

# **THE POPRAD ECONOMIC AND MANAGEMENT FORUM 2022**

Peter Madzík and Masoud Askarnia (editors)

*Conference Proceedings from International Scientific Conference*

10th – 11th November 2022

Poprad, Slovak Republic





Faculty of Management  
Comenius University Bratislava



Faculty of Education  
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2022

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## PEMF 2022

The 4th year of the PEMF conference is devoted to presenting current problems, trends and challenges in the field of theory and practice of business and non-business management in the domestic and international environment. The exchange of current theoretical and practical knowledge in the field of holistic management in the time of digital transformation is desirable and urgent. Exchange of actual theoretical and practical knowledge resulting from the area of holistic management is required. A wider public platform will contribute to the fulfilment of the idea of meaningful cooperation of theory and practice, higher quality of university programmes of studies, networking and mutual positive enrichment of experts from practice, scientific and academic staff and last but not least, students as well.

The conference is divided into four topical areas:

- Management, HRM and Finance in the Post-Covid Era (part of this topic area is the result of solving the project KEGA 012UCM-4/2022 Human Resources Management in a Digital World – A Bilingual (Slovak-English) Course Book with E-learning Modules based on Multimedia Content)
  - trends in business management and economics,
  - application of advanced information technologies in the field of HR (and traditional HR activities),
  - new approaches to reconciling soft and hard aspects of human resource management within traditional human resource activities,
  - HR in the Age of Society 5.0 (Human-centered Society), HR as a platform to connect emerging technological innovations with social problems,
  - intergenerational aspects and their impact on the use of tools in HR Impact of the COVID-19 pandemic on the HR area,
  - Expected transformations in HR and their meaningful involvement in business,
  - Promises and realities of data science in HR, related to ethical issues of equality, transparency and justice in the workplace,
  - New paths in e-HRM and i-HRM, digital HRM, augmented reality in HRM and other emerging concepts that will shape the future.
- Intellectual Capital Management and Measuring the Innovation of Companies (part of this topic area is the result of solving the project VEGA 1/0773/20 Management of Intellectual Capital and Measuring of Innovativeness of Slovak Companies)
  - intellectual capital management and its specifics in different types of organizations,
  - approaches to the management of individual components of ICM (human capital, structural capital, relational capital),
  - support for innovation and innovation activity of companies,
  - measuring business innovation,
  - resource-oriented approaches to strategic management,
  - intellectual capital reporting,
  - intellectual capital as part of performance management,
  - creative potential of organizations and regions.

- Examination of Changes in Management of Companies in Connection to Industry 4.0 Transition (part of this topic area is the result of solving the project VEGA 1/0792/20 Examination of Changes in Management of Companies in Slovakia in Connection to Industry 4.0 Transition)
  - industry 4.0 through the perspective of business management,
  - digitalization and digital transformation,
  - measuring the impact of digitalization,
  - agile approaches in management,
  - strategic aspects of Industry 4.0,
  - risk management in relation to digitalization,
  - new trends in management and organizational culture.
- Entrepreneurship in the Era of Digitalization: Pragmatic Approach (part of this topic area is the result of solving the project APVV-19-0581 Cross-Generational Entrepreneurship in the Era of Digitalization: Pragmatic Approach)
  - business at the time of digitalization
  - digital business
  - intergenerational business
  - inclusive entrepreneurship (entrepreneurship of women, young people, seniors, migrants, minorities,...)
  - academic entrepreneurship and student entrepreneurship
  - doing business within large organizations (intrapreneurship)
  - family business
  - start-ups and innovative businesses
  - business support in the age of digitalization.

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## Table of contents

FOREWORD.....	11
<b>SESSION A: MANAGEMENT, HRM AND FINANCE IN THE POST-COVID ERA</b>	
THE CHANGES IN PERCEPTION OF CORPORATE CULTURE DUE TO THE COVID-19 PANDEMIC: A STUDY IN RETAIL SECTOR Silvia Lorincova, Milos Hitka, Lenka Lizbetinova and Lubica Bajzikova.....	16
THE UTILIZATION OF DIGITAL TOOLS AND GAMIFICATION IN THE ADAPTATION PROCESS OF Z GENERATION EMPLOYEES Zdenko Stacho, Michal Hamar, Katarína Stachová and Lubica Varečková.....	30
POSSIBILITIES OF INFLUENCING ORGANISATIONAL CULTURE BY MEANS OF EMPLOYEE RECRUITMENT Erik Hegedűs, Katarína Stachová, Zdenko Stacho and Jana Galera Matúšová .....	41
WORK IN THE SHARING ECONOMY – PROS AND CONS Cecília Olexová, Karolína Červená and Anna Vartašová.....	56
CHANGES IN EMPLOYEE TRAINING AND DEVELOPMENT IN SLOVAKIA DURING THE COVID-19 PANDEMIC Lukáš Smerek .....	64
PROPOSAL FOR OPTIMIZATION OF HUMAN RESOURCES IN RAILWAY TRANSPORT OPERATION Eva Nedeliaková, Lenka Ližbetinová and Michal Valla .....	73
REMUNERATION OF EMPLOYEES AS A TOOL OF STRATEGIC MANAGEMENT OF HUMAN RESOURCES Zuzana Joniaková, Lenka Mikle, Jana Blštáková and Viktória Ali Taha .....	85
IMPLEMENTATION OF INDUSTRY 4.0 ELEMENTS IN SMES – COMPARATIVE ANALYSIS Alžbeta Kucharčíková, Nikola Štaffenová, Natália Bodorová, Erika Juríčková and Natália Zaťurová.....	100
<b>SESSION B: INTELLECTUAL CAPITAL MANAGEMENT AND MEASURING THE INNOVATION OF COMPANIES</b>	
INTELLECTUAL CAPITAL FACTORS IN FINANCIAL HEALTH PREDICTION Lenka Papíková and Mário Papík.....	115
TRENDS IN THE FIELD OF SMART PACKAGING IN THE CONTEXT OF BIOECONOMY Erika Loučanová, Martina Nosáľová, Ján Parobek, Katarína Repková-Štofková and Miriam Olšiaková .....	124
ANALYSIS OF PAYMENT DISCIPLINE IN THE PAYMENT OF INSURANCE PREMIUMS TO THE SOCIAL INSURANCE AGENCY IN THE SLOVAK REPUBLIC Tatiana Hajdúková, Lucia Kurilovská and Edita Lukáčiková .....	135
APPLICATION OF THE BALANCED SCORECARD METHOD IN AN EDUCATIONAL INSTITUTION Anna Diačiková, Iveta Ubrežiová and Jozef Hanušin .....	146
OPTIONS OF FINANCING STARTUPS IN SLOVAKIA Lucia Klapáčová and Zuzana Stoličná.....	157
IMPACT OF COVID-19 ON KPIs DEVELOPMENT FOCUSED ON INVENTORY TURNOVER RATIO IN AUTOMOTIVE SECTOR Monika Kleinová .....	165
E-GOVERNMENT STATE OF PLAY IN V4 COUNTRIES Michal Bečka and Jana Kajanová.....	175
INDUSTRY 4.0 IN CONSTRUCTION INDUSTRY: THE OVERVIEW OF RELATED TECHNOLOGIES Dávid Paculík and Zuzana Papulová .....	189

THE DEPENDENCY OF OPERATING PROFIT ON STRATEGIC GOALS IN SMALL AND MEDIUM ENTERPRISES Jürgen Klausmann and Jozef Papula .....	197
CONSUMER NEUROSCIENCE AS A TOOL FOR OBTAINING SUBCONSCIOUS USER EXPERIENCE IN M-COMMERCE Jakub Berčík, Jana Gálová and Adriana Rusková .....	209

### **SESSION C: EXAMINATION OF CHANGES IN MANAGEMENT OF COMPANIES IN CONNECTION TO INDUSTRY 4.0 TRANSITION**

THE CONTRIBUTION OF POLITICAL ECONOMY IN THE FACE OF THE CURRENT CRISES Alain Buzelay and Frédéric Delaneuville .....	219
PROJECT MANAGEMENT OF THE FUTURE - EXPLOIT THE POTENTIAL OF MEGATRENDS AND DIGITALIZATION Agnes Wittrich .....	224
THE APPLICATION OF THE SMED METHOD TO OPTIMIZE THE TIME OF USING OF MACHINES AND DEVICES Edyta Kardas, Magdalena Woźniak, Silvie Brožová, Klára Blechová, Aleš Slíva, Robert Brázda and Samuel Cienciala .....	236
PROBLEMS IN THE E-SERVICE PROVISION PROCESS IN ENTERPRISES FROM THE SME SECTOR Manuela Ingaldi, Silvie Brožová, Klára Blechová, Aleš Slíva, Robert Brázda and Dávid Srníček.....	245
EFFECTS OF THE COVID-19 PANDEMIC IN THE SLOVAK HOReCA SECTOR Monika Bálintová, Anikó Barcziová and Renáta Machová.....	259
THE LEVEL OF COVID 19 IMPACT DEPENDENT ON THE TYPE OF STRATEGY IMPLEMENTED IN SMALL AND MEDIUM ENTERPRISES Jürgen Klausmann and Jozef Papula .....	271
WORK FROM HOME AS A TOOL FOR MORE EFFICIENT BUSINESS Matúš Baráth and Dušana Alshatti Schmidt .....	284
UNIVERSITY-INDUSTRY COLLABORATION IN THE CONTEXT OF INDUSTRY 4.0 CHALLENGES Lucia Kohnová and Nikola Salajová .....	296
E-LEADER-ETHICS – A NEW APPROACH FOR FORMING E-TRUST BASED ON INFORMATION SYMMETRY Frauke Kempner .....	308
REMOTE WORK AS A NEW STANDARD? COST SAVING AND PRODUCTIVITY INCREASE WITH REMOTE WORK IN THE SLOVAK TRANSLATIONS SERVICES SECTOR Jana Kajanová and Natália Barteková .....	318
HOW TO INCREASE THE MOTIVATIONAL POTENTIAL OF ORGANIZATIONAL CULTURE? Lukáš Copuš, Katarína Moravčíková, Michaela Poláková and Juliet Horváthová Suleimanová .....	327
HOME OFFICE AS AN OPPORTUNITY TO INCREASE THE FLEXIBILITY AND PERFORMANCE OF EMPLOYEES Jaroslava Bučková and Judyta Przyłuska-Schmitt.....	337
RELATIONSHIP BETWEEN ORGANISATIONAL CULTURE AND NATIONAL CULTURE ON THE EXAMPLE OF CLASSICAL MANAGEMENT APPROACH THEORIES Lukáš Copuš and Michaela Poláková .....	345
INNOVATIVE DEVELOPMENT IN AGRICULTURE 4.0 AND THE USE OF SMART TECHNOLOGIES Dávid Paculík, Andrea Gažová .....	354
THE USE OF INDUSTRY 4.0 CONCEPTS AND TECHNOLOGIES IN WASTE MANAGEMENT SECTOR Dominik Trubač, Dávid Smolka, Katarína Adamkovičová and Zuzana Papulová .....	363

### **SESSION D: ENTREPRENEURSHIP IN THE ERA OF DIGITALIZATION**

THE DIGITAL TRANSFORMATION OF HUMAN RESOURCE MANAGEMENT IN GREECE. A CRITICAL REVIEW Vassiliki Exarchou, George Aspridis and Ilias Savvas .....	372
ETHICAL BEHAVIOR OF THE EMPLOYEES WORKING IN SMES Tibor Zsigmond, Renáta Machová and Annamária Zsigmondová .....	383

PLANNED OBSOLESCENCE WITH THE EYES OF UNIVERSITY STUDENTS Renáta Machová and Tibor Zsigmond.....	392
MODEL FOR THE EMOTIONAL INTELLIGENCE'S DEVELOPMENT IN ENTREPRENEURSHIP Juraj Mikuš, Anna Pilková, Yuliia Fedorova and Yuri Bytan .....	402
MOTIVATION OF EMPLOYEES IN FAMILY AND NON-FAMILY BUSINESS Mária Vrábliková, Zuzana Gončárová, Liliana Škodová and Zuzana Faturíková .....	410
PERSONNEL MARKETING AND PERSONNEL MANAGEMENT IN THE PRACTICE OF SMALL AND MEDIUM-SIZED ENTERPRISES Anna Hrnčiarová Turčiaková .....	423
CLUSTERING OF SLOVAK CONSUMERS ACCORDING TO THEIR ATTITUDES TOWARDS ADVERTISING Martina Jantová, Tadeáš Chujac and Peter Štarchoň .....	431
DESIGN OF ADVERTISING CAMPAIGN ON A SOCIAL NETWORK FOR THE EDUCATIONAL PROJECT Karol Čarnogurský and Ľuboš Koval' .....	443
MEASURING THE WAGE GAP FROM A GENDER AND REGIONAL PERSPECTIVE AMONG UNIVERSITY GRADUATES 2013 IN SLOVAKIA Urban Kováč and Lukrécia Kováč Gerulová.....	453
COOPERATION BETWEEN UNIVERSITY AND COWORKING SPACE IN THE PROCESS OF EDUCATION AND TECHNOLOGY TRANSFER Natália Vančíšínová, Anna Pilková and Marian Holienka .....	464
MODELING ONLINE CONSUMER BEHAVIOR TO SHAPE SHOPPING IN E-MARKET Masoud Askarnia and Peter Madzík .....	474
FACTORS INFLUENCING THE STUDENT ENTREPRENEURSHIP: WHERE IS ECONOMIC AND FINANCIAL LITERACY? Lucia Pančíková, Lukáš Falát and Zuzana Staníková.....	484

## Foreword

The International Scientific Conference has been organized since 2008 by the Department of Management, which is the part of the Faculty of Education of the Catholic University in Ružomberok. This is the fourth time, when it is organized under the integrated name **The Poprad Economic and Management Forum 2022**. During the history of the Management Department three conferences were organized:

- International Scientific Conference - **The Messages of John Paul II. in economics, management and human life** (1st - 9th year in 2008 - 2016)
- International Scientific Conference - **A knowledge-based organization in the period of globalization and internationalization** (1st - 6th year in 2009-2014)
- International Scientific Conference - **Marketing Trends in the Knowledge Society** (1st - 4th year in 2011-2014)

During this period, the external environment that formed the university education changed significantly and this influenced the strategic decision of the Department of Management to organize one integrated conference from 2017. The PEMF (Poprad Economic and Management Forum) conference is being held for the fourth time in a row under this unified name.

**The fourth year of Poprad Economic and Management Forum 2022 (PEMF 2022)** followed the successful three years and was aimed at the presentation of current trends and challenges in the field of management of organisations.

The conference is divided into four topical areas:

- Management, HRM and Finance in the Post-Covid Era (part of this topic area is the result of solving the project KEGA 012UCM-4/2022 Human Resources Management in a Digital World – A Bilingual (Slovak-English) Course Book with E-learning Modules based on Multimedia Content)
- Intellectual Capital Management and Measuring the Innovation of Companies (part of this topic area is the result of solving the project VEGA 1/0773/20 Management of Intellectual Capital and Measuring of Innovativeness of Slovak Companies)
- Examination of Changes in Management of Companies in Connection to Industry 4.0 Transition (part of this topic area is the result of solving the project VEGA 1/0792/20 Examination of Changes in Management of Companies in Slovakia in Connection to Industry 4.0 Transition)
- Entrepreneurship in the Era of Digitalization: Pragmatic Approach (part of this topic area is the result of solving the project APVV-19-0581 Cross-Generational Entrepreneurship in the Era of Digitalization: Pragmatic Approach)

The first two years of PEMF were successful in terms of international participation and scientific discussions. For this reason, a closer cooperation was later established with the Faculty of Management, Comenius University Bratislava. This cooperation resulted in the joint organization of PEMF 2021. Comenius University Bratislava is the largest Slovak university with a very good international reputation focusing on social, technical, medical, philosophical and other scientific fields. Catholic University in Ružomberok, in cooperation with Comenius University in Bratislava, organized the third year of PEMF 2021. Two other entities joined the organization of the 4th edition of the conference in

2022, namely another Slovak university from the academic environment University of Ss. Cyril and Methodius in Trnava and Slovak Academic Association for Personnel Management (SAAPM). Historically, most participants from several countries (seven) took part in this year.

The topics discussed in the presentation of papers reflect current trends and challenges in management and economics, concerning social changes related to the pandemic and the automation of production, the development of information technology, business strategy, etc. We believe that this event will build on successful past years and become a suitable platform for scientific discussion, development of partnerships, and personal contacts, thus contributing to the transfer of knowledge in managerial and economic disciplines.

Poprad, 2022 November

Anna Diačiková

Chair of Organizational Committee of PEMF 2022  
Department of Management  
Faculty of Education  
Catholic University in Ružomberok



## **Session A**

# **Management, HRM and Finance in the Post-Covid Era**

*part of this topic area is the result of solving the project KEGA 012UCM-4/2022 Human Resources Management in a Digital World – A Bilingual (Slovak-English) Course Book with E-learning Modules based on Multimedia Content*





## **The Changes in Perception of Corporate Culture due to the COVID-19 Pandemic: A Study in Retail Sector**

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### **Abstract**

The COVID-19 pandemic can surely be considered one of the most significant factors that have interfered with the global economy and business processes. This research paper aims to define the level of corporate culture and to find out whether there have been significant changes in perception of corporate culture due to the COVID-19 pandemic. The research was carried out in retail sector in the years 2021 and 2022 on a sample of more than 1,000 respondents. It follows the Cameron and Quinn methodology. The questionnaire was based on The Organizational Culture Assessment Instrument. The research results were analysed using the Tukey HSD test. The main findings suggest that there have been significant changes in perception of corporate culture due to the COVID-19 pandemic. Further findings indicate that retail sector apply clan culture that focuses on employee support. It is recommended that managers aim their strategy at supporting human resources because employees with innovative ideas, abilities, skills, and performance directly influence the company success. Moreover, it is also a competitive advantage that, at the same time, enables companies to be responsible while facing the repercussions of the COVID-19 pandemic.

**Keywords:** HRM; corporate culture; The Organizational Culture Assessment Instrument; COVID-19; retail sector.

**Article Classification:** Research article

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## 1 Introduction

A system of purposeful use and continuous development of the human resource is an inevitable part of managing any business. The main aim is embodied in creating conditions for effective fulfilment of the entrepreneurial concept based on maximizing employee performance. A key factor considered to significantly influence performance is the corporate culture that exists in every economic entity (Tulcanaza-Prieto et al., 2021; Pervakova, 2020). People are its carriers. The fact why they became the company employees, what their relationships are, what standards and life principles they determine and respect, and what is good and bad in their view, all these influence organizational standards and values not only distinguish one company from another but also determine the performance, functionality, and viability of the company from a long-term perspective (Tian et al., 2022; Sun, and Li, 2021; Stacho et al., 2017; Lizbetin, and Stopka, 2016).

Corporate culture may be perceived as a set of how the company functions and how much its management succeeds to meet its goals. It is also the everyday practice of carrying out purposes of managers, which eventually influences the offer to customers (Miklosik et al., 2020; Nedeliakova et al., 2020). Corporate culture is the functional equivalent to organizational structure, which influences the formal relationships in the company that stabilize its operation (Mura et al., 2021). Corporate culture may have its own form that is different from other companies. When a company has been established the interaction among management and employees is based mainly on general social principles and is dominated by work issues. Everything especially conforms to keep the company running. Gradually, when it is developed, the management clarifies the values they would like to enforce, their own style is being formed and informal relationships evolve. It builds its own system of real corporate culture, the concept of which is adjusted to employee demands, social requirements, and company goals (Ali Taha et al., 2016). Often a situation may arise where neither the management nor the employees are aware of the corporate culture. This relates to the fact that in a company existing for a long time, the culture is taken for granted.

Corporate culture arises spontaneously. It is a result of the natural activities of the company employees who have different personal and individual attributes and characters (Belas et al., 2020). Apart from personal and individual employee attributes, other factors have a bearing on the creation of the corporate culture such as external influence, the environment, rules, standards, and conditions which also influence employee behaviour and performance (Stacho et al., 2020; Gejdos and Potkany, 2017). Research so far focuses on corporate culture in different fields. Barth and Mansouri (2021) analyse the role of corporate culture in banking. Wang and Huang (2022) study the relationship between corporate culture and corporate sustainability performance. Tulcanaza-Prieto et al. (2022) examine how organizational culture influences corporate performance. Empirical evidence between employees' green performance, organizational culture, and adaptability capability was found in the research of Woo and Kang (2021).

One of the most significant factors that have recently interfered with the global economy and business processes may be considered the COVID-19 pandemic (Capolupo et al., 2022; Aktar et al., 2021). Previous research was focused on the impacts of COVID-19 in various contexts. Global impact of COVID-19 on health was measured in the research of Nogueira et al. (2021), Roy et al. (2021), and Laranjeira et al. (2022). The climate impacts of COVID-19 were analysed in the research of Gettelman et al. (2021). Seetharaman (2020) deals with the business model shifts and the impact of COVID-19. The early food insecurity impacts of COVID-19 were assessed in the research of Niles et al. (2020). Aday and Aday (2021) evaluated the impact of COVID-19 on the agriculture

and food sector. The impact of COVID-19 on retail was examined in Australia (Boroujeni et al., 2021), Canada (Goddard, 2020), and China (Lu et al., 2021).

The existing research stresses the need to examine the impacts of COVID-19 in various fields and points to a gap in research. Our research deals with examining the repercussions of the COVID-19 pandemic on corporate culture. It aims to define the level of corporate structure and to find out whether there have been significant changes in perception of corporate culture due to the COVID-19 pandemic. The study works with the opinions of employees working in retail sector in Slovakia. Although retail sector has an important status in the supply chain of citizens and within the flow of goods, in the pandemic time this sector recorded a negative development.

## 2 Material and Methods

The research of corporate culture was carried out in retail sector in 2021 and 2022. Cochran's Rule was used to state the minimum size of the research sample (Pacáková, 2009):

$$n_0 = \frac{z^2 pq}{e^2} \quad (1)$$

where  $z$  – critical value equivalent to the selected reliability of the assumption;  $p$  – preliminary assumption of relative number;  $q$  – equals to  $1 - p$ ;  $e$  – selected error of assumption. To be able to generalize the results, for the selected 95% reliability, accuracy of at least 5%, and critical value equivalent to the selected assumption of 1.96, the minimum size is equal to 385 respondents. Overall, 1,007 respondents took part in the research, out of which 596 respondents in 2021 and 411 respondents in 2022, which fulfilled the criteria of minimum sample size concerning conventions used in the research.

A questionnaire by American authors Cameron and Quinn (1999) was used to diagnose the corporate culture. It originated based on The Competing Values Framework. According to this theory, it is possible to categorize ways of thinking, accepted values, and understanding information into schemes. The typology arose from results obtained from research on the main factors of effectiveness of companies. Out of all thirty-nine factors of effectiveness, which were statistically analysed by the quoted authors, the two most important dimensions were identified. One of the dimensions concerns discretion, flexibility, and dynamism as opposed to order, stability, and control. The second dimension differentiates an internal orientation focusing on integration and unity from an external orientation focusing on differentiation and competition. Based on these dimensions four types of corporate culture are formed, namely clan, adhocracy, market, and hierarchy. Each type of corporate culture comprises factors of effectiveness. These factors rely on what the employees in the organization value, and what they perceive as good, and they mirror values according to which they see the organization. The questionnaire consisted of six fields (dominant characteristics, organizational leadership, management of employees, organizational glue, strategic emphases, and criteria of success), each one consisting of four sub-fields (alternatives A, B, C, and D). Respondents divided 100 points into each field among the individual alternatives according to their idea of which is nowadays the closest or most corresponding with the status quo.

The data obtained from the questionnaires were assessed in the program Statistics. The statistical method of simple arithmetic average was used, utilizing the figure (Scheer, 2007):

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} \quad (1)$$

where  $\bar{x}$  = arithmetic average,  $xi$  = individual values,  $n$  = overall number of the sample. For finding the overall type of corporate culture (clan, adhocracy, market, or hierarchy), arithmetic averages of the individual alternatives from all fields were added and the overall average was quantified. The 95% confidence interval was used. The results were further analysed using the Tukey HSD test, which according to Zaiontza (2021) enables focusing on the greatest value of the difference between two group averages. Through the Tukey HSD test, the hypothesis with following assumption was tested: there are differences in the level of corporate culture in retail sector due to the COVID-19 pandemic.

### 3 Results

The first research field dealt with the dominant characteristics. Figure 1 presents the comparison of the research results in the years 2021 and 2022. The research results indicate that in the year 2021 respondents assigned the greatest significance to alternative A ( $\bar{x} = 36.74$ ). Concerning alternative A, respondents perceived that a company is a very personal place, like a bigger family, where employees often interact and have much in common. Similarly in the year 2022, respondents assigned the highest average values to alternative A ( $\bar{x} = 31.39$ ). Respondents had the same opinion as in the year 2021, however, when tested through the Tukey HSD test, research results of which are presented in Table 1, it may be stated that in the year 2022 compared with 2021 there was a statistically significant change in perception of dominant characteristics in retail sector ( $p = 0.005$ ).

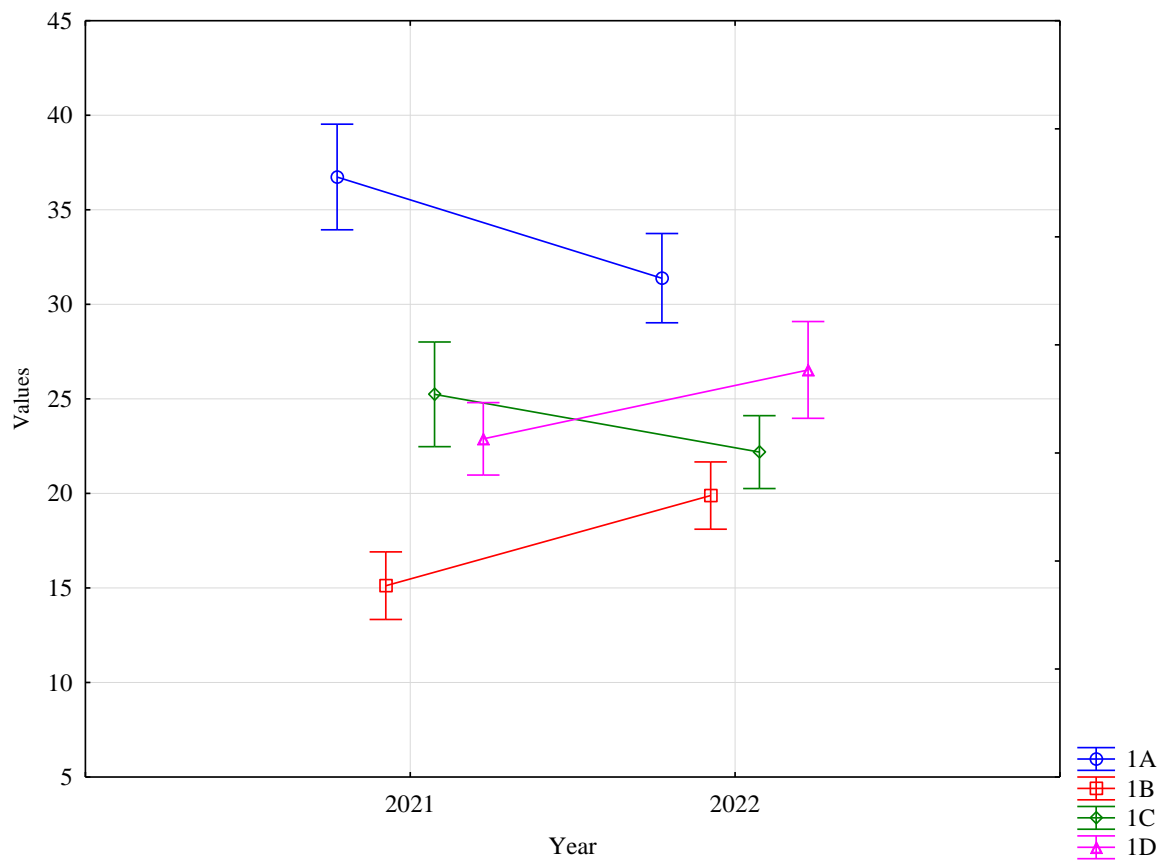


Figure 1 Comparison of dominant characteristics in retail sector (own elaboration)

Table 1 The Tukey HSD test in the field of dominant characteristics in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.005*		0.000*		0.083		0.022*
2022	0.005*		0.000*		0.083		0.022*	

Note: Single asterisk (\*) indicates significance at 5%.

In the second field researched, organizational leadership, respondents assigned the greatest significance to alternative A ( $\bar{x} = 33.820$ ). This suggests that in the respondents' opinion leadership was based on mentoring, facilitation, and support. Similarly in the year 2022, the highest average value was observed in alternative A ( $\bar{x} = 28.212$ ). In the year 2022 alternative D reached a considerably high value ( $\bar{x} = 27.883$ ). Based on the research results, it may be stated that respondents also perceive leadership as being based on cooperation, order, and effective operation. The results of statistical tests confirm that in the year 2022 compared with 2021, there was a statistically significant change in perception of alternative A ( $p = 0.002$ ) (Table 2).

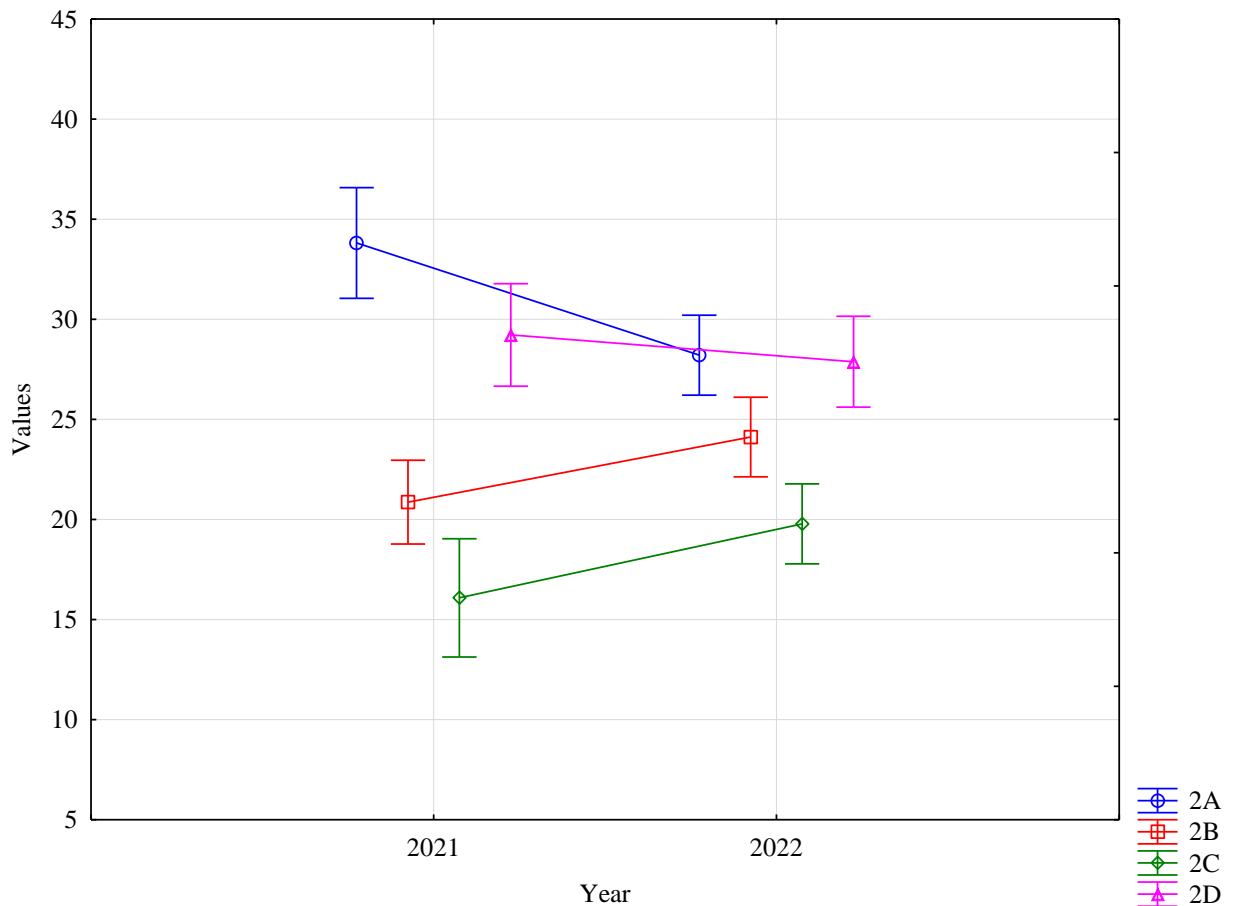


Figure 2 Comparison of organizational leadership in retail sector (own elaboration)

Research results presented in Figure 3 indicate that in the year 2021, as well as 2022, alternative A gained the highest average values also in the third field researched ( $\bar{x}_{2021} = 41.460$ ;  $\bar{x}_{2022} = 33.358$ ). Respondents felt that within the management of employees, teamwork and cooperation are practiced. The Tukey HSD test confirmed the

existence of statistically significant differences in perception of alternative A ( $p = 0.000$ ) (Table 3).

Table 2 The Tukey HSD test in the field of organizational leadership in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.002*		0.028*		0.048*		0.446
2022	0.002*		0.028*		0.048*		0.446	

Note: Single asterisk (\*) indicates significance at 5%.

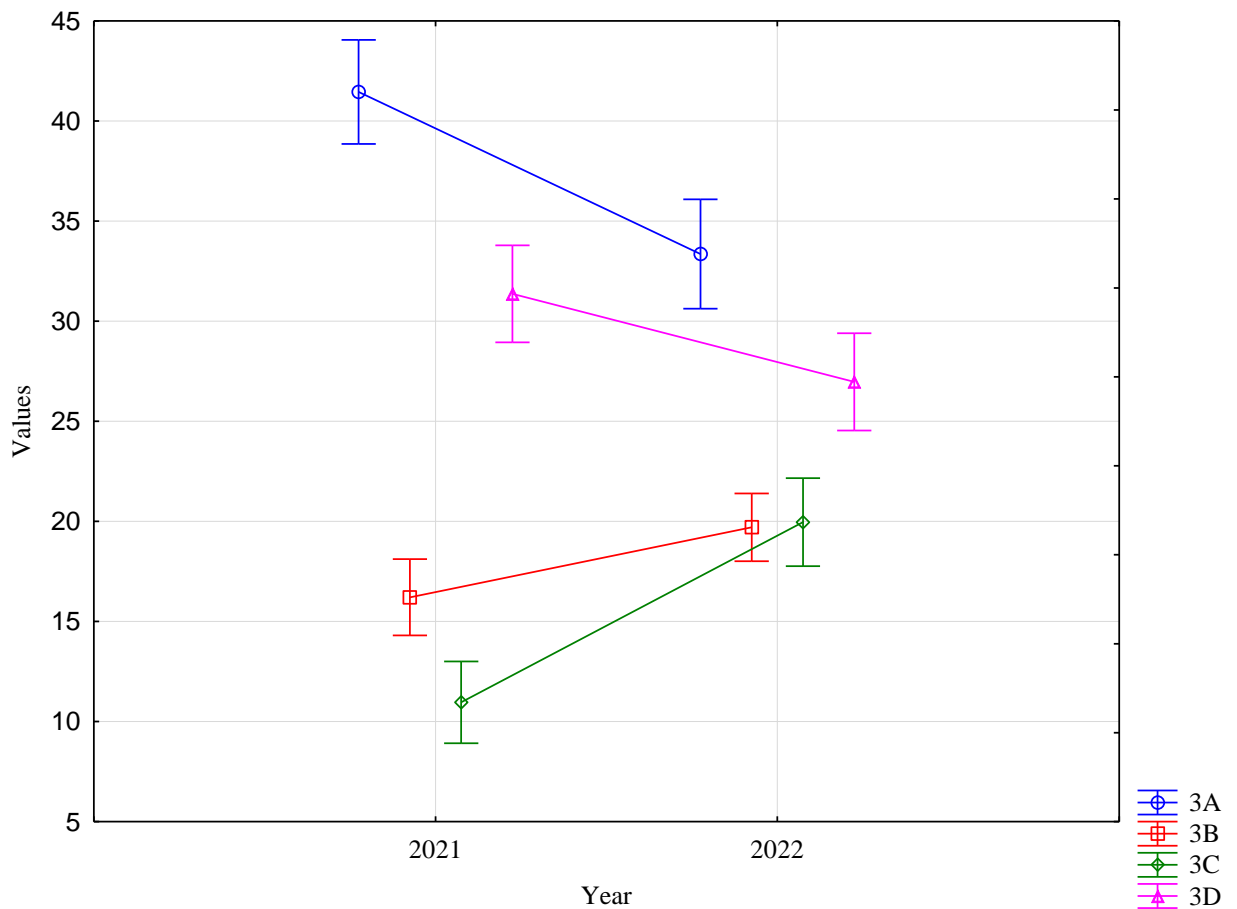


Figure 3 Comparison of management of employees in retail sector (own elaboration)

In the field of organizational glue in the years 2021, as well as 2022, alternative A dominates again ( $\bar{x}_{2021} = 31.025$ ;  $\bar{x}_{2022} = 30.073$ ) (Figure 4). Respondents hold the opinion that employees in retail sector are connected by loyalty and mutual trust. Research results presented in Table 4 suggest that in this field there was no statistically significant change in the respondents' opinions ( $p = 0.558$ ).

Table 3 The Tukey HSD test in the field of management of employees in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.000*		0.000*		0.000*		0.012*
2022	0.000*		0.000*		0.000*		0.012*	

Note: Single asterisk (\*) indicates significance at 5%.

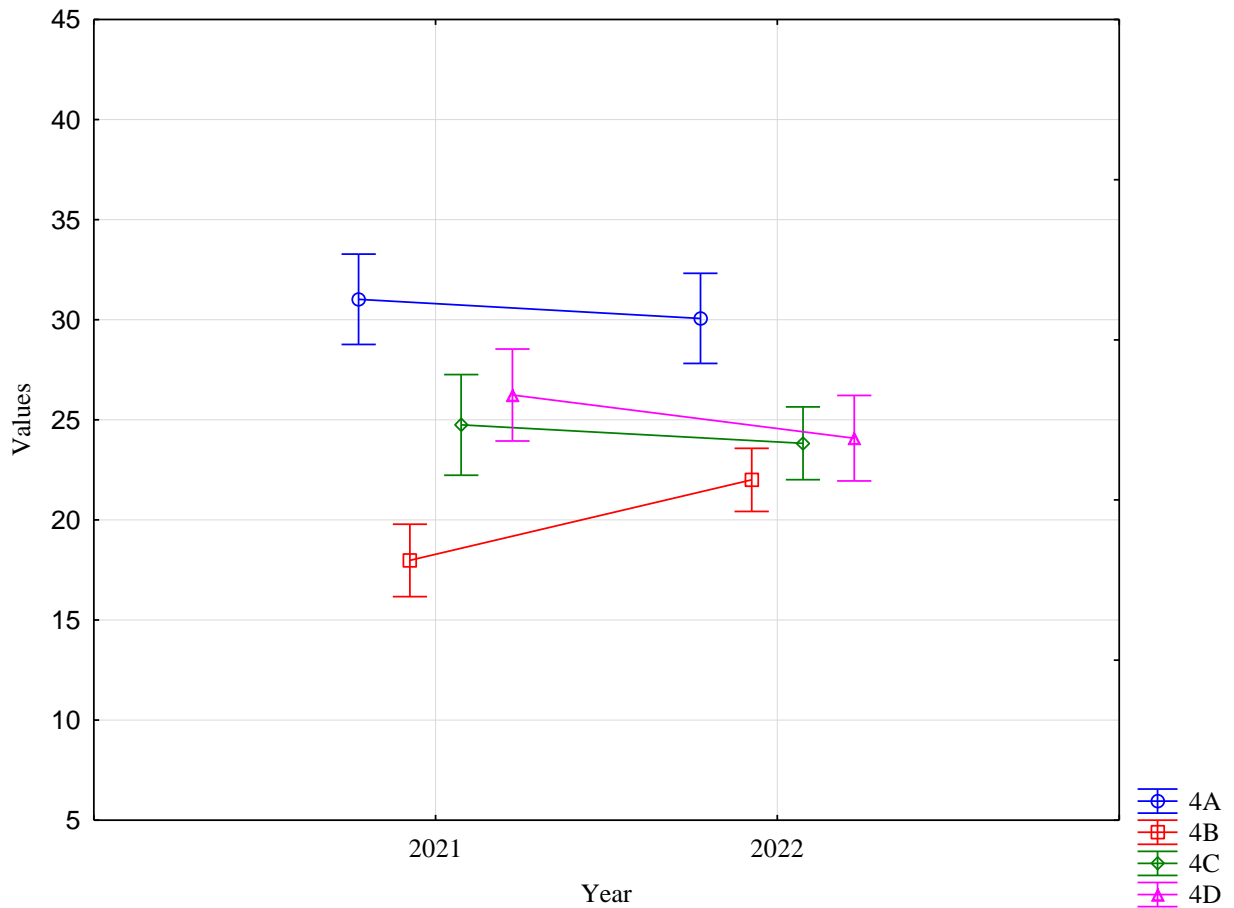


Figure 4 Comparison of organizational glue in retail sector (own elaboration)

Table 4 The Tukey HSD test in the field of organizational glue in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.558		0.001*		0.570		0.180
2022	0.558		0.001*		0.570		0.180	

Note: Single asterisk (\*) indicates significance at 5%.

Another field researched was strategic emphases. The research results are presented in Figure 5. In the year 2021 respondents identified that strategies in retail sector aimed at balance and stability. At the same time efficiency, control, and uninterrupted operation were important. Alternative D dominated ( $\bar{x} = 32.621$ ).

Nonetheless, in respondents' opinion, in the year 2022 retail sector emphasized the development of employees, trust, openness, and continuous solidarity. Alternative A prevailed ( $\bar{x} = 28.941$ ). Statistical testing through the Tukey HSD test presented in Table 5 confirmed statistically significant differences only in the perception of alternative D ( $p = 0.000$ ).

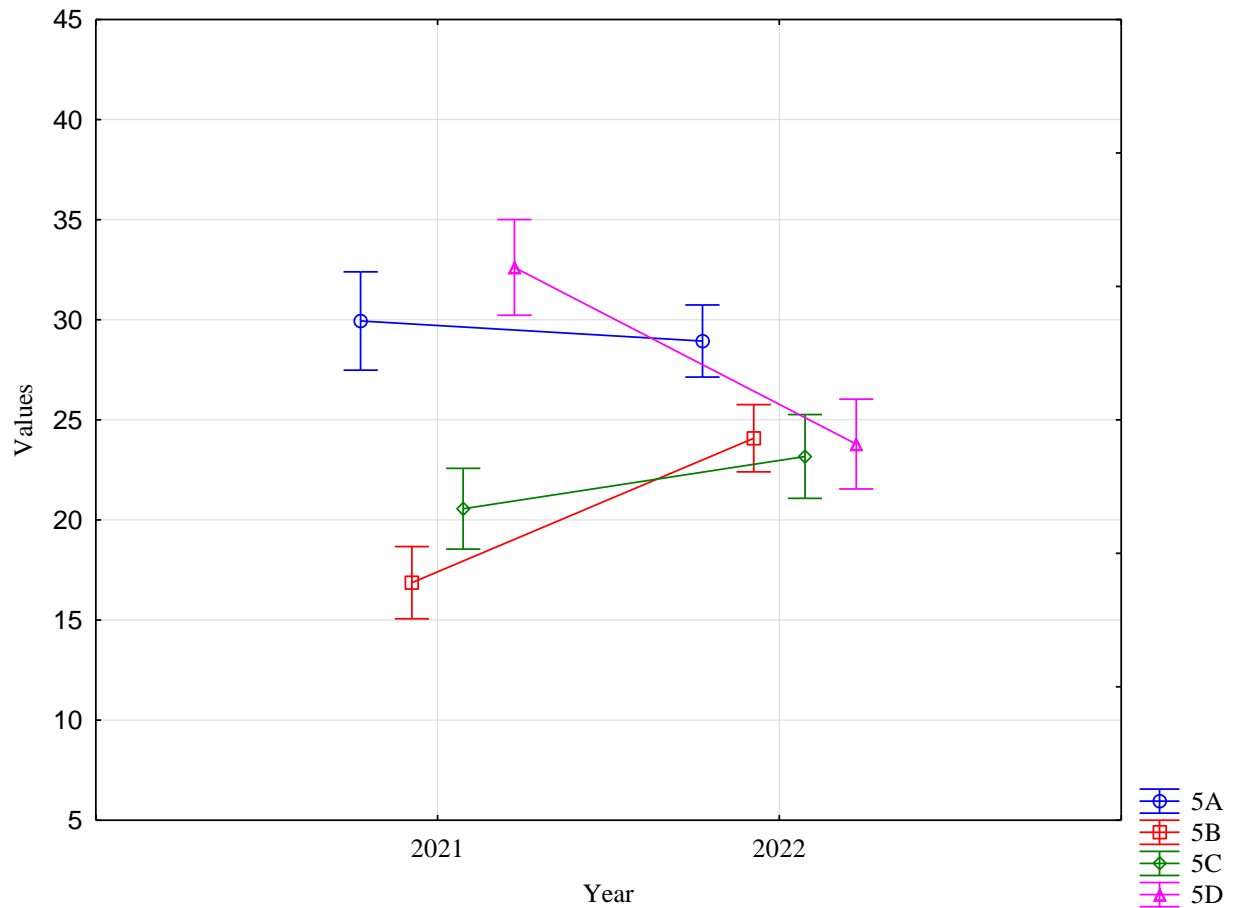


Figure 5 Comparison of strategic emphases in retail sector (own elaboration)

Table 5 The Tukey HSD test in the field of strategic emphases in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.528		0.000*		0.077		0.000*
2022	0.528		0.000*		0.077		0.000*	

Note: Single asterisk (\*) indicates significance at 5%.

In the field of criteria of success in the year 2021 respondents assigned the greatest values to alternative D ( $\bar{x} = 30.155$ ). Based on the research results it may be stated that in respondents' opinion retail sector defined success based on effectiveness. At the same time, it is necessary to state that alternative A also received relatively high average values ( $\bar{x} = 29.969$ ). Considering alternative A, employees working in retail sector also defined success based on the development of human resources, teamwork, engagement, and interest of employees. The situation was similar in the year 2022 when alternative D ( $\bar{x} = 27.504$ ) and alternative A ( $\bar{x} = 27.080$ ) gained very similar values. The following



statistical testing through the Tukey HSD test neither confirmed the existence of significant differences in the perception of alternative D ( $p = 0.112$ ) nor in the perception of alternative A ( $p = 0.092$ ).

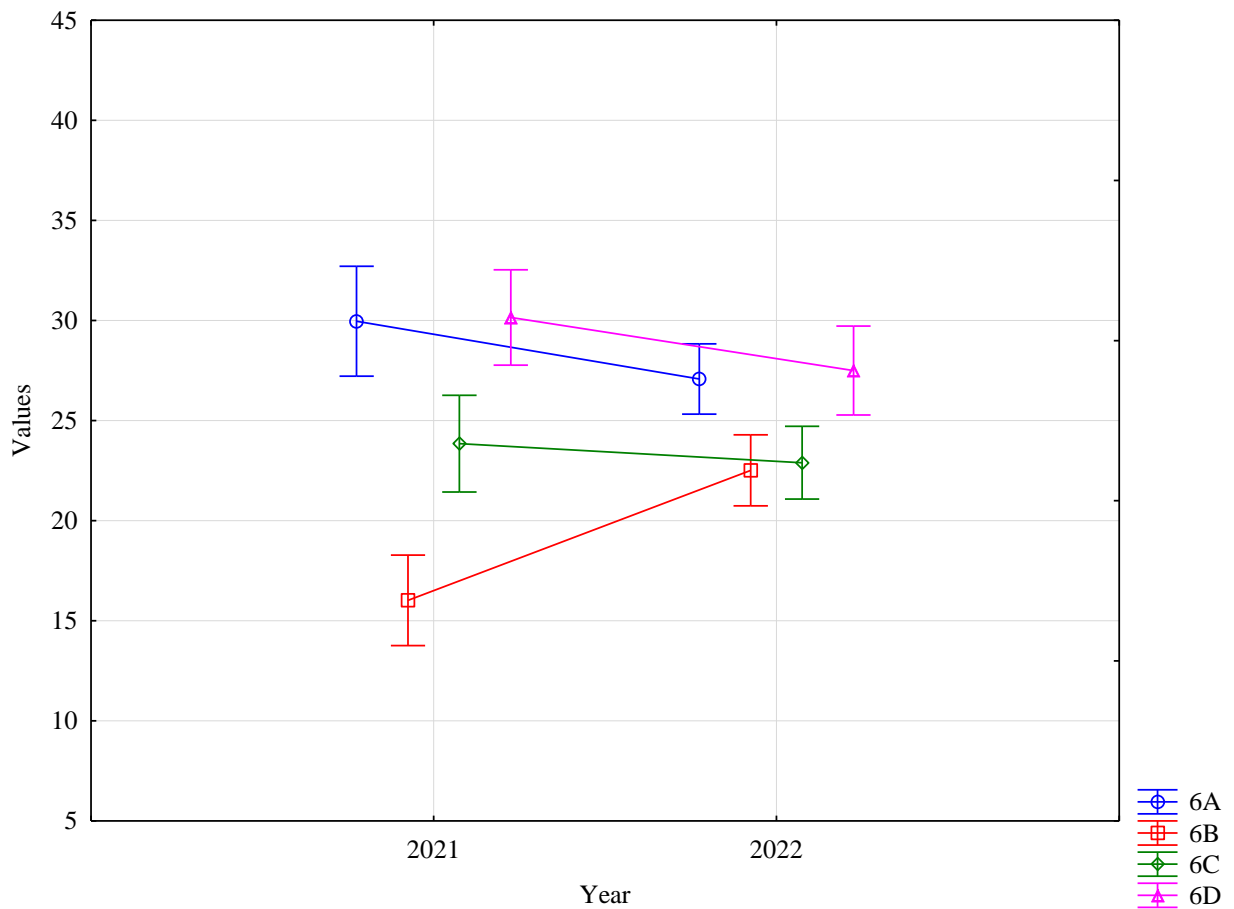


Figure 6 Comparison of criteria of success in retail sector (own elaboration)

Table 6 The Tukey HSD test in the field of criteria of success in retail sector; own elaboration

	Alternative A		Alternative B		Alternative C		Alternative D	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.092		0.000*		0.545		0.112
2022		0.092		0.000*		0.545		0.112

Note: Single asterisk (\*) indicates significance at 5%.

Complying with the Cameron and Quinn (1999) methodology, by adding the arithmetic averages of individual alternatives from all six fields, the overall average was calculated, which presents the overall type of corporate culture prevailing in retail sector. The research results indicate that according to the respondents in retail sector in the year 2021 ( $\bar{x}_{2021} = 33.826$ ) as well as in the year 2022 ( $\bar{x}_{2022} = 29.842$ ), clan corporate culture was dominated that is typically represented by a friendly work atmosphere where employees have a lot in common, share even more personal issues and the atmosphere resembles a bigger family. The managers were sensible as mentors, advisors, and at times even role models for others. The employees of retail sector were held together by loyalty, solidarity, common habits, and traditions. Emphasis was put on the long-term benefits of

human resource development. Personal relationships, ethics, and morale were greatly valued. Success was defined in the context of openness towards the needs of customers and care for employees. Teamwork, participation, and consensus was greatly valued. At the same time, the results of the Tukey HSD test (Table 6) suggest that in the year 2022, compared with 2021, there was a statistically significant change in perception of clan corporate culture ( $p = 0.000$ ).

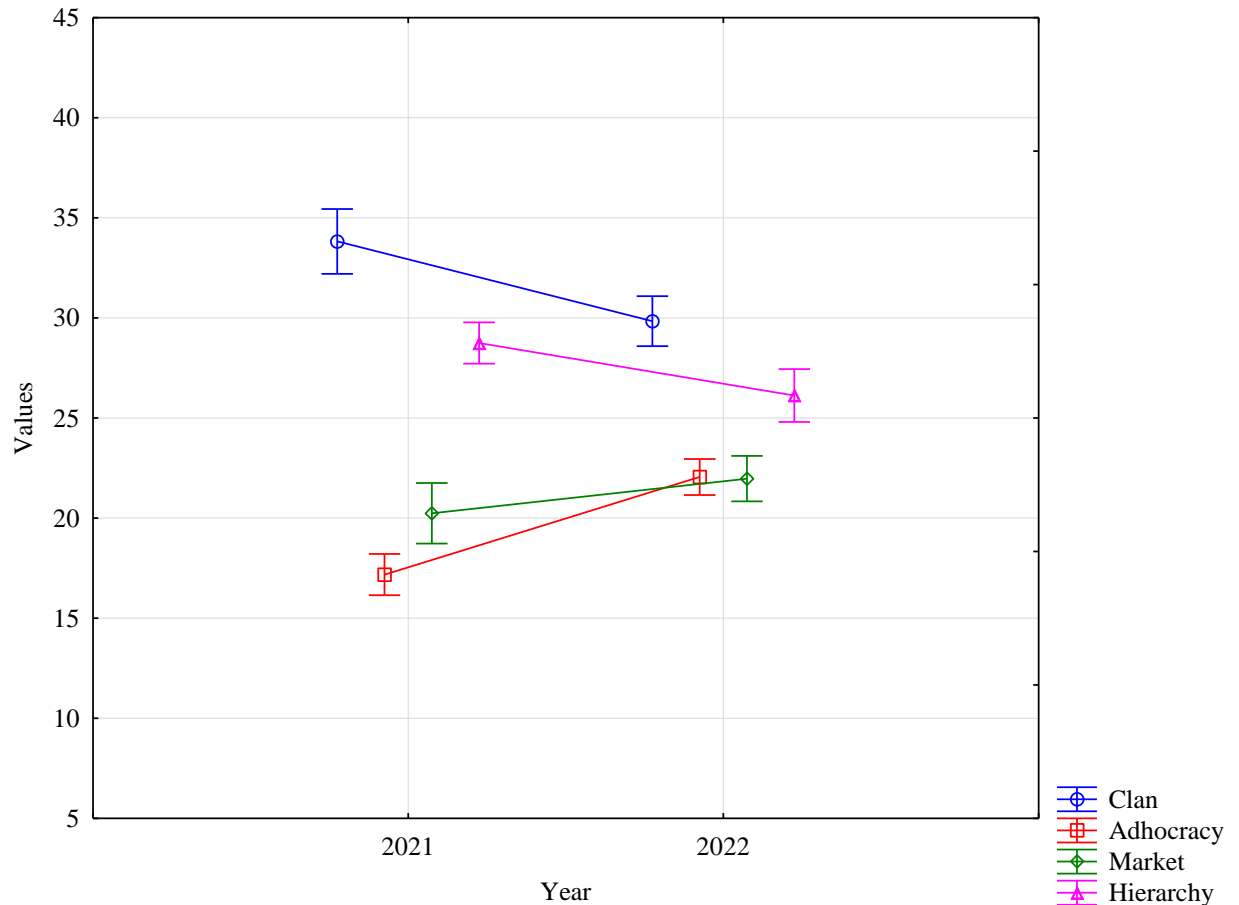


Figure 7 Comparison of corporate culture in retail sector (own elaboration)

Table 7 The Tukey HSD test in the field of corporate culture in retail sector; own elaboration

	Clan corporate culture		Adhocracy corporate culture		Market corporate culture		Hierarchy corporate culture	
	2021	2022	2021	2022	2021	2022	2021	2022
2021		0.000*		0.000*		0.079		0.002*
2022	0.000*		0.000*		0.079		0.002*	

Note: Single asterisk (\*) indicates significance at 5%.

## **4 Discussion**

The COVID-19 pandemic brought about a worldwide social and economic disruption (Olivia et al., 2020). Companies faced a drop in the demand and delayed payments from customers. The entrepreneurial income and employment dropped. Consumer spending, industrial production, investments, trade, capital flow and delivery chains were severely disrupted (Khan et al., 2021). The pandemic significantly affected the development of most sectors of economy in Slovakia, too (Kristofik and Medzihorsky, 2022). Some were more affected than other. The operation of retail sector was partially or totally limited. Although retail sector has an important status in the supply chain of citizens and within the flow of goods, in the pandemic time this sector recorded a negative development.

The aim of the research was to find out whether the COVID-19 pandemic caused significant changes in perception of corporate culture. The research was carried out in the years 2021 and 2022. More than a 1,000 employees of retail sector in Slovakia participated. It follows the Cameron and Quinn (1999) methodology. The main finding is that due to the COVID-19 pandemic there have been significant changes in perception of corporate culture. The results further indicate that in the opinion of the employees of retail sector, the clan corporate culture is dominated, which is characteristic by solidarity and high dedication to the company. Companies that apply this type of corporate culture concentrate on creating a friendly work atmosphere. Their leadership is characterized by team thinking, programmes for employee development and supporting the dedication to the company. At the same time, these are the issues highly discussed in connection with the strategic management (Pereira-Moliner et al., 2021; Tolstyakova and Batyrova, 2020; Vnouckova et al., 2015). Similarly, the research of Urbancova and Vrabcova (2020) emphasizes the need for orientation on human resources management. The reason behind is the fact that according to existing research (Ketkaew et al., 2020; Tolstyakova and Batyrova, 2020; Kucharcikova and Miciak, 2018; Olexová and Gajdoš, 2016) employees play a decisive role in the development of modern economy. Thus, we recommend that managers aim their company strategy at support of human resources because employees are the carriers of new knowledge, ideas, experience, and skills (Nasaj 2022; Gautam and Ghimire, 2017; Lim et al., 2016), thanks to which employees can significantly influence the performance of a company and its competitiveness. This will allow a company to bridge the negative impacts of the COVID-19 pandemics more easily.

## **Acknowledgements**

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## References

- Aday, S., and Aday, M.S. (2021), "Impact of COVID-19 on the food supply chain", *Food Quality and Safety*, Vol. 4 No. 4, pp. 167-180. doi: 10.1093/fqsafe/fyaa024
- Aktar, A., Alam, M.M., and Al-Amin, A. (2021), "Global economic crisis, energy use, CO2 emissions, and policy roadmap amid COVID-19", *Sustainable Production and Consumption*, Vol. 26, pp. 770-781. doi: 10.1016/j.spc.2020.12.029
- Ali Taha, V., Sirkova, M., and Ferencova, M. (2016), "The impact of organizational culture on creativity and innovation", *Polish Journal of Management Studies*, Vol. 14 No. 1, pp. 7-17. doi: 10.17512/pjms.2016.14.1.01
- Barth, A., and Mansouri, S. (2021), "Corporate culture and banking", *Journal of Economic Behavior & Organization*, Vol. 186, pp. 46-75. doi: 10.1016/j.jebo.2021.02.010
- Belas, J., Cepel, M., Gavurova, B., and Kmecová, I. (2020). "Impact of social factors on formation of business environment for SMES", *Economics & Sociology*, Vol. 13 No. 4, pp. 267-280. doi: 10.14254/2071-789X.2020/13-4/17
- Boroujeni, M., Saberian, M., and Li, J. (2021), "Environmental impacts of COVID-19 on Victoria, Australia, witnessed two waves of Coronavirus", *Environmental Science and Pollution Research*, Vol. 28 No. 11, pp. 14182-14191. doi: 10.1007/s11356-021-12556-y
- Cameron, K. S., and Quinn, R. E. (1999). *Diagnosing and Changing Organizational Culture Based on the Competing Values Framework*. Addison – Wesley, Reading, UK.
- Capolupo, N., Palumbo, R., and Adinolfi, P. (2022), "All that glitters is not gold. Exploring virtual team adoption in the Covid-19 era", *International Journal of Entrepreneurial Knowledge*, Vol. 10 No. 1, pp. 46-64. doi: 10.37335/ijek.v10i1.148
- Gautam, D. K., and Ghimire, S. B. (2017). "Psychological empowerment of employees for competitive advantages: An empirical study of Nepalese service sector," *International Journal of Law and Management*, Vol. 59 No. 4, pp. 466-488. doi: 10.1108/IJLMA-03-2016-0035
- Gejdos, M., and Potkany, M. (2017), "Prediction and analysis of Slovakian timber trade on global market conditions," *Serbian Journal of Management*, Vol. 12 No. 2, pp. 283-291. doi: 10.5937/sjm12-11228
- Gettelman, A., Lamboll, R., Bardeen, C.G., Forster, P.M., and Watson-Parris, D. (2021), "Climate impacts of COVID-19 induced emission changes", *Geophysical Research Letters*, Vol. 48 No. 3. doi: 10.1029/2020GL091805
- Goddard, E. (2020), "The impact of COVID-19 on food retail and food service in Canada: Preliminary assessment", *Canadian Journal of Agricultural Economics-Revue Canadienne D Agroéconomie*, Vol. 68 No. 2, pp. 157-161. doi: 10.1111/cjag.12243
- Ketkaew, C., Manglakakeeree, O., and Naruetharadhol, P. (2020), "The interrelationships of work-related factors, person-environment fit, and employee turnover intention", *Cogent Business & Management*, Vol. 7 No. 1. doi: 10.1080/23311975.2020.1823580
- Khan, A., Khan, N., and Shafiq, M. (2021), "The economic impact of COVID-19 from a global perspective", *Contemporary Economics*, Vol. 15 No. 1, pp. 64-75. doi: 10.5709/ce.1897-9254.436
- Kristofik, P., and Medzihorsky, J. (2022), "Capital structure determinants of wood-processing enterprises in Slovakia", *Acta Facultatis Xylologiae Zvolen*, Vol. 64 No. 1, pp. 135-146. doi: 10.17423/afx.2022.64.1.12
- Kucharcikova, A., and Miciak, M. (2018), "The application of human capital efficiency management towards the increase of performance and competitiveness in an enterprise operating in the field of distribution logistics," *Nase More*, Vol. 65, No. 4, pp. 376-283. doi: 10.17818/NM/2018/4SI.21
- Laranjeira, C., Dixe, M.A., Valentim, O., Charepe, Z., and Querido, A. (2022), "Mental health and psychological impact during COVID-19 Pandemic: An online survey of Portuguese higher education students", *International Journal of Environmental Research and Public Health*, Vol. 19 No. 1. doi: 10.3390/ijerph19010337

- Lim, B. T. H., Wang, Z., and Oo, B. L. (2016). "Change management for sustainable competitive advantages: The roles of organisational culture and employees in the Chinese construction firms", *International Journal of Sustainable Building Technology and Urban Development*, Vol. 7 No. 3-4, pp. 230-236.
- Lizbetin, J., and Stopka, O. (2016), "Practical application of the methodology for determining the performance of a combined transport terminal", in Traffic and transport engineering proceedings proceedings of the international conference in Belgrade, Serbia, 2016, pp. 382-387.
- Lu, L., Peng, J.L., Wu, J., and Lu, Y. (2021), "Perceived impact of the Covid-19 crisis on SMEs in different industry sectors: Evidence from Sichuan, China", *International Journal of Disaster Risk Reduction*, Vol. 55. doi: 10.1016/j.ijdr.2021.102085
- Miklosik, A., Starchon, P., Vokounova, D., and Korcovkova, M. (2020), "The future of tv advertising targeting young Slovak consumers," *Marketing and Management of Innovations*, Vol. 55 No. 2, pp. 122-138. doi: 10.21272/mmi.2020.2-09
- Mura, L., Zsigmond, T., and Machová, R. (2021), "The effects of emotional intelligence and ethics of SME employees on knowledge sharing in Central-European countries," *Oeconomia Copernicana*, Vol. 12 No. 4, pp. 907-934. 10.24136/oc.2021.030
- Nasaj, M. (2022), "Proactive personality and employees' innovative behaviours: The role of network building ability," *International Journal of Innovation Management*, Vol. 25 No. 25. doi: 10.1142/S1363919621500869
- Nedeliakova, E., Hudakova, M., Masar, M., Lizbetinova, L., and Stasiak-Betlejewska, R. (2020), "Sustainability of railway undertaking services with lean philosophy in risk management-Case study," *Sustainability*, Vol. 12 No. 13. doi: 10.3390/su12135298
- Niles, M.T., Bertmann, F., Belarmino, E.H., Wentworth, T., Biehl, E., and Neff, R. (2020), "The early food insecurity impacts of COVID-19", *Nutrients*, Vol. 12 No. 7. doi: 10.3390/nu12072096
- Nogueira, R.G., et al. (2021), "Global impact of COVID-19 on stroke care", *International Journal of Stroke*, Vol. 16 No. 5, pp. 573-584. doi: 10.1177/1747493021991652
- Olexová, C., and Gajdoš, J. (2016), "Logistics simulation game proposal – a tool for employees' induction", *Quality Innovation Prosperita-Kvalita Inovacia Prosperita*, Vol. 20 No. 2, pp. 53-68. doi: 10.12776/QIP.V20I2.753
- Olivia, S., Gibson, J., and Nasrudin, R. (2020), "Indonesia in the time of Covid-19", *Bulletin of Indonesian Economic Studies*, Vol. 56 No. 2, pp. 143-174. doi: 10.1080/00074918.2020.1798581
- Pacáková, V. (2009). *Štatistické metódy pre ekonómov [Statistical methods for economists]*. Iura Edition, Bratislava, Slovakia.
- Pereira-Moliner, J., López-Gamero, M. D., Font, X., Molina-Azorín, J. F., Tarí, J. J., and Pertusa-Ortega, E. M. (2021), "Sustainability, competitive advantages and performance in the hotel industry: A synergistic relationship", *Journal of Tourism and Services*, Vol. 23 No. 12, pp. 132-149. doi: 10.29036/jots.v12i23.282
- Pervakova, E. E. (2020), "Corporate culture as a performance factor of innovation activity", *Revista Inclusiones*, Vol. 7, pp. 479-497.
- Roy, D., Ghosh, R., Dubey, S., Dubey, M.J., Benito-Len, J., and Ray, B.K. (2021), "Neurological and neuropsychiatric impacts of COVID-19 pandemic", *Canadian Journal of Neurological Sciences*, Vol. 48, No. 1, pp. 9-24. doi: 10.1017/cjn.2020.173
- Scheer, L. (2007). *Biometria [Biometrics]*. Technická univerzita vo Zvolene, Zvolen, Slovakia.
- Seetharaman, P. (2020), "Business models shifts: Impact of Covid-19", *International Journal of Information Management*, Vol. 54 No. 102173. doi: 10.1016/j.ijinfomgt.2020.102173
- Stacho, Z., Stachova, K., and Caganova, D. (2020), "Participation of all employee categories in innovation processes in Slovak organisations", *Mobile Networks & Applications*, Vol. 25 No. 3, pp. 853-859. doi: 10.1007/s11036-020-01518-2
- Stacho, Z., Stachova, K., Hudakova, M., and Stasiak-Betlejewska, R. (2017), "Employee adaptation as key activity in human resource management upon implementing and maintaining desired organisational culture", *Serbian Journal of Management*, Vol. 12 No. 2, pp. 305-315. doi: 10.5937/sjm12-10340

- Sun, Y. P., and Li, Y. (2021), "COVID-19 outbreak and financial performance of Chinese listed firms: Evidence from corporate culture and corporate social responsibility", *Frontiers in Public Health*, Vol. 9. doi: 10.3389/fpubh.2021.710743
- Tian, V. I., Tang, F., and Tse, A. C. B. (2022), "Understanding corporate culture and business performance from a Confucian perspective", *Asia Pacific Journal of Marketing and Logistics*, Vol. 34 No. 4, pp. 759-777. doi: 10.1108/APJML-08-2020-0555
- Tolstyakova, O. V., and Batyrova, N. T. (2020), "Strategic management of human resources in modern conditions: a case study", *Entrepreneurship and Sustainability Issues*, Vol. 8 No. 2, pp. 370-381. doi: 10.9770/jesi.2020.8.2(22)
- Tulcanaza-Prieto, A. B., Aguilar-Rodriguez, I. E., and Artieda, C. (2021), "Organizational culture and corporate performance in the Ecuadorian environment", *Administrative Sciences*, Vol. 11 No. 4. doi: 10.3390/admsci11040132
- Urbancova, H., and Vrabcova, P. (2020), "Age management as a human resources management strategy with a focus on the primary sector of the Czech Republic," *Agricultural Economics – Czech*, Vol. 66 No 6, pp. 251-259. doi: 10.17221/11/2020-AGRICECON
- Vnouckova, L., Urbancova, H., and Smolova, H. (2020), "Approaches to employee development in Czech organisations," *Journal on Efficiency and Responsibility in Education and Science*, " Vol. 8 No. 1, pp. 1-7. doi: 10.7160/eriesj.2015.080101
- Wang, S. Y., and Huang, L. L. (2022), "A study of the relationship between corporate culture and corporate sustainable performance: Evidence from Chinese SMEs", *Sustainability*, Vol. 14 No. 13, pp. 7527-527.
- Woo, E. J., and Kang, E. (2021), "Employee environmental capability and its relationship with corporate culture", *Sustainability*, Vol. 13 No. 16. doi: 10.3390/su13168684
- Zaiontz, CH. 2021. Tukey HSD (Honestly Significant Difference). [online]. 2021. [cit. 2021-12-04]. Available at: <https://www.real-statistics.com/one-way-analysis-of-variance-anova/unplanned-comparisons/tukey-hsd/>

# The Utilization of Digital Tools and Gamification in the Adaptation Process of Z Generation Employees

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## Abstract

Innovation, in the sense of individual aspects of Industry 4.0 implementation into the systems of human resources management, is currently an important factor to maintain competitiveness. The effectiveness of available human potential use is significantly influenced on the one hand by the ability to adapt to the changes brought about by the industrial revolution and on the other hand by the ability of employees to adapt to each other. The paper presents the results of two surveys carried out between 2010 and 2019 and in 2021 in the companies operating in Slovakia. According to the research results, only 70% of organizations have implemented the employee adaptation system, while only 30% of them have implemented the adaptation system comprehensively. The use of gamification elements is at a low level, when only 5% of organizations said that they apply such elements fully, and 18% partially. An important finding is the fact that almost 70% of organizations have already used various digital interaction platforms in HR functions. Despite these findings, based on our results the vision for the future looks quite promising.

Keywords: Industry 4.0; generation Z; gamification; adaptation.

Article Classification: Research article

## 1 Introduction

Industry 4.0 has been a revolution, which is built on digitization, changes in production processes as well as changes in business models aimed at speeding up and making the production process more effective (Müller et al 2018). Terms such as Industry 4.0 and related digitization (Alcácer, Cruz-Machado 2019), the Internet of Things (Xu et al., 2018), or Big Data Analytics (Bawa et al., 2016) today have been becoming synonymous with innovations. The ultimate expression 4.0 means that it is the 4th industrial world revolution (Stachová et al. 2021). Innovations, in terms of the individual aspects of Industry 4.0 implementation, have been currently becoming a more important factor in competitiveness maintaining compared with the situation a few years ago

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(Kucharčíková et al., 2015; Papula et al., 2019). According to the Economic Forum in Davos 2016, the Internet contribution is one of the significant megatrends through which, the hypertext communication and the Internet of Things, create a new cycle of global economy which requires activities aimed at sustainable solutions (Teuteberg 2016).

The nature of work in the era of robotization, digitization and artificial intelligence has been changing; the report of the World Economic Forum on future development of jobs states that 2/3 of global in-demand jobs will be concentrated in 15 world countries (WeForum 2016). Robots will bring the elimination of 7 million jobs (mostly administration and office jobs), and only 2 million of new jobs will be created. The rapid implementation of robotics also threatens the jobs of skilled workers. Technological changes in the areas of digital connectivity, robotics and the large volumes of data processing can cause a disruptive effect on labour market, prompting the negative impact on income distribution as well as an impact on low-income groups. Expected is the increase of labour productivity as a consequence of increasing resources use efficiency, through the knowledge potential formation within the entire society scale (Stachová et al. 2021).

Further development is aimed at incorporation of virtual elements into the current physical environment, with the intention to create a real virtual reality (Mota et al. 2018). Virtual reality technologies have been developed to preserve the physical form of the real world, enriched with the potential of current computing capacities. These technologies mainly find their use in education and training as systems for simulation and they have been currently experiencing a huge boom. The pandemic has been significantly affecting the mobility of employees, causes the diversity of jobs, represents the accelerator that enormously affect the rapid spread of some digitalization elements throughout the world (Qin , et al., 2016; Urbancová et al., 2021; Kirchmayer et al., 2019; Kalina, 2020, Kupec et al., 2021).

In its nature, the individual manifestations of the fourth industrial revolution prepared the businesses environment where is possible to maintain economic activities and overcome a pandemic-type crisis characterized by social distancing. Using the potential of virtual environment in the times of pandemic crisis strongly depends on the ability to connect the digital world with the real one, and at the enterprise level it represents challenges bound with organizational and cultural changes, where mainly the leaders understanding with adequate responds to the challenges is requested (Schneider 2018).

The next non-negligible attribute to characterize work environment conditions today is the specificity of simultaneous coexistence of up to four different employee generations (Baby Boomers and generations X, Y and Z) operating at the same time and the same workplaces (Kirchmayer & Fratričová, 2018). The diversity of values and attitudes of employees across generations becomes an even more significant challenge for personnel specialists and managers of organizations, with their effort to gain, maintain and build employee engagement, team cohesion and form a desirable organizational culture.

The advent of new technologies creates new approaches for remote team management, and thanks to new tools is possible to continue and manage people effectively, compared with classical management, but at the same time it is more demanding especially in terms of understanding people, implementing proper and clear processes, but also building and maintaining the trust (Serrat, 2017). Next important factor is the level of people's tolerance to work with digital tools (Kwok, Yang 2017). Various case show a significant correlation between positive attitudes towards digital technologies perceiving and actual usefulness of online tools (Kwok Yang 2017).



Therefore can be concluded that online management tools are more effective in an environment where their users are used to working in the online world, which also uses the e-sports segment for the purpose of their performance, which can also build and support the positive relationship to work in the online world.

## **2 Theoretical background**

The industrial revolution and the pandemic, as the integration accelerator with some of its manifestations, significantly influences many human resource management tools (Tuan, 2021). In the conditions of limited employee mobility, together with the development of new technologies, in the area of people management emerge various new tools to be used, while the question remains whether their use in previous period allow the tools replacement sufficiently.

On one hand the effectiveness of available implementation of human potential is significantly influenced by the ability to adapt to changes, on the other hand the ability of employees to adapt to each other (Vetráková et al. 2021, Križo et al. 2018). In the context of a stable employee base creation, the key tool of human resources management is adaptation and training of employees, while within these HR functions, new digitized tools that involve the virtual environment and elements of gamification are already being used.

### ***2.1 Generation Z***

The principle to view the individual generation groups of employees is not new, however, it is still relevant, mainly due to the life cycle of individual generations operating in the productive age phase. During the current period, Generation Z has been entering active working life (Stareček et al. 2021), where Generation Z can be described as technological, social, global and developed (Joniaková et al. 2016). Dorsey and Villa (2020) found that the expectations of Generation Z are significantly different from others, as the generation itself is significantly different from other previous generations; this generation is the first generation ever to lead digital lives completely, and have been connected to the world as well as to each other over long distances via using technologies that have always been here for them (Gathiira, Muathe 2021). For this generation, every physical aspect has a digital equivalent, what means that for them the real world naturally overlaps with the virtual world – the world is phigital for them (Stillman, Stillman, 2017). When Millennials are considered as generation in IT revolution transition, then Generation Z is right there (Tulgan, 2013).

### ***2.2 Adaptation***

Adaptation of employees is a part of formation processes in staffing or work potential of each company. Recruitment and selection of employees is followed up with activities by which HR professionals and line managers complete their efforts to harmonize employee expectations with certain jobs requirements to ensure the maximum possible level of employee collaboration across all generations (Juříková et al. 2021).

The social aspects of work, relations with co-workers, the sense of belonging to work environment are important for every person; from the very first moment they lead to dedication and stability acquisition or, on the contrary, can lead to demotivation, or dissatisfaction resulting from the lack of information and fear of handling work tasks (Bilan et al. 2019; Ariani, 2021). During the adaptation process, from the beginning, it is

advisable to clarify the work expectations on both sides, set clear and open standards for communication and cooperation (Kulíková 2012).

The length of adaptation to a new job, work, but also to social environment varies and can last different period of time, what is influenced by various subjective factors, such as employee motivation, the ability to perceive and learn, professional preparation for work performance, habitual behaviour or habits from previous work, as well as the attitude towards work. A new employee is influenced by objective factors such as working conditions, organization of work, workplace relations, the organization of newly hired employee and the adaptation procedure, but also can be affected by various extra-work influences (Gyurák, 2011). In the context of Generation Z the more thorough focus on adaptation is needed, since the social atmosphere is perceived as more important compared with older generations X and Y (Egerová et al. 2021); and at the same time, Generation Z is not willing to wait for a long-term change and prefer immediate changes (Stacho, Stachová, 2017).

Unfortunately, the adaptation is often an underestimated area of human resource management, although its course has a direct and significant impact on the result and success of employees recruitment, selection process, and here is usually given more attention (Stýblo et al. 2009). However, if a new employee leaves the company, as a result of an unsuccessful adaptation process, it always represent significant costs for the company. Armstrong in the Handbook of human resource management practice states: "In the case a professional employee loss, the costs can represent up to 75% of his annual salary. In the case of a support employee loss, it can reach 50% of the salary. When during the year leave fifteen out of a hundred employees, with average annual salary €12,500, then the total cost can reach €90,000, i.e. 7.5% of the total wage costs (Armstrong 2009).

Therefore here appears the need to ensure quick adaptation to all aspects of new job positions, thus from their first working day, the company can contribute to stability and satisfaction of its employees.

### **2.3 Gamification**

At work environment, the gamification elements have already appeared, and the use of competitive elements and clearly defined goals and metrics to support mutual cooperation and team performance is involved (Coonradt, Nelson 2012). The game elements thus enable employees to take personal responsibility for their goals and increased performance and engagement (Coonradt, Nelson 2012). The huge growth and success of gamification use in organizations was more opened by the advent of video games, spread of game consoles left signs on thinking and habits of Generation Y (Christians 2018). Thanks to the computer games spread, and the fact that people got used to gamification elements after coming into contact with them through games, gamification has expanded considerably (Christians 2018). Empirical studies, published between 2000 and 2017, related to e-sports from a psychological perspective (Bányai et al. 2019), show that in order to achieve optimal performance, players must be able not only to adapt to their opponents, but above all to communicate correctly with their teammates, trust each other (confidence in abilities), be able to develop themselves and their team (i.e. be engaged in individual skill practice, analyze own performance) and set different type of goals (short-term, long-term) (Himmelstein et al. 2017). From the above mentioned not only appear the attractiveness of the tool (playing e-sports) for generations Y, Z and Alpha, moreover rises the added value in building employee engagement and appears the potential in adaptation process.

The knowledge published so far primarily focuses on the difference in generations' values and attitudes operating in labour market and their motivation possibilities (Hitka et al. 2021; Kupec 2020; Tej et al. 2021; Matúšová 2021). In the field of relations between the industrial revolution and human resources, almost all research focuses on changes in work competencies and jobs in general (Tokarčíková 2020; Olexova, Sudzina 2019; Blštáková et al. 2019). However, there is a lack of insight into the current application of digital tools in the adaptation process, especially the generation Z into organizations.

The paper presents the research that expands the knowledge base mainly by demonstrating the rate of formal process in employee adaptation and the degree of implemented innovations in the field of digitization and gamification, assuming the near future needs for their implementation in companies operating within the Slovak Economic Area. Following the research results, the paper presents possibilities of adaptation implementation in the form of a digital game as a tool in the process of adaptation mainly by generation Z in organizations.

### 3 Material and methods

The research framework base comes from the scope of knowledge from literary sources and published research studies. The theoretical start points are by authors drawn from sources available in electronic databases EBSCO HOST Research Databases, and licensed sources SCOPUS, Web of Knowledge and Web of Science.

Investigated were the functions of employee adaptation, the use of digital tools and gamification elements in human resources management at organizations in Slovakia through two surveys collected at different times, which are conceptually connected to each other and thus provide us with a comprehensive view.

**Survey 2010-2019.** The main goal of questionnaire surveys from 2010 to 2019 was to find out how is human resources management realized in organizations operating in Slovakia, what is the content and volume of individual human resources management functions implementation, and the changed situation over time. Surveys were always conducted between February and May, and the respondents were top representatives of companies operating in Slovakia. The survey was carried out in the form of a personally delivered questionnaires and the number of interviewed managers oscillated about 570 every year, while the return of comprehensively and correctly completed questionnaires ranged from 60% to 65%. The research sample consisted of managers working in companies throughout Slovakia, while in order to determine a sufficient research sample, the authors set two stratification criteria, the first criterion was the region of company operation according to the NUTS system (specifically Slovakia was divided according to the NUTS 2 category), while in the structural composition of the research samples were based on the data of Slovak Statistical Office (Statistical Office of the Slovak Republic).

**Survey 2021.** The survey goals were the changes of values and innovative human resource management tools as a consequence of digital transformation of companies and the readiness of companies for their application. The research sample includes responses from 608 companies. When choosing respondents, the authors tried to address companies so that the structure of the sample reflected the regional point of view as well as the criterion of the company size according to the number of employees. We obtained a sample of 608 from the 950 companies addressed, i.e. return 64%.

## 4 Research results

The authors, as a part of their research in the organizations, were first of all asking if the employee adaptation system is implemented; where in the individual research years 65% to 70% of organizations gave positive answers (Table 1).

Table 1 System of employee adaptation

Existence of adaption system for new employees:	% share in organization									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	65	67	65	66	65	64	67	71	69	70

Source: Own survey

The authors were interested in the implementation of complex adaptation system in organizations, and then in particular the organization focus on the employees adaptation. For this reason, organizations were asked to declare the existence of an adaptation system, as well as whether it is dedicated to all three adaptation levels, namely at work and social adaptation, and the level focused on the adaptation of newly hired employees in the organizational culture. The survey showed that work adaptation is addressed by all organizations and proved by implemented adaptation system, where about one third of organizations focuses on social adaptation and adaptation to organizational culture (Table 2), thus from the above mentioned comes out that these organizations are not aware of complex adaptation system importance.

Table 2 Content of new employees' adaptation

Content of new employees' adaptation	% share in organization									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Work adaptation	x	100	100	100	100	100	100	100	100	100
Social adaptation	x	34	32	30	31	28	28	29	27	28
Adaptation to organizational culture	x	38	37	35	32	31	30	31	32	30

Note: The question was added in the questionnaire survey after 2010.

Source: Own survey

Further the authors were searching whether the organizations implement gamification elements in the development of human resource functions.

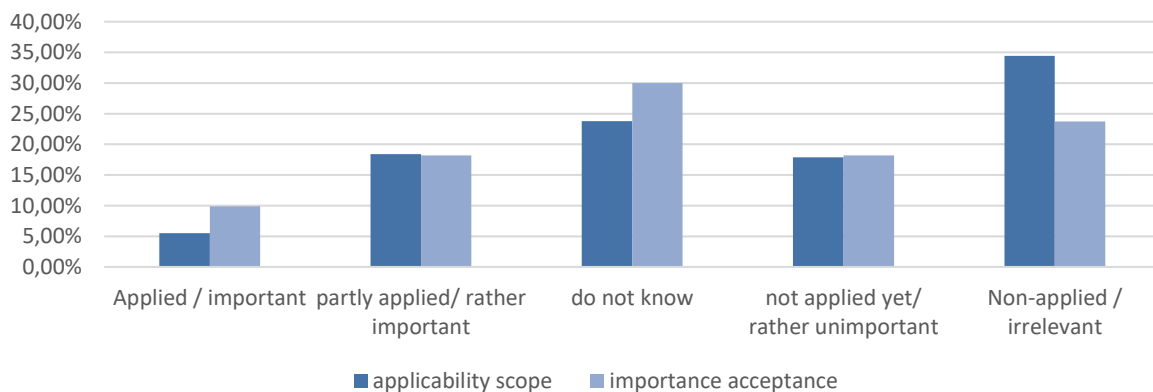


Figure 1 Utilisation of gamification elements in the human resource management

Although the results prove that in the conditions of companies operating in the territory of Slovakia is the gamification elements rate and the use in the development of human resources relatively low, only a little over 5% of respondents declared the full extent of their application, while 10% of respondents perceive them as important. Based on the above-mentioned in the future, the increase of the elements use is possible to be expected.

Further we tried to find out the scope of digital interaction platforms implementation in HRM functions or the perception level of their importance bound with the company competitiveness in the future.

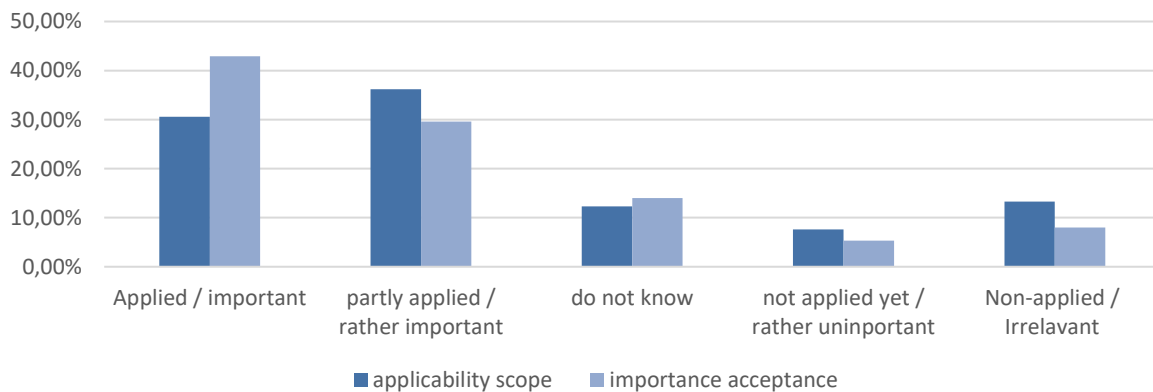


Figure 2 Utilization of gamification elements and platforms for interaction in the development of human resources

The answers to the question and their evaluation proved that during the pandemic the implementation of digital interaction tools reached a significant level and almost 70% of organizations apply the tools at least partially. Considering the results in the perception of tool importance can be also assumed the increase in implementation scope in the future.

## 5 Discussion and conclusion

Based on the described development of the current business environment (globalization, global health threat, diversity of employees, effectiveness of the work of personnel specialists and managers of organizations), it is possible to conclude that, despite the fact that professional literature (Egerová et al. 2021; Armstrong 2009; Hitka et al. 2021) as well as the knowledge resulting from business practice (Bányai et al. 2019; Čábyová et al. 2020; Jenčo et al. 2018) prove the need to focus on the function of employee adaptation in very complex way; the use of new available tools, and reality in practice in the Slovak business environment falls short of expectations. According to the research results, only 70% of organizations have implemented the employee adaptation system, while only 30% of them implement it in comprehensive scope (Table 2).

According to our research, the use of gamification elements is also at a low level, only 5% of organizations stated complex application of such elements and 18% only partial application. Nevertheless, according to our results, the vision for the future looks quite promising, and the respondents perceive these aspects as important for the future to a greater extent compared with present state of application (Figure 1).

An important finding is also the fact that almost 70% of organizations have already been using various digital interaction platforms in HR functions (Figure 2).

The limits of presented research outcomes can be accepted the research sample of individual researches, as the researches were carried out in different time frames and on different research samples, what can partially distort the presented results.

In the context of presented research, the future challenge is creation and use of a tool for employee adaptation in the form of a competitive digital game, processed in the effective team context based on Belbin's typology.

The use of e-sports segment and its implementation in the organizational environment as a part of adaptation program can allow the support of employee engagement, create cohesion in teams and build a desirable organizational culture even remotely, without the need to be physically present at one place, or even one continent. Application of a digital game tool can be beneficial from many points of view. Above all, in contrast to physical sports, when it is introduced into the organizational environment, there is no exclusion of disadvantaged groups because of their disability, and the organization is not limited either in time (time capacity of the sports field) or spatial demands (capacity of the sports field).

The benefit will also result in provision of space for informal communication of employees, within work and organizational teams, which is currently, affected by COVOD-19 pandemic, and significantly limited by locally operating organizations (where informal communication from the traditional point of view is still considered as more significant), as well as by the operation of global teams and organizations.

The benefit of introducing the form of digital game into adaptation process is mainly perceived by addressing generation Z, which chooses the jobs in organizations with an emphasis on attractiveness of the used tools; since this generation grew up with e-sports during their studies (high school e-sports league SSeL), university e-sports league (Uni cup)), and it is highly likely and natural for them to perceive such tool as attractive one.

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## References

- Alcácer, V., & Cruz-Machado, V. (2019). Scanning the industry 4.0: A literature review on technologies for manufacturing systems. *Engineering science and technology, an international journal*, 22(3), 899-919.
- Ariani, D. W. (2021). Job stress, motivation, and job performance: direct and indirect relationship. *Journal of Human Resource Management*, 24(1), 1-11.
- Armstrong, M. 2009 Handbook of human resource management practice. London: Kogan Page limited. 2009. p. 1062. ISBN 978-0-7494-5242-1
- Bányai, F., Griffiths, M. D., Király, O., Demetrovics, Z. 2019. The psychology of esports: A systematic literature review. *Journal of gambling studies*, 35(2), 351-365.
- Bawa, M., Caganova, D., Szilva, I., & Spirikova, D. (2016). Importance of internet of things and big data in building smart city and what would be its challenges. In *Smart City 360°* (pp. 605-616). Springer, Cham.

- Bilan, Y., Simionescu, M., Mentel, G., & Rozsa, Z. (2019). The role of education, individual and economic factors in entrepreneurial initiatives: A microeconomic approach for the Czech Republic, Slovakia and Poland. *E & M Ekonomie A Management*.
- Blštáková, J., Joniaková, Z., Skorková, Z., Némethová, I., & Bednár, R. (2019). Causes and Implications of the Applications of the Individualisation Principle in Human Resources Management. *Ad Alta: Journal of Interdisciplinary Research*, 9(2).
- Čábyová, L., Kusá, A., Záušková, A., Durišová, L. (2020), Visual Identity of Universities: Logo as a visual symbol of university *European Journal of Media Art and Photography* 8 (1) , pp.96-104
- Christians, G. (2018), The Origins and Future of Gamification. Senior Theses, 254, 1-65. Retrieved January 18, 2022, from [https://scholarcommons.sc.edu/senior\\_theses/254](https://scholarcommons.sc.edu/senior_theses/254)
- Coonradt, C. & Nelson, L. (2012), The Game of Work revises and updated. Layton: Gibbs Smith.
- De Vreede, GJ., Antunes, P., Vassileva, J., Gerosa, M. A., & Wu, K. (2016). Collaboration technology in teams and organizations: Introduction to the special issue. *Inf Syst Front*, 18, 1–6. <https://doi.org/10.1007/s10796-016-9632-3>
- Dorsey, J. R., & Villa, D. (2020), *Zconomy: how Gen Z will change the future of business-and what to do about it*. HarperBusiness.
- Egerová, D., Komárková, L., & Kutlák, J. (2021) Očakávania zamestnanosti generácie Y a generácie Z: Generačná kohortová porovnávací štúdia z dvoch krajín. *Obchodná správa a Management*, 3, XXIV, 2021, 93-109.)
- Gathiira, G., & Muathe, S. (2021). Separation planning, human resource practices and pre-retiree decisions: making retirement preparedness work. *Journal of Human Resource Management*, 24(2), 36-59.
- Gyurák Babel'ová, Z. (2011), Effectiveness of investments into human resources development in Slovakia Lódz: KSIEZY MLYN Dom Wydawniczy Michal Kolinski,
- Himmelstein, D., Liu, Y., & Shapiro, J. L. 2017. An exploration of mental skills among competitive League of Legend players. *International Journal of Gaming and Computer-Mediated Simulations*, 9(2), 1-21.
- Hitka, M., Schmidtová, J., Lorincová, S., Štarchoň, P., Weberová, D., & Kampf, R. (2021). Sustainability of human resource management processes through employee motivation and job satisfaction. *Acta Polytechnica Hungarica*, 18(2), 7-26.
- Hitka, M., Štarchoň, P., Lorincová, S., & Caha, Z. (2021). Education as a key in career building. *Journal of Business Economics and Management*, 22(4), 1065-1083.
- Jenčo, M., Droppa, M., Lysá, E., & Križo, P. (2018). Assessing the Quality of Employees in Terms of their Resistance. *Calitate*, 19(167), 48-53.
- Joniaková Z., Gálik, R. Blštáková, J., & Tarišková, N. (2016). *Riadenie ľudských zdrojov* Bratislava. Wolters Kluwer.
- Juříková, M., Kocourek, J., & Ližbetinová, L. (2021). Budovanie prestíže univerzity ako nástroja na dosiahnutie konkurencieschopnosti. *Komunikácia dnes* .
- Kalina, P. (2020), Change Management: COVID-19 and Beyond. *Journal of Human Resource Management*, 23(1), 38-40.
- Kirchmayer, Z., & Fratričova, J. (2018), *What motivates generation Z at work? Insights into motivation drivers of business students in Slovakia*. Innovation Management and Education Excellence through Vision 2020, IBIMA, Milan, Italy. <https://bit.ly/3zPQ4S>
- Kirchmayer, Z., Remišová, A., & Lašáková, A. (2019), The perception of ethical leadership in the public and private sectors in Slovakia. *J. East Eur. Manag. Stud*, 10-36.
- Križo, P., Čarnogurský, K., & Sirotiaková, M. (2018), Using the Concept of SoLoMo Marketing in Digital Environment to Increase Brand Awareness and Communication with Customers. In *International Conference on Knowledge Management in Organizations* (pp. 551-561). Springer, Cham.
- Kubenka, M., Myskova, R. (2019). Obvious and hidden features of corporate default in Bankruptcy models. *Journal of Business Economics and Management*. Volume 20 (2), Page 368-383. DOI 10.3846/jbem.2019.9612
- Kucharčíková, A., Tokarčíková, E. & Blašková, M. (2015), Human Capital Management – Aspect of the Human Capital Efficiency in University Education. *Procedia - Social and*

- Behavioral Sciences* Volume 177, 22 April 2015, Pages 48–60. ISSN 1877-0428  
<http://www.sciencedirect.com/science/article/pii/S1877042815016869#>
- Kulíková, A., 2012: Adaptation of new employees is just as important as their selection.  
<http://www.gastroprace.cz/infocentrum-prace-gastro/i-48.html#Uj7BXX-yk7k>  
 Accessed 6 Jun 2014
- Kupec, V. (2020). The role of SoLoMo Marketing and Media in the Communication of Eco-Innovations. Budapest: Wolters Kluwer,
- Kupec, V., Písař, P., Lukáč, M., & Pajtinková Bartáková, G. (2021). Conceptual comparison of internal audit and internal control in the marketing environment. *Sustainability*, 13(12), 6691.
- Kwok, D. & Yang, S. (2017). Evaluating the intention to use ICT collaborative tools in a social constructivist environment. *Inter. J. of Educational Tech. in Higher Educ.*, 14 (32).  
<https://doi.org/10.1186/s41239-017-0070-1>
- Matúšová, J. G. (2021). Logo as the Greatest Symbol of Brand. *European Journal of Media, Art and Photography*, 9(2), 126-133.
- Mota, J. M. – Ruiz-Rube, I. – Doderó, J. M. 2018. Augmented reality mobile app development for all. In *Computers & Electrical Engineering*. ELSEVIER, 2018, vol. 65, pp. 250-60. ISSN 0045-7906
- Müller, J. M., Kiel, D., Voigt, K. I. (2018), What drives the implementation of Industry 4.0? The role of opportunities and challenges in the context of sustainability. *Sustainability* (Switzerland), 10(1), <https://doi.org/10.3390/su10010247>
- Myskova, R., Hajek, P. (2016). The Effect of Managerial Sentiment on Market-To-Book Ratio. *Transformations in Business & Economics*.15(2A), Page 498-513.
- Myskova, R.; Hajek, P. (2020). Mining Risk-Related Sentiment in Corporate Annual Reports and its Effect on Financial Performance. *Technological and Economic Development of Economy*. 26 (6), Page 1422-1443, DOI 10.3846/tede.2020.13758
- Olexova, C., & Sudzina, F. (2019). Does Personality Influence Willingness to Pay Taxes?. *Ekonomicky Casopis*, 67(10), 1055-1069.
- Papula J., Kohnová L., Papulová Z. & Suchoba M. (2019), Industry 4.0: Preparation of Slovak Companies, the Comparative Study. *Smart Technology Trends in Industrial and Business Management*. EAI/Springer *Innovations in Communication and Computing*. Springer, ISBN 978-3-319-76998-1 [https://doi.org/10.1007/978-3-319-76998-1\\_8](https://doi.org/10.1007/978-3-319-76998-1_8)
- Qin, J., Liu, Y., & Grosvenor, R. (2016), A Categorical Framework of Manufacturing for Industry 4.0 and beyond. In *Procedia CIRP*, vol. 52, str. 173-178. ISSN 2212-8271
- Schneider, P. (2018). Managerial challenges of Industry 4.0: an empirically backed research agenda for a nascent field. *Review of Managerial Science*, 12(3), 803-848.
- Serrat, O., (2017). Working in Teams. *Know. Solutions*. 599-604. [https://doi.org/10.1007/978-981-10-0983-9\\_64](https://doi.org/10.1007/978-981-10-0983-9_64)
- Stacho, Z., Stachová, K. 2017. *Organizácia manažérskej práce*. Vydavateľstvo: Wolters Kluwer, 304 s. ISBN 978-80-81687-19-8
- Stachová, K., Blštáková, J., Stacho Z., 2021. *Riadenie ľudí v digitálnej a post-pandemickej dobe*, Bratislava: Wolters Kluwer, 148 s. ISBN 9788076762398
- Stareček, A., Gyurák Babel'ová, Z., Makyšová, H., & Cagáňová, D. (2021). Sustainable Human Resource Management and Generations of Employees in Industrial Enterprises. *Acta Logistica*, 8(1), 45–53. <https://doi.org/10.22306/al.v8i1.201>
- Stillman D., & Stillman, J. (2017), *Gen Z at Work. How the Next Generation is Transforming the Workplace*. HarperCollins Publishers.
- Stýblo, J., Urban, J., Vysokajová, M., *Meritum Personalistika 2009-2010*. Praha: ASPI, 2009. S. 912 ISBN 978-80-7357-429-1
- Tej, J., Vagaš, M., Ali Taha, V., Škerháková, V., & Harničárová, M. (2021). Examining HRM practices in relation to the retention and commitment of talented employees. *Sustainability*, 13(24), 13923.



- Teuteberg F. (2016). Understanding the implications of digitisation and automation in the context of Industry 4.0: a triangulation approach and elements of a research agenda for the construction industry. *Computer in Industry*, Volume 83, 121–139
- Tokarčíková, E., Malichová, E., Kucharčíková, A., & Durišová, M. (2020). Importance of technical and business skills for future IT professionals. *Amfiteatru Economic*, 22(54), 567-578.
- Tuan, V. K. (2021). The role of human resources practices and the mediating effect of innovative capacity on the growth of Vietnamese enterprises. *Journal of Human Resource Management*, 24(2), 01-13.
- Tulgan, B. (2013), *Meet Generation Z: The second generation within the giant "Millennial" cohort*. Rainmaker Thinking. <https://bit.ly/3xDHUd8>
- Twenge, J. M., Campbell S. M., Hoffman, B. J., & Lance C. E. (2010), Generational Differences in Work Values: Leisure and Extrinsic Values Increasing, Social and Intrinsic Values Decreasing. *Journal of Management*, 36(5), 1117-1142. <https://doi.org/10.1177/0149206309352246>
- Twenge, J.M., Spitzberg, B.H., & Campbell, W.K. (2019). Menej osobnej sociálnej interakcie s rovesníkmi medzi dospievajúcimi v USA v 21. storočí a súvisí s osamelosťou. *Časopis sociálnych a osobných vzťahov*, 36(6), 1892-1913.
- Urbancová, H., Vrabcová, P., Hudáková, M., & Petrů, G. J. (2021), Effective Training Evaluation: The Role of Factors Influencing the Evaluation of Effectiveness of Employee Training and Development, *Sustainability* 13(5), 2721; <https://doi.org/10.3390/su13052721>
- Vetráková, M., Smerek, L., Włodarczyk, K., Mazur-Wierzbicka, E., & Misiak-Kwit, S. (2021). The implementation of personnel processes in Poland and Slovakia. *Entrepreneurship and Sustainability Issues*, 8(4), 148.
- WeForum. 2016 [online]. [cit. 04.06.2016]. Dostupné na: <<http://reports.weforum.org/future--of-jobs-2016/>>.
- Xu, L. D., Xu, E. L., & Li, L. (2018). Industry 4.0: state of the art and future trends. *International Journal of Production Research*, 56(8), 2941-2962.

# Possibilities of Influencing Organisational Culture by Means of Employee Recruitment

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## Abstract

The objective of the paper is to particularly define the possibilities of influencing organisational culture by means of employee recruitment, which is a human resources management function. The paper will present the results of research conducted in organisations operating in Slovakia over the ten years 2010-2019. The method of comparison was used upon the evaluation of the present state, comparing organisations paying sufficient attention to organisational culture and employee deployment and organisations not dealing with it at all. The research showed that although 100 % of companies declare that they realise the justness of organisational culture, only 21 % - 33 % of them have defined an organisational culture strategy within their business strategy in writing. The research showed that organisations realise financial, motivational, qualification and value benefits of using internal sources upon occupying senior positions, which even increases the justness of focusing on organisational culture already upon employee recruitment also for junior positions. Based on averaging the results of the analysis of the most preferred methods of recruiting employees, the most preferred methods include newspaper advertising and references, followed by recruitment agencies and corporate websites.

Keywords: human resources management; research; organisations operating in Slovakia; values; attitudes; behaviour.

Article Classification: Research article

## 1 Introduction

Organisational culture reflects human inclinations in thinking and behaviour as well as it affects human consciousness and subconsciousness. It strengthens the

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relationship of a person to work, regulates relationships between employees and has a significant impact on the activity of employees (Kachaňáková, 2010). Generally presented and declared organisational culture elements include essential convictions, values and standards outwardly manifested by symbols and artefacts which were designed, discovered or developed in an organisation as a result of successful problem solution, and a group of people bearing organisational culture, in which such a culture is shared (Kachaňáková, Stachová 2014). Authors like Deal, Kennedy (2000); Schein (2009); Brown (1995); Cameron, Quinn (2011); Ariani, (2021); Collins, Smith (2006); Lukášová (2010); Cow (2012) and others commonly recognise that:

Organisational culture is a considerable subsystem of a company, a determinant of the effectiveness of a company and the quality of working life of company members.

Organisational culture does not have an objective form of its existence. It exists in the form of essential convictions, values, standards and patterns of behaviour shared by individuals within a company. It is outwardly manifested by means of behaviour and artefacts.

Despite the fact that organisational culture only exists through individuals, it is a group phenomenon with a supra-individual nature.

Organisational culture is a result of a learning process carried out within solving the problems of external adaptation and internal integration. It is accumulated experience of a company, transferred in socialisation process.

As accumulated experience of a company, transferred to individuals in socialisation process, organisational culture is relatively stable. However, as a product of dynamic tendency occurring on the grounds of constant confrontation of environment's requirements and internal possibilities of a company, it always comprises a certain potential to change.

In relation to the aforementioned facts organisational culture can be comprehended as a management component of a company, unifying individual management levels and leading to accepting and supporting organisational objectives and ways of their achievement by all employees (Lorincová et al. 2016; Gathiira, Muathe (2021; Bejtkovský et al 2018;). Each whole created by individuals and social groups is managed by a complex cultural system, contributing to internal harmony of such a whole (Kachaňáková, 2010, Schein 2009; Lukášová, Nový, 2004; Cooper, et al. 2001).

Regarding the achievement of a required state of organisational culture change, encouraging company sustainable development, authors like Lukášová, Nový, 2004; Kotter, Rathgeber, 2006; Covey, 2013; Armstrong, 2009; and Koubek, 2011 state that there are several factors having a significant impact on success, respectively a failure of the whole process of creating a suitable organisational culture, as well as several instruments appropriate in order to support the implementation of a suitable organisational culture.

As defined by Foot and Hook (2005), i.e. to recruit a number of suitable candidates for vacant positions; not only to declare but also adopt fair practices; to ensure that individual employee recruitment activities contribute to company objectives and its desirable image; and to carry out recruitment in an efficient and cost-effective way.

The given implies that employee recruitment should not only respect ethical and legal values of a country where the given company operates but should concurrently

outwardly declare the values, visions and objectives of a company so as to attract potential applicants for a position as well as other stakeholders.

Each company should make efforts to ensure suitable labour potential. Labour potential not only includes a number of employees but also their knowledge, abilities, skills, intelligence, talent and personal characteristics necessary to fulfil the objectives and mission set out by a company (Cagaňová et al. 2012; Gyurák Babel'ová, 2011; Tuan, 2021; Dries, 2013; Hilliard, 2013; Walker, 2013). Recruitment of such employees is therefore among the key and permanent activities of human resources management. The term "employee recruitment" (i.e. not the customary usage of terms "search and hiring") means that it does not only refer to hiring necessary employees from external sources but there is an effort made to gain employees representing a greater asset for a company, its interests and objectives. There is an effort made to gain competent and motivated employees, whose individual goals and interests do not contradict a value system and culture of their company. They can thus also include own, permanent employees who have demonstrated their qualities at work (Kachaňáková et al., 2002; Stacho et al., 2013). The usage of internal sources is evaluated very positively by employees, and such behaviour of their company has motivating effects on them (Vetráková et al., 2013; Hitka et al., 2014; Križo et al. 2018). A particular task of employee recruitment is thus to ensure that a vacant position in a company attracts a sufficient number of suitable applicants at adequate costs and timely, as well as to obtain adequate information on applicants, which is necessary for a reliable selection of the most suitable of them (Furtmueller, 2013; Klotz, et al., 2013; Tempone, et al., 2012). It is also desirable that costs incurred at employee recruitment are optimal. The amount of such costs is most significantly affected by a method chosen for this purpose. With regard to the fact that there is not a single correct method, instead, numerous methods are adopted nowadays, while each of them has positive and negative features, it is necessary that companies make individual choices, always on the grounds of actual needs.

The knowledge published so far primarily focuses on the definition of organizational culture and its significance in terms of human resource performance or sustainability of the organization's activities in turbulent conditions (Hitka et al. 2021; Kachaňáková et a. 2014; Schein 2009; Collins et al. 2006; Lukášová 2010). In the field of the characteristic of recruiting employees as one of the key functions of human resources management, in turn, almost all research and professional publications are focused on changing job competencies and jobs in general, respectively, on the need to acquire not only a highly qualified workforce but, above all, employees of the so-called "jobs". Fit into the work team (Olexová, Sudzina 2019; Kalina, 2020; Blštáková et al. 2019; Foot, Hook, 2002; Gyurák Babel'ová, 2011; Hilliard, 2013; Vetráková et al. 2013). However, there is a lack of insight into the real approach to creating and maintaining the desired organizational culture, and the possibilities of influencing it through the employee acquisition function.

The researches presented in this paper expand the knowledge base mainly by demonstrating the real approach of organizations operating in Slovakia to the creation and maintenance of the desired organizational culture and the real state of use of monotonous resources and tools in attracting employees. Building on the results of the research, the paper presents the possibilities of influencing the organizational culture through recruitment.

## 2 Materials and methods

In order to achieve the objective of the paper, a number of partial objectives were implemented, namely a questionnaire survey, a statistical evaluation of the results of the questionnaire and a subsequent evaluation of the research hypothesis.

The research question was formulated and conditioned by the research objective of the paper.

Based on the established research question, the authors formulated a research hypothesis, which was verified through a questionnaire survey and subsequent statistical evaluation in the form of a Pearson test.

VO 1: What score do the enterprises surveyed score for organizational culture analysis activities? Are there statistically significant differences between the organizations that carry out the analysis of OK and those that do not?

Hypothesis H1: There is a statistically significant relationship between the region, the organizations that carry out the analysis of OK and the perception of the influence of organizational culture on the recruitment of employees.

Research presented in the paper was conducted each year between 2010 and 2019. Its objective was to find out the present state of human resources management and organisational culture in organisations operating in Slovakia. Organisations engaged in the research were interviewed by means of a questionnaire delivered personally to a person responsible for human resources management in the given organisation. The questionnaires were used in a wider research, for example see Stacho and Stachová (2015).

In order to determine a suitable research sample, two stratification criteria were set out. The first criterion was a minimum number of employees in the organisation, which was determined at 50 employees. The given stratification criterion excluded micro and small enterprises from the research on the one hand, however, on the other hand, the justness and need to focus on a formal system of human resources management in companies with more than 50 employees were observed and especially declared by means of this criterion. The second stratification criterion was a NUTS 2 region of organisation's operation, while the structural composition of the research sample was based on the data of the Statistical Office of the Slovak Republic.

According to the Statistical Office of the Slovak Republic the number of companies with a number of employees 50 and more was between 3,261 and 3,359 over the period between 2010 and 2014. The NUTS 2 regional structure of companies with more than 50 employees in the given years is shown in Table 1.

Table 1 Regional structure of companies with more than 50 employees

Region - NUTS II.	Bratislava region	Western Slovakia	Central Slovakia	Eastern Slovakia
Districts	Bratislava	Trnava, Trenčín, Nitra	Banská Bystrica, Žilina	Košice, Prešov
Number of companies in 2010	1 056	888	631	602
Number of companies in 2011	1 064	892	638	607
Number of companies in 2012	1 082	899	634	605
Number of companies in 2013	1 074	895	639	603
Number of companies in 2014	1 098	904	644	612
Number of companies in 2015	1 105	916	651	613
Number of companies in 2016	1 14	923	649	621
Number of companies in 2017	1 123	926	654	623
Number of companies in 2018	1 125	930	659	626
Number of companies in 2019	1 137	935	661	627

Source: data processed according to the Statistical Office of the Slovak Republic

Determining an optimal research sample of the given basic group of companies, Confidence Level of the research was set at 95 %, and Confidence Interval of the research was set at  $H = \pm 0.10$ . On the grounds of the given criteria an additional, respectively relevant research sample for individual regions of Slovakia was set in the analysed years. It is shown in Table 2.

Table 2 Size of the research sample for individual regions of Slovakia

Region - NUTS II.	Bratislava region	Western Slovakia	Central Slovakia	Eastern Slovakia
Districts	Bratislava	Trnava, Trenčín, Nitra	Banská Bystrica, Žilina	Košice, Prešov
Size of the research sample	88	87	84	83

Source: Own processing

Approximately 570 organisations were included in the research each year, however due to a great extent and the form of data collection only approximately 60% - 65 % of questionnaires used to be returned comprehensively completed. Subsequently, 259 organisations, corresponding to the optimal research sample determined on the grounds of stratification criteria, were randomly selected from these organisations. We did not take into account the repeated participation of the same organizations in individual years of the research.

Key methods used in the conducted research include logical methods, adopting the principles of logic and logical thinking. Particularly the methods of analysis, synthesis, deduction and comparison were applied from this group of methods. Mathematical and statistical methods were also applied in the paper. From software products available on the market, a text editor, a spreadsheet and statistical software were

used in the research work, particularly including MS Word 2007, MS Excel 2007 and SPSS 15.0 statistical software for Windows®.

### 3 Results

The method of comparison was used upon the evaluation of the present state, comparing organisations paying sufficient attention to organisational culture and employee deployment and organisations not dealing with it at all.

Within the part of the research focused on organisational culture, we were primarily interested in whether managements of the interviewed organisations realised the importance and justness of dealing with the creation and maintaining of a suitable organisational culture. Most of the interviewed agreed on the affirmative answer to this question. Answers to sub-question “Why?” most frequently included the following reasons: because they increase motivation and willingness to work, which also results in increased performance and effectiveness, while it creates favourable and productive environment, increases the loyalty of employees, enhances relationships and atmosphere at workplace. It also has a significant impact on the view of customers and the public regarding a company; it is a picture of a company. The aforementioned answers clearly show that almost all the interviewed consider organisational culture to be a significant and crucial part of success of a company (Zábojníková, 2012).

Answers to the first question sounded very positive, however when we were determining whether the companies had defined an organisational culture strategy within their business strategy in writing, only 25 % - 40 % of organisations answered affirmatively. If a clearly and comprehensively defined organisational culture strategy is absent, it is very difficult to draw particular parameters and values of organisational culture from it. It is interesting that the monitored indicator was changing only in a minimum extent over the five years of the research, which can indicate that the awareness of leaders of organizations of the impact of organizational culture on company performance is still insufficient. The given assumption is also confirmed by the fact resulting from our research, showing that 68 % - 80 % of the interviewed organizations at an annual rate did not deal with organizational culture analysis.

Table 3 Areas for which the analyzed organizations have drawn up documents

Has the organisation elaborated the following documents:	Yes, a written document in [%]									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Strategy of the organisation	66	68	64	61	59	57	60	63	64	63
HR strategy	54	53	51	49	50	47	49	50	51	50
Organisational culture strategy	25	33	29	28	30	36	40	37	38	38
Stratégiu získavania a výberu	x	x	x	38	40	42	45	47	48	49
Stratégiu vzdelávania	x	x	x	50	52	51	53	55	54	56
Stratégiu spoločenskej zodpovednosti	31	23	23	37	37	38	39	45	44	45

Note: The range of the documents has been expanded since 2013

Source: own research

Analysing the present state of employee recruitment, we were primarily interested in whether companies prefer internal or external sources. Answers of the interviewed show that the use of internal resources is gradually increasing at averaging all positions, (Table 4) The analysis of using the sources according to individual categories implied that companies use significantly differing methods in order to recruit employees. While internal employees, i.e. internal sources are preferred to recruit employees at expert and senior positions, which were presented as preferred for managerial positions in up to 59 % - 73 % of cases; and it is approximately 58 % in case of specialists, approximately 57 % in case of administrative employees, and manual workers. This fact is probably most extensively conditioned by the fact that the possibility of growth within a company is a significant motivator for employees. In addition, costs incurred by a company to use employees from internal sources are significantly reduced, compared to costs necessary to recruit employees from external sources, while such costs are directly proportional to the position in question. The fact that the given employee knows his or her company and is familiar with organisational culture the values, approaches and standards preferred by such a company is also a significant positive feature at recruiting an employee from internal sources.

Table 4 Using internal sources to recruit employees

Internal sources	EMPLOYEE CATEGORIES			Average usage of the source for all categories in %
	M %	S %	A/MW%	
2010	62	55	47	54
2011	60	51	46	52
2012	59	43	50	51
2013	63	52	57	56
2014	65	60	63	61
2015	73	69	68	70
2016	70	64	65	68
2017	69	63	60	64
2018	70	62	60	62
2019	71	64	61	63

Note: M – management, S – specialists, A - administrative employees, R – manual workers

Sources: Own research

Based on averaging the results of the analysis of the most preferred methods of recruiting employees, the most preferred methods include newspaper advertising and references, followed by recruitment agencies and corporate websites. Other methods are used by less than 30 % of companies on average. However, significant differences in using the methods of employee recruitment also resulted from the analysis with regard to respective position (Table 7). The most significant difference is in using labour offices. While this method is used to recruit manual workers in more than 50 % of companies, this amount is ten times lower for managerial positions. Almost equally significant difference was recorded for methods based on keeping the records on random applicants and former employees. Work of the employees of human resources departments, who deal with the processing of such records, is very important in both methods, while it is desirable to keep the records of individual employees according to what position they are suitable for, i.e. on the grounds of comparing information from curriculum vitae and job description. Other methods, especially used for junior positions, are advertising in the media and recommendations of an employee. An opposite case of preferring the usage of individual methods was recorded for recruitment agencies, which companies use especially to gain employees at managerial positions and specialist positions. The research showed that cooperation with educational institutions is only very little used to recruit employees in all categories.



An analysis of the methods used to recruit managers shows that the preferences for using individual methods change significantly over time. Whereas at the beginning of the reporting years, organizations make the greatest use of advertising for this purpose, both in the media and on their and agency websites. In 2019, organisations gave almost twice as much weight to the use of references (Table 5).

Table 5 Recruitment methods used in acquiring management

Methods used to recruit management:	Share org. v %									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Advertising	32	31	30	27	25	22	20	19	20	19
References	26	18	21	27	36	49	51	53	52	53
Recruitment agencies	37	31	20	24	26	29	31	33	34	33
Corporate website	33	26	24	27	34	42	42	43	42	41
Websites of recruitment agencies	23	21	15	20	24	29	32	36	36	37
Random job applicants	11	12	14	18	20	25	23	22	24	23
Labour office	4	5	6	10	12	23	22	22	24	24
Educational institutions	5	4	2	3	4	8	10	12	13	14
Social networks (LinkedIn)	x	x	x	6	6	7	13	16	15	17

Note: The range of the recruitment method has been expanded since 2013

Source: Self-exploration

When recruiting employees for the positions of specialists and technicians, a similar change occurred in the use of individual methods of acquisition as in managerial positions. While in the early years of research, organizations preferred advertising, between 2015-2019 the share of referencing increased significantly by an average of 20% over the ten-year period under review. (Table 6).

Table 6 Recruitment methods used in the recruitment of specialists and technicians

Methods used to recruit specialists and a techniks:	Share org. v %									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Advertising	66	47	37	32	27	23	23	23	24	23
References	36	32	29	33	41	56	55	57	58	57
Recruitment agencies	37	28	18	27	28	27	28	29	28	27
Corporate website	30	34	27	35	41	43	45	46	46	45
Websites of recruitment agencies	37	23	22	28	34	38	39	39	40	41
Random job applicants	30	29	27	30	29	27	29	30	31	30
Labour office	13	11	11	14	17	23	25	28	27	25
Educational institutions	10	11	7	12	14	13	15	17	15	16
Social networks (LinkedIn)	x	x	x	8	7	7	15	16	14	15

Note: The range of the recruitment method has been expanded since 2013

Source: Self-exploration

When filling an administrative position and workers, the most significant change occurred in the ten years under review in the use of advertising, which fell by almost 30%, and also in the use of employment offices, where there was a decrease of almost 20%. A not insignificant decrease of more than 20% occurred even with the use of random job seekers. On the contrary, there has been a significant increase in the search for employees through social networks by 15% and through intermediary agencies by about 15%, and the form of use of the organization's own website has also increased (Table 7).

Table 7 Staff recruitment methods used in attracting paperwork and workers

Methods used to recruit administrative employees and manual workers:	Share org. v %									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Advertising	60	56	44	39	36	31	33	34	33	34
References	47	45	44	46	50	55	54	54	55	56
Recruitment agencies	23	15	15	16	17	18	21	28	29	30
Corporate website	37	30	27	30	35	45	50	52	50	51
Websites of recruitment agencies	28	19	16	25	36	41	40	42	42	41
Random job applicants	61	58	47	40	38	36	36	38	37	38
Labour office	65	52	57	48	41	36	43	49	48	47
Educational institutions	10	7	5	7	9	11	11	12	11	10
Social networks (LinkedIn)	x	x	x	8	10	11	18	20	22	23

Note: The range of the recruitment method has been expanded since 2013

Source: Self-exploration

We can generally state that almost all methods were used for specialists, administrative employees and manual workers in a much greater frequency in 2010 than in other years. This fact is probably due to the fact that managing employees presented the frequency of methods used in 2009, when cost-cutting measures resulting from the financial crisis had not been implemented yet.

We also focused on analyzing the impact of organizational culture on employee acquisition. As part of the analysis, we identified the most significant difference when comparing the view of different groups of enterprises on whether organisational culture makes it easier for them to recruit (Table 8).

Table 8 The influence of organizational culture on recruiting employees

In what functional areas does organizational culture make it easier for you to manage human resources [%]:	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
The impact of organizational culture on employee acquisition (enterprises performing organizational culture analysis)	48	37	36	38	41	43	40	39	45	42
The impact of organizational culture on employee acquisition (enterprises not performing organizational culture analysis)	32	25	21	23	22	24	27	23	22	24

Source: Self-exploration

When evaluating correlations, the authors of the paper proceeded to the parametric statistical Pearson correlation test ( $r$ ).

**H1:** Pearson correlation test result shows that there is a mild statistically significant relationship between the region, the organizations that carry out the analysis of OK and the perception of the influence of organizational culture on the recruitment of employees. That variable correlates at the sig. level = 0.01 with the value of the Pearson correlation coefficient  $r = 0.375$  therefore we accept the hypothesis H1.

## 4 Discussion

The research showed that although 100 % of companies declare that they realise the justness of organisational culture, only 25 % - 40 % of them have defined an organisational culture strategy within their business strategy in writing. The research showed that organisations realise financial, motivational, qualification and value benefits of using internal sources upon occupying senior positions, which even increases the justness of focusing on organisational culture already upon employee recruitment also for junior positions. However, the research also indicated that cooperation with educational institutions is only very little used to recruit employees in all categories. The greatest deficiency is perceived in this sphere, even though satisfying results in the method focused on active cooperation of work sphere and schools can be achieved even at low costs, as many grammar schools and universities are currently trying to establish cooperation with organisations where their students can gain practical experience. On the other hand, room is opening for organisations to choose, get to know and gain the most prospective students, whom they are able to try in practice, train already during their studies, and offer them a position after completing their studies, while they will know the given employee and he or she will know the given organisation and its desirable organisational culture, promoted values, approaches and behaviour, which will save them financial costs of not only the selection and recruitment of the given employee but also his or her adaptation. The given clearly indicates that it is necessary to focus on both organisational culture and employee recruitment separately and possibilities how to mutually influence one another positively. The given recommendations are also confirmed by the results of a research conducted by the Business Alliance of Slovakia (BAS), which pointed to “vocational schools unlinked with practice” as the fifth greatest competitive disadvantage of Slovakia (Hajko et al. 2011).

Businesses dedicated to organizational culture identified the significance of the influence of organizational culture on staff acquisition by a significantly higher percentage (Table 8). The mutual influence of employee recruitment and organisational culture is based on the fact that addressing of potential applicants occurs with company presentation and information flow inside but especially outside the given company. Stakeholders' approach towards their company is influenced at any presentation of the company. The key objective of employee recruitment in context with organisational culture should be to recruit employees with similar value orientation, including preconditions for identifying themselves with organisational culture. Since a narrow place within the theory is the description of activities, how in practice it is possible to influence the recruitment of employees by organizational culture, we present in the presented post:

- *Profiling of potential employees.* On the grounds of declared information, applicants have a possibility to decide whether a company is attractive enough for them to be willing to actively consider the submission of job application, i.e. they are willing and able to work in the given company and identify themselves with its values, approaches and behaviour.

- *Advertising of a vacant position.* By means of defining the criteria and requirements for employees, a company both advertises a vacant position and presents what values, ways of behaviours and approaches it considers to be proper and desirable, i.e. it presents the elements of its organisational culture.

- *Application of values declared by a company, also during the selection and recruitment of employees.* Non-application of declared values has secondarily unfavourable effects on employees themselves, as they also lose their trust in other values declared by their company, and there is also a great probability that, based on a group of applicants advancing to employee selection, this selection criterion will be revealed, while it does not even have to be legally challenged, however the given company loses trust of the public in its values. On the other hand, application of declared values can significantly increase the trust of both employees and customers of the company.

- *Following organisational tradition.* If a company has a tradition of educating its own employees, i.e. recruiting employees at senior positions from internal sources, and if suitable conditions for career growth and education are created in the given company, it is perceived very positively by both internal employees and possible, especially young applicants, who can relate their professional career to the given company, which significantly increases their motivation to identify themselves with the values, standards of behaviour and approaches declared as desirable.

- *Addressing of suitable applicants.* If a company addresses applicants who do not agree with the values, approaches and behaviour declared by a company, it can result in prolonging the time of employee selection (we need to select from a greater number of applicants) in a better case, or it can result in disturbing a working team or in unsatisfactory employee adaptation (if the disagreement with organisational culture is not revealed during selection) in a worse case.

- *Harmonise the sources of employees with suitable organisational culture.* If we want to support and maintain the present organisational culture in a company which is growing, it is also desirable to recruit internal employees in newly established teams and departments, as they are identified with the culture and can be a model of behaviour for other new employees recruited from external sources. The same result can be achieved by recruiting employees from external sources, however on the grounds of recommendations of internal employees. There is thus a high probability of their awareness and easy identification with values, approaches and behaviour of a company. If we want to support the implementation of a new and changed organisational culture, it is desirable to recruit employees from external sources, who agree with the newly implemented culture, however they at the same time agree with the former culture and leadership skills (especially an ability to persuade people from the viewpoint of natural authority). Such a combination is necessary, if a new employee is to be able to create so called islands of positive deviation.

- *Refuse tactfully and “tactically”.* Preliminary selection and classification of applicants take place already during employee recruitment from the viewpoint of satisfying, respectively, in this step unsatisfying requirements imposed on the given position (selection in terms of “who not”), which indicates that some applicants are already rejected within recruitment. It is necessary to realise that most applicants will remain in the given, respectively similar or closely related sphere, respectively sector than the company carrying out recruitment. Such a rejected applicant can subsequently get a position at which he or she will decide on providing, respectively accepting a job from a company which rejected him or her as an applicant, or will have a different impact on the quality of cooperation. The position of customer as a bearer of information on company and his or her behaviour to rejected applicant is essential. For the given reasons, it is necessary to focus on this activity as not marginal.

As presented within this part of the paper, activities carried out within the employee recruitment function have a significant impact on declaring organisational culture, and at the same time they play a significant role in implementing a new and changed suitable organisational culture, supporting sustainable development of a company.

## **5 Conclusions**

Organisational culture represents something like a personality of a company; suitable organisational culture should be a summary of ways of behaviour and acting of both a company as a whole and its individual employees on their way to achieving strategic goals of the company as well as employees' personal objectives. With regard to the fact that all employees of a company, who are expected to share and develop strategically necessary concepts, approaches and values, should be bearers of a change, respectively bearers of a suitable organisational culture it is necessary to focus on organisational culture and human resources simultaneously. The possibility of such a simultaneous focus is based on interconnecting organisational culture and human resources management, which is declared in their common primary role, which is, as Kachaňáková (2010) states, "to create conditions for so called positive behaviour of employees in accordance with strategic intentions and objectives of a company".

In order to be able to achieve the greatest possible extent of agreement between human resources in a company and desirable organisational culture elements declared by a company it is necessary to interconnect activities within individual human resources management functions, and the functions of recruiting employees with requested values, approaches and working behaviour. Such interconnection is the key precondition for positive acceptance of a suitable organisational culture by employees, its embedding in their behaviour and subsequent sharing and spreading of organisational values.

The research indicated that it is necessary to focus on organisational culture and employee recruitment not only in the context of their interconnection but also independently. The given statement results from the finding that within organisational strategy, only 21 % - 33 % of companies operating in Slovakia have defined organisational culture strategy in writing, even though almost all of them declare their awareness and justness of the need to focus on organisational culture. Within the sphere focused on employee recruitment and the context of the present condition on the labour market, it is necessary to focus on cooperation between educational institutions and practice, as this way currently appears as the only effective way to gain working experience and achieve subsequent professional success of the generation of young people entering the labour market from educational institutions in their behaviour and subsequent sharing and spreading of organisational values.

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## References

- Ariani, D. W. (2021). Job stress, motivation, and job performance: direct and indirect relationship. *Journal of Human Resource Management*, 24(1), 1-11.
- Armstrong, M. (2009). *Handbook of human resource management practice*. London: Kogan Page limited. 2009. p. 1062. ISBN 978-0-7494-5242-1
- Bejtkovský, J., Rózsa, Z., & Mulyaningsih, H. D. (2018). A phenomenon of digitalization and E-recruitment in business environment. *Polish Journal of Management Studies*, 18.
- Blašková, M. (2010). Creative proactive-concluding theory of motivating. *Business: Theory and Practice* 11 (1), pp. 39-48. doi: <http://dx.doi.org/10.3846/btp.2010.05>, ISSN 1648-0627
- Blštáková, J., Joniaková, Z., Skorková, Z., Némethová, I., & Bednár, R. (2019). Causes and Implications of the Applications of the Individualisation Principle in Human Resources Management. *Ad Alta: Journal of Interdisciplinary Research*, 9(2).
- Brown, A.D. (1995) *Organisational Culture* London: Pitman Publishing 270 p. ISBN 9780273604549
- Cagaňová, D., Čambál, M., Šujanová, J., (2012). Woolliscroft, Paul: The Multiculturality Aspects and Human Capital Management within Slovak Industrial Enterprises. *ECIC 2012: Proceedings - Arcada University of Applied Science*, Helsinki: Academic Publishing International, s. 106-117 ISBN 978198272317
- Cameron, K. S., Quinn, R.E. (2011). *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework* John Wiley & Sons 288 p. ISBN: 978-1-118-00332-9
- Collins, C. J., Smith, K. G. (2006) Knowledge exchange and combination: The role of human resource practices in the performance of high-technology firms. *Academy of Management Journal*, 49, 3: 544-560. ISSN: 1948-0989
- Cooper, C.L., Cartwright, S., Earley, P. Ch. (2001). *The international Handbook of Organizational Culture and Climate*. Chichester: John Wiley & Sons, 620 p. ISBN 9780471491262
- Council of Europe (2011) *Visegrad Youth: Comparative review of the situation of young people in the V4 countries* [https://www.minedu.sk/data/files/3644\\_mladez-v-krajinach-v4.pdf](https://www.minedu.sk/data/files/3644_mladez-v-krajinach-v4.pdf)
- Covey, S., R. (2013) *The 8th Habit: From Effectiveness to Greatness*. Simon and Schuster, 432 p. ISBN 9781476735504
- Deal, T. E., Kennedy, A. A. (2000). *Corporate cultures: The rites and rituals of corporate life*. New York: Addison Wesley 232 p. ISBN 9780738203300
- Dries, N., (2013). The psychology of talent management: A review and research agenda *Human Resource Management Review* 23 (4), pp. 272-285, doi: <http://dx.doi.org/10.1016/j.hrmr.2013.05.001>, ISSN: 1053-4822
- Foot, M., Hook, C. (2005). *Personalistika*. Brno: CP Books. ISBN 80-7226-515-6.
- Furtmueller, E. (2013). Current trends in employee recruitment using the internet: "You need to have a collaborative hiring process": Steve jobs *Lecture Notes in Business Information Processing* 150, pp. 73-78 doi: [http://dx.doi.org/10.1007/978-3-642-39336-5\\_8](http://dx.doi.org/10.1007/978-3-642-39336-5_8), ISSN: 1865-1348
- Gathiira, G., & Muathe, S. (2021). Separation planning, human resource practices and pre-retiree decisions: making retirement preparedness work. *Journal of Human Resource Management*, 24(2), 36-59.
- Gyurák Babel'ová, Z. (2011). *Effectiveness of investments into human resources development in Slovakia* Łódź: KSIEZY MLYN Dom Wydawniczy Michal Kolinski, 95 p. ISBN 9788377291146
- Hajko, J., Klátik, P, Tunega, M. (2011). *Konkurencieschopné regióny 21*, Bratislava: Devín printing house,

- <http://regiony21.sk/vystupy/publikacia/KonkurencieschopneRegiony21.pdf> Accessed 3 Jul 2014 ISBN: 978-80-89493-05-0
- Herich, J. (2013) Uplatnenie absolventov stredných škôl v praxi. Bratislava: Ústav informácií a prognóz školstva [http://www.uips.sk/sub/uips.sk/images/JH/uplatnenie\\_a13\\_.pdf](http://www.uips.sk/sub/uips.sk/images/JH/uplatnenie_a13_.pdf), Accessed 10 September 2014
- Hilliard, I. (2013) Responsible Management, Incentive Systems, and Productivity *Journal of Business Ethics* 118 (2), pp. 365-377 doi: <http://dx.doi.org/10.1007/s10551-012-1570-5> ISSN: 1573-0697
- Hitka, M., Hajduková, A., Balážová, Ž. (2014) Impact of economic crisis on changes in motivation of employees in woodworking industry. *Drvna Industrija* 65 (1), pp. 21-26 doi: <http://dx.doi.org/10.5552/drind.2014.1303> ISSN 1847-1153
- Hitka, M., Schmidtová, J., Lorincová, S., Štarchoň, P., Weberová, D., & Kampf, R. (2021). Sustainability of human resource management processes through employee motivation and job satisfaction. *Acta Polytechnica Hungarica*, 18(2), 7-26.
- Chow, I. H., (2012). The roles of implementation and organizational culture in the HR-performance link. *International Journal of Human Resource Management*, 23, 15: 3114-3132. doi: <http://dx.doi.org/10.1080/09585192.2011.639553>, ISSN: 1466-4399
- Kachaňáková, A., Stachová K., 2014: Present State of Organisational Culture in Slovakia. *Economic Annals-XXI* 3-4(1), p. 35-38. ISSN 1728-6239
- Kachaňáková, A. (2010) *Organizačná kultúra* Bratislava: Iura Edition, 137 p. ISBN9788080783044
- Kachaňáková, A., Nachtmannová, O., Mulíková, M. (2002). Tendencies in the development of human resources in organizations in Slovakia. *Ekonomický časopis*, 50(2), p. 235- 256. ISSN: 0013-3035
- Kachaňáková, A., Nachtmannová, O., Joniaková, Z. (2011). *Personnel Management. (2. ed)*, Bratislava: Iura Edition, 235 s. ISBN 9788080783914
- Kalina, P. (2020), Change Management: COVID-19 and Beyond. *Journal of Human Resource Management*, 23(1), 38-40.
- Klotz, A.C., da Motta Veiga, S.P., Buckley, M.R., Gavin, M.B., 2013: The role of trustworthiness in recruitment and selection: A review and guide for future research *Journal of Organizational Behavior* 34 (1), pp. S104-S119 doi: <http://dx.doi.org/10.1002/job.1891> ISSN: 1099-1379
- Kotter J. P., Rathgeber, H. (2006). *Our Iceberg is Melting* Publisher: Macmillan 160 p. ISBN 978-0230014206
- Koubek, J. (2011). *Personnel work in small and medium-sized companies. (3.ed.)* Praha: Grada Publishing, 288 p. ISBN 978-80-247-3823-9
- Križo, P., Čarnogurský, K., & Sirotiaková, M. (2018), Using the Concept of SoLoMo Marketing in Digital Environment to Increase Brand Awareness and Communication with Customers. In *International Conference on Knowledge Management in Organizations* (pp. 551-561). Springer, Cham.
- Kubenka, M., Myskova, R. (2019). Obvious and hidden features of corporate default in Bankruptcy models. *Journal of Business Economics and Management*. Volume 20 (2), Page 368-383. DOI 10.3846/jbem.2019.9612
- Kulíková, A. (2012). *Adaptation of new employees is just as important as their selection.* <http://www.gastroprace.cz/infocentrum-prace-gastro/i-48.html#Uj7BXX-yk7k> Accessed 6 Jun 2014
- Kupec, V., Písař, P., Lukáč, M., & Pajtinková Bartáková, G. (2021). Conceptual comparison of internal audit and internal control in the marketing environment. *Sustainability*, 13(12), 6691.
- Lorincová, S., Hitka, M., & Balazova, Z. (2016). Corporate culture in slovak enterprises as a factor of hrm quality-case study. *International Journal for Quality Research*, 10(4), 719.

- Lukášová, R. (2010). *Organisational Culture and its Change*. Praha: Grada Publicshing 240 p. ISBN 978-80-247-2951-0
- Lukášová, R., Nový, I. (2004). *Organisational Culture*. Praha: Grada Publicshing 174 p. ISBN 9788024706481
- Myskova, R., Hajek, P. (2016). The Effect of Managerial Sentiment on Market-To-Book Ratio. *Transformations in Business & Amp; Economics*.15(2A), Page 498-513.
- Myskova, R.; Hajek, P. (2020). Mining Risk-Related Sentiment in Corporate Annual Reports and its Effect on Financial Performance. *Technological and Economic Development of Economy*. 26 (6), Page 1422-1443, DOI 10.3846/tede.2020.13758
- Olexová, C., & Sudzina, F. (2019). Does Personality Influence Willingness to Pay Taxes?. *Ekonomicky Casopis*, 67(10), 1055-1069.
- Schein, E.H. (2009). *The Corporate Culture Survival Guide*. Publisher: John Wiley & Sons 256 p. ISBN 9780470494837
- Stacho, Z., Stachová, K. (2015). 'The extent of education of employees in organisations operating in Slovakia' *Proceedings of the 12th International Conference on Efficiency and Responsibility in Education, (ERIE 2015)*, pp. 548-555 ISSN 2336-744X
- Stacho, Z., Urbancová, H., Stachová, K. (2013). Organisational arrangement of human resources management in organisations operating in Slovakia and Czech Republic *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 61 (7), p. 2787-2799. doi: <http://dx.doi.org/10.11118/actaun201361072787> ISSN 1211-8516
- Stachová, K., Stacho Z. (2013). Employee Allocation in Slovak Companies. *Business: Theory and Practice* p. 332-336. doi: <http://dx.doi.org/10.3846/btp.2013.35> ISSN 1648-0627
- Tempone, I., Kavanagh, M., Segal, N., Hancock, P., Howieson, B., Kent, J. (2012). Desirable generic attributes for accounting graduates into the twenty-first century: The views of employers *Accounting Research Journal* 25 (1), pp. 41-55 doi: <http://dx.doi.org/10.1108/10309611211244519> ISSN: 1030-9616
- Tuan, V. K. (2021). The role of human resources practices and the mediating effect of innovative capacity on the growth of Vietnamese enterprises. *Journal of Human Resource Management*, 24(2), 01-13.
- Vetráková M., Potkány, M., Hitka, M. (2013). Outsourcing of facility management. *E&M Economics and Management*, 16, 80-92. ISSN 2336-5604
- Walker, W.J. (2013). The new work contract: Mitigating the negative effects on work attitudes *Journal of Organizational Culture, Communications and Conflict* 17 (2), pp. 121-136 ISSN:1750-0184
- Zábojníková, P. (2012). How we are changed and what will be our HR [video] [http://www.motivp.com/shop/video/Jak\\_jsme\\_se\\_promenili\\_a\\_jake\\_bude\\_nase\\_HR](http://www.motivp.com/shop/video/Jak_jsme_se_promenili_a_jake_bude_nase_HR) Accessed 17 October 2014



## Work in the Sharing Economy – Pros and Cons

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### Abstract

The sharing economy is constantly growing in importance, regardless of external impacts (e.g. Covid-19, although some of the platforms were subdued, the others were being developed), changing the form and nature of work. The content focus of the paper is a literature review on work in the sharing economy, taking into account its benefits and drawbacks. The main advantage is autonomy and work flexibility, while precariousness of the work and different working conditions from permanent employment, including social and health protection, are among the main disadvantages.

Keywords: work, sharing economy, advantages and disadvantages, legal regulation, review.

Article Classification: Literature review

### 1 Introduction

The sharing economy, as a model of economic functioning at the global level, is experiencing a growing trend. The increase in the volume of activities (work) within the sharing economy was caused primarily by technological progress – the development of digital platforms, scale and frequency of transactions with decreasing transaction costs and an increased guarantee of trustworthiness, ease of connection and payments (OECD, 2021). Despite the fact that sharing economy has already become a common part of the economy, there is still a lack of a clear definition and it is questionable to what extent it is possible to define its content and scope precisely.

PricewaterhouseCoopers (2015a) defines a sharing economy (hereinafter referred to as “SE”) as an economy using digital platforms. These platforms allow users to access tangible and intangible assets but not their ownership, so it is an alternative to ownership. Belk (2014) defines the SE as “people coordinating the acquisition and distribution of a resource for a fee or other compensation”. In theory and practice, also other terms are

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used, mainly “collaborative economy“, “peer economy“, “collaborative consumption“, “on-demand economy“, “gig economy“, “digital sharing economy“ (see e.g. Botsman, 2013, Pouri and Hilty, 2021). The term „sharing economy“ or „SE“ is used in the paper.

There are various forms of work in the SE. Working for platforms is a form of employment (see Eurofound, 2018), and the main characteristics of the work are:

- digital platform is used for organizing a paid work;
- three parties are involved: employee, customer and a platform;
- work is the performance of a given task or solving of a problem;
- work can be contractually agreed upon or outsourced;
- work consists of tasks;
- it is an on-demand service.

The problem that persists is the legal regulation of working in the SE. Workers can be permanent or temporary employees, part-time employees, freelancers or self-employed people. Sometimes, also the terms “disguised employment”, and false or fictitious self-employment are used, in perspective of the circumvention of the obligation of legal and social protection of such workers (De Stefano & ILO, 2016).

However, persons performing work activities in the SE are mostly self-employed workers and we can deduce that economically active persons want only to earn extra money within the SE and therefore it is not their main work activity. This is related also to the problem of other motives or, eventually, limitations of the work in the SE.

The paper aims to make a review of the literature published in the WOS database from 2017 to 2021, focused on working in the sharing economy, particularly on the pros and cons of this work, for further research purposes.

## 2 Material and methods

The advantages and disadvantages of working in the sharing economy come out from a literature review. The review was carried out systematically according to the methodology used by Dvouletý et al. (2020) and Linnenluecke et al. (2019).

The first step was to choose keywords related to the topic. The issue of sharing economy is relatively new, so a comprehensive overview of the work in sharing economy is still missing in the publications, moreover, there is still an ambiguity even in defining the sharing economy. For these reasons, the combination of more keywords was chosen:

- “employment” and “sharing economy”,
- “employment” and “collaborative economy”,
- “work” and “sharing economy”,
- “work” and “collaborative economy”.

These combinations of keywords were entered into the search in the scientific database Web of Science. Five year period was determined as the period of the review due to the rapid development in this field, i.e. 2017 and 2021, to provide up-to-date knowledge. The results of the searches were compared to exclude duplicate publications. The results were narrowed to articles in Management, Business and Economics category (as sharing economy is also in the spotlight of scientists of other fields, e.g. computer science, environmental science etc.). Then, only the relevant articles related to work in sharing economy, according to the assessment of the authors, were studied and presented in the result section (e.g. sometimes the keyword “work” referred to a work in the meaning of the paper or article, in the abstract, and so on).

### 3 Results

The results from the search for the combination of the keyword “work” or “employment” and the phrase “sharing economy” or “collaborative economy” were as follows:

- “employment” and “collaborative economy” (WOS: N = 2), both articles were included in the review,
- “employment” and “sharing economy” (WOS: N = 36), out of 36, we selected 20. Due to the duplicity of 4 of them, 16 articles were included in the review;
- “work” and “collaborative economy” (WOS: N = 26; ), six relevant articles were included in the review,
- “work” and “sharing economy” (WOS: N = 189), 21 articles were relevant and because of duplicity, we included eight of them in the review.

The succinct review of the 32 articles in total, including the authors and the year of publication, main topics related to working in the sharing economy, field (if applicable), platforms (if applicable) and countries (if applicable) is presented in Table 1.

Table 1 Literature review; authors’ processing according to the literature

Authors (year of publication)	Topic	Field / platform (if applicable)	Country (if applicable)
Aroles (2019)	New work practices, spatiality and temporality of work		
Artero et al. (2020)	Digital labour market, education, non-standard employment		
Aboobaker et al. (2021)	Contract/temporary and permanent basis, short-term contracts freelancing, well-being at work, employee loyalty		India
Burger et al. (2019)	Skills, knowledge base		USA
Burtch (2018)	Stable employment for the unemployed or underemployed	Uber X, Kickstarter	
Chai and Scully (2019)	Labour process theory, work arrangements, drivers	transportation/ Uber	
Cornelissen and Cholakova (2021)	Category work, employment relations	transportation/ Uber	
De-Miguel-Molina et al. (2021)	Taxi services, deregulation, governance model	transportation/ Uber	Spain
Dogru et al. (2020)	Positive impact on employment in the hotel sector	Hospitality, tourism, leisure industries/ Airbnb	
Eichhorst et al. (2017)	Forms of employment, solo self-employment, social protection		Germany, developed countries
Fleming et al. (2019)	Labour-based digital platforms, future of work	transportation/ Uber	USA, United Kingdom
Geissinger et al. (2021)	Digital work, transformation of work, social media analytics	Delivery / Foodora	Sweden

Gentile and Ruiz (2021)	Crowd-sourcing, digital platforms, relational labour		
Gleim et al. (2019)	Two categories of gig employment – the sharing economy or direct selling, job satisfaction		
Hagiu and Wright (2019)	Independent contractors or employees	Handy, Uber	
Hua et al. (2020)	Internet taxi drivers, employee behaviour, crowding theory, monetary incentives	transportation	
Islam (2018)	Self-employment, online workers		India
Li et al. (2021)	Labour market, empowering effect and competition effect, low-wage jobs	transportation/ Uber	USA
Malin and Chandler (2017)	pros and cons of employment in the SE	transportation/Uber, Lyft	
Meged and Christensen (2017)	Tourism, job crafting, labour market transformation	Copenhagen Free Walking Tours, Airbnb	Denmark
Melian-Gonzales and Bulchand-Gidumal (2018)	Nonstandard employment, digital labour market,	Physical tasks, tourist/ TaskRabbit, Trip4real	USA, European countries
Minter (2017)	Labour standards, contracts, employment conditions, trade unions	home & office tasks / Airtasker	Australia
Nawaz et al. (2020)	Work-life balance value and other values, freelancer Job Stress		
Newlands et al. (2018)	Informal employment, trade unionism		12 European countries
Pawlowska (2019)	Job sharing, employability market orientation		
Peticca-Harris et al. (2020)	Drivers, postcapitalist hyper-exploitation	transportation/ Uber	Canada
Thorne and Quinn (2017)	Employment relationships, independent worker		
Valente et al. (2019)	Uber drivers, matter of solving unemployment	transportation/ Uber	Brazil
Wang and Smart (2020)	Driver labour market, taxi, income	transportation / Uber, Lyft	USA
Wentrup et al. (2019)	Digital work, trust-building mechanism	transportation/ Uber	France
Williams and Horodnic (2017)	Bogus self-employment		Romania
Xiong et al. (2021)	Driver reward system	transportation/ Uber	China

*Note: in alphabetical order according to the first author's surname*

Some of the issues related to employment and new work practices in the SE are discussed by Aroles et al. (2019), including motivation, flexibility, career motivations in

self-employment and employment alike, and working conditions. Melian-Gonzales and Bulchand-Gidumal (2018) compared standard employment (i.e. permanent and a full-time job) and nonstandard employment (jobs that deviate from these characteristics and are usually linked to low wages, bad working conditions and unstable employment).

Also other authors focused on the research in this field. Malin and Chandler (2017) conducted research aimed at the impact of employment in the SE on drivers working for Uber and Lyft platforms and concluded, that the main advantages of the work from the drivers' point of view, are flexibility and sociability, and the disadvantage is bad riders' behaviour. Flexibility is presented as the main advantage by more authors (e. g. Aboobaker et al., 2021; Shokoohyar, 2018). Shokoohyar (2018) conducted research on the work of drivers for ride-sharing platforms Uber and Lyft. Advantages include working time flexibility and the experience of meeting new people (passengers, customers) making the job of the drivers more fun. Disadvantages include insufficient compensation for the operating costs, poor job security, suffering from poor and awful customer service, which is provided, and unpleasant experiences with passengers. Williams and Horodnic (2017) focus attention on workers employed as bogus self-employed who witness diminished social protection, career opportunities and job security.

Melian-Gonzales and Bulchand-Gidumal (2018) summarized the cons of the work in the digital labour market in their review based on the platform analysis and/or workers' data on the platforms. They listed these: lack of social protection, short-length assignments, low-skilled work, uncertainty, high competition, low bargaining power for workers, long workdays, subordination to customer experience, insufficient earnings to make a living, and low work demand.

#### **4 Discussion and conclusion**

The reviewed papers discussed working in the sharing economy, but not all of the papers were focused particularly on the advantages or disadvantages of the work in the SE.

We can conclude, that the pros of working in the SE include:

- autonomy and real-time work flexibility – workers, usually self-employed persons and freelancers, make their own schedules of the work,
- higher utilization of working time and capacity,
- low entry barriers,
- guaranteed payments – thanks to the use of apps,
- work-life balance.
- 
- The cons include:
- precariousness of the work,
- insufficient social and health protection of workers – due to the prevailing self-employment, workers do not have benefits resulting from employment relations,
- limitations in the price policy and low negotiating power of workers – application usually limits the pricing,
- low earnings to make a living and uncertainty of regular income,
- career growth limitation.

In terms of employment, the sector of sharing economy is still in a grey zone (PricewaterhouseCoopers, 2015b). We agree with the opinion of Dolobáč (2018) that

legal regulation is only catching up with technological progress and prevailingly legally corrects and regulates what actually works and is still developing, but with potential social threats to the wider society. Participants in the SE can have a competitive advantage thanks to lower costs and smaller administrative burdens than traditional service providers, but in case of more regulations, they could lose this advantage. On the other hand, the right regulation of the SE can be beneficial from an employment perspective.

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### References

- Aboobaker, N., Edward, M. and Zakkariya, K. A. (2021), "Workplace spirituality, well-being at work and employee loyalty in a gig economy: multi-group analysis across temporary vs permanent employment status." *Personnel review*, early access, Doi: 10.1108/PR-01-2021-0002
- Aroles, J., Mitev, N., and de Vaujany, F.X. (2019), "Mapping themes in the study of new work practices." *New technology work and employment*, Vol. 34 No. 3, pp. 285-299. Doi 10.1111/ntwe.12146
- Artero, J. M., Borra, C. and Gomez-Alvarez, R. (2020), "Education, inequality and use of digital collaborative platforms: The European case." *Economic and labour relations review*, Vol. 31 No. 3, pp. 364-382. Doi: 10.1177/1035304620943109
- Belk, R. (2014), "You are what you can access: sharing and collaborative consumption online. " *Journal of Business Research*, Vol. 67 No. 8, pp. 1595-1600. <https://doi.org/10.1016/j.jbusres.2013.10.001>
- Botsman, R. (2013), "The Sharing Economy Lacks A Shared Definition", in FastCompany, available at: <https://www.fastcompany.com/3022028/the-sharing-economy-lacks-a-shared-definition#10> (accessed 5 August 2022)
- Burger, M., Stavropoulos, S., Ramkumar, S., Dufourmont, J. and van Oort, F. (2019), "The heterogeneous skill-base of circular economy employment. " *Research policy*, Vol. 48 No. 1, pp. 248-261. Doi: 10.1016/j.respol.2018.08.015
- Burtch, G., Carnahan, S. and Greenwood, B.N. (2018), "Can You Gig It? An Empirical Examination of the Gig Economy and Entrepreneurial Activity." *Management Science*, Vol. 64 No. 12, pp. 5497-5520. Doi: 10.1287/mnsc.2017.2916
- Cornelissen, J. and Cholakova, M. (2021), "Profits Uber everything? The gig economy and the morality of category work." *Strategic organization*, Vol. 19 No. 4, pp. 722-731. Doi: 10.1177/1476127019894506
- de-Miguel-Molina, M., de-Miguel-Molina, B., and Catala-Perez, D. (2021), "The collaborative economy and taxi services: Moving towards new business models in Spain." *Research in transportation business and management*, Vol. 39 No. 100503. DOI 10.1016/j.rtbm.2020.100503
- De Stefano, V. and International Labour Office (ILO). (2016), *The rise of the «just-in-time workforce»: On-demand work, crowdwork and labour protection in the «gig-economy»*. Geneva, International Labour Office.
- Dogru, T., Mody, M., Suess, C., McGinley, S. and Line, N. D. (2020), "The Airbnb paradox: Positive employment effects in the hospitality industry. " *Tourism management*, Vol. 77. Doi: 10.1016/j.tourman.2019.104001

- Dolobáč, M. (2018), "Legislatívne výzvy priemyselnej revolúcie 4.0", in Švec, M. – Bulla, M. (eds.): *Práca 4.0, digitálna spoločnosť a pracovné právo*. Bratislava, Friedrich Ebert Stiftung, zastúpenie v SR, ISBN 978-80-89149-58-2.
- Dvouletý, O., Srhoj, S. and Pantea, S. (2020), "Public SME grants and firm performance in European Union: A systematic review of empirical evidence", *Small Business Economics*. <https://doi.org/10.1007/s11187-019-00306-x>
- Eichhorst, W., Hinte, H., Rinne, U. and Tobsch, V. (2017), "How Big is the Gig? Assessing the Preliminary Evidence on the Effects of Digitalization on the Labor Market." *Management revue*, Vol. 28 No. 3, pp. 298-318. Doi: 10.5771/0935-9915-2017-3-298
- Eurofound (2018), *Employment and working conditions of selected types of platform work*, p. 9.
- Fleming, P., Rhodes, C. and Yu, K. H. (2019), "On why Uber has not taken over the world." *Economy and society*, Vol. 48 No. 4, pp. 488-509. Doi: 10.1080/03085147.2019.1685744
- Geissinger, A., Laurell, C., Oberg, C., Sandstrom, C., and Suseno, Y. (2021), "The sharing economy and the transformation of work: evidence from Foodora." *Personnel review*, Vol. 51 No. 2, pp. 584-602. Doi: 10.1108/PR-08-2019-0450
- Gentile, A. and Ruiz, P. G. (2021), "The Meaning of Work in the Digital Society: Lessons from the Crowdsourcing." *Revista empresa y humanismo*, Vol. 24 No. 1, pp. 27-54. Doi: 10.15581/015.XXIV.1.27-54
- Gleim, M. R., Johnson, C. M. and Lawson, S. J. (2019), "Sharers and sellers: A multi-group examination of gig economy workers 'perceptions.'" *Journal of business research*, Vol. 98, pp. 142-152. Doi: 10.1016/j.jbusres.2019.01.041
- Hagiú, A. and Wright, J. (2019), "The status of workers and platforms in the sharing economy. " *Journal of economics & management strategy*, Vol. 28 No. 1, pp. 97-108. Doi: 10.1111/jems.12299
- Hua, Y., Cheng, X. S., Hou, T. T. and Luo, R. (2020), "Monetary Reward, Intrinsic Motivators, and Work Engagement in the IT-Enabled Sharing Economy: A Mixed-Methods, Investigation of Internet Taxi Drivers, " *Decision Sciences*, Vol. 51 No. 3, pp. 755-785. Doi: 10.1111/dec.12372
- Chai, S. Y., and Scully, M. A. (2019), "It's about distributing rather than sharing: Using Labor Process Theory to Probe the "Sharing" Economy, " *Journal of Business Ethics*, Vol. 159 No. 4, pp. 943-960. Doi: 10.1007/s10551-019-04210-y
- Islam, I. (2018), "Automation and the Future of Employment: Implications for India." *South Asian Journal of Human Resource Management*. Vol. 5 No. 2, pp. 234-243. Doi: 10.1177/2322093718802972
- Li, Z. R., Hong, Y. L. and Zhang, Z. J. (2021), "The Empowering and Competition Effects of the Platform-Based Sharing Economy on the Supply and Demand Sides of the Labor Market. " *Journal of management information systems*, Vol. 38 No. 1, pp. 140-165. Doi: 10.1080/07421222.2021.1870387
- Linnenluecke, M.K., Marrone, M. and Singh, A. K. (2019). "Conducting systematic literature reviews and bibliometric analyses". *Australian Journal of Management*, 1-20.
- Malin, B. J., and Chandler, C. (2017), "Free to work anxiously: Splintering precarity among drivers for Uber and Lyft. " *Communication, Culture & Critique*, Vol. 10 No 2, pp. 382–400.
- Nawaz, Z., Zhang, J., Mansoor, R., Hafeez, S. and Ilmudeen, A. (2020), "Freelancers as Part-time Employees: Dimension of FVP and FJS in E- Lancing Platforms, " *South Asian Journal of Human Resource management*, Vol. 7 No. 1, pp. 34-60. Doi: 10.1177/2322093720908453
- Newlands, G., Lutz, C., and Fieseler, C. (2018). "Collective action and provider classification in the sharing economy," *New technology work and employment*, Vol. 33 No. 3, pp. 250-267. Doi: 10.1111/ntwe.12119
- Meged, J.W. and Christensen, M. D. (2017), "Working within the collaborative Tourist Economy: The complex crafting of work and meaning." *Collaborative economy and tourism: perspectives, politics, policies and prospects*, pp. 203-220.

- Melian-Gonzales, S. and Bulchand-Gidumal, J. (2018), "What type of labor lies behind the on-demand economy? New research based on workers' data." *Journal of management & organization*, Vol. 27 No. 5, pp. 850-866. Doi 10.1017/jmo.2018.53
- Minter, K. (2017), "Negotiating labour standards in the gig economy: Airtasker and Unions New South Wales." *Economic and labour relations review*, Vol. 28 No. 3, pp. 438-454. Doi: 10.1177/1035304617724305
- OECD (2021), *The Impact of the Growth of the Sharing and Gig Economy on VAT/GST Policy and Administration*. Doi: 10.1787/51825505-en
- Pawlowska, A. (2019), "Employability Market Orientation of Employee on the Gig Economy Labour Market." *Problemy zarzadzania-management issues*, Vol. 17 No. 6, pp. 58-73 Doi: 10.7172/1644-9584.86.3
- Peticca-Harris, A., deGama, N. and Ravishankar, M. N. (2020), "Postcapitalist precarious work and those in the 'drivers' seat: Exploring the motivations and lived experiences of Uber drivers in Canada." *Organization*, Vol. 27 No. 1, pp. 36-59. Doi: 10.1177/1350508418757332
- Pouri, M.J. and Hilty, L.M. (2021), "The digital sharing economy: A confluence of technical and social sharing." *Environmental Innovation and Societal Transitions*, No 38, pp. 127-139.
- PricewaterhouseCoopers (2015a), "The Sharing Economy: Sizing the Revenue Opportunity" available at: <http://www.pwc.co.uk/issues/megatrends/collisions/sharingeconomy/the-sharing-economy-sizing-the-revenue-opportunity.html> (accessed 20 July 2021)
- PricewaterhouseCoopers (2015b), "Sharing or paring? Growth of the sharing economy", available at: <https://www.pwc.com/hu/en/kiadvanyok/assets/pdf/sharing-economy-en.pdf> (accessed 2 May 2022)
- Shokoohyar, S. (2018), "Ride-sharing platforms from drivers' perspective: Evidence from Uber and Lyft drivers." *International Journal of Data and Network Science*, Vol. 2, pp. 89-98. doi: 10.5267/j.ijdns.2018.10.001
- Thorne, D. M. and Quinn, F. F. (2017), "Supplier Resources in the Sharing Economy: Three Regulatory Concerns." *Journal of marketing channels*, Vol. 24 No. 1-2, pp. 73-83. Doi: 10.1080/1046669X.2017.1347003
- Valente, E., Patrus, E. and Guimardes, R.C. (2019), "Sharing economy: becoming an Uber driver in a developing country," *Rege-Revista de Gestao*, Vol. 26 No 2, pp. 143-160. Doi: 10.1108/REGE-08-2018-0088
- Wang, C. and Smart, M. (2020), "The disruptive effect of ridesourcing services on for-hire vehicle drivers' income and employment." *Transport policy*, Vol. 89, pp. 13-23. Doi: 10.1016/j.tranpol.2020.01.016
- Williams, C. C. and Horodnic, I. A. (2017), "Tackling bogus self-employment: some lessons from Romania." *Journal of developmental entrepreneurship*, Vol. 22 No. 2, Doi: 10.1142/S108494671750011X
- Wentrup, R., Nakamura, H.R. and Stroem, P. (2019), "Uberization in Paris – the issue of trust between a digital platform and digital workers," *Critical Perspectives on International business*, Vol. 15 No. 1, pp. 20-41. Doi: 10.1108/cpoib-03-2018-0033
- Xiong, F., Xu, S. and Zheng, D. Z. (2021), "An investigation of the uber driver reward system in China – an application of a dynamic pricing model." *Technology analysis & strategic management*, Vol. 33 No. 1, pp. 44-57. Doi: 10.1080/09537325.2020.1787975



# Changes in Employee Training and Development in Slovakia During the COVID-19 Pandemic

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## Abstract

The COVID-19 pandemic has been indelibly written in the history of mankind. Its greatest tragedy is that it claimed a large number of human lives. At the same time, however, it paralyzed cities, businesses and cut people off from their loved ones for many months. We can observe its consequences in every sphere of life, including HRM and its components. The aim of the paper is to find out whether there were changes in the methods of training and development of employees of Slovak companies during the COVID-19 pandemic. The intention was to find out whether the number of employee training and development methods used changed during the COVID-19 pandemic, and if so, which of them were used less often during the COVID-19 pandemic than before the pandemic, and which, on the contrary, more often. The research was carried out using a questionnaire survey on a sample of 308 employees of Slovak companies. Statistical methods such as mean, median or mode, Wilcoxon Signed Ranks Test and McNemar Test were used to analyse the answers. One of the main findings is the fact that among the interviewed employees there was a decrease in the used methods of training and development, especially in the use of workshops, coaching, mentoring and instructing. The only method that began to be used more often during the COVID-19 pandemic is e-learning.

Keywords: human resource management; training and development; COVID-19; Slovak employees

Article Classification: Research article

## 1 Introduction

Human resource management is not static. On the contrary, over time, due to the changing needs of the dominant generations on the labour market and the growing possibilities of companies, HRM changes, expands and becomes more complex. HRM includes work with employees in the company, which carries elements of both operational and strategic activities. Therefore, we can consider the main goal of HRM to be the use of everything that employees know and can do to achieve the company's short-term and long-term goals. Individual-level HRM processes are focused on individuals and are often

highly personalized. Most often, these are processes such as employee adaptation, evaluation of his performance and potential, education and development, or career planning (Rahn, 2012).

Employee training and development are human resource management activities used to fill gaps between current and expected performance. They are part of knowledge management and knowledge transfer and play a crucial role in human resources management (Poór et al., 2018). They represent organized activities aimed at disseminating information or instructions to improve the recipient's performance or to assist in achieving a desired level of knowledge or skill. Moreover, compared to employees without further training, those who have engaged in professional development have considerably lower risks of premature termination of their employment relationship (Becker, 2019). Employees could feel motivated to participate continuously in further training in order to guarantee their prospects of receiving benefits by improving their ability to react to the consequences of technological change (e.g. automation or rationalization) (Becker, Schömann 2015). It is a process of imparting basic skills, programmed behaviour, so that individuals become aware of rules and procedures to help them manage their own behaviour in the effective performance of their work. Although the two terms are often used interchangeably, there are certain differences between them, especially in the goals they pursue. Training is aimed at improving the skills needed to achieve organizational goals, as it increases the effectiveness of individuals, groups and the entire organization. We understand corporate training as investing in employees with the aim of achieving better performance. Its results are applied to the job where the employee is currently working. So it mainly helps in performing current tasks. The specific goals of training mainly include aligning the knowledge, abilities and skills of employees with job requirements, developing employee skills and improving their performance, eliminating undesirable employee behaviour and adjusting the value orientation of employees to be in line with organizational values (Rodriguez, Walters, 2017).

Although the concept of employee development can also be considered as further training, it focuses on acquiring new abilities and skills for personal growth, increasing qualifications, acquiring knowledge, developing abilities and skills needed in a different, usually more demanding and important job. Improving qualifications includes learning and acquiring new knowledge, skills, and abilities that an employee needs to be able, or qualified to perform a different job (Šikýř, 2016). In the case of retraining, there is the acquisition and mastering of completely new skills, knowledge and abilities, which are not necessary for the performance of current work tasks, but for the employee to increase his qualifications in the given organization, but also outside it, or to be able to apply in another job as well (PeopleHum, 2021). We understand employee development as preparation for performing higher qualified work or work with higher responsibility. It can also be seen as a broader concept. It can be considered as the overall long-term growth of individuals for the purpose of fulfilling future tasks and responsibilities, for the needs of their promotion and management of their career in the organization (Elnaga, Imran, 2013). It helps with professional orientation for the future, shapes work skills, personal qualities and potential. Development activities should signal to employees that the company is interested in employing them in the long run (Hitka et al., 2021). Development goals primarily include helping employees to grow and develop their potential in the company, promoting employees and planning their careers, meeting the future need for human resources, mainly from internal sources, and reducing the time required for training and adaptation of employees starting to work in a newly created workplace or transferred to another job or employees promoted in the company (Nassazi,

2013). Thus, training involving planning for preparing different learning techniques for the staff with the aim of increasing their ability to reach the targeted goal. While development is interested in understanding the mechanisms of things, and future issues not only current process as a general, it seeks future demands and it occurs over a longer period of time than training which is happening at the present time and deals with every single staff responsibility (Anwar, Ghafoor, 2017).

Both learning and development consist of prepared plans and ways to assist the employee in terms of their current skills, behaviours and their way of acting in the working environment (Nechirwan et al., 2021). However, systematic training and development of employees according to the individual needs of the employee began to appear in management in the 1950s to 1970s (Stachová et al., 2020). Implementation of education or development is the most important phase of the whole process. It is important to realize that the quality of the entire training process directly affects other personnel activities, and therefore it is very important that the company chooses the most appropriate training method. By applying appropriate methods, inputs are transformed into outputs, which take the form of increased performance, productivity and efficiency of work, new roles in the organization, higher responsibility at work. Part of the implementation phase of employee training and development programs is the key choice of an adequate form and method. The first of them is the form of training at the workplace, the so-called on the job (formal, informal, informal, interpersonal education), the other outside the workplace – off the job (institutionalized, lifelong education). Individual methods are shown in Table 1.

Table 1 Methods of training and development of employees; Koubek, 2015

On the job methods	Off the job methods
Instructing	Lecture
Coaching	Seminar
Mentoring	Case studies
Counselling	Workshop
Assisting	Brainstorming
Task assignment	Simulations
Cross-training program	Role playing
Work meetings	Diagnostic-training program
Demonstrating	E-learning
Shadowing	Self-Study
Consulting	Development centre
Job rotation	

On the job training is that basic means of an effective and concentrated training in most areas of dealing with money, administration, being a practical manager and etc. so that the employee is able to receive these lessons and respond to it in a good manner and apply it simultaneously when he is working daily in that area (Anwar, Abdullah, 2021). On the other hand, off the job training is away from the job circumstances, but employees would learn to get appropriate training just like that of the working place but in a different place, special environment is arranged so that to have a chance of maximum interaction between trainers and trainees (Anwar, 2017). Employees are usually expected to prefer general further training, as opposed to on-the-job further training, since the latter commonly focuses on firm-specific human capital which not only cannot be fully used in other companies, but is also rarely certified and as such is rarely acknowledged by other employers (Becker, 2019). However, the COVID-19 pandemic means a great challenge for business managers operating in various fields to consider the implementation of new

management methods and tools in this unstable and changing world. Procedures and practices of human resources management, including the management itself, are affected by COVID-19 also the other sectors in a company (Tomčíková et al., 2021). Remote working, creating virtual teams, knowledge management are some of the many practices that most companies are adopting as a concept to keep companies running smoothly (Carnevale, Hatak, 2020).

## **2 Material and methods**

The aim of the paper is to find out whether there were changes in the methods of training and development of employees of Slovak companies during the COVID-19 pandemic. We collected data using a questionnaire. Before creating the content and form of the questionnaire, we set the following research questions to which we were looking for answers:

- RQ1: Were there any changes in the number of methods of training and development of employees during the COVID-19 pandemic?
- RQ2: Which methods were used less frequently during the COVID-19 pandemic than before the pandemic?
- RQ3: Which methods were used more often during the COVID-19 pandemic than before the pandemic?

In the questionnaire survey, we asked the respondents whether they were trained or developed before and during the pandemic and, if so, what methods were used. The respondents who took part in the survey were Slovak employees. In order to be able to assess and compare the situation before the outbreak of the COVID-19 pandemic with the situation during the pandemic, they should work in one company for at least two years. Employees with a shorter employment relationship had no way to evaluate the change in professional training and development. The survey was attended by 308 compliant respondents who were approached through social networks or by direct selection. The questionnaire survey was carried out in the first half of 2022. We evaluated the summarized numerical results of the responses from the questionnaire survey using statistical methods such as mean, median or mode, Wilcoxon Signed Ranks Test and McNemar Test.

## **3 Results**

In search of an answer to the first research question, we focused on the number of methods by which employees were trained or developed. Due to anti-pandemic measures and several lockdowns, we can assume that the number of used methods has decreased. To verify this assumption, we present the descriptive statistics of the number of methods in Table 2.

Table 2 Descriptive Statistics of number of used methods; own elaboration

		Before COVID-19	During COVID-19
N	Valid	308	308
	Missing	0	0
Mean		2.86	1.42
Median		3	1
Mode		0	0
Std. Deviation		2.08	1.49
Minimum		0	0
Maximum		7	5
Before COVID-19		Frequency	Percent
No. of methods	0	86	27.92
	1	4	1.30
	2	26	8.44
	3	47	15.26
	4	66	21.43
	5	55	17.86
	6	22	7.14
	7	2	0.65
Total		308	100.00
During COVID-19		Frequency	Percent
No. of methods	0	133	43.18
	1	35	11.36
	2	61	19.81
	3	46	14.94
	4	24	7.79
	5	9	2.92
Total		308	100.00

As we can see at first glance, our assumption has been confirmed. While before the COVID-19 pandemic each employee encountered an average of 2.89 methods, during the pandemic this average value dropped to 1.42. It is also worth mentioning the fact that before the pandemic, 27.92% of the surveyed employees had no training or development at all, while during the pandemic it was up to 43.18% of the surveyed employees. Moreover, while before the pandemic employees could encounter a combination of 6 or 7 training methods (7.79% of respondents), during the pandemic it was a maximum of 4 – 5 methods (10.71% of respondents). Subsequently, we tested the number of used training and development methods with the Wilcoxon Signed Ranks Test, which tests the null hypothesis that the medians of the methods before and during the pandemics are equal against the alternative hypothesis that they are different. We performed the testing at the level of significance  $\alpha = 0.05$ . The results are shown in Table 3.

Table 3 Results of Wilcoxon Signed Ranks Test; own elaboration

	Ranks	N	Mean Rank	Sum of Ranks
During / Before COVID-19	Negative Ranks	175 <sup>a</sup> (56.82%)	115.40	20194.50
	Positive Ranks	35 <sup>b</sup> (11.36%)	56.01	1960.50
	Ties	98 <sup>c</sup> (31.82%)		
	Total	308		
	Z		Asymp. Sig. (2-tailed)	
	- 10.404		0.000	

a. Number During COVID-19 &lt; Number Before COVID-19

b. Number During COVID-19 &gt; Number Before COVID-19

c. Number During COVID-19 = Number Before COVID-19

As we can see from the results of the Wilcoxon Signed Ranks Test ( $Z = -10.404$ ; Asymp. Sig < 0.05), during the COVID-19 pandemic there were changes in the methods of training and development of employees. However, it is interesting to note that the decrease in number of used methods was witnessed by 56.82% of respondents, while 31.82% of respondents did not change the number of implemented methods. In 11.36% of cases, the number of training and development methods used even increased. This points to the fact that some companies have taken advantage of their reduced production capacity during the pandemic to invest in training and development of their employees.

For an even deeper understanding of the changes, we were interested in what changes occurred during the implementation of individual training and development methods. For our analysis, we selected the 8 most frequently mentioned methods, shown in Table 4. We determined the difference in their use by using the McNemar Test, which tests the null hypothesis that the use of individual methods before and during the pandemic was the same against the alternative hypothesis, that the use of methods was different. We performed the testing at the level of significance  $\alpha = 0.05$ . The results are shown in Table 4.

Table 4 Results of McNemar Test; own elaboration

Before / During	N	Chi-Square <sup>a</sup>	Asymp. Sig.
Coaching	308	60.016	0.000
Mentoring	308	68.014	0.000
Instructing	308	80.012	0.000
Workshop	308	149.007	0.000
E-learning	308	8.108	0.004
Model situations	308	37.026	0.000
Role playing	308	25.037	0.000
Self-Study	308	16.598	0.000
None	308	24.322	0.000

a. Continuity Corrected

Looking at the results (Asymp. Sig < 0.05 in all cases), we reject all null hypotheses and conclude that during the COVID-19 pandemic, there was a statistically significant change in the frequency of use of all training and development methods. There was also a statistically significant change in the number of respondents who were not provided with any education.

Table 5 Difference in the use of most frequently used methods; own elaboration

	Before (%)	Std. Deviation	During (%)	Std. Deviation	Difference (% points)
Coaching	36.04	0.48089	15.91	0.36636	- 20.13
Mentoring	35.71	0.47994	12.99	0.33671	- 22.72
Instructing	37.01	0.48363	10.39	0.30562	- 26.62
Workshop	64.29	0.47994	15.26	0.36018	- 49.03
E-learning	27.60	0.44773	37.66	0.48533	+ 10.06
Model situations	16.56	0.37231	3.90	0.19382	- 12.66
Role playing	10.39	0.30562	1.62	0.12658	- 8.77
Self-Study	58.77	0.49306	43.83	0.49699	- 14.94
None	27.92	0.44935	43.18	0.49614	+ 15.26

By comparing the use of individual methods before and during the COVID-19 pandemic (Table 5), we can answer the second and third research questions. We recorded the largest decrease in the use of workshops (49.03% points), since before the pandemic 64.29% of the interviewed employees took part in the workshops, compared to only 15.26% during the pandemic. The fact that the workshops took place online did not help either. We also recorded a significant decline in the use of coaching (20.13% points), mentoring (22.72% points) and instruction (26.62% points). We do not consider these results surprising, because these 3 methods probably require the most personal contact between the educator and the educated employee. On the contrary, the only method that began to be used more often during the pandemic was e-learning (increase by 10.06% points). This was also to be expected as the whole world has become forced to function much more online. It is a slight surprise that there has not been an increase in employees who have encountered self-study in the workplace, because, as we mentioned when analysing the number of methods used, some companies have used their own reduced production capabilities during the pandemic to invest in the training and development of their employees. On the contrary, we observed its decrease (14.94% points).

#### 4 Discussion

The COVID-19 pandemic has affected the entire world in all its spheres. The COVID-19 lockdowns have led a transformation in the way we run our schools, interact with loved ones, teach and learn, do our work, do our shopping, travel, get medical care, spend leisure time, engage in commerce, and conduct many of the routine transactions of life (Sneider and Sternfels 2020). The working environment has changed significantly in almost all companies, and employees were often forced to stay at home in order to protect their own health. Every area of management faced new challenges. It was the same in the case of HRM and its individual components. In recent years of continuous development of the individual, economy and society, corporate education and development have become a common and necessary part of the working life of employees. But the COVID-19 pandemic changed everything. The goal of the paper was to find out whether there were changes in the methods of training and development of employees of Slovak companies during the COVID-19 pandemic. We fulfilled this goal by searching for answers to the questions whether the number of employee training and development methods used changed during the COVID-19 pandemic, and if so, which of them were used less often during the COVID-19 pandemic than before the pandemic, and which, on the contrary, more often. Based on our findings on a sample of Slovak employees, we can claim that there has clearly been a change in the number of educational and development

methods used. Specifically, we observed a decrease in their number. All the most common methods were used less often, except for e-learning. This one was the only one that recorded a boom. This contradicts the findings of Mikołajczyk (2021), who claims that "all forms connected to development have been transferred to the Internet". Based on our findings, we claim that methods such as coaching, mentoring or instruction in the Internet environment either lose their quality or have no meaning at all. So we will correct Mikołajczyk's statement to: "MAJORITY of forms connected to development have been transferred to the Internet". Although we recognize that e-learning and internet connection have served many companies as a substitute for the mentioned educational and development activities, because ICT education and training during COVID-19 has taken centre stage due to the demand (Seberini et al., 2022). As claimed by Bondar et al. (2020), contemporary education and development requires the development of new forms of learning based on the SMART approach, which allows development of the relevant skills, abilities, and competencies. We agree with Hite and Mc Donald (2020), who think that a critical part of creating and sustaining a learning culture is recognizing how differently employees have experienced this crisis, and what they might need to return to work and be successful. Treating each employee on an individual basis will be important because for some, this pandemic has not been a career shock, but rather a minor distraction or an opportunity to spend more time with family. We consider this to be one of the main reasons why we observe a decline in self-education among employees, although in many cases the space was created for it. Another reason was identified by Mura et al. (2021), who found that learning and professional development as a means of reward were mentioned only by 6.5% of the leaders. This suggests that in the event of a pandemic, they were primarily concerned with other aspects of HRM. We therefore agree with Yawson (2020), who claims that the uncertainty that is associated with post-COVID-19 future requires strategic flexibility, the ability to change strategies, and become more adaptable.

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### References

- Anwar, K., Ghafoor, C. (2017), "Knowledge management and organizational performance: A study of private universities in Kurdistan", *International Journal of Social Sciences & Educational Studies*, Vol. 4 No. 2, 53.
- Becker, R. (2019), "Economic change and continuous vocational training in the work history: a longitudinal multilevel analysis of the employees' participation in further training and the effects on their occupational careers in Germany", *Empirical Research in Vocational Education and Training*, Vol. 11 No. 4, doi: 10.1186/s40461-019-0079-x
- Becker, R., Schömann, K. (2015), „Statusreproduktion und Mobilitätseffekte beruflicher Weiterbildung“, *Zeitschrift für Soziologie*, Vol. 44 No. 4 pp. 272-291. doi: 10.1515/zfsoz-2015-0404
- Bondar, I., Gumenyuk, T., Horban, Y., Karakoz, O., Chaikovska, O. (2020). "Distance E-Learning in the System of Professional Development of Corporation Managers: Challenges of COVID-19", *Journal of Education and e-Learning Research*, Vol. 7 No. 4, pp. 456-463. doi: 10.20448/journal.509.2020.74.456.463



- Carnevale, J. B., Hatak, I. (2020), "Employee Adjustment and Well-Being in the Era of COVID-19: Implications for Human Resource Management", *Journal of Business Research*, Vol. 116, pp. 183-187. doi: 10.1016/j.jbusres.2020.05.037
- Elnaga, A., Imran, A. (2013), "The Effect of Training on Employee Performance", *European Journal of Business and Management*, Vol. 5 No. pp. 137-147.
- Hite, L. M., McDonald, K. S. (2020), "Careers after COVID-19: challenges and changes", *Human Resource Development International*, Vol. 23 No. 4, pp. 427-437. doi: 10.1080/13678868.2020.1779576
- Hitka, M., Štarchoň, P., Lorincová, S., Caha, Z. (2021), "Education as a key in career building", *Journal of Business Economics and Management*, Vol. 22, No. 4, pp. 1065-1083. doi: 10.3846/jbem.2021.15399
- Ismael N. B., Othman, B. J., Gardi, B., Hamza, P. A., Sorguli, S., Aziz, H. M., Ahmed, S. A., Sabir, B. Y., Ali, B. J., Anwar, G. (2021), "The Role of Training and Development on Organizational Effectiveness", *International Journal of Engineering, Business And Management* Vol. 5 No. 3, pp. 29-38. doi: 10.22161/ijebm.5.3.3
- Koubek, J. (2015), *Řízení lidských zdrojů – Základy moderní personalistiky*. Management Press, Praha.
- Mikołajczyk, K. (2021), "Changes in the approach to employee development in organisations as a result of the COVID-19 pandemic", *European Journal of Training and Development*, Vol. 46 No. 5/6, pp. 544-562. doi: 10.1108/EJTD-12-2020-0171
- Mura, L., Zsigmond, T., Machová, R. (2021), "The effects of emotional intelligence and ethics of SME employees on knowledge sharing in Central-European countries", *Oeconomia Copernicana*, Vol. 12 No 4, pp. 907-934. doi: 10.24136/oc.2021.030
- Nassazi, N. (2013), *Effects of training on employee performance: Evidence from Uganda (Unpublished doctoral dissertation)*. University of Applied Sciences, Vassa.
- Peoplehum. (2021), "What is Retraining in HRM?", available at: <https://www.peoplehum.com/glossary/retraining> (accessed 16 September 2022)
- Poór, J., Juhász, T., Machová, R., Bencsik, A., Bilan, S. (2018), "Knowledge management in human resource management: Foreign-owned subsidiaries' practices in four CEE countries", *Journal of International Studies*, Vol. 11 No. 3, pp. 295-308. doi:10.14254/2071-8330.2018/11-3/23
- Rahn, H. J. (2012), *Prozessorientiertes Personalwesen (Arbeitshefte Führungspsychologie)*. Feldhaus Verlag, Hamburg.
- Rodriguez, J., Walters, K. (2017), "The importance of training and development in employee performance and evaluation", *World Wide Journal of Multidisciplinary Research and Development*, Vol. 3 No. 10. pp. 206-212.
- Seberini, A., Nour, M. M., Tokovska, M. (2022), "From Digital Divide to Technostress during the COVID-19 Pandemic: A Scoping Review" *Organizacija*, Vol. 55 No. 2, pp.98-111. doi: 10.2478/orga-2022-0007
- Sneider, K., Sternfels, B. (2020), *From Surviving to Thriving: Reimagining the post-COVID-19 Return*. McKinsey & Company, New York.
- Stachova, K., Stacho Z., Raišienė, A. G., Barokova, A. (2020), „Human resource management trends in Slovakia”, *Journal of International Studies*, Vol. 13 No. 3, pp. 320-331. doi:10.14254/2071-8330.2020/13-3/21
- Šikýř, M. (2016), *Personalistika pro manažery a personalisty*. Grada, Praha.
- Tomčíková, L., Svetozarovová, N., Coculová, J., Daňková, Z. (2021) "The impact of the global Covid-19 pandemic on the selected practices of human resources management in the relationship to the performance of tourism companies", *GeoJournal of Tourism and Geosites*, Vol. 35 No. 2, pp. 525-530. doi: 10.30892/gtg.35233-680
- Yawson, R. (2020), "Strategic flexibility analysis of HRD research and practice post COVID-19 pandemic", *Human Resource Development International*, Vol. 23 No. 4, pp. 406-417. doi: 10.1080/13678868.2020.1779169

## Proposal for Optimization of Human Resources in Railway Transport Operation

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### Abstract

Persons who ensure the operation of the runway or the operation of transport on the runway must be professionally, medically, sensually and mentally fit. Measurements of working time consumption for standardisation purposes should be adapted to the real conditions in the workplace. They must be based on an analysis of the work activities carried out. Measurements must be made in such a way that they can be assessed, compared and evaluated in terms of the time consumption of the operations and processes required to carry out the work. Measurements of working time consumption for standardisation purposes should be adapted to the real conditions of the workplace. Time consumption measurements are necessary for railway operations to determine the future period of the expected necessary consumption of working time and its standardisation. The main objective and research of the paper is to determine the time standards of the infrastructure manager's employees and the employees of the railway passenger transport operator. Determination of standards will be determined both for individual activities of the process of the starting and finishing, and for the determination of standards of activities during the working day. The methodology used in the determination is derived from the national carrier providing rail passenger transport services.

Keywords: standardization of work; technological operations; railway passenger transport.

Article Classification: Research article

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## 1 Introduction

In railway transport, the distribution of working time for operational staff is regulated by a turn-round, which is worked to a fixed working time so that, on average, over a regularly recurring turn-round period, it corresponds to a specified weekly working time pool. A tour is a regularly recurring schedule of working time for work carried out every day, i.e., on Saturdays, Sundays, public holidays and public holidays, in shifts with regular or irregular starting times, with equal or unequal shift lengths. This cycle shall be interrupted according to the needs of the establishment for which the turn is fixed and adjusted (Brumerčíková and Šperka, 2020).

- Turnaround employees are employees who work in shifts assigned to a turnaround and employees whose shifts are determined by the needs of the operation - disposition employees. *et veri mandamus inciderint eam.*
- A dislocated transport employee is an employee who cannot be given at least one week's notice by the employer of an uneven distribution of working time valid for at least one week.
- The employee's working time must be so arranged that it does not exceed 60 hours per week.
- A working shift is the part of the established weekly working time that an employee is required to work within 24 consecutive hours, including preparatory work and breaks, on the basis of a predetermined shift schedule. The working time shall be so arranged that the duration of the working shift is no more than 12 hours.
- The employer is obliged to arrange the working time so that the employee has a minimum rest period of 12 consecutive hours within a 24-hour period between the end of one shift and the beginning of another shift.
- The tour is compiled taking into account the timetable of train transport, station and operating schedules of executive offices, technological procedures, etc., as well as taking into account the economy, safety and continuity of transport (Černá, and Dolinayová, 2020).

Measurements of labour time consumption for standardisation purposes should be adapted to the real conditions of the workplace. They must be based on an analysis of the work activities carried out. Measurements must be made in such a way that they can be assessed, compared and evaluated in terms of the time consumption of the operations and processes necessary to carry out the work. Measurement of time consumption is necessary in railway operations to determine the future period for the anticipated necessary consumption of working time and its standardisation (Gašparík et al, 2022).

However, the choice of the appropriate and correct method for measuring working time consumption depends mainly on (Dedík, 2020):

- Operation cycle time lengths,
- Volumes of the executed operation,
- Required measurement accuracy,
- Speed requirements for setting time consumption standards.

To determine the working time of a shift, it is possible to start with the methods used, where the time can be normalized. We can normalize the actual working time, the work tasks and processes, the necessary breaks and the time of conditionally necessary breaks.

However, it is also necessary to consider the time loss for the determination of the working shift time. Most often, it can be faults, and impediments in the performance of tasks, which can also be related to the loss of extra work in removing and eliminating technical and technological obstacles. Determination of working times and working shifts is very important for railway transport operations, as working shifts depend on these times and tasks (Dolinayová et al, 2018).

The following figure 1 provides a graphical representation of the breakdown of time consumption work activities for the purpose of examining, analyzing, standardizing and managing work in a railway undertaking.

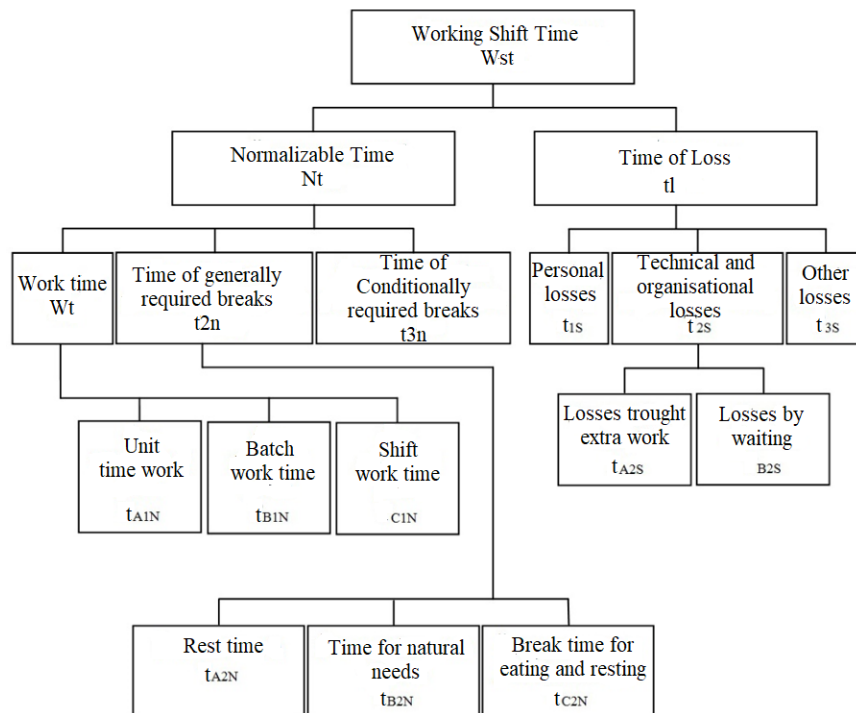


Figure 1 Sorting of partial times in standardization of railway transport work (Sablik et al. 2022)

## 2 Material and methods

As already mentioned above, in railway transport operation, it is very important to determine the working times for the individual tasks and sub-tasks that are included in one process.

There are several ways and methods to determine these individual times. The simplest way is to time an employee on individual tasks. However, it is very important to consider the time allowance for external activities and this is due to weather conditions. A continuous layer of snow also causes considerable complications. However, there are several methods for measuring and determining time consumption (Dolinayová, 2018):

- Analytical:
  - analytical - chronometric,
  - analytical - computational,
  - analytical-comparative.

- Summary (global):
  - statistical,
  - summative – comparative.
  
- Structured estimates,
- Time studies,
- Snapshot observations,
- Methods of predetermined times,
- Enterprise Normative Methods,
- Snapshots of work operations.

However, the choice of the appropriate and correct method for measuring working time consumption depends mainly on (Dolinayová, 2020):

- Work practice standards,
- Qualification standards,
- Labour consumption standards,
- Performance standards,
  - Time standard,
  - Norm of quantity.

The above standards tell us in general terms the normative need for human resources. to carry out certain work, or in railway operations to carry out certain work practices under certain working conditions. We characterize the standards in more detail (Dolinayová, 2020).

Work practice standards determine the most economically appropriate way of carrying out a particular job under specific technical and organisational conditions (Gašparík, 2021).

Qualification standards determine the required qualifications for performing a certain job, in railway transport operation these are qualification of a job position. Jobs are classified into tariff classes according to complexity, responsibility and exertion (Gašparík, 2020).

Labour consumption standards define the normative need for live labour to perform a particular job in specific technical and organisational conditions. They are expressed in terms of the amount of time or the number of employees required to perform a specific work task. According to the standard of expression, performance standards and labour standards are distinguished (Gašparík et al 2021).

Performance standards indicate the normative need for time and necessary breaks to complete a work task. They are expressed as standards of time or standards of the number of tasks performed in a given time period (Podmienky používania železničnej siete, 2022).

A time standard expresses the time required to complete a particular work task or unit of work. It is given in time units such as most commonly hours or minutes and focuses on a unit of output. The creation of time standards and the quantity standards derived from them is called performance standardization (Jurík, 2020).

A quantity standard indicates the output of an employee expressed in terms of the number of units to be processed at normal work intensity per unit of time. The quantity standard is the inverse of the time standard. For the human resource workflow and scientific needs of the paper, it is important to establish a method using the following relationships. The first relation gives us the norm of the quantity per hour of work. Thus, in our case, since these are tasks, it expresses how many activities in the technology of work an employee is able to perform in 1 hour, since each activity represents different durations of time (Kohnová, 2020):

$$S_q = \frac{1}{N_t} \quad (1)$$

where:

$S_q$  = standard of quantity [number]

$1 = 1$  [hour]

$N_t$  = time standard per activity [h/q]

The following relation is derived from the previous formula and expresses the norm of quantity per working shift (Kupec, 2021):

$$S_q = - \frac{T}{N_t} \quad (2)$$

$S_q$  = standard of quantity [number]

$T$  = duration of the working [h]

$N_t$  = time standard per activity [h/q]

The determination of time and labour standards is very important in railway transport operations. It is about the subsequent derivation and determination of the number of employees and the time standard for the performance of work and technological tasks. In the following part of the paper, the system of application of the above mentioned standards in railway passenger transport operation for technological procedures of train processing will be determined. Likewise, the tasks will be allocated to specific operational employees in the station (Lukáč, 2021).

### 3 Determination of technological procedures and results

The following part of the post deals with the creation of technological procedures, determining the optimal times for their execution and compiling the relevant Gantt diagrams for the given technological procedures for the starting and ending passenger train at the station, future use. The point of the Gantt chart for determining the train processing technology compared to the table is to clearly display and time duration of each technology. The clarity of the diagram lies in the fact that some of the technology tasks can be performed simultaneously by other employees, where the spreadsheet does not provide such clarity. The contribution of the following section is to find out the total time required to carry out all the actions, on the basis of which it is possible to further to establish timetables, the corresponding train turnarounds, the number of units needed to perform operation and servicing of passenger services and the determination of the length of service in a turn for locomotive and train crews. All of the following individual operations that are carried out, as well as the total time and all time values are given in minutes (Nedeliaková, 2020).

The research methods that were used in order to create the article are set by the standards for each assignment. In this article, a 671 series electric unit was used as a model, which implies that the technology cannot be applied to other train sets of different construction. If we consider a train set composed of a locomotive and railcars, it would also be necessary to include the technology for moving the locomotive, and other operations that are not counted in the case of an electric unit, because they are not necessary to perform the technology of the starting and finishing trains.

### ***3.1 Starting Train Technology***

It is about setting up all the necessary operations to assemble the starting train so that the train can depart from the departure station with all the necessary operations completed to ensure the safe operation of the train. It is also necessary to establish on the basis of these operations the total time required to carry out all the operations in order to establish the boarding time margin of the locomotive and train crews (Nedeliaková, 2020).

The following table lists all the necessary actions to be taken in the starting train technology. The point of this is that some of the actions build on each other, and therefore the next action cannot be performed unless the previous action is completed and also some actions can be performed in parallel, i.e. at the same time as other actions are being performed. Further, in terms of establishing the technology of the initial train, a number of human resources with the necessary expertise are required. These are the carrier's staff such as the driver and the train crew and the infrastructure manager's staff of the dispatcher. The method of determining the technology, its time duration and the number of staff required to build the originating train depends on the number of tracks in the originating station, the technology of the station interlocking and the composition of the train. For the case of the technology shown in the Table 1, this is a station with SIMIS electronic interlocking. In the total time technology the time lengths of the individual technological operations are included and in the case of a set shift to the passenger platform the length of the track in the station must also be taken into account. The timeframe for the acts is also given, i.e. the start of the act, its duration and who the act is performed. For a better overview, a Gantt chart is constructed where the individual actions are numbered and their duration is graphically represented, thus giving a better view of which actions can be performed simultaneously while other actions are being performed (Nedeliaková et al, 2020).

Table 1 Determination of the starting train technology (authors on the basis of data provided by ZSSK, a.s.)

i	Action	Start	Duration	End	Carried by out
1	Unit unlock	0:00:00	0:00:10	0:00:10	Train driver
2	Boarding on train	0:00:10	0:00:10	0:00:20	Train driver
3	Unlocking and arriving at the checkpoint	0:00:20	0:01:00	0:01:20	Train driver
4	Technical inspection of the unit	0:01:20	0:12:00	0:13:20	Train driver
5	Collector stroke	0:13:20	0:01:00	0:14:20	Train driver
6	Putting the unit into operational status	0:14:20	0:02:30	0:16:50	Train driver
7	Enrolment of the train driver	0:16:50	0:01:00	0:17:50	Train driver
8	Complete test of the brake of a traction unit	0:17:50	0:06:00	0:23:50	Shuttle Driver
9	Preparing for the shift	0:23:50	0:02:00	0:25:50	Train driver/Shunter/ Dispatcher
10	Unit shift	0:25:50	0:04:00	0:29:50	Train driver/Shifter/ Dispatcher
11	Notification of train arrival to passengers	0:25:50	0:00:30	0:26:20	Dispatcher
12	Arrival of passengers on the platform	0:26:20	0:03:00	0:29:20	Passengers
13	Train docking	0:29:50	0:01:00	0:30:50	Train driver/Shifter
14	Passenger boarding	0:30:50	0:02:00	0:32:50	Passengers
15	Train inventory	0:30:50	0:01:00	0:31:50	Conductor
16	Preparation of a train braking report	0:31:50	0:01:00	0:32:50	Conductor
17	Receiving a train braking report	0:32:50	0:01:10	0:34:00	Train driver/Shifter
18	Signature and receipt of the order	0:30:50	0:01:10	0:32:00	Dispatcher/Shuttle driver
19	Simple test of the brake of a traction unit	0:32:00	0:01:00	0:33:00	Train driver
20	Position of the departure train path	0:32:00	0:01:00	0:33:00	Dispatcher
21	Train dispatch	0:34:00	0:01:00	0:35:00	Dispatcher
Total		0:35:00			

The following figure 2 is a graphical representation of the technological processing of the initial train.



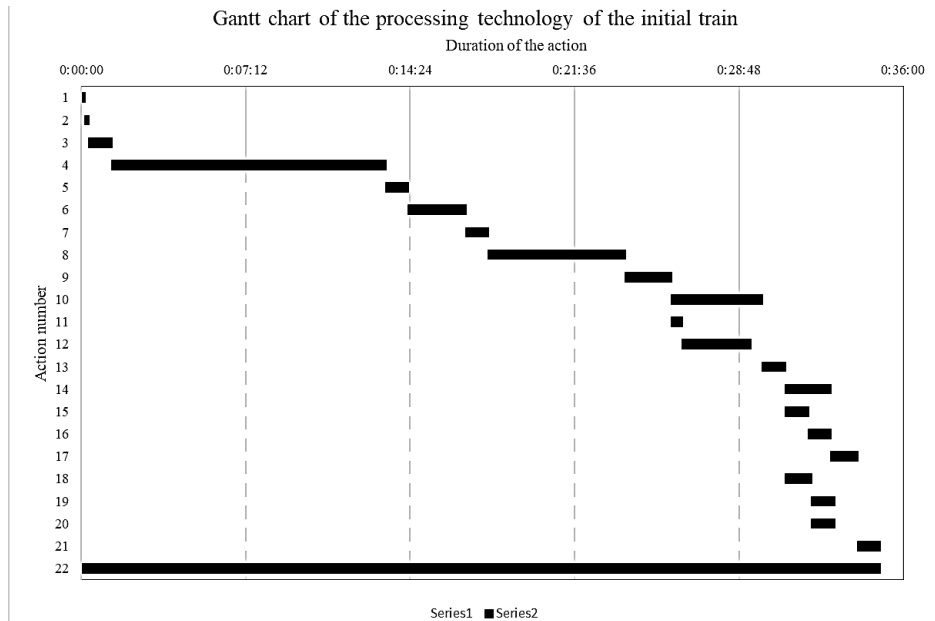


Figure 2. Gantt chart of the processing technology of the initial train (Prepared by the authors based on data from ZSSK, a. s.)

### 3.2 The technology of the ending train

The next processing of the spreadsheet form train is the processing of the ending train processing technology. These are specific trains that end at the destination station in the locomotive depot. It is about setting the minimum time for termination of all the necessary operations that are required to carry out the arrival of the train, the exit passengers, preparing the unit to move to the depot, carrying out cleaning operations, locking the unit and all activities up to the arrival of the driver at the depot. Given that locomotive depots are not too far away from the stations, it is therefore possible to carry out the cleaning activities even during the shunting. This is in order to optimise the working time of the staff and therefore reducing staff costs. This is a common standard procedure, which is also carried out by other competing carriers. The following table lists all the operations that need to be carried out at the end of the shift train, their duration with a time limit and the total time duration of this technology procedure. The resulting total time is added to the driver's performance service (Nedeliaková et al, 2014).

Table 2 Determining the technology of the ending train (authors on the basis of data provided by ZSSK, a.s.)

i	Action	Start	Duration	End	Carried by out
1	Construction of the train entrance road	0:00:00	0:00:30	0:00:30	Dispatcher
2	Train entrance to the station	0:00:30	0:01:00	0:01:30	Train driver
3	Bringing the train to the platform	0:01:30	0:01:00	0:02:30	Train driver
4	Passenger exit	0:02:30	0:02:00	0:04:30	Passengers
5	Cleaning activities	0:04:30	0:12:00	0:16:30	Cleaning squad
6	Securing the train against movement	0:02:30	0:00:30	0:03:00	Train driver
7	Setting the unit to "shunting" mode	0:03:00	0:00:30	0:03:30	Train driver
8	Positioning the road to shunting	0:04:30	0:00:30	0:05:00	Dispatcher
9	Performing the shunting	0:05:00	0:06:00	0:11:00	Train driver/Dispatcher
10	Shutting down the unit	0:11:00	0:02:00	0:13:00	Train driver
11	Dropping the collector	0:13:00	0:01:00	0:14:00	Train driver
12	Deregistration of a driver	0:14:00	0:00:30	0:14:30	Train driver
13	Dropping the collector	0:14:30	0:00:30	0:14:30	Train driver
14	Shutting down the unit from operating mode	0:14:30	0:03:00	0:17:30	Train driver
15	Summary of personal belongings	0:17:30	0:02:00	0:19:30	Train driver
16	Leaving the unit	0:19:30	0:02:00	0:21:30	Train driver / Cleaning squad
17	Lock the cabin	0:21:30	0:00:30	0:22:00	Train driver
18	Lock the unit	0:22:00	0:04:00	0:26:00	Train driver
19	Lockout control	0:26:00	0:01:00	0:27:00	Train driver
20	Departure to the locomotive depot	0:27:00	0:06:00	0:33:00	Train driver
Total		0:33:00			

In addition to the processing of the technology of the starting and ending trains, technologies are also developed for the turnaround train, which, unlike the ending train, is not moved to the depot, but is brought to the platform at the ending station, where it starts a new journey, usually in the opposite direction. Then there is the technology of processing the train en route, where it may be a split train, or a change of locomotive and train crews on route at the station (Stacho et al, 2017).

#### 4 Discussion

Previous research has shown that setting time and technology standards is very important for rail operations. This is particularly so because, on the basis of traffic and operational technologies, it is possible to draw up a working regime for employees working for the infrastructure manager or for freight or passenger carriers that takes into account working time, compulsory and natural rest time, and also takes into account time off work. Thus, based on the turnover requirements, it is possible to establish the optimal number of staff of the infrastructure manager at a given station, such as train dispatchers, switchmen or dispatchers, and the optimal number of staff of the carrier, where this category includes drivers and train crews. Determining the optimum number of staff is an important component for the undertaking, particularly in terms of staff costs. For this reason, every rail operation has a precise timetable and a pre-processed technology, whether it is the construction of the train path in the station or the technology for handling freight or passenger trains. The research conducted in the paper serves as a basis for the origin and destination train processing technology in the station. As it has already been

shown there is a time difference in the processing of these types of trains, which also depends on the technological operations and their actual duration. These may vary from station to station depending on the technological procedures in each station, the number of staff and other technological procedures. This means that if the technologies of the origin and destination trains expressed in the article were used using the same electrical unit, even if the same procedures were maintained, the individual technological operations would be more time-consuming, but the technology of the procedures of the individual operations would be maintained.

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## References

- Brumercikova, E., and Sperka, A. (2020, September 28). Problems of access to services at railway stations in freight transport in the Slovak Republic. MDPI. Retrieved September 16, 2022, from <https://www.mdpi.com/2071-1050/12/19/8018/htm>
- Černá, L., Dolinayová, A., and Hranický, M. P. (2020). Optimisation of transport capacity of a railway siding through construction-reconstruction measures. *Open Engineering*, 10(1), 245–254. <https://doi.org/10.1515/eng-2020-0012>
- Dedík, M., Mašek, J., Gašparík, J., and Lupták, V. (2022). Assessment of the perspective ratios in rail crossings as an important evaluation factor of rail crossings. *Applied Sciences*, 12(15), 7489. <https://doi.org/10.3390/app12157489>
- Dedík, M., Zitrický, V., Valla, M., Gašparík, J., and Figlus, T. (2022). Optimization of timetables on the Bratislava–žilina–košice route in the period after the end of the COVID-19 pandemic. *Sustainability*, 14(9), 5031. <https://doi.org/10.3390/su14095031>
- Dolinayová, A., Černá, L., Hřebíček, Z., and; Zitrický, V. (2018). Methodology for the Tariff Formation in railway freight transport. *Naše More*, 65(4), 297–304. <https://doi.org/10.17818/nm/2018/4si.25>
- Dolinayova, A., Danis, J., and Cerna, L. (2018). Regional Railways transport—effectiveness of the regional railway line. *Sustainable Rail Transport*, 181–200. [https://doi.org/10.1007/978-3-319-78544-8\\_10](https://doi.org/10.1007/978-3-319-78544-8_10)
- Dolinayova, A., Masek, J., Kendra, M., Čamaj, J., Grandsart, D., Marlier, E., Colzani, P., Arena, M., Paragreen, J., Navaratnam, P., Brennan, M., and Paleta, T. (2018). Research of the passenger's preferences and requirements for the Travel Companion Application. *Journal of Advanced Transportation*, 2018, 1–12. <https://doi.org/10.1155/2018/8092147>
- Dolinayova, A., Zitricky, V., and Cerna, L. (2020). Decision-making process in the case of insufficient rail capacity. *Sustainability*, 12(12), 5023. <https://doi.org/10.3390/su12125023>

- Gašparík, J., Čechovič, L., Blaho, P., and Pečený, L. (2021). Capacity of corridor lines after modernization. *Transportation Research Procedia*, 53, 159–166. <https://doi.org/10.1016/j.trpro.2021.02.021>
- Gasparik, J., Dedik, M., Cechovic, L., and Blaho, P. (2020). Estimation of transport potential in regional rail passenger transport by using the innovative mathematical-statistical gravity approach. *Sustainability*, 12(9), 3821. <https://doi.org/10.3390/su12093821>
- Gašparík, J., Motyčka, V., Šťastný, P., and Szalayová, S. (2021). Multi-criteria optimization of Mechanized Earth processes and its impact on economic and Environmental Sustainability. *Sustainability*, 14(1), 78. <https://doi.org/10.3390/su14010078>
- InterWay, a. s.- [www.interway.sk](http://www.interway.sk). (n.d.). Podmienky Používania žel. siete 2022: ŽSR. [www.zsr.sk](http://www.zsr.sk). Retrieved September 16, 2022, from <https://www.zsr.sk/dopravcovia/infrastruktura/podmienky-pouzivania-zel-infrastruktury/podmienky-pouzivania-zel-siete-2022/>
- Jurík, L., Horňáková, N., Šantavá, E., Cagánová, D., and Sablik, J. (2020). Application of AHP method for project selection in the context of sustainable development. *Wireless Networks*, 28(2), 893–902. <https://doi.org/10.1007/s11276-020-02322-2>
- Kohnová, L., Papula, J., Papulová, Z., Stachová, K., and Stacho, Z. (2020). Job mismatch: The phenomenon of overskilled employees as a result of poor managerial competences. *Entrepreneurship and Sustainability Issues*, 8(1), 83–102. [https://doi.org/10.9770/jesi.2020.8.1\(6\)](https://doi.org/10.9770/jesi.2020.8.1(6))
- Kupec, V., Písař, P., Lukáč, M., and Pajtková Bartáková, G. (2021). Conceptual comparison of Internal Audit and internal control in the marketing environment. *Sustainability*, 13(12), 6691. <https://doi.org/10.3390/su13126691>
- Lukáč, M., Stachová, K., Stacho, Z., Bartáková, G. P., and Gubíniová, K. (2021). Potential of marketing communication as a sustainability tool in the context of Castle Museums. *Sustainability*, 13(15), 8191. <https://doi.org/10.3390/su13158191>
- Nedeliaková, E., Hranický, M. P., and Valla, M. (2022). Risk identification methodology regarding the safety and quality of railway services. *Production Engineering Archives*, 28(1), 21–29. <https://doi.org/10.30657/pea.2022.28.03>
- Nedeliakova, E., Hudakova, M., Masar, M., Lizbetinova, L., Stasiak-Betlejewska, R., and Šulko, P. (2020). Sustainability of railway undertaking services with Lean Philosophy in risk management—case study. *Sustainability*, 12(13), 5298. <https://doi.org/10.3390/su12135298>
- NEDELIAKOVA, E., LIZBETINOVA, L., STASIAK-BETLEJEWSKA, R., and SPERKA, A. (2020). Application of the reason model within risk management on railway crossings – A case study. *Scientific Journal of Silesian University of Technology. Series Transport*, 109, 129–140. <https://doi.org/10.20858/sjsutst.2020.109.12>
- Nedeliaková, E., Sekulová, J., Nedeliak, I., and Loch, M. (2014). Methodics of identification level of service quality in Railway Transport. *Procedia - Social and Behavioral Sciences*, 110, 320–329. <https://doi.org/10.1016/j.sbspro.2013.12.876>
- Orgány a štruktúra spoločnosti - železničná spoločnosť Slovensko a.s. (n.d.). Retrieved September 16, 2022, from <https://www.zssk.sk/o-spolocnosti/organizacne-zlozky/>
- Stacho, Z., Stachová, K., and Cagánová, D. (2020). Participation of all employee categories in innovation processes in Slovak organisations. *Mobile Networks and Applications*, 25(3), 853–859. <https://doi.org/10.1007/s11036-020-01518-2>
- Široký, J., Nachtigall, P., Tischer, E., and Gašparík, J. (2021). Simulation of railway lines with a simplified interlocking system. *Sustainability*, 13(3), 1394. <https://doi.org/10.3390/su13031394>
- Nedeliaková, E., Štefancová, V., and Hranický, M. P. (2019). Implementation of Six sigma methodology using DMAIC to achieve processes improvement in Railway Transport. *Production Engineering Archives*, 23(23), 18–21. <https://doi.org/10.30657/pea.2019.23.03>

Stacho, Z., Stachová, K., Hudáková, M., and Stasiak-Betlejewska, R. (2017). Employee adaptation as key activity in human resource management upon implementing and maintaining desired organisational culture. *Serbian Journal of Management*, 12(2), 303–313. <https://doi.org/10.5937/sjm12-10340>

## Remuneration of Employees as a Tool of Strategic Management of Human Resources

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### Abstract

Compensation is a critical function of human resource management that affects an individual's motivation to join, learn and stay with the company. It is also an important tool for maintaining high levels of individual performance and promoting employee engagement. The paper presents the results of three surveys carried out between 2006 and 2013 and in 2019 in the companies operating in Slovakia. According to the research results, there is a clear trend of professionalisation of remuneration in companies, where companies develop their remuneration systems holistically, following corporate strategies, but their interconnection with the company culture is insufficient (only 16% of the surveyed sample declare it). The degree of formalization of remuneration is decreasing, which is a consequence of the need to react flexibly to changing conditions, but also a manifestation of a culture of trust. The involvement of line managers in remuneration processes is increasing. Businesses are striving for a comprehensive and systemic approach to remuneration, based on the principle of total compensation.

Keywords: reward system; total compensation; strategic approach, wage, benefits

Article Classification: Research article

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## **1 Introduction**

In general, the area of employee remuneration, like other human resources management functions, is subject to constant evolution. In the current approach to remuneration, it is necessary to view and approach remuneration as a strategic tool. Employee remuneration must be linked to the goals, strategy and culture of the enterprise, operating in a global competitive environment (Lawler, 2000). Trevor (2011) also talks about strategic reward, which he sees as a means of improving business performance and securing competitive advantage by aligning reward strategies, systems, policies and practices with the strategy of the business. Monetary rewards are no longer just a cost of hiring the necessary workforce, but a means of aligning the unique and inimitable asset of the enterprise - its employees - with the strategic direction of the enterprise. According to Brown (2001), strategic reward is a way of thinking that links reward practices to the goals of the enterprise as well as to the values and needs of the employees that are critical to the achievement of the enterprise's goals.

To implement strategic remuneration, it is essential to interlink remuneration strategies, corporate strategies, and human resource management strategies, while also linking the remuneration system to the corporate culture. Important principles are fairness, decency, principle and consistency. There is a need to ensure transparency of the reward system and processes and to treat people as an important stakeholder. At the same time, take an integrative approach with other human resource management processes and provide managers with the authority, skills, guidance and support to use the reward system to achieve their objectives (Turnea, 2018).

Thus, to manage reward strategically is to conceive of it as an integrative innovative process that can support meeting the needs of the business and its people. However, the emphasis should be on rewarding the right things, i.e. those that the enterprise values and perceives as important. In this way, it can use the reward system to spread the message of what it values and sees as valuable.

## **2 Theoretical background**

Current remuneration is characterised by features such as complexity, flexibility and a systemic approach. Businesses use a wide range of monetary, non-monetary rewards and employee benefits to create an integrated and mutually supportive set of tools that, when used in conjunction with each other, will have a much more significant and long-lasting impact on individual, team and organisational effectiveness (Sarkar et al., 2021; Armstrong, 2015). What is evident is a move away from situational responses to market and intra-company pressures and a move towards linking reward not just to HRM strategy, but to corporate strategy. A necessary condition for success is compatibility with culture and market orientation (Lorincová et al., 2018). Remuneration systems evolve in parallel with the business; the optimal path is one of gradual evolutionary change. Within the reward framework, employees themselves are perceived as partners with whom there is open communication and who are actively involved in the reward processes.

Remuneration is no longer an isolated activity, it becomes part of a strategic organisational process. Increasingly, there is also a tendency to integrate reward with other HRM processes and functions (Kang & Lee, 2021). Armstrong (2009) emphasizes that the impact of reward strategy on employee performance can only be maximized by linking it to human resource development strategy and especially to recruitment strategy. Employee reward as a function of human resource management is increasingly becoming an organic, flexible process that reflects the business at hand, rewards the contribution of

individual employees to the business and focuses increasingly on their lateral development (Trevor, 2011).

### ***2.1 Preconditions for effective remuneration***

The remuneration system is a tool that the company creates to meet its own needs. A well-constructed remuneration system helps it to attract the necessary number of job applicants in the required qualification structure and quality, to stabilise high-performing employees and to ensure their willingness to perform at a high level. A good remuneration system can be used simultaneously to build a reputation as an attractive and reputable employer and to increase its own competitiveness on the labour market.

A reward system, if it is to be fully functional, must reflect both requirements and performance (Kang & Lee, 2021). The variable through which companies evaluate and quantify job requirements is the difficulty of the activities performed. Independent of the employee's performance on the job at a specific time and place, the degree of knowledge, skills, experience and responsibility required is assessed and the overall job demands, expressed through the job value, are determined. This must be strictly separated from the individual performance of the job holder, which is determined by comparing the defined tasks and objectives with the actual result achieved. The tool here is the employee's performance appraisal. In practice, quite often there is a situation where past individual performance is valued by increases in long-acting base wages instead of one-off, short-term variable components (Peccei, 2017). This mistake should be avoided and a strict separation should be made between fixed wage components, which reward the type of work performed (i.e., what the employee does), and variable components, which, in turn, should reward the employee's individual performance (i.e., how well he or she does the job).

The remuneration system must be perceived as fair by employees. This requirement is one of the fundamental requirements that strongly determine the effect of remuneration. Employees perceive remuneration as unfair if they feel that comparable performances are arbitrarily different and dissimilar performances are arbitrarily equally evaluated and rewarded (Hartmann & Slapničar, 2012; Hitka et al., 2021). Although absolute fairness is a utopia and employees perceive it relatively based on comparisons with coworkers, efforts to objectify evaluation processes, both job and performance, are essential (Rouen, 2019; Bakker et al., 2014). This is facilitated by the various methods and tools for designing a reward system.

The simplicity and transparency of the reward system is also a necessary condition for its effectiveness. The need to reflect as accurately as possible the differentiation of individual roles, responsibilities, requirements as well as performance in remuneration can be counterproductive and lead to a highly complicated and opaque remuneration system (Rehman et al., 2019). Therefore, it is necessary to consider the condition of its practicality. On the one hand, the reward system must create sufficient room for differentiation, but on the other hand, it must remain comprehensible and transparent for both users and recipients. However, transparency in remuneration also has its risks. There is a need to ensure transparency in remuneration procedures and instruments, but when it comes to specific remuneration levels, transparency can be a source of dissatisfaction. Indeed, as several studies confirm, if an employee finds that he or she is underpaid, his or her satisfaction decreases. This occurs with even minimal differences in pay levels, and especially if disclosure of pay levels is not coupled with transparency in performance appraisal results as well (Rehman et al., 2019).



At the same time, the remuneration system must also reflect and actively respond to the labour market situation. Because a company operates in interaction with its environment, it needs to take into account the situation in competitors when setting its own remuneration system. Otherwise, it will have difficulty in attracting and retaining qualified labour.

In order to be able to meet these requirements, remuneration systems must be regularly reviewed and adapted by companies. The labour market has recently undergone significant changes, particularly as a result of globalisation trends. Personnel measures, including those in the area of pay, are increasingly difficult to plan in the long term. The market situation to which these measures must respond is changing rapidly. However, any change in the remuneration system is usually associated with additional costs. At the same time, it poses implementation problems, as it tends to be positively received only by those employees who benefit from it (which is on average less than a third of the workforce). Compensation changes are easier and more successful to enforce in an environment where there is a culture of trust, but this is often absent in companies in practice, creating a significant barrier to flexible compensation reform (Kang & Lee, 2021).

The above suggests that remuneration is a complex and challenging task. As Femppel and Zander (2005) state, "the excellence of reward systems is limited in practice by their progressively increasing complexity. This limits operability and transparency, with the result that reward systems only achieve their objectives to a limited extent".

## **2.2 Current trends in remuneration**

A professional approach to remuneration is now a central tool of competitive HR policy (Knebel, 2005). It reflects a company's culture and an indicator of the professionalism of its human resource management. The role of compensation specialists is to bridge extremely contradictory positions - on the one hand, to be a reliable partner of management, promoting effective solutions to support corporate goals, but having the courage to implement innovations in compensation tools so that this area supports the long-term competitiveness of the company (Zingheim et al., 2009).

In the design of reward systems, companies prefer the concept, called total rewards, which integrates diverse elements and tools into a comprehensive whole and uses them in the form of rewards for employees (Alhmoud & Rjoub, 2019; Rai et al., 2019). According to research findings, such a holistic approach to reward promotes positive employee attitudes, work behaviors, and thus company performance (O'Neal, 1998). Total rewards link the pay system, both base and variable, with benefits and other components of remuneration, which are predominantly intangible in nature and are often tools used in other human resource management functions (Mabaso & Dlamini, 2021). All components of total rewards need to be considered in relation to each other so that they form a compact and balanced whole (Peluso, 2017; Innocenti et al., 2011). While monetary rewards can only consider the individual needs of employees to a limited extent, it is the non-monetary components of total rewards that make this possible (Blštáková et al., 2019; Baumeister, 2014). Contemporary human resource management considers an effective approach to be the selection of individual tools to take into account the life and career stages of an employee's life to satisfy their needs and requirements to the maximum extent possible and to align these with the company's objectives. Reward systems oriented towards life stages are considered to be part of sustainable, future-oriented human resource management (Blštáková et al., 2019). It is the concept of total rewards that supports and implements such an approach within the employee remuneration function.

The basic wage, determined through the company's tariff system, remains the main component of total remuneration. Currently, there is a noticeable tendency to move away from the rigorous formalisation of tariff systems, which is both a manifestation of a culture of trust and an opportunity to deal with the need for constant flexible changes to the remuneration system as a result of changes in the corporate environment (Prouska et al., 2016). There is a continuing drive towards performance orientation in base pay, which is implemented through pay ranges. The need for pay equity is more prominently asserted, but the emphasis is on 'performance equity'.

Flexibilization of personnel costs is now often among the objectives of companies' remuneration policies. It involves reducing the fixed parts of remuneration, which depend on job demands, and strengthening the variable elements in relation to the financial capacity of the company. With variable components of pay linked to performance, there is much debate as to what type of performance should be the basis for determining remuneration. Individual employee performance is still the preferred method; team performance has long lagged behind, despite the promotion of teamwork. There is clearly a strong inconsistency here, where reward systems do not reflect and support the practice of corporate governance. The link to corporate performance associated with participative elements is coming to the fore, the introduction of which in remuneration systems is also being supported legislatively by several countries (Khalid & Nawab, 2018; Coz, 2000). The performance principle remains ever-present in remuneration, but its nature is changing due to the shift in perceptions and definitions of performance.

Employee perks or benefits have become an integral part of remuneration systems and are becoming increasingly important in the context of total remuneration. There is a call in the professional discourse to link them more strongly to other components of remuneration and to decide on them in a context in line with the principle of executive fairness (Wagner, 2015). Benefit structure and elements of optionality are tools to support the individualization of pay (Bryant & Allen, 2013).

The intention of this paper is to comprehensively evaluate the development of reward systems in the conditions of companies operating in Slovakia in the context of their function in strategic human resource management.

### **3 Material and methods**

The research framework base comes from the scope of knowledge from literary sources and published research studies. The theoretical start points are by authors drawn from sources available in electronic databases EBSCO HOST Research Databases, and licensed sources SCOPUS, Web of Knowledge and Web of Science.

The starting point for the research and analysis were the results of several research carried out at the Department of Management of the Faculty of Business Management of the EU in Bratislava. In 2006 and 2019, a comprehensive survey was carried out on remuneration in organisations using a similar research instrument (questionnaire), which allowed for a comparison of the results obtained and an assessment of the development of the issue under study. The results were supplemented by data obtained in the framework of the international survey of human resources management in 2013 in the member countries of the CRANET network, of which the teachers of the Department of Management are stable members. Obtaining data from the member countries allowed to compare the situation also in the international context.

The 2006 survey, specialised in the area of remuneration, was carried out on a sample of 110 organisations. In terms of legal form, 34.4% of the sample included public limited companies and the vast majority (52.5%) of limited liability companies. Only

13.1% of the sample consisted of other legal forms. This structure of the sample suits the needs of the analysis, as it includes mostly business entities for which, on the basis of the current legislation, the remuneration of employees is fully liberalised and the enterprises themselves are responsible for its form. As regards the size structure of the organisations included in the survey, all size groups are represented (see Table 1).

Table 1 Structure of the 2006 survey sample by enterprise size; own elaboration

Number of employees	Percentage of enterprises in the sample
under 50	11,0
51 – 100	23,6
101 – 300	27,2
301 – 500	9,9
501 – 1000	16,7
above 1001	11,6%

The 2013 survey was carried out as part of the wider CRANET Human Resource Management Survey. The research sample included data from 262 companies in the Slovak Republic. In terms of sector of operation, the survey sample includes 88.7% of private sector enterprises, primarily established for the purpose of making a profit, and 9.5% of enterprises operating in the public service or not-for-profit sector. This structure of the sample suits the needs of the analysis of remuneration in the system of human resources management, because it is equally dominated by business entities, creating their remuneration systems autonomously. In terms of the size structure of the organisations included in the 2013 survey, their representation is shown in Table 2.

Table 2 Structure of the 2013 survey sample by enterprise size; own elaboration

Number of employees	Percentage of enterprises in the sample
under 50	3,1
51 – 100	24,6
101 – 300	32,6
301 – 500	8,9
501 – 1000	11,6
above 1001	19,2

The 2019 remuneration survey was carried out by the author of the paper using a similar research instrument to that used in 2006. The sample includes 148 companies. 91.2% of the enterprises of the research sample operate in the private sector, the representation of the size categories of enterprises is shown in the following table (Table 3).

Table 3 Structure of the 2019 survey sample by enterprise size; own elaboration

Number of employees	Percentage of enterprises in the sample
under 50	11,5
51 – 100	33,1
101 – 300	23,6
301 – 500	6,8
501 – 1000	9,5
above 1001	15,5

## 4 Results

The subject of the research was reward systems as a tool for strategic human resource management. The very inclusion of remuneration within the organisational structure of a company suggests a great deal about the importance that management attaches to it and the expectations that they associate with it. At present, the trend to integrate remuneration into the HR department is significantly prevalent in Slovak companies, with 67% of the surveyed companies applying this solution and a significant increase of up to 20% over the last six years (see Table 4). This solution shows that remuneration is perceived as a systemic tool, competently designed and managed, which can contribute to the development of the enterprise. It is particularly appropriate in a situation where the HR manager is also a member of the top management. This is currently the case in 67% of companies, and the number is also increasing (up 15% compared to 2013, when we identified such a solution in 52% of the surveyed companies). The involvement of HR managers in corporate governance is a global trend. It is also confirmed by the results of the CRANET research studies, which show that while in 2004 only 41% of enterprises included HR managers as members of their top management, in 2015 up to 70% included them there, representing a 30% increase in one decade.

Table 4 Enterprises with the participation of HR manager in top management in the Slovak Republic; own elaboration

<b>2006</b>	<b>2013</b>	<b>2019</b>
35%	52%	67%

Table 5 Companies with HR manager involvement in senior management globally; own elaboration

<b>2004</b>	<b>2009</b>	<b>2015</b>
41%	63%	70%

In the long term, the number of companies that integrate the area of remuneration into the financial department (the most frequent argument for such a solution is the processing of the payroll agenda) has been continuously decreasing, which is not an optimal solution. Currently, only 9% of companies prefer such a solution, compared to 25% in 2006 (see Table 6). The remuneration specialists then report directly to the finance manager and the cost and financial considerations tend to be the preferred considerations for dealing with employee remuneration issues. In almost a fifth of the enterprises surveyed, remuneration management falls under the CEO and is thus directly the responsibility of top management, providing a stronger link to the overall direction of the enterprise. Compared to the previous assessment period, we have seen a decline in such organisational design. Overall, the results show a greater professionalisation of the remuneration function, whereby this function is supported to a greater extent by professional know-how, while at the same time increasing the representation of HR managers in top management, which we assess positively.

Table 6 Classification of remuneration in the organisational structure of the company; own elaboration

<b>Remuneration in the organisational structure</b>	<b>2006</b>	<b>2013</b>	<b>2019</b>
Personnel Department	46%	43%	67%
Finance Section	25%	19%	9%
the Director-General's Department	16%	30%	19%
other solutions	13%	8%	5%

As regards the formalisation of remuneration systems, there has been a partial decline compared to 2006, which has continued steadily, which may be due to a preference for flexibility, but at the expense of transparency. In fact, the number of companies that do not formalise their systems has increased at the expense of those that have formalised systems in place (see Table 7). This approach may reflect current trends, which reflect the need for remuneration systems to adapt quickly to changes in the functioning of enterprises and the labour market. As Knebel (In: Zander - Wagner, 2005, p. 349) states, companies need to "strike a balance between rules and freedom" in remuneration as never before. In dynamic times of constant change, the need for situational and flexible management prevails, which is made possible precisely by the reduction of formalisation. However, as the author points out, this is not a return to the early days of reward systems in the 1950s; the current approach is one of promoting autonomy, taking ownership and a partnership approach with employees. Reducing the degree of formalisation is then an expression of trust and not an expression of the unfairness of the system.

Table 7 Evolution of the formalisation of reward systems; own elaboration

<b>Remuneration system</b>	<b>2006</b>	<b>2013</b>	<b>2019</b>
formalised in written form	73%	67%	62%
unwritten formalised	20%	16%	21%
informalised	7%	17%	17%

The development of remuneration systems is based in up to 70% of companies on their own remuneration strategy, the definition of which is mainly the responsibility of top management (up to 80% of companies that have a remuneration strategy) with the cooperation of HR departments (30%). Compared to 2009, there is a clear increase in the use of formalised remuneration strategies (14%) and a decrease in the number of companies that do not develop their own strategies. Currently, only 7% of enterprises have such strategies compared to 2009, when up to one fifth of enterprises had such strategies (see Table 8). Most often, companies have defined in their remuneration strategies the priorities and objectives they pursue in the area of remuneration, the components of the remuneration system, the attitude to competition, and responsibilities for individual parts of the system. It is striking that almost three quarters of the surveyed companies (71%) report that they do not directly link reward systems to corporate culture, which is one of the basic conditions for their effectiveness. Only 23% declare such a link in the category of managers, which is, however, completely insufficient. For other employee categories, only 16% of companies promote corporate values through remuneration. These results are evidence of the fact that the management of enterprises is not sufficiently aware of the interconnection between these two areas and does not work with it in a targeted manner, which is naturally a shortcoming, but at the same time creates potential and room for making reward systems more effective in practice. Indeed, the

reward system is one of the most powerful tools for promoting corporate culture and it is therefore beneficial to use it in this respect.

Table 8 Existence of a remuneration strategy in companies; own elaboration

<b>Remuneration document</b>	<b>2006</b>	<b>2019</b>
in writing	56%	70%
unwritten	23%	23%
does not exist	21%	7%

As regards the influence of the different actors in the companies on the design of the remuneration system, this has evolved over the period under review (see Tables 9 and 10). The influence of HR managers as a professional component in the actual development of the system has been strengthened, the involvement of employee representatives has increased significantly (up to twice as much) and the use of external know-how in the design of remuneration systems has been strengthened to an even greater extent. These changes indicate a drive towards professionalisation and a more expert approach to remuneration. The increased involvement of employee representatives, in particular trade unions, reflects a move towards a more transparent, partnership-based approach and a consideration of employee demands, which may support their perception of the system as fair and equitable. At first sight, the significant decline in line managers' involvement in the design of the remuneration system, which runs counter to current trends, may appear surprising. However, a closer look at the involvement of stakeholders in the different stages of the remuneration process, from strategy development to system implementation, reveals a different picture. The influence of line managers is relatively weak at the stage of strategy formulation (11% of companies) and remuneration system development (only 7% of companies involve them in system development), but their influence grows significantly at the stage of remuneration system implementation (at 39% of companies), which shows that the transfer of competences and empowerment of line management in remuneration in the context of current trends is also observable in our conditions, although not yet to the full extent. The historically persistent low level of use of external entities, i.e. consultants, in the design of remuneration systems (around 3-4%) seems to have been overcome. Consultants are currently used by 16% of companies in the design of remuneration systems, but they are still used to a small extent in the formulation of strategies and implementation of systems.

Table 9 Evolution of actors' influence on the design of remuneration systems; own elaboration

<b>Remuneration entities</b>	<b>2006</b>	<b>2013</b>	<b>2019</b>
top management	49%	74%	50%
personnel management	47%	42%	68%
line management	20%	20%	7%
employee representatives	13%	10%	23%
external consultants	3%	4%	16%

Table 10 Influence of actors on the strategy, design and implementation of reward systems; own elaboration

<b>Impact of remuneration entities</b>	<b>Remuneration strategy</b>	<b>Developing a reward system</b>	<b>Implementation of remuneration</b>
top management	80%	50%	25%
personnel management	30%	68%	48%
line management	11%	7%	39%
employee representatives	11%	23%	14%
external consultants	5%	16%	9%

The objectives that companies formulate in relation to employee remuneration were also examined. In particular, they expect their remuneration systems to increase motivation over the long term through competitive, fair pay linked to employee performance (see Table 11), and companies' priorities have evolved over time. Whereas in 2006 the objectives of motivation, fairness and performance pay dominated with equal weight, in 2013 the focus has shifted to promoting performance pay and employee motivation. Currently, these objectives are slightly receding in favour of pay equity. As many as 57% of companies prefer fairness in their own reward system, 47% aim to ensure that pay is linked to performance, 45% see pay as an opportunity to retain motivated employees and the same number aim to make pay competitive. To be a market leader in this area, 16% of enterprises are striving, which represents a significant increase compared to the past, especially in the category of managers. Likewise, the number of businesses focused on controlling compensation costs has been growing continuously, from 9% in 2006 to 36% in 2019. This fact may be partly a reaction to the crisis period, when businesses had to focus more strongly on the economic side of remuneration, but at the same time it reflects a general trend in human resources management, leading HR departments to report their own contribution to the business result. A consequence is the growing importance of HR controlling.

Table 11 Remuneration objectives in companies; own elaboration

<b>Remuneration objectives</b>	<b>2006</b>	<b>2013</b>	<b>2019</b>
cost control	9%	20%	36%
employee motivation	47%	53%	45%
linking remuneration to performance	47%	61%	47%
pay equity	47%	49%	57%
being a market leader	4%	7%	16%
comparability with competitors	40%	37%	45%

In terms of companies' remuneration intentions for the near future (see Table 12), the focus remains on performance-related remuneration systems, which was identified as a priority by almost half of the companies (49%), while there is also a strong desire to differentiate remuneration on the basis of differences in employee performance (33%). The trend towards performance orientation in remuneration is expected by companies to continue in the coming years, but its intensity is slightly decreasing. A change compared to 2013 is the interest of enterprises in promoting remuneration through communication, where enterprises have realised their shortcomings and plan to concentrate on in the coming years. The increase from 19% to 42% of enterprises with this priority is significant. Interest in developing individual areas is now more balanced, with two new

themes emerging, namely the desire to involve line managers more in employee reward (14% of businesses) and to build reward systems supported by modern technology (23%).

Table 12 Evolution of staff remuneration priorities; own elaboration

<b>Staff remuneration priorities</b>	<b>2013</b>	<b>2019</b>
development of pay-for-performance schemes	61%	49%
pay differentiation based on employee performance	36%	33%
promoting reward systems through communication and training	19%	42%
reassessing remuneration in the light of labour market pressures	15%	21%
developing appropriate indicators of the effectiveness of the reward system	9%	12%
keeping costs at an appropriate level	20%	26%
increasing the role of managers in remuneration		14%
supporting the remuneration system through modern technology	-	23%

Regarding the complexity of the approach to remuneration and the concept of remuneration itself, its structure and components in line with the so-called total remuneration principle, the surveys confirmed the continuing efforts to implement it in Slovak companies (see Table 13). Looking at the use of various "superstructure" elements to traditional monetary rewards and its development, it is evident that the tendency to use not only monetary, but also various tangible and intangible instruments as a form of remuneration is growing. The results of the surveys showed that the category of employee benefits is a stable part of remuneration systems, almost all enterprises involved in the 2019 survey reported that they use some form of benefits, and in 2006 their popularity was already high, with 80% of the surveyed sample of enterprises having them included in their remuneration systems at that time. The fact that benefits are a popular remuneration tool is evidenced by their growing share of total employee remuneration. In 2013, a third of enterprises (34%) reported that they had increased this share in the last three years; in 2019, up to 52% of them declared this. The proportion of businesses using praise as a tool in reward has also increased significantly (from 46% in 2006 to 85% in 2019), which is equally a confirmation of the implementation of the total reward principle.

Table 13 Evolution of remuneration instruments; own elaboration

<b>Remuneration system tools</b>	<b>2006</b>	<b>2019</b>
employee benefits, perks	80%	98%
compliments	46%	85%
training and development	53%	65%
career development	40%	66%

## 5 Discussion

The demands and requirements placed on current remuneration systems are well known and clearly articulated. They are expected to be simple, transparent, flexible and variable. The focus on corporate objectives and the need to be linked to performance, as well as the differentiation of remuneration according to performance, while maintaining the principle of fairness, are widely emphasised. The concept of "total rewards" is applied, integrating all remuneration instruments from a single functional unit (Akhtar et al., 2015). At the same time, businesses do not operate in isolation; they are part of a wider



environment that influences them and therefore their reward systems. As a result of intense changes in the world of work, they are forced to adapt their own reward systems to suit the changed conditions (Prouska et al., 2019). The aim of this paper was to map the development of remuneration systems in Slovak companies between 2006 and 2019, to identify the main changes that have occurred in them and to examine to what extent the above characteristics are applied in them.

The findings show that the changes that have taken place in the last decade are not groundbreaking and fundamental; rather, it is possible to talk about the adaptation of the systems and their evolution in the context of developments and changes in the environment. The identification of weaknesses also reveals the reserves available to companies and outlines the potential for further possible development of reward systems. Increasing the role and involvement of line managers in reward processes, linking them more purposefully to the culture of their own business and improving the evaluation of their effectiveness are challenges that can help businesses increase the return on resources spent on rewarding employees.

Compensation as a function of human resource management has undergone professionalization, with companies implementing it in line with current trends and striving for a holistic approach (Gulyani & Sharma, 2018). In our context, remuneration reflects the principle of 'total rewards', that is, all remuneration instruments are used in an integrated manner and are considered in relation to each other (Rai et al., 2019). Reward systems are less formalised, with rewards based on reward strategies that are linked to the strategies of the company. Compared to the past, companies' remuneration objectives are more oriented towards pay equity; the link to performance and the desire to increase motivation through competitive pay remain, albeit to a lesser extent. The influence of line management on staff remuneration is strengthening, especially in the implementation phase of remuneration systems, but remains weak in their design.

The performance-based nature of remuneration systems is still maintained; the performance principle as the 'engine of the economy' in remuneration continues to find its way into remuneration, but unlike in the past, its form is changing to some extent. There has been a move away from direct pressure on performance, which is evident, for example, in the increasing importance of the seniority criterion in setting base salaries (Bayo-Moriones et al., 2010). Seniority, which many authors nowadays refer to as an unimportant criterion, is increasingly valued by companies in our context, which can also be assessed as a consequence of the impact of the labour shortage on the labour market and the struggle for talent in it. Seniority pay is an instrument by which companies seek to promote the stabilisation of their own employees. A reserve in performance remuneration in Slovak companies compared to the global trend is the insufficient application of participative elements, which have not been able to establish themselves in our conditions for a long time.

The reward system is a tool that can promote employee involvement in the achievement of the company's goals and thus its overall effectiveness. However, it should be noted that there is no ideal reward system that is universally suitable for all businesses. Each system is unique, clearly signalling what values are most important to the enterprise and reflecting its mission. The design of a reward system is therefore highly dependent on the culture of the enterprise and the characteristics of its workforce. Only by taking these linkages into account will businesses be able to use their own reward system as a mechanism to support the achievement of strategic objectives and enhance competitiveness.

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## References

- Akhtar, C. S., Aamir, A., Khurshid, M. A., Abro, M. Q., & Hussain, J. (2015). *Total rewards and retention: Case study of higher education institutions in Pakistan*. *Procedia—Social and Behavioral Sciences*, 210, 251-259.
- Alhmoud, A. & Rjoub, H. (2019). *Total Rewards and Employee Retention in a Middle Eastern Context*. *SAGE open*, 9(2). ISSN 2158-2440
- Armstrong, M. (2015). *Řízení lidských zdrojů*. 13. vydání. Praha: Grada Publishing, 2015. 920s. ISBN 978-80-247-5258-7.
- Armstrong, M. (2009). *Handbook of human resource management practice*. London: Kogan Page limited. 2009. p. 1062. ISBN 978-0-7494-5242-1.
- Baumeister R. F. (2014). Yes, but are they happy? Effects of trait self-control on affective wellbeing and life satisfaction. *Journal of Personality*, 82 (4), pp. 265-277. ISSN:1467-6494.
- Bakker, A. B. & Demerouti, E. & Sanz-Vergel, A. I. (2014). *Burnout and work engagement: the JD–R approach*, *Annual Review Organizational Psychology of Organization Behaviour*, 2014(1), pp. 389-411.
- Bayo-Moriones, A., Galdon-Sanchez, J. E., & Güell, M. (2010). *Is seniority-based pay used as a motivational device? Evidence from plant-level data*. *Jobs, Training, and Worker Well-Being*, 155–187. doi:10.1108/s0147-9121(2010)000003.
- Blštáková, J., Joniaková, Z., Skorková, Z., Némethová, I., & Bednár, R. (2019). Causes and Implications of the Applications of the Individualisation Principle in Human Resources Management. *Ad Alta: Journal of Interdisciplinary Research*, 9(2).
- Brown, D. (2001). *Reward Strategies: From intentto impact*. London: Gardner Books, Chartered Institute of Personnel and Development, 2001. 296s. ISBN 0852929056.
- Bryant, P.C. and Allen, D.G. (2013), “Compensation, benefits and employee turnover: HR strategies for retaining top talent”, in *Compensation and Benefits Review*, Vol. 45 No. 3, pp. 171-175.
- Coz, A. (2000). The importance of employee participation in determining pay system effectiveness. in *International Journal of Management Reviews*, 2(4), 357–375. doi:10.1111/1468-2370.00047.
- Gulyani, G. and Sharma, T. (2018). “Total rewards components and work happiness in new ventures: the mediating role of work engagement”, in *Evidence-Based HRM: a Global Forum for Empirical Scholarship*, Vol. 6 No. 3, pp. 255-271.
- Hartmann, F., & Slapničar, S. (2012). Pay fairness and intrinsic motivation: the role of pay transparency. in *The International Journal of Human Resource Management*, 23(20), 4283–4300. doi:10.1080/09585192.2012.664962
- Hitka, M., Schmidtová, J., Lorincová, S., Štarchoň, P., Weberová, D., & Kampf, R. (2021). Sustainability of human resource management processes through employee motivation and job satisfaction. in *Acta Polytechnica Hungarica*, 18(2), 7-26.

- Innocenti, L.; Pilati, M.; Peluso, A. M. (2011). Trust as moderator in the relationship between HRM practices and employee attitudes. in *Human Resource Management Journal*, 21(3), 303-317.
- Kang, E., & Lee, H. (2021). Employee Compensation Strategy as Sustainable Competitive Advantage for HR Education Practitioners. in *Sustainability*, 13(3), 1049. doi:10.3390/su13031049.
- Khalid, K., & Nawab, S. (2018). *Employee Participation and Employee Retention in View of Compensation*. *SAGE Open*, 8(4), 215824401881006. doi:10.1177/2158244018810067
- Knebel, H. (2005). Variable Vergütung gekoppelt and Zielvereinbarungen. in *Handbuch Entgeltmanagement*. München: Verlag Franz Vahlen, 2005. 366s. ISBN 3800627086.
- Kusý, Š. (2021). Artificial intelligence as a tool in human resource management—potential and current use. *Journal of Human Resource Management*, 24(2), 60-68
- Lawler, E. (2002). *Rewarding Excellence: Pay Strategies for the New Economy*. Sage Publications, Inc., 47(1), 162-164, DOI: 10.2307/3094895.
- Lorincová, S., Hitka, M., Štarchoň, P., & Stachová, K. (2018). Strategic Instrument for Sustainability of Human Resource Management in Small and Medium-Sized Enterprises Using Management Data. in *Sustainability*, 10(10), 3687. doi:10.3390/su10103687
- Lukáč, M., Stachová, K., Stacho, Z., Bartáková, G. P., & Gubíniová, K. (2021). Potential of marketing communication as a sustainability tool in the context of castle museums. *Sustainability*, 13(15), 8191.
- Mabaso, C.M. and Dlamini, B.I. (2021), “Investigating the total rewards and its effects on organisational commitment in higher education institutions”, in *Insights into Economics and Management*, Vol. 7, pp. 69-82.
- O' Neal, S. (1998). The Phenomenon of total rewards. in *ACA Journal*, 7(3), 18-23. ISSN 1068-0918.
- Peluso, A. M. (2017). Pay is no everything. Evidence-based HRM: a Global Forum for Empirical Scholarship. 2017, Vol. 5, Issue 3, ss 311-327. Emerald Publishing Limited 2049-3983 DOI10.1108/EBHRM-07-2015-0031.
- Peccei, R. & van Veldhoven, M. (2017). *Well-being and Performance at Work*. New York: Psychology Press, 2017. 163p. ISBN 978-1-315-74332-5.
- Prouska, R., Psychogios, A.G. and Rexhepi, Y. (2016), “Rewarding employees in turbulent economies for improved organisational performance: exploring SMEs in the South-Eastern european region”, in *Personnel Review*, Vol. 45 No. 6, pp. 1259-1280.
- Rai, A., Ghosh, P. and Dutta, T. (2019), “Total rewards to enhance employees’ intention to stay: does perception of justice play any role?”, *Evidence-based HRM*, Vol. 7 No. 3, pp. 262-280, doi: 10.1108/EBHRM-07-2018-0045.
- Rehman, S.; Shahrukh, H.M.; Virk, A.M.; Butt, M. *Pay for Performance (Pfp) Increasing Creativity Through Intrinsic Motivation*. *Int. J. Res. Bus. Soc. Sci.* 2019, 8, 74–90.
- Rouen, E. (2019). Rethinking Measurement of Pay Disparity and its Relation to Firm Performance. in *The Accounting Review*. doi:10.2308/accr-52440.
- Sarkar, J., Jena, L.K. and Sahoo, K. (2021), "Mediating role of need satisfaction on total reward management towards retention: a conceptual framework", in *Vilakshan - XIMB Journal of Management*, Vol. ahead-of-print No. ahead-of-print. <https://doi.org/10.1108/XJM-03-2021-0083>

- Turnea, E. S. (2018). Attraction and retention of the employees. A study based on multinationals from Romania. *Procedia— Social and Behavioral Science*, 238, 73-80.
- Trevor, J. (2011). *Can Pay be Strategic?* Basingstocke: Palgrave Macmillan, 2011. 226s. ISBN 978-0-230-22354-7.
- Zingheim, P.K., Schuster, J.R. and Dertien, M.G. (2009), “Compensation, reward and retention practices in fast-growth companies”, in *World at Work Journal*, Vol. 18 No. 2, pp. 22-39.

## Implementation of Industry 4.0 Elements in SMEs – Comparative Analysis

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### Abstract

Industry 4.0 can be understood as a set of technologies, equipment and processes capable of operating in an integrated way in several stages of the production process, enabling self-sufficient production, integrated operations, decentralized decisions and minimal human intervention. The aim of the article is to analyze and compare the results of research studies that examined the readiness and experience of small and medium enterprises (SMEs) with the implementation of some elements of Industry 4.0 into various business processes and identify the biggest barriers to this implementation. The method of comparative analysis was used to conduct 6 research studies, which pointed to the results of various types of surveys conducted in the countries of Europe and Asia. In the end, in addition to the identification of the biggest barriers in the implementation of elements and technologies of Industry 4.0 in the conditions of SMEs, the possibilities of the solution were also indicated.

Keywords: Industry 4.0; SMEs; effectiveness; performance; barriers; advantages.

Article Classification: Research article

### 1 Introduction

Industry 4.0 is difficult to define precisely, but according to Castelo-Branco, it can be understood as a set of technologies, equipment and processes capable of operating in an integrated manner at several stages of the production process and at several levels of the supply chain, enabling self-sufficient production, integrated operations, decentralized decisions and at least human interventions (Beltrami et al., 2021).

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The Internet became the key starter of the fourth industrial revolution, which is not only used for communication between people on social networks, but also brought a new dimension to the digital transformation of internal company processes. So it serves not only for social purposes, but also for production equipment, materials and physical reality with virtual. The Internet is becoming ubiquitous, regardless of the size of companies, their area of operation or the specifics of internal company processes (Bílík, Kudláč, 2019; Blštáková et al., 2020).

Keeping up with developing technology is challenging, those, businesses that can constantly improve in this area are ahead of the competition (Turak, 2015). The starting point of Industry 4.0 is the introduction of intelligent operation, focused on technology, productivity, efficiency and adaptation to changing requirements. The strategy of this revolution is to increase the competitiveness of companies on the market using this system (Xu et al., 2021).



Figure 1 Industry 4.0 and its elements; source: own elaboration

Industry 4.0 consists of several elements and technologies, but many authors identify and state them differently. It goes, for example o Big Data, horizontal and vertical system integrations, cloud systems, Business Intelligence, digitalization, robotics and automation, artificial intelligence. Some of them, such as augmented virtual reality, autonomous robots, simulations, additive manufacturing (3D printing), cyber-physical systems, Internet of Things, Internet services, etc., are shown in Figure 1. The listed elements, technologies and their combinations can be used within the production process regardless of the type of production (e.g. furniture production and related anthropometric measurements) (Gergel et al., 2019).

Industry 5.0 is also currently being talked about. This concept comes from Japan in 2016 and is still more of a question of the future. The step forward is mainly the direction towards a sustainable, human-centered and resilient industry. The concept of

Industry 4.0 is used not only by large, but also by small and medium-sized enterprises. The aim of the use is the improvement of production processes and their adaptation to constantly changing conditions (Polat, Erkollar, 2020). The same is expected in the future from the Industry 5.0 concept.

It is extremely important for businesses to be prepared for radical change, which brings with it the introduction of new technologies such as the already mentioned digitalization, cloud computing, industrial automation, sensors, predictive maintenance, the Internet of Things, additive manufacturing, augmented reality, Big Data and analytics, cyber security, etc. (Rajnai, Kocsis, 2018). All these technologies, as long as they are properly implemented into business processes, bring benefits to companies in the form of increased efficiency, performance, competitiveness and, ultimately, increased value for interested groups (Chodasová, Králik, 2019; Ďurišová et al., 2019).

SMEs are of great importance for every economy, because they cover a high industrial share (Potkany, Hitka, 2009), and therefore the integration of Industry 4.0 into SMEs, but also other possible forms of support, for example from the government (Kozubíková, Jacková, 2019), is important not only for the development of these businesses, but also of every economy (Malichová, Tokarčíková, 2019). In order for the integration of Industry 4.0 elements in these companies to be successful and for employees to be willing to implement changes, it is also necessary to adopt a complex of motivational tools (Lorincová et al., 2019). The aim of the article is to analyze and compare the results of research studies that monitored the readiness and experience of small and medium-sized enterprises with the implementation of some elements of Industry 4.0 into various business processes and to identify the biggest barriers to this implementation. SMEs are characterized by a turnover of 50 mil. € with a maximum of 250 employees. We analyzed and compared 6 research studies that described the results of various forms of surveys carried out in European and Asian countries.

## **2 Material and methods**

In the article, we used the methods of analysis, synthesis, induction, deduction and comparison. We compared six research studies that focused on the implementation of Industry 4.0 elements in European and Asian countries. The aim of the article is to analyze and compare the results of research studies that examined the readiness and experience of small and medium enterprises (SMEs) with the implementation of some elements of Industry 4.0 into various business processes and identify the biggest barriers to this implementation.

## **3 Results - Research studies**

### ***3.1 Research in the Danish-German border region***

The aim of the study (Yu, Schweisfurth, online, 2020) is to investigate the connection of factors closely related to technology, society, and industry with the implementation of Industry 4.0 in German and Danish SMEs. The study was carried out by the method of examining samples of manufacturing SMEs in the German-Danish border region with 4,669 manufacturing enterprises with 10-250 employees. Of these, 1,573 enterprises were filtered, and only 751 enterprises agreed to participate in the survey. Finally, 59 observations were usable for the purposes. The study was carried out at the regional level in the form of several surveys and points to the fact that more successful enterprises that have a varied production and a high level of automation in place are more likely to implement Industry 4.0 technologies.

The analysis showed that no company is interested in augmented reality, and more than 90% of companies do not plan to invest in the Internet of Things there is also a low interest in additive manufacturing, Big Data, and simulation. More than 15% of enterprises have planned investments in technology within four years, simulation is used by 6.78% of enterprises, and 11.86% of enterprises plan to introduce it in the future. 12% of businesses use robots, and 27.11% are still planning to use them. The most implemented technologies include system integration with cloud computing (20%) and cyber security (50%).

According to the conducted study, SMEs feel threatened by Industry 4.0 and its technologies. In-house knowledge is considered crucial, because if business managers do not continuously train their employees, they will not be able to evaluate the usability, efficiency and, ultimately, even the benefits and meaning of the introduced technologies. Without the necessary knowledge, they are likely to rate technologies as unpromising (Yu, Schweisfurth, 2020).

### ***3.2 A survey of Malaysian manufacturing SMEs***

This research study (Tay et al., 2021) aims to discuss the current practice and challenges in Malaysian manufacturing enterprises due to the introduction of Industry 4.0. At the same time, it examines seven Malaysian manufacturing companies that, by trial and error, incorporate and remove Industry 4.0 tools in and out of their operations, to achieve higher efficiency.

The adoption of Industry 4.0 in practice is still at an early stage in Malaysia, and therefore the barriers to its implementation were also investigated to bring solutions to the emerging concerns. The analysis revealed three key implementation issues are mindset, culture, and competition. Other identified challenges for manufacturing Industry 4.0 include education, workforce, capital, security, technology, knowledge orientation, governance, and integration.

The conclusions from the study point to the fact that the Malaysian industry is currently using Industry 3.0, and the transition to 4.0 is only in the initial phase. Most SMEs try new technologies in practice, mainly expecting an increase in efficiency. Based on the responses from the respondents, it was found that they all agreed that the challenges are in the areas of data management and integration, and listed knowledge orientation, technology, capital, education, and workforce as the main challenges. Among the results is the finding that the problem is in the mindset, with businesses having a misconception about industrial revolutions, which is highlighted as a critical issue in the implementation of Industry 4.0 (Tay et al., 2021).

According to Haseeb et al. (2019) and tracked results, Malaysia's manufacturing technologies will remain at the level of Industry 2.0 and 3.0 as Malaysia has taken a more liberal approach to developing policies to implement Industry 4.0. and it is more comfortable with the level of mass production and automation. There is a knowledge gap among employees of private enterprises in Malaysia, so it would be better to work on eliminating the deficit of professional knowledge and skills.

According to a report by the Malaysian Investment Development Authority (2021), although SMEs make up 98.5% of Malaysia, most SMEs cannot afford to apply smart operation solutions because they lack money or new technologies are too expensive. However, they can afford the digital transformation of corporate documents by implementing cloud computing, which is necessary and affordable in the current pandemic era.

The study also points to the action of the government, which despite offering some



support for vocational training in digitalization, tax incentives for a better transition to digitalization or creating a program of guarantees for business loans for investments in automation, should adapt its policy to stimulate more SMEs in the transformation of production, for example, development and training funds, and has become a support for Malaysian enterprises to move out of their comfort and status quo (Tay et al., 2021).

### ***3.3 Research in the Basque Country – a resource-based view of SMEs***

The study focused on the implementation of the Industry 4.0 concept in 354 SMEs in the province of Gipuzkoa, Basque Country (Spain), using a mixed method approach thus, it is a combination of qualitative and quantitative elements. The qualitative method includes interviews of researchers and SMEs on the topic of Industry 4.0, and the quantitative method records the results of the qualitative method. The subject of interviews with 354 SMEs participating in the research were questions related to Industry 4.0, aimed at informing about possible ways to help with the implementation of Industry 4.0, where after collecting the answers, the answers were recorded and discussed.

The Basque Country is considered the only innovative region in Spain and at the same time the most industrial in Europe, comparable to, for example, the Baden-Württemberg region in Germany or Lombardy or Piedmont in Italy. This leading region accounts for about 50% of employment compared to the rest of Spain and accounts for almost 70% of the country's GDP. Moreover, these mentioned regions are known for companies such as Bosch, Fiat and Daimler (Navarro et al., online, 2014). The industrial transformation of the mentioned areas is, therefore, the main challenge for Industry 4.0.

According to Horvátja and Szabá's (2019) study states in the results that 54% of SMEs are currently involved in the use of the Industry 4.0 concept, where the driving reason is the growing pressure of competition, coming from value chains and imitation. The remaining 46% of SMEs have not yet implemented this concept in their corporate strategy. However, this percentage is divided into 19% of SMEs, which have the potential and resources for immediate implementation but still resist. According to Müller and Voigt (2018), the remaining 25% are SMEs that also lack basic resources, and attention to these businesses is neglected in Europe.

This Europe could be inspired by China, which has many enterprises at such a stage, and the implementation of Industry 4.0 is planned for them very quickly.

### ***3.4 Triple bottom line in manufacturing SMEs in Malaysia***

Another research study also follows the implementation of Industry 4.0 in Malaysia but with a focus on sustainability. Because industrialization has caused a world uproar regarding the changing climate, excessive consumption of natural resources, and ecological threats, more and more companies are trying to achieve the TBL (Triple Bottom Line) goal of social, environmental, and economic sustainability.

According to Yusoff et al. (2018), Malaysia introduced the NEM economic model aimed at achieving business goals in parallel with sustainability. Researchers Jayashree et al. (2021) argue that, because of this model, Malaysia is committed to promoting sustainable industrialization, and by the end of 2030 has set itself the goal of increasing the share of employment and the well-being of the population.

In the study (Jayashree et al., 2021), there is a connection between Industry 4.0 and sustainability, and its purpose is to propose a framework containing the main determinants (top management commitment, supply chain unification and IT infrastructure) that can influence the implementation of Industry 4.0. The study aims to highlight the consequences and use of determinants in the implementation of the Industry

4.0 concept, where the findings are intended to help governing bodies optimize the creation of values to achieve economic, social and environmental sustainability. The determinants in this study are referred to as dynamic capabilities, which include financial, human, and strategic capital. The study was carried out through structural equation modelling and was conducted using a questionnaire with a quantitative approach that uses simple random sampling to obtain actionable feedback from 199 respondents who are also employees of Malaysian SMEs.

The result of the research study is that determinants such as top management and IT infrastructure affect the implementation and sustainability of Industry 4.0 to a large extent, but the supply chain is negligible for implementation. Considering that the implementation of Industry 4.0 is only "in its infancy" in Malaysia, the results of this study will be very useful especially to explain the benefits for SMEs (Jayashree et al., 2021).

### ***3.5 Research in the industrial SMEs in Konya (Turkey)***

The Internet of Things is one of the basic elements of Industry 4.0 and is related to the use of technologies in the manufacturing industry (Polat, Karakuş, online, 2019). Thanks to IoT, objects interact with each other on a virtual platform without the intervention of the human factor, which also brings many advantages in terms of time (Xu et al., 2014).

This study is focused on the manufacturing sector, which is taking on new dimensions thanks to the Internet of Things. The classic production system operating with the help of the human factor is being replaced by machines that function and communicate with each other thanks to autonomous control. Industry 4.0 leads to a reduction in costs by 10 to 30 % in areas such as production, purchasing, storage, logistics, and maintenance (Bauernhansl et al., 2016). By reducing costs, companies can increase their competitiveness in the market.

The main goal of the study is to find out the awareness and implementation procedures of Industry 4.0 of companies operating in the Turkish city of Konya, which has a strong industry composed of several small and medium-sized enterprises (Polat, Karakuş, 2019).

We reviewed several studies dealing with the issue of Industry 4.0. A questionnaire form of obtaining information was also used to evaluate the individual approaches of companies to Industry 4.0. The questionnaire deals with awareness and implementation of Industry 4.0 specifically in 2 companies in the city of Konya. The entire research was enriched with information obtained from personal in-depth interviews, which were conducted with persons in the top management of these two companies.

The conclusion of the study showed that small and medium enterprises in Turkey, which contribute to the development of the country, are not sufficiently informed about the given issue. The biggest prejudices about Industry 4.0 refer to the high investment need and insufficient qualification of the workforce (Polat, Karakuş, 2019).

### ***3.6 Research in the Italian SMEe***

Currently, more and more physical processes are being replaced by digital ones in the industry. This guarantees a benefit for companies in the form of increasing the qualifications of the workforce, eliminating inefficiency, reducing costs, or increasing the level of customer satisfaction. New digital technologies are constantly appearing in businesses, which contribute to increased flexibility and improved decision-making

ability (Alfano et al., 2020; Ślusarczyk, 2018).

The following study (Alessia et al., 2021) closely touches on the empirical evidence on how manufacturing enterprises, which are small or medium-sized, face the transformation related to Industry 4.0. The study aimed to investigate the level of knowledge, skills and readiness for Industry 4.0 in Italian companies of the Campania region.

An internet questionnaire was used to achieve the aim of the study. The main part of the questionnaire consisted of questions aimed at collecting data from the field of Industry 4.0 and data on the readiness of companies for this change. The sample was companies belonging to regional trade associations. The questionnaire was distributed to 150 experts in the industry, namely in 2019. It was required to be filled by employees holding positions such as executive director, research and development manager, operations manager, or technical manager. A total of 77 respondents representing companies filled out the questionnaire.

The survey results show that SMEs still have limited knowledge about Industry 4.0 and are not well prepared for its implementation. The smaller the size of the company, the more obvious the situation. The vast majority do not even realize what opportunities the introduction of digitalization and new technologies offers. It represents a great opportunity for businesses to gain a competitive advantage in the markets. Transformation can bring many benefits and change the functioning of businesses in the right direction. Medium-sized enterprises are the best. However, for this radical change to take place in businesses, it is extremely important that they understand the entire Industry 4.0 that can bring them added value. However, most enterprises do not take any measures regarding new technologies.

The second important point that guarantees competitiveness is the high-quality training of the workforce. Here is a visible problem with all companies. The labour market is not sufficiently prepared for the new revolution (Alessia et al., 2021).

### **3.7 Another research studies**

A survey conducted by Thomas and Barton (2012) on 260 manufacturing SMEs in the United Kingdom found that businesses are concerned about high risk when implementing advanced technologies. According to them, the difference between small and large enterprises is that SMEs focus more on operations, while large enterprises focus on strategic planning, business formalization and control systems. The result is that when implementing Industry 4.0 in SMEs, the factor of company size is critical.

Based on the implementation of a survey (Spena et al., 2016) in Italy, which was conducted in the form of a questionnaire for 27 SMEs, the analysis found that the enterprises had a low level of automation and faced ever-increasing delivery costs, increasing quality requirements, ensuring the diversity of production and price competition. To implement the elements of Industry 4.0, companies must achieve a certain level of flexibility.

Currently, SMEs are increasingly compared with Industry 4.0, e. g. increased flexibility, production quality, speed, productivity, and real-time data exchange are compared (Li et al., 2017). According to Colotl et al. (2016), Danish companies expect better flexibility, speed, and higher productivity from Industry 4.0 at the expense of jobs. Also, the rate of implementation of artificial intelligence and big data is lower, no matter how big the company is. According to a survey conducted by Stentoft et al. (2017) on 33 large, 127 medium and 110 small manufacturing enterprises located in Denmark, robots, digitalization, automation, and data visualization are considered the most important

technologies, with the introduction of 3D printers and cloud computing being of lesser importance. Big Data, the Internet of Things and augmented reality have the least importance. Even though SMEs are aware of the benefits, importance and profit from Industry 4.0 technologies, they lag significantly behind large enterprises in their real application, due to the need for additional resources to prepare for the implementation of Industry 4.0 technologies. Driving forces that motivate SMEs to put these technologies into practice include cost reduction, speeding up the product launch, amended legislation, and labour shortage, but there are also barriers, such as a misunderstanding of the strategic importance of technology and a lack of knowledge, the need for human capital and its continuing education and the need for a greater orientation to the business than to its development.

As part of the summary, an overview table 1, in which the specific established areas of Industry 4.0 in SMEs were identified in individual research studies and the benefits resulting from the implementation of some elements or technologies of Industry 4.0 in the conditions of SMEs were identified.

Table 1 Results of reasearch studies – part one; source: own elaboration

No.	Country	Established area of Industry 4.0	Identified benefits
1.	Danish-German border	Varied production, established automation at a high level, data visualization, robots, simulations, augmented reality, Internet of Things	Improvement of competitiveness, efficiency, flexibility, productivity, cost reduction, faster introduction of the product to the market
2.	Malaysia 1	Intelligent production	Close integration with IT and cyber security, tax incentives,
3.	Basque Country (Spain)	Equipment automation	Increasing the country's GDP
4.	Malaysia 2	New technologies, intelligent solutions, sustainability	Cost reduction, efficiency growth, competitiveness growth, profit growth, cost minimization, better storage and logistics, better information handling, business performance growth
5.	Konya (Turkey)	Internet of Things	Increased productivity and quality
6.	Italy	Smart businesses	Future readiness for the labour market

Table 2 identifies the main barriers to the implementation of the elements and technologies of Industry 4.0 in SMEs as they emerged from the comparative analysis. At the same time, was identified the expected impact of this implementation on human capital (HC) as a crucial production factor in enterprises in the future.

Table 2 Results of reasearch studies – part two; source: own elaboration

No.	Country	Identified barriers	Expect impact on HC
1.	Danish-German border	Misunderstanding of the meaning of Industry 4.0, lack of knowledge, need for continuous education, greater focus on the company than its development, price competition, cost growth	Growth in production of work, education, HC without knowledge cannot evaluate the usability and effectiveness of investments in I 4.0, not the meaning of technologies
2.	Malaysia 1	Need for education and lack of capital, competition, mindset, technology, management and integration, workforce	Knowledge gap due to automation
3.	Basque Country (Spain)	Financial constraints, competition	Knowledge gap
4.	Malaysia 2	Environmental pollution	Reduction of labour costs, growth of well-being, motivation of employees
5.	Konya (Turkey)	Absence of the best practices for the implementation of Industry 4.0	The need to raise awareness among all working subjects
6.	Italy	Low qualification of the workforce	Necessity of retraining

#### 4 Discussion

Industry 4.0 brings many benefits for SMEs, from generating profit, increasing production efficiency, employee productivity, and increasing performance to creating more favourable conditions for environmental protection. The implementation of Industry 4.0 digitizes connectivity and integrates production and technology, which leads to the possibility of producing more intelligent products and provided services (Buer et al., 2018).

Industry 4.0 technologies bring several benefits, such as reducing set-up time and delivery times, reducing labour costs, increasing profit, minimizing waste, increasing savings energy, recycling and reuse, increased competitiveness and ultimately, benefits will also be felt by workers in the form of its health and safety protection and increased motivation and productivity (Bai et al., 2020; Khan et al., 2021; Yadav et al., 2020; Kumar et al., 2020; Müller et al., 2018).

Considering the determinants it is possible to point out the fact that top management is very actively involved in building dynamic capabilities (Garbellano and Da Veiga, 2019). However, he should also understand Industry 4.0 to correctly combine horizontal, vertical and end-to-end integration (de Sousa Jabbour et al., 2018). Also, according to Helfat and Peteraf (2014), top management should have such qualities as sensitivity and attention to detect changes. According to Roy and Khojle (2016), it should also be sensitive to understanding the company's goals and intentions in connection with Industry 4.0.

The integration of the supply chain defines how the company should cooperate with its partners, customers, and suppliers to achieve smooth flows (Huang and Huang, 2019; Kušnířová, Ďurišová, 2021). Smart technologies also play a big role, not only in the supply chain but also enable companies to better store, logistics, manage stocks, as well as more efficiently order and transport (Ben-Daya et al., 2019; Ďurišová, Kušnířová, Malichová, 2021 ). Big Data also brought its benefits in the form of support for the development of logistics, handling of information, support of employee skills, creativity and expertise (Queiroz and Telles, 2018; Ližbetinová et al., 2019).

The last determinant, namely IT infrastructure, serves companies in setting up Industry 4.0 and is essential in improving business strategy and business procedures

(Mikalef and Pateli, 2017). IT infrastructure increases efficiency, improves business performance, reduces costs, produces profits and improves competitiveness (Erkmen et al., 2020).

According to Horváth and Szab (2019), SMEs do not want to apply the elements of Industry 4.0 to their business because of limited resources. They are just trying to understand the strategic benefits. According to them, the low level of digitalization and smaller series production combined with less automated equipment can prevent small and medium-sized enterprises from obtaining funds for the implementation of Industry 4.0.

In the same way, according to Müller (2018), barriers include little or no automation and business models that are more oriented to operations than to the creation of new values. According to him, the concept of industry 4.0 involves mainly large enterprises, which have better predispositions for it, and its development may therefore be threatened due to the stopping of the influx of SMEs, which make up the largest share of European industry. In addition, SMEs must be involved in Industry 4.0, as they represent one of the crucial links in the supply chain.

## **5 Conclusion**

From the performed comparative analysis, it is clear that many SMEs have not yet implemented Industry 4.0 in their business and that many aspects influence their decision to implement them. Among the biggest barriers to the introduction of Industry 4.0 in the conditions of SMEs are their low flexibility towards technological innovations, weak financial possibilities, a lower level of knowledge of managers about Industry 4.0, the necessity of training workers, and ultimately the size of enterprises. The introduction of new technologies is less likely for SMEs than for large ones.

Companies use the most technologies in the field of information systems. Also, the use of robots and digitalization in the form of simulations and Big Data are considered the potential for the future.

It can also be concluded that the Malaysian industry is still in the early stages of implementing Industry 4.0, and the identified financial and mindset barriers need to be broken to bring success. According to research studies, the government should take the first step by providing more incentives and a more favourable environment for investment. The second step should be to increase knowledge about the benefits of Industry 4.0 to clarify misconceptions and increase companies' competitiveness in the market.

According to Müller et al. (2021), companies have a better chance of overcoming financial constraints when trying to implement Industry 4.0 if they have an active strategy and the ability to acquire knowledge and know-how and create networks. Schmidt et al. (2020) stated that if businesses want to maintain their competitiveness, they must be correlated with the management concept, represented by the existence of an Industry 4.0 implementation plan.

More attention should be paid to those companies that have not yet implemented Industry 4.0 because a certain part of them has the potential to implement it immediately, but they lack knowledge and need a detailed explanation of its benefits (Malichová, Mičiak, 2019). The government should help the rest of the companies that do not have the resources to implement the Industry 4.0 strategy by amending legislation and other policies and measures.

It is also important that the awareness of SMEs about Industry 4.0 increases with the help of large technological research companies, which will contribute to the sharing of best practices in the transformation by disseminating their research and studies. In

addition, it is important that educational institutions also take a position in this area, which must bring reforms in the curriculum and thus prepare a qualified workforce with a high level of human capital for the labour market.

Significant changes must also be made in the area of educational systems and retraining of knowledge, abilities and skills. If such an important area suffers from deficiencies, a proper and successful transformation of SMEs to Industry 4.0 will never be ensured. The cooperation of companies with educational and research institutions as well as universities is crucial and can help to better prepare for the adoption of Industry 4.0, not only in SMEs, but it applies universally.

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### References

- Alessia, M. R.T, Alfano, M., Di Pasquale, V., Raffaele, I., Cesare, P. (2021). *A survey study on Industry 4.0 readiness level of Italian small and medium enterprises*. *Procedia Computer Science*, vol. 180, 2021, pp. 744-753 [online]. Elsevier, 20 February 2021.n. 1. Available at: <https://www.sciencedirect.com/science/article/pii/S1877050921003720#!>
- Alfano, M., Di Pasquale, V., Iannone, R., Miranda, S., Riemma, S. (2020). *Assessment and implementation of Industry 4.0 paradigm: research topics and trends*. 2020. XXV Summer School “Francesco Turco” – Industrial Systems Engineering, 2020. Google Scholar
- Bai, C., Dallasega, P., Orzes, G., Sarkis, J. (2020). *Industry 4.0 technologies assessment: a sustainability perspective*. *International Journal of Production Economics*, vol. 229 (2020), No. 107776
- Bauernhansl, T. a kol. (2016). *Wgp-Standpunkt Industrie 4.0, Wissenschaftliche Gesellschaft für Produktionstechnik*. Google Scholar
- Beltrami, M., Orzes, G., Sarkis, J., Sartor, M. (2021). *Industry 4.0 and sustainability: Towards conceptualization and theory*. *Journal of Cleaner Production*, vol. 312, 20, 2021, No 127733
- Ben-Daya, M., Hassini, E., Bahroun, Z. (2019). *Internet of things and supply chain management: a literature review*. *International Journal of Production Research*, vol. 57 (15-16), 2019, pp. 4719-4742
- Bílik, P., Kudláč, M. (2019). *Anatómia inteligentného priemyslu: internet* [online]. Quark, Anasoft, 4th January 2019 Available at: <https://www.quark.sk/anatomia-inteligentneho-priemyslu/>
- Blišťáková, J., Joniaková, Z., Jankelová, N., Stachová, K., Stacho, Z. (2020). *Reflection of Digitalization on Business Values: The Results of Examining Values of People Management in a Digital Age*. *Sustainability*, vol. 12, issue 12, article no. 5202.
- Buer, S.V., Strandhagen, J.O., Chan, F.T.S. (2018). *The link between Industry 4.0 and lean manufacturing: mapping current research and establishing a research agenda*. *International Journal of Production Research*, 56 (8) (2018) , pp. 2924 - 2940

- Colotla, I., Faeste, A., Heidemann, A., Winther, A., Andersen, P. H., Duvold T., et al. (2016). *Winning the industry 4.0 race, how ready are Danish manufacturers?* (2016)
- Creswell, J.W. (2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Sage Journals, Thousand Oaks, CA. 2013, pp. 97. Google Scholar
- De Sousa Jabbour, A.B.L., Jabbour, C.J.C., Foropon, C., Filiho, M.G. (2018) *When titans meet – can industry 4.0 revolutionise the environmentally-sustainable manufacturing wave? The role of critical success factors*. Technol. Forecast. Soc. Change, 132 (January) (2018), pp. 18-25
- Ďurišová, M., Kušnírová, D., Malichová, E. (2021). *Value management principles' extension for suppliers, as major company's stakeholder*. In: New trends in sustainable business and consumption: conference proceedings. - ISSN 2457-483X. - 1. vyd. - Bukurešť: EDITURA ASE, 2020. - s. 81-87
- Ďurišová, M., Tokarčíková, E., Virlanuta, F.O., Chodasová, Z. (2019). *The corporate performance measurement and its importance for the pricing in a transport enterprise*. Sustainability. Roč. 11, č. 21 (2019), s.1-17.
- Erkmen, T., Gunsul, A., Altidag, E. (2020). *The role of innovative climate in the relationship between sustainable IT capability and firm performance*. Sustainability, 12 (10) (2020)
- Garbellano, S., Da Veiga, M.D.R. (2019). *Dynamic capabilities in Italian leading SMEs adopting industry 4.0*. Meas. Bus. Excell., 23 (4) (2019), pp. 472-483
- Gergel, Z., Bucha, T., Gejdoš, M., Vyhnalíková, Z. (2019). *Computed tomography log scanning - high technology for forestry and forest based industry*. Central European Forestry Journal, vol. 65, issue 1, pp. 51-59.
- Haseeb, M., Hussain, H. I., Ślusarczyk, B., Jermsttiparsert, K. (2019). *Industry 4.0: a solution towards technology challenges of sustainable business performance*. Soc. Sci., 8 (2019), p. 154, 10.3390/socsci8050154
- Helfat, C.E., Peteraf, M.A. (2014). *Managerial cognitive capabilities and the microfoundations of dynamic capabilities*. Strat. Manag. J., 36 (6) (2014), pp. 831-850
- Horváth, D., Szabó, R. Z. (2019). *Driving forces and barriers of Industry 4.0: Do multinational and small and medium-sized companies have equal opportunities?* Technological Forecasting and Social Change, 146, pp. 119-132, 10.1016/j.techfore.2019.05.021
- Huang, M.C., Huang, H.-H. (2019). *How transaction-specific investments influence firm performance in buyer-supplier relationships: the mediating role of supply chain integration*. Asia Pac. Manag. Rev., 24 (2) (2019), pp. 167-175
- Chodasová, Z., Králik, M. (2019). *Indicators of profitability in the building enterprise*. In Advances and Trends in Engineering Sciences and Technologies III. 1. vyd. London : CRC Press, Taylor&Francis Group, 2019, S.381-386.
- Jayashree, S., Reza, M.N.H, Mohiuddin, M. (2021). *Impact of cleaner production and environmental management systems on sustainability: the moderating role of industry 4.0*. IOP Conf. Ser. Zemské prostredie. Sci. , 795 (1) (2021), 012013
- Khan, I.S., Ahmad, M.O., Majava, J. (2021). *Industry 4.0 and sustainable development: a systematic mapping of triple bottom line, Circular Economy and Sustainable Business Models perspectives*. J. Clean. Prod., 297 (2021), p. 126655
- Kozubíková, Z., Jacková, A. (2019). *Support of small and medium-sized enterprises by the state and public administration in Slovakia*. In: Modernization of public administration - 1. vyd. - Strážnice: Public administration educational institute, 2019. - ISBN 978-80-907057-6-0. s. 35-38
- Kumar, R., Singh, R.K., Dwivedi, Y.K. (2020). *Application of industry 4.0 technologies in SMEs for ethical and sustainable operations: analysis of challenges*. J. Clean. Prod., 275 (2020), p. 124063
- Kušnírová, D., Ďurišová, M. (2021). *Value creation indicators in building relationships with suppliers in Slovakia and other countries*. In: CER Comparative European Research 2021, proceedings / research track of the 16th Biannual CER Comparative European Research Conference. - 1. vyd. - London: Sciemcee, 2021. - ISBN 978-1-7399378-0-5. - s. 23-26.



- Li, G., Hou, Y., Wu, A. (2017). *Fourth industrial revolution: Technological drivers, impacts and coping methods*. Chinese Geographical Science, 27 (4) (2017), pp. 626-637, 10.1007/s11769-017-0890-x
- Ližbetinová, L., Štarchoň, P., Lorincová, S., Weberová, D., Průša, P. (2019). *Application of cluster analysis in marketing communications in small and medium-sized enterprises: An empirical study in the Slovak Republic*. Sustainability. 2019, roč. 11, č. 8, s. nestránkováno, 18 s. ISSN 2071-1050. doi:10.3390/su11082302.
- Lorincová, S., Hitka, M., Bajžíková, L., Weberová, D. (2019). *Are the Motivational Preferences of Employees Working in Small Enterprises in Slovakia Changing in Time?* Entrepreneurship and Sustainability Issues, vol. 6, issue 4, pp. 1618-1635.
- Mikalef, P., Pateli, A. (2017). *Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: findings from PLS-SEM and fsQCA*. J. Bus. Res., 70 (2017), pp. 1-16
- Malichová, E., Mičiak, M. (2019). *The model of managerial decision-making on investment in medium-sized enterprises*. In: Hradec economic days : double blind peer-reviewed proceedings part II. of the international scientific conference : February 5-6, 2019, Hradec Králové, Czech Republic. Vol. 9 (2). - Hradec Králové: Univerzita Hradec Králové. s. 45-56
- Malichová, E., Tokarčíková, E. (2019). *The identification of the factors affecting the volume of service provided in a small business*. In: Uluslararası stratejik araştırmalar kongresi VI = International strategic research congress VI : proceeding book, ISBN 978-605-81633-7-9. - s. 605-612.
- Muller, J.M., Kiel, D., Voigt, K.I. (2018). *What drives the implementation of Industry 4.0? The role of opportunities and challenges in the context of sustainability*. Sustainability, 10 (1) (2018)
- Muller, J.M., Voigt, K.I. (2018). *Sustainable industrial value creation in SMEs: A comparison between industry 4.0 and made in China 2025*. International Journal of Precision Engineering and Manufacturing-Green Technology, 5 (5) (2018), pp. 659-670, 10.1007/s40684-018-0056-z
- Navarro, M., Gibaja, J. J., Franco, S., Murciego, A., Gianelle, C., Hegyi, F. B., Kleibrink, A. (2014). *Regional benchmarking in the smart specialization process: Identification of reference regions based on structural similarity*. S3 Working Paper Series, N° 03/2014. JCR Technical Reports. European Commission (2014)
- Polat, L., Karakus, G. (2019). *Approach of Medium-Sized Industry Enterprises to Industry 4.0 a Research in Konya*. In: Durakbasa N., Gencyilmaz M. (eds) *Proceedings of the International Symposium for Production Research 2018*. ISPR 2018. Springer, Cham. [https://doi.org/10.1007/978-3-319-92267-6\\_30](https://doi.org/10.1007/978-3-319-92267-6_30)
- Polat, L., Karakus, G. (2019). *Approach of Medium-Sized Industry Enterprises to Industry 4.0 a Research in Konya*. [online] In: Durakbasa N., Gencyilmaz M. (eds) *Proceedings of the International Symposium for Production Research 2018*. ISPR 2018. Springer, Cham. [https://doi.org/10.1007/978-3-319-92267-6\\_30](https://doi.org/10.1007/978-3-319-92267-6_30)
- Potkany, M., Hitka, M. (2009). *Utilization of contribution margin in the costing system in production of components for wood working machines*. Drvna Industrija, vol. 60, issue 2, pp. 101-110.
- Queiroz, M.M., Telles, R. (2018). *Big data analytics in supply chain and logistics: an empirical approach*. Int. J. Logist. Manag., 29 (2) (2018), pp. 767-783.
- Rajnai, Z., Kocsis, I. (2018). *Assessing industry 4.0 readiness of enterprises*. In 2018 IEEE 16th world symposium on applied machine intelligence and informatics (SAMI), No. 000225-000230, Google Scholar
- Roy, K., Khokle, P. (2016). *Staged development of dynamic capabilities: a study of international joint ventures in India*. Thunderbird Int. Bus. Rev., 58 (6) (2016), pp. 537-554
- Schmidt, M.C., Veile, J.W., Muller, J.M., Voigt, K.I. (2020). *Ecosystems 4.0: Redesigning global value chains*. International Journal of Logistics Management (2020), 10.1108/IJLM-03-2020-0145

- Spena, P. R., Holzner, P., Rauch, E., Vidoni, R., Matt, D. T. (2016). *Requirements for the design of flexible and changeable manufacturing and assembly systems: A SME-survey*. 48th CIRP conference on manufacturing systems, Vol. 41 (2016), pp. 207-212, 10.1016/j.procir.2016.01.018
- Stentoft, J., Rajkumar, C., Madsen, E.S. (2017). *Industry 4.0 in Danish Industry - an empirical investigation of the degree of knowledge, perceived relevance and current practice*. Syddansk Universitet, 52 p., 978-87-91070-90-7, 2017
- Tay, S.I., Alipal, J., Lee, T. C. (2021). *Industry 4.0: Current practice and challenges in Malaysian manufacturing firms*. Technology in Society, vol. 67, 2021, No. 101749 Available at: <https://www.sciencedirect.com/science/article/pii/S0160791X21002244#bib23>
- Thomas, A. J., Barton, R. A. (2012). *Characterizing SME migration towards advanced manufacturing technologies*. Journal of Engineering Manufacture, 226 (2012), pp. 745-756, 10.1177/0954405411424977
- Turak, Y. (2015). Nesnelerin İnterneti Ve Güvenliği. Available at: <http://www.yigitturak.com/wp-content/uploads/IoTGuvenligi.pdf>. Accessed 19 Jan 2018
- Xu, L.D., He, W., Li, S. (2014). *Internet of Things in industries: a survey*. IEEE Trans Ind Inf 10(4):2233–2243. <https://doi.org/10.1109/TII.2014>.
- Xu, X., Lu, Y., Vogel-Heuser, B., Wang, L. (2021). *Industry 4.0 and Industry 5.0—Inception, conception and perception*. Journal of manufacturing systems, vol. 61, 2021, pp. 530-535, Available at: <https://www.sciencedirect.com/science/article/pii/S0278612521002119>
- Yu, F., Schweisfurth, T. (2020). *Industry 4.0 technology implementation in SMEs – A survey in the Danish-German border region*. International Journal of Innovation Studies, vol. 4, Issue 3, 2020, pp. 76-84 Available at: <https://www.sciencedirect.com/science/article/pii/S2096248720300>

## **Session B**

# **Intellectual Capital Management and Measuring the Innovation of Companies**

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and Measuring of Innovativeness of Slovak Companies*

# Intellectual Capital Factors in Financial Health Prediction

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## Abstract

Bankruptcy models are a tool of financial analysis which allow the users of financial information to better assess a company's financial health and position. This paper aims to analyze the possibilities of application of the intellectual capital factors in order to develop bankruptcy prediction models. As an outcome, several bankruptcy prediction models were developed using the XGBoost method from 2018 to 2020. The developed models used either a) only financial ratios, b) only intellectual capital variables or c) all variables together. The models were developed on data from 23,494 small and medium-sized enterprises, out of which 23 went bankrupt in 2021. The results of this paper indicate that the intellectual capital factors contribute to the improvement of the predictive capabilities of bankruptcy models based on financial variables. The model developed in this way achieved an AUC of 89.75% for one-year prediction, 75.15% for two-year prediction and 64.80% for three-year prediction.

Keywords: intellectual capital; financial health; SME; bankruptcy prediction; XGBoost; SHAP;

Article Classification: Research article

## 1 Introduction

Bankruptcy models are a tool of financial analysis that allows the users of accounting information to better assess a company's financial health. Although the foundations of bankruptcy models were laid in the 1930s, when the Bureau of Business Research (BBR) published an article including an analysis of bankrupting industrial companies and their financial ratios, more frequent application of bankruptcy models began in the 1960s. Studies from Altman (1968), Ohlson (1980) and Taffler (1984) have helped to scale up bankruptcy prediction models based on financial ratios.

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Research of bankruptcy prediction models is currently experiencing expansion. With the application of big data and machine learning, it is possible to determine patterns in the financial statements which might indicate a company's financial difficulties before they occur. (Ringsdorf and Kajanová, 2017) Recent studies apply machine learning algorithms and approaches (various pre-processing procedures, specific datasets, etc.) to predict bankruptcy. Kou et al. (2021) applied several resampling and feature selection methods and compared their influence on the created XGBoost model. The AUC reached 79% in that study. Son et al. (2019) applied several machine learning algorithms and compared mutual results. Out of the tested methods, logistic regression, random forest, XGBoost, LightGBM and artificial neural network, the study achieved the best results with the application of XGBoost 88%.

While the studies mentioned above applied financial or non-financial variables, Papík et al. (2020) applied inputs in the form of other models (specifically Altman's Z-score, Taffler's Z-score, IN05 index) to develop bankruptcy prediction models. The research results have shown that a combination of bankruptcy models can achieve better results than applying these models alone. However, creating models using three categories (companies in bankruptcy, grey, and non-bankruptcy zone) is significantly more demanding than just using two groups of companies (companies in bankruptcy and not in bankruptcy).

In terms of used variables, the existing studies can be divided by the type of variables used to predict bankruptcies. The most frequently developed models use financial ratios (Papík et al., 2020; Son et al., 2019) because financial ratios are easily applicable to many machine learning methods. Non-financial variables are more difficult to apply to prediction models (Kou et al., 2021; Schalck and Schalck, 2021) because not all machine learning methods can work with categorical variables. However, the authors like Kou et al. (2021) agree that models with categorical variables achieve performance metrics more than models based on purely financial ratios. Another possibility is the application of various indicators derived from financial ratios. As an example, intellectual capital (IC) factors can be mentioned. According to Cenciarelli et al. (2018), Festa et al. (2021) and Shahdadi et al. (2020), intellectual capital factors can improve the prediction capabilities of the created models. According to Dženopoljac et al. (2016) or Papíková and Papík (2022b), intellectual capital impacts company performance and is therefore important in the evaluation of the financial health of companies.

This paper aims to analyse the possibilities of applying intellectual capital factors in developing bankruptcy prediction models. To fulfil the aim of this study, several bankruptcy models were created using the XGBoost method with various input variables. Three datasets were used as input variables: a) only financial ratios, b) only intellectual capital variables, and c) all these variables. In addition, the variables themselves and their relevance were also analysed through the SHAP plot. This paper's novelty is based on applying intellectual capital variables to a sample of Slovak companies using the XGBoost method. The existing studies have not yet analysed a combination of methods, factors, and datasets.

## **2 Data and Methodology**

The following part of this manuscript shows the data sample and data source, financial and intellectual capital features and the applied data mining approach.

## 2.1 Data sample and data source

Data from the company financial statements of Slovak SMEs were collected from 2018 to 2021. The Finstat database (2022) was used as the data source. Only the companies with financial records available from 2018 to 2020 were kept in the data sample. Also excluded from the sample were the companies that went bankrupt or underwent restructuring in the past. Only the companies that went bankrupt in 2021 were retained in the data sample. Large companies were also removed from the data sample. Only small and medium-sized companies were retained in the data sample. The European Union recommendation no. 2003/361 defines SME as a company with a) sales turnover below 50 million euros or b) the value of total assets below 43 million euros and c) the number of employees below 250. The final data sample included 23 494 SMEs, of which 23 went bankrupt in 2021, whilst the rest of the companies did not go bankrupt and remained in business.

Table 1 includes the distribution of the data sample as per regions in Slovakia. As shown in the table, almost half of the data sample are companies operating in the western part of the country – in the Bratislava, Nitra or Trnava regions whilst most companies operate in the Bratislava county.

Table 1 Sample – region distribution, own elaboration based on Finstat database (2022)

Region	SMEs	%
Banskobystrický	2 197	9,35
Bratislavský	6 387	27,19
Košický	2 594	11,04
Nitriansky	2 544	10,83
Prešovský	2 362	10,05
Trenčiansky	2 170	9,24
Trnavský	2 375	10,11
Žilinský	2 865	12,19
<b>Total</b>	<b>23 494</b>	<b>100,00</b>

Table 2 Sample – sector distribution, own elaboration based on Finstat database (2022)

Sector	SMEs	%	Sector	SMEs	%
Advertising	316	1,35	Intermediary activity	597	2,54
Agriculture and forestry	1 020	4,34	Law, consulting and accounting	1 159	4,93
Automobile industry	89	0,38	Media, publishing and culture	283	1,20
Automobile industry	31	0,13	Metalworking and metallurgy	872	3,71
Clothing and footwear	183	0,78	Production - other	110	0,47
Construction	2 750	11,71	Real estate	1 195	5,09
Development and civil engineering	667	2,84	Research and development	280	1,19
Education	158	0,67	Retail	1 716	7,30
Electrical engineering	284	1,21	Sales and main. of vehicles	576	2,45
Energy and mining	258	1,10	Service	928	3,95
Engineering	461	1,96	Telecommunications	59	0,25
Finance	328	1,40	Tourism and gastronomy	1 180	5,02
Food processing industry	366	1,56	Transportation and logistics	1 271	5,41
Health care	2 057	8,76	Waste management	169	0,72
Chemistry and plastics	295	1,26	Wholesale	2 527	10,76
Information technology	939	4,00	Wood and paper	370	1,57

Table 2 shows the data sample distribution per industrial sector according to NACE categorization. In total, 16 industrial sectors were included in the data sample, with a higher ratio of companies operating in the Construction, Whole sales and Health care industries.

## 2.2 Financial and intellectual capital features

To predict a company's financial health, ten indicators were calculated from the collected financial statements. The indicators were divided into two categories: five financial indicators (two of which were profitability variables, one debt variable and two liquidity ratios) and five indicators expressing intellectual capital or its components. Whilst the financial indicators are among the most common financial indicators used in prediction models (Son et al., 2019; Liu et al., 2022), the intellectual capital indicators are not so commonly used, mainly based on the VAIC model from Pulic (2004). In the past, the IC variables have been used to predict company bankruptcy by Cenciarelli et al. (2018), Festa et al. (2021) and Shahdadi et al. (2020). Individual variables and corresponding formulas are shown in Table 3.

Table 3 Features and formulas, own elaboration based on Papiková and Papík (2022)

Group	Feature	Long name	Formula
	ROA	Return on assets	Net income/Total assets
	ROE	Return on equity	Net income/Total equity
FI	DEBT	Debt ratio	Debt/Total assets
	CASH	Cash ratio	Cash/Current liabilities
	CR	Current ratio	Current assets/Current liabilities
	HCE	Human capital efficiency	$(\text{Operating profit} + \text{Employee costs} + \text{Depreciation} + \text{Amortization}) / \text{Total salaries and wage paid}$
	SCE	Structural capital efficiency	$(\text{Operating profit} + \text{Employee costs} + \text{Depreciation} + \text{Amortization} - \text{Total salaries and wage paid}) / (\text{Operating profit} + \text{Employee costs} + \text{Depreciation} + \text{Amortization})$
IC	ICE	Intellectual capital efficiency	Human capital efficiency + Structural capital efficiency
	CEE	Capital employed efficiency	$(\text{Operating profit} + \text{Employee costs} + \text{Depreciation} + \text{Amortization}) / \text{Book value of the net assets of company}$
	VAIC	Value added intellectual capital	Intellectual capital efficiency + Capital employed efficiency

### 2.3 Data mining approach

The data processing of this manuscript can be described in the following steps:

- data collection of companies from the Finstat database;
- calculation of the financial and intellectual capital indicators;
- elaboration of SHAP with feature relevance overall data;
- elimination of companies that were not SMEs or for which it was not possible to calculate the necessary indicators;
- division of companies into 5-folds;
- adjustment of imbalanced data in the training sample via SMOTE;
- creation and tuning of the prediction model through XGBoost on the training sample;
- testing of the created prediction model on a testing sample;
- calculation of performance metrics (accuracy, specificity, sensitivity, and AUC) as an average from testing five rounds within 5-folds
- visualization of the AUC metric on the ROC curve plot;
- formulation of discussion and conclusions.

The 5-folds approach is one of the ways how to evaluate the performance metrics of the developed model robustly. Each data sample is divided into five folds - four folds are used as testing datasets, and the remaining one fold is used as a training dataset. This process is repeated five times, with each fold used just once as a testing dataset. The final performance metrics of the developed model are then counted as the average of all five measurements. This approach has been used, for example, by Son et al. (2019) in the prediction of bankrupting companies, by An and Sun (2020) or by Wang et al. (2020) in the prediction of fraudulent companies.

In order to deal with the imbalanced class datasets – datasets including fewer bankrupting companies than non-bankrupt companies, SMOTE has been applied. As part of the process, SMOTE creates synthetic data that both bankrupting and non-bankrupting companies equally represent. This approach has been used, for example, in the studies of Kou et al. (2021), Liu et al. (2022) and Papíková and Papík (2022a). Due to the analysis of an imbalanced dataset, AUC was chosen as the primary performance metric in this manuscript.

The XGBoost method was used to develop the prediction models in this study. This method is one of the gradient-boosting algorithms and so far has been used, for example, in studies by Kou et al. (2021), Liu et al. (2022) and Son et al. (2019). The algorithm starts with the same weights assigned to all data and is followed by iterations. In each iteration, more attention is paid to incorrectly classified data by assigning them higher weight and, on the other hand, reducing the weight of correctly classified data. This process creates models which correct the bugs of previous models. Three datasets were used as input variables for XGBoost calculation, a) all variables (ten indicators), b) only financial variables (FI ratios), and c) only intellectual capital features (IC features). The performance metrics for the individual models were then compared and statistically significant differences between datasets a) and b), and a) and c) were validated by the Kruskal-Wallis test.

In order to display the feature importance of individual variables, the SHAP method was used. The SHAP method helps to bridge the "black box" problem of many prediction algorithms such as XGBoost, which is very difficult to interpret. The SHAP method is based on the concept of Shapley value of the game theory and the LIME (Local



Interpretable Modelagnostic Explanations approach (Antipov and Pokryshevskaya, 2020).

All calculations and charts were done in R-studio v.1.3.959, whilst XGBoost and SHAP were done using the "xgboost" package in version 1.5.0.2.

### 3 Results

The results can be divided into two parts: analysis of feature importance and results of the developed prediction models.

From the feature importance point of view, DEBT, VAIC, ROE, ROA and ICE could be considered as the most important variables. While lower DEBT and VAIC values reduce the likelihood of company bankruptcy, ICE variable tends to have the opposite effect. Unlike these variables, when the values of ROE and ROA are rather high, the probability of financial difficulties followed by company bankruptcy is lower. As far as financial ratios are concerned, the findings of this study are in line with the expectations that a lower level of company debt and higher profitability means that the analysed company is in good financial condition. However, the findings related to IC provide opposite results: lower values of added intellectual capital and higher values of intellectual capital efficiency might indicate deterioration of financial health. An interesting finding is also related to liquidity ratios when CASH and CR proved to be insignificant variables. Therefore, whether a company declares bankruptcy depends on its long-term financial position (debt and profitability) rather than on the liquidity, which has a short-term impact on the company. SHAP plot for analysed features is shown in Figure 1.

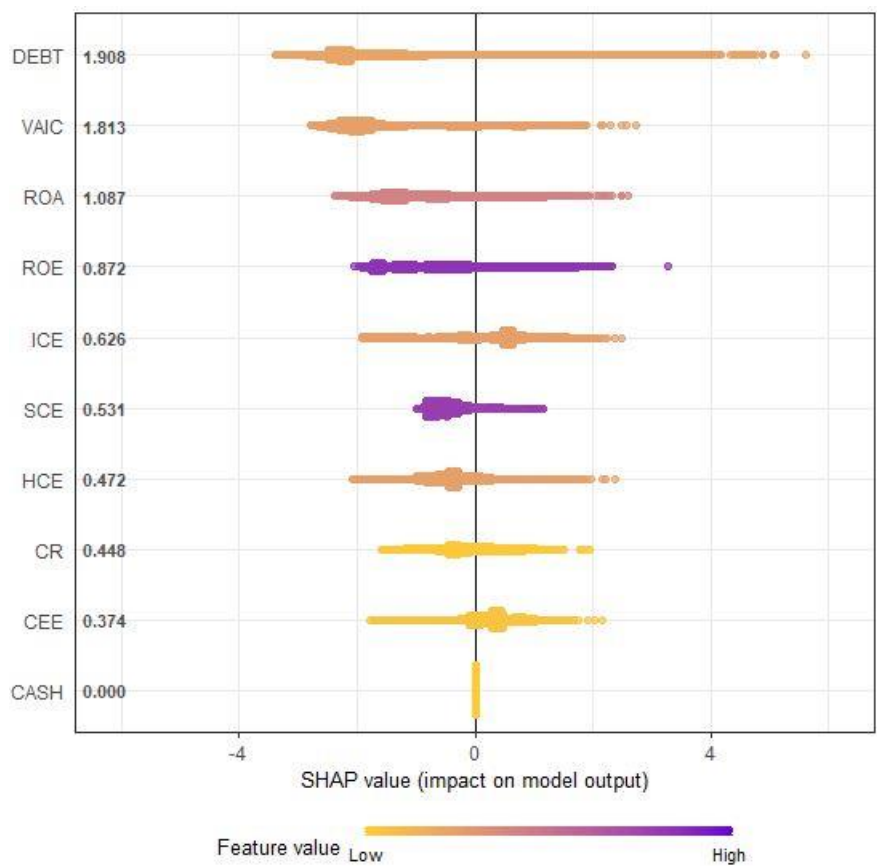


Figure 1 SHAP plot, source: own elaboration in R-Studio

The results achieved by the developed prediction models are listed in Table 4. As is shown in Table 4, the AUC of the developed models decreases with increasing prediction time. This decrease is between 8% to almost 16% year on year. Models using both FI and IC variables achieved the best results for all three predictions. However, statistically significant differences between these models and models developed on data using only one type of variables were identified only for predictions done one year prior to the declaration of bankruptcy. This behaviour can be explained, e.g., by the COVID-19 pandemic, which erupted in 2020 and spilt over into 2021. Therefore, the two- and three-year predictions (using 2019 and 2018 data) may not have recorded significant changes in the financial statements related to the pandemic outbreak.

Table 4 XGBoost performance metrics; own elaboration in R-Studio

Group	Years (prior)	Accuracy (%)	Sensitivity (%)	Specificity (%)	AUC (%)	Kruskal-Wallis test (sign.)
ALL	Three years	54,94	90,00	54,90	64,80	-
	Two years	58,62	96,67	58,58	75,15	-
	One year	83,39	92,50	83,38	89,75	-
FI	Three years	60,84	75,33	60,83	58,11	
	Two years	78,40	75,33	78,40	73,69	
	One year	73,99	90,00	73,97	81,81	*
IC	Three years	65,84	76,00	65,83	61,05	
	Two years	53,89	96,67	53,85	70,65	
	One year	93,90	78,50	93,92	80,30	*

ROC curves provide a slightly better comparison. As seen in Figure 2, the best results were achieved by the predictions that are done one year prior to bankruptcy (solid lines). In contrast, there are also three-year predictions (dotted lines), pictured as the lowest of all ROC curves. Despite the lower number of variables, it can be concluded that the AUC of one-year predictions is above 80% and above 70% for two-year predictions, which can be considered a solid result.

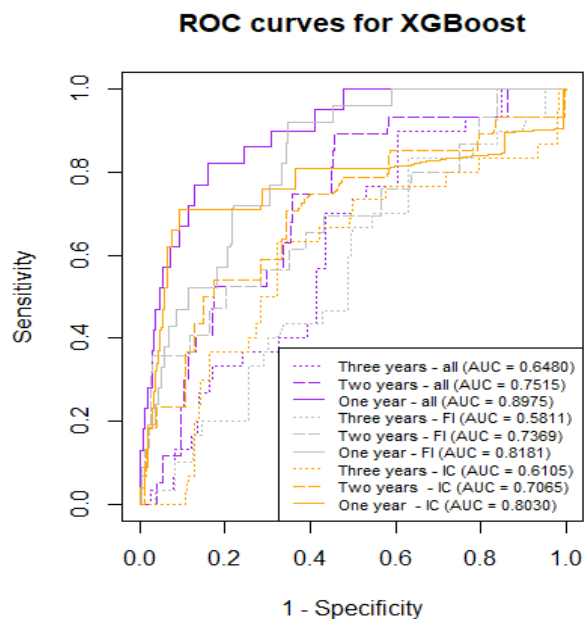


Figure 2 ROC curves for XGBoost, source: own elaboration in R-Studio

## 4 Discussion

This paper aimed to analyse the application possibilities of intellectual capital factors in developing bankruptcy prediction models. The results of this paper have shown that intellectual capital factors contribute to the improvement of the performance of the models based on financial variables. The model developed in this way achieved an AUC of 89.75% for one-year prediction, 75.15% for two-year prediction and 64.80% for three-year prediction. The results align with the findings of the studies by Cenciarelli et al. (2018), Festa et al. (2021) and Shahdadi et al. (2020), whose models using intellectual capital factors outperformed models using only financial variables.

A relatively small number of used variables can be considered as a limitation of this study. However, comparable results between the two developed models (models with only financial ratios and only intellectual capital features) were achieved, and statistically significant differences in the combination of both types of variables may have been caused by an increase in the number of predictors. Due to this reason, it would be appropriate to validate this research using a control group consisting of ten financial indicators. Future research could therefore attempt similar verifications. In addition, future research could also try to combine intellectual capital variables with other classification methods other than XGBoost.

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## References

- Ali, A. (2020). Working capital, profit and profitability: An absolute and relational study of selected leading Indian pharmaceutical firms. *Accounting*, 6, pp. 951-960. doi: 10.5267/j.ac.2020.8.001
- Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance*. 23. pp. 589–609. doi: 10.2307/2978933
- An, B., and Suh. Y. (2020). Identifying financial statement fraud with decision rules obtained from Modified Random Forest. *Data Technologies and Applications*, 54 (2), pp. 235-255, doi: 10.1108/DTA-11-2019-0208
- Antipov, E.A., and Pokryshecskaya, E.B. (2020). Interpretable machine learning for demand modeling with high-dimensional data using Gradient Boosting Machines and Shapley values. *Journal of Revenue and Pricing Management*. 19(5), pp. 355-364, doi: 10.1057/s41272-020-00236-4.
- Cenciarelli, V. G., Greco, G., and Allegrini, M. (2018) Does intellectual capital help predict bankruptcy?, *Journal of Intellectual Capital*, 19(2). pp. 321-337, doi: 10.1108/JIC-03-2017-0047
- Dženopoljac, V., Janošević, S., and Bontis, N. (2016). Intellectual capital and financial performance in the Serbian ICT industry, *Journal of Intellectual Capital*, 17(2), pp. 373-396. doi: 10.1108/JIC-07-2015-0068

- Festa, G., Rossi, M., Kolte, A. and Marinelli, L. (2021). The contribution of intellectual capital to financial stability in Indian pharmaceutical companies, *Journal of Intellectual Capital*, 22(2), pp. 337-359. doi: 10.1108/JIC-03-2020-0091
- Finstat, (2022). Dataset of Financial Statements, Retrieved from <https://finstat.sk/datasety-na-stiahnutie> May, 24, 2022
- Kou, G., Xu, Y., Peng, Y., Shen, F., Chen, Y., Chang, K., and Kou, S. (2021). Bankruptcy prediction for SMEs using transactional data and two-stage multiobjective feature selection. *Decision Support Systems*. 140, 113429. doi: 10.1016/j.dss.2020.113429
- Lin, W. C., Lu, Y. H., and Tsai, C. F. (2019). Feature selection in single and ensemble learning-based bankruptcy prediction models. *Expert Systems*. 36(1). e12335 doi: 10.1111/exsy.12335
- Ohlson, J. A. (1980). Financial ratios and the probabilistic prediction of bankruptcy. *Journal of Accounting Research*. 18(1), 109-131. doi: 10.2307/2490395
- Papík, M., Papíková, L. and Kajanová, J. (2020). Bankruptcy prediction in chemical industry. *Przemysł Chemiczny*, 99(12), pp. 1762-1769. doi: 10.15199/62.2020.12.14
- Papíková, L., and Papík, M. (2022a). Effects of classification, feature selection, and resampling methods on bankruptcy prediction of small and medium-sized enterprises. *Intelligent Systems in Accounting, Finance and Management*, pp. 1–28. doi: 10.1002/isaf.1521
- Papíková, L. and Papík, M. (2022b). Intellectual capital and its impacts on SMEs profitability during COVID-19 pandemic. *Journal of Eastern European and Central Asian Research*, 9(3), pp. 521-531. <https://doi.org/10.15549/jeecar.v9i3.894>
- Pulic, A. (2004). Intellectual capital—does it create or destroy value? *Measuring Business Excellence*, 8(1), pp. 62-68.
- Ringsdorf, B. and Kajanová, J. (2017). Predictive Analytics, in Manufacturing. *Global Scientific Conference on Management and Economics in manufacturing*. Technická univerzita. Zvolen, Slovakia
- Schalck, Ch., and Schalck, M. (2021). Predicting French SME failures: new evidence from machine learning techniques, *Applied Economics*, 51(53). pp. 5948-5963, doi: 10.1080/00036846.2021.1934389
- Shahdadi, K. M., Rostamy, A. A. A., Sharif, S. J. S., and Ranjbar, M. H. (2020). Intellectual capital, liquidity, and bankruptcy likelihood. *Journal of Corporate Accounting & Finance*. 31(4). pp. 21-32. doi: 10.1002/jcaf.22460
- Son, H., Hyun, C., Phan, D., and Hwang, H. J. (2019). Data analytic approach for bankruptcy prediction, *Expert Systems with Applications*, 138. doi: 10.1016/j.eswa.2019.07.033
- Taffler, R. J. (1984). Empirical Models for the Monitoring of UK Corporations. *Journal of Banking & Finance*, 8(2), pp. 199-227. doi: 10.1016/0378-4266(84)90004-9
- Wang, R., Asghari, V., Hsu, S.-H., Lee, C.-J., and Chen J.-H. (2020). Detecting corporate misconduct through random forest in China's construction industry. *Journal of Cleaner Production*, 268. doi: 10.1016/j.jclepro.2020.122266

## Trends in the Field of Smart Packaging in the Context of Bioeconomy

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### Abstract

The research of new smart features has shown huge potential to optimise the supply chain and enhance consumer consciousness of product utilisation. The implementation of bioeconomy principles in all sectors is essential in seeking to achieve the Sustainable Development Goals. Innovation in the packaging industry can be considered one of the key area and trend in this approach. The study deals with the evaluation of the perception of smart packaging in Slovakia as ecological innovation through the Kano model. The results indicate that customer awareness of smart packaging as ecological innovation in the context of bioeconomy is still at a low level in Slovakia. However, from the point of view of smart packaging, Slovak customers represent a key element of stakeholders for the management of innovation processes towards bioeconomy criteria.

Keywords: innovation, smart packaging, ecological innovations, bioeconomy

Article Classification: Research article

### 1 Introduction

Many academics or policy makers consider the progress leading to the popularization of the bioeconomy to be a significant step towards eliminating dependence on non-renewable resources. Nevertheless, research related to the bioeconomy is still low at the appropriate level of the microeconomics. Shortcomings were noted mainly in bioeconomy research in the context of technology and innovation management. The importance of innovation and knowledge is considered to be crucial in supporting the development of trends toward the bioeconomy.

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From the point of view of the innovation process, the bioeconomy includes crucial issues as follows:

- corresponding stakeholder groups (their importance in the innovation development),
- operative management and the innovation network and strategy,
- organizational issues marked as basics for collaborative innovation.

With regard to the material and technical aspects, the packaging development is a result of all socio-economic changes during the last decades. At present, many smart solutions and innovation are applied in the packaging industry. It is associated with significant potential leading to modern approaches such as bioeconomy and sustainable development. As we have mentioned, the bioeconomy brings possibilities that allow the companies to achieve a competitive advantage. In practice, they can take the form of a circular and sustainable economy and transit industrial base which is less dependent on fossil carbon. The sustainable bioeconomy supports climate change mitigation in all ecosystems. The European Union has invested significantly in innovation and research and started to apply the common European strategy of bioeconomy. EU Bioeconomy Strategy should ensure the sustainable supply, use and recycling of biomass. The challenge is the complex regulatory framework in which the bioeconomy operates and which affects business models and investments in many areas, one of them food safety legislation and bio-based products standards. A sustainable bioeconomy will deliver on these challenges also through changing the approach of consumers with respect to food waste and motivate them towards more sustainable consumption patterns, which concerns and affects as well packaging industry (Bell et al., 2018).

At present, product packaging is becoming an intermediary among people in different parts of the world. It supports the international exchange of goods and the development of communication. Packaging technology also plays a significant role in world trade development. In the production process, packaging is considered to be the last link in technological operations. The packaging quality is a very important part of the quality of packaged products and requires the implementation of demanding technological innovations in the user and packaging industries.

Packaging is divided into three basic groups in the context of (Urbílková, Gajdoš, 2013):

- consumer – it creates direct protection of the product or group of products and creates a product unit for end user or consumer at the place of purchase.
- group – it creates a group of a certain number of goods units at the point of purchase and can also serve as a means of adding products to the offer during the sale. It can be removed from the product without affecting its properties.
- transport – it facilitates the handling and transport of a certain number of goods units or group packages in order to prevent physical damage during handling and transport. Road, rail, sea and air containers are not transport packaging.

The packaging should create products of various types, shapes, sizes of units after the production process, which will ensure economical storage, transport, handling and also protection against external influences. The purpose of packaging is to ensure economical storage, transport, handling and also protection against external influences after the end of the production process (Kollár, 1999).

With respect to global changes and progress in recent years, the approach to packaging materials and packaging techniques has changed. Packaging functions have begun improving with the aim to increase product durability, product tracking and to gain

consumer awareness of usage. The result of the innovative approach is the creation of packaging that has interactive functions. The effort to innovate food packaging is mainly caused by the needs and requirements of consumers, which are influenced by changing global trends (e.g. expectation of a higher average shelf life). Traditional food packaging presents a passive barrier and it postpones the unfavourable effects of the environment on the food product. Innovative packaging systems can create a product that is enhanced by the use of packaging features that are unconventional to provide safer, more nutritious or more attractive food products that are environmentally friendly.

In literature, it is possible to find various terms for new packaging methods, such as active, smart, interactive or intelligent packaging, where the differences are as follows (Loučanová, Kalamárová, Parobek, 2017):

- passive packaging - uses protective materials that are characterized by basic insulation, protection or quality improvement during handling. Its important features are protection, closure and presentation.
- active packaging - a specific packaging that can regulate various incentives with the intention of keeping the product in a favourable environment (e.g. a package with the function of absorbing certain substances).
- intelligent packaging – allows customers a wider use (packaging of the product made-to-measure, which is convenient for them, without any additional accessories).
- smart packaging - packaging that is focused primarily on functions and uses. It involves the use of technologies that add properties and then the packaging becomes an irreplaceable part of the whole product. It also performs other functions such as responding to stimuli that are generated by the environment or that come from the product packaging. At the same time, it can respond to behavioural changes that make the product more suitable and usable from the consumer's point of view. This type of packaging relies on the use of chemical, electronic, but also mechanical technologies or their most suitable combination.

Smart packaging is a packaging system that controls the conditions around the packaged food and that provides information on the quality of the packaged food during transport and storage. These packages contain a kind of indicator. The application of indicators in practice shows one of the alternatives to ensure a system of critical points in the implementation of food production. For example, temperature indicators in production can easily and quickly distinguish already sterilized cans from unsterilized ones that are still being prepared. Indicators are important to inform customers about the current quality of products that are bought by them.

It may happen that the quality of food will change significantly during the transport from the producer to the customer (because of the interruption of the refrigeration chain). The commercial interest is mainly in temperature indicators, indicators of the freshness of packaged food and microbial indicators, as well as indicators of the composition of the internal atmosphere, which are sometimes marked as indicators of the integrity of the packaging or integrity indicators. We can also find position indicators or shock indicators in the market. A new group of intelligent packaging systems are displayed by elements that use radio frequency identification. In the field of packaging, RFID systems are currently used as a means of tracing a product, but also as anti-theft or anti-counterfeiting indicators (Ducková, Pavelková, 2012).

The packaging includes a set of tools designed to protect the goods from possible damage. Packaging functions focus on improving marketing, shipping, handling and final consumption (Zeman, 2005). Packaging materials currently have determined a high and

low degree of proactive behaviour. The additional packaging material is an important part of the packaging with the aim to ensure full functionality and specific tasks, e.g. they contain labels, adhesives, nails, caps or corks (Dzurová, 1997, Kačenák 1996, Zeman, 2005, Loučanová et al., 2016, Straka, 2013). It is necessary to understand how packaging features can influence these modern approaches in the whole chain of custody (Loučanová et al., 2016). Smart packaging is usually associated with functions enabling the shelf life and quality extension, ensuring product safety, providing product information or warning about potential problems (Yam et al., 2005).

Innovations focused on smart packaging are defined as “any autonomic changes with positive impact to the customers”. They are usually safer and healthier and provide higher comfort to the customer. At the same time, they provide more efficient solutions (Loučanová et al., 2017). The smart packaging can be connected with smart innovation. In terms of smart packaging, these innovations are focused on the sustainable development and can be identifying as eco-innovation.

The eco-innovations are defined as innovations aimed at decreasing the total amount of emissions, health risks and energy demands. They apply new approaches, such as circular economy, renewable energy resources or new ecological materials (Lešková, 2009). From the global point of view, it is necessary to apply changes in the resources.

It is important to move from fossil fuels and materials towards bio-based materials as renewable materials. Different supply chains must be found to increase the interconnection among existing technologies platforms. In order to create and exchange new knowledge across scientific disciplines, it is necessary to carry out research and development focused on technological development and innovation, which combine the bioeconomy based on knowledge with research on technology management and innovation (Golembiewski et al., 2015).

In addition to the above, smart packaging has these advantages:

- They can help to reduce food waste by achieving higher food safety, convenience and consumer management in the food supply chain.
- They can help to ensure product quality and obtain information on the food product, such as the country of origin, the month of harvest, allergens and the food composition. Smart packaging may only be displayed if the packaged food is fresh or vice versa if it has expired. Smart packaging can also show food temperature, food temperature history, and can be used to check the effectiveness or integrity of active packaging systems.
- They offer visible potential as a marketing tool in an effort to differentiate their brand.

Future development of smart packaging assumes:

- Important systems improvement using nanotechnologies, electronic printing and photonics, which will lead to the use of low-cost materials with a high capacity to detect and indicate changes in food products.
- Smart packaging will not only be used just to check the effectiveness of active packaging systems, but will also be used to launch the desired active packaging function and, if necessary, to release the active substance.
- Integration of many functions within one device and development of new functions, e.g. systems that can report the presence of potential allergens, draw attention to the dangers associated with diet management and also draw attention to the prevention of errors (Actinpak, 2018; Regattieri et al., 2014; Rogers, 1995).



These issues were applied by Van Lancker et al. (2016) to identify specific factors influencing the bioeconomy. Main descriptions of innovation processes in the bioeconomy were specified according to these factors. Companies apply these methods to analyse shopping behaviour with the aim to establish the marketing strategy.

A sustainable bioeconomy encourages the modernisation and the industrial base reinforcement through the creation of new value chains and more ecological and cost-effective industrial processes. The innovative solutions implementing to produce new and sustainable biological products and packaging increase the ability to substitute fossil raw materials in very significant industrial parts, such as construction, packaging, etc. (European Union, 2018).

On the other hand, businesses should concentrate on innovative technologies in products and packaging as a competitive advantage. At present, packaging is considered to be a marketing tool within which producers can declare their relationship with the environment - they can identify and present the amount of recycled materials are used (Pajtinková-Bartáková, Gubíniová, 2012; Šupín, 2009, Paluš, 2004, Loučanová et al., 2016).

In terms of the bioeconomy, the packaging production of high quality is significant, because company is responsible for packaging usage after the product consumption (e.g. recycling) after utilisation of product. The study is focused on the smart packaging perception in Slovakia in the context of bioeconomy. These data are essential for companies to understand new challenges and future development of the packaging industry in the Slovak Republic.

## 2 Material and methods

The Kano model is the main method to evaluate the consumers' perception of smart packaging in the context of bioeconomy. The analysis of parameters focused on the examined problem was followed by the methodical procedure to assess the smart packaging in the context of bioeconomy by Slovak consumers, such as:

1. Smart cover concept
2. Availability
3. Awareness
4. Functionality
5. Voice performance
6. Attractiveness
7. Advertising
8. Freshness indicator
9. The price

The sample consisted of 1125 respondents, so the minimum number of respondents was fulfilled (minimum number of respondents 667 respondents, at the 99 % confidence level and margin of error of 5 %). The survey was more often completed by women (56.44 % of responses). Briefly, 32.36 % of the respondents were 18 to 30 years old, 38.49 % of the respondents were 31 to 50 years old and 29.16 % of the respondents were 51 and more years old.

In the framework of the questionnaire, individual terms appearing in the questionnaire were explained on the basis of theoretical principles. The illustrative examples of intelligent and active packaging and their functionalities were also used for a clear understanding. The analysis was primarily focused on finding the characteristics

of the smart packaging in the context of bioeconomy that the consumer considers to be must-be, attractive and one-dimensional requirements.

The must-be (M) requirements are significant from the consumer point of view because in the case of their non-compliance they cause his strong dissatisfaction. On the other hand, if they are met, they have little effect on consumer satisfaction. It is a basic product criterion that the consumer requires automatically.

One-dimensional (O) requirements are defined as claims, where we can see a linear dependence between their fulfilment and consumer satisfaction. The more requirements are met, the more satisfied the consumer is.

Attractive (A) values include requirements that lead exponentially to an increase in consumer satisfaction. Regarding the above-mentioned information these requirements have the most significant impact on consumer satisfaction.

In addition to the above explained requirements, there are also identified reverse (R), questionable (Q) and indifferent (I) requirements not influencing the consumers. Of course, it is not possible to strictly separate individual requirements. They overlap and influence each other at the same time (Grapentine, 2015; Loučanová, 2021; Loučanová, Olšáková, 2020).

The identified consumer requirements were divided into groups and redistributed with regard to the proportions of respondents' sample in percentage. The most represented group of requirements characterize the resulting perception of the examined parameter or value. The derived individual categorizations can be utilized further by aggregating them across all respondents using the customer satisfaction (CS) and customer dissatisfaction (CD) indices (Berger et. al, 1993; Shahin et al., 2013 and Beier at al. 2020):

$$CS = \frac{(\#A + \#O)}{(\#A + \#O + \#M + \#I)} \quad (1)$$

$$CD = \frac{\#O + \#M}{\#A + \#O + \#M + \#I} x - 1 \quad (2)$$

with #A, #I, #M, and #O being the frequencies of requirements categorization, it means the number of respondents who classified the requirements as attractive, indifferent, must-be, or one-dimensional.

The indices reflect the proportion of respondents for whom the existence (absence) of an offering attribute influences customer satisfaction (customer dissatisfaction). Additionally, customer satisfaction has a minus sign to emphasize the negative effects on customer satisfaction (for historical reasons). For each requirement, the satisfaction index is within the range of [0, 1] and for customer dissatisfaction within [-1, 0]. A value close to 1 of customer satisfaction indicates a high proportion of customers among whom satisfaction can be generated, and a value close to -1 indicates a high proportion of respondents among whom dissatisfaction can be generated. The scale mean of 0.5 for customer satisfaction (or -0.5 for customer dissatisfaction) indicates whether the majority of respondents can be positively (or negatively) stimulated, yielding a two-dimensional grid with four quadrants: Attractive requirements, Indifferent requirements, Must-be requirements, One-dimensional requirements.

Besides the satisfaction indices, it can be determined the total strength (TS) of each requirement, which indicates the proportion of attractive, one-dimensional, and must-be assessment of this offering among all assessments:

$$TS = \frac{\#A+\#M+\#O}{\#A+\#I+\#M+\#O+\#Q+\#R} \quad (3)$$

Finally, the consumer segments that are highly receptive can be identified.

### 3 Results

Under the influence of the global development, attitudes toward packaging materials are considerable. The consumers' approaches to the product packaging and favourite functions are changing as well. Innovative packaging is the output of original and unconventional solutions. The study describes a perception of smart packaging as innovation from the bioeconomy point of view. We focused on evaluation of availability, functionality and other requirements by using the Kano model. The hypothesis was based on the assumption, that new products do not have equal success in the market (Chukhray, 2012). Some products are accepted by consumers almost immediately, whereas others need much time to get consumers' appreciation. Even a very successful innovation can end in failure because consumers are unaware of it (Garcia-Torres, 2009).

The results of our research indicate that smart packaging is characterized by these requirements: the highest share has indifferent requirements (I) present in 6 parameters, namely the concept of smart packaging (34.83%), the availability (48.33%), the functionality (53.50%), the execution (61%), the attractiveness (51.33%) and the price of smart packaging (50.17%). These requirements do not affect the satisfaction or dissatisfaction of the respondent in any way, they are not important for him and it is not essential for him whether they are fulfilled or not.

The parameters of awareness of smart packaging (65.50%) and advertisement for smart packaging (46.83%), were identified as reverse requirements (R), which means that the higher the degree of their fulfillment, the more clearly the dissatisfaction of the respondent increase. For the awareness, this is a psychological point of view, because the respondents have a weak awareness of smart packaging.

One parameter is characterized as questionable requirements (Q) - the freshness indicator (40.84%). This result could have arisen on the basis that the question was either incorrectly formulated during the research or the respondents could have misunderstood it and therefore could not express themselves adequately and clearly about the question.

On the other hand, none parameter was determined as an attractive requirement (A), must-be requirements (M) and one dimensional requirements (O). This could be due to the fact that smart packaging is not a familiar term for the respondents and many have not yet encountered it or they haven't heard of him yet.

Individual categorization based on the customer requirements was derived by Kano model and then by aggregating them across all respondents using the indexes of customer satisfaction, customer dissatisfaction and total strength (Table 1).

Table 1 The peception of the smart packaging from the point of view of satisfaction and dissatisfaction

	Total Strength	Customer satisfaction	Customer dissatisfaction
Smart cover concept	0.310	0.46	-0.02
Availability	0.056	0.11	-0.02
Awareness	0.026	0.06	-0.03
Functionality	0.130	0.16	-0.04
Voice performance	0.160	0.10	-0.05
Attractiveness	0.281	0.29	-0.11
Advertising	0.055	0.10	-0.02
Freshness indicator	0.245	0.59	-0.02
The price	0.061	0.08	-0.03

Figure 1 illustrates previous findings. The parameters represented by individual peception of smart innovation are positioned with respect to their customer satisfaction and dissatisfaction values. The four quadrants visualize the respondents' majorities divided into mandatory, one-dimensional, attractive and indifferent requirement categories.

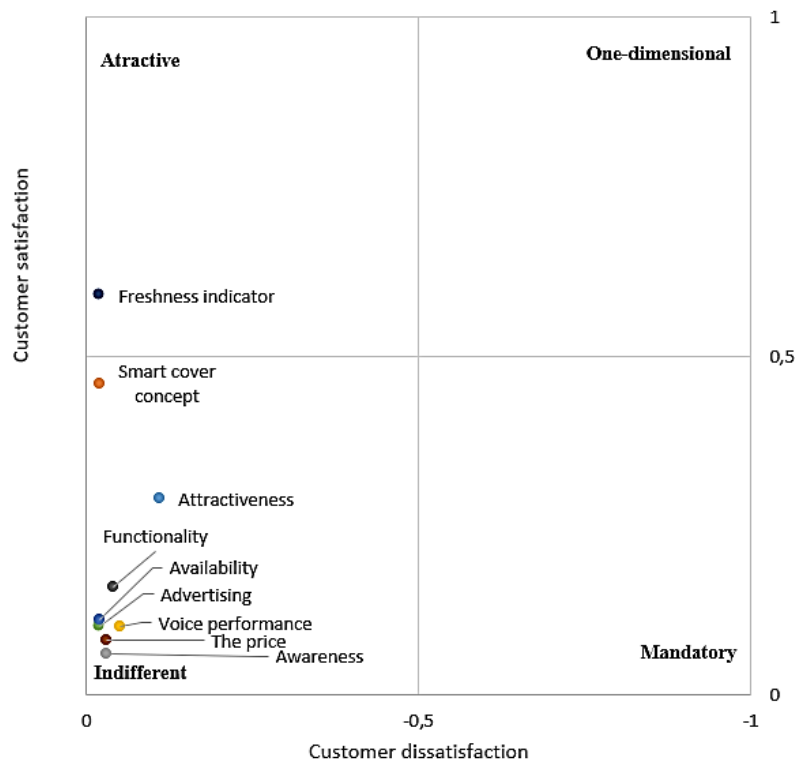


Figure 1 View of the overall assessment

The results point to the perception of smart packaging as an eco-innovation in Slovakia. The acquisition of theoretical knowledge can lead to their real implementation in practice and help to increase the performance of enterprises in their investment decisions in the context of innovation and environmental processes (Ipate et al. 2015, Loučanová et al. 2018). The importance of innovation is considered crucial to making the transition toward a greener economy (Van Lancker et al., 2016). Research and Innovation investments by public and private actors are supporting the shift from a conventional

consumption and mass production model to food system supporting sustainable food and nutrition security for all. It calls for a more customized food consumption model, while simultaneously improving sustainability, safety, resilience and source efficiency of food production.

These investments drive solutions in the area of smart packaging, smart and active packaging or smart local food systems to name just a few. At the same time, actors within the food system increasingly acknowledge that they need to engage more with citizens to design new solutions and to rebuild trust in the food systems. The research presented on the basis of these analyses provides both theoretical and practical information for innovators in the area of smart innovation issues specifically focused on smart packaging and bioeconomy. The acquisition of theoretical knowledge can then lead to their real implementation in practice and help to increase the performance of enterprises in their investment decisions in the context of innovation and environmental processes, as stated by several authors Ipate et al. (2015) and others.

#### **4 Discussion**

The aim of the research is to highlight the different view on active and smart packaging functions by consumers. During the last period these innovative technologies are strictly connected with new strategies. Bioeconomy as a tool for sustainable management also focuses on packaging, as well as, different other sectors.

That is why the study analysed new possibilities to find gaps in the market and identified how consumers accept these innovations. The results can be applied by companies to encourage them to involve bioeconomy principles not only in the production of goods but also in their packaging. Based on the Kano model, results show requirements for new packaging in terms of all parameters of the smart packaging as ecological innovation in the context bioeconomy. The Kano model indicates that older consumers have a lower innovation status. However, they have the highest need for packaging innovation. On the other side, they are not interested in all packaging functions. Finally, we can conclude that all age categories of consumers require ecological innovation in packaging in the context bioeconomy, but with different intensities of influence. The age is a limiting factor in the implementation of smart packaging as an eco-innovation in practice. Therefore, from the point of view of smart packaging, Slovak customers represent a key element of stakeholders for the management of innovation processes.

#### **Acknowledgements**

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#### **References**

- Bell, J., Paula, L., Dodd, T., Németh, S., Nanou, C., Mega, V., & Campos, P. (2018). “EU ambition to build the world’s leading bioeconomy—Uncertain times demand innovative and sustainable solutions”. *New biotechnology*, Vol. 40, pp. 25-30. DOI: 10.1016/j.nbt.2017.06.010.

- Chukhray, N. (2012). "Marketing Strategies for Overcoming Consumer Resistance to Innovations". *Konsumpcja i Rozwój NR*, Vol. 1 No. 2, pp. 71-84, 2012.
- Garcia-Torres, M. A. (2009). Consumer behaviour: evolution of preferences and the search for novelty, in *UNU-MERIT Working Papers; No. 005*, Maastricht: UNU-MERIT, Maastricht Economic and Social Research and Training Centre on Innovation and Technology, 2009.
- Dzurová, M. (1997). *Obal a balenie ako súčasť logistiky*. Bratislava: Eurounion.
- European Union, (2018). *A sustainable bioeconomy for Europe: strengthening the connection between economy, society and the environment*. Belgium : Brusel, 2018. 108p.
- Golembiewski, B., Sick, N., & Bröring, S. (2015). "The emerging research landscape on bioeconomy: What has been done so far and what is essential from a technology and innovation management perspective?" *Innovative Food Science & Emerging Technologies*, Vol. 29, pp. 308-317. DOI:10.1016/j.ifset.2015.03.006
- Goodpasture, J. (2003). *Quantitative Methods in Project management*. USA: J. Ross Publishing.
- Grapentine, T. (2015). "Why the Kano model wears no clothes", available at: <http://www.quirks.com/articles/2015/20150407.aspx>. (accessed 12 April 2021)
- Ipate, N., David, K. G., Ipate, I., Bogdan, A. (2015). "The bioeconomy model in future sustainable development", *Studia Universitatis "Vasile Goldiș" Arad Economics Series*, Vol. 25 No. 2. DOI:10.1515/sues-2015-0016
- Kačénák, I. (1996). *Balenie tovaru*. Bratislava: Ekonóm.
- Lesáková, D. (2012). "Determinanty úrovne, štruktúry a tendencií v osobnej spotrebe a spotrebiteľskom správaní seniorov v kontexte cenovej a dôchodkovej politiky v SR", *Vedecké state Obchodnej fakulty*, pp. 422-429.
- Lešková, A. (2009). Politika eko-inovácií a jej prejavy v automobilovom priemysle, available at: <http://www.sjf.tuke.sk/transferinovacii/pages/archiv/transfer/13-2009/pdf/037-040.pdf> (accessed 20 May 2014)
- Loučanová, E. (2016) *Inovačné analýzy a stratégie*. Zvolen: Technická univerzita vo Zvolene, 2016. 149 p.
- Loučanová, E., Kalamárová, M., Parobek, J. (2017). "The innovative approaches to packaging - comparison analysis of smart and active packaging perceptions in Slovakia". *Studia Universitatis „Vasile Goldiș" Arad*, Vol. 27 No. 2, pp. 33-44. DOI:10.1515/sues-2017-0007.
- Loučanová, E., Nosál'ová, M., Parobek, J., Dopico, A. (2018). "The Kano model use to evaluate the perception of smart and active packaging of Slovak customers". *Studia Universitatis „Vasile Goldiș" Arad*. Vol. 28 No. 1, pp. 35-45. DOI:10.2478/sues-2018-0003.
- Loučanová, E., Parobek, J., Kalamárová, M. (2016). "The perception of respondents of packaging innovations in Slovakia". *Studia Universitatis „Vasile Goldiș" Arad*, Vol.26 No. 3, pp. 33-43. DOI:10.1515/sues-2016-0013.
- Loučanová, E., Parobek, J., Kalamárová, M., Paluš, H., Lenocho, J. (2015). "Eco-innovation performance of Slovakia". *Procedia - economics and finance*. Vol. 26, pp. 920-924. DOI:10.1016/S2212-5671(15)00906-5.
- Pajtinková, Bartáková, G., Gubíniová, K. (2012). *Udržateľný marketingový manažment*. Bratislava: IAM press.
- Paluš, H. (2004). "Trvalo udržateľný rozvoj a certifikácia lesov", *Nová ekonomika*, Vol. 3 No. 2, pp. 63-68,
- Regattieri, A Santarelli, G. Gamberi, M. Mora, C., (2014). "A new paradigm for packaging design in web-based commerce". *International Journal of Engineering Business Management*, Vol. 6 No.1, pp. 1-11. DOI:10.5772/58825.
- Rogers, E.M. (1995). "Lessons for guidelines from the diffusion of innovations", *Effecting Change in Physician Practice: Moraine-Institute Diffusion/Dissemination Conference Location*, pp. 324-328. DOI: 10.1016/s1070-3241(16)30155-9.
- Straka, M., (2013). *Logistika distribúcie, Ako efektívne dostať výrobok na trh*. EPOS, Bratislava.
- Šupín, M. (2009). "Megatrendy vo vývoji svetového hospodárstva a možnosti Slovenskej republiky zmäkčiť dôsledky hospodárskej krízy", *Marketing a obchod* , pp. 5-8.

- Van Lancker, J., Wauters, E., & Van Huylenbroeck, G. (2016). "Managing innovation in the bioeconomy: An open innovation perspective". *Biomass and Bioenergy*, Vol. 90, pp. 60-69. DOI: 10.1016/j.biombioe.2016.03.017.
- Yam, K.L., Takhistov, P.T., Miltz, J. (2005). "Smart Packaging: Concepts and Applications", *Journal of Food Science*, Vol. 70 No. 1. DOI: 10.1111/j.1365-2621.2005.tb09052.
- Urbíliková, D., Gajdoš, J. (2013). *Balenie, doprava azasielateľstvo v logistike*. Bratislava: Vydavateľstvo EKONÓM. 120 p.
- Zeman, S. (2005). *Balenie a obalová technika*. Nitra: Slovenská poľnohospodárska univerzita.

# **Analysis of Payment Discipline in the Payment of Insurance Premiums to the Social Insurance Agency in the Slovak Republic**

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## **Abstract**

Even the most optimistic ones do not expect the company's operations to return to the levels reached before December 2018, when the first SARS-COV-2 virus infections were identified in Wu-chan, China. The need to deal with the current situation, complicated by other major events, is felt by everyone, both as a private individual and as an employee. As a result of the significant inflation and economic changes, many are experiencing serious or even existential shortfalls in their financial resources. The search for various forms of savings begins, as a matter of priority, with optimising consumption and activities in employment or business. The management of funds belonging to policy holders of the Social Insurance Agency has a significant impact on public finances. Improving fulfilment of the contribution obligations is a more favourable solution than increasing the contributions of disciplined citizens. The aim of the paper is to highlight the shortfalls in the area of fulfilling the contribution obligations in relation to the Social Insurance Agency at the national level and to specify disparities at the level of regions.

Keywords: Not paying taxes and insurance, debtors, Social insurance

Article Classification: Research article

## **1 Introduction**

The intensity of events in recent years has forced the need for fundamental changes in the functioning of society at national, international and global levels. Even the most optimistic estimates do not foresee that the functioning of society can return to

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the condition before the COVID 19 pandemic, even though only 4 years have passed since then. Among the most intense effects, we can recall the last economic crisis, the COVID pandemic, the war in Ukraine and the closely related energy problems, the environmental problems caused by both human activity and climate change. None of these problems has yet been solved, but we can confidently expect that everyone will have to cut back or give up some of the claims of the past, and this situation will last for some time. With regard to the financial problems, the need to deal with the changed situation is felt by every individual and by those who employ people. As a result of inflation and economic changes, there are significant shortfalls in the funds, making it necessary to seek various cost-saving measures (Felcan, 2021). Priority should be given to optimising various types of employment and business activities in accordance with the law (Kopencova at. al, 2020). The management of funds belonging to policy holders of the Social Insurance Agency has a significant impact on public finances. In recent years, the collection of social security contributions, amounting to around 9 billion a year, even exceeded the strong tax revenues from value added tax or income tax. (Social Insurance Agency of the Slovak Republic) Each country fights against shadow economy, tax frauds and tax evasion. (Dobrovic, J., Koraus, A., Rajnoha, R. 2018). Differences between tax efficiency are caused by few factors and their combinations (BÁRTOVÁ, H., 2020).

## 2 Social insurance system

A policy issue of significant interest concerns the effect of state and local taxes on subnational economic activity, such as employment, income, investment, and firm location. (Jiang Cheng, Travis Chow, Tzu-Ting Lin, Jeffrey Ng, 2021). Most citizens at working age are obliged to meet their contributions and tax obligations set by the state, which in turn invests them for public benefit. Tax is a non-refundable payment which is in accordance with the law and constitutes one of the most important resources of the public sector. Tax, as an economic category, is one of the oldest obligatory monetary payments made originally for the benefit of the sovereign and later for the benefit of the State, and is therefore as old as the institution of the State. (Stieranka at. al., 2016) The definition of tax is provided by Act No. 563/2009 Coll., as amended (the Tax Code) in Article 2(b) *“Tax means tax according to special regulations, including default interest, interest and penalty according to this Act or special regulations, and local fee for municipal waste and small construction waste according to a special regulations. The taxable person may not claim any consideration from the State for payment thereof. The tax is therefore a transfer of funds from the private sector to the public sector.”* (Kuchta & Púry, 2013) The tax revenue is primarily used to perform important tasks that are important for the development of the society and the State, such as security, civic amenities, health, education, culture, rental housing, and environmental protection.

The employer for the purposes of social insurance is mainly a natural person or a legal entity (Rak, 2020). The employer is obliged to provide the employee with income listed as the employee’s income from dependent activity within the meaning of the Income Tax Act, or from gainful activity, the income from which is not subject to income tax because the regulations and international treaties on the avoidance of double taxation so provide, or income which is not subject to income tax according to the Income Tax Act, if the regulations of the Slovak Republic apply to the natural person who performs such gainful activity within the legal relations of social insurance.

For the purpose of paying social insurance, a self-employed person (SEP) means a natural person who has attained the age of 18 years and in the calendar year determining

the commencement or duration of compulsory sickness insurance and compulsory pension insurance of a self-employed person earned income from entrepreneurship and other self-employed activities according to the Income Tax Act, carried out gainful activity, the income from which is not subject to income tax because the regulations and international treaties on the avoidance of double taxation so provide, or carries out a gainful activity, the income from which is not subject to income tax under a special regulation, if the regulations of the Slovak Republic apply to the natural person who carries out such gainful activity within the legal relations of social insurance.

The social insurance system consists of five separate insurance schemes:

- Sickness insurance;
- Old-age insurance;
- Disability insurance;
- Accident insurance;
- Guarantee insurance;
- Unemployment insurance;

regulated by Act No. 461/2003 Coll. on social insurance, as amended.

Compulsory sickness insurance, compulsory pension insurance and compulsory unemployment insurance of an employee shall arise from the date of the legal relationship which gives rise to the right to income from dependent activity within the meaning of the Income Tax Act, or from gainful activity to which the social insurance regulations apply for the purposes of payment of insurance premiums. The employer contributes to the five insurance schemes listed and into the solidarity reserve fund. The employer pays premiums on behalf of the employee for sickness insurance, old-age insurance, invalidity insurance and unemployment insurance.

Compulsory sickness insurance and compulsory pension insurance for a self-employed person shall commence on 1 July of the calendar year following the calendar year for which their income exceeded 12 times the assessment base referred to in Section 138(5) of the Social Insurance Act and shall cease on 30 June of the calendar year following the calendar year for which their income did not exceed 12 times that assessment base. For the year 2022, the occurrence of the obligation to pay social contributions or the change in the amount of social contributions as of 1 July 2022 (or 1 October 2022) is assessed on the basis of the tax return filed for the year 2021, i.e. on the basis of the income earned and the tax base for the year 2021, i.e., for persons whose income from entrepreneurship and other self-employment exceeded EUR 6,798 in the calendar year of 2021.

The amount of premiums for sickness insurance, old-age insurance, invalidity insurance, accident insurance, guarantee insurance, and unemployment insurance, are determined by a percentage rate of the assessment base achieved in the decisive period.

### **3 Social Insurance Agency of the Slovak Republic**

The Social Insurance Agency of the Slovak Republic was established on 1 November 1994 by Act No. 274/1994 Coll. on the Social Insurance Agency as a public institution which carries out the activities entrusted to it by law (Ivancik, R. 2012). It is directly involved in the implementation of the social policy of the State in the area defined by law, in accordance with the applicable legislation and recognised values, by observing which it protects the interests of insured persons and employees and determines relations

with the external environment. Since 1 January 2004, it has been in charge of social insurance on the basis of Act No 461/2003 Coll. on Social Insurance.. It performs public tasks in the field of social security on the basis of the constitutional guarantee of citizens' incomes in the event of various life events (primarily related to illness, old age, loss of wage earner, maternity leave and loss of employment) (Draft strategic objectives of the Social Insurance Institution for the period 2017-2022). The Social Obligation Strategy includes among its specific objectives:

- Increasing compliance with levy obligations;
- Cooperation with other institutions in carrying out external controls;
- Analysis of processes, their automation and setting of control mechanisms;
- Ongoing monitoring of the risk areas;
- Making proposals for legislative changes.

The resources of one of the pillars of social security, namely social insurance, are mainly made up by statutory contributions of employers and employees as well as self-employed persons. In total, social insurance in Slovakia has for more than 15 years covered almost 2.7 million insured persons on the basis of the principle of merit in the form of premium payments (social contributions) (Audit Report 2020 of the Supreme Audit Office, System of Collection and Administration of Social Insurance Contributions and Old-Age Pension Savings).

Paying tax has always been an unpopular obligation. (Janurová, K., Litschmannová, M., Beloch, M. 2016). A debt owed by a legal or natural person to the Social Insurance Agency can arise in several ways:

- Non-payment of insurance premiums;
- Payment of a lower premium than prescribed. The consequence is an imposition of a lower payment penalty;
- Settlement of premium after the due date. The consequence is an imposition of a late payment penalty;
- Imposition of a fine. When determining the amount of the fine, the gravity of the obligation breach laid down by law shall be taken into account;
- Entering an incorrect variable symbol, specific symbol or constant symbol;
- By offsetting the SEP's overpayment (Overpayments occur quite often, for example, when a sole trader is unable to work in a given month. During temporary sick leave, the sole trader is not obliged to pay sickness and pension insurance premiums.) against the next payment (The fastest and fairest way to recover an overpayment is by submitting a written request for a refund to the relevant branch of the Social Insurance Institution. The time limit for reimbursement is 30 days from the date of receipt of the request).

The first two items from the above list occur the most frequently in practice. A natural or legal person becomes aware of the occurrence of a debt by receiving a decision of the Social Insurance Agency on the prescription of the amount of insurance premiums, penalties or the imposition of a fine in parallel with a notification by SMS or e-mail.

Taxpayers' natural inclination is to minimize their levy burden, as the tax reduction usually represents a benefit of income for personal use or business improvement. "Saving" money by not paying the tax attracts many liable persons, as they are aware that the State has to follow legal procedures for tax collection, which are quite lengthy and difficult to control, as they affect a huge number of persons (Antoch, J. 2008).

## 4 Material and methods

The aim of the paper is to highlight the shortfalls in the area of fulfilling the contribution obligations in relation to the Social Insurance Agency at the national level and to specify disparities at the level of regions. The input data for an analysis of the payment discipline is based on publicly available relevant facts from open sources of state institutions, i.e. the list of debtors of the Social Insurance Agency, the gross value added in current prices and the number of registered traders and entrepreneurs. The overview of debtors in this paper was processed for the month of July 2023, other indicators were based on reports for the last comprehensive calendar year 2022. The data used were obtained from credible sources based on standardized procedures established and followed by the State. The data are indicative of the entire population, i.e., they are not burdened by sampling errors. Among the methods applied in this paper, we mention frequency analysis with graphical output using a histogram, One-Sample Kolmogorov-Smirnov Test, and correlation analysis in which MS Excel and SPSS statistical software were used.

### *4.1 Debtors of the Social Insurance Agency of the Slovak Republic*

The Social Insurance Agency maintains a public electronic list of debtors on its website. The list of debtors includes legal and natural persons who owe at least EUR 5 to the Social Insurance Agency and it is updated four times a month.

The list of debtors of the Social Insurance Agency published on the website as at the 30th week of 2022, i.e. 31 July 2022, consisted of 101,979 unique debtors and the total amount owed reached EUR 718,311,117. This is an amount that is also significant from the point of view of the State budget, so it should be in the interest of the State to improve the fulfilment of its levy obligations.

The fifteen largest debtors include exclusively health care institutions whose debts amount to EUR 110,568,432. The insurance premium debts owed by health care institutions are due to non-payment of employer's insurance premiums, which are a specific type of debt and are not systematically recovered. As the Social Insurance Agency states, it has not proceeded to the recovery of these debts in the form of administrative execution or by way of execution because it takes into account the societal impact which, in the event of execution, would clearly result in the overall insolvency of the health care institutions (The fastest and fairest way to recover an overpayment is by submitting a written request for a refund to the relevant branch of the Social Insurance Institution. The time limit for reimbursement is 30 days from the date of receipt of the request).

While his debt is still pending execution, the debtor has an option to apply to the branch office of the Social Insurance Agency for permission to pay the amounts due (under a repayment schedule). If the debtor does not pay the amount owed within the given time limit, does not appeal the decision, or does not request a repayment schedule, the Social Insurance Agency recovers the debt ex officio by means of administrative enforcement or refers the debt to the bailiff or under mandated administration. In order to improve the collection of insurance premiums, the Social Insurance Agency files criminal reports in cases where it suspects that a criminal offence of not transferring or paying of insurance premiums has been committed.

We will show, step by step, that the Social Insurance Agency does not apply the same approach to all non-payers. While it does not take any action to recover non-transferred/unpaid insurance premiums against health care institutions, it uses almost all legal methods of debt recovery in relation to other debtors, ranging from recovery through administrative enforcement or executions to filing criminal complaints, but with regional differences in individual regions.

#### 4.2 Distribution of debtors of the Social Insurance Agency by amount of debt

We performed a frequency analysis to get an idea of the distribution of debtors based on the amount owed; the result is shown using a histogram in Figure 1.

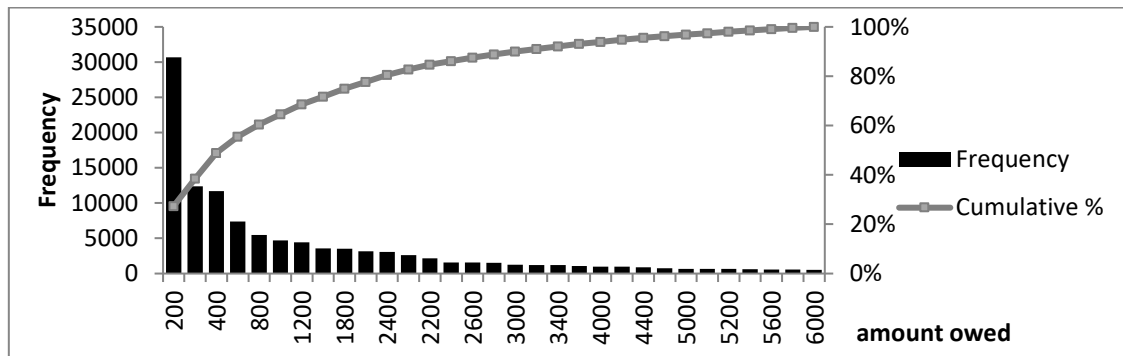


Figure 1 Histogram of debtor frequency distribution by debt size; Source of data the SIA

The distribution of debtors of the Social Insurance Agency (SIA) clearly points to the most frequent debtors (i.e. more than 25% with over 30,000), with the amounts owed up to EUR 200. These are minor arrears which were probably not paid by omission on the part of the premium payers. For example, in the case of self-employed persons, we could talk about an underpayment of insurance premiums for one period only (the minimum monthly social contributions in 2022 are EUR 187.78) or non-payment of a fine.

On a cumulative basis, half of all debtors owe up to EUR 600.

It is clear from the graph no. 1 that the number of debtors continuously decreases with the amount owed. Significant debtors, such as the aforementioned health facilities, represent isolated debtors, but with high receivables.

#### 4.3 Comparison of regions according to the amount of arrears to the Social Insurance Agency

Tracking regional differences at the level of regions in terms of the amount of arrears of insurance premiums to the Social Insurance Agency, the situation is clearly the worst in the Bratislava region as can be seen on Figure 2.

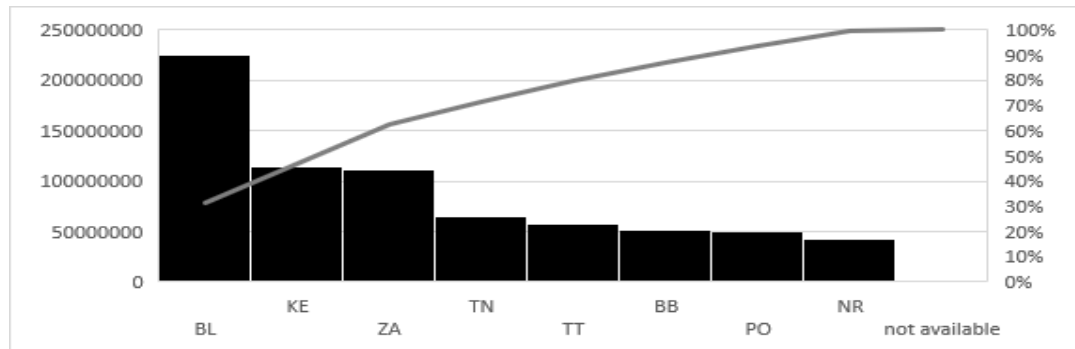


Figure 2 Histogram of the distribution of social insurance debt by regions of the Slovak Republic, July 2022\*\*\*\*; Source of data the SIS

## 5 Results

A great amount of the debt in the Bratislava Region may not come as a surprise when we consider that for a number of pragmatic reasons Bratislava, as the capital of the Slovak Republic, has a higher concentration of business entities as well as sole traders.

### 5.1 Relationship between gross value added at current prices and premium debt

We sought to use correlation analysis to identify the presence of a link between the amount of debt owed to the Social Insurance Institution and gross value added at current prices (GVA). Pragmatically, one would expect a direct dependence with increasing GVA could be expected to increase the amount owed to the Social Insurance Institution as concerns the insurance premiums.

In the first step, we verify that the assumption of normality of the distribution of the observed input numerical variables, i.e., GVA and insurance premium arrears, is satisfied using the One-Sample Kolmogorov-Smirnov Test; the result is shown in Table no. 1.

Table 1 One-Sample Kolmogorov-Smirnov Test of GVA and Debt in Regions of the SR

One-Sample Kolmogorov-Smirnov Test			
		GVA	Dept
N		8	8
Normal Parameters <sup>a,b</sup>	Mean	10302.6075	89668668.2175
	Std. Deviation	5411.72807	61013967.68719
Most Extreme Differences	Absolute	.402	.282
	Positive	.402	.282
	Negative	-.270	-.222
Test Statistic		.402	.282
Asymp. Sig. (2-tailed)		.000 <sup>c</sup>	.060 <sup>c</sup>

a. Test distribution is Normal.  
b. Calculated from data.  
c. Lilliefors Significance Correction.

\*\*\*\* BL – Bratislava Region, KE – Košice Region, ZA – Žilina Region, TN – Trenčín Region, TT – Trnava Region, BB . Banská Bystrica Region, PO – Prešov Region, NR – Nitra Region)

If we disregard the failure to meet the assumption of a normal distribution of GVA and perform a correlation analysis, the result points quite clearly to a strong direct dependence of debt on the level of GVA according to the assumption.

Table 2 Correlations

		GVA	dept
GVA	Pearson Correlation	1	.928**
	Sig. (2-tailed)		.001
	N	8	8
dept	Pearson Correlation	.928**	1
	Sig. (2-tailed)	.001	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

A better visual representation of the situation is provided by the distribution of GVA and the debt for taxes and Social Security premiums, which we have carried out using a group bar graph n. 3. Given the order of magnitude differences between the items being compared, we used the minor axis on the right to represent GVA. We kept the arrangement of regions on the horizontal axis identical to that in Figure 2.

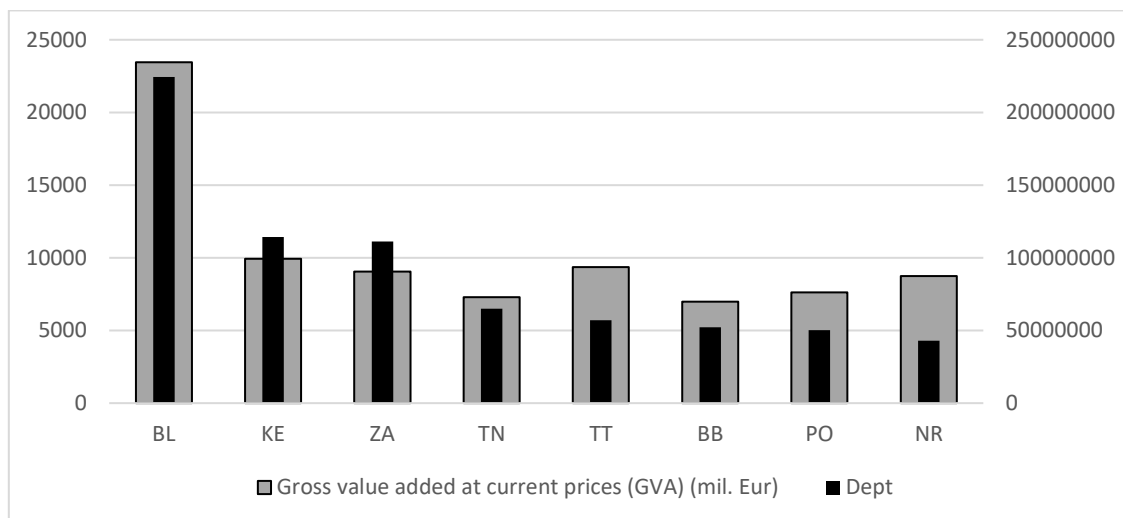


Figure 3 Tax and insurance debt to the Social Insurance Agency and gross value added at current prices (GVA), regions of the Slovak Republic; Source of data the SIA and Statistical Office of the Slovak Republic

On the basis of graph n. 3, despite the fact that more than twice as much tax and social insurance contributions are owed to the Social Insurance Agency in the Bratislava Region than in any other region, due to the similarity of the most significant share of GVA, this amount appears to be relatively comparable to other regions. Upon comparison, negative differences in the Košice and Žilina Regions, where the share of insurance premium debt is higher than in other regions of the Slovak Republic due to the GVA, come into focus.

### 5.1 Payment discipline towards the Social Insurance Agency in the regions of the Slovak Republic in relation to the number of entrepreneurs and sole traders

In the next step, we tracked the number of insurance premium debtors per number of registered entrepreneurs and sole traders by regions of Slovakia using a relative expression, keeping the arrangement of regions on the horizontal axis of Figure 2 and Figure 3.

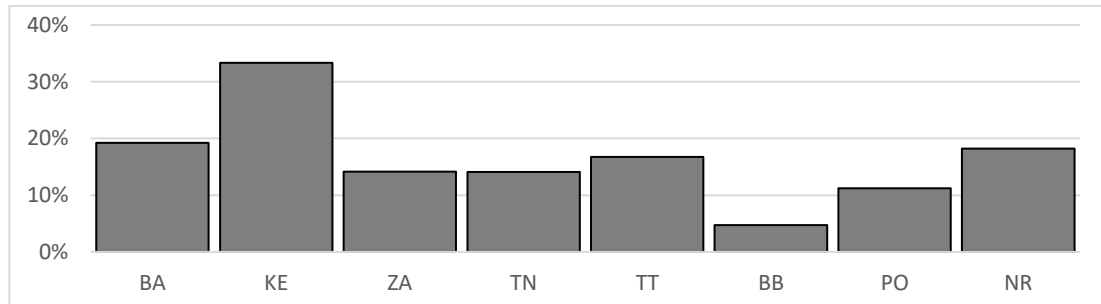


Figure 3 Relative share of insurance premium debtors in relation to the SIA as concerns the number of registered entrepreneurs and sole traders, regions of the Slovak Republic in 2022; Source of data the Social Insurance Agency and Statistical Office of the Slovak Republic

The relative share of debtors in relation to the number of registered entrepreneurs and sole traders is relatively balanced in individual regions, again including the Bratislava Region. An exception, with a significantly higher share of debtors than in other regions, is again the Košice Region, where the payment discipline of social insurance tax payers is the worst. In contrast, the Banská Bystrica Region has the lowest share of debtors. It can be concluded that in the Banská Bystrica Region, the payers of insurance premiums in relation to the Social Insurance Agency either have the best payment discipline or the bodies of the Social Insurance Institution carrying out debt recovery activities work more efficiently compared to other regions.

## 5 Discussion

The distribution of debtors of the Social Insurance Agency clearly points to the most frequent debtors (i.e. more than 25%, exceeding 30,000), with the amounts owed up to EUR 200. These are mostly minor arrears, which were probably due to an omission on the part of the premium payer. Half of all debtors owe less than EUR 600.

The aim of the article was to analyse the insurance premium debtors in relation to the Social Insurance Agency in the context of regional disparities. In terms of the relative share of debtors in relation to the number of registered entrepreneurs and sole traders, this is relatively balanced in individual regions, including the Bratislava Region, despite the fact that the amount of insurance premium debt is more than twice as high as in any other region.

We pointed out that the Social Insurance Agency does not apply the same approach to all non-payers. The failure to take action to recover non-transferred/unpaid premiums in relation to health care facilities is understandable, as an intervention could disrupt the provision of health care to the population. By comparing the regions of the Slovak Republic, we identified that the same methods of debt collection are no longer



used in the administrative enforcement of insurance premiums. Despite the same legal framework in the Slovak Republic, the results of the payment discipline clearly lag behind in the Košice Region. It is not only the high share of debtors in relation to the number of entrepreneurs and sole traders, but also the increased share of receivables in relation to the gross value added at current prices produced in the Košice Region compared to other regions. On the contrary, the relative share of insurance premium debtors in relation to the number of registered entrepreneurs and sole traders in the Banská Bystrica Region is significantly lower than in other regions. The results achieved in the Banská Bystrica Region are a clear example of the importance of efficient tax collection processes and they are possible even under the current legislative situation. It is in the interest of the State and all of us to make the collection of insurance premiums more efficient, both by minimising the influence of the human factor through automated processes and by tightening the control mechanisms in the Košice Region.

In the future, it might be interesting to examine the signs showing when debtors objectively cannot pay the premium (e.g. due to insolvency) and when they refuse to do so.

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### References

- Antoch, J. (2008), „Environment for statistical computing.“ *Computer Science Review*, Vol 2, No. 2, pp.113-122.
- Bártová, H. 2018. „Tax Efficiency of Czech Insurance Undertakings.“ In: Procházka, D. (eds) *The Impact of Globalization on International Finance and Accounting. Springer Proceedings in Business and Economics*. Springer, Cham. [https://doi.org/10.1007/978-3-319-68762-9\\_13](https://doi.org/10.1007/978-3-319-68762-9_13)
- Dobrovic, J., Koras, A., Rajnoha, R. (2018) „Activity Management of the Action Plan for a Sustainable Fight Against Tax Fraud and Tax Evasion in Slovakia as Compared with the EU.“ *Marketing and Management of Innovations Publishing*, Vol. 9, No 3, pp.313-323.
- Ivancik, R. (2012) „Security from the View of Economic Theory.“ *Politické vedy - Vol. 15*, No. 3 pp. 100-124.
- Felcan, M. (2021) „Teoreticko aplikačné aspekty správy dopravy. České Budějovice.“: Vysoká škola evropských a regionálních studií,, pp. 207-2017.
- Jiang Cheng, Travis Chow, Tzu-Ting Lin, Jeffrey Ng, (2021).“The effect of accounting for income tax uncertainty on tax-deductible loss accruals for private insurers.“ *Journal of Risk and Insurance*, 10.1111/jori.12367, Vol. 89, No. 2, pp.505-544,
- Janurová, K., Litschmannová, M., Beloch, M. (2016) „Supporting for statistical lecture – RKWard“ *Conference Paper Proceedings 10TH International Days of Statistics and Economics*, pp.711-722, 2016.
- Kuchta, T., Púry, F. (2013) „Poznámky k daňové kriminalitě v České republice“ *Časopis pro právní vědu a praxi*,. Vol. 21, No. 2. pp 112.128.
- Kopencová, D., Felcan, M., Rak, R. (2020). „Role and meaning of equilibrium and limit states in risk analysis, security and forensic science).*Management and information technology: a new challenges*. pp.. 117-139.

- Rak, R. (2020). „Occurrence, event, state and situation as basic phenomenon in the field of economy, criminalistics, social and forensic science“ Proceedings of the international scientific conference Economic and social policy, pp. 403-421
- Stieranka, J., Szabayová, M., Šimonová, J. (2016) „Daňové úniky a daňová kriminalita v Slovenskej republike“, pp 359.
- Report of Audit Results for 2020 of the Supreme Audit Office, System of Collection and Administration of Social Insurance Contributions and Old-Age Pension Savings
- Draft strategic objectives of the Social Insurance Institution for the period of 2017-2022.
- Minutes of the meeting of the Supervisory Board of the Social Insurance Institution in June, <https://www.socpoist.sk/zoznam-dlznikov-emw/487s>
- Zákon o sociálnom poistení č. 461/2003 Z. z.
- United Nations, Department of Economic and Social Affairs. (2015), “Transforming our world: the 2030 Agenda for Sustainable Development.” available online: [https://sdgs.un.org/2030\\_agenda](https://sdgs.un.org/2030_agenda).

## **Application of the Balanced Scorecard Method in an Educational Institution**

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### **Abstract**

The paper deals with the application of the Balanced Scorecard method and its four perspectives, indicators and their measurement in the conditions of a secondary vocational school. The financial perspective, the customer perspective, the perspective of internal processes and the perspective of learning and growth are concretized. The analyzes confirmed that an educational institution, like any business, must have its own vision, strategic goals, performance measures, marketing and the interconnection of all goals in order to fulfill its mission, operate in the market for a long time, develop, increase its quality and be competitive on a strong the market of other secondary schools. By applying the BSC method, we showed the implementation and practical use of this method in education as a non-profit organization.

Keywords: Balanced Scorecard method, educational institution, strategy, competitiveness

Article Classification: Research article

### **1 Introduction**

Without a clear vision, strategy and its consistent fulfillment, the organization does not long duration and sooner or later it will reach its demise. And it does not matter if it is a profit or non-profit organization. One of the ways to ensure the long-term and successful functioning of any company is to set the right strategic goals, their fulfillment and control, reassessment and the involvement of all company stakeholders in this process. Combining these requirements and ensuring the long-term prosperity of the organization is possible through the application of the Balanced Scorecard method.

The first basic information about the balanced scorecard was first published by Robert S. Kaplan and David P. Norton in the American magazine Harvard Business

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Review in 1991. The first sentence of this article reads: What you measure is what you get (Kaplan, Norton, 1991). They state that they were inspired by ideas expressed already in the 19th century:

Our interest in measurement for driving performance improvements arose from a belief articulated more than a century earlier by a prominent British scientist, Lord Kelvin (1883): „*I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind*“. And then Kaplan and Norton wrote: The balanced scorecard is like the dialog in an airplane cockpit: it gives managers complex information at a glance. This new approach to performance measurement is consistent with the initiatives under way in many companies: cross-functional integration, customer-supplier partnerships, global scale, continuous improvement, and team rather than individual accountability. By combining the financial, customer, internal process and innovation, and organizational learning perspectives, the balanced scorecard helps managers understand, at least implicitly, many interrelationships. This understanding can help managers transcend traditional notions about functional barriers and ultimately lead to improved decision making and problem solving. The balanced scorecard keeps companies looking- and moving-forward instead of backward.

The authors of the BSC method continued to publish updates, and a comprehensive article on the BSC from 2005 (Kaplan, Norton, 2005) marked its world-leading scientific success in the strategic management of companies that implemented this concept in their processes. Since 2005, this article has achieved more than 29,000 citations, which means a globally successful scientific milestone.

The Balanced Scorecard method is one of the new sophisticated methods of evaluating the organization, which combine quantitative information obtained from the company's accounting with qualitative information (Kožená et al., 2014). BSC is a strategic performance management system for the entire company. It is a communication tool that clarifies strategic performance for every employee of the company. Balanced Scorecard can be defined as a way to harmonize the corporate vision with human and capital resources and daily activities (Janišová, Křivánek 2013).

We can consider the BSC as a complex method of measuring business performance, which emphasizes the linking of all processes and the better fulfillment of the company's strategies. The BSC method is primarily used for the implementation of the company's strategies and vision, clearly defining goals, measuring performance and setting out the paths to meet these goals, and thus actually managing the entire company.

The benefit of this method is careful consideration of the interests and requirements of all stakeholders, such as customers, shareholders, managers and top managers, suppliers, partners, communities, regulators, institutions, media and, last but not least, company employees (Diačiková, Lach, 2019). It places importance on the connection of financial and non-financial indicators, with which all employees must be familiar, so that they can always understand the importance of their work decisions and their connection to the organization as a whole when making decisions. With the correct setting, full or partial involvement of stakeholders in the creation, application, control and outputs of this method, we will achieve a common goal, vision and the best possible satisfaction of all involved.

Every organization must have a clearly defined vision and strategy, which must be reflected in every activity of the company. Each activity must have its own purpose and reason, must be controlled, measured and connected to other activities. Without establishing and following a clear strategy and vision, the organization has no perspective and its progress, development or even its long-term maintenance on the market is questionable. After establishing the vision and strategy of the company, the important fact is that it cannot be fulfilled only by the shareholder or the management at their discretion, but it must be done mainly with the active involvement of customers and employees. It is a very demanding Sisyphian work and if it was done without a concept, without its context, without its clear determination and without being put into written and graphic form and communicated especially with employees and managers, it would be useless. The fulfillment of the strategy must be confronted on a daily basis with business processes that are ensured by the activities of competent employees. One of the ways to transform the vision, develop it, with goals, measure, and involve all stakeholders is through the four perspectives of the Balanced Scorecard method. The significant share of human resources, company culture and new challenges in fulfilling the BSC and therefore the company's strategy were pointed out, for example, by (Kaplan, Norton, 2007; Chavan, 2009; Diačiková, Lach, 2019) and many other authors. By articulating the outputs, expectations, and drivers of those outputs, managers navigate the energy, skills, and knowledge of their employees needed to achieve those long-term goals.

The BSC application is suitable not only for profit-making organizations, but also for organizations with a combined focus, that is, with the object of business, but also with a non-profit focus, or for non-profit organizations only. Such organizations primarily include: healthcare - healthcare facilities, social institutions and education - educational institutions and schools with public and private capital across the entire spectrum of the educational system from kindergartens to universities. Zelman et al. showed the application of BSC in healthcare (Zelman et al., 2003) and also with the dynamically changing external environment, the BSC method is increasingly penetrating the field of education.

Venkatesh and Kirti have applied the Balanced scorecards in managing higher education institutions, when their findings include: The BSC approach offers an institution the opportunity to formulate a cascade of measures to translate the mission of knowledge creation, sharing and utilization into a comprehensive, coherent, communicable and mobilizing framework – for external stakeholders and for one another. By implication in practice they state: A useful model is proposed that can be adapted with appropriate modifications to the management of tertiary institutions of education in India, whether it be a university, affiliate college, autonomous institution or private educational institution (Venkatesh, Kirti, 2007).

Although the application of the balanced scorecard (BSC) in the business sector is well documented, very little research has been reported regarding the adaptation or application of the BSC in the education sector. Karathanos D. and Karathanos P. describe how the Baldrige Education Criteria for Performance Excellence (The Baldrige Model, created in the USA, is the best-known model for improving and improving the quality of company processes in a constantly growing and intensifying competition in order to ensure an increase in the overall performance of the organization) has adapted the concept of the BSC to education and discuss significant differences as well as similarities between

the BSC for business and the BSC for education. In the process of reaching by BSC goals, the educational institutions are confronted with many barriers that are difficult to overcome however, many barriers originate from the institutions organizational members themselves by way of resistance to change, fear of accountability and its derivative pressure, lack of commitment and fear of failure (Karathanos D., Karathanos P., 2010). Despite these claims Azizi et al. in a detailed review studied stated that the BSC can be used to communicate and build a common understanding of institutional vision and strategy, to guide faculty and staff toward common goals, and to identify areas where improvements are needed. They state on which perspectives in the balanced scorecard are appropriate for the universities (Azizi et al., 2012).

With the growing need to find new methods of effectively planning, managing, and leading higher education institutions, Bissessar proposes the Balanced Scorecard Concept. The Balanced Scorecard Concept (BSC), a concept traditionally used in business to measure financial returns, she proposed to leadership and management in higher education institutions. The need to encompass praxis and theory is one which is a constant struggle for researchers. In this proposal, the author recommends the BSC model as a tool to better understand and measure the dynamics of the: (a) customer perspective, (b) internal business process, (c) learning and growth, and (d) financial aspect within the realm of higher education institutions. This paper contributes to the extant research literature in three ways. It extends the focus of the BSC in leadership from the business sector to the higher education realm. There is an expansion of the ideas of the customer perspective and these transcend the students and teachers to encompass all stakeholders and their individual and collective needs. The four drivers of the BSC take into account not just the present intellectual, organizational, fiscal, and technological needs but also insists that an element of forecasting be adopted vis a vis succession planning, instructional design and delivery, the development of reflective praxis, and professional learning communities (Bissessar, 2011).

Last years, even in Slovakia, education has become a market where there is strong competition. Schools have to develop, develop a comprehensive view of their organization, focusing on key goals. Schools must to map, to set, to measure and to manage processes with a new modern comprehensive method, and to have their own vision, strategy and marketing. In the submitted contribution, we pointed out that the school is also an organization to which the BSC method can be appropriately applied, which will set its long-term development and the fulfillment of the school's vision and mission.

The article communicates strategic goals, indicators, methods of measuring indicators and target values of four perspectives of the BSC method. The work confirmed that the school must have its vision, strategic goals, performance measures, marketing and the interconnectedness of all goals in order to fulfill its mission of education and training, stay on the market, develop, increase its quality and has held its the strong market of other secondary schools.

## **2 Material and methods**

In order to respond to the research question, we carried out qualitative research based on a bibliographic systematic review of theoretical and empirical papers. According to Lueg (2015), the methodology of the systematic review of the literature allows a review

of the evidence on a clearly formulated question, using systematic and explicit methods to identify, select and evaluate critically relevant primary research and analyse data from the studies included in the review.

Data collection was done in a real high school. The private secondary vocational school in Prešov, Slovakia is an educational institution that is a non-profit organization in which over 300 students study. Its organizational and economic components are: secondary vocational school, school dormitory, school canteen, school guesthouse and school restaurant. The data and the analyzes made refer only to the secondary vocational school, which is non-profit organization (Hanušín, 2022). The results were organized according to the methodology of Quesado et al., who summarize the strengths of the BSC, contributions of the BSC, as well as some benefits that may result from its implementation in organizations (Quesado et al, 2018):

### **Benefits of the BSC**

- Establishing a business model and translating it into indicators facilitates consensus for the entire company, not only of the management, but also on how to achieve it,
- it clarifies how day-to-day actions affect not only the short-term, but also the long-term (easily applicable to the control of daily work),
- once the BSC is in action, it can be used to communicate the company's plans, direct efforts in one direction, avoiding dispersion,
- it can also be used as a tool to learn about the business. The comparison between the plans and the current results actually helps the management team to reassess and adjust both the strategy and action plans,
- support for objectives and organizational strategies (the measures are aimed at the strategy),
- structure and procedures based on systemic conception (complements financial measures with non-financial ones): structured model that defines measures for all organizational levels (operational flexibility).

### **Strengths of the BSC**

- Organizational consensus in relation to the strategy: it facilitates the consensus of the entire company by clarifying and translating the mission and strategy into manageable terms for the entire organization,
- translation of the strategy in operational terms: it communicates the strategic objectives in practical terms and enables to link them to each other through cause-effect relationships,
- budget-strategy relationship: it allows the budget to be linked to the strategy, through the allocation of adequate resources to achieve the objectives,
- learning tool, by comparing plans and results with the objective of evaluating and adjusting strategic objectives, indicators and action plans,
- possibility of implementation in any type of entity,
- simple model, conforming to the principles or foundations of performance measurement (it provides a broad view of how to implement a performance measurement system).

### **Contributions of the BSC**

- Comprehensive vision of the company's business system, overcoming traditional methods of performance measurement (inclusion of tangible and intangible assets) and focusing on critical activities for the creation of value,
- it serves as a basis for prediction (using the indicators to predict the effects in the future),
- communication, execution and implementation of the strategy (translating the objectives set out in the strategy into concrete actions and results, allowing the company's management to focus its attention on what it considers most important to achieve the foreseen strategic objectives). It is a highly valued instrument, as proof of a new style of effective and modern management (when a change of leadership occurs),
- it evaluates and adjusts both the strategy and the action plans by analysing deviations, balance and alignment of the objectives between the different managers, departments, divisions, etc.,
- it allows for improvements in quality and productivity with immediate effects,
- it focuses attention on increasing revenue and not only on cutting costs and increasing productivity to achieve greater growth,
- it specifies the business model, facilitating the achievement of consensus in all the company on what the strategy is and how it can be reached,
- in times of change, it provides the bases or indicators for the future or to implement new strategies (mergers or important strategic changes, it highlights a change in leadership style, it summarizes the information in synthetic tables to focus on the most vital aspects of the company, and facilitates the path that must be followed in times of business crisis),
- it assigns people responsible for certain strategic objectives,
- it is a highly valued instrument as proof of a new style of effective and modern management (when a change of leadership occurs),
- it reduces traditional planning and budgeting processes,
- it includes information related to the company's environment (market, competition, suppliers, etc.),
- it motivates and rewards employees (support for variable remuneration).

Internal information and documents of the school in question were used for the analyses.

### **3 Results**

The central motive of the BSC is that the vision and strategy of the organization is elaborated and fulfilled through four perspectives. Each perspective has its own core mission, goals, metrics, objectives, and initiatives. These four perspectives - financial, customer, learning and growth, and internal business processes - are based on the vision and strategy, and they interact with each other. For each perspective, we set a strategic goal, its indicators, methods of measuring indicators and a target value. By correctly defining, setting, measuring and evaluating the company's perspectives, the organization will always move towards fulfilling its vision.



Four perspectives as the drivers of future financial performance are:

- Customer perspective – how do customers see us?
- Internal perspective – what must we excel at?
- Innovation and learning perspective – can we continue to improve and create value?
- Financial perspective – how do we look to stakeholders?

Table 1 Customer perspective (results of own research, Hanušin, 2022)

Strategic goal	Indicators	The process of measuring indicators	Target value
To be the largest school of a similar focus in the region, increasing the number of students	Number of students in the region	The indicator will be evaluated once a year on September 15	- to be the largest school of a similar focus in the region -increase in the number of students by 5% compared to the previous year due to the relative increase in other schools
Increase the number of registered (accepted students) to 100% of free places	Number of registered students	The indicator will be evaluated once a year to the ratio of 100% filling of the capacity of free places	100% occupancy of the permitted number of students
Increase the number of applications received from elementary school students for the 1st + 2nd round of entrance exams	Number of applications received	The indicator will be evaluated once a year after the admission procedure	125 applications for the 1st + 2nd round of entrance exams
Maintain the number of admitted students from primary schools	Number of students from primary schools	The indicator will be evaluated once a year on September 15	Maintain at least the same number of admitted students from primary schools
Increase the satisfaction of school students with the teaching proces	Measuring student satisfaction	The indicator will be evaluated at the end of the first semester using questionnaires	Achieve at least 85% student satisfaction
To increase the satisfaction of parents of school students with the school and the teaching process	Measuring the satisfaction of parents of students	The indicator will be evaluated at the end of the second semester using questionnaires	Achieve at least 85% satisfaction of parents of students
Increase the number of first-year students involved in dual education	% of first-year students with a dual education contract	The indicator will be evaluated using the percentage annual increase of first-year students in dual education	Increase the percentage of students involved in dual education by 8% of the previous year
Increase the satisfaction of companies cooperating in the field of dual education	Measuring the satisfaction of companies involved in dual education	The indicator will be evaluated at the end of the second semester using questionnaires	To achieve at least 8% satisfaction of companies involved in dual education

Table 2 Internal perspective (results of own research, Hanušin, 2022)

Strategic goal	Indicators	The process of measuring indicators	Target value
Updating of curriculum according to the requirements of employers and the labor market	Employers' satisfaction with the content of education	The indicator will be evaluated at the end of the calendar year using questionnaires	To achieve at least 85% satisfaction of companies involved in dual education
Introducing new teaching methods into the teaching process and innovating approach of teachers to teaching	School students' satisfaction with the teaching methodology	The indicator will be evaluated at the end of the calendar year using questionnaires	To achieve at least 85% student satisfaction
Additional equipment of specialist classrooms	Satisfaction of students, teachers and masters of professional education with classroom equipment	The indicator will be evaluated at the end of the second semester using questionnaires	To achieve at least 85% satisfaction of students and teaching staff
To analyze the satisfaction and feedback of school graduates	Feedback from school graduates	The indicator will be evaluated for graduates once a year, 6 months after graduation using questionnaires	To get an 85% return on questionnaires

Table 3 Innovation and learning perspective (results of own research, Hanušin, 2022)

Strategic goal	Indicators	The process of measuring indicators	Target value
Increasing the qualifications of teachers and masters of professional education	Qualification of teaching staff	The indicator will be evaluated once a year on September 15 based on the analysis of the qualifications of teachers compared to the previous year	To achieve 90% proficiency in taught subjects
To increase the number of continuous educations, trainings and increased qualifications	Number of absoluated educations and trainings	The indicator will be evaluated once a year using the analysis of absoluated trainings	To achieve 50% involvement of teaching staff in further education
To increase student involvement in internships and professional courses	Number of students on professional internships and courses	The indicator will be evaluated at the end of the second semester using student portfolios	To achieve 25% student involvement in professional internships and courses
To increase the % of system Edupage use in the teaching process	% of system Edupage use in the teaching process	The indicator will be evaluated monthly according to accesses to system Edupage and comparison with last year	To increase the use of system Edupage by 5% compared to last year
Effective, high-quality computing technology	Employee and student satisfaction	The indicator will be evaluated at the end of the second half of the year using employee questionnaires	To achieve at least 80% employee and student satisfaction

To retain key employees	% of employees leaving	The indicator will be evaluated once a year using the employee fluctuation analysis	Maximum 3% employee fluctuation
Creation of motivational programs for employees	Employee satisfaction with their evaluation	The indicator will be evaluated at the end of the second half of the year using employee questionnaires	To achieve at least 80% employee satisfaction

Table 4 Financial perspective (results of own research, Hanušin, 2022)

Strategic goal	Indicators	The process of measuring indicators	Target value
To increase the financial income of normative financing	The total number of school students included in the financial funding	The indicator will be evaluated annually on September 15 on the basis of Edupage system, according to normative financing set	To increase of income from normative financial funding to 100% of permitted students
To increase the income of non-normative financing from the school restaurant and school guesthouse for the development of the school	Revenues for services provided	The indicator will be evaluated annually using a financial analysis of income from the school restaurant and school guesthouse	8% increase in average monthly sales in the same month in the previous year and in 2019 (a year before the coronavirus pandemic)
To increase income from grants and projects focused on education	Obtained subsidies and grants	The indicator will be evaluated annually using a financial analysis of the school's income from subsidies and grants	Get at least €20,000 from subsidies and grants
Increase income from 2% taxes	Obtained funds from 2% taxes	The indicator will be evaluated once a year by adding money	Increase income from 2% taxes by at least 10% compared to the average of the previous two years
To involve cooperating companies and dual education companies in financing the development of the school	Obtained funds and donations from cooperating companies	The indicator will be evaluated annually using a financial analysis of the school's income from donations	Obtain income from cooperating companies in the amount of at least €10,000

If you can not measure it, you cannot improve it (Kaplan, Norton, 2007).

#### 4 Discussion

BSC is a modern method that allows tracking and reporting a large amount of data that comes from various areas of business management. By using the BSC, the company's reporting becomes more complex, provides more relevant information, and the company thus becomes more transparent and attractive to investors (Horváthová, Mokrišová, Suhányiová, 2016).

Balanced Scorecard can be free translated as a system of balanced indicators. In practice, this means that financial indicators do not set in the organization, but the organization has a set in system of indicators based on non-financial indicators as well. This will create a balanced performance evaluation system based on key indicators based on four perspectives (Gallo, Gallo, Tomčíková, 2019). BSC goals and measures are based on the vision and strategy of the company and monitor its performance from four perspectives: financial, customer, internal processes, learning and growth. By combining these balanced perspectives, Kaplan and Norton, the authors of the BSC method, proved that it is not correct to rely only on financial indicators, which limits the potential of the company to create future values. Employee awareness and measurement of the driving forces of current and future success is important (Kaplan, Norton, 2007).

Education has become a market where there is strong competition. The schools have to fight for students, they have to develop, progress and if they want to be sustainable in the long term, they have to have their own vision, strategy and marketing. With the Balanced Scorecard application at the Private Vocational High School from Prešov, Slovakia we showed the practical and useful using of this method in education as a non-profit organization. We have created BSC strategic goals, indicators, ways to measure indicators and desired target values of financial perspective, customer perspective, internal business processes and learning and growth perspective for the learning organization. By designing and applying the strategic goals of individual perspectives, we showed that not only commercial companies can use the BSC method for their development and the fulfillment of their vision, but also a secondary school, which must have written goals that will be measured, controlled and fulfilled together with employees and other school stakeholders. Each employee must be familiar with the strategic map and its goals, so that they see the importance and connection of all goals that are necessary to achieve the vision of the school, that every step of each employee will contribute to this.

## References

- Azizi, F., Behzadian, M., Afshari, A. (2012). Which perspectives in the Balanced Scorecard are appropriate for the Universities? *European Journal of Scientific Research* . Vol. 74, No 2, pp. 164-175. ISSN 1450202X.
- Bissessar, C. (2011). Proposal for the Implementation of the Balanced Scorecard in Managing Higher Education Institutions. *Journal of University College of Cayman Islands*. Vol. 6, 2011. ISSN 0799-2262.
- Diačiková, A., Lach, M. (2019). *Úspech je voľba. Manažment podnikania a podnikových procesov. Teória a prax aplikovaná v spoločnosti Chemosvit, a.s.* Svit: Chemosvit, a.s. Svit. 2019, 400 s. ISBN 978-80-971931-1-9.
- Hanušín, J. (2022). *Aplikácia metódy BSC a marketingová stratégia vybranej organizácie*. [Diplomová práca]. Ružomberok: Katolícka univerzita v Ružomberku, Pedagogická fakulta, Katedra manažmentu, 2022, 86 s.
- Chavan, M. (2009). The balanced scorecard: a new challenge. *Journal of Management Development*. Vol. 28, No. 5, pp. 393-406. <https://doi.org/10.1108/02621710910955930>
- Janišová, D., Křivánek, M. (2013). *Velká kniha o řízení firmy. Praktické postupy pro úspěšný rozvoj*. 1. vyd. Praha: Grada, 2013, 394 s. ISBN 978-80- 247- 4337-0.
- Kaplan, S.R.: (2009). Conceptual Foundations of the Balanced Scorecard. *Handbooks of Management Accounting Research*. Volume 3, 2009, p. 1253-1269. [https://doi.org/10.1016/S1751-3243\(07\)03003-9](https://doi.org/10.1016/S1751-3243(07)03003-9)

- Karathanos, D., Karathanos, P. (2010). Applying the Balanced Scorecard to Education. *Journal of Education for Business*. Volume 80, Issue 4, 222-230. doi:10.3200/JOEB.80.4.222-230
- Kaplan, S.R., Norton, P.D. (1991). The Balanced Scorecard - Measures That Drive Performance. *Harvard Business Review*. January-February 1991, p. 71 – 79. ISSN 0017-8012.
- Kaplan, S.R, Norton, P.D. (2005). The balanced scorecard: measures that drive performance. *Harvard business review*. No 83. July-August, (2005): p.172. ISSN 0017-8012.
- Kaplan, S.R, Norton, P.D. (2007). *Balanced scorecard. Strategický systém měření výkonnosti podniku*. Vyd. Praha: Management Press. 5. vydanie, 268 s. ISBN 8072611775.
- Lueg, R. (2015). Success Factors in Balanced Scorecard Implementations – A Literature Review. *Management Revue*. Vol. 26, No 4, pp. 306-327. <https://doi.org/10.5771/0935-9915-2015-4-306>
- Quesado, P. R., Aibar Guzmán, B., Lima Rodrigues, L. (2018). Advantages and contributions in the balanced scorecard implementation. *Intangible capital*, 14(1), 186-201. <https://doi.org/10.3926/ic.1110>
- Venkatesh, U., Kirti, D. (2007). *Balanced scorecards in managing higher education institutions: an Indian perspective*. *International Journal of Educational Management*, 2007. <http://dx.doi.org/10.2139/ssrn.1615304>
- Zelman, W.N. et al. (2003). Use of the balanced scorecard in health care. *Journal of Health Care Finance*, 01 Jan 2003, 29(4):1-16. PMID: 12908650.

## Options of Financing Startups in Slovakia

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### Abstract

The paper defines the issue of startups, describes the meaning of the term and its characteristic elements. It also deals with the possibility of financing startups in Slovakia. The goal of the thesis is not only to define the theoretical framework of the issue of startups and to describe the possibilities of their financing. Paper summarizes the results obtained through the analysis and thus propose recommendations for the future. The paper analyzes both private and public sources of financing. The result of the work is a summary of the possibilities of obtaining financial resources for budding startups in Slovakia. The paper thus provides a comprehensive view of the selected issue, supports the importance of Startups in today's modern, rapidly developing society, and thus represents a good tool, e.g. for budding entrepreneurs

Keywords: Startup; Financing; Slovakia; Funding sources

Article Classification: Research article

### 1 Introduction

A startup is a specific type of business that nowadays is experiencing a great boom not only in our territory, but also in large numbers all over the world. These are mainly companies emerging and moving in the dynamic areas of internet business, virtual products or mobile devices. During the current period of rapid technological development of society, it is Startup companies that are key to the area of the regional and, consequently, the world economy. Startup companies and their ecosystems are thus a frequently discussed topic among the lay and professional public today. However, it is important to understand this term in context so that it is possible to appreciate its overall potential as one of the models of successful business. Investors who take on the investment risk often enter the world of emerging startups. So startups are financed from various sources, one of them being public sector sources. A startup should be created with a smaller amount of funds and achieve efficient and dynamic growth on the market.

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In order for the given project to be successful and also exhibit elements of a startup. It is necessary that it meet the following criteria (HOJSTRICHOVÁ, 2015):

- No or only minimal initial costs;
- The existence of a big idea that is related to taking risks. The risk in business is therefore more substantial than in ordinary companies;
- If the project is successfully completed and the developed strategy works effectively, the potential return on costs is relatively high.

Blank also provides 9 basic elements for a startup. He emphasizes that the vision alone is not enough to achieve a successful startup. In order for the project to go in the right direction and work, it is necessary to focus on 9 elements that influence it with their content (BLANK, 2012):

1. *Value proposition.* Value represents an element that characterizes a product or service and distinguishes it from the competition by its uniqueness. It also defines the scope of the market that we want to reach with the given product or service.
2. *Customer segment.* This is an element that is formed by the target group and the solution to the problem that the product brings with it.
3. *Channels.* It is an element of distribution and sale of products and services.
4. *Customer relationship.* An element whose content is the goal of producing the greatest possible relationship with the customer and the subsequent rising demand.
5. *Cost structure.* An element containing fixed and variable costs.
6. *Key activities.* It is about working out the tasks and goals that the company must achieve in order to be successful on the market.
7. *Key resources.* This includes suppliers and commodities.
8. *Key partners.* It represents all the partners that are necessary for success in business.
9. *Revenue streams.* It is an element of turnover or sources of profits and their extent.

In the first stages of the developing business model, based on practical experience, it is recommended to start with the first four elements, which represent the so-called heart model. The success of startups is purposeful and closely related to the methods used.

## 2 Material and methods

The aim of the research is not only to define the theoretical but also describe the possibilities of their financing. Paper summarizes the results obtained through the analysis and thus propose recommendations for the future. The paper is the basis for clarifying how you can use financial organizations and other sources of finance to support startups in Slovakia. Considering the dynamic environment in Slovakia and in the world, the contribution summarizes the overview of individual financial options. To achieve the goal, we used several methods, such as induction, deduction and analysis.

### 3 Results

When entering the capital market, startups encounter a lack of both internal and external resources. Common forms of financing and types of investors, such as banks and the loans provided by them, are unattainable for this type of project due to their riskiness. Thus, young startup and innovative projects get financial support rather from alternative forms of financing that use risk capital. The selection of a suitable source of startup financing must be adapted to the development stage and category of the startup. It is true that not all forms of financing through venture capital are suitable for all forms of startups and all stages of development. However, finance is needed already at the start of the business, e.g. to pay legal fees, create capital or purchase necessary equipment.

#### 3.1 *Own resources*

The ideal way to finance a startup is own resources, or own capital. This is an ideal case when the person who came up with an innovative idea for the project has the finances to implement it.

#### 3.2 *Friends, Family and Enthusiasts*

Loans from loved ones or family are also a frequent and advantageous way of financing startups. In this case, although the founder owes money to someone, the advantage is that he hopes that his family will be more accommodating to him in the event of failure than bank or non-bank entities. Just like the sources mentioned above, support sources from family members and friends are also a frequent method of financing.

#### 3.3 *Risk capital*

As part of financing a startup, the founder can also use a risk capital fund, which is also referred to as a "venture capital fund". The type in question is used mainly in the field of financing projects with higher risk, but also with the possibility of high profit or returns. The investor solves the return of invested financial resources mostly only at the final exit from the company, i.e. the sale of his share. However, the return can also be realized during the investment, in the form of a dividend. This risk capital can be divided into several categories (National Holding Fund, 2014):

- *Seed capital* - In the given type of business financing, it is a type of investment with substantial risk, which, however, is e.g. can be used even before the establishment of the company. In practice, it is mainly used for financing the development of a product prototype, patent protection or market research,
- *Early stage development capital* - In this type of financing, there is risk capital financing of already functioning businesses, where further positive development is highly likely,
- *Later stage development* - If the company plans to expand to new (foreign) markets or also to expand production, it is possible to use another type of financing - development financing. The risk associated with this investment is generally lower than with the aforementioned investments, and the payback period of the provided resources is also shorter,



- *Development, expansion* - Financing provided for the purpose of growth and development of an already producing enterprise, regardless of whether it has already reached the break even point or not. The investment is aimed at expanding production capacities, developing market potential.

### 3.4 Business angels

A certain type of financing on a commercial basis is also represented by individual investors, who are also called "Business Angels", i.e. "business angels". EBAN (European Business Angels Network) is a non-profit organization whose mission is to represent the pan-European community of early-stage investors. These are investors who provide their own resources to support startups. They support businesses with high growth potential in their early stages, or prospective projects (mostly in the seed phase). Financing procedures are similar to financing through a venture capital fund. But business angels tend to do business on a smaller scale and specifically finance those businesses that have the potential to increase profits. At the same time, they choose industries that they either know very well, or do business in the same industry, thus having a highly positive effect on the startup (EUROPEAN BUSINESS ANGELS NETWORK, 2018). The social trust influences angel investment because this relies on information exchange and collaboration between individuals, and it also operates as a mechanism of effective sanctioning (FERNANDEZ, 2021). There are several areas that business angels focus on. We describe the most represented ones on the graph below (Figure 1).

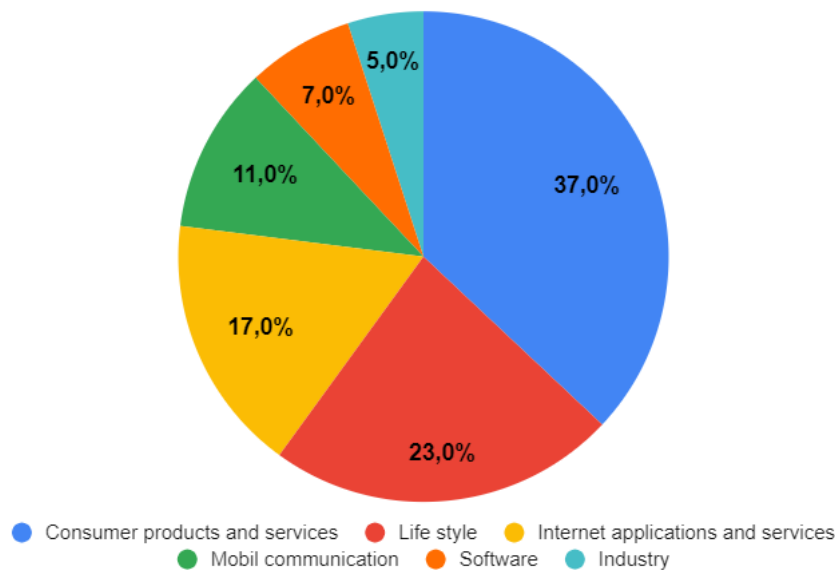


Figure 1 Investment activity of business angles; Source: CB Insights, 2017

### 3.5 Crowdfunding

In his work, Steinberg defines the term crowdfunding as a certain process of demand from the general public for donations, which the public provides as startup capital for new, starting businesses. This is a unique form of financing, when startups are financed by group resources. A startup must address a significant part of the public with its project and business plan. If the project has an exceptional idea, a properly set plan and a creative work team, it can get high financial support even by collecting smaller

amounts from a larger number of investors. The procedure for this financing option is simple - you share your idea or vision through a regional or global level.

The Obama administration amended new laws regarding crowdfunding, because it offers help for entrepreneurs and helps organizations within the business community. The researchers suggested that crowdfunding can reduce the difficulty of raising funds by bringing higher production, lower transaction costs increased flexibility in global financial market (ORANBURG, 2020).

On a global scale, Kickstart is the absolute leader in this field. So far, more than 9 million people in the world have used it and more than 90,000 projects in the amount of more than 1.8 billion US dollars have received support. In the Slovak and Czech territories, entrepreneurs with innovative ideas present their projects through the websites ludialudom.sk, hithit.cz, dakujeme.sme.sk, dobrakrajina.sk, darujme.sk, startovac.cz and others (GUILLEBEAU, 2013).

Crowdfunding has several models (NATIONAL BANK OF SLOVAKIA):

- *Reward-based crowdfunding.* In this crowdfunding model, supporters usually receive a material (not financial) reward for the funds provided, such as a product or service from the project owner.
- *Donation.* The investor donates his money without expecting any kind of service or goods in return. Supporters usually contribute to a smaller-scale project, for example with the aim of supporting the development of art, science or for charitable purposes.
- *Loan.* In the case of the loan model, supporters or investors lend funds to specific individuals as a group and with interest, as a rule, for their business activities.
- *Auction model.* This model is characterized by the fact that the crowdfunding platform sets the maximum possible interest rate, and within it investors make their own offers to those interested in financing (potential borrowers).
- *Presale.* An investor buys something in advance that does not yet exist. In this way, it will provide you with the funding you need to get started. After the product is made, it is first distributed to those who contributed to it.

Top 10 crowdfunding sites by Forbes (FORBES, 2013):

- Kickstarter
- Indiegogo
- Crowdfunder
- RocketHub
- Crowdrise
- Somolend
- Appbackr
- AngelList
- InvestedIn
- Quirky

### **3.6 Support of startups by the public sector**

Startups are allowed to apply for other forms of state support in addition to grants and capital investment. From the point of view of such support, the Slovak Guarantee and Development Bank is available, as well as the Slovak Business Agency, which is the oldest specialized institution for this purpose. Entrepreneurs are provided with so-called A microloan program where they can apply for a loan under the best conditions on the market. The scope of the loan ranges from €2,500 to €50,000, while the principal can be repaid only after 6 months after signing the loan (the maturity of the loan ranges from 6 months to 4 years). The interest rate itself is also advantageous, which under favorable conditions ranges from 1.19% and ends at 9.03%.

From the conclusions of the KPMG analysis, it also emerged that up to 62% of the public sector supports startups in Slovakia, while the largest scale is support through various types of events of an informal nature, various forms of education or export support. It is not about direct funding, but rather only about supporting activities from the state within the public sector (education, meetings, networking or various types of mentoring).

A survey of the Slovak startup ecosystem conducted by the KPMG agency found that more than 79% of startupists are people aged 25-34 (THE STARTUP STUDIO, 2014). It points to the fact that entrepreneurship has already taken root in Slovak society and that the young generation has entrepreneurial aspirations. People at this age also tend to take higher risks. However, young startups also face challenges. This age group is less likely to have adequate financial resources to develop their business, and they also lack sufficient business experience.

Slovak Business Agency was created to support small and medium-sized enterprises, also as an implementer of support projects and a micro-loan program as a financial instrument to help nascent startups at the national, regional and local level. Among the missions of this institution, we can also find efforts to support the competitiveness of business entities both in the common market of the European Union and in the markets of third countries. The Slovak Business Agency has set several goals, among them it is possible to include support and improvement of the rate of existence of companies on the market, employment within the private sector, support and highlighting of the innovative nature and performance of Slovak business entities, support of their entrepreneurial spirit and competitiveness, improvement of the business environment in Slovakia and elimination of the marginalization of business enterprises and much more. Their goals are justified in relation to small and medium-sized enterprises (and startups without exception), since they are the pillar of the Slovak economy (Slovak Business Agency, 2014):

- they represent 99.9% of the total number of entrepreneurs,
- their offer of job opportunities is for approximately 75% of the active workforce,
- actively participate in gross production and creation of added value in a value representing over 50%.

### **3.7 Support of startups by the commercial banks**

Another option for financing a startup is commercial banks. Many of them offer loans for entrepreneurs and small businesses. Some are more advantageous, others less so. Even before you choose one, it is a good idea to compare them and find out which institution will give you a lower interest rate and better terms.

Slovenská sporiteľňa offers a special "Programme for startup entrepreneurs and women entrepreneurs". It includes the provision of credit, leasing or free education in the area of possible risks or business plan. Since its launch, they have helped more than 7,000 people and financed more than 700 startups (SLOVENSKA SPORITELNA, 2022). The most common areas of support are clinics, e-shops, schools, non-profit organizations and crafts.

Companies that are new to the market but are already doing business can get financial resources from the bank in the form of a loan or lease (usually for 3-5 years). In order to provide funds, it is necessary for the company to be able to repay the amount owed.

#### **4 Discussion**

Startups are distinguished by many characteristic elements from classic business, the investigation of the effectiveness of spent investment resources is an integral part of business management. Before starting the implementation of the project and looking for venture capital investment, it is necessary to evaluate the efficiency of the project, mainly on the basis of high-quality and real information in combination with different methods of evaluating economic efficiency. It is more than certain that an inappropriately chosen business or investment plan and a developed business plan can be a significant threat to the realization of any startup.

Most people support the opinion that there is a stigma of failure in the Slovak Republic. Such a stigma represents a real obstacle for them to decide to start their own business. However, failure is a part of business, sometimes successful entrepreneurs with innovative ideas fail before achieving success.

However, by examining the issue, we confirmed that there are several financing options for small and medium-sized businesses in Slovakia. Despite this, there are opinions that there is a lack of these possibilities and this absence represents one of the obstacles to successful financing of startups in our territory. The state is aware of this situation to a certain extent and is looking for effective options in terms of funding support. In practice, it is a common phenomenon that ordinary credit sources are impossible for young businesses without collateral. Also for this reason, the founders are looking for other, alternative sources of financing through external sources. The potential of financing from public sources is great, so it is only up to specific projects to be able to use it to their advantage.

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## References

- Blank, S. Dorf, B. (2012), *Startup owner's manual*. California: K&S Ranch Press.
- European Business Angels Network, (2018), *About us*, available at: <https://www.eban.org/about-us/> (accessed 27.9.2022)
- Fernandez, V., (2021), "*The role of trust and social commitment in start-up financing*" available at: <https://doi.org/10.1016/j.irfa.2021.101722> (accessed 28.9.2022)
- Frobes (2013), *Top 10 crowdfunding sites for fundraising*. available at: <https://www.forbes.com/sites/chancebarnett/2013/05/08/top-10-crowdfunding-sites-for-fundraising/> (accessed 25.9.2022)
- Guillebeau, Ch. "*Startup bucks*". Brno: Jan Melvil Publishing, 2013. p. 183-184.
- Hojstřičová, V. (2015), "*Startup as a new concept of a new idea*", available at: <https://www.jobfairs.eu/magazin/start-up-jako-nova-koncepcie-nove-myslenky> (accessed 2.9.2022).
- National Bank of Slovakia, *Crowdfunding*, available at: <https://nbs.sk/dohlad-nad-financnym-trhom/fintech/crowdfunding/> (accessed 16.9.2022)
- National Holding Fund, (2014), "*What is risk capital*", available at: <http://www.nhfond.sk/Podpora-MSP/co-je-rizikovy-kapital/> (accessed 15.9.2022).
- Oranburg, S. (2020), "*Start-up financing*", available at: <https://doi.org/10.1016/B978-0-12-819946-6.00004-7> (accessed 29.9.2022)
- Ries, E. (2011). *The lean startup: how today's entrepreneurs use continuous innovation to create radically successful businesses*. New York: Crown Business, ISBN 978-80- 265-0389-7.
- Slovak Business Agency, (2014), *About us*, available at: <http://www.sbagency.sk/o-nas> (accessed 31.8.2022).
- Slovak Business Agency, "*Start your business with a microloan*" <http://www.sbagency.sk/rozbehnite-svoje-podnikanie-s-mikropozickou#.YycsNnZBxPY> (accessed 7.9.2022).
- Slovca, *PE/VC explained*, available at: <https://www.slovca.sk/sk/private-equity-venture-capital/vysvetlenie-pojmov.html> (accessed 14.9.2022)
- Slovenská sporiteľňa, 2022. "*Programme for startup entrepreneurs and women entrepreneurs*" available at: <https://www.slsk.sk/sk/biznis/zaciname-podnikat> (accessed 28.9.2022)
- The Startup Studio, (2014), "*Survey of the Slovak startup ecosystem*", available at: <https://assets.kpmg/content/dam/kpmg/sk/pdf/Startup-survey-2014-SK.pdf> (accessed 15.9.2022)

# Impact of COVID-19 on KPIs Development Focused on Inventory Turnover Ratio in Automotive Sector

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## Abstract

Key Performance Indicators (KPIs) are the vital navigation instruments used by managers to understand whether their business is on a successful voyage or whether it is veering off the prosperous path. The right set of indicators will show the company performance and point out the areas which need attention. The impact of COVID-19 on today's globally integrated automotive sector is significant. The management has focused on main questions like how to accelerate cost-out measures and optimize the working capital across the entity. One of the items that have started to be in the center of attention nowadays is a company's inventory and its level and turnover time. Therefore concerning about this, the inventory management should be sensitive in terms of continuous production and cash flow. Important question for management is how to identify, prioritize and accelerate cost-out measures across the entity. Finding the way how to optimize of volume of inventory, working capital and identify the proper measures to deliver rapid, tangible cash-flow benefits should be consulted in each company on daily basis.

Keywords: Key Performance Indicators (KPIs), inventory, inventory turnover ratio, value added indicator, cash conversion cycle, working capital.

Article Classification: Research article

## 1 Introduction

The outbreaks of the COVID-19 pandemic have had enormous impact on the economic activities in all countries. Supply chain sector was one of the business areas which were struggling a lot. The consequences of this persist until today. Lockdowns interrupted the demand and supply of many goods due to which the financial flows have been affected. It destabilized specially small and medium enterprises. Managers had to

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watch very carefully the production cycle to avoid any stop production. One the main their goal was to set up KPIs as useful measuring tool to uncover the weaknesses and start the action immediately. In the following paper we focus on the inventory cycle as an important part of KPIs measurements. The aim of the paper was to show how it is important to recognize each cycle of inventory turnover to eliminate the deviations. In the way to achieve the targets the company has to find the way how to use the sources more effectively. As a methodology we used data analysis and logarithmic method of calculation. As the target company for the analysis we chose the Slovak factory operating in automotive industry. Then we compared the figures from production database with targets for 2020. Real figures represent the material consumption, the volume of semi-finished goods, finished goods and total turnover of sale during the period from January to May 2020. Target figures are set up by management and controlling of the company usually ones a new and are valid for the next year.

## **2 Material and methods**

Measuring of the company performance is related with fulfillment of one main task of management accounting. It means to provide the information about company performance focused on effective solutions and application of tools for managerial control (Kráľ, 2018).

Well-known is saying which is used to highlight the critical importance of metrics: “What you get measured gets done” and “if you cannot measure it, you cannot manage it” (Marr, 2012). It is very important to set up the right KPIs instead to collect and report everything that is easy to measure. Marr classifies KPIs from these perspectives: financial, customer, marketing and sales, operational processes and supply chain, employee and corporate social responsibility (Marr, 2012). Another approach shows on the critical factors of success which determines well-being and vitality of the company in the business area where good results should be achieved. At the beginning the company would have around 30 areas for critical factors statement. Parameter declares that it is important to decrease their numbers to 5-8 (Parameter, 2008). Their identification easier leads to KPIs settings. KPIs parameters are the useful tools for detecting deviations in the economic situation of the company and play important role in crisis management. Top management usually uses the set of financial analysis indicators where the inventory turnover ratio plays important role (Gozora, 2017).

Inventory turnover ratio says about how many days last one turn of inventory. It indicates the required time for the transformation of the financial funds via production and sale of goods back to financial funds. The optimum is if the company shows decreasing values (Kotulič, 2010). Nevertheless KPIs setting should start with the company strategy in its field of business. Papula declares that for objective assessment of company’s strengths and weaknesses it is required to set up the measure tools which can be comparable with the subjects operating in the same business area (Papula, 2018).

## **3 Inventory level management**

Inventory measurement is very important indicator that shows how well the company process depending on its inventory. It is a part of current assets in balance sheet. From the valuation point of view we can identify these categories of inventory: purchased inventory - raw material, packaging material, other material expenses and Inventory of own production - unfinished and finished goods.

The inventory is filled with the goods that are currently on demand in the market and to run out of stock is undesirable. Also if the automotive sector can meet the future demand based on forecast the proper inventory management is achievable. Purchased inventory is evaluated by purchased prices plus acquisition cost. Inventory from own production is evaluated by own production cost and it is regulated by §44 of Law published by Ministry of Finance of the Slovak Republic from 16 December 2002 No. 23054/2002-92 where are defined the accounting procedures and frameworks.

### 3.1 Inventory turnover ratio - calculation and comparison

It is essential to have enough material, semi finished goods and finish goods for continuous production process. Just-in-time inventory management is more or less rarely possible. To secure the availability, the inventory factor has to be stored which requires additional cost. Therefore to measure the inventory turnover ratio is essential. The goal of each company is to shorten this ratio as much as it could not affect the production. Following analysis should show us how to accelerate the time of inventory turnover. Inventory turnover ratio formula.

$$ITR = \frac{INV \times d}{T} \quad (1)$$

ITR - inventory turnover ratio (ITR0 – planned, ITR1 – real),

INV - inventory summary,

T - Turnover,

d - Certain period of the year in days (month – 30 days, quarter – 90 days, year – 365 days).

Inventory turnover ratio represents the relationship between the inventory category and certain turnover depends on turnover type. We can categorize the turnover indicators into following groups.

Table 1 Categorization of inventory turnover indicators; source: (ZALAI, 2016)

Global inventory turnover indicators	Particular inventory turnover indicators (turnover is related to particular inventory category)
Mostly use the total turnover of realized goods for each type of inventories	1. Material stock - material consumption 2. Semi finished goods stock - cost of semi finished goods 3. Finished goods - cost of finished goods 4. Total stock from production - total turnover

Global turnover indicators indicate how the change of total inventory turnover is influenced by turnover of each inventory category. Particular turnover indicators allow us to analyze turnover for each inventory category separately and gives us better view for further analysis. Following pyramid shows us that by connecting the particular inventory indicators into one analytical model we can analyze inventory turnover ratio expressed by global inventory turnover:



$$\begin{array}{c}
 \frac{INV.d}{T} \\
 | \\
 \hline
 \frac{MAT.d}{T} + \frac{SFG.d}{T} + \frac{FG.d}{T} \quad (2) \\
 | \qquad \qquad \qquad | \qquad \qquad \qquad | \\
 \hline
 \frac{MAT.d}{MC} \cdot \frac{MC}{CSFG} \cdot \frac{CSFG}{CFG} \cdot \frac{CFG}{T} \quad \frac{SFG.d}{CSFG} \cdot \frac{CSFG}{CFG} \cdot \frac{CFG}{T} \quad \frac{FG.d}{CFG} \cdot \frac{CFG}{T}
 \end{array}$$

Figure 1 Multiplicative model of inventory turnover analysis. Source: (ZALAI, 2016)

- MAT - material in inventory,
- SFG - semi-finished goods,
- FG - finished goods,
- d - certain period in days (month – 30 days, quarter – 90 days, year – 365 days),
- T - total turnover of realized goods,
- MC - material consumption (raw material, packaging material) ,
- CSFG - cost of semi-finished goods,
- CFG - cost of finished goods (production performance).

From the analytical model is clear that inventory turnover depends on:

- particular indicators of each inventory category and
- speed of going through from one to another inventory category (the speed of change of material inventory to unfinished goods, from unfinished goods to finished goods and finished goods to sale).

In the following analysis there is an example where the actual data of turnover time of whole inventory is compared with planned turnover time. It is in relation with average status of each inventory type and the speed of their change from one category to another within production cycle. There are used multiplicative links between the indicators which are mentioned in formula 2 above.

Table 2 Actual figures of inventory and turnover development of production company in automotive industry; source: (ZALAI, 2016) and own research

Indicator	2020	2020	2020	2020	2020	2020
	Target	Jan	Feb	March	April	May
MAT	1 356 000	1 486 000	1 437 000	1 421 000	1 313 000	861 000
MC	706 000	567 000	699 000	583 000	369 000	167 000
SFG	1 108 000	1 528 000	1 456 000	1 717 000	1 378 000	1 213 000
CSFG	904 000	903 000	1 066 000	1 110 000	1 041 000	930 000
FG	610 000	668 000	708 000	702 000	960 000	799 000
CFG	1 230 000	1 337 000	1 424 000	1 373 000	838 000	383 000
Inventory	3 074 000	3 682 000	3 600 000	3 839 000	3 651 000	2 873 000
ITR	35,84	51,50	46,65	50,40	63,10	71,88

The data in table are used in following KPIs figure and further calculations shown in tables 3, 4, 5.

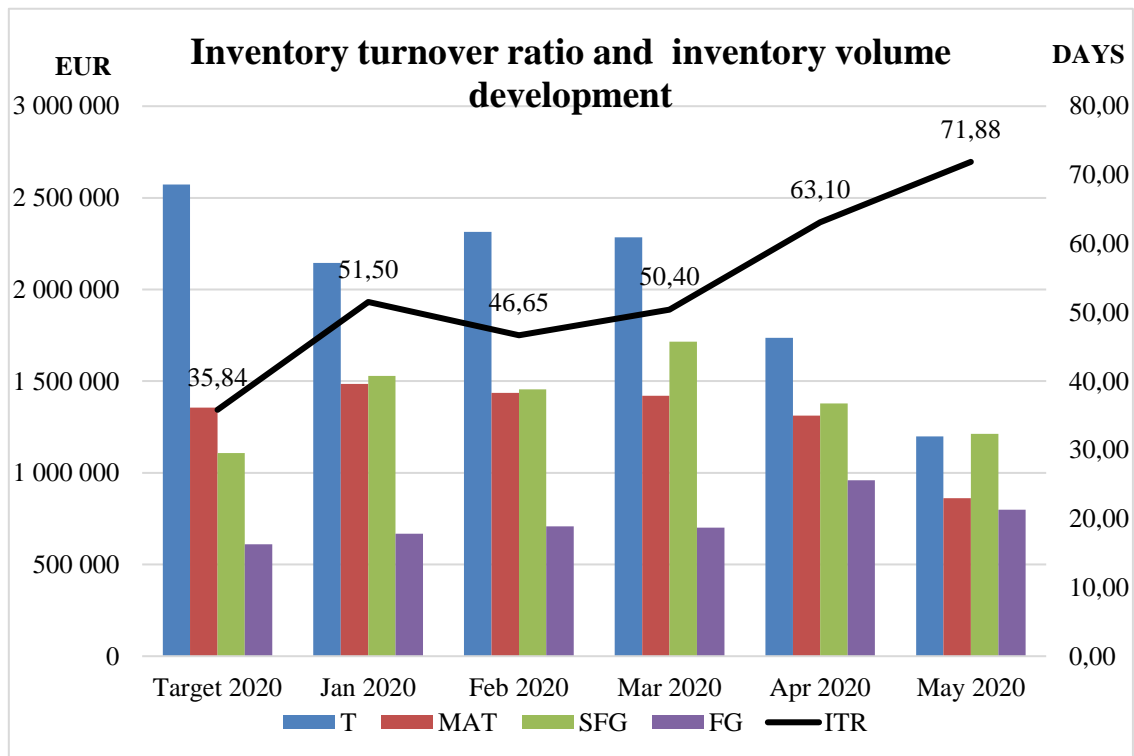


Figure 2 KPI development; source: own research

From the chart is clear that the production performance from January to March 2020 was on desirable way to achieve the turnover target. But from April to May there was recorded significant drop in sale due to lower customer demand caused by situation on the market with COVID-19. The company in an effort not to stop the production and keep human resources at the same level as was planned, produced the parts for inventory. It can be seen in higher level of finished goods. Inventory turnover ratio significantly increased during the period from January to May 2020 due to high level of material, semi-finished and finished goods.

In following 3 tables we analyzed the variations between actual inventory turnovers as for May 2020 and compared them with planned data taken from operational plan. Data are taken from the real production company.

### ***3.2 The analysis of impact on the first level of pyramid (formula 2) – level of global indicator and inventory turnover time***

Total turnover is the summary of global indicators change of each inventory category (calculation in Tab-3, 4, 5):

- impact of global indicator on MAT turnover: 5,73 days,
- impact of global indicator on SFG turnover: 17,43 days,
- impact of global indicator on FG turnover: 12,88 days.

In the analyzed period the inventory turnover time increased by average 36 days. Each category caused an extension in days; mostly the slowdown is seen in the transfer from semi-finished goods into finished goods.

### 3.3 The analysis of the impact of each inventory categories on global indicators

In the analysis is used logarithmic method for calculation of inventory category on respective global indicator of this category and on global indicator of total inventory turnover. Data are compared together planned with actual as for May 2020.

Table 3 The analysis of the influence of particular indicators on material turnover; source (ZALAI, 2016) and own research

	<b>Plan</b>	<b>May 2020</b>	<b>Change</b>
MAT.d/T	15,81 days	21,54 days	+ 5,73 days
MAT.d/MC	57,62 days	154,67 days	+ 97,05 days
MC/CSFG	0,78	0,18	-0,60
CSFG/CFG	0,74	2,43	+1,69
CFG/T	0,48	0,32	-0,16

In the table as for May 2020 it is shown the increase of material turnover time by 5,73 days. The reason for that was in slow down the material consumption by 97,05 days as the result of decreased demand. It negatively affected the transfer from semi finished goods to finished goods. Positive is transfer from material to semi-finished goods and realization of finished goods.

Table 4 The analysis of the influence of particular indicators on semi finished goods turnover; source: (ZALAI, 2016) and own research

	<b>Plan</b>	<b>May 2020</b>	<b>Change</b>
SFG.d/T	12,92 days	30,35 days	+17,43 days
SFG.d/CSFG	36,77 days	39,13 days	+2,36 days
CSFG/CFG	0,74	2,43	+1,69
CFG/T	0,48	0,32	-0,16

In the case of detailed analysis of semi-finished goods inventory it can be seen again that the turnover period extended especially in relation with cost of material consumption. The transfer from semi-finished goods to finished goods slowed down a bit.

Table 5 The analysis of the influence of particular indicators on finished goods turnover; source: (ZALAI, 2016) and own research

	<b>Plan</b>	<b>May 2020</b>	<b>Change</b>
FG.d/T	7,11 days	19,99 days	+12,88 days
FG.d/CFG	14,87 days	62,58 days	+49,71 days
CFG/T	0,48	0,32	-0,16

The turnover of finished goods inventory increased for global indicator by 13 days as well as for particular indicator - cost of finished goods by 50 days. Transfer from semi finished goods to finished goods took longer as it was desired. It shows the problems with requirements on the market like missing some components which caused stop production in some final customers plants (Mercedes, Land Rover or Stellantis group). Some volume of semi finish goods were produce on stock due to not stop production.

The change of inventory turnover ratio has impact on company economy. Turnover acceleration allows fulfill the production goals with lower need of the funds. On the other hand slowdown the turnover binds the fund in material, unfinished and finished goods. Therefore it is handy to complete the analysis by calculation either of fund amount saving or fund overrun. In the following formula there is compared actual inventory turnover time with planned and the difference is multiplied by average amount of daily turnover.

$$R = (\text{ITR1} - \text{ITR0}) \cdot \frac{\text{turnover May 2020}}{d=365} \quad (3)$$

$$R = (71,88 - 35,84) \cdot 1199000/365 = +118 \text{ T EUR}$$

R – saving/overrun the funds

Longer inventory turnover time in May 2020 compared to plan for 2020 by 36 days caused the overrun the funds by 118 T EUR.

This analysis shows that the saving of funds was especially during the process of transfer of material into semi-finished goods. It is the signal of smooth cooperation between stock of material and production requirements. Another saving of funds is seen from realization of finished goods into sale. It means that produced goods were immediately sold.

Finally we can tell that for acceleration of turnover time is the most important to shorten the production cycle on each level. It is essential to realize that technological and economical discipline should be always under the control in the company. Then the volume of inventory on each phase would be desirable, corresponding to the plan. It is very common that due to mistakes in planning the companies have to face with high level of useless inventory.

Impact of inventory management decision is significant in other important measurements like value added, cash conversion cycle or working capital.

### ***Value Added***

To increase the volume of value added is ensured by the growth in volume of economical process output on the one side while at the same time minimize inputs (Chajdiak, 2010). KPIs for value added show how efficient the good parts are produced. It is the result from own production realization and represent the key indicator for whole organization.

$$\text{Value added} = \text{Sale revenues} - \text{Total material costs} \quad (4)$$

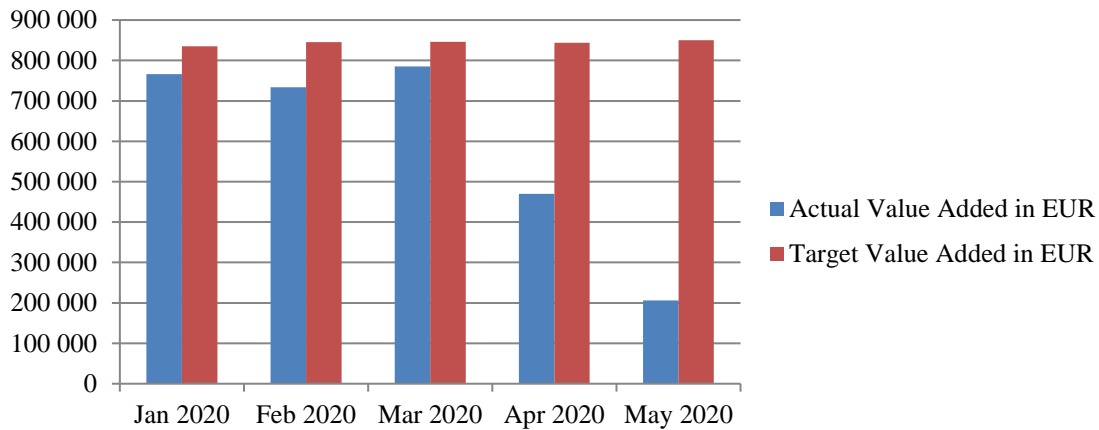


Figure 3 The development of value added indicator compared to target; source: data from internal Profit and Loss report of automotive filters production

The chart shows us the unpleasant development of production in automotive industry due to COVID-19 impact. There is seen a significant decrease of production performance due to lack of demand and high level of unused total material stock.

### *Cash Conversion Cycle*

The main reasons why the companies get into difficulties are not just lack of sales but the company is running out of money (cash) to pay their day-to-day cost of business. A numbers of KPIs have been developed to access a company's cash position, generally known as cash flow. The cash conversion cycle (CCC) is this metric and inventory is a part of it. The CCC metric presents the length of time, usually in days, that it takes for an organization to convert resource input into cash flow. The metric calculation is composed from three steps:

1. the length of time needed to sell inventory (DIO),
2. the length of time needed to collect receivables (DSO),
3. the length of time the company is afforded to pay its bills without penalties (DPO) (Marr, 2012).

Generally said the lower the CCC numbers in days the better for the company's liquidity.

$$CCC = DIO + DSO + DPO \quad (5)$$

DIO gives a measure of the number of days it takes for the company's inventory to turn over, or to be converted to sales, either as cash or as account receivable.

DSO gives a measure of the number of days it takes a company to collect on sales that go into accounts receivables.

DPO gives a measure of how long it takes the company to pay its obligations to suppliers.

CCC KPI should be used as the starting point for performance improvement interventions such as reducing inventory levels by introducing techniques like lean or just-in-time production or techniques to smooth the account receivables process.

## ***Working Capital***

If the organization wants to build a healthy business, needs to measure the cash availability on day-to-day operational activities. For this purpose the working capital ratio is another key cash-flow measure also referred to current position. It measures how much in liquid assets a company has available to build and maintain its business. Generally said the companies with positive working capital ratio will be more successful since they can expand and improve their operations. Current assets represent cash, marketable securities, account receivables and current inventories. Current liabilities include account payables, accrued expenses, current reserves, short-term debt and part of long-term debt that is classified as current (Marr, 2012).

$$\text{Working capital} = \text{Current assets} - \text{Current liabilities} \quad (6)$$

Working capital is often used as barometer to measure an organization's overall health and liquidity. Being in a negative working capital position often makes an organization unattractive to potential investors.

## **4 Discussion and conclusion**

Having a clear picture about the inventory management is helpful at any moment in business. However, during the COVID-19 outbreak, knowing what we have in stock is more important than ever. The companies must closely monitor short-term and long-term demand. For the situations, where stock demand changes dramatically, like the consequences of the pandemic, an effective inventory management system can be extremely beneficial. It can for example reduce manpower needed for managing extra stock requirements. On the other side the company is at the risk of supply chain disruption due to shortage of raw material and component parts. That is why the inventory safety stock parameters need to be updated to reflect the supply-side volatility. Also at the same time; from the cash flow perspective, the entity should consider the actions to reduce semi finished and finished goods inventory. Balancing the demands for more buffer inventory and managing cash flow may not be easy. To keep continuous savings requires fundamental improvements in supply chain visibility, planning and setting the inventory and safety stock policies, production planning and lead-time updating.

There are many KPIs that look at stock management efficiency. However the most important inventory KPIs are those that show how well the company can optimize the stock level. KPIs should meet demand while managing stock levels to prevent over or under stocking.

We might think that KPIs should not primarily be about measurement. We have to remember that behind every number are real people, such as customers who have purchased goods or services or employees who are satisfied or not. It is very important always look behind of the KPIs values to get a real sense of their meaning.

## References

- Marr, B., (2012), "Key Performance Indicators: the 75 measures every manager needs to know", Ashford Color Press Ltd, Gosport, Hampshire, Great Britain, ISBN 978-0-273-75011-6.
- Parameter, D., (2008), "Klíčové ukazatele výkonnosti", John Wiley and Sons, Inc., Hoboken press, New Jersey, United State.
- Zalai, K., a kolektív (2016), "Finančno-ekonomická analýza podniku", Sprint 2 s.r.o. press, Bratislava, Slovakia, ISBN 978-80-89710-22-5.
- Šlosárová, A., (2017), "Analýza účtovnej závierky", Wolter Kluwer servo. press, Bratislava, Slovakia.
- Gozora, V. (2017), "Krizový manažment podniku", Wolter Kluwer s.r.o., Praha, Czech Republic, ISBN 978-80-7552-805-6.
- Král, B. a kol. (2018), "Manažérske účtovníctví", Management Press, Praha, Czech Republic, ISBN 978-80-7261-568-1.
- Chajdiak, J. (2010), "Pomerové ukazovatele ekonomiky firmy", STATIS, Bratislava, Slovakia, ISBN 978-80-85659-61-0.
- Kotulič, R., (2010), "Finančná analýza podniku", Wolters Kluwer, Bratislava, ISBN 978-80-8078-342-6.
- Papula J., Papulová Z., Papula J. (2018), "Strategický manažment", Wolters Kluwer, Bratislava, ISBN 978-80-7598-535-4.
- Moretto A., Caniato F., (2021), "Can Supply Chain Finance help mitigate the financial disruption brought by Covid-19?" (2021) Journal of Purchasing and Supply Management, Elsevier Ltd., 1478-4092.
- Riany D., Norisanti N., Komariah K., (2021), "Financial Performance Analysis using inventory turnover ratio, receivable turnover ratio and fixed asset turnover ratio (2021) ", ALMANA: Jurnal Manajemen dan Bisnis, Volume 5, No. 1/ April 2021, ISSN 2655-8327 online.
- Clampit J., Hasija D., Dugan M., Gabmle J., (2021), "The Effect of risk, R&D Intensity, Liquidity, and Inventory on Firm Performance during COVID-19: Evidence from US Manufacturing Industry", Journal of risk and financial Management, , 14, 499. <https://doi.org/10.3390/jrfm14100499>.
- Vitale J. (2020), "Understanding the impact of COVID-19 Automotive sector", [www.deloitte.com/covid-19-resilient-leadership](http://www.deloitte.com/covid-19-resilient-leadership).

## eGovernment State of Play in V4 countries

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### Abstract

The paper presents the e-government state of play in V4 countries. The primary goal of the research is to present the development of online interactions between citizens and e-government in V4 countries (the Slovak Republic, Czech Republic, Poland, Hungary). Defined sub-goals fulfill the primary goal. Our results provide consistent findings in relative terms about the evolution of interactions between citizens and e-government in individual V4 countries. We then compare these findings and in Table 7 we present the ranking of the V4 countries according to the research results.

Keywords: citizen, Internet, e-government, V4 countries, E-Government Development Index (EGDI)

Article Classification: Research article

## 1 Introduction

Electronic government (e-government ) is the application of Information Technology to government services and procedures in order to deliver public services and information to citizens, businesses and governments electronically (Kim, Pan and Pan, 2007). Access to the Internet is a necessary prerequisite for the real functioning of e-Government (Vartášová, Červená, 2017). Currently, public administration faces increasing challenges in the field of effective electronic public administration, as well as in the field of providing information and services to those who do not have access to the Internet or do not have a bank account (Majerová, 2019, p. 121).

In this case, governments realize that by applying the same principles and technologies that drive e-business, they can achieve a similar transformation in relation to citizens (Silcock, 2001). This contribution is aimed at presenting the results of online citizen and e-government interactions in the V4 countries.

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## 2 Methodology and Methods

At the beginning of the research, we formulated the following research questions:

1. What is the percentage of households connected to the Internet in the V4 countries?
2. What is the percentage of online interactions citizen vs. e-government in V4 countries?
3. What is the percentage of online information retrieval from e-government websites in V4 countries?
4. What is the percentage of online downloads of official e-forms from e-government sites in V4 countries?
5. What is the percentage of online submissions of completed official e-government e-forms in V4 countries?

Based on the established research questions, we set the goal of the research. The aim of the research is to present the development of online interactions between citizens and e-government in V4 countries (the Slovak Republic, the Czech Republic, Poland, Hungary). In order to fulfill the primary goal, we have defined partial goals:

- find out the percentage of household connections to the Internet in the V4 countries (research variable „A“),
- find out the percentage of online interactions between citizens and e-government in V4 countries (research variable „B“),
- find out the percentage of online information acquisition from e-government websites in V4 countries (research variable „C“),
- find out the percentage of online downloads of official e-forms from e-government in V4 countries (research variable „D“),
- find out the percentage of completed e-government e-forms sent online in V4 countries (research variable „E“),
- visualize the obtained outputs using tables and graphs, provide interpretations of the obtained outputs.

In the research, we applied the following mutually complementary research methods: analysis - synthesis, induction - deduction, abstraction - concretization, comparison. We used the following research techniques: literature search, data analysis. The object of the research is: online interaction via the Internet – citizen vs. e-government. The subject of the research is scientific and professional literature, data from Eurostat, data from the statistical offices of the V4 countries. The examined period is 2018 – 2021. The structure of the paper is created in accordance with the requirements for scientific papers (introduction, methodology and methods, current state of the issue home and abroad, results, discussion and conclusion, references).

## 3 Current state of the issue home and abroad

Defination of e-gouvernement: Administrative authorities fulfil self-governing, administrative and public administration tasks. Public authorities refer to both public services and administration activities, e.g. tax, customs, business registration, social security, public health, environment or commune administrations. By competency, there are central, regional and local public authorities. The enterprise or household can use the Internet for interaction with public authorities to obtain information from public

authorities' websites or home pages obtain forms from public authorities' websites or home pages, submit completed forms electronically (KSH, 2022).

Electronic government plays a decisive role in the advancement of the economy of the government, enabling citizens to interact more efficiently, transparent and economic ways between the government and citizens – Government to Citizen (G2C), government and businesses – Government to Business (G2B) and between agencies and relationships – Government to Government (G2G) (Mushayt, 2019).

As he states Aranyossa (2018, p. 2) points out, although the research area of e-government technology adoption by individuals (citizen/client) is underexplored, most studies fall into the following categories:

- analysis of technology adoption of electronic public administration services under hypothetical circumstances (e.g. Alomari et al. 2014; Nemeslaki et al. 2016);
- analysis of intentions to use the technology, not the actual use of the e-government service (e.g. Carter and Belanger 2005, Lin et al. 2011);
- analysis of the actual use of only one system or service (e.g. Hung et al. 2006, AlAwadhi and Morris 2008).

Several studies also deal with the integration of innovative artificial intelligence technologies into e-Government, for example: Cloud Computing (Zhang and Chen, 2010; Almarabeh, Majdalawi and Mohammad, 2016; Nanos, Manthou and Androutsou, 2018; Mudawi, Beloff, White, 2020; and others ), Blockchain (Park, Kim, Choi and Shim, 2018 ; Kuperberg, Kemper, Durak, 2019; Fatrah, Kafhali, Haqiq and Salah, 2019; Kassen, 2022; Saxena, Shao, Nikiforova and Thapliyal, 2022; and others), Learn Machine (Alexopoulos, et al., 2019; Zhao, 2021; Mengesha and Ayanso, 2021; Aljuboori, 2021; and others), Deep Learning (Mushayt, 2019; Gaur, Ujjan and Hussain, 2022; and others).

Several empirical studies on the impact of e-Government on citizens bring findings that the most frequently investigated impacts of this area are productivity for taxpayers and clients, client satisfaction and quality of services for clients, and better trust and communication for citizens. Likewise, there are many areas where limited research has been conducted (Lean, Titah, 2021).

The study of authors Morote, Rosa and Chicharro, (2020, p. 13) brings findings that the level of use of e-government services by citizens in EU countries is influenced by „the quality of the national offer of such services, the levels of citizens' trust in governments and the digital divide generated by populations' per capita income and citizens' level of education”.

The quality of electronic public administration services should be regularly analyzed. Subsequently, based on the results of the analysis, a strategy capable of improving the quality of the services offered, or increasing the satisfaction of the beneficiaries, should be developed (Sá, Rocha and Cota, 2016).

According to Bečka (2014, p. 10), the very transformation of the governments of the European Union countries into a system computerized society (e-government) is not a guarantee of the quality of the desired output for citizens, because the primary creation of the output (acceptance of the citizen/client request, its processing and sending) is ongoing in the internal environment of the public administration organization (not in the e-network) controlled synergistic ( $1+1 = 2 +$  added value) cooperation of resources 6M + 1K + 1I (Man/human resources, Medium/working environment, Money/ financial resources, Method/ working methods and procedures, Machine/ working machines and equipment, Material/ working material + Knowledge + Information). The interaction link through the e-network (e-government vs. citizen/client) represents the very distribution of input and output value (receiving a request, sending a response).

In the same way, the expected positive success of e-government ultimately depends on whether users - public administration employees and citizens (clients) are „willing to accept and use an innovation, a new tool, system or service“ (Aranyossy, 2018).

As reported by Zheng and Schachter (2017) greater citizen satisfaction with e-services leads to greater use and participation in such services.

It turns out that one of the most used models for investigating the acceptance of information technology innovations is the Technology Acceptance Model (TAM®). The original TAM model was expanded with many improvements, and the United Theory of Acceptance and Use of Technology (UTAUT) model tried to unify these improvements into a congruent whole (Aranyossy, 2018).

According to the TAM (Davis, 1986), individuals' acceptance of information systems is influenced by two key variables, namely “perceived ease of use” and “perceived usefulness” (Morote, Rosa a Chicharro, 2020).

Since 2002, the European Commission established an annual survey of Information society on measurement of development in the area of the use of Information and Communication Technologies (ICT) in enterprises and households. Eurostat has developed two models of surveys for enterprises and individuals, in collaboration with the member countries of the EU and OECD, which they have adapted into the totheir statistical programs. The aim of ICT survey is to determine the level of households access to Information and Communication Technologies as well as determine the level of knowledge and skills of the population and the ability to use these Technologies. The results of the servey to assess developments in the field of information and communication technologies, also in international comparisons (SO SR, 2021, p. 7).

Also, several initiatives have tried to measure the efforts of the states that they spend on the development of electronic public administration. According to a study (Mengesha and Ayanso, 2021), the UN e-Government Development Index (EGDI) is the only global report that ranks and classifies UN member states into four categories (very high, high, middle and low) based on a weighted average of the normalized scores of online services (OSI)<sup>1</sup>, telecommunications infrastructure (TII)<sup>2</sup> and human capital (HC)<sup>3</sup>. The EGDI is used as a benchmark to determine a numerical ranking of e-government development of United Nations Member (United Nations, 2020, p. 231).

According to Alexopoulos, Ch. et al., (2019, p. 8), the most cited advantage of using Machine Learning in e-government is „accuracy, efficiency, scalability and flexibility“. The limitation of machine learning shows „the nature of the data and the human intervention required to interpret the results“, which may lead to misleading outputs.

When implementing new innovative technological projects in organizations (financial, non-financial, government), there is a significant risk from the point of view of the security of the virtual world – for example: unverified nature of innovative technology, cyber attacks, theft and misuse of data, etc. Governments should therefore

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<sup>1</sup> The scope and quality of online services (questionnaire) quantified as the Online Service Index (OSI);

<sup>2</sup> The Telecommunication Infrastructure Index (TII) is an arithmetic average composite of four indicators: estimated internet users per 100 inhabitants; number of mobile subscribers per 100 inhabitants; active mobile-broadband subscription; and number of fixed broadband subscriptions per 100 inhabitants. The International Telecommunication Union is the primary source of data.

<sup>3</sup> The Human Capital Index (HCI) consists of four components: adult literacy rate; the combined primary, secondary and tertiary gross enrolment ratio; expected years of schooling; and average years of schooling. The UNESCO-UIS is the primary source of data.

reduce the pressure of future risk by including ethical codes (protocols) and legislative frameworks in their projects (Bečka, 2019, p. 72).

#### 4 Results

Table 1 shows the percentage of households with internet in the Visegrad Group countries and the mean for the EU-27 in the period under review 2018 – 2021.

In Figure 1, we visualize the development of the percentage of households with internet in the V4 countries and the mean for the EU-27 in the period under review 2018 – 2021. In Figure 2, we visualize the percentage of households with internet in the countries of the V4 in 2021.

Table 1 The percentage of households with internet in the Visegrad Group countries and the mean for the EU-27; source: Eurostat, 2022

Country/Year/(%)	2018	2019	2020	2021
Slovak Republic	81	82	86	90
Czech Republic	86	87	88	89
Poland	84	87	90	92
Hungary	83	86	88	91
European Union - 27 countries (Mean)	88	90	91	92

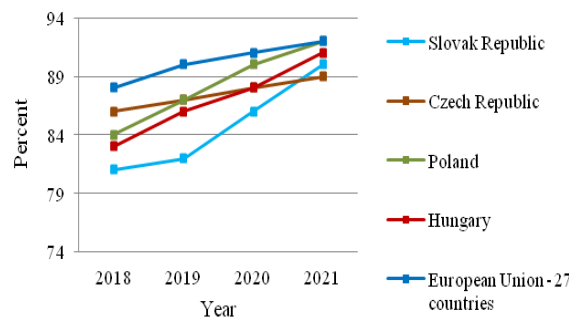


Figure 1 The percentage of households with internet in V4 countries; source: Eurostat, 2022

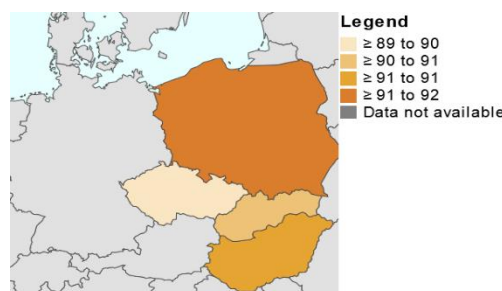


Figure 2 The percentage of households with internet in V4 countries (2021); source: Eurostat, 2022

From the data presented in Table 1 and Figure 1, we observe a growing trend in the development of the percentage of households with the Internet in all V4 countries in the examined period 2018 – 2021 (for more details, see also Figure 1 – data for the year 2021). The largest year-on-year growth in the percentage of households with internet is observed in Slovakia in 2020 and 2021 (the period of the Covid-19 pandemic), when we record an increase in the number of households with internet by  $\uparrow 4\%$  (2020) compared

to 2019 (82 %) and an increase by  $\uparrow 4$  % (2021) compared to 2020 (86 %). In the other V4 countries, we note year-on-year increases in the number of households with internet by  $\uparrow 1$  % (Czech Republic) and by  $\uparrow 2$ -3 % (Poland and Hungary) in the period under review. For the EU-27 average, we observe year-on-year changes in the range of  $\uparrow 1$ -2 %.

It is clear from the Figure 2 that the largest percentage of households with internet (2021) is in Poland, 92 %. Poland is followed by Hungary with 91 % of households with internet, then Slovakia with 90 % of households with internet and the Czech Republic with 89 % of households with internet. The mean for the EU-27 is 92 %. From the above, we conclude that in 2021 the number of households with internet in the V4 countries was close to the EU-27 mean.

Table 2 shows the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to interact with e-government online in the period under review 2018 – 2021.

Table 2 The percentage of all citizens in V4 countries and the mean for the EU-27 who use the Internet to interact with e-government online; source: Eurostat, 2022

Country/Year/(%)	2018	2019	2020	2021
Slovak Republic	51	59	62	56
Czech Republic	53	54	57	68
Poland	35	40	42	47
Hungary	53	53	60	73
European Union - 27 countries (Mean)	51	53	57	58

In Figure 3, we visualize the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to interact with e-government online in the period under review 2018 – 2021.

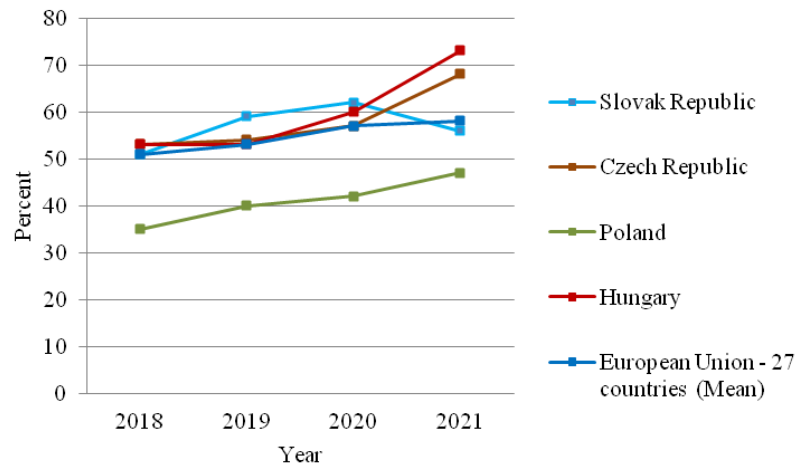


Figure 3 The percentage of all citizens in V4 countries and the mean for the EU-27 who use the Internet to interact with e-government online; source: Eurostat, 2022

In the examined period 2018 – 2021, we observe an increasing trend in the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet for online interaction with e-government. The exception is the Slovak Republic, where we observe a sharp increase in online interaction between citizens and e-government in 2019, when we record an annual increase of  $\uparrow 8$  % (from 51 % to 59 %)

compared to 2018, an increase of  $\uparrow 3\%$  (from  $59\%$  to  $62\%$ ) in 2020 and a subsequent decrease of  $\downarrow 6\%$  (from  $62\%$  to  $56\%$ ) in the second year of the Covid-19 pandemic (2021). The biggest year-on-year increase in the percentage of online interaction citizen vs. e-government by  $\uparrow 13\%$  (from  $60\%$  to  $73\%$ ) is recorded for Hungary in 2021 (the second year of the Covid-19 pandemic). In the same year (2021) in the Czech Republic, we observe a year-on-year increase in online interaction between citizens and e-government by  $\uparrow 11\%$  (from  $57\%$  to  $68\%$ ) and in Poland an increase by  $\uparrow 5\%$  (from  $42\%$  to  $47\%$ ). We recorded the lowest percentage of online interaction between citizens and e-government in 2018 in Poland with a value of  $35\%$ . Poland did not reach the average percentage values of the EU-27 in the 2018 – 2021 period under review. The other V4 countries significantly exceeded the mean percentage value of the EU-27.

Table 3 shows the percentage of all citizens in the V4 countries and the average for the EU-27 who use the Internet to obtain information from e-government websites in the period under review 2018 – 2021.

Table 3 The percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to obtain information from e-government websites; source: Eurostat, 2022

Country/Year/(%)	2018	2019	2020	2021
Slovak Republic	46	47	51	52
Czech Republic	50	52	53	58
Poland	24	25	27	29
Hungary	48	50	60	72
European Union - 27 countries (Mean)	43	44	48	47

In Figure 4, we visualize the percentage of all citizens in the V4 countries and the average for the EU-27 who use the Internet to obtain information from e-government websites in the period under review 2018 – 2021.

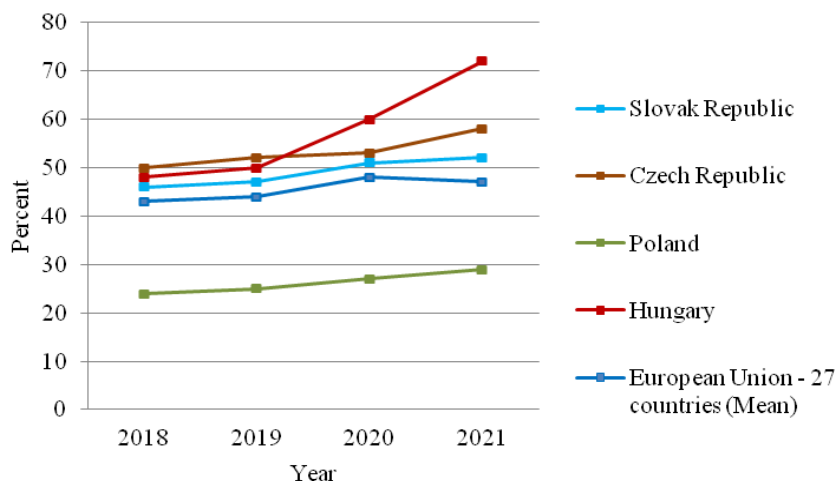


Figure 4 The percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to obtain information from e-government websites; source: Eurostat, 2022

In the examined period 2018 – 2021, we observe a growing trend in the percentage of residents using the Internet to obtain information from e-government websites, which exceeds the mean percentage values for the EU-27 (except Poland). The greatest increase in the use of the Internet for obtaining information from e-government websites is

observed in Hungary during the Covid-19 pandemic, when in 2020 we record an annual increase of  $\uparrow 10\%$  compared to 2019 (from  $50\%$  to  $60\%$ ) and in 2021, when we are recording year-on-year growth of  $\uparrow 12\%$  (from  $60\%$  to  $72\%$ ). We observe the lowest percentage of Internet use for obtaining information from e-government websites in Poland during the entire 2018 – 2021 period under review, where we record a maximum of  $\uparrow 1\text{-}2\%$  year-on-year growth. The percentage variable – citizens' use of the Internet to obtain information from e-government websites in Poland ( $24\%$ ,  $25\%$ ,  $27\%$ ,  $29\%$ ) do not reach the mean values for the EU-27 ( $43\%$ ,  $44\%$ ,  $48\%$ ,  $47\%$ ).

In Table 4, we present the percentage of all citizens in the V4 countries and the average for the EU-27 who use the Internet to download official e-forms from e-government websites in the period under review 2018 – 2021.

Table 4 The percentage of all citizens in V4 countries and average for EU-27 who use the Internet to download official e-forms from e-government websites; source: Eurostat, 2022

Country/Year/(%)	2018	2019	2020	2021
Slovak Republic	24	25	28	30
Czech Republic	26	28	28	31
Poland	22	25	25	27
Hungary	38	41	41	67
European Union - 27 countries (Mean)	31	32	35	38

In Figure 5, we visualize the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to download official e-forms from e-government sites in the period under review 2018 – 2021.

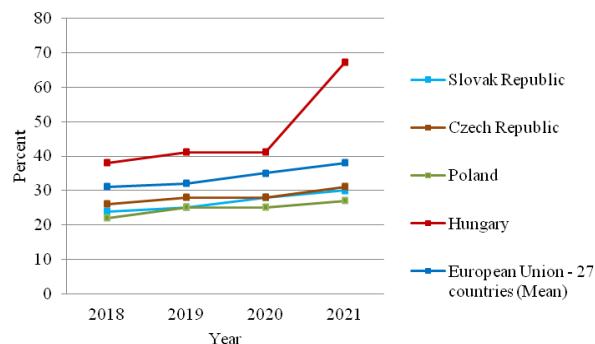


Figure 5 The percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to download official e-forms from e-government websites; source: Eurostat, 2022

In the examined period 2018 – 2021, we observe the largest increase in the percentage variable – citizens of the V4 countries who use the Internet to download official e-forms from the e-government websites near Hungary, where we note a slight year-on-year growth of the variable by  $\uparrow 3\%$  (year 2019) compared to 2018 (from  $38\%$  to  $41\%$ ), zero year-on-year growth of the variable in 2020 and up to  $\uparrow 26\%$  year-on-year growth of the variable in the second year of the Covid-19 pandemic (2021) compared to 2020 (from  $41\%$  to  $67\%$ ). The stated values of the variable (Hungary) exceed the average values of the variable for the EU-27. The rest of the V4 countries do not reach the EU-27 mean in the period under review.

In Table 5, we present the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to send completed e-forms to e-government in the period under review 2018 – 2021.

Table 5 The percentage of all citizens in V4 countries and mean for EU-27 who use the Internet to send completed e-forms to e-government; source: Eurostat, 2022

Country/Year/(%)	2018	2019	2020	2021
Slovak Republic	16	18	19	25
Czech Republic	26	25	29	52
Poland	25	31	34	40
Hungary	37	39	37	66
European Union - 27 countries (Mean)	33	36	38	44

In Figure 6, we visualize the percentage of all citizens in the V4 countries and the mean for the EU-27 who use the Internet to send completed e-forms to e-government in the period under review 2018 – 2021.

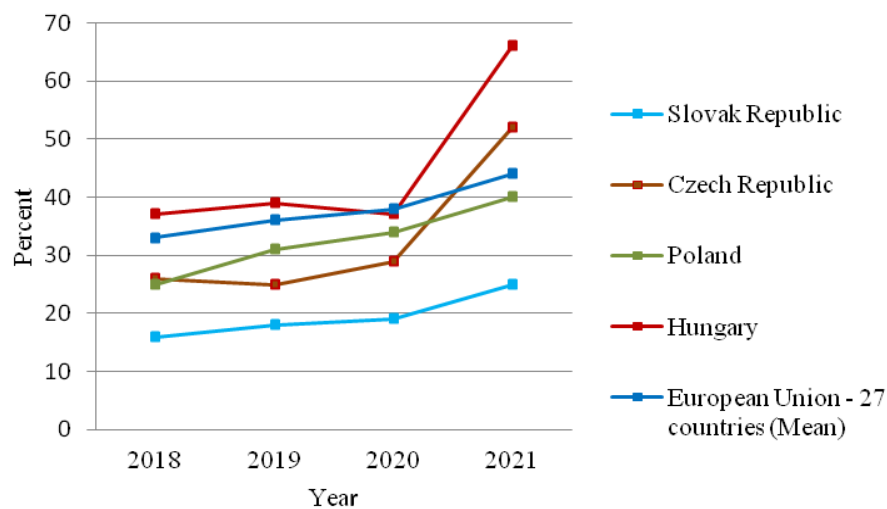


Figure 6 The percentage of all citizens in V4 countries and mean for EU-27 who use the Internet to send completed e-forms to e-government; source: Eurostat, 2022

In the examined period 2018 – 2021, we observe a slight year-on-year growth of the relative variable for the Slovak Republic – all citizens who use the Internet to send completed e-forms to the e-government by  $\uparrow 2\%$  in 2019 compared to 2018 (from 16 % to 18 %). by  $\uparrow 1\%$  in 2020 compared to 2019 and an annual increase of  $\uparrow 6\%$  in the second year of the Covid-19 pandemic (2021) compared to 2020 (from 19 % to 25 %). In the examined percentage variable, the Slovak Republic does not reach the mean percentage values for the EU-27 (2018 – 2021). For the Czech Republic, we observe a slight year-on-year growth of the studied percentage variable by  $\uparrow 1\%$  in 2019 compared to 2018 (from 25 % to 26 %), by  $\uparrow 4\%$  in the first year of the Covid-19 pandemic (2020) compared to 2019 (from 25 % to 29 %). In the second year of the pandemic (2021), we note a significant increase in the percentage of all citizens in the Czech Republic who use the Internet to send completed e-forms to e-government by  $\uparrow 23\%$  compared to 2020 (from 29 % to 52 %). For Poland, we observe an annual growth of the studied percentage variable by  $\uparrow 6\%$  in 2019 compared to 2018 (from 25 % to 31 %), by  $\uparrow 3\%$  in 2020 and an increase of 6 % in the second year of the Covid-19 pandemic (2021) compared to in 2020 (from 34 % to 40 %). Hungary shows the highest values of the examined percentage variable for V4. The maximum value of the percentage variable – all citizens who use the Internet to send completed e-forms to the e-government was reached by Hungary in the second year of the Covid-19 pandemic (2021), when we record a year-on-year increase



of 29 % compared to 2020 (from 37 % to 66 % ). The values of the studied percentage variable of Hungary are the only one for the V4 that exceed the mean of the values of the percentage variable for the EU-27 during the entire study period 2018 – 2021. Table 6 illustrates the EDGI ranking of the V4 countries.

Table 6 E-Government Development Index (EGDI) 2020; source: United Nations, 2020, pp. 266-272

Country	EGDI Level	Rating Class	2018 Rank	2020 Rank	EGDI	Online Service Index	Telecommunications Infrastructure Index	Human Capital Index
Slovak Republic	Very High	V1	49	48	0,78	0,72	0,80	0,83
Czech Republic	Very High	V2	54	39	0,81	0,72	0,81	0,90
Poland	Very High	V3	33	24	0,85	0,86	0,80	0,90
Hungary	Very High	V1	45	52	0,77	0,75	0,73	0,85
Europe	Very High	VH	-	-	0,82	0,77	0,82	0,87

From Table 6, we observe that all V4 countries achieve the highest degree of EGDI level (Very High), which is a positive level. The best results in the EGDI ranking (2020) for V4 were achieved by Poland with an E-Government Development Index (EGDI) of 0.85, which is above the EU mean (0.82); Online Service Index 0.86, Telecommunications Infrastructure Index 0.80 and Human Capital Index 0.90. In 2020, Poland is on the 24th place (rank) (out of 193 evaluated countries), it has improved its ranking by 9 places compared to 2018. Behind Poland on the 39th place is the Czech Republic with an EGDI of 0.81. It is followed by Slovakia with EGDI 0.78 and Hungary with EGDI 0.77. In the global ranking for 2020, Denmark ranks first with an EGDI index rating of 0.98. In second place is the Republic of Korea with an EGDI of 0.96; in third place is Estonia with EGDI 0.95 (United Nations, 2020).

Table 7 shows the ranking of the V4 countries according to the research results

Citizen vs. e-government in V4/ranking	A	B	C	D	E	EGDI (2020)
Slovak Republic	3	3	3	3	4	1
Czech Republic	4	2	2	2	2	1
Poland	1	4	4	4	3	1
Hungary	2	1	1	1	1	1

Explanations to Table 7:

research variable A, B, C, D, E

A – Percentage of households with internet in the Visegrad Group countries;

B – Percentage of all citizens in V4 countries who use the Internet to interact with e-government online;

C – Percentage of all citizens in the V4 countries who use the Internet to obtain information from e-government websites;

D – Percentage of all citizens in V4 countries who use the Internet to download official e-forms from e-government websites;

E – Percentage of all citizens in V4 countries who use the Internet to send completed e-forms to e-government;

ranking – 1, 2, 3, 4

EGDI level – „Very High“ (rank 1)

The as we can see from Table 7, Hungary achieves the best results in research variables. According to our assessment, the Czech Republic is second in the order,

followed by Slovakia. Despite the fact that Poland has 92 % of households with the Internet (1 in our ranking) and according to the EGDI ranking (2020) it is in the first place among the V4 countries, according to the results of our research it is ranked last.

## 5 Discussion and Conclusion

Our research brings the following findings: the countries of the Visegrad Group (the Slovak Republic, Czech Republic, Poland, Hungary) show a growing trend of the research variable „A“ – the percentage of households connected to the Internet in the V4 countries, while the largest percentage value of this studied variable is recorded for Poland in 2021 with a value of 92 %, which corresponds to the mean level of the studied variable for the EU-27. In second place is Hungary with a percentage value of household internet connection of 91 % (2021). In third place was the Slovak Republic with 90 % (2021), and in fourth place was the Czech Republic with 89% of households connected to the Internet (2021).

Similarly, the growing trend is shown by the research variable „B“ – the percentage of online citizen-e-government interactions in V4 countries that use the Internet to interact with e-government. An exception in the growing trend of the examined variable „B“ is the Slovak Republic, where in the second year of the Covid-19 pandemic (2021) we record a year-on-year decrease of ↓6 % (from 62 % to 56 %). The highest percentage values of variable no. 2 is recorded for Hungary with a maximum value of 73 % in 2021, which is 15 % more than the EU-27 mean (58 %). On the contrary, Poland shows the lowest percentage values (e.g. in 2021 at the level of 47 %).

In the research variable „C“ – the percentage of online obtaining of information from e-government websites in V4 countries, we note an increasing trend of the percentage variable for all V4 countries. The highest year-on-year growth of the examined variable „C“ we observe for Hungary in the first and second year of the Covid-19 pandemic, where in 2020 we record the percentage of online acquisition of information from e-government websites at the level of 60 % and in 2021 at the level of 72 %, which is 25 % more than the mean for EU-27 (2021). The lowest percentage values of the investigated variable no. 3 we record for Poland (e.g. 27 % in 2020, 29 % in 2021). The Slovak Republic and the Czech Republic show percentage values above the level of the EU-27 mean.

When research variable „D“ – the percentage of online downloads of official e-forms from e-government in V4 countries, we observe the highest percentage growth in Hungary in the second year of the Covid-19 pandemic, when we record an annual growth of ↑26 % compared to 2020 (from 41 % to 67 %). These values exceed the mean values for the EU-27 by 6 and 29 %. The rest of the V4 countries do not reach the EU-27 mean in the period under review.

The research variable „E“ – the percentage of completed e-government e-forms sent online in the V4 countries shows the highest values in Hungary, where in the second year of the Covid-19 pandemic (2021) we record a year-on-year increase of 29 % compared to 2020 (from 37 % to 66 %). The values of the studied percentage variable of Hungary are the only one for V4 that exceed the mean of the values for the EU-27 during the entire studied period 2018 – 2021. The lowest percentage values of the studied variable no. 5 in the range of 16 % (2018) to 25 % (2021) we record for the Slovak Republic.

The conclusions of our research prove that the state of e-government in the V4 countries is from the point of view of citizen vs. e-government (2018 – 2021) in good

condition. The best results are achieved by Hungary, followed by the Czech Republic, Slovakia and Poland (see Table 7 for details).

## References

- AlAwadhi, S., and Morris, A. (2008), *The Use of the UTAUT Model in the Adoption of E-government Services in Kuwait*. Proceedings of the 41st Hawaii International Conference on System Sciences. pp. 1530-1605. doi:10.1109/HICSS.2008.452.
- Alexopoulos, Ch. et al., (2019), *How Machine Learning is Changing e-Government*. ICEGOV'19, 3-5 April 2019, Melbourne, Australia. Pages: 10. doi:10.1145/3326365.3326412.
- Aljuboori, S. (2021), *Botnet detection in e-government network using machine learning*. (Yayınlanmamış yüksek lisans tezi). Altınbaş Üniversitesi, Lisansüstü Eğitim Enstitüsü, İstanbul. Pages: 60.
- Almarabeh, T., Majdalawi, Y., Mohammad, H. (2016), *Cloud Computing of E-Government*. Computer Science & Communications, Scientific Research Publishing, pp. 1-8, doi: 10.4236/cn.2016.81001.
- Alomari, M. K., Sandhu, K., & Woods, P. (2014), *Exploring citizen perceptions of barriers to e-government adoption in a developing country*. Transforming Government: People, Process and Policy, 8(1), pp. 131-150, doi:10.1108/TG-05-2013-0013.
- Androniceanu, A., Kinnunen, J., Georgescu, I. (2020), *E-Government clusters in the EU based on the Gaussian Mixture Models*. Administratie si Management Public, 35, pp. 6-20, doi: 10.24818/amp/2020.35-01.
- Aranyosy, M. (2018), *Citizen adoption of e-government services – Evidence from Hungary*. 31th Bled eConference Digital Transformation – Meeting the Challenges, Bled, Slovenia, 2018. Pages: 18.
- Bečka, M. (2014), *Implementácia modelu CAF do systému riadenia inštitúcie verejnej správy*. Diplomová práca. Bratislava: VŠM v Trenčíne, Slovakia 2014, Pages: 149.
- Bečka, M. (2019), *Alternatívne investovanie. (Alternative Investment)*. International Scientific Conference „Current Problems of the Corporate Sector 2019. Department of Business, Faculty of Business Management, EU in Bratislava, Slovakia. pp. 62-77.
- Carter, L., Bélanger, F. (2005), *The utilization of e-government services: citizen trust, innovation and acceptance factors*. Information Systems Journal, 15(1), pp. 5-25, doi: 10.1111/j.1365-2575.2005.00183.x.
- Davis, F.D. (1986), *A technology acceptance model for empirically testing new end-user information systems: theory and results*. Doctoral dissertation. MIT Sloan School of Management, Cambridge, MA.
- Fatrah, A., El Kafhali, S., Haqiq, A., Salah, K. (2019), *Proof of concept blockchain-based voting system*. In: Proceedings of the 4th International Conference on Big Data and Internet of Things, pp. 1–5. ACM, New York, doi: 10.1145/3372938.3372969.
- Gaur, L., Ujjan, R. M. A. and Hussain, M. (2022), *The Influence of Deep Learning in Detecting Cyber Attacks on E-Government Applications*. Cybersecurity Measures for E-Government Frameworks. IGI Global, Publisher of Timely Knowledge. Pages:16, doi: 10.4018/978-1-7998-9624-1.ch007.
- Hung, S. Y., Chang, C. M., and Yu, T. J. (2006), *Determinants of user acceptance of the e-Government services: The case of online tax filing and payment system*. Government Information Quarterly, 23(1), pp. 97-122, doi: 10.1016/j.giq.2005.11.005.
- Kassen, M. (2022), *Blockchain and e-government innovation: Automation of public information processes*. Information Systems, Elsevier, Volume 103, pages: 11, doi:10.1016/j.is.2021.101862
- Kim, H. J., Pan G., and Pan, S, L. (2007), *Managing IT-enabled transformation in the public sector: A case study on e-government in South Korea*. Government Information Quarterly 24(2): pp. 338-352, doi:10.1016/j.giq.2006.09.007.

- KSH, (2022), Information, Communication. Telecommunication. [online] <[https://www.ksh.hu/docs/eng/modsz/ikt\\_meth.html](https://www.ksh.hu/docs/eng/modsz/ikt_meth.html)> [accessed 2022-03-13].
- Kuperberg, M., Kemper, S. and Durak, C. (2019), *Blockchain usage for government-issued electronic IDs: a survey*. In: Proper, H., Stirna, J. (eds.) *Advanced Information Systems Engineering Workshops CAiSE (2019), International Workshops*, vol. 349, pp. 155–167. Springer Cham (2019), doi: 10.1007/978-3-030-20948-3\_14.
- Lean, D. M., Titah, R. (2021), *A Systematic Literature Review of Empirical Research on the Impacts of e-Government: A Public Value Perspective*. *Public Administration Review*, Vol 82, Iss 1, pp. 23-38. By The American Society for Public Administration, doi: 10.1111/puar.13413.
- Lin, F., Fofanah, S. S., and Liang, D. (2011), *Assessing citizen adoption of e-Government initiatives in Gambia: A validation of the technology acceptance model in information systems success*. *Government Information Quarterly*, 28(2), pp. 271-279, doi: 10.1016/j.giq.2010.09.004
- Majerová, I. (2019), *E-Government a Smart Solution For Public Administration: A Case Of Visegrad Group*. *Association of Economists and Managers of the Balkans JETSS*, 2019, 2: pp. 115-123. doi: 10.31410/Balkans.JETSS.2019.2.2.115-123.
- Mengesha, N., Ayanso, A. (2021), *Examining the Evolution of E-Government Development of Nations Through Machine Learning Techniques*. *Handbook of Research on Applied Data Science and Artificial Intelligence in Business and Industry*. Pages: 23, doi: 10.4018/978-1-7998-6985-6.ch004.
- Morote-Pérez, R., Rosa-Pontones, C., Chicharro-Núñez, M. (2020), *The effects of e-government evaluation, trust and the digital divide in the levels of e-government use in European countries*. *Technological Forecasting & Social Change*, Volume 154, pp. 1-14, doi: 10.1016/j.techfore.2020.119973.
- Mushayt, O. S. A., (2019), *Automating E-Government Services With Artificial Intelligence*. Published in: *IEEE Access*, Volume 7, Pages: 146821-146829. doi: 10.1109/ACCESS.2019.2946204.
- Mudawi, N. A., Beloff, N. and White, M. (2020), *Issues and challenges: cloud computing e-Government in developing countries*. *International Journal of Advanced Computer Science and Applications*, Volume 11, No 4. pp. 7-11.
- Nanos, I., Manthou, V., Androutsou, E., (2018), *Cloud Computing Adoption Decision in E-government*. *Operational Research in the Digital Era – ICT Challenges*, Springer Proceedings in Business and Economics book series (SPBE), pp. 125–145, doi: 10.1007/978-3-319-95666-4\_9.
- Nemeslaki, A., Aranyossy, M., and Sasvári, P. (2016), *Could on-line voting boost desire to vote?– Technology acceptance perceptions of young Hungarian citizens*. *Government Information Quarterly*, 33(4), pp. 705-714, doi: 10.1016/j.giq.2016.11.003.
- Park, J. S., Kim, I. S., Choi, CH. and Shim, J. S. (2018), *How to Define Value on Data under Blockchain Driven Open Data System for E-Government*. *ICEGOV '18: Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance* April 2018 Pages 670–672, doi: 10.1145/3209415.3209436.
- Saxena, S., Shao, D., Nikiforova, A., and Thapliyal, R. (2022), *Invoking blockchain technology in e-government services: a cybernetic perspective*. *Digital Policy, Regulation and Governance*, Vol. 24, No. 3, pp. 246-258, doi: 10.1108/DPRG-10-2021-0128.
- Sa, F., Rocha, A., and Cota, M. P. (2016), *Potential dimensions for a local e-Government services quality model*. *Telematics and Informatics*, 33(2), pp. 270-276, doi: 10.1016/j.tele.2015.08.005.
- Silcock, R. (2001), *What is E-government*. *Parliamentary Affairs*, Volume 54, Issue 1. Pages: 88–101, doi:10.1093/pa/54.1.88.
- SO SR, (2022), *Survey on Information and Communication Technologies Usage in Households 2021*. [online] Vartašová, A., Červená, K. (2017), *Implementation of e-Government in the Slovak Republic at the level of local self-government*. Conference: ECDG: 17th European Conference on Digital Government At Lisboa, Portugal. [online] Available:

- <[https://www.researchgate.net/publication/335882859\\_Implementation\\_of\\_e-Government\\_in\\_the\\_Slovak\\_Republic\\_at\\_the\\_level\\_of\\_local\\_self-government](https://www.researchgate.net/publication/335882859_Implementation_of_e-Government_in_the_Slovak_Republic_at_the_level_of_local_self-government)> [accessed 2022-06-07] .
- Zang, W. J., Chen, Q. (2010), *From E-government to C-government via Cloud Computing*. International Conference on E-Business and E-Government (Guangzhou, China, 2010), doi: 10.1109/ICEE.2010.177.
- Zhao, W. (2021), *Construction and Application of E-Government Simulation Network Experimental Teaching Practice Environment under the Background of Machine Learning*. Mobile Information Systems, Volume 2021, doi: 10.1155/2021/1952428.
- Zheng, Y., Schachter, H.L. (2017), *Explaining citizens' E-participation use: the role of perceived advantages*. Public Org. Rev. 17 (3), pp. 409–428, doi: 10.1007/s11115-016-0346-2.
- United Nations, (2020), *E-Government Survey 2020*. Digital Government in the Decade of Action for Sustainable Development. With addendum on COVID-19 Response. United Nations, New York, 2020. Pages: 323. [online] Available: <<https://publicadministration.un.org/en/Research/UN-e-Government-Surveys>> [accessed 2022-07-13] ISBN 978-92-1-123210-3.

## Industry 4.0 in Construction Industry: The Overview of Related Technologies

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### Abstract

There are numerous changes happening in current society, however it is difficult to determine which of these changes are more significant and influential than others. One of the views on this problematic suggests that between there are technological changes included in the most important factors when summarizing the condition of the societal world of today. The Industry 4.0 is precisely the study of these type of changes, which reviews the latest and the most actual ongoing innovations and milestones in this field. However, the Industry 4.0 is categorically too comprehensive topic from many points of view. Not only it is the continuous process of previous industrial revolutions and potentially, the Industry 4.0 is also a predecessor of new conceptual technological eras which are ahead of present society. There are also various types of technologies themselves, which split the Industry 4.0 into different variations of this concept. That is why one of the methods of division of Industry 4.0 is an areal differentiation based on the specific industry which is affected by the concept. Several research and articles study and analyze the Industry 4.0 in the construction industry, which became a background for the formation of new field of study with the related term that was put to use. It is so-called Construction 4.0 and this concept is comprised of innovations and technologies used in this industry, which is one of the largest and the most influential in the economy. There are constant changes and new trends occurring in Construction 4.0, which makes it a suitable representant of the Industry 4.0 topic. Researching and exploring this subject is vital as the construction industry grows and in certain economies there is expected increase of more than 50% in usage of new technologies in this industry by 2025.

Keywords: Construction 4.0; Industry 4.0; innovations; technologies.

Article Classification: Research article

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## **1 Introduction**

Industry 4.0, also known as the fourth industrial revolution, represents the concept of industry transformation and into a digital form in order to achieve a better quality of the organizational process and higher added value. This transformation should be accomplished by various factors. For instance, the usage of modern technological systems with sophisticated software built-in, the implementation of the IoT concept in the production process, the expansion of communication or the interconnection of machines used in industry in many other ways serving for innovation and the efficiency of industrial production. In a very simplified manner, it is possible to define Industry 4.0 as a conceptual tool used in production processes nowadays in order to increase the efficiency of output, while decreasing the input and therefore rising the economy of production itself.

### ***1.1 Brief history of the evolution of the concept of Industry 4.0***

Fourth industrial revolution is essentially a continuation of previous changes that have occurred within production, such as mechanization, electrification, the use of belt production, primary robotization, and other key elements of industry necessary for its functioning as we know it today. These changes within the concept of Industry 4.0 signify enormous opportunities that companies can use in the market to create their competitive advantages and create their competitive strategies. However, at the same time, they can also represent significant threats involving the operation of companies in the markets, such as the loss of their original competitive position.

The entire concept of Industry 4.0 is a part of broader topic of industrial revolutions that began to emerge during the second half 18<sup>th</sup> century with the bring technological changes which enabled industrial transformation that immensely increased the output of worldwide production. These changes were later formed into concepts of industrials revolutions, also called as Industry 1.0, Industry 2.0 and Industry 3.0 up until the actual stage of Industry 4.0. Each of these eras has its separate specifications characterizing every stage individually. The discussion which is still valid for research nowadays is, among others, the question of rapidity of these changes in every stage of industrial revolutions. There are many studies comparing this specific factor in order to measure the actual condition of Industry 4.0 in relation with other industrial revolutions (Popkova et al., 2019).

Industry 4.0 brings new methods of execution to the production process, raising it to a higher level and thereby increasing the competitiveness and economic output of entities that use such a concept in their production. Automation, more flexible processes, as well as horizontal and vertical integration are becoming more important elements modern, competitive production structure. According to a study made by the Economic Institute of Slovak Academy of Sciences, in Slovakia, within the processing industry, which plays a very important role in the Slovak economy, in recent years a relatively low rate of innovation can be seen compared to foreign competitors. However, Slovak companies still maintain a certain level of innovation and thus represent the potential for successful inclusion among companies that actively implement Industry 4.0 in their corporate strategy. This statement is also supported by the fact that Slovakia, as a part of the EU, plans to invest in digitalization and mutual technological connectivity in the coming years with high financial resources within European funds and support programs, which creates a suitable environment for expanding the concept of Industry 4.0 throughout Slovak (as well as European) industry (SAS, 2017).

However, the fourth industrial revolution also brings many other corporate changes that will have an impact on the choice of strategy of individual companies and its subsequent form of implementation. These include, for example, the qualification requirements for company members, the degree of cooperation in the external environment, the allocation of company funds, employment, the degree of use of information technology at all levels of the company, the level of wages, the employee structure, and many other changes that need to be analyzed and examined more deeply during the assessment of the success of the implementation of the Industry 4.0 concept in the business area. These changes will be so extensive that they will not only affect the companies themselves and their strategic functioning, but will also affect the economic, technological, social and environmental areas. It is therefore very necessary to investigate more broadly and deal professionally with the impact of Industry 4.0 on companies and their current and future strategies associated with this phenomenon of the 21<sup>st</sup> century.

### ***1.2 Construction industry affected by Industry 4.0***

As it was claimed previously, Industry 4.0 is comprised of vast amount of data and research, which makes it very complex topic to handle without dividing it into more processed segments describing each part of the industry that this concept relates to. Therefore, there have been various research covering individual industries and technologies used in them to find out if there are technological specifications not only in chronological order but in industries themselves too. One of these industries is the construction industry with its accounting for nine percent of global GDP (and around six percent in the USA). It was found out that in construction industry there are many new technologies occurred during the 21<sup>st</sup> century. Consequently, the concept of so-called Construction 4.0 was created (Prieto, 2021).

Construction 4.0 is comprised of various factors constantly formed in its emerging nature. Therefore, there are numerous definition that can describe the interpretation of the concept of Construction 4.0. For instance, one approach claims that Construction 4.0 is a process of implementing cyber-physical systems to encourage the digitizing of the construction industry with the intention of achieving optimum performance of the sector (Temidayo, Oke, Aigbavboa, Liphadzi, 2018). Another perspective explains this concept as an innovative construction management technique, driven by Industry 4.0 technologies, that allows for the creation of a smart construction site. There is also a view on Construction 4.0 which determines the notion as combination of cyber-physical technologies that supports a smart construction site, digital modeling (Building Information Modeling (BIM); digital twin – a digital replica of potential and actual physical assets, processes, people, places, systems, and devices), simulation, and virtualization (Hossan, Nadeem, 2019).

The topic of Construction 4.0 is very extended because of elongated history, that the industry itself has gone through. There are also many challenges which the construction industry is facing, which can influence the Construction 4.0 too. According to some opinions, the construction industry is quite controversial nowadays. Suppliers do not focus on long-term investments but on managing of project risks. Designers do not focus on innovations but on project risks management. Purchasers focus more on ROI than on real extracted from realized projects. If leading values in the culture of the industry is mistrust and each part of it does not do anything but look out for its own interests, it may occur that productivity-enhancing tools and processes such as BIM, SAM or Lean Construction, which rely on collaboration and sharing of information, have been failed to apply in broader extent so far (Construction TRADE, 2020).



## 2 Material and methods

This article was prepared by analysis of research and statistics from academical and national institutions, as well as analysis of secondary data as a systematic method of interpretation. Also, the compilation of information from several corporate were used in this article.

Mostly, there were articles and research about new trends in the construction industry analyzed in this article. Recurrently used research was the study from The Ingenieur magazine named Construction 4.0 to Transform the Malaysian Construction Industry. Also, there were many Slovak sources regarding Construction 4.0 researched in this article. For instance, reports of numerous companies (Construction TRADE, Positive group, PlanRadar and BEEVAM) which are statements of professionals representing these companies. After the analysis of mentioned documents, there was a collection of precise details for further research purposes and choosing right sections researched in the article.

## 3 Results

The concept of Construction 4.0 consists of numerous technologies. While almost all of them are still in their certain stage of development, many of them are still getting evolved and not used in the construction industry at extended level. The term of Construction 4.0 itself is not broadly used for a long period of time, so precise list of technologies used in it is slightly differed in research to some extent. Many of them are however mentioned in vast majority of studies analyzing this topic, therefore, some general overview of technologies utilized in Construction 4.0.

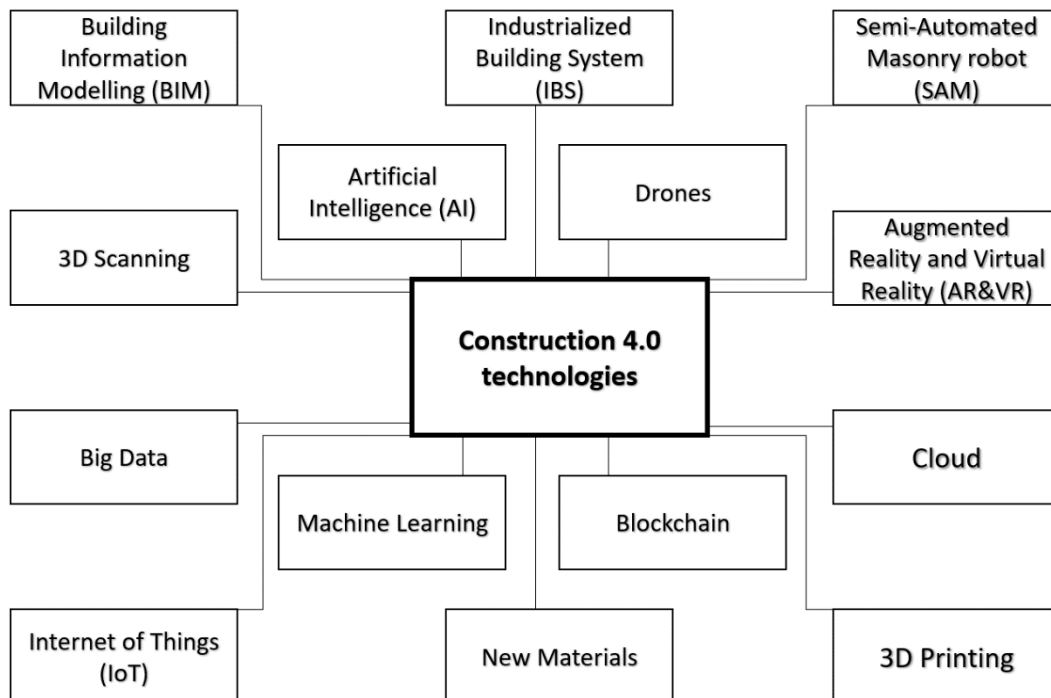


Figure 1 Overview of Construction 4.0 technologies, Source: The Ingenieur magazine

The graphics above shows that Construction 4.0 is a broad topic with many sub-topics to be processed, so it is useful to introduce what specific technologies are actually

considered to take part in this topic. According to practical data analyzed in several studies, there are 12 emerging technologies expected to be generally used in Construction 4.0 by 2025. Except these, there have been few more widely augmented during last years, so they have potential to complement those that were already projected as the most emerging ones in Construction 4.0. Admittedly, as the topic itself is in constant progression, in a short period of time, this set can be changed, but according to latest data, these technologies are expected to take major part in Construction 4.0 on the global level.

One of the most innovative technologies used in Construction 4.0 is system called Building Information Modelling (BIM) which is able to create virtual model of the building together with detailed information about it before it is started to be constructed. BIM is stated as an important construction technology in strategic documents such as UK Construction 2025, UK Built Environment 2050 or Singapore Construction ITM. The technology of BIM is expected to be backbone of construction processes in short-term, as well as long-term period in construction industry. However, latest data show that in some cases only 13% of construction corporations use the BIM tool in their business practice. Another technology emerged in Construction 4.0 and one of the most discussed is Industrialized Building System (IBS) mainly used nowadays in Malaysian construction industry. This idea suggests a method of constructing, where specific parts of building could be made at construction site. Even though there are several problems with adopting this technology on the market (for instance more comprehensive approaches and strategies which should support the development of this technology), there have been giant increase recorded in usage of IBS (from 24% in 2014 to 81% in 2019 in Malaysian public sector). This exceptional growth suggests that despite its lower usage on global level, IBS should be monitored and its growth potential pushes it to the group of emerging technologies in Construction 4.0.

Method utilized frequently in combination with different technologies as additional complement is 3D scanning technology. 3D scanning is mostly used for display of specific object or building. The most challenging issue for 3D Scanning technology nowadays is the problem with precise scanning of large area or entity. In a simplified kind of explanation, AI is a type of technological tool used mainly for problem solving and task resolution which was previously done by real person. It makes the whole process much more effective as human labor does not need to be employed for duties and simple decisions so there is space for dedicating the human labor to learn more difficult kind of jobs, which is necessary especially in the construction industry, and this can be achieved because of AI (PlanRadar, 2021). As well as AI, drones assist human labor to gain more time and save part of resources by its use in practice by construction companies. In addition, they contribute in tasks that would be hardly possible without this technology, such as 3D map creation, obtaining aerial photography, recording of volumetric measurement (meaning collecting data about the exact heights and volumes in specific parts of construction area) etc. (Hadi, 2022).

SAM, also known as Semi-automated masonry robot, is an emerging technology which sets expectations to replace the traditional method of constructing which operates in present time. Except advantages such as increased work safety, more efficient production on the construction site, the SAM offers the differentiation in focusing on main tasks when managing a building construction. While currently, middle management in a construction company has to pay high attention in fulfillment of putting up the core of the building structure for instance, with SAM fully adapted in the operating processes, the management can now focus more on different tasks that need to be done in the construction process and therefore be more efficient in processes delivered to the company (Roslan et al., 2022). Among new technologies in architecture and construction

industry, AR&VR are particularly interesting. Through their usage, the entire space in every detail can be copied in virtual world. There can be complete constructions displayed before the start of the project, many errors can be avoided and fixed in advance, so a lot of resources for purchases, suppliers and construction companies are about to be saved with these technologies.

Another advanced technology, which can be part of optimization in the construction industry is the Big data. They make usable structure of massive volume of information, which are processed with this technology to functioning set of data. By this, there can be prediction of behavior patterns and monitoring of business performance. In future there can be expected increase in data volume because of the advancement in Construction 4.0. That is also one of reasons for usage of Big data (Ngo et al., 2020). Cloud is another technology used in Construction 4.0. In cooperation with the Big data, there is a space for potentially far-reaching advantages derived for the industry. One of them is estimation of energy consumption of the building, as well as the prediction of project delays.

It is often referred to Machine learning as a subgroup to the AI technology. Despite that, there are slight differences in the determination of terms. The importance for the construction industry is based on the fact that Machine learning provides the opportunity for machines to predict and learn outcomes on their own. Instead of necessity of programmer coding them, they are able to use algorithms allowing them to create decisions with their own data analysis. It is very similar to the AI, but here, the usage is more focused on software rather than the hardware. In construction industry, main advantages brought by Machine learning are represented by reducing of the risk, higher lifecycle of the project or improvement of the quality of design of models of the buildings or any object about to be constructed. IoT is an innovation changing the way of how people interrelate with technologies connected to the internet. Core uses of the IoT in construction industry are the utilization of sensors monitoring temperature, pressure, humidity or motion (Gbadamosi et al., 2021).

Blockchain is a controversial technology which separates laymen as well as professional community into protagonist and opponents of this new trend used in Industry 4.0. It can be also beneficial for the construction industry even it can appear that its benefits are largely limited for the Construction 4.0. Blockchain can bring the transparency to the process of construction by providing visible information for all parties. Also, it simplifies many processes where information are used inside the construction companies. Middle and top management does not need to physically participate in as many tasks as today because of responsibilities distributed to all parts of company (delivering the right information would often not be based on one part of the company but on all of them). One of technologies widely spread during the last decade is 3D printing, which offers a lot of efficiency to the construction industry too. Similar to IBS, 3D printing offers the phenomenon, that many components necessary at the construction site can be manufactured right at the place of action and do not need to be made and delivered from elsewhere. Except this, there are types of 3D printers developed directly for the construction industry, meaning that there can be whole houses and buildings created with the 3D printing innovation. This emerging technology offers some game-changing advantages to the industry, but it will be only up to the companies and their focusing on R&D regarding 3D printing that will show the real output achieved from it during upcoming years.

Specific innovations in the construction industry are concentrated to discovery of new materials, which are not technologies themselves, but they are brought because of usage of technologies and that is why they are listed in the group of Construction 4.0 too.

This highly helps companies to build their competitive advantage as well as Intellectual Capital for the reason of influencing the basic form of existence of the company (its value chain, supply chain, setting of the competitive strategy etc.). There are many combinations of the materials and substances that construction companies use to bring new innovations and improve their position on the market. There are also many research made on this topic. Many companies keep their specific materials as part of their property in order to retain their advantage on the market. This field has created a serious topic on its own and therefore that is why its position in the concept of Construction 4.0 is settled and it needs to be reviewed how it will evolve in future.

#### **4 Discussion and conclusion**

Considering previous findings, there are few points of discussion which can be concluded and evoke basics for topics of next research made in the field of Construction 4.0:

- Even though construction industry is integrated between the largest industries globally and has an enormous potential regarding innovations and technological development, its real future form is put in question because of several factors (one of them is the fact that construction companies are often more focused on short-term profits than investments in R&D providing long-term sustainability).
- A lot of tools of Construction 4.0 are designed to make processes in the construction industry more effective and one of the closest challenges for companies existing in the industry is to incorporate these tools into productive business practice.
- Understanding the concept of Industry 4.0 and technologies emerging in this segment can help construction companies to build their competitive advantage, as well as their competitive strategy, structure their Intellectual Capital and strengthen their ability to react on changes in the industry, if they will focus on the most suitable tools and the process in the company will be well set.
- Concentration on human capacities can be important in this field, as there are various Construction 4.0 technologies substituting the human labor and consequently an opportunity for advanced education of personnel in construction companies arises, which is very important and notifying for the industry.
- Technologies of Construction 4.0 must be applied adequately and after previous measurable analysis, otherwise there appear to be risks which company will face associated with sunk cost because of using the wrong technology, lost profit for ineffectively using the same technology as competition of the company or innovating materials which are not about to adapt on the market.

As mentioned previously, there are many challenges that construction industry and its parties face. There are also numerous opportunities for companies operating in this industry (in Slovakia, as well as globally). In case of suitable execution, the Construction 4.0 will be able to bring new and innovative knowledge to research made in Industry 4.0, Intellectual Capital, competitive strategies and other fields helping to study

and understand the behavior on the market, potentially even evolving them to a broader level of study.

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### **References**

- Popkova, E. et al. (2019), "*Industry 4.0: Industrial Revolution of the 21st Century*." Springer International Publishing, Vol. 169, pp. 3-29
- Maskuriy, R. et al. (2019), "Industry 4.0 for the Construction Industry—How Ready Is the Industry?." *Applied Sciences*, Vol. 9, pp. 1-26
- Jeck, T. (2017), "Slovenská ekonomika a štvrtá priemyselná revolúcia: Faktory a predpoklady." Institute of Economic Research SAS, pp. 5-13
- Temidayo, O. et.al. (2020), "Appraisal of stakeholders' willingness to adopt construction 4.0 technologies for construction projects." *Built Environment Project and AssetManagement*, pp. 1-17
- Hossan, M. A., and Nadeem, A. (2019), "Towards Digitizing the Construction Industry: State of the Art of Construction4.0." pp. 2-5
- Prieto, R. (2021), "Construction 4.0." *National Academy of Construction Executive Insights*, pp. 1-8
- Roslan, A. F. et al. (2022), "Construction 4.0 to Transform the Malaysian Construction Industry." *The Ingenieur magazine*, Vol. 88, pp. 6-23
- Hadi, R. A. (2022), "*Drone technology in construction industry*." Peoples' Friendship University of Russia, Moscow, pp. 1-8
- Ngo, J. et al. (2020), "Factor-based big data and predictive analytics capability assessment tool for the construction industry." *Automation in Construction*, Vol. 110, pp. 2-6
- Gbadamosi, et al. (2021), "IoT for predictive assets monitoring and maintenance: An implementation strategy for the UK rail industry." *Automation in Construction*, Vol. 122, pp. 486-488

# The Dependency of Operating Profit on Strategic Goals in Small and Medium Enterprises

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## Abstract

The objective of this article is to examine the relationship between strategic goals, achieved market position and operating profit of small and medium enterprises (SMES). In 2020 an online survey regarding company size, performance, strategy process, strategy content, market position and operating profit situation of SMEs was carried out. The survey reached out to 813 owners, presidents, CEOs and CFOs of small and medium sized business, mainly in German and USA, with a response rate of 13%; this means that ultimately 109 decision makers from the companies contacted took part in this survey. The answers to the questions were statistically evaluated and assessed. 62% of the participants had a corporate strategy (not specified) defined and implemented between 2014 and 2019. The majority of the participants but still only 29% named: strengthen or improve competitiveness and develop or sharpen USP and achieve or hold a dominant market position as their main 3 strategic goals. SMEs that had implemented such a strategy from 2014 to 2019 achieved significant more likely a dominant market position and a satisfactory operating result in 2019 than SMEs which did not pursue a strategy or pursue a more arbitrary strategy. This paper contributes to the knowledge about the strategy content of SMEs and the impact of the strategy type on market position and operating result.

Keywords: Small and Medium Enterprises, SMEs, strategy types, strategic goals, objectives, dominant market position, operating result, competitive advantage, USP.

Article Classification: Research article

## 1 Introduction

In short, small and medium enterprises (SMEs) are described as independently operating companies with less than 250 employees and less than 50 Mio € revenues or a balance sum below 43 Mio € (European Commission 2017). For example, in 2017, 99.5% of all German companies were SMEs and comprised of 35% of revenues for all German

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enterprises (IfM 2017). In 2018, SMEs accounted for 99.8% of all enterprises in the EU-28 non-financial business sector (NFBS), generating 56.4% of value added and 66.6% of employment in the NFBS (European Commission 2019).

Although SMEs play such a significant role in the world-wide economy, they are rarely focus of investigation and theory building, especially in the field of strategic management, strategic positioning and resilience (Klausmann et al. 2020).

In particular, SMEs are generally less resilient than large and public companies, which usually have more resources and reserves and have implemented an established strategic development process (Gunasekaran et al. 2011, Hong et al. 2012, Kraus et al. 2013, Ozgulbas et al. 2012). After the 2008 financial crisis, various studies were conducted on crisis survival and resilience of SMEs (Bourletidis et al. 2014, Dolz et al. 2018, Tchouvakhina et al. 2013, Wishard 2018). Only few papers investigate the correlation between the specific implemented SME strategy, the company performance, the occurrence of existence-threatening crises and crisis resilience of SMEs (Stokes et al. 2010 Vargo et al. 2011).

To gain deeper insight into the above, an online survey was conducted in 2020. In particular, this is intended to gain insights into the following:

- Proportion of companies that implement a strategy at all
- the strategic goals of SMEs
- whether the three strategic goals of: developing a unique selling proposition (Anderson et al. 2006, Mayr et al. 2019, Penzel et al. 2017, Reeves 2015), strengthening competitiveness (David et al. 2017, Porter 1985 and 1998,) and achieving a dominant market position (Lerner 1934, Montgomery 1985) are part of the strategy
- the market position achieved
- the financial performance (operating profit) of the participating SMEs

## 2 Material and methods

### 2.1 Method

An online survey was developed and conducted at <https://www.umfrageonline.com> by the author. The goal of the survey was to gain deeper insights into industrial active SMEs' behavior in terms of strategy development, strategic goals, market position, response to crises and crisis prevention, and into relevant key process indicators (KPI)s.

A total of 29 questions were developed for this survey, which was conducted between July 3, 2020 and April 29, 2021.

For this article, the questions on the following topics were evaluated:

- Company size (KPIs: revenue and number of employees) to classify the companies as SMEs or non-SMEs
- Company strategy as such, strategic goals and the strategy process itself
- Market position and Financial performance (operating profit)

Since the above data for SMEs is not publicly available and cannot be collected via trade associations for data protection reasons, the search for potential participants was mainly conducted through the internet platform LinkedIn <https://www.linkedin.com>. Decision makers from industrially active SMEs in Europe, with a focus on Germany and the USA, were sought and selected for contact. However, it is not clear from the LinkedIn

profiles whether the decision maker's company meets all the criteria for a SME. Therefore, also decision makers from firms that did not necessarily meet the criteria for SMEs, defined as above, were contacted and answers received. However, these firms did not deviate significantly from the SME criteria and decision making structures (largely independent, foreign subsidiary with its own management for example) of SMEs.

The decision makers contacted were managing directors, managing partners, presidents, CEOs and CFOs, decision makers who are responsible for both, the strategy process and the company performance in SMEs and who have the deepest insight into these issues.

Decision makers from industrially active companies, i.e., not decision makers from the tourism industry, financial investors, and the like, were specifically selected for contact. The selected decision makers were asked to network with the author's LinkedIn profile. After successful acceptance at the network of the decision maker, the potential study participants were asked to participate in the online survey by sending the link <https://www.umfrageonline.com/s/ba7fd95>.

## 2.2 Number of participants generated

Using the procedure described above, 813 decision makers were contacted, of which 679 were in Germany, 48 in other European countries, 82 in the USA and 4 in the rest of the world. A total of 109 participants (84 German, 7 European and 18 US participants) were generated, which corresponds to a participation rate of 13%.

Table 1 Number of contacted decision makers

Location of participants	Number of contacted companies	Number of participants	Proportion
Germany	679	84	12 %
Europe without Germany	48	7	15 %
USA	82	18	21 %
Rest of World	4	0	0
Total	813	109	13 %

Ninety companies (83%) of the 109 participants fulfilled the 2 selected and queried criteria for SMEs (< 50 Mio € turnover and < 250 MA); 2 exceeded only the number of employees criteria but not the turnover requirements; 10 companies exceeded the turnover criteria but not the requirement for the number of employees and only 7 companies exceeded both the revenue size and the maximum number of employees criteria.

Considering these results and the fact that when contacting the decision makers via the LinkedIn profiles, care was taken to ensure that they were mainly independent operating and not large or public companies, for example foreign daughter companies (GmbH in Germany). Therefore, for the following investigation, the answers of all 109 participants were taken into account and considered to be valid for SMEs.

A complete list of the 813 contacted decision makers including public available information is available.



Table 2 Number of employees and turnover of participating companies

Turnover in 2019	0-5 employees	6-20	21-40	51-150	151-250	>250	Total
0-5 Mio €	18	15	5				38
5-10 Mio €		6	5	8			19
10-25 Mio €		1	4	19	3	1	28
25-50 Mio €		1		4	1	1	7
>50 Mio €			1	4	5	7	17
Total	18	23	15	35	9	9	109

### 2.3 Meaningfulness of the generated number of participants

In 2018 alone in Germany 3,466,583 SMEs existed of which 20.3% equates to 703,716 were SMEs in the manufacturing sector (IfM 2017). In Europe existed approximately 22 million SMEs, meaning an extremely large population size existed with no knowledge about the standard deviation in the total population or about the proportion of the population with regards to the questions in the questionnaire. By using the following equation:

$$n=p(1-p)(Z/E)^2 \quad (1)$$

n= sample size

p=proportion

Z= Z level for the desired confidence level

E=the maximum allowable error with E=10%

With 109 participants, the confidence level Z of the questionnaire results for the total population is 98%; for the 90 SMEs alone, the confidence level Z corresponds to 97% with an allowable error rate of 10%.

## 3 Results

### 3.1 Proportion of SMEs that had implemented a strategy during the years 2014-2019

The evaluation of the answers to question 8: Have you defined and implemented a corporate strategy between 2014 and 2019? led to the following results:

Of the 109 participants, 102 participants answered this question and 68 announced that they had defined and implemented a strategy (62%), unspecified in any respect, whereas 34 did not define and implement a strategy during this period (31%).

That leads to the following conclusion:

Based on a confidence interval of 5% and assumed a binomial distribution, 53% to 71% of the global population of SMEs had a strategy implemented, unspecified in any respect, during the period under consideration.

Table 3 Between 2014-2019 a strategy was defined and implemented

Answer	Number	Proportion
Yes	68	62.4%
No	34	31.2%
Blank	7	6.4%
Total	109	100%

### 3.2 Main goals of the implemented strategies

The aim of the following 4 questions was to find out the main objectives of the implemented strategy:

Question 11: does your strategy aim to strengthen or improve your competitiveness in your core business(es)?

Question 12: if you answered no to question 11, what is the main goal of your strategy?

Question 13: does your strategy aim to become or remain No. 1 or No. 2 in your main market, hereinafter referred to as: does your strategy aim to hold or achieve a dominant market position?

Question 14: does your strategy aim to develop a unique selling proposition (USP) or sharpen the existing USP?

Results:

Sixty-eight participants gave plausible combinations of answers, but in 18 cases participants answered yes to one or more of questions 11, 13, and 14, even though they had answered no to question 8 (have you defined and implemented a strategy), which is implausible.

This can have several causes:

One of the possibilities is that the participant answered question 8 with no instead of yes by mistake. Another possibility for this behaviour is that top management had an idea about a strategy, but it was not clearly defined, communicated, and implemented; means a well-defined strategy process and strategy content did not exist in fact.

Therefore, for the following analyses, only responses to questions 11, 13, and 14 were counted if question 8 was answered "yes," resulting in the following:

93 % of the participants of the survey who had defined and implemented a strategy process during the years 2014-2019 had the objective to strengthen or improve competitiveness of their company; 83% aim to develop or sharpen a USP and 56% aim to achieve or hold a dominant market position in their core market(s).

Abbreviations:

Strengthen or improve competitiveness = COM

Develop or sharpen USP = USP

Achieve or hold a dominant market position = DMP

Table 4 Strategic main goals

Answer	COM (11)	Proportion*	DMP (13)	Proportion*	USP (14)	Proportion*
Yes	63	93%	38	56%	56	83%
No	4	6%	29	43%	11	16%
Blank	1	1%	1	1%	1	1%
Total	68	100%	68	100%	68	100%

Proportion\*: calculated in relation to 68 "yes" answers to question 8

Analysing the answers to question 12 (If you answered no to question 11, what is the main goal of your strategy?) led to the following additional insight:  
Only 4 participants answered yes to question 8 and no to question 11, citing the following 4 goals:

- Products, markets, commercialization, technology
- Survive!
- Developing new business areas
- Risk management

Even taking this information into account, the absolute majority of participants (who answered the questions in a plausible way) identified three main strategic goals:

- Strengthen or improve competitiveness
- Develop or sharpen USP
- Achieve or hold a dominant market position

### 3.3 The most frequent strategy types

For this purpose, the combinations of answers to questions 11, 13, and 14 are noted for the 68 participants who established and implemented a strategy.

Results:

47% of the participants, who had a strategy defined and implemented, named all 3 goals: strengthen or improve their competitiveness, develop or sharpen their USP and achieve a dominant market position. The second largest part (31%) of the participants, who had a strategy defined and implemented, named only 2 goals:

strengthen or improve their competitiveness, develop or sharpen their USP but do not focus on achieving a dominant market position.

Table 5 Combination of responses to questions 11,13 & 14

Com	Combination of responses		Number	Proportion*
	USP	DM		
No	No	No	1	1%
Yes	No	No	5	8%
No	Yes	No	2	3%
No	No	Yes	0	0%
Yes	Yes	No	21	31%
Yes	No	Yes	5	8%
No	Yes	Yes	1	1%
Yes	Yes	Yes	32	47%
Blank	Blank	Blank	1	1%
Total			68	100%

Remark: other possible combinations with "blank" answers were not named by the participants

### 3.4 Dependency of a dominant market position (in the key markets) on the type of strategy implemented

To find out if the participants had reached a dominant market position at the time of the survey (2020), question 18 (is your company the market leader or number 2 in your most important market?) was asked and the answers analysed.

## Results:

35% of the participants stated that they had achieved a dominant market position, while 50% had not achieved it.

Table 6 Dominant market position achieved

Answer	Number	Proportion
Yes	38	35%
No	54	50%
Blank	17	15%
Total	109	100%

In order to analyse to what extent the dominant market position can be related to the implemented strategy, the answers of questions 8,11,13,14 and 18 were analysed but only plausible combinations of answers were recorded (see chapter 3.2. Main goals of the implemented strategies).

## Results:

Sixty-three out of 109 participants answered all 5 questions plausibly, of which only 1 participant denied having implemented a strategy and achieved a dominant market position.

With 63 participants the confidence level of these results of the questionnaire for the total population is 94% at an allowable error rate of 10% (see equation chapter 2.3 Meaningfulness of the generated number of participants).

Twenty-eight participants who had implemented a strategy achieved a dominant market position; however, 34 participants who had implemented a strategy did not achieve a dominant market position.

Table 7 Plausible response combinations to questions 8,11,13,14,18

Strategy Implemented (8)	Strategy objectives			Dominant market position achieved (18)	Number of answers
	COM (11)	USP (13)	DMP (14)		
Yes	Yes	Yes	Yes	No	10
	Yes	Yes	Yes	Yes	19
	Yes	No	No	No	4
	Yes	No	No	Yes	1
	No	Yes	No	No	1
	No	Yes	No	Yes	1
	No	No	Yes	No	0
	No	No	Yes	Yes	0
	Yes	Yes	No	No	17
	Yes	Yes	No	Yes	3
	Yes	No	Yes	No	2
	Yes	No	Yes	Yes	3
	No	No	Yes	No	0
	No	No	Yes	Yes	1
No	No	No	No	0	
No	No	No	Yes	1	

The following terms have been defined for further evaluation:

Complete strategy implemented: question 11 and 13 and 14 were answered with yes

Incomplete strategy implemented: one or two or all three questions (11,13 and 14) were answered with no

Incomplete strategy I implemented: question 11 and 13 answered with yes and question 14 answered with no

To analyse the dependency between the type of strategy implemented and the market position achieved the  $\chi^2$  test is used.

### 3.4.1 Complete strategy versus incomplete strategy

H0: There is no difference in achieving a dominant market position between companies with a complete strategy and companies with an incomplete strategy in place.

H1: Companies with a complete strategy achieve a dominant market position more likely than companies with an incomplete strategy implemented.

Results:

With  $\chi^2= 2,031E-08$ , tested at a significance level of  $\alpha=0,05$  (95% probability), H0 is rejected, means below data show significant dependence between implemented type of strategy and achievement of a dominant market position, i.e. firms that had implemented a complete strategy were significantly more likely to achieve a dominant market position (in their core markets) than firms that had implemented a more arbitrary strategy.

Table 8 The dependence of market position on strategy type: Complete versus incomplete strategy

Strategy type	Dominant market position achieved	Dominant market position not achieved	Total
Complete strategy implemented	19	10	29
Incomplete strategy implemented	9	24	33
Total	28	34	62

### 3.4.2 Complete strategy versus incomplete strategy I

H0: There is no difference in achieving a dominant market position between companies with a complete strategy and companies with an incomplete strategy I in place (strengthen or improve their competitiveness, develop or sharpen their USP but do not focus on achieving a dominant market position).

H1: Companies with a complete strategy achieve more likely a dominant market position than companies with an incomplete strategy I implemented.

Results:

With  $\chi^2= 2,0288E-13$ , tested at a significance level of  $\alpha=0,05$  (95% probability), H0 is rejected, means below data show significant dependence between implemented type of strategy and achievement of a dominant market position, i.e. firms that had implemented a complete strategy were significantly more likely to achieve a dominant market position (in their core markets) than firms that had implemented a strategy that focus only on strengthen or improve their competitiveness, develop or sharpen their USP but do not on achieving a dominant market position (incomplete strategy I).

Table 9 The dependence of market position on strategy type: Complete versus incomplete strategy I

Strategy type	Dominant market position achieved	Dominant market position not achieved	Total
Complete strategy implemented	19	10	29
Incomplete strategy I implemented	3	17	20
Total	22	27	49

In summary, companies that pursue a complete strategy are more likely to achieve a dominant market position than companies that do not pursue a strategy or pursue a rather arbitrary strategy. Even companies that pursue a strategy with the goals strengthen or improve competitiveness and develop or sharpen USP - are less likely to achieve a dominant market position.

### 3.5 Dependence of a satisfactory operating profit on a dominant market position

The following analysis is intended to examine whether there is a correlation between dominant market position and satisfactory operating results.

For this purpose, the answers to question 18 (is your company the market leader or number 2 in your most important market?) and the answers to questions 19 (did you achieve a satisfactory operating result in 2019?) are examined by means of  $\chi^2$  test.

Ninety-two evaluable response combinations were obtained.

H0: The achievement of a satisfactory operating result is not dependent on the attainment of a dominant market position.

H1: The achievement of a satisfactory operating result is dependent on the attainment of a dominant market position.

Results:

With  $\chi^2 = 0,0258402$ , tested at a significance level of  $\alpha = 0,05$  (95% probability), H0 can be rejected, means below data show a (low) dependence of a satisfactory operating result on a dominant market position.

Table 10 The dependence of satisfactory operating profit on achievement of a dominant market position

Satisfactory operating result	Dominant market position achieved	Dominant market position not achieved	Total
Answer yes	32	34	66
Answer no	6	20	26
Total	38	54	92

It is assumed that the result of the  $\chi^2$  test is falsified by the number of implausible answer combinations - see chapter 3.2. Main goals of the implemented strategies. Therefore, the above analysis is now conducted with data sets where question 8 was answered yes, a complete strategy was implemented, and question 18 and question 19 were also answered.

Results:

With  $\chi^2 = 1,7072E-12$ , tested at a significance level of  $\alpha = 0,05$  (95% probability), H0 is rejected, means below data show that companies which achieved a dominant market position will more likely achieve a satisfactory operating result than companies which did not achieve a dominant market position.

Table 11 The dependence of satisfactory operating profit on achievement of a dominant market position

Satisfactory operating result of companies with a complete strategy	Dominant market position achieved	Dominant market position not achieved	Total
Answer yes	16	3	19
Answer no	6	4	10
Total	22	7	29

#### 4 Discussion

62% of the participating companies, mainly based in Germany and USA, announced that they had defined and implemented a corporate strategy (not specified) during the years 2014-2019. Therefore, with a confidence interval of 5%, we estimate a minimum of 53% of industrial active SMEs in Europe and USA had a corporate strategy defined and implemented during that time.

The majority of participants but still only 29% = 32 of the participants named the following 3 strategic goals for their strategy:

- Strengthen or improve competitiveness
- Develop or sharpen USP
- Achieve or hold a dominant market position

All other participants (77) had no, or a more arbitrary strategy implemented during that time.

It was found that there is a significant dependency between the type of strategy and the achievement of a dominant position (being number 1 or number 2 in the key markets).

SMEs that implemented a strategy based on the above three objectives in the years 2014-2019 had a significantly higher chance to achieve a dominant market position than companies that did not pursue a strategy or pursued a rather arbitrary strategy.

In addition, SMEs that had achieved a dominant market position in their key markets were found to be more likely to achieve satisfactory operating results in 2019 than companies that did not achieve a dominant market position.

Therefore, the results of this research show specifically for SMEs the relationship between the type of strategy implemented, the achievement of a dominant market position and the achievement of satisfactory operating results.

That means that the top management of SMEs must make strategy development and implementation their top priority, in particular they must focus on the 3 strategic goals: improving competitiveness, developing or sharpening a unique selling proposition, and achieving a dominant market position to enable their companies to achieve satisfactory operating results, which is one of the most important objectives for the sustainable existence of a company.

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## References

- Anderson, J., C., Narus, J., A., and Van Rossum, W. (2006). *Customer Value Propositions in Business Markets*. Harvard Business Review.
- Bourletidis K., Triantafyllopoulos Y. (2014). *SMEs Survival in time of Crisis: Strategies, Tactics and Commercial Success Stories*. Procedia – Social and Behavioral Sciences 148, 639-644.
- David, Fred R., David, Forest R. (2017). *Strategic Management: A Competitive Advantage Approach Concepts and Cases*. Pearson Education Limited, Edinburgh Gate, Harlow, Essex CM20 JE, England.
- Dolz C., Iborra M., Safron V., (2018). *Improving the likelihood of SME survival during financial and economic crises: The importance of TMTs and family ownership for ambidexterity*. BRQ Business Research Quarterly 22, 119-136.
- European Commission (2017). Benutzerleitfaden zur Definition von KMU. [ONLINE], Available at: [https://op.europa.eu/de/searchresults?p\\_p\\_id=portal2012searchExecutor\\_WAR\\_portal2012portlet\\_INSTANCE\\_q8EzsBteHybf&p\\_p\\_lifecycle=1&p\\_p\\_state=normal&queryText=Benutzerleitfaden+zur+Definition+von+KMU.&facet.collection=EUlex%2CEUPub%2CEUDir%2CEUWebPage%2CEUSummariesOfLegislation&startRow=1&resultsPerPage=10&SEARCH\\_TYPE=SIMPLE](https://op.europa.eu/de/searchresults?p_p_id=portal2012searchExecutor_WAR_portal2012portlet_INSTANCE_q8EzsBteHybf&p_p_lifecycle=1&p_p_state=normal&queryText=Benutzerleitfaden+zur+Definition+von+KMU.&facet.collection=EUlex%2CEUPub%2CEUDir%2CEUWebPage%2CEUSummariesOfLegislation&startRow=1&resultsPerPage=10&SEARCH_TYPE=SIMPLE). [Accessed 06 January 2020].
- European Commission (2019). SME Performance Review. Annual Report on European SMEs 2018/2019. [ONLINE] Available at: [https://ec.europa.eu/growth/smes/business-friendly-environment/performance-review\\_en](https://ec.europa.eu/growth/smes/business-friendly-environment/performance-review_en). [Accessed 06 January 2020].
- Gunasekaran, A., Rai, B. K., and Griffin, M. (2011). *Resilience and competitiveness of small and medium size enterprises: an empirical research*. International Journal of Research, 49(18), 5489-5509.
- Hong, P., Huang, C., and Li, B. (2012). *Crisis management for SMEs: insights from a multiple-case study*. International Journal of Business Excellence, 5(5), 535-553.
- IfM, Institut für Mittelstandsforschung, Bonn. (2017). Kennzahlen der KMU nach Definition des IfM Bonn, Deutschland. [ONLINE] Available at <https://www.ifm-bonn.org/statistiken/mittelstand-im-ueberblick/#accordion=0&tab=0>. [Accessed 29 October 2019].
- Klausmann, J., Papula, J. (2020). *The strategic crisis as root cause for existence-threatening crises in small and medium enterprises*. IAETSD Journal for advanced Research in applied Sciences, Volume VII, Issue III, 34-42
- Kraus, S., Moog, P., Schleppehorst, S., and Raich, M. (2013). *Crisis and turnaround management in SMEs: a qualitative-empirical investigation of 30 companies*. International Journal of Entrepreneurial Venturing, 5(4), 406–430.
- Lerner, A., P. (1934). *The Concept of Monopoly and the Measurement of Monopoly Power*. The Review of Economic Studies. 1, Nr. 3, 1934, 157–175
- Mayr S., Mitter C., and Aixhmayr A. (2019). *Corporate Crisis and Sustainable Reorganization: Evidence from Bankrupt Austrian SMEs*. Journal of Small Business Management 55, 108-127.
- Montgomery, C., A. (1985). *Produkt-Market Diversification and Market Power*. The Academy of Management Journal, Volume 28, Issue 4, 889-798.
- Ozgulbas, N., Koyuncugil, A., S. (2012). *Risk Classification of SMEs by Early Warning Model Based on Data Mining*. World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and
- Penzel, D., Kryvinska, N., and Strauss, C. (2017). "Cloud Market – Analysis of Potentials and Challenges for Service Providers". AMCIS 2017 Workshops 4.
- Porter, M., E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press, 1230 Avenue of the Americas, New York, NY 10020.
- Porter, M., E. (1998). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press, 1230 Avenue of the Americas, New York, NY 10020
- Reeves, R. (2015). *Reality in Advertising*, N.W. Widener Inc., 1105 Lexington Ave., New York NY 10075.



- Stokes, D., Wilson, N. (2010). *Small Business Management and Entrepreneurship*. Cengage Learning EMEA, Cheriton House, Noth Way, Andover, Hampshire, SP10 5BE, United Kingdom.
- Tchouvakhina Dr., M., Stöver Dr., P. (2013). *How companies recognise, exploit and overcome crises*. KfW Economic research No 29.
- Vargo, J., Seville, E. (2011). *Crisis Strategic Planning for SMEs: Finding the Silver Lining*. International Journal of Production Research - Creating Resilient SMEs special issue, 49(18), 5619-563.
- Wishart, M. (2018). *Business resilience in a SME context: A literature review*. Enterprise Research Centre and Warwick Business School, Coventry, CV4 7AL, UK.

# Consumer Neuroscience as a Tool for Obtaining Subconscious User Experience in M-commerce

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## Abstract

Mobile devices such as smartphones and tablets offer consumers and brands the ability to conveniently buy and sell things with a single click. Mobile commerce (m-commerce) is a category of e-commerce that has quickly gained popularity due to the simplicity of transactions. Mobile devices are a common part of everyday life and their popularity continues to grow. In 2022, retail sales from e-commerce via smartphones are expected to exceed \$432 billion, up from \$148 billion in 2018. The rapid penetration of smartphones into consumers' lives is undoubtedly driving the growth of mobile commerce. This is creating room for designing a sufficiently attractive and interesting solution that will be available on all mobile devices and at the same time will be easy enough for the customer or visitor to get to the destination or to get the necessary information in a few clicks. This is the area that User Experience (UX) designers deal with. The basis for changes in UX design can now be obtained not only through online analytical tools, but also through consumer neuroscience, especially in the case of mobile devices. The paper highlights possibilities for testing UX design applications on mobile devices using a special platform that combines a stationary eye camera (eye tracking) and facial analysis.

Keywords: user experience; consumer neuroscience; consumer; m-commerce.

Article Classification: Research article

## 1 Introduction

Every day, the science of marketing and marketing research is trying to get closer to understanding the consumer – their needs and desires, and as a result, the field of consumer perception is developing. Consumer neuroscience incorporates several research methods to cater to the diverse needs of companies. Their use is based on what the

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company needs to reinforce at the moment, such as developing a new product or focusing on the impact of advertising. The most commonly used research methods include eye tracking, EEG (electroencephalography) analysis and fMRI imaging (Chlibovytsch, 2022). The indicators that help us evaluate the consumer decision-making process in addition to EEG are the physiological indicators of the respondent itself. The above neuromarketing techniques bring new possibilities for consumer behaviour research. The first marketing implication of these techniques is the use of the neuroscientific approach not only in academic or scientific settings, but also its applicability in commercial settings (business operations). Other implications are the effectiveness in the design of advertising campaigns, and the wide-ranging use of data obtained by neuroscience from respondents regarding their cognitive and emotional aspects during the evaluation of different marketing stimuli (Babiloni & Cherubino, 2022).

The use of mobile devices is literally an essential part of consumers' daily lives. The need to spend time on smartphones even increased during the global pandemic, which had a positive impact on the proliferation of e-commerce, as it offers an easy, fast and wireless access to various chain store networks from anywhere (Vinerean et al., 2022). The creation and adoption of mobile commerce applications has become a necessity for merchants and mobile shoppers, which has resulted in the global acceptance of this form of virtual shopping (Ajibola et al., 2022). Mobile commerce can only present the product in a virtual form, which tells us that this form of shopping might bring with it some disadvantages for the consumer that need to be taken into consideration (Rajendran et al., 2022). However, m-commerce is another way of doing business that is poised to become the future of the online marketplace (Jain & Tan, 2022).

User Experience (UX) talks about the experience that the respondent or consumer has with a given good or service. Based on this experience, various elements are taken into account when designing products. UX research serves to understand the respondent's experience in a better and more systematic way and since it leads to improvements, it should be conducted regardless of the type of product or service (Jang & Han, 2022). The interconnectedness between consumer memory, expectations and experiences are important factors that help us understand consumer decision-making in product selection, which tends to be based on emotional experiences. Positive emotions such as a user's pleasant experience with a product are important for future product or service recommendations to other potential users (Reddy et al., 2022).

User Interface (UI) represents a piece of technology that allows the user to interact with the product itself, usually in the form of buttons, touch screens, knobs, etc. Their design should suit every user who comes into contact with them (Moonty et al., 2022). In this case, there is an interaction between the human and the machine/technology, with the goal of the interaction being the ability to use and control the machine efficiently from the human side, and the provision of quick information back from the machine (Churchville, 2022). It is important to consider the expectations of the future consumer in terms of accessibility, visual aesthetics and ease of use when designing the UI. The optimal combination of effective visuals and effective responsiveness will have a positive impact for the user because it anticipates their needs and then satisfies them (Indeed, 2022). UI testing, covers a range of visual indicators and graphical icons such as toolbars, fonts, menus, text boxes, toggles, checkboxes, colours, and more. Test suites designed for UI testing include features such as functionality, visual design, performance, usability, and compliance (Bose, 2021). The top 12 UI design trends for web and mobile in 2022 as named by Design4users (2022) include diversity of shapes, video integrations, accent line elements, background layer on the caption, eye-catching motion graphics,

typographic experiments, interactive pages, horizontal galleries, creative menus, 3d graphics and animation, unusual grids, as well as custom illustrations.

## 2 Material and methods

The aim of the paper was to identify the subconscious User Experience (UX) with selected parts of the mobile version of the website of the GymBeam.sk company. The purpose was to identify problematic aspects of the perception within the purchase process of the selected consumer segment. Due to the fact that the results of online analytics and explicit customer evaluation did not provide a sufficient picture of the problematic aspects of product selection and ordering process, a qualitative ad hoc research was conducted using consumer neuroscience tools. The assignment for the 40 participants (45% men and 65% women interested in healthy lifestyles aged 18-45) who took part in the testing was: "Imagine you want to buy nutritional supplements. Visit [www.gymbeam.sk](http://www.gymbeam.sk) on your mobile device and order any number of nutritional supplements."



Figure 1 Testing the UX design; source: own photo documentation

During the test (Figure 1), a special platform for testing UX and UI design in mobile devices was used. Respondents' visual attention was monitored using a stationary eye tracking camera (Tobii X2-30), and emotional response was also captured using facial analysis (FA) by FaceReader 7 from Noldus. After the test, respondents answered questions about their perception of the buying process through the mobile device on a conscious level. The collected data were processed in Observer XT and Tobii Pro Lab Studio software environment and evaluated using descriptive statistics. The survey was conducted on the 23, 24 and 27 November 2021 in the Laboratory of Consumer Studies of the FEM SUA in Nitra, Slovakia.

## 3 Results

Based on the results obtained through qualitative research conducted using a dedicated platform, the subconscious perception of the GymBeam website on mobile devices was identified. For some respondents, problematic aspects of the ordering process itself were identified, which is mainly related to the UX design of the website. Heat maps and areas of interest (AOI) were created from the data collected through eye tracking. At the same time, the level of emotional attention was identified from the data obtained through facial expression monitoring. In order to consider heat maps as a relevant statistical indicator, the requirement of a minimum of 30 respondents must be met in general, which was fulfilled in the case of this research. Looking at the heat map

(Figure 2) obtained through eye tracking, we see that in addition to the menu and search box, respondents also viewed the benefits/value added in the form of texts displayed on the page as well as the image of the first product.

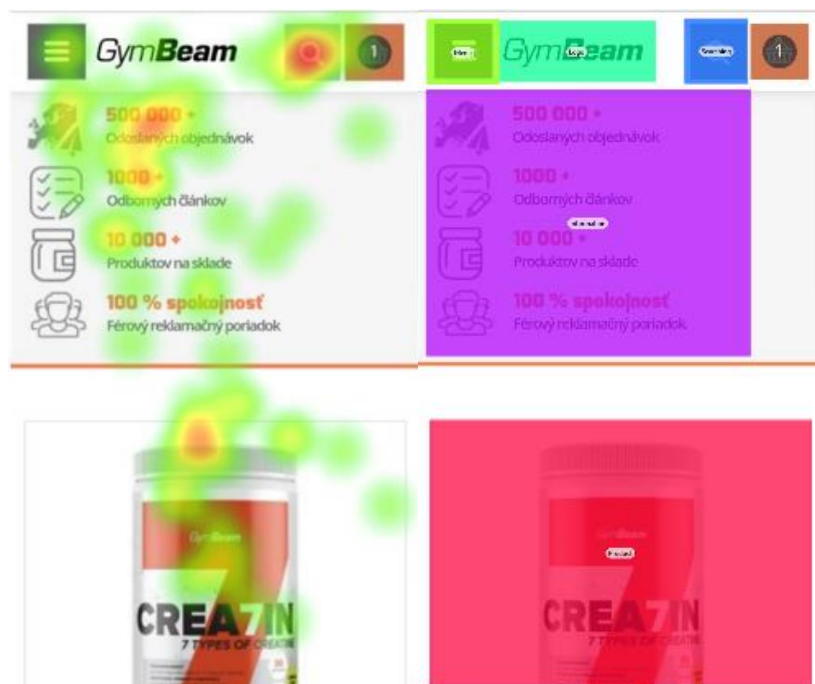


Figure 2 Visual attention (left side) recorded by eye tracking and Areas of Interest (AOI, right side) – homepage displayed on a mobile device; source: own documentation

In terms of AOI (Table 1), respondents noticed the company logo first on the homepage (0.68 ms). In terms of the observed indicators, they noticed the texts with value-added information as the last ones (4.02 ms). Respondents looked at the search button the longest on average (1.11 ms), while they spent the least time looking at the logo (0.10s). The initial view was also the longest on the search button (0.96 s), with the most repeated views directed here, too (5 revisits).

Table 1 Areas of Interest (AOI) by eye tracking – homepage displayed on a mobile device; own elaboration

	Menu	Logo	Search	Information	Product
Time to First Fixation (ms)	1.01	0.68	1.20	4.02	2.54
First Fixation Duration (s)	0.10	0.15	0.96	0.72	0.65
Total Fixation Duration (s)	0.49	0.10	1.11	0.59	0.72
Revisits	3	2	5	2	3

The results of measuring the emotional attention show that the highest one was focused on the search button. This fact may be largely related to the need to quickly find preferred products, which is also declared by the rate of repeated views. Relatively higher emotional attention was also attracted by the menu button (see Figure 3, left side). From previous research, the online tool Hotjar identified that visitors upon arriving at the homepage immediately go to the menu or search box without performing any interaction with other parts of that page. The results show the difference between where visitors click and what they actually view on the page. The comparison shows that eye tracking can significantly add information about the actual visual attention of respondents when viewing a page on a mobile device.

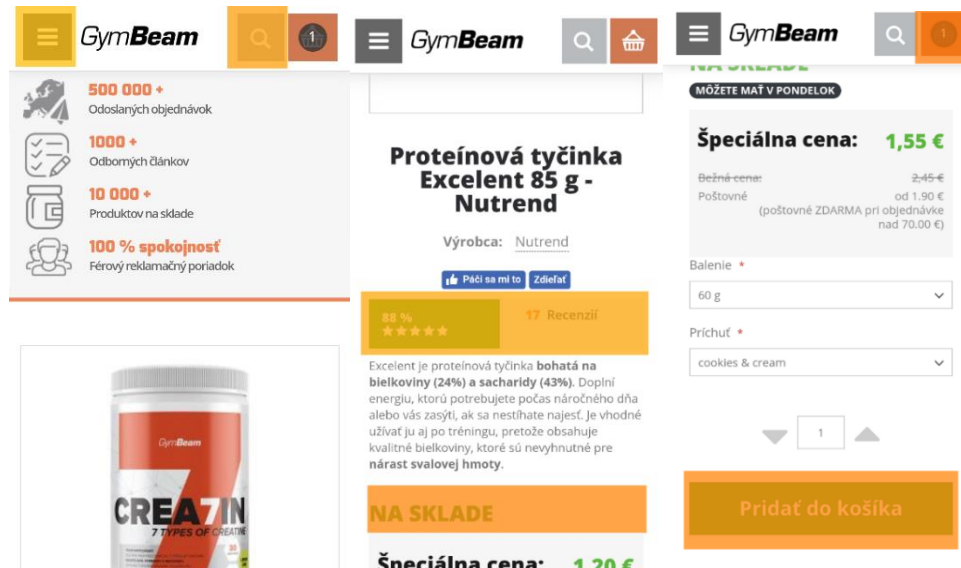


Figure 3 Emotional attention recorded by Facereading – homepage (left side), product category I. (middle), and product category II. (right side) displayed on a mobile device; source: own documentation

Looking at the product category presented by the heat map (Figure 4), we observe that respondents also pay significant attention to product description, availability, reviews and price benefits. In this respect, the data largely differs with online analytical tools that present respondents' touch rather than visual attention alone.

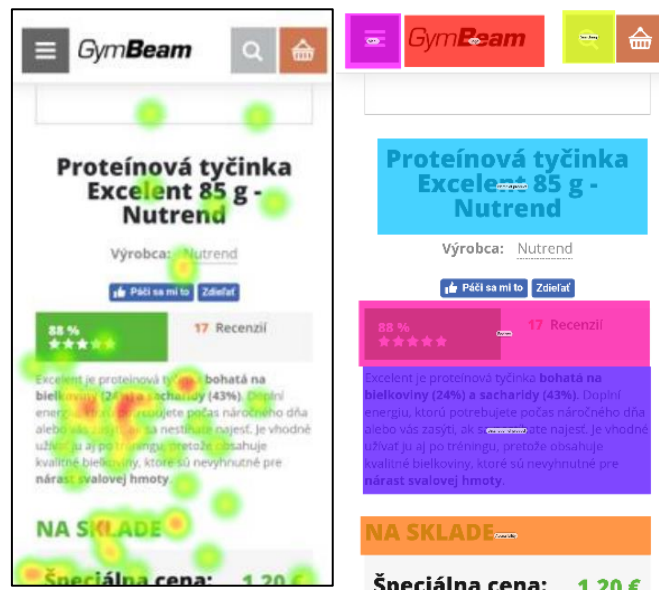


Figure 4 Visual attention (left side) recorded by eye tracking and Areas of Interest (AOI, right side) – product category I. display on a mobile device; source: own documentation

In terms of AOI (Table 2), respondents in the case of product category I. noticed the product name first (0.25 ms). In terms of the indicators, they noticed the logo the last one (4.77 ms). Respondents took the longest time to notice the product name button on average (1.17 ms). The logo was viewed for the least amount of time (0.10 s). The initial view was also the longest on the product name button (0.90 s). The most repeated views were on reviews (3 revisits).

Table 2 Areas of Interest (AOI) by eye tracking – product category I. display on a mobile device; own elaboration

	Menu	Logo	Search	Name	Description	Reviews	Availability
Time to First Fixation (ms)	0.37	4.77	1.70	0.25	1.19	0.37	1.02
First Fixation Duration (s)	0.25	0.37	0.09	0.90	0.67	0.55	0.45
Total Fixation Duration (s)	0.23	0.10	0.24	1.17	0.65	0.55	0.20
Count	2	1	1	2	2	3	2

From measuring the emotional attention (see Figure 3, middle part), the greatest level in this case was focused on product reviews and availability. This fact is also declared by the higher rate of repeated views in terms of visual attention. Relatively higher emotional attention was also attracted by the product name itself.

Looking at another interface within the product category presented by the heat map (Figure 5), we see that respondents pay significant attention to the price, shopping cart and the add to cart button. Again, the data largely differs from that obtained through online analytics tools, which present respondents' touch rather than actual visual attention.

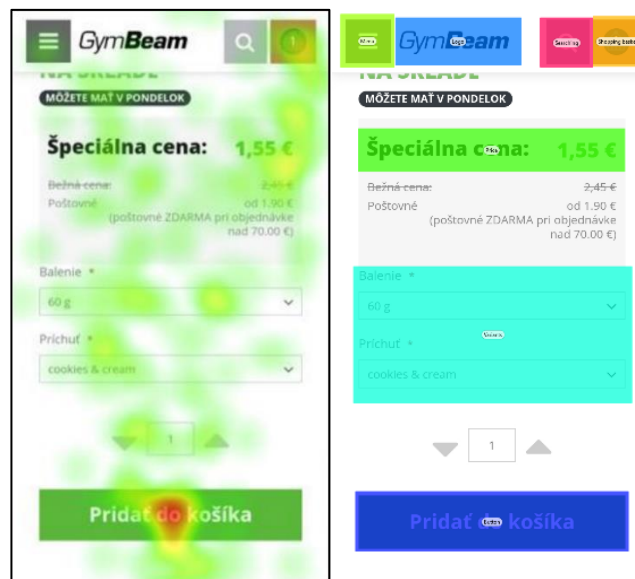


Figure 5 Visual attention (left side) recorded by eye tracking and Areas of Interest (AOI, right side) – product category II. display on a mobile device; source: own documentation

In terms of AOI (Table 3), in the case of product category II. display, respondents noticed the cart button first (0.33 ms). In terms of the observed indicators, they noticed the logo (5.90 ms) as the last one on the mobile interface screen. Respondents took the longest time to view the product price on average (0.95 s). The menu button took the least time to view (0.09 s). The initial view also took the longest time to view the product price (0.97 s). The most repeated views were on the add to shopping cart button (5 revisits).

Table 3 Areas of Interest (AOI) by eye tracking – product category II. display on a mobile device; own elaboration

	Menu	Logo	Search	Basket	Price	Variants	Button
Time to First Fixation (ms)	0.58	5.90	1.09	0.33	0.60	0.37	1.02
First Fixation Duration (s)	0.30	0.17	0.09	0.90	0.97	0.25	0.90
Total Fixation Duration (s)	0.03	0.09	0.04	0.17	0.95	0.55	0.45
Count	1	0	0	2	4	2	5

From the emotional attention measurement (see Figure 3, right side), the highest emotional attention in this case was focused on the shopping cart button and the add to shopping cart button. This fact is also declared by the higher rate of repeated views in terms of the visual attention measurement in the case of the add to shopping cart button.

#### 4 Discussion

An important aspect in m-commerce design is to focus on the system's usability both through UI and UX (Ahmad & Ibrahim, 2017), while in all aspects of user interaction the UX is beyond UI design and usability (Noman, 1999). Moreover, Hassenzahl (2008) refers to UX as the quality of interactive technology, focusing on the human and not on the product. UX is the effect felt by a user as a result of interaction and the usage of a system, device, or product, including the influence of usability, usefulness, and emotional impact during the interaction itself, which embraces seeing, touching, and thinking about the system or product, including admiring it and its presentation before any physical interaction (Hartson & Pyla, 2012; Lilley et al., 2020). This study builds on the findings by Berčík et al. (2022).

The use of implicit methods suggests that some improvements need to be made. This implies that not only online analytics, but also innovative approaches in the form of consumer neuroscience tools should be emphasized when improving the UX and UI design of a mobile site. From the AOI results, we see the detailed process of consumer product selection in a mobile device environment. While online analysis on mobile devices provides a comprehensive picture of where consumers click the most, heat maps point to the places where people actually look (visual attention). Emotional attention, in turn, can point to the places where people were most engaged and therefore using consumer neuroscience tools can be an effective method to improve the UX and UI design of a website viewed on a mobile device.

Based on this study, we recommend GymBeam to simplify the process of adding products to the shopping cart, as respondents spent time after adding a product to the cart checking if the product was actually added to the cart, and then performed this action multiple times, resulting in multiple items being added at once, which was confirmed by emotional attention (score 0.045). Based on the above, a solution could be to introduce a simple information window after a product has been added to the cart, indicating that it has indeed been added, which would provide a better and clearer UX interface. These changes would mainly contribute to improving the UI, but also the UX. Incorporating consumer neuroscience tools into mobile page perception testing revealed a wealth of detailed consumer perception information that is further useful in the marketing management and communication process.



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## References

- Ahmad, Z., and Ibrahim, R. (2017), “Mobile Commerce (M-Commerce) interface Design: A Review of Literature.” *IOSR Journal of Computer Engineering*, Vol. 19 No. 3, Ver. IV (May – June 2017), pp. 66-70. doi: 10.9790/0661-1903046670
- Ajibola, A. S., Abiodun, E. T., and Goosen, L. (2022), “Development of A New Model for the Usability Evaluation of M-commerce Applications.” *Journal of Telecommunication, Electronic and Computer Engineering*, Vol. 14 No. 3, pp. 1-9, available at: <https://jtec.utem.edu.my/jtec/article/view/6189>. (accessed 18 September 2022)
- Babiloni, F., and Cherubino, P. (2022), “Consumer Neuroscience: A Neural Engineering Approach”, in Thkor, N.V. (Ed.), *Handbook of Neuroengineering*, Springer, Singapore, pp. 1-29, doi: 10.1007/978-981-15-2848-4\_74-1
- Berčík, J., Mravcová, A., Gálová, J., and Neomániová, K. (2022), “New Possibilities for Testing UX and UI Design on Mobile Devices.” World Academy of Science, Riverside.
- Bose, S. (1 May, 2021), “UI Testing: A Detailed Guide”, available at: <https://www.browserstack.com/guide/ui-testing-guide>. (accessed 18 September 2022)
- Chlibovytch, N. (2022), “Consumer Neuroscience: The use of neuroscience techniques to create better advertising.” *Brain Matters*, Vol. 4 No. 1, available at: <https://ugresearchjournals.illinois.edu/index.php/brainmatters/article/view/809/698>. (accessed 18 September 2022)
- Churchville, F. (2022), “User Interface”, available at: <https://www.techtarget.com/searcharchitecture/definition/user-interface-UI>. (accessed 18 September 2022)
- Design4users (2022), “12 UI Design Trends for Web and Mobile We Started 2022 With”, available at: <https://design4users.com/hot-ui-design-trends/>. (accessed 18 September 2022)
- Hartson, R., and Pyla, P. (2012), “The UX book: process and guidelines for ensuring a quality user experience.” Morgan Kaufmann, Burlington.
- Hassenzahl, M. (2008), “User experience (UX): Towards an experiential perspective on product quality,” in *Proceedings of the 20th International Conference Association Francophone d'Interaction Homme-Machine – IHM '08*, Metz, pp. 11-15. doi: 10.1145/1512714.1512717.
- Indeed Editorial Team (1 June, 2022), “What Is User Interface (UI)?”, available at: [https://www.indeed.com/career-advice/career-development/user-interface?utm\\_campaign=earnedsocial%3Acareerguide%3Asharedirectshare%3AUS&utm\\_content=What%20Is%20User%20Interface%20%28UI%29%3F&utm\\_medium=social&utm\\_source=directshare](https://www.indeed.com/career-advice/career-development/user-interface?utm_campaign=earnedsocial%3Acareerguide%3Asharedirectshare%3AUS&utm_content=What%20Is%20User%20Interface%20%28UI%29%3F&utm_medium=social&utm_source=directshare). (accessed 18 September 2022)
- Jain, N., and Tan, T. F. (2022), “M-commerce, Sales Concentration, and Inventory Management.” *Manufacturing & Service Operations Management*, Vol. 24 No. 4, July-August 2022, pp. 1887-2386, doi: 10.1287/msom.2021.1071
- Jang, H., and Han, S. H. (2022), “User experience framework for understanding user experience in blockchain services.” *International Journal of Human-Computer Studies*, Vol. 158, February 2022, pp. 102733. doi: 10.1016/j.ijhcs.2021.102733

- 
- Lilley, M., Pyper, A., and Rawska, J. (2020), "Applying user experience techniques to the design of a programme site," in *European Conference on e-Learning*, Academic Conferences International Limited, Oct. 2020, pp. 291.
- Moonty, B., Bhattacharyya, N., Karmakar, S., and Nayak, B. K. (2022), "Eye Tracking to Evaluate the Usability of User Interfaces", in *Ergonomics for Design and Innovation, Humanizing Work and Work Environment: Proceedings of HWWE 2021*, pp.201-210. doi: 10.1007/978-3-030-94277-9\_18.
- Norman, D. A. (1999), "The Invisible Computer: Why Good Products Can Fail, the Personal Computer Is So Complex, and Information Appliances Are the Solution." MIT Press.
- Rajendran, M. M. A., Kumar, D. V., and Nedelea, A. M. (2022), "Enhancing Consumer Experience through Mobile Commerce: Challenges and Opportunities." *Ecoforum Journal*, Vol. 11, No. 1(27).
- Reddy, H. B. S., Reddy, R. R. S., & Jonnalagadda, R. (2022), "A Proposal: Human Factors Related to the User Acceptance Behavior in Adapting to New Technologies or New User Experience." *International Journal of Research Publication and Reviews*, Vol. 3, No. 8, pp. 121-125. doi: 10.55248/gengpi.2022.3.8.1
- Vinerean, S., Budac, C., Baltador, L. A., & Dabija, D. C. (2022), "Assessing the Effects of the COVID-19 Pandemic on M-Commerce Adoption: An Adapted UTAUT2 Approach." *Electronics*, Vol. 11, No. 8, pp. 1269. doi: 10.3390/electronics11081269

## **Session C**

# **Examination of Changes in Management of Companies in Connection to Industry 4.0 Transition**

*this session was supported by the project VEGA 1/0792/20 Examination of Changes in  
Management of Companies in Slovakia in Connection to Industry 4.0 Transition*

# The Contribution of Political Economy in the Face of the Current Crises

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## Abstract

Political economics is a social science that has been developed over the centuries by the most famous authors such as Adam Smith, Karl Marx, Alfred Marshall and Maynard Keynes. The so-called "classical" school of thought was historically built in opposition to the hyper-regulation of society, but to convince public opinion, its supporters often adopt a dogmatic approach. The perfect balance between supply and demand illustrated by the "law of opportunities" is a simple accounting equality, not an economic equilibrium. Crises, inequalities and unemployment bear witness to this and the inadequacies of regulatory policies are numerous. The difficulties of regulatory strategies are mainly due to the differences in approach to the problems to be solved - more interventionist approaches for some, more liberal approaches for others. As recommended by Esther Duflo, Nobel Prize in Economics in 2019, it is necessary to know the causes of these differences before attempting to upset or marginalise them by playing on the balance of power, which is why it is so important to resort to a decision-making consensus.

Keywords: Political economics, liberalism, state interventionism, dogmatism, decision-making consensus

Article Classification: Research article

## 1 Introduction

The term 'political economy' has three Greek roots: oikos (house), nomos (norm) and politikos (relating to the city). It was first used in 1615 by Antoine de Montchrétien as the title of a treatise intended for the young Louis XIII and his mother, the regent Marie de Médicis, in order to set out rules favourable to the management of affairs and the

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enrichment of the kingdom. Later, with the contribution of the Scotsman Adam Smith (1723-1790), father of the classical economists, and the Liberal School, Political Economy ceased to be a set of recipes and became a science at the service of the satisfaction of men living in society. In accordance with a systemic approach, numerous "laws" were developed, such as the "law of opportunities", the "law of wages", the "law of one price"...

While recognising the economic efficiency of the liberal system, the Rhineland-born Karl Marx (1818-1883) contested the social exploitation it engendered, the cause of its self-destruction. In reaction, the British economist Alfred Marshall (1842-1924), leader of the neoclassical school, reconstructed the liberal argument and reminded us that Political Economy is nothing more than the study of humanity in the conduct of its daily life.

Reconciling liberalism and state interventionism to fight unemployment, the British economist John Maynard Keynes (1883-1946) gave a social purpose to Political Economy. This purpose was to be emphasised by certain post-Keynesian authors, such as the British author Joan Robinson (1903-1983), who postulated that, in its absence, economics as a science had no reason to exist.

If Political Economy is a social science, one may ask whether it still sufficiently responds to the demands of society in the face of the various crises we are currently experiencing.

## **2 Material and methods**

The work of classical and more contemporary authors is used in this article to understand the inadequacies of market regulation policies. Political Economy aims to understand and explain the economic dimension of the world as rationally as possible, but in order to understand reality, which is not always rational, it needs to draw on the contributions of other disciplines such as mathematics, statistics, sociology and, more generally, the human sciences.

### ***2.1 A science professing certainties that are sources of uncertainty***

#### ***2.1.1 Recourse to dogmatism to better convince people of the virtues of ultraliberalism***

Challenging the hyper-regulation of the society of the time, a current of thought known as 'classical' wants to replace it with an ultraliberal organisation. In order to convince the leaders and public opinion, its supporters adopted a dogmatic approach that excluded any contestability of the benefits expected from such a change.

Hence the assertion of several laws and theories that claim to be universal. One of these is the "law of opportunities" of Jean-Baptiste Say (1767-1832), according to which all supply creates its own demand, thus guaranteeing, except for very short-term adjustments, equilibrium on all markets, including the labour market, where unemployment can only be residual. Formulated by the Prussian theorist Ferdinand Lassalle (1825-1864), the "iron law of wages" shows that, in the long term, the level of the real wage tends towards a minimum necessary to maintain the labour force. Any increase in this level encourages an increase in the birth rate, which ultimately leads to an increase in the active population, thus reducing social tensions on the labour market. The "law of one price" dear to classical and neoclassical authors reminds us that in a market of pure and perfect competition, there can only be one price for a given good, and that

this price is to everyone's advantage since it is the lowest possible for the consumer while ensuring a maximum profit for the producer, given the quantities sold at this price.

The "quantitative theory of money", initially outlined by Jean Bodin (1529-1596), creates a direct and proportional relationship between the increase in the money supply (or set of means of payment in circulation) and the increase in the average price level.

### *2.1.2 A total lack of relativism, a source of questions*

The perfect balance between supply and demand illustrated by the "law of opportunities" is a simple accounting equality and not an economic equilibrium. Crises, inequalities and unemployment are proof of this. The "iron law" according to which wages cannot deviate for long from a minimum threshold, necessary for the survival of workers, is based on the relationship between rising wages and rising birth rates. It should be noted, however, that this relationship was largely relativised by the Irishman Richard Cantillon (1680-1734), who already observed that an increase in living standards would slow down the number of births to a higher level.

The 'law of one price' is consistent with a situation of pure and perfect competition made possible by the homogeneity of the products traded, by atomicity, by the fluidity and transparency of transactions. But the reality is far from meeting these conditions. Let us add that pure and perfect competition remains a textbook hypothesis that makes it possible to grasp reality without being a reflection of it. As for the "quantitative theory of money", what reality contests is not the relationship established between the amount of the money supply and the average price level, but the strict proportionality introduced, as well as the uniqueness of the direction of causality retained. If the money supply can indeed influence the average price level, the opposite relationship is not impossible.

Let us also specify that if in fact the market does not protect us against the imbalances of growth, the latter does not eliminate situations of extreme poverty and all its forms of exclusion: difficulties or impossibility of access to housing, health services, knowledge, modern communication techniques. Finally, we should note that growth does not spare us from crises linked to the decoupling of the real sphere from the financial sphere: a decoupling caused by speculative tensions, by the crumbling of social ties, by the lack of cohesion and solidarity, by attacks on national sovereignty, by supply crises or disruptions, etc.

## *2.2 A so called social science still far removed from social problems*

### *2.2.1 The need for a more pragmatic approach*

While the problem posed by the international division of labour is linked to that of unfair competition caused by countries practising social, monetary or fiscal dumping, it is now also linked to the greater geographical segmentation of value chains which may call into question - in a context of geopolitical tensions - the security of energy, technological, food or health supplies. Hence the periodic return of protectionist tendencies. But like competition, protectionism has its limits. It can lead to higher prices without any productive counterpart. It can encourage partner countries to take retaliatory measures. It is an obstacle to the spread of technology and skills transfers. It is a brake on exports that are more or less dependent on imports.

The problem of sustainable growth is alien to the classical analysis, according to which any increase in supply, i.e. in production, generates an increase in demand without inducing any counterproductive effect. In reality, however, the sustainability of growth is

called into question as soon as the value of consumption for production purposes in a country exceeds the value of final production. This is in accordance with the following relationship: final output or sum of value added = total output - sum of intermediate consumption. This risk of unsustainable growth was raised in the first half of the 20th century by the American Alvin Harvey Hansen (1887-1975), leader of the Stagnationist School, then by the zero growth theorists initiated by the Meadow Report of 1971, and finally by the Paris Conference and the COP 21 agreement of 12 December 2015, the start of a multilateral process to combat climate change. Since the Earth Summit in Rio de Janeiro in 1992, sustainable growth, associated with sustainable development, must make it possible to meet the needs of the present without compromising the ability of future generations to meet theirs. It should be added that safeguarding the natural environment implies safeguarding the social environment and the consensus that guarantees its stability and that of growth.

The migration problem - from the perspective of Political Economy - refers to the mobility of labour which, like that of capital, can only be stabilising. Indeed, the labour factor tends to leave the regions where it is in abundance, and therefore more poorly paid, in favour of regions where it is in short supply, and therefore better paid. But in reality, this thesis is far from being verified, for at least four reasons:

- It is more in line with the national than the international framework, given the linguistic, cultural and regulatory barriers.
- It ignores the fact that, very often, labour (like capital) tends to favour areas where it is already highly concentrated, a tendency explained by the search for proximity, economies of scale, etc.
- This thesis does not take into account the need for qualifications - the more developed a region is, the greater the share of unskilled immigration in its total immigration.
- The classical Political Economy approach does not take into account massive migrations - exodus of populations fleeing wars, poverty, natural disasters...

### 2.2.2 *In search of a more consensual socio-economic regulation*

The inadequacies (or even failures) of regulation policies are numerous. The succession of crises in monetary and financial activities bears witness to this. These activities have been destabilised by the abolition of fixed exchange rates since 1975, by the resulting intensification of speculation, by transfers of capital and investments weakening national sovereignty. This is illustrated by the intensification of global trade liberalisation which, despite the rules imposed by the WTO in particular, does not always guarantee the equity and balance expected from competitive enlargement. This is also illustrated by the management of the migration problem, which to date has not enabled the United States to reach a consensual agreement on the flow, particularly from Mexico, nor the European Union to consolidate the simple safeguard decisions quickly taken after the massive influx of migrants in 2015. Decisions and measures that are far from being sustainable, given the possible arrival of new migrants fleeing war, floods, drought, famine, etc.

The difficulties of regulation strategies are mainly due to differences in approach to the problems to be resolved - more interventionist approaches for some, more liberal for others. As Esther Duflo<sup>1</sup>, winner of the Nobel Prize in Economics in 2019, recommends, we must first identify the causes of these differences before trying to upset or marginalise them by playing on power relations. He goes on to say that it is essential

to analyse the reasons for the other person's refusal in order to convince him that his interest, like that of others, is not his refusal.

This is where the importance of recourse to decision-making consensus comes in. A consensus that will be all the easier to obtain if it is sought in concentric circles, on the basis of regional agreements that spread from the centre to the periphery, from the bottom to the top. However, we should be wary of a decision-making consensus that, mainly due to the emotionality and sensitivity of the surrounding context, would very quickly crumble over time.

### **3 Results**

Like any science, Political Economy aims to understand and explain as rationally as possible, on the basis of an organised body of knowledge, the economic dimension of the world around us, in order to forecast and act functionally. However, for a science that seeks rationality to help us understand a reality that is not always rational, it must be impregnated with the contributions of other disciplines.

### **4 Discussion**

While maintaining close relations with the mathematical and statistical sciences, which are indispensable instruments for evaluation and forecasting, it must become more closely linked to demography, which has an impact on impoverishment in some countries and enrichment in others; and to sociology, given the growing role of institutions, morals and the degree of social cohesion. It must also be closer to psychology, which plays on the needs for integration, incentives, identity and security. Political Economy cannot remain alien to the environmental sciences, which encourage us to rethink the phenomenon of scarcity introduced by neoclassical theory; to geopolitics, which calls on us to take into account the need for security of supply and the redrawing of geographical areas of sovereignty.

This strong permeability to other sciences is inevitable so that Political Economy, which claims to be the most scientific of the social sciences, is not also the least social of the human sciences.

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### **References**

- Duflo, E. (2020), *Good Economics for Hard Times*. Editions du Seuil, Paris.  
Keynes, J.M. (1936) *Théorie générale*  
Marshall, A. (1890) *Principles of Economics*.  
Marx, K. (1867) *Das Kapital. Kritik der politischen Ökonomie*  
Smith, A. (1761). *Theory of Moral Sentiments*



# Project Management of the Future - Exploit the Potential of Megatrends and Digitalization

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## Abstract

The paper is a call for project performers of the future to train their sensitivity for the emerging of megatrends, to recognize their potential and to use the opportunities they offer for the further development of project management. This theoretical study applies as method the systematic literature review to show how megatrends and digital transformation impact the discipline and how their potential can be utilized for its progress. Project management cannot withdraw from influence of the megatrends. The degree of their impact on the project management processes may differ, but they constitute the framework which supports the formation of reliable predictions regarding the direction in which this discipline is moving.

Keywords: project management, digitalization, megatrends, future.

Article Classification: Literature review

## 1 Introduction

This theoretical study emphasizes the significance of megatrends and digitalization in the future development of project management. Based on a systematic literature review the study analyses the impacts of digital transformation on and reveals the changes of the discipline in the future. The topic is relevant since the society is facing a continuous increase of projectification grade.

In nearly all operational functions work is performed within and with help of projects. This applies as well to Information Technology, to product and research development, supply chain, production, as to general management. Projects are established in non-profit organizations and in the public administration (Weßels et al., 2014). One cannot imagine any sector of the economy and public life without projects.

The “Deutsche Gesellschaft für Projektmanagement” (German society for Project Management [GPM]) commissioned 2021 a study to systematically investigate the projectification in all areas of the German society (GPM, 2021). This phenomenon can be described as the fusion between project and organizational transformation.

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The study identified digitalization, growing complexity and need for innovation as key drivers for expanding of projectification (GPM, 2021). Digital transformation and organizational change are driven forward by projects, so that a boost for project management is to be expected in the next five to ten years. The increasing product and project complexity implies a growing importance of project management, as a result of the increasing volume of and added value creation through projects.

In the context of digitization project managers and teams are confronted with a better understanding of how to deal with new technologies, business models, organizational forms, ways of communication and cooperation to become capable of acting as individuals and as companies in the digital transformation. From a holistic perspective successful management of complex projects goes beyond methods, tools, and techniques. Controlling complexity in the project environment requires from project managers the ability to solve and mitigate conflicts, to motivate teams, ensure availability of required resources to complete tasks, and to satisfy the stakeholders.

Organizations are in the midst of the digital transformation, driven by projects, and are simultaneously designers of the digitization.

## **2 Material and methods**

The research object of the study is project management as a discipline, explored from the perspectives of emerging megatrends and progress of digitalization.

The methodology of the systematic literature review has been selected because it provides a process for identifying and critically appraising relevant research data for this paper. It aims to identify most empirical evidence that matches with the pre-defined search criteria to answer the research questions (Snyder, 2019).

The systematic literature review has been performed according to an iterative process of four sequential phases: data collection, selection, evaluation and synthesis (integration in the own research).

The reporting of the review has been guided in accordance with the Preferred Reporting Items for Systematic Review and Meta-Analysis [PRISMA] Statement (Page et al., 2021).

The review of the scientific literature focussed on the concepts of project management and digital transformation in combination with megatrends, outlined insights on the current state of the art, indicated trends of further research and guided to interpretations of the research material. The search concentrated on peer-reviewed, scientific publications between 2017 and 2022, limited to articles, books, book chapters, standards, conference papers and studies, in English and German.

In the scientific source selection Google Scholar has been set as the starting point for the research. Databases selected by the online library of the Comenius University and mostly used for management studies have been taken in consideration as further sources for gathering scientific research data. The repositories for scientific articles, studies and research results of the Project Management Institute, the International Project Management Association and the Association for Project Management have been identified as valuable data sources. Websites of groups and organizations which cover topics of, and websites of journals and blogs dedicated to megatrends and digital transformation have been revised. The scientific data bases which demonstrated to be comprehensive in terms of publications have been selected: ScienceDirect, JSTOR, SpringerLink and Google Scholar.

### 3 Results

#### *3.1 The influence of megatrends on future project management*

Megatrends are a core element of the futurology because they affect all levels of society and consequently influence companies, institutions and individuals. The megatrend system constitutes the foundation of work for the Institute for Future [Zukunftsinstitut] in Frankfurt/Main, Germany (Zukunftsinstitut, 2021). Researchers identified twelve megatrends and described the key features and criteria for identification, definition, and differentiation from other trends.

Main characteristics of megatrends are: duration, ubiquity, globality, and complexity. They last several decades and impact all areas of society, economy, the political system, media, consumption, and the way people live together.

Megatrends are global, they emerge not everywhere simultaneously, but sooner or later can be observed universally. Megatrends do not act in isolation, they influence and reinforce mutually effects. Their interactions generate their dynamic forces and changing qualities. The Institute for Future identified following megatrends which will shape the society: gender shift, globalization, health, connectivity, individualization, mobility, new-work, neo-ecology, safety, urbanization, silver society and knowledge culture (Zukunftsinstitut, 2021).

The phenomenon of globalization has been reflected already since the last two decades. It enabled the realization of multi-national projects through an increasingly free exchange of ideas, knowledge, and experience on the level from a worldwide placed team members to larger project manager communities. The disappearance of geographical boarder will lead to a project management of the future which understands diversity of cultures and perspectives as a productive area with a common horizon of expertise.

Globalization, the beneficial exchange of information and practical capabilities would not be possible without connectivity, the basic pattern which describes the social and economic transformation of the current century, the networking society based on the digital infrastructure. Globalization is continuously contributing to the expansion of connectivity. Project management and teams become independent of space and time. Projects processing becomes more efficient, so that several customer wishes can be fulfilled and turnover is generated in shorter time.

In the future not only team members of the same projects are connected, but projects of different types, sizes, and complexity grades. Synergies are generated to enable an efficient and quick realization of projects. These ways of collaboration are encouraged by the concept of new-work. The boundaries between life and work dissolve, meaningfulness of work is slipping into the foreground. New-work structures characterized by remote work and collaboration spread in the organizations. Teams become progressively empowered, individuals see themselves more and more as problem solvers instead of orders receivers and executers. From this perspective it can be predicted that agile and hybrid approaches will dominate the project management environment and replace more and more the traditional, waterfall methodology. This tendency could jeopardize the role of the future project manager. Since teams become increasingly independent and self-responsible, project managers turn out to be obsolete. Their core responsibilities will move in a direction beyond a singular project toward to project networks with overall coordinating and financial controlling functions.

The megatrend silver society describes the manifold effects of the demographic change of word population getting older. Sustainable companies rely on mixed-age teams

and management structures. Instead of investing too much time in the competition for young talent, it is important to stimulate bright minds in the ranks of senior employees, to further qualify and keep them in the company through innovative employment models. In addition to the lifelong learning component, the entire working environment has to be appropriate, including health-promoting components (Zukunftsinstitut, 2021).

Frontiers of gender and age disappear, diversity of teams will help projects to achieve positive results in shorter time, since wide range of expertise and cognitions from lessons learned are available in higher density compared to homogeneously structured teams. The megatrend health has a positive effect on project teams. Employees remain longer productive and failures in project work will be less frequent.

A large future potential for project management lies in the knowledge culture. Fuelled by the megatrend of connectivity the knowledge of the world and the way to deal with information are changing. Education is becoming more digital. Cooperative and decentralised structures for knowledge generation are spreading, and the understanding about knowledge, its creation and dissemination, is improving continuously. Open, available knowledge and free creativity impacts everyday working life. Creativity cannot be forced and needs freedom - both in the company and in school education. A new understanding of creativity, playfulness and open knowledge could lead to different, better results and innovations in the management of projects. (Zukunftsinstitut, 2021). Critical thinking and the correct handling of complexity are becoming increasingly important in the project work. Research in the field of project management will become more accessible for daily project work, the collaboration between practitioners and academia on this field will become normality.

In the future project management education is no longer conceivable without digitalisation. Digital literacy is needed, access to digital services and devices and the ability to use them must be guaranteed and taught by the companies to all. Living and working in connectivity and instant information flow requires data, technological and human literacy, the ability to handle with and understand the tides of information in order to use them in a beneficial way. To function in a social environment students and practitioners should cultivate their human side. Human literacy is teaching them the human aspects of work, encouraging innate strengths, preparing students to compete in an environment where smart machines collaborate along with human professionals. A “life-long-learning” mindset will support them to cope with the changes (Aoun, 2017).

The megatrend of individualisation is driven by the increase in personal freedom of choice and individual self-determination. The importance of new communities is growing, which will give individualisation a new face in the future. Project teams of the future come together and cooperate independently of time and place, a strong “we” culture emerges, characterised by professional cooperation in the sense of achieving the project goals.

The megatrend of mobility in a new dimension of using a large range of infrastructure offers will support merging of teams in case meetings on personal level are required. Despite the unlimited possibilities to connect virtually, personal come together will continue to stimulate the work in and between projects.

A potential to exploit is the increasing heterogeneity regarding age and gender, which represents an enrichment for the performance of the project team.

The Corona crisis has clearly shown that projects can be executed differently and project management as a method can be performed exclusively with virtual teams localized in different corner of the world, working remote from home. Globalization and worldwide connectivity will facilitate to set-up teams with expert knowledge on specific scientific or economic areas.

Schoper et al. claimed already in 2017 that “there are more than 1500 papers that deal with the observable fact that tasks are increasingly carried out in the form of projects and less as “ordinary” line work” (Schoper et al., 2017). According to the authors by providing empirical evidence to the general assumption of the increasing projectification of the society underlines the importance of project work and calls out for future research in project management with the objective to improve project performance.

With increasing of projectification the position of project management and its professionals in the organization will continue to reinforce, project organization replace gradually matrix and hierarchical structures. Connectivity, performance in virtual teams to ensure project success is only possible with an expanded and functional digital infrastructure.

### ***3.2 Project management and digital transformation***

Digital transformation stands as a generic term to describe the expanding use of networked, web-based, and automated technologies in the society. It is frequently associated with the descriptive concepts of Industry 4.0 and fourth industrial revolution, whereby different meanings are behind them.

Industry 4.0 refers to “a marketing term that is also used in science communication and stands for a “Project of the future” (according to the high-tech strategy website) of the German federal government. The so-called fourth industrial revolution to which the number refers is characterized by individualisation (even in the series production) or hybridization of products (coupling of production and service) and the integration of customers and business partners in business and value-added processes” (Bendel, 2021).

The first industrial revolution which covered the second half of the eighteenth and first half of the nineteenth century was characterised by the introduction of industrial machines and ushered in mechanical production. In the late nineteenth until the early twentieth century the second industrial revolution made mass production possible, encouraged by the beginning of electricity and the assembly line. The third industrial revolution began in the 1960s and is usually called the computer or digital revolution. It was triggered by the development of semiconductors, mainframe and personal computing and Internet. The world is now in the middle of a fourth industrial revolution that began at the turn of this century and builds on the digital revolution (Schwab, 2017).

For Industry 4.0 is Internet the core technology. It refers to the intelligent networking of machines and processes for industry with the help of information and communication technology. Digitalizing production is achieving a new level of quality with global networking across corporate and national borders. Machine-to-machine, as well as human-to-machine communication, manufacturing facilities that are becoming ever more intelligent, artificial intelligence are proclaiming the new era of the fourth industrial revolution (Federal Ministry of Economic Affairs and Energy, Federal Ministry of Education and Research, 2021).

The industrial revolution might be seen as a huge complex, multi-national and transdisciplinary project, with the goal of process digitization and networking. To manage the complexity project management goes beyond of focussing to control the rigid “magic triangle” of scope, time, budget. Artificial intelligence (AI) and machine learning is able to realize connections between data and would make possible resource allocation in real time. Virtual assistants in form of chatbots will be helpful aides for project teams.

Robot Process Automation (RPA) automates processes, already practiced in the different industry sectors, can be applied in project management for the execution of

repetitive and standardized tasks done by humans, to handle data, or even to read e-mails in order to increase efficiency and speed (SAS Institute Incorporated, 2021).

Cloud and edge computing will continue to influence the way of work in projects. A continuously increasing data volume is made available for project managers and their teams accessed via Internet by only using a smartphone. Creative collaborative tools made teams possible to come together on a virtual board and continue their project work on daily basis.

Blockchain, Internet of Things (IoT), virtual, augmented, and mixed reality could be used to simulate project execution, to facilitate planning, monitoring and control.

Pajares et al. describe the main features of projects of the fourth industrial revolution focusing on those that could affect the management style when managing these kinds of projects (Pajares et al., 2017). They refer to them as Internet of Things (IoT) projects which can involve different technologies. According to their point of view technological revolution is caused by the maturity of several technologies and its empowerment by means of connectivity.

The phenomenon of the significant reduction of product life cycles in the last decades makes time as one of the most important factors in project management, according to Pajares et al., probably more important than cost and scope. Project teams should be used to work under time pressure. A strong competition exists between companies to launch new products and to be the first on the market becomes priority over reduction of costs to develop new products or versions of a product. Project success will be associated with the market success of a new product or service rather with producing deliverables measured by the requirements of the “magic triangle” of scope, time, and costs. The projects 4.0 generate new knowledge that will be further used in new projects and for business development and have a strong innovative component. To succeed in projects, innovation, knowledge, and project management should be interlocked.

In the new competitive environment project performers have to exhibit professional competencies to deal with complexity, shortened durations and to work in decentralized environments, like open innovation or network collaboration. The project management of the future means grappling with projects that have to adapt and innovate to keep pace with increasingly complex, fast changing, and uncertain conditions. The project management community is continuously facing challenges and, at the same time new opportunities for improving and consolidating their professional competencies (Pajares et al., 2017).

In a report published in 2017 ARUP dealt with the evolution of the project management until 2045 focused on construction projects. The “Future of Project Management” considers emerging trends and drivers, combines best practices and visual thinking to imagine the future through the eyes of its clients and creates a roadmap for future research and academic. The ARUP concept, which could be extended to a wider scale of project types in different environments, predicts that social responsibility of individuals and companies to act in the best interest of their ecosystem will continue to grow in importance, so that by 2025 it becomes a dedicated chapter of the Project Management Body of Knowledge (PMBok) of the Project Management Institute. It can also be predicted that the project management institutions will continue to consolidate their position and develop their standards in accordance with the global technological, economic, and social changes. The project management profession will continue to grow in importance and consolidate its position in the society. The project management institutions have the possibility to encourage research in the field of project management, enable and promote the collaboration between industry and academia.

The ARUP report argues that even in a future where professionals across the world have been gradually replaced by increasingly capable systems, core elements of project management will provide the human combination of leadership, experts integration, empathy, and ethical behaviour (ARUP, 2017). Beyond technical and methodological skills of project experts behavioural characteristics, emotional and social intelligence will be required increasingly in the recruitment.

Analysing project management in terms of influences specific to the fourth industrial revolution, projectification of the society, digitalization, virtualization, coping with complexity, trans-nationalization and professionalization, Simion et al. defined a new stage in the development of the discipline as Project Management 4.0 (Simion et al., 2018). They developed three definitions of this concept: as a project management specific to the fourth industrial revolution, as a fourth stage of project management evolution and as a set of project planning and execution processes using technological tools specific to the fourth industrial revolution. They argue that seven key components of project management are mostly affected by elements specific to the fourth industrial revolution: cost, time, quality, team, communication, risk, and procurement.

Project management 4.0 will take advantage of real-time monitoring and real-time cost progress indicators in the execution, elaboration of progress reports and quality control of deliverables will be automated, which facilitates time saving. The communication processes in and between projects will be accelerated, connectivity is increasing and removing physical and personal interchange of information. Communication between human and machine, as well as machine and machine will be deployed in the execution process. Simulation of the execution enables forecast and identification of risks, which are evaluated using techniques based on using large volumes of data from other projects.

Virtual platforms will be used to share and publish knowledge, lessons learned and best practices in several project subject areas. Regarding team collaboration and work, the use of virtual teams will be generalized, gamification will be applied for development of human resources and collective intelligence will facilitate problem solving and efficient management of projects (Simion et al., 2018).

The downside of teams virtualization is the decreasing of social interaction between project members. Automation and increasing connectivity may spare time of individuals, which can be invested in creativity, knowledge accumulation and potential expansion. Virtual environments enable cooperation beyond borders and use of collective intelligence to solve issues in short time. But the human aspect of the teamwork will continuously fade. The daily work loses human connection, inspiration triggered by a personal conversation between colleagues, motivation fired by positive feedback from superiors or peers, praise for a good job and the joy of coming together to celebrate successes as results of good performance.

A large-scale study performed by KPMG in collaboration with the Australian Institute of Project Management [AIPM] and the International Project Management Association [IPMA] with over five hundred participants from fifty-seven countries shows that the future of project management is anchored more in the strategic orientation than in the methodical handling of projects. The methods of project management are progressively being used to overcome an increasing number of business challenges. This demonstrates the essentiality of project delivery for modern organizations as a tool to implement strategic changes and increase profitability.

The study shows that sixty-three percent of the companies surveyed carry out projects with essential change management skills. This is in line with the finding that thirty percent of companies believe that their change management skills are very

effective. Change management competence is rated as particularly important skill for project managers in the future, followed by communication and interpersonal competencies. The future of the project management is “as a connected facilitator of change and return of investment” (KPMG; Australian Institute for Project Management, International Project Management Institution, 2019).

Project performers have to sharpen their skills toward strategic and interpersonal competencies. According to the study organizations have to double down their commitment to project and program management, to critical governance activities like risk identification and handling to obtain a return on investment, to invest in new technologies such as collaboration tools and artificial intelligence, which is pioneering for faster and more effective project management (KPMG; Australian Institute for Project Management, International Project Management Association, 2019).

Ribeiro, Amaral and Barros assert that the technological breakthroughs of the Industry 4.0 will trigger significant changes of the project manager regarding their soft and hard skills. The significant changes regarding the skills of the Industry 4.0 project managers will focus on the way of communicating, the speed and capacity of work and basic knowledge. Specialized project managers related to different elements of Industry 4.0 have to enhance their technical, methodological, social and personal skills. Technical competencies concern process understanding and state-of-the-art knowledge, methodical refers to creativity, decision-making, conflict and issue solving, entrepreneurial thinking, analytical skills. The social area comprises teamwork, intercultural skills, ability to transfer knowledge, motivating, coaching, networking ability, whereas personal competencies refer to flexibility, willingness to learn, tolerance of ambiguity, adaptability, pragmatism, sustainable mindset, compliance, and positivity. The existence of more behavioural and soft skills is associated with the project manager 4.0 profile, compared to the traditional project manager profile (Ribeiro et al., 2021).

#### **4 Discussion: towards a digital project management**

How project management will line up in the future delivers an explanation of the VUCA meaning. The term “VUCA” became indispensable in the language of the present management world. It is the acronym for Volatility, Uncertainty, Complexity and Ambiguity. Originally it was first used by two course participants of the United States Army War College, Lawrence and Steck, in their study regarding contemporary management theories in 1991 and concluded that “No one can accurately predict what tomorrow will bring. We do know that volatility, uncertainty, complexity, and ambiguity will define our future work environment” (Lawrence and Stack, 1991). This was the birth of a term which moved two decades later into the business world and is used almost inflationary to deliver a holistic description of the environment in which the society is located, impacting the way of its handling, decision-making and interaction between its systems.

VUCA combines four distinct types of challenges that demand four distinct types of response. The description by Bennett and Lemoine of these four elements can be transferred to project management, so that an approach for the future of the discipline can be derived.

They describe volatility as an unexpected challenge of an unknown duration, which is not essentially hard to understand since knowledge about it is available. In case of uncertainty the basic cause of the event is known, but a lack of information exists. Complexity is compared with a situation with many interconnected variables, with partially available information, or which can be predicted. But the volume or nature of it



can overwhelm the process. Ambiguity means that causal relationships are completely unclear, no precedents are available, organizations are dealing with “unknown unknowns” (Bennett and Lemoine, 2014). Based on these characteristics the project management in the future needs to re-organize, build-up specialists and resources focussing on their special needs dictated by the nature of their business. Organization will invest in buying talents, if required build stockpile inventory, collect, interpret, and share information. To cope with ambiguity the project management of the future is experimental. To understand cause and effect, hypothesis have to be constructed and tested, experiments will be designed, so that lessons learned should be applied broadly.

With the continuous review and renewal of knowledge the learning methods needs to be re-assessed too and modernized to enable people to build competencies and offer new ways of learning. The project management of the future is characterized by the utilization of automated methods and techniques supported by innovative, continuous evolving tools, which will facilitate and accelerate the daily project work. For this the discipline needs to retain a high degree of flexibility and connect traditional methods with the comprehension of new markets, deep knowledge about products and services of its own companies, how they are used by their customers.

The digital transformation is essentially emerging through a succession of technological innovations, which are becoming gradually more established in organizations and society. Then again digital transformation is accomplished through projects, further indication for the growing volume of projects in the future and consequently for an increasing demand on project management professionals. Hereby play project managers and their teams a meaningful role in managing the challenges of the digital transformation in the sense of meeting project goals. Project goals are not only reduced to profit realization, which remains one major purpose to ensure long-term survival of organizations, they concentrate on sustainability and responsibility for the impact of their projects on the society.

Project management is developing from a process- to a principle-oriented discipline, aiming to create values for organizations and society at whole. It becomes an instrument to contribute to a more sustainable society.

Project managers have to deal with resource diversity and create balanced teams integrating native and new knowledge. Emphasis will be on open mindsets and cognitive capacities. As artificial intelligence and robotics conquer more and more the organizations, leadership becomes more a collaborative process. In this new dynamic leadership and project management overlap, relationship and emotional intelligence become essential for project leaders since they facilitate motivation, engagement, and passion for the project within the organization (Bolick, 2019).

Digital transformation triggers projectification of society and vice versa. Further effects of these interrelated phenomena are the increasing demand of qualified project professionals and the transformation of their competencies required to meet objectives of projects. Further research is required on the transformation of the roles in project management under the influence of megatrends and digitalization regarding required future competencies and didactical approaches to acquire knowledge and build-up skills.

Project management cannot withdraw from influence of the megatrends. The degree of their impact on the project management processes may differ, but they constitute the framework which supports the formation of reliable predictions regarding the direction in which this discipline is moving.

A potential to exploit are the increasing heterogeneity regarding age and gender, which represents an enrichment for the performance of the project team, silver society, health, and knowledge culture. Fuelled by the megatrend of connectivity, the knowledge

of the world and the way to deal with information are changing. Virtual environments enable cooperation beyond borders and use of collective intelligence to solve issues in short time but diminish the human aspect of the teamwork.

Project teams should be sensitized for the emerging of megatrends, recognize their potential and the chances they offer to use them for the further development of the discipline.

Projects will continue to represent the way to transform innovative ideas into endeavours put into practice, or to experience and test the feasibility of theories with support of project management. Project success will be associated with the market success of a new product or service. The project management of the future means dealing with projects that have to innovate in order to deal with increasingly complex, fast changing and uncertain conditions and focussing on change management.

The future project management is aware of disruptive technologies, understands the potentialities of new technologies and is capable to think ahead and act proactively to produce added value for the organizations, since automation including artificial intelligence, machine learning, robotics, Internet of Things, impacts increasingly the work environment. Project performers of the future know their organizations, are aware of their strategic objectives and the orientation of the projects and are able to perceive and deal with the fast occurring changes. Leadership qualities, solid business judgment and pragmatic handling of uncertainties complete the necessary requirements for a successful project team of the future.

Project management is developing from a rational, strictly process-oriented, focussed on delivering in time and budget to a principle-oriented approach focussed on providing values for the society at whole.

The study is limited due to its theoretical approach. Further research is required to explore potentials of megatrends and digitalization for project management in practice.

Research around future competencies of project practitioners and educational approaches to acquire knowledge and skills would help practitioners and organizations to find appropriate ways to cultivate their capabilities for the future. Intensifying collaboration between academia and industry would foster research and practical application of the results in project management.

## References

- Aoun, J. E. Robot-Proof, "Higher Education in the Age of Artificial Intelligence", *The MIT Press, Cambridge Massachusetts*, London, England, 2017 Massachusetts Institute of Technology, United States of America, ISBN-13: 978-0262535977, pages xviii-xix. Overview available on: <https://mitpress.mit.edu/books/robot-proof>
- ARUP. "Future of Project Management". *Edition 01*, London/United Kingdom, April 2017, available at: <https://www.arup.com/perspectives/publications/research/section/future-of-project-management>
- Bendel, O. "Industrie 4.0. In: Gabler Wirtschaftslexikon (Online) ", available at: <https://wirtschaftslexikon.gabler.de/definition/industrie-40-54032/version-384598>
- Bennett, N., Lemoine, J. "What VUCA Really Means for You". In: *Harvard Business Review*, Volume 92, Number 1/2, 2014, available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2389563](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2389563)
- Bolick, C. "How Project Managers Can Prepare for the Fourth Industrial Revolution? ". In: *Northeastern University Graduate Programs*, 2019, available at: <https://www.northeastern.edu/graduate/blog/project-management-fourth-industrial-revolution/>

- Federal Ministry for Economic Affairs and Energy, “Federal Ministry of Education and Research“, available at: <https://www.plattform-i40.de/IP/Navigation/EN/Industrie40/WhatIsIndustrie40/what-is-industrie40.html>
- GPM Deutsche Gesellschaft für Projektmanagement e.V., “Projektifizierung der Gesellschaft in Deutschland“. *Summary of essential results of a study*, 2021, page 4, 14, available at: [https://www.gpm-ipma.de/fileadmin/user\\_upload/Know-How/studien/Sonstige\\_Studien/Ergebnisbericht\\_zur\\_Studie\\_Projektifizierung\\_der\\_Gesellschaft\\_in\\_Deutschch..\\_.pdf](https://www.gpm-ipma.de/fileadmin/user_upload/Know-How/studien/Sonstige_Studien/Ergebnisbericht_zur_Studie_Projektifizierung_der_Gesellschaft_in_Deutschch.._.pdf)
- KPMG, “Australian Institute of Project Management“, *International Project Management Association*. The future of Project Management: Global Outlook 2019. Project Management Survey, November, 2019, available at: <https://www.ipma.world/assets/PM-Survey-FullReport-2019-FINAL.pdf>
- Lawrence, J., A., Steck, E. A.. “Overview of Management Theory“, *A Group Study Project*. In: *U.S. Army War College Carlisle Barracks*, Pennsylvania 17013. Carlisle, 3 Pennsylvania/United States of America, 1991. DOI: 10.21236/ADA235762
- Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., Moher, D.: “The PRISMA 2020 statement: an updated guideline for reporting systematic reviews“. In: *Systematic Reviews* 10, Article Number 89, 2021, available at: <https://doi.org/10.1186/s13643-021-01626-4>
- Pajares J., Poza D., Villafañez F., López-Paredes A. “Project Management Methodologies in the Fourth Technological Revolution“. In: *Hernández C. (eds) Advances in Management Engineering*. Lecture Notes in Management and Industrial Engineering. Springer, Cham, 2017, pages 121-147, available at: [https://doi.org/10.1007/978-3-319-55889-9\\_7](https://doi.org/10.1007/978-3-319-55889-9_7)
- Ribeiro, A., Amaral, A., Barros, T. “Project Manager Competencies in the context of the Industry 4.0“. In: *Procedia Computer Science*, Volume 101, 2021, pages 803, 808-809. Available on: <https://www.sciencedirect.com/science/article/pii/S1877050921002763>
- SAS. “Accelerate and improve business outcomes with AIoT“. *How to deploy the artificial intelligence of things (AIoT) for stronger results*. SAS Institute Inc., North Carolina, United States of America, 2021, available at: <https://www.sas.com/content/dam/SAS/documents/marketing-whitepapers-ebooks/ebooks/en/artificial-intelligence-of-things-111551.pdf>
- Schooper, Y.-G., Wald, A., Ingason, H., T., Fridgeirsson, T., V. “Projectification in Western economies: A comparative study of Germany, Norway and Iceland“. In: *International Journal of Project Management*, Volume 36, Issue 1, 2017, pages 81. Available on: <http://dx.doi.org/10.1016/j.ijproman.2017.07.008>
- Schwab, K. “The Fourth Industrial Revolution“. *Crown Business*, New-York/United States of America, 2017. ISBN: 978-1-5247-5887-5, pages 6-8.
- Simion, C.-P., Popa, S.-C., Albu, C. “Project management 4.0 - Project management in the digital Era“. *Proceedings of the 12th International Management Conference “Management Perspectives in the Digital Era”*, November 1st - 2nd, 2018, Bucharest/Romania, pages 93-100, available at: [http://conference.management.ase.ro/archives/2018/pdf/1\\_11.pdf](http://conference.management.ase.ro/archives/2018/pdf/1_11.pdf)
- Snyder, H. “Literature review as a research methodology: An overview and guidelines“. In: *Journal of Business Research*, Journal of Business Research, Volume 104, November 2019, pages 333-339. Available on: <https://doi.org/10.1016/j.jbusres.2019.07.039>
- Weßels, D., Bochert, S., Jürgensen, F., Kasperek, I., Ladwig, D., Nachbagauer, A., Raimer, S., Rehm, S., Renfer, S., Schelle, H., Schneider, S., Schröder, I., Smuc, M., Vanini U., Wagner, R., Wiebusch, A., Windhager, F., Zenk, L. (2014). “Zukunft der Wissens- und Projektarbeit: Neue“ *Organisationsformen in vernetzten Welten*, 14. ISBN 978-3-86329-620-9.
- Zukunftsinstitut. “Die Megatrends“. In: *Zukunftsinstitut, Die Megatrends (Online)*, Frankfurt/Main, available at: <https://www.zukunftsinstitut.de/dossier/megatrends/>

- Zukunftsinstitut. "Megatrend Knowledge Culture". In: *Zukunftsinstitut, Die Megatrends (Online)*, Frankfurt/Main, available at: <https://www.zukunftsinstitut.de/dossier/megatrend-wissenskultur/>
- Zukunftsinstitut. "Megatrend Silver Society". In: *Zukunftsinstitut, Die Megatrends (Online)*, Frankfurt/Main, available at: <https://www.zukunftsinstitut.de/dossier/megatrend-silver-society/>

## The Application of the SMED Method to Optimize the Time of Using of Machines and Devices

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### Abstract

Each company wants to: achieve the best results, bear the lowest costs and use resources in the most optimal way. Among these resources, machines and devices should be distinguished. The most effective use of machines and devices as well as their working time are important factors increasing the company's efficiency. It is a good practice to evaluate their effectiveness and identify possibilities for improvement. There are many methods and techniques for assessing and improving the efficiency of machines, among them SMED is very popular. It is used to evaluate and optimize the loss of time spent on changeovers of machines. The main purpose of the paper is the presentation of the results of the analysis of implementation of SMED method in the selected company. The analysis presents three elements: the starting situation, implemented changes and results of implementation (5 months before implementation and 7 months after the implementation).

Keywords: SMED, TPM, efficiency, production management.

Article Classification: case study.

### 1 Introduction

The goal of each company is a profit, so the evaluation of its performance is extremely important, as it can provide a lot of information about the condition of the

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company. An important element of the analysis of the production process is assessing productivity and efficiency (Kardas et al., 2020). Calculating efficiency allows for a matter-of-fact and well-thought-out organization of work and the production process (Stabyła, 2010).

Many various factors that reduce the efficiency of the enterprise should be identified. These include, among others, too long changeover times, inadequate inventory management or the lack of standardization of work. Their elimination will help the company to increase efficiency and achieve better results.

Various methods and tools are used to improve efficiency of production processes. One of very popular techniques is the TPM - Total Productive Maintenance. According to Radosław Wolniak, "It is a resource management strategy that emphasizes cooperation between departments - operational and service, aimed at reducing defects and waste" (Wolniak, 2013). This concept is based on eight pillars. They are presented in Figure 1.

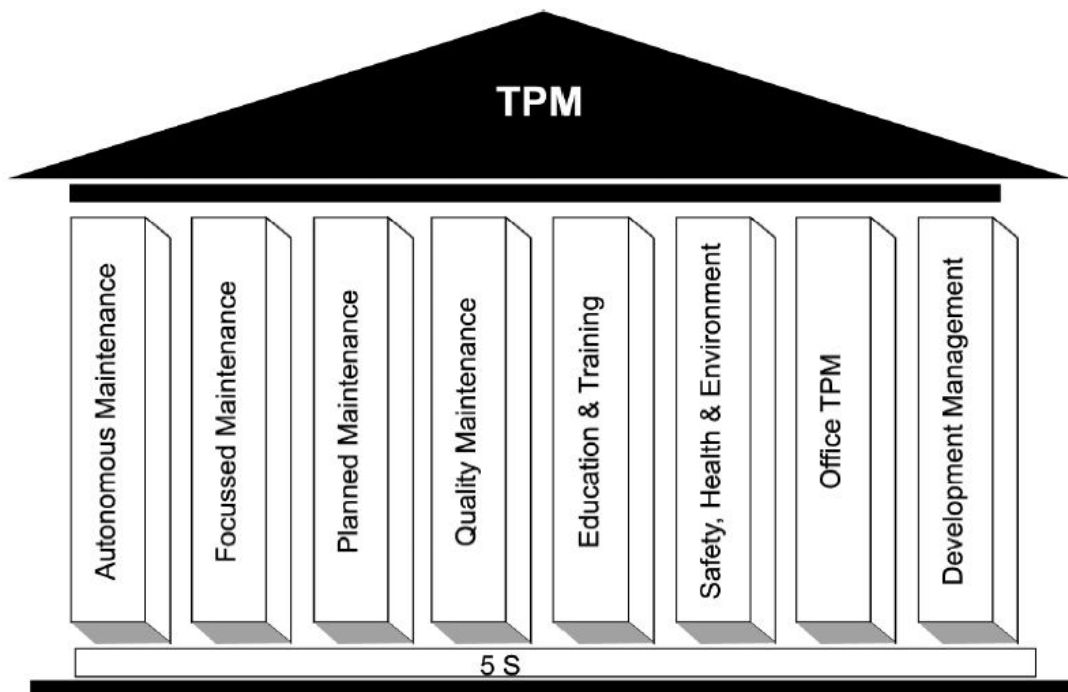


Figure 1 The concept of eight pillars of TPM source: (Parikh et al. 2015)

The tool that is needed to be used in TPM is SMED methodology, which improves the efficiency of machines by reducing the machine changeover time by the implementation of new technologies (Dvorsky et al., 2010; Dvorsky et al., 2011; Sliva et al., 2010; Sliva et al., 2003; Sliva et al., 2010; Sliva et al., 2019). The SMED (Single Minute Exchange of Die) methodology is a group of tools and techniques that shorten the time needed to change over machines and devices to a minimum and increase the productivity and efficiency of machines (Rosa et al., 2017).

Production managers see a changeover of machinery and equipment (Cep et al. 2013) as a time that creates waste. The saved time will primarily shorten the production cycle and allow for faster delivery of goods to customers. One of the advantages of using the SMED methodology is minimizing the disadvantages of mass production. This is

related to the reduction of the time needed to change the position. By adapting the method, small series production can be produced. As a result, the delivery time to the customer is shortened, inventory is reduced, flexibility is increased, and the productivity of employees and devices is increased by minimizing downtime (Klimecka-Tatar et al., 2022). The advantage is also the reduction of inventories, which results in an increase in the working area. As a result of implementing the methodology, work safety is also increased, which reduces the occurrence of an accident. Another advantage is the simplification of changeover procedures (Kruczek et al., 2012).

SMED (Single Minute Exchange of Die) is a method used to improve work efficiency and eliminate bottlenecks in production systems (Oujezdsky et al. 2016). In the literal sense, it means changing the form within a single-digit number of minutes (Stabryła 2010). The creator of the SMED concept is the Japanese, the engineer Shigeo Shingo, who in the 1950s, in consultation with Toyota, analyzed the plant's inability to eliminate bottlenecks in the production of car bodies using stamping presses. The "narrow" throats were caused by long times of changeover of the presses (Karam, 2018). According to the name of the methodology, the goal is to changeover the device in less than ten minutes. It is not always possible to achieve this, but each time this concept is used, the changeover is simplified and shortened (Mali et al., 2012).

According to the concept of S. Shingo, four stages of proceeding in order to improve the changeover processes should be distinguished (Walczak, 2006):

- Study 0 - preparatory study - filming, movement analysis, operation analysis,
- Study 1- separation of internal and external activities - control cards, functional check, transport of parts and tools,
- Study 2- transformation of internal into external actions - advanced work preparation, standardization, indirect clamping devices,
- Study 3- rationalization of all aspects of operations – tool storage and management, parallel operations, clamping clamps, elimination of adjustments, mechanization.

The purpose of the paper is the assessment of the problems with the efficiency and the presentation of possibility of its improvement for the selected device (the calender used for extruding rubber plates).

The purpose of this work is to identify and analyze the reasons of reducing the efficiency associated with the changeover time for a selected machine in a manufacturing company using the SMED method. The analysis includes three elements: the starting situation, the implemented rationalizations and the results of the implementation (5 months before the implementation and 7 months after the implementation).

## **2 Material and methods**

The paper presents the results of the SMED analysis conducted in selected production company. The analytical part of the work was carried out in the production company manufacturing conveyor belts. The machine for pressing rubber plates was analyzed. The application of the SMED method for the tested device required a lot of time and work of the design team. The analysis was divided into three elements:

- the analysis of the changeovers process and its time,
- the analysis of implemented rationalizations,
- the analysis of changeover time before (5 months) and after (7 months) the implementation of the rationalizations.

### 3 Results

The analysis was divided into 3 stages, according to the general division in the SMED method. First, the analysis of the changeovers process of the analyzed machine was performed. There are 3 types of activities performed during the changeover process:

- *Internal activities* - activities performed with the machine turned off.
- *External activities* - activities performed while the device is operating.
- *Waiting* - activities that occur by waiting for tools.

During the analyzed production process, four main changeovers were identified. The analysis of duration time was made. Results of this analysis were presented in Table 1.

Table 1 The analysis of the changeover time of individual elements of the device

No	Activity	Time of external activities / min.	Time of internal activities / min.	Waiting / min.
1	Changeover of body on rewinder without spacer	0	25	0
2	Changeover of body on unwinder with spacer	2	41	1
3	Changeover of warp on rewinder	0	10	0
4	Changeover of warp on unwinder	0	248	2

source: own elaboration based on (Woźniak, 2021)

The analysis of the results presented in Table 1 shows that:

- For the first activity, only internal activities were identified. Total time of this changeover was 25 minutes.
- For the second activity, changeover took 44 minutes in total. Most of the steps were done internally. They lasted 41 minutes. Only one operation was performed externally and lasted 2 minutes. During this process, also waiting was identified, and it lasted 1 minute.
- For the third activity, all activities were performed while the calender was turned off. This changeover took 10 minutes.
- The last changeover was the longest. The entire changeover took 4 hours and 10 minutes. All activities were performed when the machine is turned off. There was a 2-minute waiting. It was the main reason for the decision of implementation of SMED methodology.

The next step of the research was connected with the presentation of possibilities of improving the efficiency of changeover process. 16 various rationalizations were recommended and implemented. The list of implemented rationalizations is presented in Table 2. Analyzing presented possibilities it can be seen that rationalizations are connected with different elements of process.



**Table 2** The analysis of implemented rationalizations according to SMED methodology

No	Activity	Cause	Purpose	Rationalization
1	Transport of the press with the use of press slings.	No handles for safe transport.	Safe transport.	Mounting of handles for a 4-part chain sling.
2	Bench suspended on a fence.	There is no designated place for cable-laying benches.	Designating and describing the place and mounting the handle.	Designating a place to hang a bench that does not block the fence.
3	Helmets stacked on a shadow board.	No helmet holder near the control panel.	Clutter in the workplace.	Designating the place and mounting the handle.
4	No preview of pallets on scales.	Problems with sticky mixes and lack of review of the current amount of mix on the pallet.	Enabling the control of the current quantity of mix on the pallet and react faster to problems with the sticky mix.	Mounting the camera directed at the scales and the monitor on the cutting mill.
5	Problem of the working range of the unwinder.	No designation of the unwinder's operating range.	Enabling the correct body or fabric positioning when starting production.	Determination of the working range of the unwinder
6	Screws lying on the body of the machine	No dedicated screw container.	Designation of a place for screws.	Assembling the screw container and labelling it.
7	Sewing fabrics for cladding.	Low thread strength; cladding fabrics are sewn many times and the stitches break under slight tension anyway.	Reducing the number of stitches and increasing the strength of the thread.	Changing the thread type to a more durable one and describing the sewing machine.
8	Implementation of new pilots for machine.	Poor quality of the remote controls (the time of moving the switchboard from the remote control is very long and the number of protruding threads in the remote control is also large).	Shorter time of shifting the screed while connecting the remote control and making it easier for operators to transfer.	Execution of new pilots in three copies, 80 meters long with vulcanized ears.
9	Installation of the washers for circulation cards	Lack of designated space for circulation cards on the unwinders on the doubling table.	Designating a place for circulation cards of doubled blanks.	Mounting the washers on the unwinders structure on the doubling table.
10	The second line cutter.	Single scissors for cutting lines up to 2.5mm in diameter. Cutting lines with a diameter of 2.85 mm is very difficult using the scissors available at the station.	Allowing operators to cut lines with larger diameters.	Adding scissors for cutting lines with a thicker diameter.
11	Changing the location of the grinder.	Bad grinder location.	Changing the location of the grinder and changing the route of the fence.	Positioning the grinder outside the fence.

12	Storage space for friction fabrics and rollers for core replacement.	No stand for friction fabrics. The friction fabrics lie on the ground, they do not have a designated place for replacing the core on the roller.	Designating an appropriate place for friction fabrics, which will facilitate the replacement of the core on the roller.	Designating an appropriate place for friction fabrics, which will facilitate the replacement of the core on the roller.
13	Change the printer location on the line.	Little space on the desk. The new warehouse management system requires printers at each station, and the printer is very large.	Freeing up space on the desk.	Making a shelf for a printer on the right side of the control panel.
14	Marking of the limit stop adjustment buttons in a different colour.	Inconspicuous markings of the limiters adjustment buttons, which causes mistakes when adjusting the limiters or the machine gaps.	Reducing the risk of mistakes and marking the limiter adjustment buttons more clearly.	Reducing the risk of mistakes and marking the limiter adjustment buttons more clearly.
15	Marking the scope of work of unwinders on the mirror table.	No indication of the central position and the scope of the unwinders' work on the mirror table.	Allowing the blank to be correctly positioned in the centre.	Marking the central position of the unwinder and the operating range of the
16	frequent shortages of strips.	Poor quality of the strips to connect the remote control, frequent missing strips. Long connection time of the remote control in the line due to the need to find the right terminal.	Increasing the availability of strips.	Ordering strips of different lengths and marking them.

source: own elaboration based on (Woźniak, 2021)

Before and after the implementation of the rationalizations, the analysis of the effectiveness of the machine working time was performed based on monthly results. The changeover index was determined based on the following formula:

$$\frac{\text{changeover time [min.]}}{\text{total working time of machine [min.]}} \cdot 100\% \quad (1)$$

To show the influence of the use of SMED method on the efficiency of changeover process, two period of time were compared. The analysis covered 5 months before the implementation of rationalizations (Table 3) and 7 months after implementation (Table 4).

Table 3 The ratio of changeover time to the operation time of the line before implementing changes

The ratio of changeover time to the operation time of the line before implementing changes	1	2	3	4	5
Value	41,5	40,5	40,4	37,9	37,9

source: own elaboration based on (Woźniak, 2021)

Table 4 The ratio of changeover time to the operation time of the line after implementing changes

The ratio of changeover time to the operation time of the line after implementing changes	6	7	8	9	10	11	12
Value	37,6	37,0	36,2	35,6	34,9	33,8	32,7

source: own elaboration based on (Woźniak, 2021)

The results presented in tables 3 - 4 show that the implemented rationalizations caused a measurable effect. In the last month, after the implementation of the rationalizations, the current state indicates that the share of changeover time during machine operation decreased to 32.7%. This shows that the line changeover time has been significantly reduced, thus the changeover is done faster and better.

#### 4 Discussion

Each company wants to work efficiently and achieve the best possible results, but unfortunately many factors reduce this efficiency. The aim of the study was to identify and analyze the reasons for reducing the effectiveness of the selected machine, which was caused by a long changeover time.

The conducted literature study allowed for the following conclusions that were useful in the analysis of the presented case:

1. Evaluation of performance in the company is very important factor for the success of the organization. It can help to optimize many processes and increase profits.
2. Many companies use TPM technique that is a good resource management strategy that optimize the use of machinery and device.
3. Changeovers of machine and device are a big problem for companies, because they decrease the efficiency of the use of working time, so implementation of tools, such as SMED methodology, is very helpful to change this situation.
4. Not all problems that appear during the changeover process can be removed. In such situation, so good option is the reduction of changeover time by small rationalizations. Even small changes can increase the efficiency of working time of a machine.

The conducted research allowed for the following statements and conclusions:

- 1 The analyzed device is of great importance for the process, but quite old, not very modern, so problems of low efficiency arise from it.
- 2 The analysis showed that the biggest problems were the operations related to the changeover of the machine. The entire changeover takes up to 4 hours and 10 minutes. All activities are performed when the machine is turned off.
- 3 The analysis of the changeover time has shown that most of the activities are internal, which means that they are performed during the shutdown of the device. The longest operation lasts 76 minutes.
- 4 16 rationalizations were proposed, they will significantly reduce the time of changeovers, thanks to which the machine will operate more efficiently.
- 5 The changeover time was 106,3 minutes after the implementation of changes, which accounts for 37.3% of the machine's operation. Comparing this time to the previous period, a significant time saving of 7.3% was demonstrated. This time can be used differently (e.g. for a specific production), thanks to which the company will produce more and earn more.

- 6 The application of the SMED method can bring many benefits to the enterprise. The benefit is higher efficiency. However, this method must be used by qualified people who make good use of it. Efficiency can be achieved through small activities that do not require large costs. The implementation of the method results in higher machine productivity, higher production flexibility, elimination of errors related to changeover, as well as increasing the comfort of employees' work.

## 5 Conclusion

The analysis of efficiency of machine and device is very important element of the assessment of economic situation of company. It can help to find any problems connected with non-proper using the equipment and the use of its working time. Time of changeovers of machine or device can decrease the efficiency of use of work time. So, many various tools (such as SMED) can be helpful in optimization of such situation. In the paper, the situation analysis in selected company was presented. The analysis showed that activities and their operations are mainly internal, so the best option is to shorten their time. In this changeover process 16 rationalizations were implemented, and it caused the decrease of changeover index significantly. Some of them were quite expensive, but a few of them were very simple and cheap. However, the process should be still analyzed and next possibilities of rationalizations should be proposed by workers.

## Acknowledgements

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## References

- Brožová, S. (2013), "Possibility of using pyrolysis and plasma during disposal of plastic parts of electric waste". *SGEM*, pp. 423-428, ISBN 978-619710503-2. DOI 10.5593/SGEM2013/BD4/S18.018
- Brožová, S; Ingaldi, M and Šperlín, I. (2013) "Economical aspects of high-temperature heating utilization for industrial waste treatment". *METAL 2013: 22nd international conference on metallurgy and materials*, pp. 1735-1739.
- Cep, R., Janasek, A., Sliva, A., Neslusan, M., and Binder, M. (2013), "Experimental tool life tests of indexable inserts for stainless steel Machining." *Tehnicki vjesnik-technical gazette*. Vol. 20, No. 6, pp. 933-940.
- Dvorsky, R., Lunacek, J., Sliva, A., and Sancer, J. (2011), "Preparation of Silicon Nanoparticulate Nanocomposite with Thin Interparticulate Tin Matrix." *Journal of nanoscience and nanotechnology*, Vol. 11, No. 10, pp. 9065-9071. doi: 10.1166/jnn.2011.3510.
- Dvorsky, R., Sliva, A., Lunacek, J., and Piksova, K. (2010), "Preparation of Silicon nanoparticles by means of disintegration in a cavitation water jet", in *2nd NANOCON International Conference, 2010*, TANGER Ltd, Olomouc, Czech Republic, pp. 144-150.
- Karam, A.-A., Liviu, M., Cristina, V., Radu, H. (2018), "The contribution of lean manufacturing tools to changeover time decrease in the pharmaceutical industry. A SMED project", *Procedia Manufacturing*, Vol. 22, pp. 886-892. <https://doi.org/10.1016/j.promfg.2018.03.125>
- Kardas, E., and Brožová, S. (2013), "Situation in waste treatment in Poland". *METAL 2013: 22nd international conference on metallurgy and materials*, pp. 1773-1778.

- Kardas, E., Prusak, R. (2020), "The Assessment Of Efficiency Of Work Of Blast Furnace", *Metallurgija = Metallurgy*, vol. 53, iss. 3, pp. 403-406.
- Klimecka-Tatar, D., Ingaldi, M. (2022), "Digitization of processes in manufacturing SMEs - value stream mapping and OEE analysis", 3rd International Conference On Industry 4.0 And Smart Manufacturing. *Procedia Computer Science*, 2022, Iss. 200, 660-668, doi: 10.1016/j.procs.2022.01.264
- Konstanciak, A., Brožová, S., and Pustejovská, P. (2013), "The use of alternative energy sources in Poland and Europe". *Rynek Energii*, Vol. 107, Iss. 4, pp. 33-36. ISSN 14255960
- Kruczek, M., Żebrucki, Z. (2012), "Utilization of the SMED technique in the improvement of the productive process", *Logistyka* Iss. 2 (2012).
- Mali, R.Y., Inamdar, K.H., (2012), "Changeover Time Reduction Using Smed Technique Of Lean Manufacturing", *International Journal of Engineering Research and Applications*, Vol. 2, Is. 3, pp.2441-2445.
- Ujezdsky, A., Sliva, A., and Brazda R. (2016), "Using ICT in education: measuring systems interfaced to computers", in *9th International technology, education and development conference, 2016*, Madrid, Spain, INTED Proceedings, pp. 7509-7512. ISBN:978-84-606-5763-7.
- Parikh, Y, Mahamuni, P. (2015), "Total Productive Maintenance: Need & Framework, nternational Journal of Innovative Research in Advanced Engineering, Is. 2, Vol. 2 (2015), pp. 126-130.
- Rosa, C., Silva, F.J.G., Pinto Ferreira, L., Campilho, R., (2017), "SMED methodology: The reduction of setup times for Steel Wire-Rope assembly lines in the automotive industry", *Procedia Manufacturing*, Vol. 13, pp. 1034-1042. <https://doi.org/10.1016/j.promfg.2017.09.110>
- Sliva, A., Brazda, R., Prochazka, A., Martynkova, G., S., and Barabaszova, K., C. (2019), "Study of the optimum arrangement of spherical particles in containers having different cross section shapes." *Journal of Nanoscience and Nanotechnology*, Vol. 19, No. 5, pp. 2717-2722. doi: 10.1166/jnn.2019.15873.
- Sliva, A., Brazda, R., Prochazka, A., Martynkova, G., S., and Barabaszova, K., C. (2019), "Investigation of geometric properties of modified titanium white by fluidisation for use in the process of transport, handling, processing and storage." *Journal of Nanoscience and Nanotechnology*, Vol. 19, No. 5, pp. 2997-3001. doi: 10.1166/jnn.2019.15872.
- Sliva, A., Brazda, R., Zegzulka, J., Dvorsky, R., and Lunacek, J. (2010), "Particle Characterization of Nanoparticle Materials in Water Jet Mill Device." *Journal of scientific conference proceedings*, Vol 2, No 1. 2010, pp. 45-+. doi: 10.1166/jcp.2010.1009.
- Sliva, A., Samolejova, A., Brazda, R., Zegzulka, J., and Polak, J. (2003), "Optical parameter adjustment for silica nano-and micro-particle size distribution measurement using Mastersizer 2000", in *Microwave and Optical Technology*, 2003, pp.160-163. doi: 10.1117/12.558761.
- Stabryła A. (2010), "Concepts of modern enterprise management", Printing House Mfiles.pl, Series: Management encyclopedia, Cracow.
- Walczak, M. (2006), "Organisational Techniques in the SMED Method", *Science notebooks of University of Economics in Krakow*, No 713/2002, pp. 123-137.
- Wolniak, R. (2013), "Lean production methods and tools and their role in shaping innovation in Industry", *Innovations in Management and Production Engineering* (red.) Knosala R., Publishing House of the Polish Production Management Society (PTZP), Opole, pp. 524-533.
- Woźniak, M. (2021), "The identification and analysis of the reasons for reducing the effectiveness of a selected machine in a manufacturing company", Engineering thesis, Czestochowa University of Technology, Faculty of Production Engineering and Materials Technology, Czestochowa, Poland.

## Problems in the E-service Provision Process in Enterprises from the SME Sector

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### Abstract

Covid-19 has shown that the digitization process, especially for service providers and shops, has been accelerated. We buy more and more online. Unfortunately, we are not always satisfied with such purchases, we may have a problem with the complicated e-shopping process, too little information about the offered goods, an unreliable e-shop or poor quality of the offered goods. The authors decided to look at the problems in the e-services provision process from the point of view of customers, because they participate in this process, but also in the process of assessing the quality of e-services. The aim of the article was therefore to analyze the digitization process of e-services, with particular emphasis on e-shops. The article presents the results of surveys conducted in Poland and the Czech Republic in September-December 2021. 724 respondents (498 from Poland and 226 from the Czech Republic) took part in the study. The Importance Performance Analyzes (IPA) described in the literature was used to conduct the analysis. A traditional IPA map was constructed to assess the individual attributes taken into account in the research on the e-service provision process. Due to the analysis of the obtained results, it was possible to identify the biggest problems in the e-services provision process as experienced by customers.

Keywords: SME's; services; service quality; Industry 4.0; digitalization.

Article Classification: Research article

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## 1 Introduction

In every area of human activity, the amount of processed information grows rapidly. It is related to the increasing demand for information exchange. Most of us use the Internet, including e-mail, various types of social networks, online shopping, etc. There are 20 years of such opportunities, and now it is impossible to imagine life without the Internet, which has certainly made life easier in many areas.

European companies' spending on software increased by 38% in the decade after the financial crisis, even though overall capital expenditure fell during this period (Cyfryzacja to więcej niż technologia). It was caused, among others, by the development of technology and the slowly emerging Revolution 4.0, one of the elements of which is the digitization of practically all processes that take place in the enterprise. Digitization allowed for a very wide development of modern computer technology and many fields of science, especially in the field of production engineering, it enabled virtual simulation of real production processes, as well as virtual customer service (Krynke, 2021). The concept of Industry 4.0 is a new reality in the modern economy, as progress in digital transformation and growing interconnections pose new challenges for many organizations, including service and commercial enterprises (Cep et al., 2013). Certainly, the implementation of this concept will have further consequences for the management and operation of enterprises (Ślusarczyk, 2018).

It can be said that society and organizations are involved in digital transformation, as can be seen in various industries, this also applies to communication, sales and distribution channels (Kawa, 2020; Corejova et al., 2022), recently also e-learning caused by the Covid pandemic 19 (Teplická and Kádárová, 2022), but also the very fast development of e-commerce. It was Covid-19 that showed that the digitization process can be done even faster. What seemed impossible was forced by the pandemic and the fact of a worldwide lockdown.

Digital technologies have become an important part of people's lives of all generations. This is reflected in various areas, such as interpersonal communication, which has rapidly undergone electronic progress, and the way of shopping that we can now consider much more sophisticated (Frankovský et al., 2018; Fedorko et al., 2018). During a pandemic, many people who rarely shopped online or only bought select products were often forced to change their minds. Due to such experience, we continue to make more and more purchases of various types via the Internet.

Cantamessa et al. (2020) found that digitization is changing the world, which has become an important research topic in academia, industry and politics. Digital technology has indeed brought changes and disruptions to many industries around the world, and "digital" corporations are now reaching the top of the rankings when it comes to market capitalization.

The successful implementation of digital solutions in a given region or country largely depends on the implementation of this process by small and medium-sized enterprises (SMEs). This problem is very well understood in the European Union, where actions are taken to accelerate this process and build a sustainable and competitive knowledge-based economy (Brodny and Tutak, 2022). Due to lower capital, enterprises in this sector have greater problems in implementing all kinds of changes, which, unfortunately, often require large financial outlays (Dvorsky et al. 2011).

The digitization and economy of platforms have changed both business and consumption patterns. New digital innovations and the progressive expansion of large platforms have put pressure on the development of legislation around the world (Jakosuo, 2019). In addition, the appearance of the Covid-19 pandemic in 2020 meant that

practically every enterprise was forced to use new technologies in order to be able to continue to operate on the market and become more available to customers virtually.

However, important negative factors related to the digitization of enterprises should also be indicated. Rapidly developing digitization will significantly affect several jobs and enterprises in the coming years. Some jobs are expected to disappear completely. Progressing digitization can be treated as an example of innovation diffusion (Jylha and Syynimaa, N. 2019). It should be counted, however, that other jobs related to new technologies should emerge. Lähteenmäki and co-authors (2022) emphasized that digitization and the related transformation of services disrupts existing companies and changes the positions and roles of existing and new players in the industry, as well as customers.

One of the main features of good management in terms of building unique competitive advantages is the company's ability to learn and transfer knowledge. Today, knowledge is becoming - on a micro scale - a priority production factor and - on a macro scale - a determinant of technical progress (Prusak and Kardas, 2022). It allows to get to know and understand customer requirements, design an appropriate production process, or in the case of services, the process of their provision. It allows to obtain the appropriate quality of various types of products offered on the market (Grebski and Mazur, 2022; Dulcka et al., 2021; Czajkowska, 2018; Siwiec and Pacana, 2022), but also to act in accordance with the principles of sustainable development, and thus to take care of the natural environment around us (Richnak and Fidlerová, 2022; Konstanciak et al., 2013; Deja et al., 2021; Dvorsky 2010; Sliva et al., 2003; Sliva et al. 2010, Sliva et al. 2019). Nowadays, in the face of constantly growing competition, the overriding goal of any company is to meet or even exceed the requirements of its customers, which allows building strong relationships between the company and its customers (Knop, 2019).

Digitization has become the basis of industrial competitiveness, especially for small and medium-sized enterprises. Managers of industrial facilities need to deal with the complexities that accompany Industry 4.0 in different dimensions to exploit the potential of digitizing their facilities (Jansen and Jeschke, 2018). This also applies to the service provision process.

The digitization of micro, small and medium-sized enterprises (MSMEs) is important, given the many benefits that come with it. Kilay and co-authors (2022) described the example of Indonesia, which, under the guidance of the government, began to expand digitization by introducing electronic payments and e-commerce services into its MSMEs supply chains, but still faces many challenges. In this study, they demonstrated the impact of using electronic payments and e-commerce services on the performance of the MSMEs supply chain, and suggested open innovation and solutions to accelerate the digitization of MSMEs.

Klimecka-Tatar (2018) stated that the value of the product or service depends on the activities included in the process. One of the most important determinants is to estimate the quality level of the implemented process at each stage, it is also the basis for management in accordance with the principles of TQM and in relation to the quality management standards ISO 9001:2015. In the case of services, this process is very specific, it starts with the customer placing an order for services where he describes the requirements. The customer participates in this process because it is directly related to the consumption of services. The customer has an influence on the features of the service offered all the time, as he often has the possibility to request changes to the service during the process. Of course, it all depends on the type of service.

The e-services provision process, especially by e-shops, is also very specific. This process is mostly done electronically, but it is allowed that the last stages, i.e., delivery



of the ordered goods and the process of return, complaint, etc., may be carried out in a traditional way. An example of the e-services provision process by e-shops is presented in the article (Ingaldi, 2021). It is a very general process that takes into account different types of payment methods and different types of delivery methods for the ordered goods.

It should be kept in mind that many online shops are small, often family-owned, e-commerce brokers. Therefore, they belong to the sector of small and medium-sized enterprises. In 2018, there were 2.15 million enterprises of this size in Poland, including micro-enterprises (over 96.7%). In this group, service enterprises account for over 52.1% of all enterprises, and trade enterprises account for 23.6%. Most of them are young enterprises, just entering the market or developing. The largest number of active enterprises in the SME sector per 1,000 inhabitants is in the Mazowieckie (76.64) voivodships, followed by the Wielkopolskie (62.60) and Pomorskie (60.96) voivodships, and the lowest numbers are mainly in the voivodships of eastern Poland (Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce, 2020).

During the e-services provision process, both customers and service providers may encounter many problems. In both cases, these problems can take different forms and causes. From the customer's point of view, it may turn out that a complicated e-shopping process can be complicated, too little information on the goods offered be provided, the e-shop may be unreliable, and the offered goods may be of poor quality. From the point of view of an e-shop, it may be a customer who does not pick up the ordered goods with cash on delivery, returns damaged goods or gives a negative opinion, despite the e-shop fulfilling all its promises.

There are studies related to the evaluation of the e-services provision process for a given type of service, but most often they are limited to one example (one enterprise). Strengths and weaknesses of such services are shown in the eyes of customers, but there are few items which can emphasize problems with digitization of services. That is why the authors decided to continue their previous research in this direction.

The authors decided to look at the problems in the e-services provision process from the point of view of customers, because they participate in this process, but also in the process of assessing the quality of e-services. The aim of the article was therefore to analyze the digitization process of e-services, with particular emphasis on e-shops. The article presents the results of surveys conducted in Poland and the Czech Republic in September-December 2021. 724 respondents (498 from Poland and 226 from the Czech Republic) took part in the study. Due to the analysis of the obtained results, it was possible to identify the biggest problems in the e-services provision process as experienced by customers.

## **2 Material and methods**

The aim of the study was to evaluate the digitization of the e-service provision process (Oujezdsky et al., 2016). The research concerned the assessment of the quality of service provision by Polish and Czech e-shops that belong to the SME sector. The result of the research is to identify the areas that pose the greatest difficulties to e-shops from the point of view of their customers.

The research is a continuation of the research presented in the paper (Ingaldi et al., 2021). This stage of research allowed to indicate whether service companies operating via the Internet properly used the digitization process they underwent and how their e-service provision process is assessed by the customers of such companies. Due to the survey, it was possible to identify the problems faced by customers, which resulted in their high dissatisfaction. The earlier stage of the research made it possible to group and

categorize the positive and negative events described by the respondents. The groups and categories are presented in Table 1. They were also used in this stage of research.

Table 1 Groups and categories used in the research (Ingaldi et al., 2021)

Group	No	Categories
G1. Website of the e-shop	1.	Appearance of the website
	2.	Functioning of the website
	3.	Organization of the website
	4.	Website usability
	5.	Information on products
G2. Contact with the e-shop	6.	Contact info
	7.	Chatbot
	8.	Staff response
	9.	Staff reliability
	10.	Speed of the reaction
G3. Order	11.	Search engine operation
	12.	Personal information posted on the website
	13.	Order process flow
	14.	Speed of the ordering process
	15.	Choice of payment methods
	16.	Choice of delivery methods
	17.	Order security
	18.	Confirmation of order
G4. Delivery	19.	Information on the date and method of delivery
	20.	Information on the status of the order
	21.	Order fulfilment tracking
	22.	Timely delivery
	23.	Condition of the packaging
	24.	Course of delivery
	25.	Compliance of the shipment with the order
	26.	Quality of the ordered products
G5. After-sale services	27.	Return policy
	28.	Contact with the e-shop after delivery
	29.	Process of returning the ordered goods
	30.	Course of the complaint submission process
	31.	Course of the complaint consideration process
	32.	Opinions of customers
	33.	Loyalty programs

The next stage of the research included a questionnaire survey, taking into account the listed categories. The respondents were asked to indicate how important individual categories are to them and how they evaluate these categories in terms of their experience with e-shops (the quality of services offered by Polish and Czech e-shops). Unlike typical service quality surveys, one specific e-shop was not included, but the respondents were supposed to evaluate e-shops generally. The respondents were asked to assess particular categories on a 7-point Likert scale, where 1 meant very low importance / very poor quality, and 7 - very high importance, very good quality.

The research was conducted in January-December 2021, the survey part covered the period September-December 2021. 724 respondents (498 from Poland and 226 from the Czech Republic) took part in it. An online form with mandatory answer options was used to conduct the survey. This allowed for the elimination of errors when filling in the form by the respondents.

When analyzing the responses, the first step was to analyze the reliability of the obtained results using the Cronbach Alpha test. Then, the average values for each category were calculated, both for importance and performance, i.e., the actual operation of e-shops. The difference between performance and importance was also calculated.

The last stage of the analysis of the obtained results was the construction of the Importance / Performance map created by (Martilla and James, 1977). This map is a four-field matrix with the average performance value for service attributes (in the case of research categories) on the X axis, and their importance on the Y axis. The map includes the following fields (Martilla and James, 1977; Hariyani, 2017; Esmailpour et al., 2020; Wong et al., 2011; Ingaldi, 2021):

- Quadrant I: Low Performance – High Importance (Concentrate here): attributes in this category indicate primary weaknesses. If left uncontrolled, these attributes can threaten an organization's ability to attract customers and compete with other organizations. It is very important that the provider pay special attention to them.
- Quadrant II: High Performance – High Importance (Keep up the good work): attributes in this category represent major strengths that have succeeded in achieving a standardized level of performance.
- Quadrant III: Low Performance – Low Importance (Low priority): attributes in this category are low performing for customers, but do not threaten an organization because of their low importance and, indeed, are sub-weaknesses. If there are free recourses, then the enterprise can consider improving them.
- Quadrant IV: High Performance – Low Importance (Possible overkill): attributes in this category, which reflect secondary and insignificant strengths, have the least potential impact on attracting customers. Instead of continuing to focus here, they should allocate more resources to deal with attributes that reside in quadrant I.

The categories which, as a result of the analysis, are in square I, will indicate problematic areas in the operation of e-shops and their e-service provision process.

### 3 Results

First, the Cronbach Alpha test and statistical analysis were conducted, and their results are presented in Table 2. In the case of the Cronbach Alpha test, the assumption made by Hair et al. (2003) was that the test result should be at least 0.7 for the data to be considered reliable.

The Cronbach Alpha test result was over 0.8 for both importance and performance. In the case of individual groups, both in the case of Importance and Performance, a large variation in the test result can be noticed, however, in all cases it was greater than 0.7, which means that all data can be further analyzed.

The obtained averages are also worthy of attention. In the case of importance, the total mean was 5,999, which means the general importance of the research groups and categories. The highest assessment was observed for the group G1. Website of the e-shop, which means that customers pay a lot of attention to this group of categories.

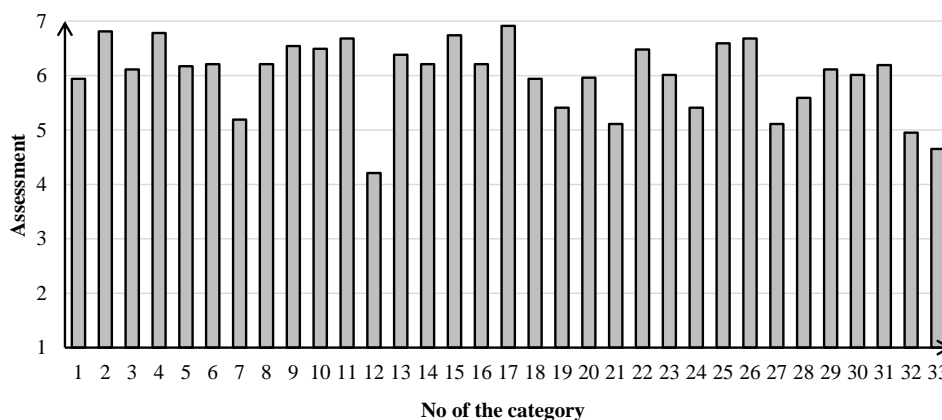
In the case of performance, the overall mean was 4.530, which means much lower than importance. At this point, it can be concluded that customers do not fully assess the digitization of the e-service provision process, and their expectations are much higher

than the actual services. However, it should be emphasized that they did not show dissatisfaction. The groups G5. After-sale services and G4. Delivery were assessed the lowest, and the averages were 4,123 and 4,163 respectively. This is a slight satisfaction from the customers.

**Table 2** Cronbach Alpha and statistical analysis (own study)

	Group	Cronbach Alpha	No of items	Mean	Standard deviation
Importance	Total	0.894	33	5.999	0.3489
	G1. Website of the e-shop	0.729	5	6.362	0.2541
	G2. Contact with the e-shop	0.841	5	6.128	0.4895
	G3. Order	0.901	8	6.160	0.3487
	G4. Delivery	0.796	8	5.956	0.2684
	G5. After-sale services	0.813	7	5.956	0.3247
	Performance	Total	0.821	33	4.530
G1. Website of the e-shop		0.917	5	4.482	0.3274
G2. Contact with the e-shop		0.716	5	4.365	0.6314
G3. Order		0.739	8	4.222	0.2974
G4. Delivery		0.874	8	4.163	0.6547
G5. After-sale services		0.834	7	4.123	0.3657

In Figures 1 and 2, the average importance and performance assessments for each category were presented. In the case of importance, there are some differences in the average assessments. However, it should be emphasized that most of the categories were assessed above 5. For customers, the least important (importance assessments below 5) were categories 12. Personal information posted on the website; 33. Loyalty programs; and 32. Opinions of customers. Surprisingly, the importance of category 12 is not so high, because we can often hear about the leakage of data, information about the customers of certain companies, which should arouse customer vigilance and make such a category important for them.



**Figure 1** Average importance for the individual categories (own study)

When it comes to performance, there was a very large variation in the average assessments of individual categories. Only a few categories were assessed above 6. There were also a few assessments from 2 to 3, and from 3 to 4. This indicates customer dissatisfaction.

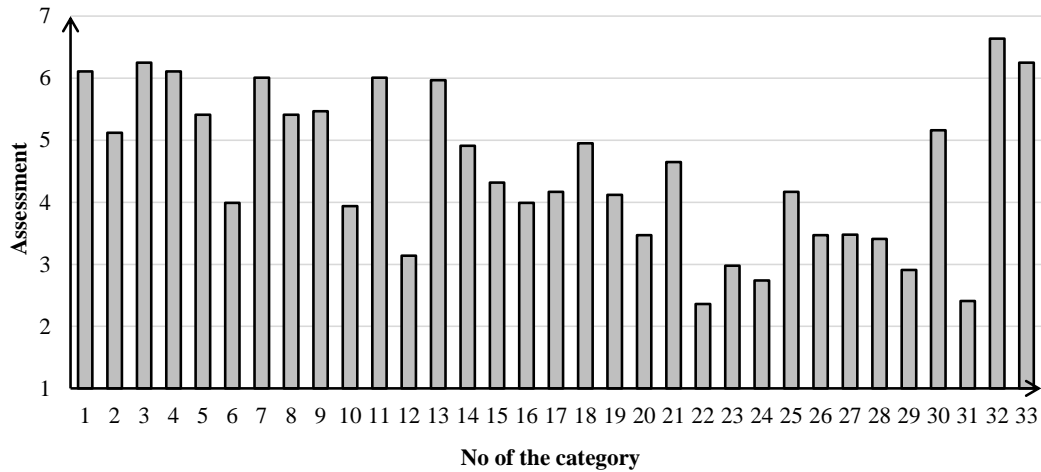


Figure 2 Average oerformance for the individual categories (own study)

Additionally, the difference between performance and importance was compared, which is usually used in the Servqual method. However, the authors decided to show this relationship in order to indicate large differences in the assessments of individual categories in terms of their importance and performance. The results of the analysis are presented in Figure 3. Only in the case of five categories, this difference turn positive, which indicates that an assessment of the performance of these categories was higher than the customers' expectations. In the remaining cases, negative results were recorded, in some cases even below -3. It can be concluded that the situation should be looked at in more detail, because at first glance, this does not look like an e-shop.

However, it should be emphasized that in the Importance Performance method, it does not necessarily mean that the customer is dissatisfied with a given category. The results of importance and performance should be analyzed first, and then mapping the IPA should be analyzed. Only such a step will allow to draw specific conclusions, assess customer satisfaction and identify weaknesses in the e-service provision process.

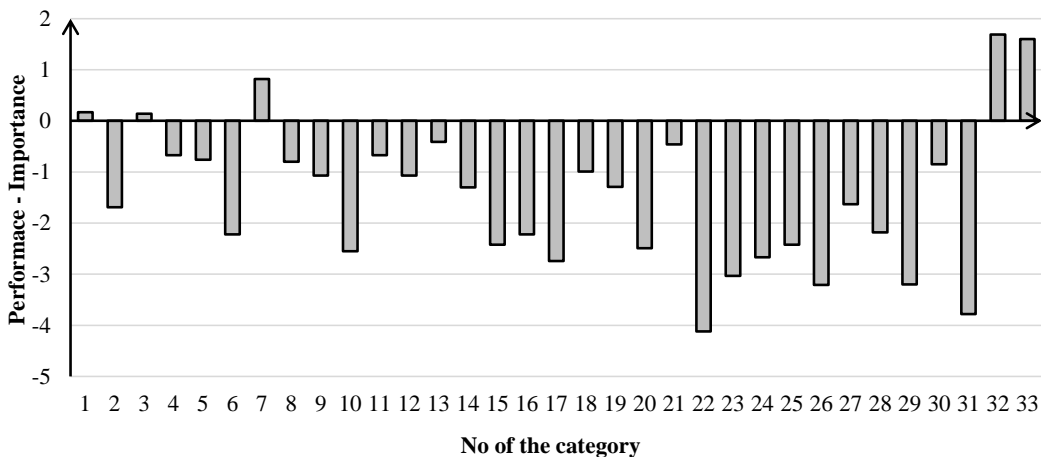


Figure 3 Difference between performance and importance for the individual categories (own study)

## 4 Discussion

The IPA map for individual categories included in the analysis is presented in Figure 4. It should be noted that none of the points were included in quadrants III and IV of the map. No point has been observed directly on the diagonal of the map, which would indicate that importance equals performance. However, as it has already been shown, this was not the case.

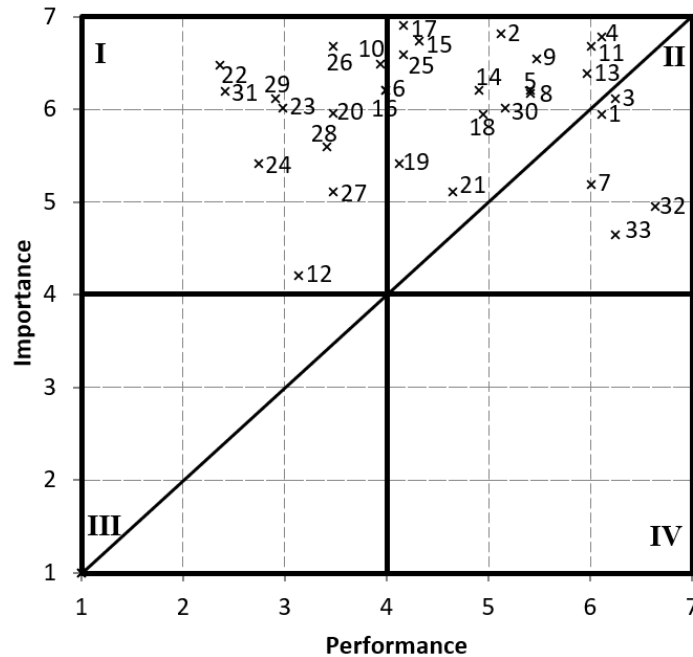


Figure 4 IPA map for all categories (own study)

Most of the points were noticed in quadrant II of the map, i.e., high importance and high performance. This is a field called "keep up the good work". These are categories that are important to customers, but have also been highly assessed by them. Although in some cases, importance was higher than performance (negative difference in Figure 3), it is not a bad situation for e-shops. It should be remembered that often customer requirements are exaggerated, which is related to the customer's market, it means that it is a customer who decides which e-service provider will be used. Additionally, however, it should be pointed out that some points are very close to quadrant I, i.e., categories 6 and 16, directly on the left side of the border (already in quadrant I). If nothing is done, these categories may be slightly lower assessed in the future by the customer, which means that improvement will be required anyway.

There were also many categories in quadrant I. This area contains categories that are important to customers, but are assessed as low in terms of performance. This is an area that requires concentration. These are categories that should be treated as problems in the e-services provision process. However, it should be emphasized that all points are in the right half of this area. The categories are discussed roughly in the order of their distance from the right quadrant I limit (highest average performance score).

For customers, Contact info (category 6) is important, because in case of problems, they would like to contact a given e-shop, or find out more about this e-shop, where its headquarters is located, etc. Unfortunately, not all e-shops provide such information, and often it is very scarce information, e.g. an e-mail address or a form for sending information, and information about direct contact in such cases is completely

absent, which may cause doubts as to the use of such an e-shop. Another category is speed of the reaction (10). During contact, customers want the representative of such an e-shop to react as soon as possible to any contact attempt on their part. Otherwise, they often give up the service and decide to use the e-services of the competitive e-shop. This also applies to Contact with the e-shop after delivery (28), when the ordered goods do not meet the expectations of customers, especially since in the case of online purchases, customers' rights, e.g. as regards complaints and returns, increase, but customers often want to ask first, contact the e-shop to consult about this product.

For customers, the Choice of delivery methods (category 16) is also important. There are people who prefer personal pickup, others prefer home delivery, and still others prefer parcel lockers. A wide range of delivery methods means that the e-shop can count on all these groups of customers. And it should be emphasized that, especially during the pandemic, many e-shops and other service providers developed their supply networks, so it is a bit surprising that customers assessed performance low in this category. Perhaps they had a bad experience with selected e-shops where such a choice was very limited.

Customers would also like to receive Information on the status of the order (20). Many e-shops take this option into account, but research shows that in many cases, it is not possible yet. And customers want to know what is happening with their order, where it is, and when it will be delivered.

Customers pay attention to the Course of delivery (24) and Timely delivery (22). They have the right to check the parcel, if they pay for home delivery, they would also like the parcel to be brought home in good condition, which is related to the condition of the packaging category (23). Additionally, if they have a specific date and time of delivery, then they would like to receive the goods at that moment. Unfortunately, these three categories also did not receive high marks in terms of perception.

The quality of the ordered products (26) is important to customers. Unfortunately, the quality of the delivered goods is often not as high as expected, which is an obvious area that requires improvement. It should be emphasized that customers use the services of e-shops to order a specific service or buy a specific product. So it can be said that this is one of the most important categories. Therefore, according to customers, each e-shop should have a properly developed and meeting the legal conditions Return policy (27), as well as Process of returning the ordered goods (29), or Course of the complaint consideration process (31). E-shops from the territory of the European Union are legally obliged to do so. Unfortunately, it is worse when customers use e-shops from other areas, especially from Asia, where such a return is often very difficult or even impossible to obtain.

The last category, important for customers, but unfortunately low-assessed when it comes to performance, is Personal information posted on the website (12). Many e-shops require full registration from customers who want to place an order. And customers want to provide as little information as possible to protect their privacy.

One important thing should be emphasized. Research using the IPA method has so far been used to assess the quality of various types of services. When it comes to e-services, especially e-shops, other research methods are used more often. However, it is possible find some interesting studies on the use of the IPA method in e-services.

Luo and co-authors in their work (2017) presented a comprehensive framework for the e-services quality and measured the quality of e-services based on a modified validity and performance analysis based on 4 e-shops. They used the IPA method for this purpose. They found that the results they obtained can help practitioners to identify existing problems and formulate strategies to meet consumer needs. However, it should

be remembered that these studies were carried out in the Chinese market, which is clearly different from the European market.

Interesting findings of the results were presented by Magno and Dossen (2022). They used the IPA method to assess the impact of chatbots on customers behavior and their satisfaction. As a result, they showed how important for marketing is the emergence of new technologies and their use on the market. However, the study concerned only part of the evaluation of e-services.

Jin and co-authors (2021) conducted the research to identify critical quality of service attributes for online hotel reservations. The results, compared to the traditional method of partial correlation analysis, differed in the dimensions of fulfillment and responsiveness, security and protection, website functionality, and customer relationships. Taken together, this study broadens the perspective of the research method and improves the evaluation of the performance of e-service quality attributes. The interesting approach of the authors allows to conclude that perhaps it would be worthwhile to modify the traditional IPA method.

However, no general research was conducted for a given service industry in terms of assessing the functioning and problems that arise during the service provision process. However, the authors decided to show that it is worth to conduct them in this way. The results of the presented analysis made it possible to indicate the categories of attributes that are important to customers, but on the other hand, do not meet their requirements and are poorly assessed by them. It is a list of categories of attributes that e-shop owners should consider. The results presented in the paper can therefore be treated as an instrument for the improvement of the service provision process in e-shops.

## **5 Conclusion**

The conducted research allowed to identify the problems that customers point to during the e-service provision process in the e-shops. The issue was highlighted when, for example, the Covid-19 pandemic has shown how important it is to be able to shop online. It should be emphasized that shopping in this form is becoming more and more popular, and the forecasted tendency indicates the advantage of this type of shopping over the traditional ones in a short time.

It should be emphasized that customer requirements in relation to products but also to the e-service provision process, are very high, hence their dissatisfaction can often be observed. However, this did not always mean that the process was being carried out inappropriately. Only some categories need improvement. Research results can help e-shops adapt to customers' requirements and eliminate or minimize the problems that these customers often encounter when shopping online.

It should be emphasized that when shopping online, we have to do it wisely. It is good to read the opinions of other customers about a given product or e-shop, not only directly on the website of a given e-shop, where such information can be made up. It is worth using the websites created for this purpose. In many countries, so-called "white and black" pages where customers can describe their positive and negative experiences with e-shops, supporting their opinions with photos, were created. This will certainly avoid some problems, especially those related to the quality of the ordered goods.

The conducted research is not free from limitations. It should be emphasized that the categories, although resulting from previous literature and practical research, may not fully reflect the e-service provision process in different e-shops. Perhaps some categories were omitted, but the authors did not do it on purpose. Additionally, the number of respondents may be questionable as well, but this research will be continued to take a



closer look at the problems encountered by customers during e-shopping. Perhaps the research will be expanded to include a structured interview with a smaller group of respondents who will want to share their observations and experience in this area, which will certainly result in additional conclusions. Further research will allow to look at the indicated groups of attributes determining the quality of e-services and indicate a practical solution to the problem.

The conducted research allowed to indicate which categories of attributes are particularly important for e-shop customers, but, on the other hand, are often poorly assessed by them. This research can be treated as a hint on what to pay special attention to when running e-shops, but also when designing new one. They show in a special way what determines the quality of e-services, especially those offered by e-shops. It is up to the customers and their opinion that the success of the e-commerce market depends, they decide where they will make their purchases, and therefore they will also decide how much it will benefit e-commerce companies. Therefore, this article can be treated as a hint on how to take care of the quality of e-shops.

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### References

- Brodny, J., and Tutak, M. (2022), "Digitalization of Small and Medium-Sized Enterprises and Economic Growth: Evidence for the EU-27 Countries". *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 8, Iss. 2, Art. No 67.
- Brožová, S. (2013), "Possibility of using pyrolysis and plasma during disposal of plastic parts of electric waste". *SGEM*, pp. 423-428.
- Cantamessa, M., Montagna, F., Altavilla, S., and Casagrande-Seretti A. (2020), "Data-driven design: the new challenges of digitalization on product design and development". *Design Science*, Iss. 6, e27.
- Cep, R., Janasek, A., Sliva, A., Neslusan, M., and Binder, M. (2013), "Experimental tool life tests of indexable inserts for stainless steel Machining." *Tehnicki vjesnik-technical gazette*. Vol. 20, No. 6, pp. 933-940.
- Corejova, T., Jucha, P., Padourova, A., Strenitzerova, M., Stalmachova, K., and Valicova, A. (2022), "E-commerce and last mile delivery technologies in the European countries". *Production Engineering Archives*, Vol. 28, Iss. 3, pp. 225-232.
- "Cyfryzacja to więcej niż technologia", available at: [https://psik.org.pl/images/publikacje-i-raporty---publikacje/cyfryzacja\\_to\\_wi%C4%99cej\\_ni%C5%BC\\_technologia\\_spot\\_data.pdf](https://psik.org.pl/images/publikacje-i-raporty---publikacje/cyfryzacja_to_wi%C4%99cej_ni%C5%BC_technologia_spot_data.pdf) (accessed 10 June 2022)
- Czajkowska, A. (2018), "The role of sustainable construction in sustainable development". *MATEC Web of Conferences*, Vol. 174, Art. No 01027.
- Deja, A., Ulewicz, R., and Kyrychenko, Y. (2021), "Analysis and assessment of environmental threats in maritime transport". *Transportation Research Procedia*, Vol. 55, pp. 1073-1080.
- Dulska, A., Szajnar, J., Król, M. (2021), "Analysis of the mechanical properties of the titanium layer obtained by the mold cavity preparation method". *Archives of Metallurgy and Materials*, Vol. 66, Iss. 1, pp. 51-56.
- Dvorsky, R., Lunacek, J., Sliva, A., and Sancer, J. (2011), "Preparation of Silicon Nanoparticulate Nanocomposite with Thin Interparticulate Tin Matrix." *Journal of nanoscience and nanotechnology*, Vol. 11, No. 10, pp. 9065-9071.

- Dvorsky, R., Sliva, A., Lunacek, J., and Piksova, K. (2010), "Preparation of Silicon nanoparticles by means of disintegration in a cavitation water jet", in *2nd NANOCON International Conference, 2010*, TANGER Ltd, Olomouc, Czech Republic, pp. 144-150.
- Esmailpour, J., Aghabayk, K., Vajari, M.A., and De Gruyter, C. (2020), "Importance - Performance Analysis (IPA) of bus service attributes: A case study in a developing country". *Transportation Research Part A-Policy And Practice*, Vol. 142, pp. 129-150.
- Fedorko, R., Fedorko, I., Riana, I.G., Rigelský, M., Oleárová, M., and Obšatníková, K. (2018), "The impact of selected elements of e-commerce to e-shop recommendation". *Polish Journal of Management Studies*, Vol. 18, Iss.1, pp. 107-120.
- Frankovský, M., Birknerová, Z., Benková, E., and Suhányi, L. (2018), "Neuro-Linguistic Programming and Managerial Communication", in: *Digital Communication Management*, Intech Open Limited, London.
- Grebski, M., and Mazur, M. (2022), "Social climate of support for innovativeness". *Production Engineering Archives*, Vol. 28, Iss. 1, pp. 110-116.
- Hair, J.F. JR., Babin, B., Money, A.H. and Samouel, P. (2003), *Essential of business research methods*. John Wiley & Sons, United States of America.
- Hariyani, S. (2017), "School bus's level of service in Malaga City. 3rd International Conference of Planning in the Era of Uncertainty". *IOP Conf Series: Earth and Environmental Science*, Vol. 70, Art. No 012023.
- Ingaldi, M. (2021), "Assessment of the Service Provision Process as a Business Process Management Tool". *Polish Journal of Management Studies*, Vol. 23, Iss. 1, pp. 204-223.
- Ingaldi, M., Brozova, S., Sliva, A., and Brazda, R. (2021), "Assessment of the Digitization of the Service Provision Process in Enterprises from the SME Sector with Use of the CIT Method", in *International Scientific Conference The Poprad Economic and Management Forum 2021 (PEMF2021)*, Poprad, Slovakia. Madzik P., Janoskova M. (red.). *The Poprad Economic and Management Forum 2021*, Verbum, Catholic University in Ruzomberok, Poprad, pp. 391-401.
- Jakosuo, K. (2019), "Digitalisation and platform economy - disruption in service sector". In Joint Conference ISMC 2018-ICLTIBM 2018 - 14th International Strategic Management Conference & 8th International Conference On Leadership, Technology, Innovation And Business Management. *European Proceedings of Social and Behavioural Sciences*, Vol. 54, pp. 75-85.
- Jin, J., Lu, L., Yan, X. (2021), "Service quality evaluation of satellite data distribution system based on BP-IPA". *Computational Intelligence*, Vol. 37, Iss. 3, pp. 1236-1253.
- Jylha, T., Syynimaa, N. (2019), "The Effects of Digitalisation on Accounting Service Companies". In *Proceedings Of The 21st International Conference On Enterprise Information Systems (ICEIS)*, VOL 1, pp. 502-508.
- Kardas, E., and Brožová, S. (2013), "Situation in waste treatment in Poland". *METAL 2013: 22nd international conference on metallurgy and materials*, pp. 1773-1778.
- Kawa, A. (2020), "Out-of-Home Delivery as a Solution of the Last Mile Problem in E-commerce", in Golinska-Dawson, P., Tsai, K.-M. and Kosacka-Olejnik, M. (eds.) *Smart and Sustainable Supply Chain and Logistics - Trends, Challenges, Methods and Best Practices* (Chapter 2), Springer pp. 25-40.
- Kilay A.L., Simamora B.H., Putra D.P. (2022), "The Influence of E-Payment and E-Commerce Services on Supply Chain Performance: Implications of Open Innovation and Solutions for the Digitalization of Micro, Small, and Medium Enterprises (MSMEs) in Indonesia". *Journal of Open Innovation: Technology, Market, and Complexity*, Vol.8, Iss.3, Art. No 119.
- Klimecka-Tatar, D. (2018), "Contemporary quality management model of professional services in B2C and B2B systems cooperation", in Stankeviciene, J., Skvarciany, V., Jureviciene, D., Miecinskiene, A., Davidaviciene, V., Skackauskiene, I., and Mitkus, S. (eds.) *Business and Management-Spausdinta*, VGTU Press, Vilnius, Lithuania, pp. 371-380.

- Knop, K. (2019), "Evaluation of quality of services provided by transport & logistics operator from pharmaceutical industry for improvement purposes." *Transportation Research Procedia*, Vol. 40, pp. 1080-1087.
- Konstanciak, A., Brožová, S., and Pustejovská, P. (2013), "The use of alternative energy sources in Poland and Europe". *Rynek Energii*, Vol. 107, Iss. 4, pp. 33-36.
- Krynke, M. (2021), "Management optimizing the costs and duration time of the process in the production system". *Production Engineering Archives*, Vol. 27, Iss. 3, pp. 163-170.
- Lähteenmäki, I., Nätti, S., Saraniemi, S. (2022), "Digitalization-enabled evolution of customer value creation: An executive view in financial services". *Journal of Business Research*, Vol. 146, pp. 504-517.
- Luo, C., Shen, L., Gao, H. (2017), "Modified importance-performance analysis of e-service quality". *Journal of Electronic Commerce in Organizations*, Vol. 15, Iss. 1, pp. 84-95.
- Magno, F., Dossena G. (2022), "The effects of chatbots' attributes on customer relationships with brands: PLS-SEM and importance-performance map analysis". *TQM Journal*, ahead-of-print No. ahead-of-print. [Doi: 10.1108/TQM-02-2022-0080](https://doi.org/10.1108/TQM-02-2022-0080).
- Martilla, J.A., and James, J.C. (1977), "Importance – Performance Analysis". *Journal of Marketing*, Vol. 41, Iss. 1, pp. 77-79.
- Oujezdsky, A., Sliva, A., and Brazda R. (2016), "Using ICT in education: measuring systems interfaced to computers", in *9th International technology, education and development conference, 2016*, Madrid, Spain, INTED Proceedings, pp. 7509-7512. ISBN:978-84-606-5763-7.
- Prusak R., and Kardas E. (2021), „Wpływ wybranych aspektów zarządzania wiedzą na funkcjonowanie przedsiębiorstwa”. *Gospodarka Materialowa & Logistyka*, Vol. 74, Iss. 4, pp. 2-12.
- "Raport o stanie sektora małych i średnich przedsiębiorstw w Polsce". Polska Agencja Rozwoju Przedsiębiorczości PARP, Warszawa, 2020.
- Richnák, P., and Fidlerová, H. (2022), "Impact and Potential of Sustainable Development Goals in Dimension of the Technological Revolution Industry 4.0 within the Analysis of Industrial Enterprises". *Energies*, Vol. 15, Iss. 10, Art. No 3697.
- Siwiec, D., and Pacana, A. (2022), "A New Model Supporting Stability Quality of Materials and Industrial Products". *Materials*, Vol. 15, Iss. 13, Art. No 4440.
- Sliva, A., Brazda, R., Prochazka, A., Martynkova, G., S., and Barabaszova, K., C. (2019), "Study of the optimum arrangement of spherical particles in containers having different cross section shapes". *Journal of Nanoscience and Nanotechnology*, Vol. 19, No. 5, pp. 2717-2722.
- Sliva, A., Brazda, R., Prochazka, A., Martynkova, G., S., and Barabaszova, K., C. (2019), "Investigation of geometric properties of modified titanium white by fluidisation for use in the process of transport, handling, processing and storage". *Journal of Nanoscience and Nanotechnology*, Vol. 19, No. 5, pp. 2997-3001.
- Sliva, A., Brazda, R., Zegzulka, J., Dvorsky, R., and Lunacek, J. (2010), "Particle Characterization of Nanoparticle Materials in Water Jet Mill Device". *Journal of scientific conference proceedings*, Vol 2, No 1. 2010, pp. 45-47.
- Sliva, A., Samolejova, A., Brazda, R., Zegzulka, J., and Polak, J. (2003), "Optical parameter adjustment for silica nano- and micro-particle size distribution measurement using Mastersizer 2000". *Microwave and Optical Technology*, 2003, pp.160-163.
- Ślusarczyk, B. (2018), "Industry 4.0 – are we ready?", *Polish Journal of Management Studies*, Vol. 17, Iss. 1, pp. 232-248.
- Teplická, K., and Kádárová, J. (2022), "The new model of the engineering education using digitalization and innovative methods". *Management Systems in Production Engineering*, Vol. 30, Iss. 3, pp. 207-213.
- Wong, M.S., Hideki, N., George, P. (2011), "The Use of Importance-Performance Analysis (IPA) in Evaluating Japan's E-government Services". *Journal of Theoretical and Applied Electronic Commerce Research*, Vol. 6, Iss. 2, pp. 17-30.

# Effects of the Covid-19 Pandemic in the Slovak HoReCa Sector

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## Abstract

The Coronavirus epidemic has formed the world with unprecedented social and economic challenges. Among the sectors most affected by the pandemic was positioned the tertiary sector, including tourism and the hospitality industry (restaurant and accommodation services). In order to mitigate the negative effects of the epidemic and emergency measures due to the epidemic situation, the Slovak government, like other countries affected by the coronavirus crisis, approved an economic protection action plan. This study is an empirical research paper. Its purpose is to present the processes occurred in the Slovak HoReCa sector as a result of the Covid-19 pandemic, also to illustrate the economic protection measures implemented by the Slovak government and to briefly evaluate their use. The study is created according to a systematic literature review and secondary data analysis. Based on our studies and analyses, the epidemic and the restrictive measures, in line with global events, affected the Slovak HoReCa sector more harshly than other, similarly labor-intensive sectors of the economy. In our point of view, the amount of "First Aid" subsidies coming to the sector cannot be considered fair, since the damages in the mentioned sector has been remarkably higher. Therefore, the level of support provided within the framework of the individual "First Aid" programs was not in line with the level of negative effects on the sector.

Keywords: HoReCa sector; coronavirus pandemic; support scheme; First Aid package.

Article Classification: Research article

## 1 Introduction

Nowadays, restrictive measures caused by the coronavirus epidemic have become part of our everyday life. The examination of social and economic consequences of the pandemic has become an integral and significant part of economic policy researches. This study is an empirical research paper, with the purpose to present the effects of the

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coronavirus epidemic on the Slovak HoReCa sector, as well as to illustrate the economic protection measures implemented by the Slovak government and to briefly evaluate their effectiveness and fairness. The study does not include primary data collection. The views included in the study were established by reviewing relevant domestic and foreign literature sources and analyzing secondary data.

The coronavirus epidemic hit the Slovak economy at the beginning of 2020. Epidemiological measures introduced to limit the pandemic affected all sectors of the economy. However, one of the sectors most affected by the Covid-19 pandemic was the so-called HoReCa sector in Slovakia. The mentioned collective term that is becoming more and more popular these days is an acronym formed from the abbreviation of three English words Hotels, Restaurants and Cafés/Catering, which denotes the (catering) segment of hotels, restaurants and cafés (Juhász-Kis and Lendvai, 2021). Free movement and social contact were restricted during the various waves of the coronavirus epidemic. The mentioned restrictions have fundamentally influenced the so called HoReCa sector (Debreceni and Fekete-Frojimovics, 2021). Severe restrictions on mobility have radically changed the consumption habits of families, who stopped visiting restaurants and other collective food supply facilities and ate exclusively at home. Restrictions on transit and border closures led to a decrease in the number of guests in hotel establishments (Garcia-Madurga et al., 2021). The change in consumer habits and the lack of guests also meant a decline in the sector's incomes. The decrease in revenues over time encourages companies to follow defensive strategies, which is manifested, among other things, in the reduction of costs. One of the biggest cost items are the wages. As a result of limiting the range of services has also caused reduction in the number of employees (Costa Dias et al., 2020). When analysing an economy it is necessary to observe the unemployment rate. During the pandemic countries with high unemployment rate started to create regulations with the goal to stop the increasing trend (Mura et al., 2020).

In order to suppress the epidemic, with the example of other countries of the world, even the Slovak government has introduced restrictive measures. In order to mitigate the negative consequences of the restrictive measures, on March 31, 2020, it approved an economic protection action plan called "First Aid". The stakeholders of the mentioned action plan were employees, sole proprietors and (small) businesses. The measures of the action plan were co-financed from the European Social Fund. The compensations of the original "First Aid" program were divided into four support areas, while the individual areas were divided based on additional aspects (Table 1). The economic protection package has also included, the assumption of workers' wage costs for companies and sole proprietors that retain their employees. Furthermore, a support for sole proprietors showing at least 20% drop in income due to the epidemic, flat-rate benefits for one-person limited liability companies, citizens who were left without a regular income during the epidemic assistance (so-called SOS support) were included (Buchel et al., 2020).

Table 1 Amount of aid for First Aid economic protection package; source: own elaboration based on Baliak et al. (2021); Buchel et al. (2020); Domonkos et al. (2020)

Support Scheme	Target Group	First Aid	First Aid+	First Aid++
1	Employee	80% of the employee's average salary (max. €1,100)	80% of TLC	100% of TLC
2	Self-employed person	From €180 [€90] to €540 [€270], depending on the extent of revenue drop	From €270 to €810 per worker, depending on the extent of the loss of income	From €330 to €780 per worker, depending on the extent of the loss of income
3A		Up to 80% of the employee's average salary (max. €880)	80% of TLC max. €1,100	100% of TLC
3B	Employee	From €180 [€90] to €540 [€270] per worker, depending on the extent of revenue drop, up to 80% of the average employee's wage	From €270 to €810 per worker,	From €330 to €780 per worker, depending on the extent of the loss of income
4A	Self-employed person	Flat contribution of €210	Flat contribution of €315, depending on the amount of income	Flat contribution of €360, depending on the amount of income
4B	Single-member private LLC.	[€105]		

By modifying the original economic first aid package, the Slovak Ministry of Labour, Social Affairs and Family launched a new "First Aid +" program in November 2020, which focuses on maintaining employment, preserving jobs, and supporting individual entrepreneurs (Buchel et al., 2020). The biggest change was connected with the usage of financial support, which could be applied for the payment of contributions (Baliak et al., 2020). The measures of the mentioned economic aid package were subsequently edited as well. From February 2, 2021, the support package existed under the name "First Aid ++". There was a further increase in the compensations for support areas 2 and 3B, and in the case of support area two, the number of support categories was also expanded (Baliak et al., 2021).

## 2 Material and methods

In our study, we present the effects of the coronavirus epidemic on the Slovak HoReCa sector, as well as we present the economic protection measures implemented by the Slovak government. We place great emphasis on the evaluation of the use of the economic protection programs called "First Aid" and the fairness of the subsidies in the case of the accommodation service and catering sector. The main goal of the study is to present the processes that occurred in the Slovak HoReCa sector as a result of the Covid-19 epidemic.

The impact of the Covid-19 pandemic on economic activities, and primarily on the HoReCa sector, has already been examined in several researches. In their work, Gursoy and Chi (2020) discussed the observable consequences of the pandemic in the hospitality industry. Dube, Nhamo and Chikodzi (2021) researched the effects of the pandemic on the global restaurant sector, employment and revenue processes in the sector for Australian, American, Canadian, German, Irish, Mexican and English restaurant

chains. Blahušiaková (2021) examined the effects of the coronavirus epidemic on the financial (accounting) situation of Slovakian tourism, accommodation and catering units. However, so far, no attempt has been made to examine the effectiveness (and fairness) of the individual First Aid economic protection packages for the HoReCa sector individually. The results of our research can therefore put a new approach to the issue of the efficiency and fairness of the distribution of subsidies (for the accommodation service and catering sector) during the pandemic. We consider the research of the topic significantly important. For this reason, and based on the problematic we formulated the following research questions:

1. The Covid-19 epidemic and the restrictive measures, in line with global events, affected the Slovak HoReCa sector more significantly than other, similarly labor-intensive sectors of the economy (e.g. trade, manufacturing and construction) or the Slovak accommodation sector - unlike global processes, did handle the challenges posed by the epidemic more effectively (Q1)?
2. Can the level of "First Aid" subsidies to the Slovak HoReCa sector be considered fair, taking into account the sector's exposure to the negative effects of the epidemic and restrictive measures (i.e. was the level of subsidies provided within the framework of individual "First Aid" programs in line with the negative impacts affecting the sector with the degree of effects) (Q2)?

In our exploratory research, we used quantitative research method. The formulated paradigms and the obtained results are supported by secondary data provided by the databases of the Statistical Office of the Slovak Republic and the Ministry of Labour, Social and Family Affairs of the Slovak Republic. Data processing was carried out in Microsoft Excel using descriptive statistics. The so-called: difference-in-differences (diff-in-diff) method.

### 3 Results

On a global level, the pandemic as caused serious difficulties for live-work sectors that require personal contact (e.g. tourism, accommodation services and hospitality) (Csizmadia & Illésy, 2020). Based on the results of research by Dube, Nhamo and Chikodzi (2021), the global HoReCa sector was among the economic sectors most affected by the Covid-19 pandemic. In March 2020, as a result of the pandemic, seat reservations in American, Australian, British, Irish, Canadian, Mexican and German restaurants dropped by about 90%. The majority of American family restaurants have laid off or furloughed 80% of their employees. This meant the loss of jobs for 10.8 million employees working in restaurants and catering establishments. The catering units struggled with serious liquidity problems, which has cost about 242 billion dollars.

In our opinion, the effects of the coronavirus epidemic did not affect individual sectors of the Slovak economy equally. In line with global developments, the pandemic and the restrictive measures have affected the Slovak HoReCa sector more significantly than other, similarly labor-intensive sectors of the economy (e.g. trade, manufacturing and construction) (Q1). This is also proved by the negative change in the indicators, which influence the performance of the HoReCa sector. Based on the data of the Slovak Statistical Office, as a result of the Covid-19 epidemic, the number of guest nights spent in hotel and accommodation during multi-day and one-day private trips showed a sharp decline. In 2018, before the epidemic, the number of guest nights spent in commercial accommodation within the framework of domestic private trips was 24.48 million. In 2019, an intense 16.72% increase was observed in the number of domestic private roads. However, in 2020, as a result of the first noticeable effects of the epidemic, the number

of one-day and multi-day domestic private trips have also fell sharply. The number of guest nights spent for multi-day domestic trips decreased by 45.55%, and the number of one-night trips by 43.40%. During multi-day private trips abroad, the number of guest nights spent in commercial accommodation showed the historical minimum of the last 17 years. And the number of guest nights spent in the framework of one-day private trips abroad fell to the lowest value in the last decade. All the mentioned facts were also felt in the revenues of the affected sector. In 2020, the sales revenue of accommodation service units has decreased to 245.7 million euros (by 43.71%) compared to the previous year, and the sales revenue of restaurants and other catering units decreased to 118.8 million euros (by 8.29%). On the other hand, the sales revenues of trade (by 15.03%), construction industry (by 9.46%) and manufacturing industry (by 9.35%), which require similar live work, also showed a significant, but low decline compared to the HoReCa sector (ŠÚSR, 2022b; ŠÚSR, 2022c). The decrease in the sector's sales revenues was manifested in an intense intention to reduce costs, which resulted a reduction in the number of employees. As a result of the coronavirus, the average number of employees fell by 16.03% for accommodation service units and by 8.53% for restaurants and other catering units compared to 2019. In the same period, the average number of workers in the construction industry increased by 5.98% (10,579 employees), in the manufacturing industry by 5.73% (31,837 employees), and in the retail and wholesale trade and repair sector it has decreased by 3.62% (11 197 workers) (ŠÚSR, 2022d; ŠÚSR, 2022e; ŠÚSR, 2022f; ŠÚSR, 2022g). As a further consequence of the epidemic, the number of companies operating in the HoReCa sector also decreased significantly (Figure 1).

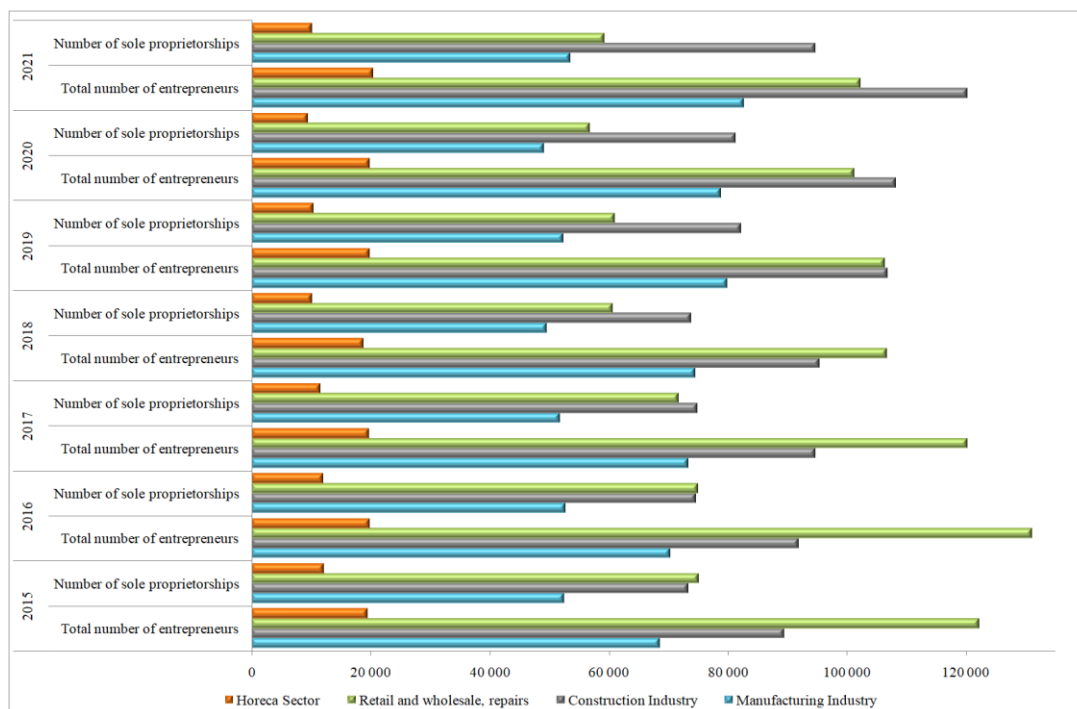


Figure 1 The number of natural persons and sole proprietors engaged in economic activity in the HoReCa sector; source: own elaboration based on ŠÚSR (2022h)

Small and medium-sized enterprises are the powerful driving engines of the market economy, and the most important elements of the national economy. Also they are able to adapt to market requirements to a high degree, they are innovative, flexible and satisfy even the most demanding consumers, they create new jobs, and thereby significantly influence the development of employment (Ježková, 2008). In addition, they



can have a significant national and regional economic development role in the field of tourism (Marin-Pantelescu and Candidatu, 2019). Small and medium-sized enterprises have also an outstanding importance in the Slovak HoReCa sector. In 2019, before the epidemic, 52% of economic units operating in the sector operated as sole proprietors or belonged to the SME's. However, as a result of the pandemic, the number of individual entrepreneurs operating in the sector fell by more than 8%. In contrast, the decrease in the number of sole proprietors being active in the manufacturing industry and trade was smaller. In the case of the construction industry, an increase in the number of natural persons engaged in economic activity was observed (ŠÚSR, 2022h).

The Slovak hospitality, accommodation and food services (HoReCa) sector was one of the sectors whose operation was significantly damaged by the Covid-19 epidemic. Compared to 2019, by 2020, as a result of the epidemic and restrictive measures, the gross added value produced by restaurants and catering establishments decreased by 14.36%. The contribution of economic units dealing with accommodation services to Slovakia's gross domestic product fell by 35.81% (Table 2). Comparing the 2020 data with 2018, the differences are even more striking. The data shows a decrease by 40.30% in the case of the accommodation service sector, and 30.13% in the case of restaurants and other catering units (ŠÚSR, 2022a).

Table 2 Gross value added per economic activity at current prices (million EUR); source: own elaboration based on ŠÚSR (2022a)

Sectors of the Economy/Years	2018	2019	2020
Manufacturing Industry (10-33)	16 930,53	18 555,60	16 149,66
Construction Industry (41-43)	6 441,90	5 655,31	5 367,25
Retail and wholesale, repairs (45-47)	8 422,50	9 534,61	9 345,48
Hospitality and related services (55)	357,81	332,79	221,95
Restaurant and Catering (56)	1 014,67	827,75	708,93

Based on the results obtained with the Difference-in-differences method, due to the epidemic, a lower performance decline occurred in the construction industry, trade and repair sector than in the investigated HoReCa sector (Table 3).

Table 3 Difference-in-difference method in the case of Gross Value Added Capacity; source: own elaboration based on ŠÚSR (2022a)

Sectors of the Economy/Years (in %)	2018	2019	2020	Difference 2018-2019	Difference 2019-2020
Manufacturing Industry (10-33)	21,14	22,08	19,59	0,94	-2,49
Construction Industry (41-43)	8,05	6,73	6,51	-1,32	-0,22
Retail and wholesale, repairs (45-47)	10,52	11,34	11,34	0,82	0,00
Horeca Sector (55-56)	1,66	1,47	1,23	-0,19	-0,24
From this:					
Hospitality and related services (55)	0,44	0,40	0,27	-0,04	-0,13
Restaurant and Catering (56)	1,22	1,07	0,96	-0,15	-0,11

The economic shock caused by the waves of the epidemic in Slovakia, as in other parts of the world, has strongly influenced the operation of the economy. However, it did not threaten the existence of individual sectors equally. In our point of view, significant changes in employment, income and performance have occurred in the Slovak HoReCa

sector as a result of the epidemic situation. Their degree exceeds the level of involvement of other sectors of the economy by the coronavirus crisis.

In order to mitigate the negative consequences of the Covid-19 epidemic restrictive measures were introduced. Between March 2020 and January 2022, in total 1,626,566 subjects were supported in Slovakia within the framework of the "First Aid" packages (Figure 2). Based on the data of the Ministry of Labour, Social and Family Affairs of the Slovak Republic, the number of subsidized subjects in Support Area 1 was 49,566, and 973,182 in Support Area Two. During the mentioned period, 122,503 subjects benefited from the 3A Support scheme, 274,609 applicants from the 3B scheme, 186,438 and 20,268 applicants from the 4A and 4B schemes.

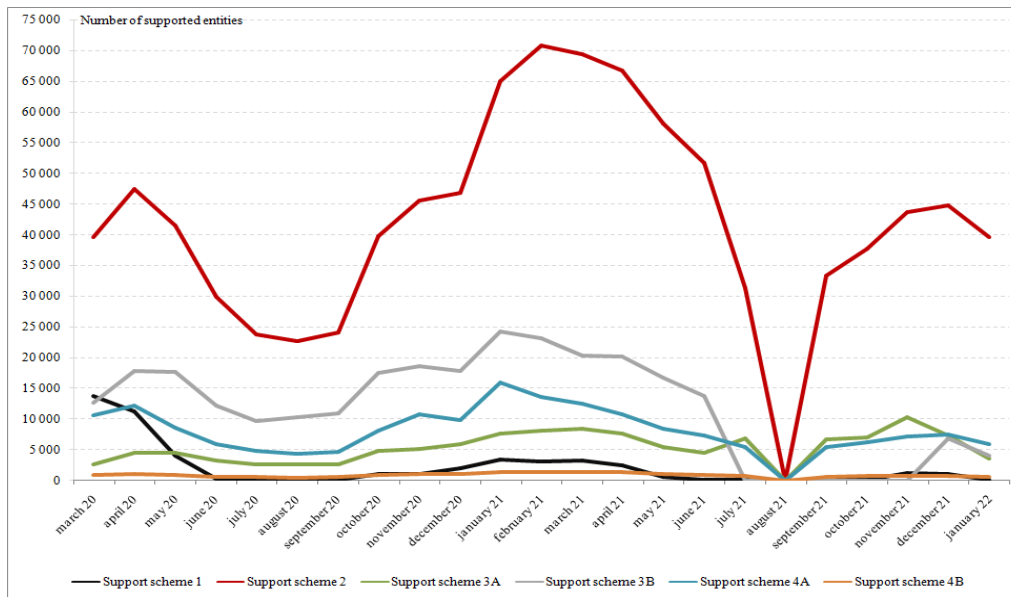


Figure 2 Number of supported subjects for each support scheme; source: own elaboration based on ŠÚSR (2022h)

In our opinion, the amount of "First Aid" subsidies coming to the Slovak HoReCa sector cannot be considered fair considering the sector's exposure to the negative effects of the epidemic and restrictive measures. Therefore, the level of support provided within the framework of the individual "First Aid" programs was not in line with the level of negative effects on the sector (K2). This is also confirmed by the number of subsidies received in certain sectors of the Slovak economy. To sum up, the largest part of the funds for the "First Aid" packages came from the manufacturing industry (661.66 million euros), trade and repair (425.51 million euros), and the construction industry (264.74 million euros). Between March 2020 and January 2022, the amount of funds coming to the Slovak HoReCa sector to compensate the loss exceeded 253.3 million euros. This represented 10.77% of all subsidies paid in the framework of state economic protection programs (Figure 3). The mentioned data provide really interesting results if we also take into account the evolution of the sectors' ability to generate added value. Based on the results obtained using the Difference-in-differences method, the majority of the "First Aid" grants went to the construction industry, trade and repair, which showed lower performance due to the epidemic.

In the breakdown by support schemes, the amount of compensation for the HoReCa sector was 25.4 million euros in the case of Support Scheme 1, and 45 million euros in the case of Support Area 2. Applicants received an amount corresponding to 65 million euros in the framework of Support area 3A, and 116.2 million euros in the

framework of the 3B scheme. In the framework of Support areas 4A and 4B, compensation corresponding to 1.4 million euros and 210 thousand euros was distributed among the applicants.

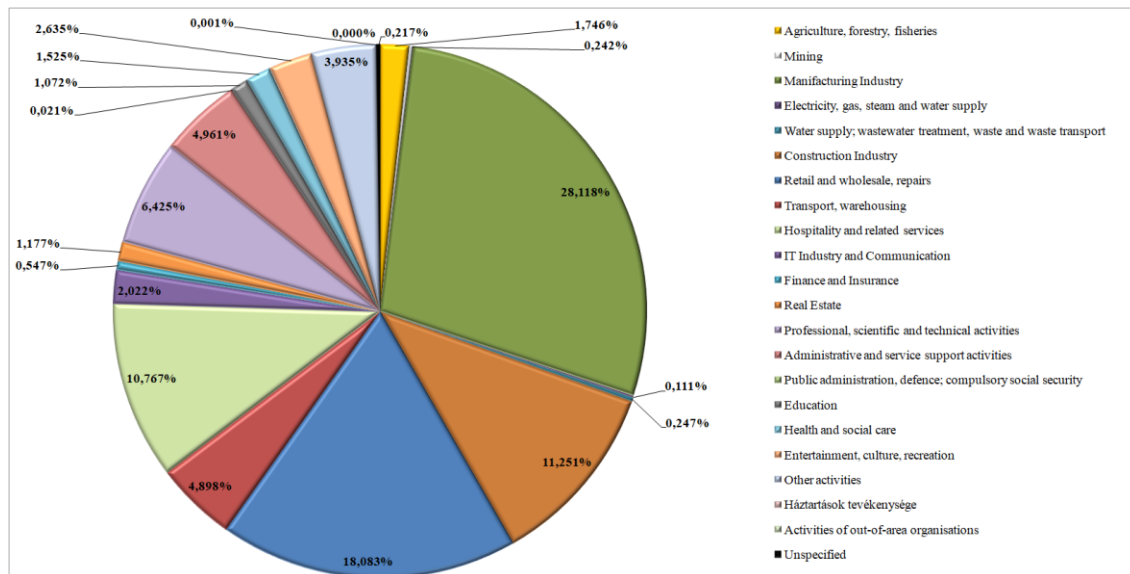


Figure 3 Distribution of subsidies by economic sector for all subsidy areas; source: own elaboration based on MPSVaR SR (2022)

In the examined period, the number of subsidized subjects in the HoReCa sector for all subsidized areas was 155,055. In the segment of hotels, restaurants and cafes, the number of subsidized subjects during the first (from March 6, 2020), second (from the end of July 2020) and third wave (from July 2021) of the epidemic was the highest in February 2021 (a total of 10,789 applicants). For all waves, the number of beneficiaries reached its minimum in the months of July and August. As Klimovský et al. (2021) also noted, the summer months were a turning point from both epidemiological and economic points of view. More residents spent their summer holidays in the countries marked as safe and considered to be the main tourist destination (e.g. Croatia), and domestic tourism also became more and more intense. During these months, a temporary upswing in the examined HoReCa sector and a decrease in the number of requested subsidies were observed. However, improper compliance with the regulations (wearing a mask, keeping a distance, washing hands) was also typical, which contributed to the start of the second and third waves of the epidemic.

Applicants who received support most often used the compensation options of Support area 2. By January 2022, approximately 72,283 economic units operating in the HoReCa sector were assisted through the second scheme. Through the "First Aid" programs, 483,440 workers employed in hospitality establishments and individual entrepreneurs operating in the sector were compensated. This represented 9% of all employees and sole proprietors who received support. In the case of subsidized subjects belonging to individual economic sectors, the inequality of the distribution of compensations is also evident. During the entire period of the epidemic, among the analyzed sectors, the number of beneficiaries was the highest in those which, based on the previously presented indicators, were less disadvantaged as a result of the pandemic. In the manufacturing industry, the number of subsidized subjects (109,292) made up more than one tenth of all compensation recipients. Trade actors accounted for nearly a quarter of the users of the resources, and companies operating in the construction industry

accounted for more than 16%. When evaluating the fairness of the distribution of support, an additional aspect may be the different role of the economic sectors in each district. Accommodation service units, restaurants and other catering units are most present in the districts of Bratislava, Žilina and Trnava (ŠÚSR, 2022i). As a result, the unequal sector distribution of resources and beneficiaries has also led to regional inequalities in the preservation of jobs.

#### 4 Discussion

After the first wave of the Coronavirus epidemic, the majority of the population has hoped that social and economic life will one day return to normal (Veteška, 2021). Nowadays, in the second half of 2022, at the beginning of the expected next wave of the pandemic, it is becoming ever clearer that the global economy, and the tertiary sector which forms part of it, has undergone a significant transformation. The sector's ability to generate gross added value has dropped enormously. The continuous decline in the revenues of the HoReCa sector and the increase in the number of unemployed could not be corrected even by the period of temporary lifting of restrictions between the individual waves. In their work, Debreceni and Fekete-Frojimovics (2021) note that resilience, i.e. the ability to prepare for, adapt to and recover from undesirable events similar to the Covid epidemic, together with further innovations, is essential for the survival of the players in the sector. Kochańska et al. (2021) draws attention to the rapid growth of the food delivery market and the spread of food orders via internet platforms during the transformation of the HoReCa sector, and sees it as the creation of a circular economy (shortening distribution channels, using local raw materials, minimizing raw material and energy consumption, and waste production).

Among other things, the "First Aid" packages approved by the Slovak government were intended to help the operators in the HoReCa sector. However, in our point of view, the number of subsidies coming to the sector cannot be considered fair, seeing the sector's exposure to the negative effects of the epidemic and restrictive measures. The effects of the coronavirus epidemic affected the Slovak HoReCa sector more sensitively than other live-work-intensive sectors of the economy. The number of people employed by hotels, restaurants and cafes, similarly to the number of companies and entrepreneurs operating in the sector, decreased significantly. The same can be said about the sector's revenue and gross added value generation capacity. On the other hand, the largest part of the "First Aid" compensations was directed to the trade, construction and manufacturing industries, which suffered less from the effects of the epidemic. The companies in the HoReCa sector were dissatisfied with the level of compensation. This is also confirmed by the results of the survey carried out by the Association of Hungarian Entrepreneurs in Slovakia at the beginning of 2021, with the participation of domestic SMEs. The research results of Szeiner et al. (2022) also point to this fact. They came to conclusion that small (less than 50 people) organizations (especially in consulting industry) were more affected by the pandemic. Therefore, it is important to provide adequate public support for SME.

Among the limitations of the research, we would like to mention that when proving the conclusions, we only relied on the freely available data of two most-used databases, and that the study does not include primary data collection. The assessment of the experiences and opinions of the actors in the HoReCa sector affected by the epidemic was therefore not carried out. In our opinion, the future continuation of the research and the substantiation of the conclusions formulated in the study with primary data can provide clearly interesting results. It may also be important to examine the extent to which

the economic downturn in the HoReCa sector affected certain regions of Slovakia, thus the impact of the sector on changes in territorial inequalities.

## References

- Baliak, M., Domonkos, Š., Fašungová, L., Hábel, B., Komadel, J. and Veselková, M. (2020), "Prvá pomoc Slovensku: priebežná správa o sociálnej pomoci pracujúcim a rodinám (Aktualizácia 7)", available at: [https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp\\_2020\\_prva\\_pomoc\\_update7.pdf](https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp_2020_prva_pomoc_update7.pdf) (accessed 1 July 2022)
- Baliak, M., Domonkos, Š., Fašungová, L., Hábel, B., Chujac, T., Komadel, J. and Veselková, M. (2021), "Prvá pomoc Slovensku: priebežná správa o sociálnej pomoci pracujúcim a rodinám (Aktualizácia 9)", available at: [https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp\\_2021\\_prva\\_pomoc\\_update9\\_final.pdf](https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp_2021_prva_pomoc_update9_final.pdf) (accessed 1 July 2022)
- Blahušiaková, M. (2021), "Vplyv krízy súvisiacej s pandémiou COVID-19 na účtovné jednotky podnikajúce v odvetví cestovného ruchu", *Ekonomika a informatika, Dopad koronakrízy na hospodárstvo, spoločnosť a vzdelávanie - špeciálne monotematické číslo*, Vol. 19 No. 3, pp. 4-17.
- Buchel, O. Domonkos, Š., Fašungová, L., Hábel, B., Hlaváč, B., Komadel, J. and Veselková, M. (2020), "First Aid for Slovakia (Updated report on the economic policy response to the COVID-19 pandemic)", available at: [https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/spi\\_first\\_aid\\_sr\\_aug2020\\_final.pdf](https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/spi_first_aid_sr_aug2020_final.pdf) (accessed 1 July 2022)
- Costa Dias, M., Joyce, R., Postel-Vinay, F. and Xu, X. (2020), "The Challenges for Labour Market Policy during the COVID-19 Pandemic\*", *Fisc. Stud.* Vol. 41 No. 2, pp. 371–382. doi:10.1111/1475-5890.12233.
- Csizmadia, P. and Illésy, M. (2020), "A nagy leállás: a magyar munkahelyek közel fele került veszélybe", available at: [Csizmadia-Illessy\\_A\\_virus\\_es\\_a\\_munka-F.pdf](https://www.cszizmadia-illesy.hu/files/Csizmadia-Illessy_A_virus_es_a_munka-F.pdf) (tk.hu) (accessed 1 July 2022)
- Debreceni, J. and Fekete-Frojimovics, Zs. (2021), "A vendéglátás nemzetközi kutatási paradigmái a Covid19 árnyékában. Szisztematikus szakirodalmi áttekintés és egy koncepcionális keretmunka", *Turizmus Bulletin*, Vol. 21 No. 4, pp. 5-13. doi:10.14267/turbull.2021v21n4.1.
- Domonkos, Š., Fašungová, L., Hábel, B., Komadel, J. and Veselková, M. (2020), "Prvá pomoc Slovensku: priebežná správa o sociálnej pomoci pracujúcim a rodinám", available at: [https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp\\_2020\\_prva\\_pomoc\\_slovensku\\_final5.pdf](https://www.employment.gov.sk/files/slovensky/ministerstvo/analyticke-centrum/analyticke-komentare/isp_2020_prva_pomoc_slovensku_final5.pdf) (accessed 1 July 2022)
- Dube, K., Nhamo, G. and Chikodzi, D. (2021), "COVID-19 cripples global restaurant and hospitality industry", *Current Issues in Tourism*, Vol. 24 No. 11, pp. 1487-1490. doi:10.1080/13683500.2020.1773416.
- Garcia-Madurga, M.Á., Esteban-Navarro, M.Á. and Morte-Nadal, T. (2021), "CoVid Key Figures and New Challenges in the HoReCa Sector: The Way towards a New Supply-Chain Sustainability", Vol 13 No 12, pp. 1-19. doi:10.3390/su13126884.
- Gursoy, D. and Chi, G.Ch. (2020), "Effects of COVID-19 pandemic on hospitality industry: review of the current situations and a research agenda", *Journal of Hospitality Marketing & Management*, Vol. 29 No. 5, pp. 527-529. doi:10.1080/19368623.2020.1788231.

- Ježková, R. (2008), "Podnikanie a podpora miestnej ekonomiky", in *Nadregionálna spolupráca Trnavska: Zborník príspevkov z medzinárodnej vedeckej konferencie, Sládkovičovo, Slovenská republika, 2008*, Vysoká škola v Sládkovičove, Sládkovičovo, pp.138-158.
- Juhász-Kis, V. and Lendvai, E. (2021), "Fenntarthatóság a Horeca ágazatban - netnográfia felmérések alapján", *Jelenkori társadalmi és gazdasági folyamatok*, Vol. 16 No. 3-4, pp. 1-9. doi:10.14232/jtgf.2021.3-4.35-43.
- Kochańska, E., Łukasik, R.M. and Dzikuć, M. (2021), "New Circular Challenges in the Development of Take-Away Food Packaging in the COVID-19 Period". *Energies*, Vol.14 No. 15, pp. 1-18. doi:10.3390/en14154705.
- Klimovský, D., Nemeč, J. and Bouckaert, G. (2021), "The COVID-19 Pandemic in the Czech Republic and Slovakia", *SciPap*, Vol. 29 No. 1, pp. 1-12. doi:10.46585/sp29011320.
- Marin-Pantelescu, A. and Candidatu, C. (2019), "The Place of Small and Medium-sized Enterprises (SMEs) in Sustaining Trade in Tourism Services", in *Collaborative Research for Excellence in Economics and Social Sciences, Proceedings of the 2<sup>nd</sup> International Conference on Economics and Social Sciences (ICESS)*, Bucharest, Romania, 2019, Sciendo, pp. 256-264. doi:10.2478/9788366675322-030.
- MPSVaR. (2022), "Prvá pomoc Slovensku", available at: <https://www.employment.gov.sk/sk/ministerstvo/vyskum-oblasti-prace-socialnych-veci-institut-socialnej-politiky/analyticke-komentare/prva-pomoc-slovensku.html> (accessed 1 July 2022).
- Mura, L., Zsigmond, T., Kovács, A. and Baloghová, E. (2020), "Unemployment and GDP Relationship Analysis in the Visegrad Four Countries". *Online Journal Modelling the New Europe*, Vol. 34, pp. 118-134.
- Szeiner, Z., Kovács, Á., Zsigmond, T., Mura, L., Sanders, E. and Poór J. (2022), "An empirical study of consulting in a transitional economy in the Central European region during COVID-19". *Journal of Eastern European and Central Asian Research (JEECAR)*, Vol. 9 No 3, pp. 471-485. doi: 10.15549/jeecar.v9i3.854
- ŠÚSR. (2022a.), "Hrubá pridaná hodnota podľa ekonomických činností A88 v bežných cenách", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN/nu1054rs/v\\_nu1054rs\\_00\\_0\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN/nu1054rs/v_nu1054rs_00_0_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022b), "Počet prenocovaní - ročne", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN2/cr1804rs/v\\_cr1804rs\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN2/cr1804rs/v_cr1804rs_00_00_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022c.), "Tržby za vlastné výkony a tovar v obchode, hoteloch a reštauráciách - štvrťročné údaje [ob2008qs]", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SLOVSTAT/ob2008qs/v\\_ob2008qs\\_0\\_0\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SLOVSTAT/ob2008qs/v_ob2008qs_0_0_00_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022d.), "Vybrané ukazovatele za ubytovacie a stravovacie služby (SK NACE Rev. 2) [ob2801rs]", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SLOVSTAT2/ob2801rs/v\\_ob2801rs\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SLOVSTAT2/ob2801rs/v_ob2801rs_00_00_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022e.), "Vybrané ukazovatele priemyselných podnikov podľa SK NACE Rev. 2 - ročne [pm1001rs]", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN/pm1001rs/v\\_pm1001rs\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN/pm1001rs/v_pm1001rs_00_00_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022f.), "Vybrané ukazovatele za vnútorný obchod [ob2802rs]", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SLOVSTAT2/ob2802rs/v\\_ob2802rs\\_00\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SLOVSTAT2/ob2802rs/v_ob2802rs_00_00_00_00_sk) (accessed 1 July 2022).
- ŠÚSR. (2022g.), "Stavebníctvo - celé odvetvie (SK NACE Rev. 2) [st3001rr]", available at: [http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN/st3001rr/v\\_st3001rr\\_00\\_00\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN/st3001rr/v_st3001rr_00_00_00_sk) (accessed 1 July 2022).

- ŠÚSR. (2022h.), "Ekonomické subjekty v RO podľa vybraných právnych foriem a Štatistickej klasifikácie ekonomických činností k 31. 12. [og1006rs]", available at:[http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN/og1006rs/v\\_og1006rs\\_00\\_0\\_0\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN/og1006rs/v_og1006rs_00_0_0_00_sk)(accessed 1 July 2022).
- ŠÚSR. (2022i), "Sieť pohostinstva veľkých podnikov za 20 a viac zamestnancov [ob3005rr]", available at:[http://datacube.statistics.sk/#!/view/sk/VBD\\_SK\\_WIN/ob3005rr/v\\_ob3005rr\\_00\\_0\\_0\\_00\\_sk](http://datacube.statistics.sk/#!/view/sk/VBD_SK_WIN/ob3005rr/v_ob3005rr_00_0_0_00_sk)(accessed 1 July 2022).
- Szlovákiai Magyar Vállalkozók Szövetsége. (2021), "A koronavírus járvány hatása a szlovákiai kis- és középvállalkozásokra", available at:[https://vallalkozzosokan.sk/wp-content/uploads/2021/04/A\\_koronavirus\\_hatasa\\_a\\_szlovakiai\\_KKV\\_szektorra\\_20210407.pdf](https://vallalkozzosokan.sk/wp-content/uploads/2021/04/A_koronavirus_hatasa_a_szlovakiai_KKV_szektorra_20210407.pdf)(accessed 1 July 2022).
- Veteška, L. (2021), "Komparácia ekonomických dôsledkov pandemickej krízy 2020 s veľkou recesiou 2008", MANEKO: časopis o ekonomike a manažmente priemyselných podnikov, Vol. 13 No. 2, pp. 220-227.

## The Level of Covid 19 Impact Dependent on the Type of Strategy Implemented in Small and Medium Enterprises

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### Abstract

The objective of this article is to examine whether small and medium enterprises (SMEs) that implemented a corporate strategy based on the 3 main strategic goals: develop or sharpen a unique selling proposition, strengthen or improve the competitiveness and achieve a dominant market position in the core market(s), here-in-after referred to as a complete strategy, were less harmed by the Covid 19 Sars-2 pandemic than SMEs that had no or a less specific strategy implemented. In addition, it should be investigated to what extent the pandemic represents an opportunity for strategy improvements and whether potential improvements for the company's own strategy can be derived from the behaviour of its competitors. To obtain more detailed information on these issues, an online survey was conducted in 2020. A total of 109 participants (owners, presidents, CEOs, CFOs) from mainly German and US SMEs took part in the survey. The answers to the questions were statistically evaluated and assessed. The  $\chi^2$  test showed that SMEs that had implemented a complete strategy from 2014 to 2019 clearly felt a much smaller impact of the pandemic on their business than companies that had no or a more haphazard strategy implemented. 47% of the participating SMEs saw the pandemic as an opportunity to make important strategic changes with focus on digitalization, markets, customers and streamlining the organization. It was confirmed that monitoring competitors can provide opportunities for one's own company, especially in times of crisis. Companies were able to take over customers when competitors ceased their business or marketing efforts. Overall, it has become clear that pure cost control is not the right way to emerge stronger from a crisis. This paper contributes to the knowledge about the impact of the Covid 19 pandemic on SMEs, depending on their strategy and the strategy changes prompted by the pandemic.

Keywords: Covid 19 Pandemic, Small and Medium Enterprises, SMEs, strategy, strategic changes, dominant market position, competitive advantage, USP.

Article Classification: Research article

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## 1 Introduction

The Covid 19 Sars-2 pandemic occurred suddenly in early 2020 and threatened the existence of public, large and especially small and medium-sized enterprises (SMEs). This pandemic was the next global threat to the existence of many companies after the 2008 financial crisis. In particular, SMEs are generally less resilient to external threats than large and listed companies, which usually have more resources and reserves and have implemented an established strategic development process (Gunasekaran et al. 2011, Kraus et al. 2013).

In short, small and medium enterprises (SMEs) are described as independently operating companies with less than 250 employees and less than 50 Mio € revenues or a balance sum below 43 Mio € (European Commission 2017).

For example, in 2017, 99.5% of all German companies were SMEs and comprised of 35% of revenues for all German enterprises (IfM 2017). In 2018, SMEs accounted for 99.8% of all enterprises in the EU-28 non-financial business sector (NFBS), generating 56.4% of value added and 66.6% of employment in the NFBS (European Commission 2019).

After the 2008 financial crisis, various studies were conducted on crisis survival and resilience of SMEs (Bourletidis et al. 2014, Dolz et al. 2018, Tchouvakhina et al. 2013, Wishard 2018). Although SMEs play such a significant role in the world-wide economy and are particularly vulnerable for existence-threatening crises (Hong et al. 2012, Ozgulbas et al. 2012) only few papers investigate the correlation between the specific implemented company strategy and the occurrence of existence-threatening crises and crisis resilience of SMEs (Klausmann et al. 2020, Stokes et al. 2010, Vargo et al. 2011).

In the following, we will examine the extent to which companies that, prior to the Covid pandemic, had implemented a corporate strategy based on the 3 goals of:

Develop and continuously sharpen a unique selling proposition (Anderson et al. 2006, Mayr et al. 2019, Penzel et al. 2017, Reeves 2015), strengthen or improve competitiveness (David et al. 2017, Porter 1985 and 1998), and achieve a dominant market position in the core market(s) (Lerner 1934, Montgomery 1985), here-in-after referred to as a complete strategy, were affected by the pandemic compared to firms that did not pursue a strategy or a more haphazard strategy.

Furthermore, it will be investigated to what extent the Covid 19 pandemic has triggered strategy changes in SMEs, and if so, in which areas the changes have been made. It also examines whether competitors' behavior during the Covid 19 crisis provides evidence for improving their own strategy and competitiveness.

In order to explore the above points and generally provide more information on strategic goals, the strategy process, and the impact on SME performance, an online survey was conducted by the author in 2020 with the theme of 'relationship between existence-threatening crises of SMEs and type of company strategies implemented.' For this survey, owners, CEOs, CFOs and presidents of 813 small and medium-sized companies operating industrially in Europe with a focus on Germany (697) and the USA (82) were contacted, with 109 respondents.

For this article, the survey results were analyzed specifically in terms of the relationship between the impact of the Covid 19 pandemic and the strategies implemented by the companies.

## 2 Material and methods

### 2.1 Method

To investigate the relationship between the occurrence of SMEs' existence-threatening crises and the quality and objectives of company strategies, an online survey was developed and conducted at <https://www.umfrageonline.com>.

The general objective of the survey was to investigate the relationship between the occurrence and overcoming of existence-threatening crises and the implemented or not implemented company strategy in industrially active SMEs. In addition, the question was addressed: do SMEs that have implemented a complete strategy come through the crisis better than companies that had not implemented a strategy process or had implemented a rather haphazard strategy process in the years leading up to the pandemic?

A total of 29 questions were developed for the survey. The survey, conducted between July 3, 2020 and April 29, 2021 included questions on:

- Company size (KPIs: revenue and number of employees) to classify the companies as SMEs or non-SMEs.
- Company performance (KPIs: sales and contribution margin) to determine whether the company was or is in crisis in the period under review
- Company strategy as such and on the strategy process itself
- Level of impact of the Covid 19 pandemic on company performance and on the impact on the implemented company strategy

Since the above mentioned data for SMEs are not publicly accessible and, for data protection reasons, these data cannot be collected via trade associations, the search for potential participants was mainly conducted through the internet platform LinkedIn, <https://www.linkedin.com>. Decision makers from industrially active small and medium-sized companies in Europe, with a focus on Germany and the USA, were sought and selected for contact. However, it is not clear from the LinkedIn profiles whether the decision maker's company meets all the criteria for a SME. Therefore, also decision makers from firms that did not necessarily meet the criteria for SMEs, defined as above, were also contacted and answers received. However these firms did not deviate significantly from the SME criteria and decision-making structures (largely independent, foreign subsidiary with its own management for example) of SMEs.

The decision makers contacted were owners, managing directors, managing partners, presidents, CEOs and CFOs, decision makers who are responsible for both, the strategy process and the company performance in SMEs and who have the deepest insight into these issues.

Decision makers from industrially active companies, i.e., not decision makers from the tourism industry, financial investors, and the like, were specifically selected for contact. The selected decision makers were asked to network with the author's LinkedIn profile. After successful acceptance at the network of the decision maker, the potential study participants were asked to participate in the online survey by sending the link: <https://www.umfrageonline.com/s/ba7fd95>.

## 2.2 Number of participants generated

Using the procedure described above, 813 decision makers were contacted, of which 679 were in Germany, 48 in other European countries, 82 in the USA and 4 in the rest of the world. A total of 109 participants (84 German, 7 European and 18 US participants) were generated, which corresponds to a participation rate of 13%.

Table 1 Number of contacted decision makers

Location of participants	No of contacted companies	No of participants	Percentage of participants
Germany	679	84	12 %
Europe without Germany	48	7	15 %
USA	82	18	21 %
Rest of World	4	0	0
Total	813	109	13 %

Ninety companies (83%) of the 109 participants fulfilled both queried criteria for SMEs (< 50 Mio € turnover and < 250 MA); 2 exceeded only the number of employees criteria but not the turnover requirements; 10 companies exceeded the turnover criteria but not the requirement for the number of employees and only 7 companies exceeded both the revenue size and the maximum number of employees criteria.

In view of these results and the fact that when contacting the decision makers via the LinkedIn profiles, care was taken to ensure that they were mainly independently operating companies, e.g. foreign subsidiaries (GmbH in Germany), and not large or public companies, the responses of all 109 participants were taken into account for the following study and considered to be valid for SMEs. A complete list of the 813 contacted decision makers is available.

Table 2 Number and size of participating companies that met the 2 criteria

Turnover in 2019	0-5 employees	6-20	21-40	51-150	151-250	>250	Total
0-5 Mio €	18	15	5				38
5-10 Mio €		6	5	8			19
10-25 Mio €		1	4	19	3	1	28
25-50 Mio €		1		4	1	1	7
>50 Mio €			1	4	5	7	17
Total	18	23	15	35	9	9	109

## 2.3 Meaningfulness of the generated number of participants

In 2018 alone in Germany 3,466,583 SMEs existed of which 20.3% equates to 703,716 were SMEs in the manufacturing sector (IfM 2017). In Europe existed approximately 22 million SMEs, meaning an extremely large population size existed. By using the following equation:

$$n = p(1 - p)(Z/E)^2 \quad (1)$$

n= sample size

p=proportion, p=0,5

Z= Z level for the desired confidence level

E=the maximum allowable error with E=10%

With 109 participants the confidence level Z of the results of the questionnaire for the total population is 98%, for the ninety SMEs alone the confidence level Z equivalent of 97 % with an allowable error rate of 10%.

### 3 Results

This article aims to provide answers to the following 3 questions:

- What was the level of the Covid 19 pandemic impact on SMEs that had previously implemented a complete strategy before the pandemic occurred in comparison to companies which had not implemented a strategy or had implemented a more haphazard strategy?
- Was the Covid 19 pandemic crisis an opportunity to make important strategic changes to strengthen the future competitiveness of the company?
- Did the analysis of competitors' behaviour during the Covid 19 crisis provide any clues for improving your own company's strategy or competitiveness?

#### 3.1 Covid 19 impact on SMEs depending on their strategy

To provide answers to above question the following questionnaire results were analyzed:

Had you defined and implemented a corporate strategy between 2014 and 2019 (survey question 8)?

Results:

Of the 109 participants, 102 participants answered this question and 68 announced that they had defined and implemented a strategy (62%), unspecified in any respect, whereas 34 did not define and implement a strategy during this period (31%).

That leads to the following conclusion:

Based on a confidence interval of 5% and assumed a binomial distribution, 53% to 71% of industrially active SMEs (in Germany and USA) had a strategy implemented, unspecified in any respect, during the period under consideration.

Table 3 Between 2014-2019 a strategy was defined and implemented

Response type	Number	Proportion
Answer yes	68	62.39%
Answer no	34	31.19%
Blank	7	6.42%
Total	109	100%

Did your implemented strategy help minimize the impact of the Covid 19 pandemic (survey question 21)?

In order to answer the above question, the answer combinations to question 8 (had you defined and implemented a strategy?) and to question 21 (did your implemented strategy help minimize the impact of Covid 19 pandemic?) were determined.

Results:

Of the 109 companies that participated in the study 34 (31,19%) participants responded that their implemented strategy helped to minimize the impact of the pandemic, while 26 (23,85%) participants felt that their strategy did not help minimize the impact of the pandemic. Thirty-three (30.28%) did not answer one or both questions, while 16 (14.68%) participants gave an implausible combination of answers (“No” to question 8 and “yes” to question 21). This could be due to the following reasons:

- Question 8 or 21 were answered incorrectly by mistake
- Question 8 was interpreted to mean that a company strategy was not explicitly defined and implemented, but an "unwritten" strategy was nevertheless intuitively followed by management
- A corporate strategy was not defined and implemented until 2020

Finally, of the 109 participants, 60 plausibly answered both questions, of which 34 were convinced that the implemented strategy led to a minimal impact of the pandemic on the business, while 26 were of the opposite opinion.

Table 4 Received answer combinations to question 8 and 21

Response type to Question 8	Response type to Question 21	No of answer combinations	comment	Proportion
Yes	Yes	34	Plausible answer combination	31,19%
Yes	No	26	Plausible answer combination	23,85%
Yes	Blank	8	Plausible but not fully answered	7,33%
Blank	Blank	7	Both questions not answered	6,42%
Blank	Yes	0		0
Blank	No	0		0
No	No	11	Plausible answer combination	10,09%
No	Blank	7	Plausible but not fully answered	6,42%
No	Yes	16	Non-plausible answer combination	14,68%
		109		100%

To investigate in detail whether there is a dependency between the type of strategy implemented prior to the Covid 19 pandemic and the impact of the Covid crisis on the company, the following survey questions were evaluated:

Question 11: Does your strategy aim to strengthen and improve your competitiveness?

Question 13: Does your strategy aim to become or stay No 1 or No 2 in your main market(s) (achieve a dominate market position)?

Question 14: Does your strategy aim to develop a unique selling proposition or sharpen the existing unique selling proposition?

Question 21: Did your implemented strategy help to minimize the impact of the Covid 19 crisis?

Results:

Of the 109 participants 60 answered all 4 questions (equals the 60 participants who answered plausible questions 8 and 21).

With 60 participants the confidence level of these results of the questionnaire for the total population is 94% at an allowable error rate of 10% (see equation chapter 2.3 Meaningfulness of the generated number of participants).

The following terms have been defined for further evaluation:

Complete strategy implemented: question 11, 13 and 14 were answered with yes

Incomplete strategy implemented: one or two or all three questions (11,13 and 14) were answered with no

Minimal Covid impact: question 21 was answered with yes

Strong Covid impact: question 21 was answered with no

Results:

Twenty-seven (45%) of the companies who answered all 4 questions (questions 11, 13, 14, 21) had a complete strategy installed during the years 2014 – 2019 and 33 companies had an incomplete strategy implemented during that time.

Table 5 Results of survey questions 11,13,14 and 21 summarized

Strategy type	Minimal Covid Impact	Strong Covid Impact	Sum of companies	Strategy implemented
Complete strategy	20	7	27	45%
Incomplete strategy	14	19	33	55%
Sum	34	26	60	100%

To analyze the dependency between level of Covid 19 pandemic impact and type of strategy implemented the  $\chi^2$  test is used:

H0: There is no difference in the level of impact of the Covid 19 pandemic on the investigated companies with a complete strategy and companies with an incomplete strategy in place.

H1: Companies with an incomplete strategy experienced strong Covid 19 impact and companies with a complete strategy implemented experienced only a minimal Covid 19 impact.

Results:

With  $\chi^2=6,059$  and tested at a significance level of  $\alpha=0,05$  (95% probability, threshold=3,581) H0 is rejected, means above data show significant dependence between implemented type of strategy and level of Covid 19 pandemic impact on company performance, i.e. firms that had implemented a complete strategy prior to the pandemic were significantly more likely to have a minimal impact of the pandemic on their business than firms that had not implemented a strategy or had implemented a more arbitrary strategy.

A more detailed analysis of the responses of the 33 participants who implemented an incomplete strategy reveals the following:

20 Participants targeted for improving the competitiveness and improving the unique selling proposition but not for achieving a dominant market position (No 1 or No 2) = incomplete Strategy I

5 Participants targeted for improving the competitiveness and a dominant market position but not for improving the unique selling proposition

1 Participant did not target for improving he competitiveness but for a dominant market position and for improving the unique selling proposition

5 Participants targeted for improving the competitiveness but not for a dominant market position and not for improving the unique selling proposition

2 Participants did not target for improving the competitiveness and for a dominant market position but for improving the unique selling proposition

Thus, the largest group of companies (20) with an incomplete strategy are companies with a strategy to improve competitiveness and unique selling proposition, but without the goal of achieving a dominant position (incomplete strategy I).

Again, the  $\chi^2$  test ( $\chi^2=4.11$ , significance level  $\alpha=0.05$ , 95% probability, threshold=3.581) shows that companies that had a complete strategy in place prior to the pandemic faced significantly less impact from the pandemic than companies with an incomplete strategy I.

Table 6 Results for firms with implemented complete strategy and incomplete strategy I

Strategy type	Minimal Covid Impact	Strong Covid Impact	Sum of companies	Strategy implemented
Complete Strategy	20	7	27	57.5 %
Incomplete Strategy I	9	11	20	42.5 %
Sum	29	18	47	100 %

### 3.2 Was the Covid 19 pandemic crisis an opportunity to make important strategic changes to strengthen the future competitiveness of the company?

To provide answers to above question the following questionnaire results were analyzed:

Will you stick to your current strategy despite the changes in the environment (question 24)? This question was asked to determine the resilience of the strategy to the Covid 19 pandemic.

Results:

Despite the effects of the pandemic, 78% of the participants are still convinced of their strategy and only 10% no longer want to adhere to the strategy implemented between the years 2014 and 2019.

Table 7 Will you stick to your current strategy despite the changes in the environment?

Response type	Number	Proportion
Answer yes	53	77.94%
Answer no	7	10.29%
No Answer	8	11.76%
Total	68	100%

Do you see the current situation (Covid 19 pandemic) as an opportunity to make important strategic changes to strengthen the future competitiveness and successful development of the company (question 25)?

Results:

As many as 47% of the participants see the pandemic as an opportunity to improve the competitiveness of their company. Only 33% did not receive any impetus to improve competitiveness because of the pandemic.

Table 8 Is the Covid 19 pandemic an opportunity for strategic changes?

Response type	Number	Proportion
Answer yes	51	46.78%
Answer no	36	33.03%
No Answer	22	20.18%
Total	109	100%

Question 26 asked specifically about the planned changes in strategy and question 27 about the changes already implemented.

Results:

A total of 46 study participants named 75 specific planned and / or already implemented strategy changes.

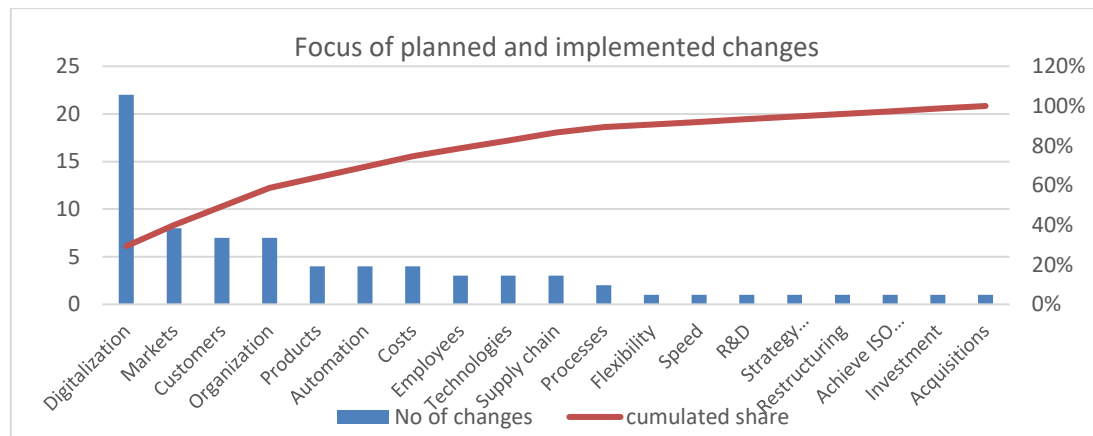


Figure 1 Planned and / or already implemented strategy changes due to the Covid 19 pandemic

The main measures mentioned are as follows:

Digitalization:

- Reduce complexity by simplifying basic structures; digitize all processes where possible
- Implementation of new software to meet demand faster
- Reaching new and existing customers through virtual meetings, video calls and online product presentations
- Development of new ways to train customers via the Internet and to provide them with support solutions
- All workstations can be operated from home; customer contacts as well
- Situation-related more home office capacities and possibilities / Online presence of sales, especially for international customers improved, nevertheless difficult for high-priced machinery and equipment



Markets:

- Have changed select talent in the organization; have diverted resources to stronger markets; have launched a new team to focus on market area strengthened by COVID 19
- Target more resources into the growing health care/ personal safety market (large sales growth past 6 months)
- Development of new business areas/markets
- New target industries
- Diversify into less cyclical areas

Customers:

- Expansion of the customer base, reduction on dependency of large customers
- Change sales model and channels
- Sales model will be adjusted and also a stronger prioritization on the core business or the core segments assessed in the strategy
- OEM strategy

Organization:

- Streamlining of the organisation due to short time work and home office
- Reduce complexity by simplifying basic structures
- During this downturn we are using the time to organize our manufacturing and write procedures so we can achieve ISO compliance in 2021
- But above all we are working on our corporate culture and management

Products:

- Focus on core products
- Elimination of products that do not fit the core business
- Clear focus on profitable business
- More new product solutions

Automation:

- More automation in manufacturing
- Strengthen process automation
- Automation - Process optimization

Costs:

- Re-evaluating low margin items to determine if they drive business or reduce profits
- Cost improvements

Employees

- Focus on employees
- Hiring of personnel plus training
- Continue work force flexibility and being effective from off site (not being in the office every day)

### 3.3 Did the analysis of competitors' behaviour during the Covid 19 crisis provide any clues for improving your own company's strategy or competitiveness?

To provide answers to above question the following questionnaire results were analyzed:

Do you know of any competitors who have already responded strategically to the Covid 19 challenge by abandoning their original business model (question 28)?

Question 28 was designed to identify other possible actions the participants could take to adapt their business model to the pandemic impact.

Results:

Of the 109 participants, 78 answered no to the above question, 9 answered yes, and 22 did not answer the question, i.e., only 8% of participants have noticed changes in their competitors' business model.

Table 9 Participants who know competitors who have abandoned their strategy due to the Covid 19 pandemic

Response type	Number	Proportion
Answer no	78	72 %
Answer yes	9	8 %
No answer	22	20 %
total	109	100 %

The following three changes on the business model / strategy of the competitors were noted:

- Their strategy changed to survival. Some competitors shut down their business and have given us the opportunity to gain new clients
- Our two largest competitors stopped or paused all marketing efforts. We trimmed in other areas and get our marketing going which has allowed us to continue to add customers
- In the service sector as well as in the sale of products, more reliance is being placed on digital methods / business models

## 4 Discussion

62% (68) of the participants had a corporate strategy (not specified) defined and implemented between 2014 and 2019.

Based on a confidence interval of 5% this statement applies to 53% to 71% of all industrially active SMEs (in Germany and USA).

Sixty of the 109 participants answered all relevant questions about the strategic goals and impact of Covid 19 and 27 of them had implemented a complete strategy (strengthen or improve the competitiveness, develop or sharpen a unique selling proposition and achieve a dominant market position).

The  $\chi^2$  test showed that SMEs that implemented such a complete strategy during the years 2014 – 2019 were significantly more likely to have minimal impact of the pandemic on their business than firms that had not or implemented a more arbitrary strategy. This shows that such corporate strategy (complete strategy) is particularly effective for SMEs, even in the event of natural disasters such as the Covid 19 pandemic. It makes SMEs more crisis resilient.

47% of the participating SMEs saw the pandemic as an opportunity to make important strategic changes to strengthen the future competitiveness and successful

development of the company with focus on digitalization, markets, customers and streamlining the organization and not primarily on cost control and cost reduction.

It was confirmed that monitoring competitors can provide opportunities for one's own company, especially in times of crisis. Companies were able to take over customers when competitors ceased their business or marketing efforts.

Overall, it has become clear that pure cost control is not the right way to emerge stronger from a crisis.

This paper shall encourage decision makers of SMEs to spend much more time in developing and implementing a specific strategy based on developing an USP, improving the company's competitiveness and achieving a dominant market position in the core market(s).

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## References

- Anderson, J., C., Narus, J., A., and Van Rossum, W. (2006). *Customer Value Propositions in Business Markets*. Harvard Business Review.
- Bourletidis K., Triantafyllopoulos Y. (2014). *SMEs Survival in time of Crisis: Strategies, Tactics and Commercial Success Stories*. Procedia – Social and Behavioral Sciences 148, 639-644.
- David, Fred R., David, Forest R. (2017). *Strategic Management: A Competitive Advantage Approach Concepts and Cases*. Pearson Education Limited, Edinburgh Gate, Harlow, Essex CM20 JE, England.
- Dolz C., Iborra M., Safron V., (2018). *Improving the likelihood of SME survival during financial and economic crises: The importance of TMTs and family ownership for ambidexterity*. BRQ Business Research Quarterly 22, 119-136.
- European Commission (2017). Benutzerleitfaden zur Definition von KMU. [ONLINE] [Accessed 06 January 2020].
- European Commission (2019). SME Performance Review. Annual Report on European SMEs 2018/2019. [ONLINE] Available at: [https://ec.europa.eu/growth/smes/business-friendly-environment/performance-review\\_en](https://ec.europa.eu/growth/smes/business-friendly-environment/performance-review_en). [Accessed 06 January 2020].
- Gunasekaran, A., Rai, B. K., and Griffin, M. (2011). *Resilience and competitiveness of small and medium size enterprises: an empirical research*. International Journal of Research, 49(18), 5489-5509.
- Hong, P., Huang, C., and Li, B. (2012). *Crisis management for SMEs: insights from a multiple-case study*. International Journal of Business Excellence, 5(5), 535-553.
- IfM, Institut für Mittelstandsforschung, Bonn. (2017). Kennzahlen der KMU nach Definition des IfM Bonn, Deutschland. [ONLINE] Available at <https://www.ifm-bonn.org/statistiken/mittelstand-im-ueberblick/#accordion=0&tab=0>. [Accessed 29 October 2019].
- Klausmann, J., Papula, J. (2020). *The strategic crisis as root cause for existence-threatening crises in small and medium enterprises*. IAETSD Journal for advanced Research in applied Sciences, Volume VII, Issue III, 34-42
- Kraus, S., Moog, P., Schleppephorst, S., and Raich, M. (2013). *Crisis and turnaround management in SMEs: a qualitative-empirical investigation of 30 companies*. International Journal of Entrepreneurial Venturing, 5(4), 406-430.

- Lerner, A., P. (1934). *The Concept of Monopoly and the Measurement of Monopoly Power*. The Review of Economic Studies. 1, Nr. 3, 1934, 157–175
- Mayr S., Mitter C., and Aixhmayr A. (2019). *Corporate Crisis and Sustainable Reorganization: Evidence from Bankrupt Austrian SMEs*. Journal of Small Business Management 55, 108-127.
- Montgomery, C., A. (1985). *Produkt-Market Diversification and Market Power*. The Academy of Management Journal, Volume 28, Issue 4, 889-798.
- Ozgulbas, N., Koyuncugil, A., S. (2012). *Risk Classification of SMEs by Early Warning Model Based on Data Mining*. World Academy of Science, Engineering and Technology, International Journal of Social, Behavioral, Educational, Economic, Business and
- Penzel, D., Kryvinska, N., and Strauss, C. (2017). "Cloud Market – Analysis of Potentials and Challenges for Service Providers". AMCIS 2017 Workshops 4.
- Porter, M., E. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. Free Press, 1230 Avenue of the Americas, New York, NY 10020.
- Porter, M., E. (1998). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press, 1230 Avenue of the Americas, New York, NY 10020.
- Reeves, R. (2015). *Reality in Advertising*, N.W. Widener Inc., 1105 Lexington Ave., New York NY 10075.
- Stokes, D., Wilson, N. (2010). *Small Business Management and Entrepreneurship*. Cengage Learning EMEA, Cheriton House, North Way, Andover, Hampshire, SP10 5BE, United Kingdom.
- Tchouvakhina Dr., M., Stöver Dr., P. (2013). *How companies recognise, exploit and overcome crises*. KfW Economic research No 29.
- Vargo, J., Seville, E. (2011). *Crisis Strategic Planning for SMEs: Finding the Silver Lining*. International Journal of Production Research - Creating Resilient SMEs special issue, 49(18), 5619-563.
- Wishart, M. (2018). *Business resilience in a SME context: A literature review*. Enterprise Research Centre and Warwick Business School, Coventry, CV4 7AL, UK.

## Work from Home as a Tool for More Efficient Business

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### Abstract

At the beginning of the pandemic an involuntary implementation of work from home practices was considered a short-term solution. The continuous pandemic has resulted in a work from home phenomenon. It is assumed that work from home can create substantial savings. The question is, therefore, whether work from home can reduce labour cost and be a cost saving tool for more efficient business. This paper analyzes the link between work from home and labour cost in 29 European countries. Analyzed data from Eurostat for the period 2019-2021 suggest a strong link between work from home and labour cost regardless of the frequency of use (sometimes or usually). We can observe an increasing dependence of these two variables, which will be apparently reflected as a trend in the nearest future. Growing inputs in the form of an increase in the price of electricity and gas forces us to reconsider the strict functioning of the on site work.

Keywords: labour cost; work from home; flexibility.

JEL Classification: M12, M54, J22;, J33, L23

Article Classification: Research paper

### 1 Introduction

The impact of the pandemic on individual segments of the labour market caused a huge shock, the immediate consequences of which began to be felt already during the first days of the pandemic announced by The World Health Organization (WHO, 2020). This proclamation caused that almost 40% of workers in the European Union reconfigured their professional activity for teleworking as a result of the epidemiological situation (Farinha and Ascenso, 2022). In essence, all job positions were moved to a "temporary home office"

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except for essential occupations and positions. However, many job positions were not prepared for such move. Furthermore, some sectors, such as hospitality lost their profitability and functionality (El Hajal, 2022).

Despite an unplanned change in work settings, it can be said that many organizations adapted very quickly (Aloisi and De Stefano, 2022) and were able to have functional processes (Howe and Menges, 2021). This moment could be seen as a turning point in the world of work. While before the pandemic and enforced restrictions many positions were described as purely office-based and localization flexibility in the form of a Friday home office was offered as a benefit to balance employees' satisfaction (Wojčák, 2013; Allen et al., 2015; Nakrošienė et al., 2019, Yu et al., 2019; Baráth, 2022), now it is a global phenomenon.

### ***1.1 Work from home application***

In the first moments, the shock of the pandemic was taken as a temporary condition and the transfer of work to the online space as a short-term issue, however, the ILO (2020a; 2020b) issued guidelines for employment needs and the subsequent crisis scenario for individual segments of the economy. Countries in Europe took different approaches, according to the development and speed of the spread of the pandemic. As a result of these activities and adaptation to the situation, it led to the strengthening of legislation and especially to the significant development of the sustainability of teleworking and working from home. The most important tools in European countries:

- investing in the quality and performance of the Internet;
- home fees assistance package;
- hybrid work model;
- more frequent home office as a mandatory part and moving from benefits to regularity.

Table 1 contains data of the employed persons working from home, however for the two measured frequencies of work from home that differ by definition. *Work from home - sometimes* can be defined as a less frequent or irregular work from home. In this case, it is a benefit that is based on an informal agreement with employers and is not firmly defined or contractually treated. In terms of frequency, these values are a maximum of 5 times a month or once a week. *Work from home - usually* can be defined as a more frequent or work performed from home on a regular basis. The implementation of changes in the legislation took place only recently and the unification of terms is still not completely finished. In this case, uniform or more detailed definitions at the level of European countries are still different. In essence, however, this type is treated contractually and is often referred to as telework.

Table one shows the trend in the use of working from home - sometimes increasing at a slow pace until 2019. Countries that had a low proportion of employees working from home occasionally achieved increasing numbers during 2020 and 2021 because, in addition to the pandemic, employers began take this setting as a normal benefit. Many countries that had a high proportion of people working at home already before the pandemic saw a downward trend in occasional work from home during 2020 and 2021. This trend is due to the fact that due to the development and functioning processes in the online space, many organizations have decided to introduce permanent work from home, thus moving work from home - sometimes to the category work from home - usually. This category for the years 2020 and 2021 has seen an increase in almost all countries, and to assess the trend it will be necessary to follow the further data for several years.

Table 1 Employed persons working from home as a percentage of the total employment

Country/Code		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
		<i>Sometimes</i>					<i>Usually</i>				
Belgium	BE	16.5	16.1	17.7	16.5	13.7	6.9	6.6	6.9	17.2	26.2
Bulgaria	BG	0.6	0.7	0.6	1.8	3.7	0.3	0.3	0.5	1.2	2.8
Czechia	CZ	5.2	5.4	5.4	5.9	7.3	3.9	4.0	4.6	7.2	7.2
Denmark	DK	21.1	19.6	20.7	18.3	17.9	8.8	7.8	7.8	17.0	18.1
Germany	DE	6.0	6.6	7.4	7.3	7.7	4.8	5.0	5.2	13.6	17.0
Estonia	EE	10.3	12.0	13.1	10.8	11.4	5.7	7.4	6.6	12.2	14.9
Ireland	IE	11.5	12.8	12.9	10.5	7.3	5.0	6.5	7.0	21.5	32.0
Greece	GR	3.2	3.1	3.4	3.4	8.2	2.3	2.0	1.9	7.0	6.7
Spain	ES	3.0	3.2	3.5	4.2	5.8	4.3	4.3	4.8	10.9	9.5
France	FR	13.6	14.1	15.8	13.7	17.2	6.7	6.6	7.0	15.7	17.0
Croatia	HR	4.6	5.3	5.0	7.9	8.7	1.4	1.4	1.9	3.1	4.6
Italy	IT	1.1	1.2	1.1	1.4	6.5	3.5	3.6	3.6	12.2	8.3
Cyprus	CY	1.3	1.0	1.2	2.9	6.0	1.2	1.2	1.3	4.5	6.7
Latvia	LV	1.2	1.9	1.8	1.6	2.6	2.1	2.9	3.0	4.5	11.0
Lithuania	LT	2.1	2.1	2.1	2.9	5.2	2.6	2.5	2.4	5.4	9.1
Luxembourg	LU	20.9	19.8	21.5	24.4	17.0	12.7	11.0	11.6	23.1	28.1
Hungary	HU	4.1	3.7	3.4	7.4	8.8	2.5	2.3	1.2	3.6	4.5
Malta	MT	3.1	3.9	5.4	10.9	14.4	4.4	5.8	6.1	14.8	14.9
Netherlands	NL	21.4	21.7	23.0	22.3	31.3	13.7	14.0	14.1	17.8	22.5
Austria	AT	12.1	11.7	12.1	11.1	12.5	9.5	10.0	9.9	18.1	15.9
Poland	PL	9.1	9.4	9.8	9.2	8.4	4.5	4.6	4.6	8.9	6.9
Portugal	PT	8.3	8.6	9.0	8.7	11.5	5.9	6.1	6.5	13.9	14.5
Romania	RO	0.2	0.3	0.6	0.6	4.2	0.4	0.4	0.8	2.5	2.4
Slovenia	SI	11.0	10.9	11.0	12.6	12.3	7.2	6.9	6.8	7.4	10.6
Slovakia	SK	4.9	5.4	5.8	5.9	8.4	3.5	3.6	3.7	5.7	6.6
Finland	FI	16.2	17.0	17.6	14.1	16.2	12.3	13.3	14.1	25.1	24.8
Sweden	SE	27.4	29.4	31.3	32	19.2	5.0	5.3	5.9	14	27.0
Iceland	IS	26.7	25.0	24.1	29.3	32.7	7.2	6.5	5.7	8.7	13
Norway	NO	5.3	5.9	5.2	6.8	25.7	5.1	5.5	5.0	4.7	16.4

source: data modified from (Eurostat 2022)

Work from home has a significant impact on wellbeing, changes and benefits for employees (Felstead and Henseke, 2017) and this impact has been described by several authors from different perspectives during the pandemic (Kaufman and Taniguchi, 2021; Ipsen et al., 2021). Among the biggest advantages can be considered the creation of a balance between work and private life (Farinha and Ascenso, 2022), new possibilities in the field of education and taking courses online (Bjursell et al., 2021), which, with the help of the development of internal company software and international connectivity, was able to make available many new online possibilities; save commuting time and transport costs (Kelly et al., 2022). From the point of view of nature protection, this has a positive impact on saving costs in office space (O'Brien and Aliabadi, 2020), it also saves nature and contributes to increasing the level of ecology (Loia and Adinolfi, 2021; Taboroši, 2021).

The new state in pandemic era, however, was not voluntary and temporary, but imposed with an unclear termination, which gave room for new research and setting up work from home differently than it was before. Many negatives are linked to social isolation

(Wang et al., 2020) and communication (Maier et al., 2022) or failure to fulfill work tasks, or these problems can lead to a loss of motivation (Ngamkroekjoti et al., 2022). So it is still true that voluntary and desired work from home is an advantage, but long-term duration can disrupt social ties and the possibility of promotion, or professional success (Golden and Eddleston, 2020). It is noteworthy, that findings on the advantages and disadvantages in the literature vary and are inconclusive.

## 1.2 Labour cost levels

The labour cost levels are based on the *Labour Cost Survey* (is a four-yearly survey that gathers levels of labour costs at a very comprehensive level) and an extrapolation based on the quarterly *Labour Cost Index* (relates to total average hourly labour costs and to the labour cost categories "wages and salaries" and "employers' social security contributions plus taxes paid minus subsidies received by the employer). The levels are available in euro and national currencies (Eurostat, 2022). Values in local currencies were converted to euro (Figure 1).

From a statistical point of view, an increasing trend of labour costs can be seen since 2017 before the pandemic. Primary data in the table for individual European countries is attached in Appendix A.1. The minimum value was represented by Bulgaria, whose labour costs were 5 euros in 2017, up to increasing costs in 2021 in the amount of 7 euros. The maximum value was represented by Norway, whose maximum value reached 50.1 euros in 2017 and 51.1 euros in 2021. The overall average in selected European countries also had a linearly increasing trend from 23 euros in 2017 to a value of 25.5 euros in 2021. The same trend was visible for the median in selected European countries from 17.6 euros in 2017 to the resulting 21.1 euros in 2021.

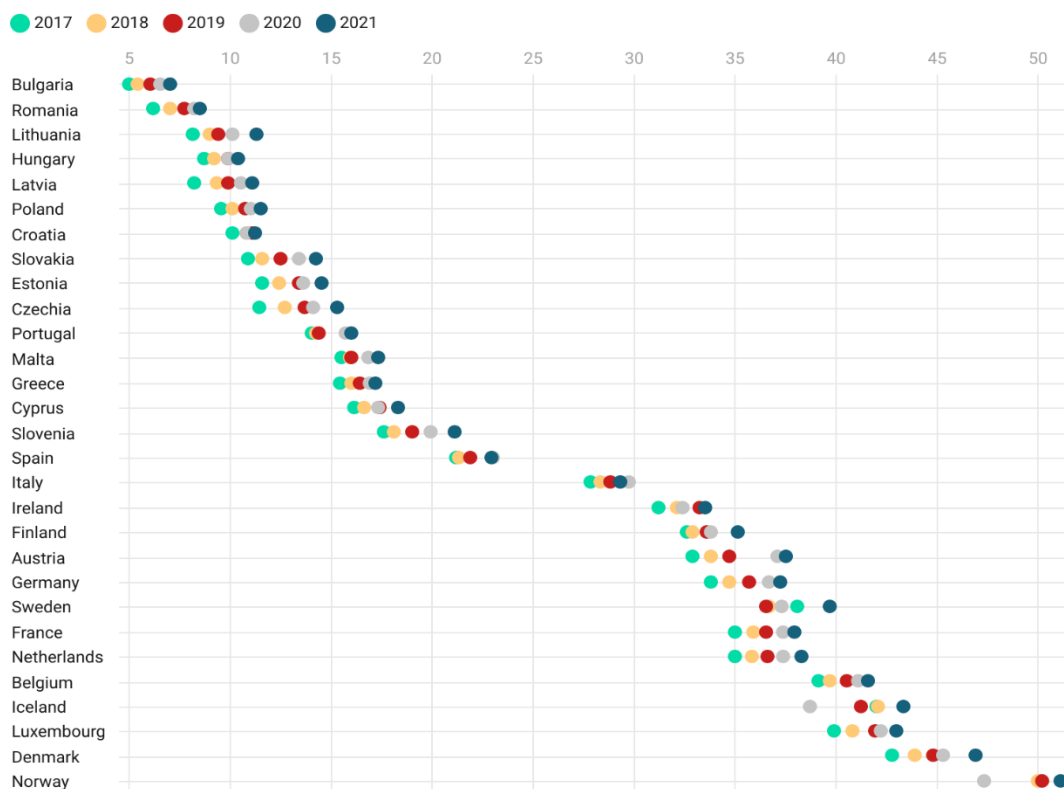


Figure 1 Labour cost levels structure by Countries 2017-2021 in Euros; source: data modified from (Eurostat 2022)



If we take 2019 as the base year before the pandemic, we can still see continuous linear growth in labour costs in individual countries. In 2020, in two countries in Europe (Norway, Iceland), total costs decreased. In Norway, a decrease was recorded in 2020, when the total price of labour costs fell from 50.2 euros to 47.3 euros in 2020. In the following year, the cost increased again. In Iceland, from a statistical point of view, a similar trend was recorded in 2020, when the total price of labour costs decreased from 41.2 euros to 38.7 euros in 2020. In the following year, the cost increased again. Statistical data in a table for individual European countries are attached in Appendix A.2.

## **2 Research objective and methodology**

The purpose of the paper was to identify possible association between work from home and labour cost. The objective was to answer the following question:

Can work from home reduce labour cost and be a cost saving tool for more efficient business?

In addition, the study aimed to test the following hypotheses:

H<sub>01</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2019.

H<sub>02</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2020.

H<sub>03</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2021.

Data for the selected countries were obtained from EUROSTAT (Figure 1, Appendix A.1, Table 1). In total, complete data for the period 2017-2021 were available for 29 countries, which included EU countries, countries that are members of the EU and use the euro currency and countries of European Economic Area (EEA). ISO 3166-1 Alpha 2 country codes were used to represent the studied countries in figures and tables. Switzerland was excluded from the sample due to incomplete data. A year 2019 was defined by the pandemic and can be considered as very important milestone for data research. Hence, in this study it is a base year as implications of the pandemic started showing in 2020, 2021.

To determine the association between independent (work from home) and dependent (labour cost) variables and to test the hypotheses the correlation coefficient, regression analysis and ANOVA analysis were computed using MS Excel (Data Analysis ToolPack).

## **3 Results**

### ***3.1 Correlation coefficient***

Correlation coefficients were determined by inbuilt correlation formula from MS Excel Data Analysis ToolPack. Table 2 indicates a strong positive correlation between work from home and labour cost during the analyzed period (2019-2021) regardless of the frequency of use (sometimes or usually).

Table 2 Correlation coefficient between the work from home (%) and labour cost (€)

	Correlation coefficient		
	2019	2020	2021
Work from home - Sometimes	0.685	0.648	0.727
Work from home - Usually	0.634	0.675	0.749

source: own elaboration

### 3.2 Linear regression

Determining the magnitude of change the regression analysis seemed necessary (Appendix B). Figure 2, 3, 4, 5, 6 and 7 suggest a linear relationship between studied variables. The linear graphs show that with an increased use of work from home practices the labour cost increases in all studied European countries. It is noteworthy, that closer the points are to the regression line the stronger the relationship between the variables is. It should also be emphasized in the interpretation of the results that countries above the regression line have higher costs, but their number of workers working from home is lower than the estimates show. However, the important fact remains that 2019 is not a pandemic and in this case the composition of the country's economy and its possibilities for using work from home sometimes or usually also matter.

Countries such as Iceland (IS), the Netherlands (NL) and Luxembourg (LU) achieved very significant dependence in this regard. In these countries, the increasing costs in 2019 depended on the percentage of work from home. All countries above the regression line had higher costs than the number of workers from home, which indicated a weak correlation and rather a trend to satisfy the employee with an occasional home office instead of solving costs. From Figure 2, it follows that the countries, which had a higher number of employees with the possibility to work from home sometimes were the countries of Central and Eastern Europe. The absolute leader in promoting the possibility to work from home was Sweden (SE), where more than 30% of employees could work this way.

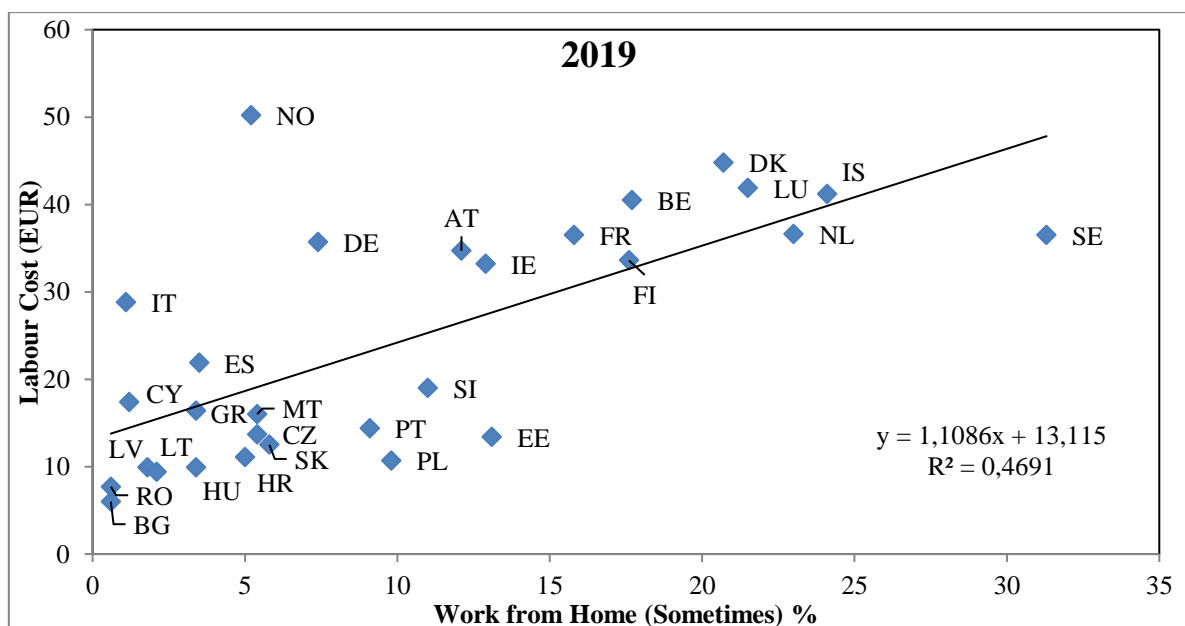


Figure 2 Linear Regression for 2019 - sometimes; source: own elaboration

In the case of work from home on a regular basis (Figure 3), the dependence was more pronounced on the employer's side who wanted to save on the expenses of the organization. In this case, the leaders were countries such as Greece (GR), Spain (ES), Austria (AT) and Luxembourg (LU). The Netherlands (NL) and Finland (FI) provided work from home on a regular basis much more than the dependency with labour costs shows.

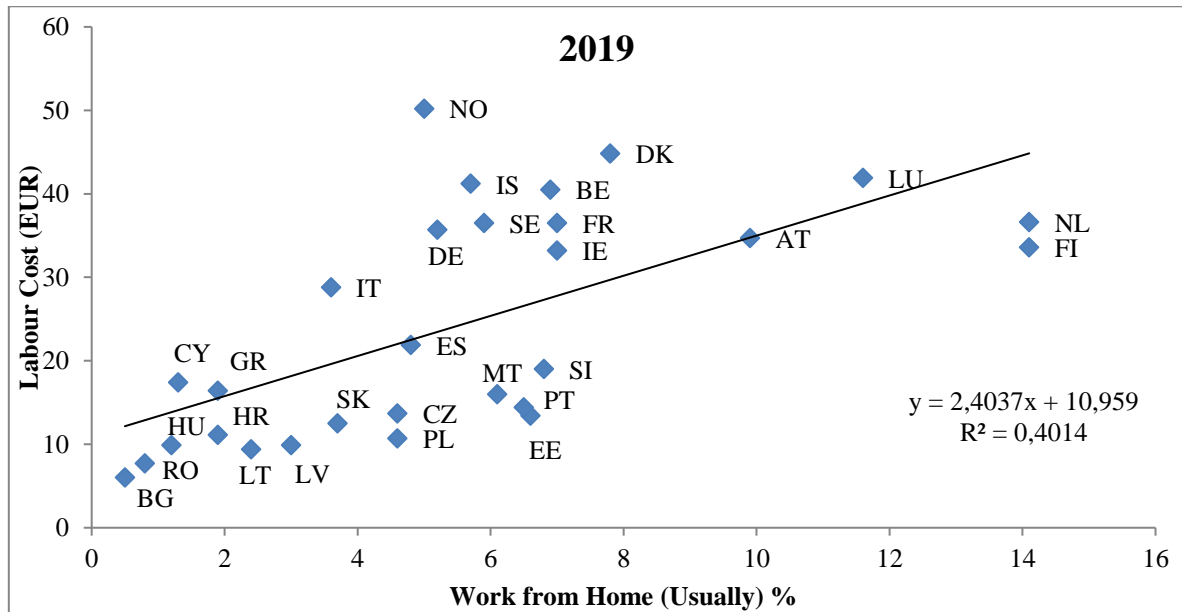


Figure 3 Linear Regression for 2019 - usually; source: own elaborations

In 2020, a pandemic broke out, which in many cases increased the provision of work from home. This year, the shift was more related to health protection and regulations in individual countries than to labour costs, which did not have a significant growth in that year. The absolute leader was Iceland (IS).

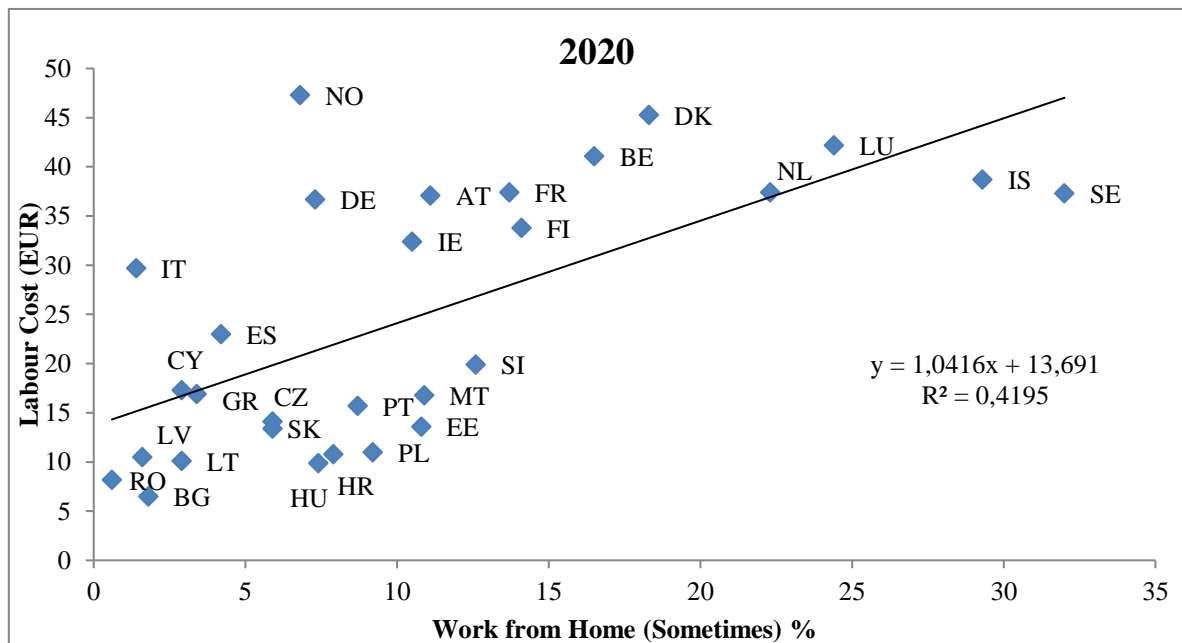


Figure 4 Linear Regression for 2020 - sometimes; source: own elaboration

In case of regular work from home (Figure 5), for countries below the regression line, there was an increase and a shift in the provision of work from home on a regular basis. In the countries of Central and Eastern Europe, a significant trend was the transition from irregular to a regular work from home. In countries such as the Netherlands (NL) or Norway (NO), the trend was the opposite. Many employees wanted to return to work and to offices after the long-term work from home.

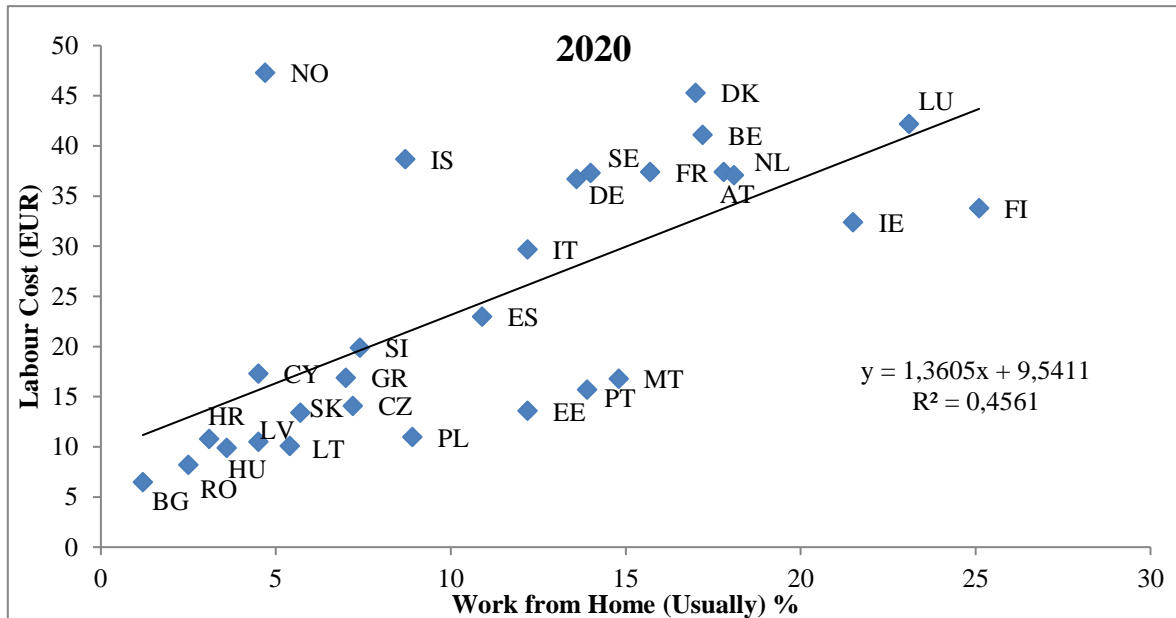


Figure 5 Linear Regression for 2020 - usually; source: own elaborations

In 2021, various measures and lockdowns occurred in many countries, which once again strengthened the trend of occasional work from home, mainly for those employees who did not experience it in the past. A typical example was Sweden (SE), which had a significant decrease in values compared to 2020 and a shift above the regression line.

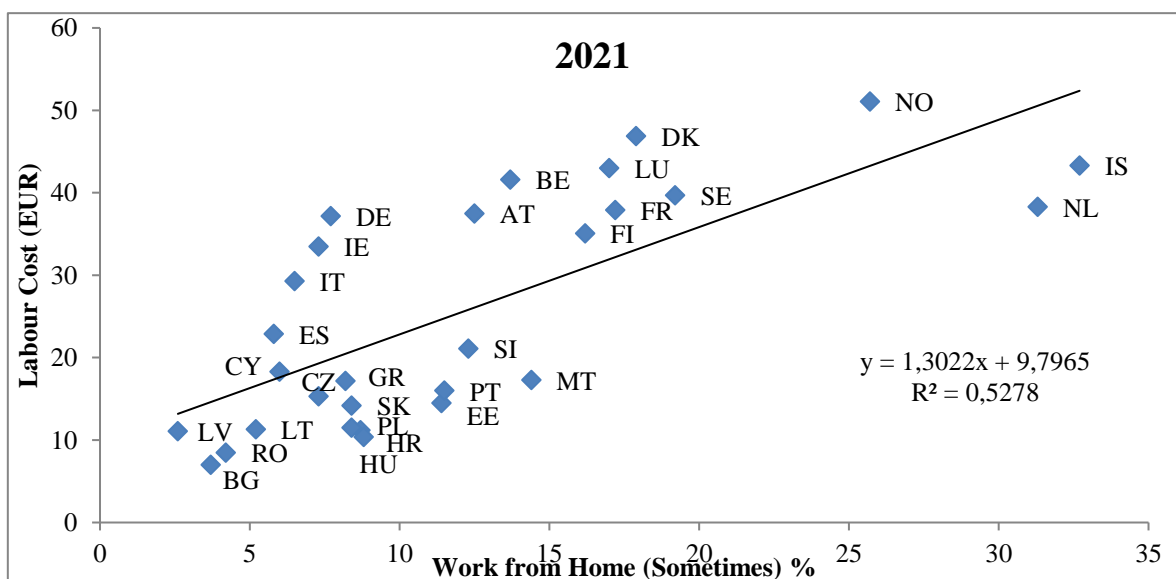


Figure 6 Linear Regression for 2021- sometimes; source: own elaboration

In 2021 (Figure 7), there was already a strong trend of increased work from home on a regular basis, when the number of permanent home office workers increased in all countries. In addition to the trend of employee safety and protection, the main topic became sustainability, saving labor costs and employers' costs in general. It can be assumed that increasing energy prices will also be reflected in increased labor costs and this trend of employees with regular or permanent work from home will be even more pronounced in 2022 and 2023.

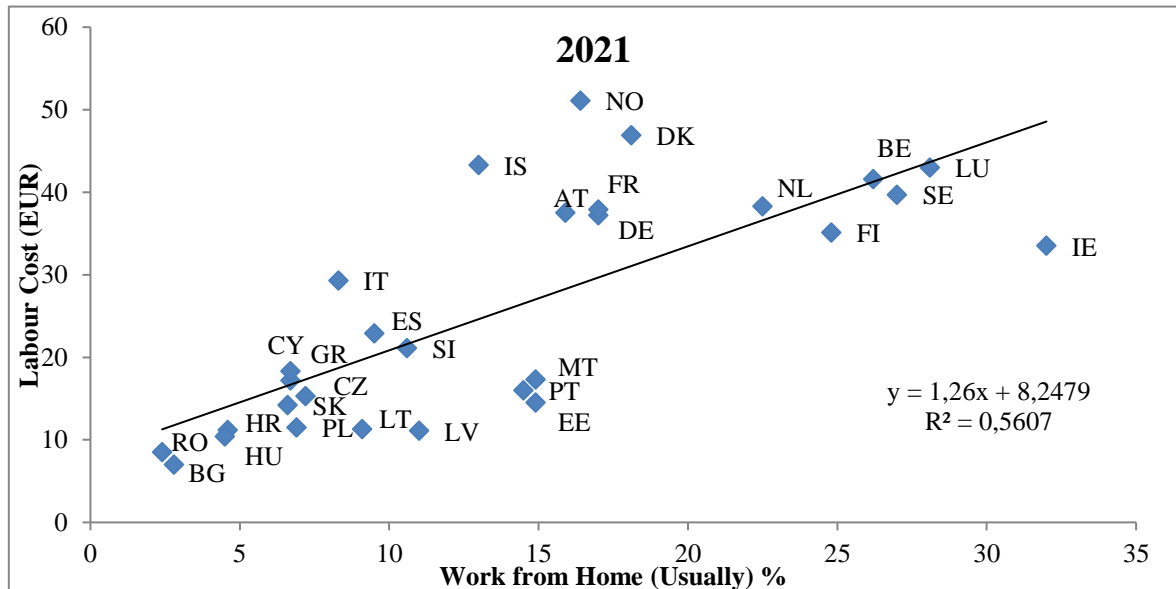


Figure 7 Linear Regression for 2021 - usually; source: own elaborations

In order to test the significance of the regression models (Appendix B) the analysis of variance (ANOVA) was used to generate F-value (significance F). In all six-regression models the significance F is less than the significance level .05. Therefore all generated regression models can be accepted.

### 3.3 Hypotheses

The findings provided all the required data to test the set hypotheses:

*H<sub>01</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2019.*

(F = 18.106, df = 27, r = 0.633, p < 0.001, t = 4.255)

*H<sub>02</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2020.*

(F = 22.646, df = 27, r = 0.675, p < 0.001, t = 4.759)

*H<sub>03</sub>: More frequent use of work from home practices did not have a significant relationship with the labour cost in 2021.*

(F = 34.465, df = 27, r = 0.749, p < 0.001, t = 5.871)

Based on the analysis it can be concluded that more frequent use of work from home practices and the level of labour cost were positively correlated in 2019, 2020 and 2021, and

the relationship was significant ( $p < 0.001$ ). As the use of work from home practices increased, the labour cost increased in all studied European countries. Hence, all three hypotheses  $H_{01}$ ,  $H_{02}$  and  $H_{03}$  can be rejected.

#### **4 Discussion and conclusion**

On the basis of the used scientific and statistical methods, we were able to answer the question: *Can work from home reduce labour cost and be a cost saving tool for more efficient business?* Yes, work from home can contribute to saving and streamlining processes, but it must be part of a larger package of measures that are related and complementary. The selected hypotheses were not confirmed, which is proof that there is a dependence between labor cost and the number of employees working from home. We can observe an increasing dependence of these two variables, which will be apparently reflected as a trend in the nearest future. Growing inputs in the form of an increase in the price of electricity and gas forces us to reconsider the strict functioning of the on site work.. Until now, we perceived working from home more as a benefit for employees, which was supposed to ensure a balance between work and private life, or give room for increased efficiency and performance outside the workplace. Benefits on the part of employers, which are supposed to save costs for operation or offices, come to the fore. In essence, the question will be how the increased household costs will be reimbursed by employers. Finding a balance in the hybrid work model will be a challenge for the near future. Likewise, the introduction of home office fees and their amount will be a question that will resonate in the near future. Some countries have strong labor laws, other European countries will have to respond flexibly to these changes, either at the level of national legislation or in the organizations themselves, so that individual processes are functioning and still effective for all parties.

As a result, it is true that working from home in various forms and volumes has already become a common part of our work setup. As a result of the pandemic and lockdowns, shift from infrequent to occasional work from home has become noticeable. The number of employees working from home sometimes is growing in countries where this type of work was not very popular and provided to employees. The second significant trend is that the number of employees working from home sometimes is decreasing in countries where work from home was commonly used. The shift in the trend from temporary to permanent work from home is obvious. With an increased cost and changing macroeconomic indicators the group that works purely from home will only grow.

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#### **References**

- Allen, T. D., Golden, T. D. and Shockley, K. M. (2015), "How effective is telecommuting? Assessing the status of our scientific findings." *Psychological science in the public interest*, Vol.16 No 2, pp.40-68. <https://doi.org/10.1177/1529100615593273>.

- Aloisi, A. and De Stefano, V. (2022), "Essential jobs, remote work and digital surveillance: Addressing the COVID-19 pandemic panopticon." *International Labour Review*, Vol. 161 No. 2, pp. 289-314. <https://doi.org/10.1111/ilr.12219>.
- Baráth, M. (2022), "Definition of Embedded Flexible Elements in Working Form and Working Contracts." In *Developments in Information & Knowledge Management for Business Applications*, Springer, Cham, pp. 123-137. [https://doi.org/10.1007/978-3-030-97008-6\\_6](https://doi.org/10.1007/978-3-030-97008-6_6).
- Bjursell, C., Bergmo-Prvulovic, I. and Hedegaard, J. (2021), "Telework and lifelong learning." *Frontiers in sociology*, 6, 642277. <https://doi.org/10.3389/fsoc.2021.642277>.
- El Hajal, G. (2022), "Teleworking and the jobs of tomorrow." *Research in Hospitality Management*, Vol. 12 No. 1, pp. 21-27. Doi: 10.1080/22243534.2022.2080953
- Eurostat, (2022), "Labour cost levels by NACE Rev. 2 activity", available at: [https://ec.europa.eu/eurostat/databrowser/view/LC\\_LCI\\_LEV\\_\\_custom\\_2477319/default/table](https://ec.europa.eu/eurostat/databrowser/view/LC_LCI_LEV__custom_2477319/default/table) (accessed 8 August 2022)
- Farinha, J. and Ascenso, L. R. (2022), "Telework as an Element That Leverages Professional Performance and Family Balance", in P. Figueiredo, E. Tomé, & J. Rouco (Ed.), *Handbook of Research on Challenges for Human Resource Management in the COVID-19 Era*, pp. 187-207. <https://doi.org/10.4018/978-1-7998-9840-5.ch010>.
- Felstead, A. and Henseke, G. (2017), "Assessing the growth of remote working and its consequences for effort, well-being and work-life balance." *New Technology, Work and Employment*, Vol 32 No 3, pp. 195-212. <https://doi.org/10.1111/ntwe.12097>
- Golden, T. D. and Eddleston, K. A. (2020), "Is there a price telecommuters pay? Examining the relationship between telecommuting and objective career success." *Journal of Vocational Behavior*, Vol 116. Doi: <https://doi.org/10.1016/j.jvb.2019.103348>.
- Howe, L. C. and Menges, J. I. (2021), "Remote work mindsets predict emotions and productivity in home office: A longitudinal study of knowledge workers during the Covid-19 pandemic." *Human-Computer Interaction*, pp. 1-27. <https://doi.org/10.1080/07370024.2021.1987238>.
- ILO, (2020a), "ILO Monitor: COVID-19 and the World of Work", 2nd ed., 7 April 2020. Geneva, available at: [https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms\\_740877.pdf](https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_740877.pdf) (accessed 6 August 2022)
- ILO, (2020b), "Teleworking during the COVID-19 Pandemic and Beyond: A Practical Guide", Geneva, available at: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---travail/documents/instructionalmaterial/wcms\\_751232.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/instructionalmaterial/wcms_751232.pdf) (accessed 6 August 2022)
- Ipsen, C., van Veldhoven, M., Kirchner, K. and Hansen, J.P. (2021), "Six Key Advantages and Disadvantages of Working from Home in Europe during COVID-19." *International Journal of Environmental Research and Public Health*, Vol 18 No 4: 1826. Doi: <https://doi.org/10.3390/ijerph18041826>.
- Kaufman, G. and Taniguchi, H. (2021), "Working from Home and Changes in Work Characteristics during COVID-19." *Socius*, 7:237802312110527. <https://doi.org/10.1177/23780231211052784>.
- Kelly, J. A., Kelleher, L., Guo, Y., Deegan, C., Larsen, B., Shukla, S. and Collins, A. (2022), "Assessing preference and potential for working from anywhere: A spatial index for Ireland." *Environmental and Sustainability Indicators*, Vol 15, 100190. Doi: <https://doi.org/10.1016/j.indic.2022.100190>.
- Loia, F. and Adinolfi, P. (2021), "Teleworking as an eco-innovation for sustainable development: Assessing collective perceptions during COVID-19." *Sustainability*, Vol 13 No 9. Doi: <https://doi.org/10.3390/su13094823>.
- Maier, C., Laumer, S. and Weitzel, T. (2022), "A Dark Side of Telework: A Social Comparison-Based Study from the Perspective of Office Workers." *Business & Information Systems Engineering*, pp. 1-19. <https://doi.org/10.1007/s12599-022-00758-8>.
- Nakrošienė, A., Bučiūnienė, I. and Goštautaitė, B. (2019), "Working from home: characteristics and outcomes of telework." *International Journal of Manpower*, Vol. 40 No. 1, pp. 87-101. <https://doi.org/10.1108/IJM-07-2017-0172>.

- Ngamkroeckjoti, C., Klongthong, W. and Thavorn, J. (2022), "Motivational factors influencing telework during the COVID-19 pandemic." *Emerging Science Journal*, Vol 6, pp. 229-246. Doi: 10.28991/esj-2022-SPER-016.
- O'Brien, W. and Aliabadi, F. Y. (2020), "Does telecommuting save energy? A critical review of quantitative studies and their research methods." *Energy and buildings*, Vol 225, 110298. Doi: <https://doi.org/10.1016/j.enbuild.2020.110298>.
- Taboroši, S., Maljugić, B. and Kovačević, A. (2021), "Ecological Impact of Telework", in *XI International Conference Industrial Engineering and Environmental Protection 2021*, Zrenjanin, Serbia, pp. 270-273.
- Wang, W., Albert, L. and Sun, Q. (2020), "Employee isolation and telecommuter organizational commitment." *Employee Relations*, Vol. 42 No. 3, pp. 609-625. Doi: <https://doi.org/10.1108/ER-06-2019-0246>
- WHO, (2020), "WHO Director-General's opening remarks at the media briefing on COVID19 - March 2020", available at: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> (accessed 6 August 2022)
- Wojčák, E. (2013), *Flexibilné formy organizácie práce*. Ofprint, Bratislava.
- Yu, R., Burke, M. and Raad, N. (2019), "Exploring impact of future flexible working model evolution on urban environment, economy and planning." *Journal of Urban Management*, Vol 8 No 3, pp. 447-457. <https://doi.org/10.1016/j.jum.2019.05.002>



## University-industry Collaboration in the Context of Industry 4.0 Challenges

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### Abstract

Building effective cooperation or partnership between two entities is beneficial for both sides. In the context of technology transfer, it is about carrying out research activities on the one hand and receiving this research with the purpose of using the research to one's own advantage on the other hand. In this study, we focused on cooperation and technology transfer between universities and industry. Universities have a suitable environment for research activities that can improve some product, process or service in industrial companies. The aim of the study was to analyze selected barriers to cooperation between companies and universities in the context of the introduction of individual Industry 4.0 technologies. We conducted research in Slovakia in 2021/2022. The results of the research showed that the biggest barrier to technology transfer in the Slovak Republic is "we feel discrepancy in this collaboration in our goals and expectations (ours and theirs)". The research also showed that regardless of the industry in which companies operate, they have interest in the introduction of new technologies brought about by Industry 4.0. Companies in Slovakia show the greatest readiness for automation and robotization and the least for using elements of VR. It is the universities that Slovak companies can turn to through cooperation in removing the barriers they face when adapting to the current environment.

Keywords: Industry 4.0, university-industry collaboration, technology transfer.

Article Classification: Research article

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## 1 Introduction

The topic of technology transfer began to be discussed in the 1970s due to the accelerating awareness of the important role of technology in economic development. The essence was the need to understand the process, the determinants, the effects on the transferor and the acquirer, and the factors influencing control. The technology transfer process is lengthy and complex and is influenced by interactions between different actors from different sources. The role of technology transfer should be to introduce new techniques into new facilities through innovation, improve existing techniques and stimulate new knowledge (Saad, 2000). This term is used for various activities that turn inventions into innovations. Technology transfer can take place between countries, from industry to society and also between industries. In industrial research, the term can mean transfer from the laboratory to the development and production of products within a company (Hilton & Inzelt, 1999). However, technology transfer is not a clear concept, as it refers to technology as a finished product that we can transfer and then use. When we move a device that has built-in technology, it leads to its use, but not the transfer of the technology that is embodied. In order to be able to use, preserve and repair the device, it is necessary to constantly educate in this direction (Hilton & Inzelt, 1999). In our article, we focused on technology transfer between a university and an industrial company. There are many ways in which industrial companies can work with universities. These may include joint research, academic consultancy, technology / intellectual property licensing, testing and analytical services, education / training of staff in new technology (U2B Staff, 2019).

### 1.1 Literature review

According to Hilton & Inzelt (1999), technology transfer between research institutions and industry is perceived as „an inventive concept being explored in research institutions and made available subsequently for transfer into industrial development, application and market introduction“ (Hilton & Inzelt, 1999). Kooli-Chaabane et al. (2014) present the idea of technology transfer as „an exchange of ideas, practices, objects, know how, technical knowledge, intellectual property, discovery or invention resulting from scientific research conducted at universities, or in industry“. The process is dynamic, time-limited and may involve other stakeholders, e.g. public institutions or other industrial structures (Kooli-Chaabane et al., 2014).

The university and the industrial company are two different institutions, each with its own goals, purpose and motives. When building cooperation between universities and industrial companies, it cannot happen that the university turns into industry and vice versa. Coordination between university and business must be managed in such a way that cooperation adds value and improves innovation processes (Horvat, 1995). It is in the interest of universities around the world to ensure that research results are as much as possible in the public interest. One option is to publish research results, which does not always work due to the commercialization of technology. Patenting research results is also an interesting option. Patenting is considered a useful mechanism to create the necessary impulse between researchers, universities and businesses. Patenting is appropriate because it can serve as a means of ensuring technology transfer and the willingness of organizations to invest in bringing technology to market. The relationship between universities and industry depends on the cultural aspect of the country. Universities are subject to different rules, practices and restrictions in each country

(WIPO, 2007). The result of technology transfer between the university and the organization is the transformation of the university's research results into new products and services that are important to society. The university licenses to use its research results for business. Organizations then invest in developing products and services that are better based on university research (Hockaday, 2020).

### ***Factors influencing successful technology transfer***

Technology transfer consists of the physical structure, knowledge, skills, organization, values and capital of the provider and the recipient. Hidden factors such as knowledge, skills and organization can be more critical to the transfer itself than physical factors. Technology is an aspect whose operation depends on people. Therefore, the effective transfer of technology must include the ability of staff to constantly learn about technology. Not only education is considered a critical factor for successful technology transfer. Another important factor is an effective plan, which must include ways of cooperation between the provider and the recipient. Unless there is interest in the transfer, it is not possible to adapt, adopt and create new technology (Choi, 2009).

Crisan & Chis (2020) define as critical success factors in technology transfer: technological factors related to the technology itself (these are factors related to the existence, availability and development of technology on the university side), organizational factors related to university technology (these are factors that may cultural and information barriers on the university side), contextual factors related to the environment in which the university operates (government support, environmental factors, politics and social factors), cooperation factors related to industry relations in the academic environment (openness to cooperation, support for technology transfer institutions, commercialization opportunities and interconnections between universities and industry) and factors related to the company's ability to acquire technological knowledge and absorption capacity (the company's ability to acquire new skills and apply them in practice) (Crisan & Chis, 2020).

Today's environment is affected by the arrival of Industry 4.0, and technology transfer should be the right way to become competitive in this environment. The leader of the Industry 4.0 context is Germany, which between 2009 and 2016 invested more than EUR 450 million in research and development of technologies and solutions related to the arrival of Industry 4.0. The results achieved by universities or research institutions do not have to lead to a specific product, service or business model, the basis is to transform investments into innovations. In this sense, technology transfer is understood as a critical success factor. Technology transfer can help companies operate successfully in the Industry 4.0 environment by participating in research and using this research economically through appropriate transfer mechanisms (Fechtelpeter et al., 2016).

### ***Benefits of technology transfer between universities and industry***

Technology transfer brings benefits not only to universities and industrial companies that cooperate together, but also to the public, region or country.

Table 1 Benefits of technology transfer

Benefits for university	Benefits for industry	Benefits for the public
<p><b>Revenue generation</b> - the revenue generated from the license will provide the university with relatively unlimited funding, which can help institutions with limited funding. In most cases, the inventors and authors themselves will also receive some funding from the university.</p> <p><b>Increased prestige</b> - another advantage is gaining recognition from the university where the research took place. Successful technology transfer can positively affect the name of the university.</p> <p><b>Student success</b> - involving students in a technology transfer program gives them the opportunity to participate in research, gain experience, use the acquired knowledge to work with an industrial company, which will give them a good prospect of finding a job in the future</p>	<p><b>Increasing competitiveness</b> - working with the university will ensure that the company gets lower R&amp;D costs and also by not having to do the R&amp;D itself, it only buys a license and can gain more speed in bringing new innovation to market, making it more competitive.</p> <p><b>Long-term and valuable partnership with the university</b> - using the partnership for future opportunities, in the field of technology transfer or another area.</p>	<p><b>Public benefit</b> - thanks to this type of research, universities have the ability to solve social, medical, environmental and technical problems. Such innovations can improve the quality of life of the public.</p> <p><b>Economic development</b> - the development of new technology also helps to create jobs and brings advances affecting sustainability (environmental innovation).</p>

Source: McDevitt, et al., 2014; U2B Staff, 2019.

### **Barriers of technology transfer between universities and industry**

For both side, a university or an industrial organization, technology transfer brings certain barriers that may prevent effective cooperation. Mazurkiewicz & Poteralska (2017) identify barriers at three levels: organizational and economic barriers, system barriers and technical barriers.

Table 2 Barriers on the side of the industry (receiver)

Organizational and economic barriers	System barriers	Technical barriers
<ul style="list-style-type: none"> <li>• Different perceptions of time, goal and expected risk between the university and the company</li> <li>• Mismatch in skills, price, equipment, internal structure, size and experience between university and business</li> <li>• Different opinion on the desired results</li> <li>• Incomplete technology transfer and insufficient cooperation between the university and the company</li> <li>• Insufficient business management and negotiation skills</li> <li>• Lack of plan for implementation of research results and analysis of implementation results</li> <li>• Insufficient knowledge of potential markets and consumers</li> <li>• Lack of time to test new technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of developed infrastructures, market and public incentives</li> <li>• Absence of a technological development plan - insufficient promotion and support at national level</li> <li>• Lobbying, deliberate obstruction of change and innovation, impossibility of transfer by interest groups</li> </ul>	<ul style="list-style-type: none"> <li>• The requirement for a high level of tacit knowledge in new technologies may be difficult for the technology transfer itself</li> <li>• Requirement of thorough testing before placing on the market and acceptance by public authorities</li> <li>• Too sophisticated technology - inability to customize for the desired product / market</li> <li>• The technology recipient does not know the level and characteristics of the technology</li> </ul>

Source: Mazurkiewicz & Poteralska, 2017

Table 3 Barriers on the side of the university (provider)

Organizational and economic barriers	System barriers	Technical barriers
<ul style="list-style-type: none"> <li>• Intellectual property rights issues</li> <li>• Theft of the idea by the company in the initial phase of cooperation - before signing the contract</li> <li>• Triad of cooperation beneficial only for industry: lowest possible price (excluding research and development costs), full takeover of ownership by the company, responsibility for possible losses during the use of technology</li> <li>• Organizational changes in the company</li> <li>• Different organization of work in science and business</li> <li>• Industry is interested in funding only the end result, not the research process</li> <li>• Insufficient technology transfer skills, which can lead to low efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• Insufficient skills needed to effectively commercialize research results</li> <li>• Research and development focused on research results, not implementation</li> <li>• Lack of funding from the government budget for a very costly phase of implementation</li> <li>• Lack of effective organizational structures supporting the implementation of technologies on the market</li> </ul>	<ul style="list-style-type: none"> <li>• Impossibility of several solutions - capacity limitation to only one solution in research &amp;&amp; due to technical and personnel demands</li> <li>• Slow development of technology over time, which may discourage potential applicants</li> <li>• Change in the technological concept during research or during the implementation of the contract</li> <li>• The prototype version of the technology is not compatible with the requirements of series production - unsatisfactory technical and economic parameters</li> <li>• New technology can cause high costs in short series production</li> </ul>

Source: Mazurkiewicz & Poteralska, 2017

Innovation in a company cannot be started only by information about new technology, but it is important to identify needs. A change in organizational structures is often required to prepare an organization to adapt and implement new technology. There is also a requirement to involve employees in the change process, as they must be qualified to use the new technology. Technology transfer must therefore take place in a comprehensive manner with regard to knowledge, using managerial approaches, values and interests (Horvat, 1995).

The study of Kusmin et al. (2018) mapped the obstacles between universities and industry in the Industry 4.0 environment, which are: different expectations of the workforce in industry and at the university, incompatibility between university study results and expected skills in industry, low level of cooperation between university staff and industry representatives, and insufficient organization student internships (Kusmin et al., 2018).

## 2 Material and methods

The aim of this study is to analyze selected barriers to cooperation between companies and universities in Slovakia in the context of the introduction of individual Industry 4.0 technologies. The research was carried out on 82 Slovak companies in 2021/2022, while the perceived barriers to cooperation were subsequently examined in a deeper context from the point of view of the industry and service sectors, from the point of view of the operation of the company as a domestic and subsidiary company or the stage of maturity. Also, the areas of Industry 4.0 were incorporated into the research from the point of view of how the company is prepared for the arrival of the fourth industrial

revolution in the following areas: Implementation of IoT; Automation of processes/robotization; Use of artificial intelligence; Using elements of virtual reality. The distribution of answers is shown on a scale from 1 to 5, where 1 is absolutely ready, 5 is not ready at all. Descriptive statistics and correlation analysis were used in the research, based on Person's correlation coefficient suitable for qualitative data analysis. The research results point to the current perception of barriers to cooperation with universities from the perspective of companies, as well as the current state and key challenges associated with Industry 4.0, which point to new possibilities for building and developing cooperation. Original and up-to-date research thus enriches the theory of cooperation between universities and companies with an aspect focused on the current challenges of Industry 4.0 and the new economic environment, as well as the results themselves clearly specify the potential that results from cooperation. The researched topics are not specific locally, and therefore the results can be used for other countries and can support the improvement of the level and focus of cooperation between companies and universities.

### 3 Results

Selected barriers to cooperation between companies and universities point to what prevents companies from achieving greater cooperation. In the examined period, "we feel discrepancy in this collaboration in our goals and expectations (ours and theirs)", perceived by 26% of companies from the total sample, was considered the biggest barrier. This barrier was followed by „We do not know what universities can offer us“ with 22% of companies perceiving this barrier. On the other hand 7% of companies feel like they speak another language and 11% feel like collaboration is time and cost intensive – inefficient.

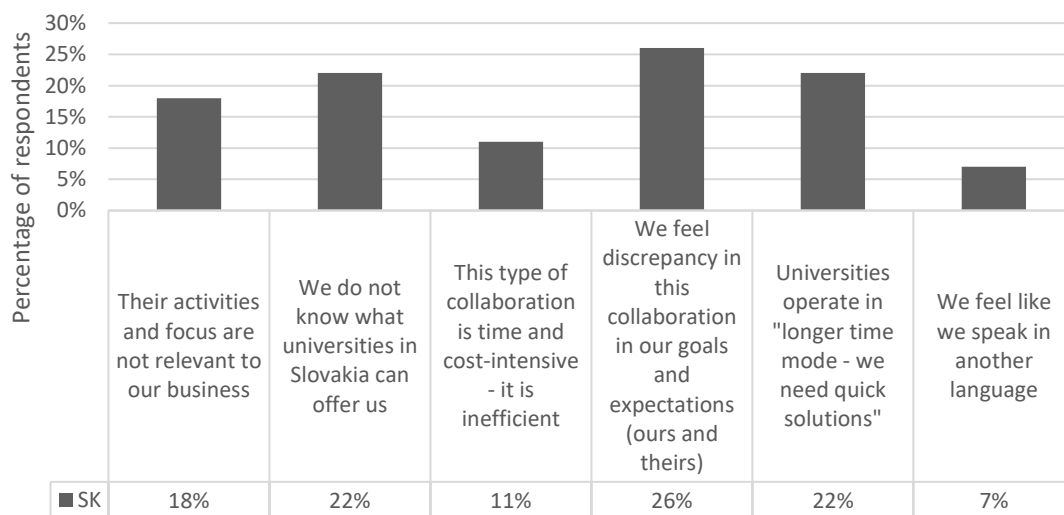


Figure 1 Barriers to university industry collaboration among SK companies

In the context of current challenges caused by Industry 4.0, the corona crisis and following economic problems, it is important to include new challenges associated with the introduction of technologies such as digitization, IoT, automation, artificial intelligence or robotization in the context of cooperation between universities and businesses. These technologies do not only affect manufacturing companies, but affect all types of companies. In the examined sample, we analyzed how the company is

prepared for the arrival of the fourth industrial revolution in the following areas: Implementation of IoT; Automation of processes/robotization; Use of artificial intelligence; Using elements of virtual reality. The distribution of answers is shown on a scale from 1 to 5, where 1 is absolutely ready, 5 is not ready at all. In the examined sample of 82 Slovak companies, 28% are assessed as absolutely ready in the field of automation and robotization, similarly 26% in the field of introducing IoT. A significantly lower level of readiness was observed in using AI and using elements of VR among companies.

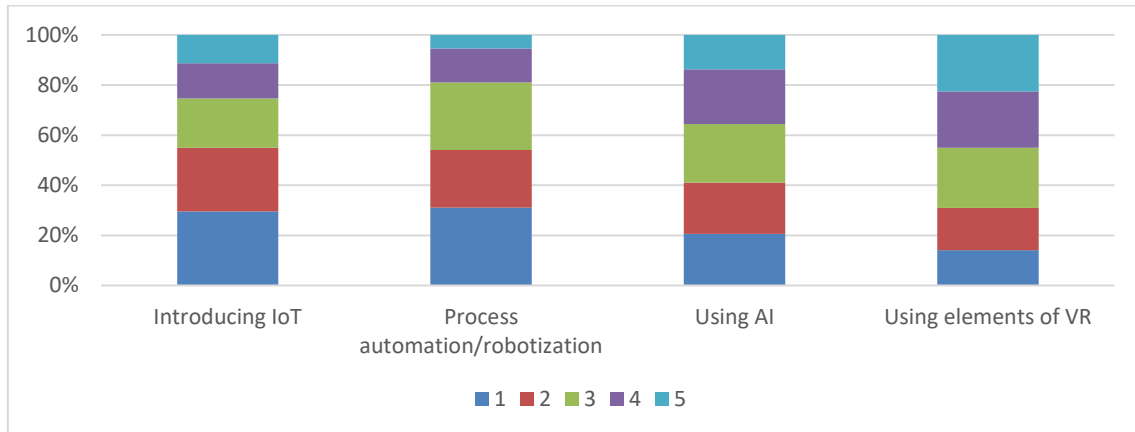


Figure 2 Level of readiness for Industry 4.0 technologies (SK)

Within the industrial sector, businesses were evaluated in a similar direction, while they felt best prepared for automation and robotization (30% were evaluated as fully prepared), at least when using elements of VR. When comparing the industrial sector with the overall examined sample, it can be seen that the identified level of preparedness is covered not only by industrial enterprises, but also by enterprises operating in services, trade, business shared services, the IT sector, etc. The fact that the readiness of Slovak companies in the area of automation and robotization is the best among the mentioned areas is also confirmed by the ranking Robot density (number of robots installed per 10,000 employees) in the manufacturing industry increased for Slovakia from 135 in 2016 (ranking 16th in the world) to 175 in 2020 (ranking 20th in the world) (IFR, robot density index).

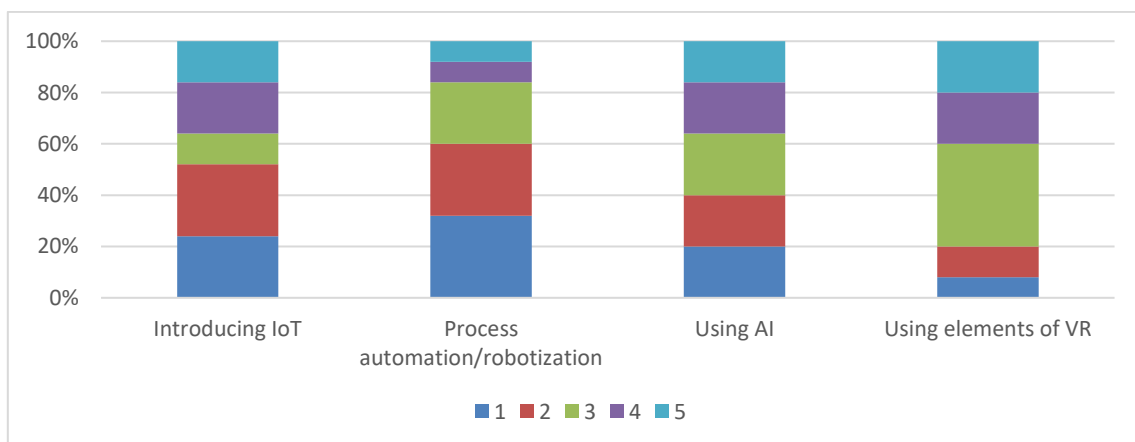


Figure 3 Level of readiness for Industry 4.0 technologies (SK industrial sector)

Pitfalls in the readiness of Slovak companies for the introduction of new technologies represent an opportunity precisely in the use of the potential of cooperation

with other partners in the framework of the introduction of innovations, such as universities. Precisely through the identification of perceived barriers in the context of various areas of preparation for Industry 4.0, it will be possible to better set the processes of cooperation and the focus of joint projects, so that the cooperation is mutually beneficial and effective. In companies that are at a low level in introducing IoT, the strongest correlation is with "we feel like we speak a different language". At a low level of preparation for process automation/robotization, only a low correlation with cooperation barriers was found. When using AI, a negative correlation of -0.16 was found with „we do not know what universities can offer“, which means that companies that are ready for using AI are those that perceive this barrier more significantly, and therefore it is likely that they implemented the introduction of AI elements with a lower level of cooperation with universities. When using elements of VR, companies that are poorly prepared for this area often encountered the collaboration barrier - time and cost intensive, inefficient.

Table 4 Barriers on the side of the university (provider)

	Introducing IoT	Process automation/r obotization	Using AI	Using elements of VR
Their activities and focus are not relevant to our business	0.07	0.02	-0.04	-0.04
We do not know what universities in Slovakia can offer us	0.10	0.05	-0.16	-0.10
This type of collaboration is time and cost-intensive – it is inefficient	-0.02	0.10	0.09	0.20
We feel discrepancy in this collaboration in our goals and expectations (ours and theirs)	0.11	0.03	0.07	0.09
Universities operate in „longer time mode - we need quick solutions“	0.10	-0.02	-0.04	0.00
We feel like we speak in another language	0.19	0.10	-0.01	-0.02

There is room for cooperation between companies and universities in many areas of technology transfer, but also joint innovations in the field of AI or VR, mainly due to building the competitiveness of Slovak companies and the importance of development in the field of research and development. However, the space for cooperation arises mainly with regard to Slovak companies, which, according to our research, lag significantly behind companies that operate in Slovakia as foreign subsidiaries in terms of readiness for Industry 4.0 in the examined technologies. The following graph shows the assessment of readiness in the four investigated technological areas. Even in the field of process automation/robotization, 41% of foreign subsidiaries felt the most prepared compared to 5% of Slovak companies. When using AI, 10% of Slovak companies and 29% of foreign subsidiaries felt absolutely prepared. When using elements of VR, 5% of Slovak enterprises and 19% of foreign subsidiaries. It is therefore obvious that the preparation of companies for Industry 4.0 is stronger in the case of foreign companies with Slovak subsidiaries. Foreign companies from neighboring countries such as the Czech Republic, Austria, Hungary or Germany are strongly represented in Slovakia. And it is often the parent companies that bring innovations to their foreign branches. Also, within the framework of the intensity of cooperation between companies and universities, they show better results than Slovakia. According to the ranking of cooperation between universities and companies in the field of research and development (Global Competitiveness Report 2017-2018, World Economic Forum), Slovakia was in 77th place. For comparison, the Czech Republic was in 41st place, Austria in 19th place, Germany in 7th place. Within



Europe, university-business R&D collaboration is highest in Switzerland (1st place), Finland (4th place), the Netherlands (5th place) and Great Britain (6th place).

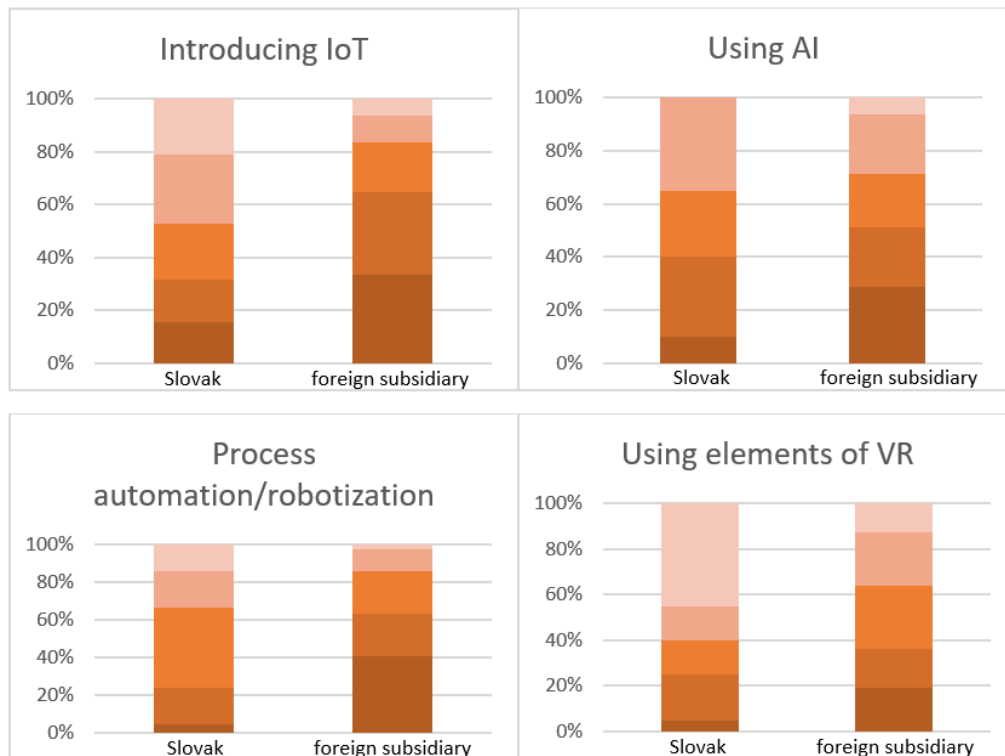


Figure 4 Level of readiness for Industry 4.0 technologies (slovak companies and subsidiaries)

#### 4 Discussion and conclusion

Cooperation between universities and companies is increasingly considered a driving force of innovation, precisely through the mutual exchange of knowledge and technology. Universities are a source of industrially valuable technical skills, innovation and entrepreneurship (Yusuf, Nabeshima 2007). Such exchange can take place through various formal and informal channels, such as university spin-offs, joint research between universities and enterprises, patents and licenses, consultations, or various forms creating knowledge networks. Different forms of cooperation naturally vary between industries (Schartinger et al. 2002). While patents and licenses are part of collaboration in the material and chemical sciences, in the humanities labor transfer and training and courses for companies are more significant. Cooperation of universities with the environment generally has a significant impact on the development of regions, competitiveness and economic growth (Gunasekara 2006). Since universities are part of, if not the main source of, R&D processes in a country, it is interesting to point out Zimmermann's (2015) finding that a one percentage point increase in the growth rate of R&D leads to an increase in GDP growth in the following year by about 0.05 to 0.15 percentage points (Zimmermann 2015). Our research pointed out that, despite the differences in the focus of various industries, there is a noticeable common interest in preparing for Industry 4.0 in the context of introducing new technologies such as IoT, process automation/robotization and, to a lesser extent, using AI or using elements of VR. These technologies are introduced to a higher extent in subsidiaries, which means that in order to maintain and support the competitiveness of domestic companies, it is necessary to include these topics in the innovation strategies of companies. However, at the same time, an important

element of preparation for Industry 4.0 is the building of partnerships, where partners can be valuable resources in joint research, development and commercialization of innovations or introduction of technology. Our own original research compared the barriers to higher cooperation with universities perceived from the point of view of companies between the periods 2015/2016 and 2021/2022 and pointed to a positive shift in the context of companies' knowledge of what universities can offer. On the other hand, the feeling of discrepancy in goals and expectations of collaboration is still strongly prevalent among companies (26% in whole sample, 33% in industrial sector). Already in 2015/2016, only 10% of AT, DE, CH companies, which are one of the innovation leaders in Europe, perceived this barrier and their cooperation with universities is significantly more intensive than in Slovakia. Even in view of the slower onset of domestic enterprises to the challenges associated with Industry 4.0, it is necessary to create mechanisms that make it easier for enterprises and universities to find common challenges and their solutions, for example through research projects. The lagging behind of Slovak companies in this area is also confirmed by the result of the University – Industry R&D collaboration (2021) – Global innovation index ranking, where Slovakia is in 90th place with a score of 37.7, compared to the Czech Republic in 32nd place with a score of 53.7 and Germany in ninth place with a score of 68.5. Similarly, as another statistical indicator of the intensity of research and development, the Number of resident patent applications filed at a given national or regional patent office per billion PPP\$ GDP can be mentioned with Slovakia – (ranking 55th) - score 10, Czech Republic – (ranking 34th) – score 15.9 and Germany (ranking 1.) – score 100.

Universities are an important part of the innovation ecosystem and are considered part of the so-called Triple Helix model (Etzkowitz, Leydesdorff 2000), which points to the importance and importance of cooperation between universities, businesses and the government. Likewise, this model can be extended to include other subjects such as the media and the public (Carayannis, Campbell 2011). Therefore, even in the context of knowledge and technology transfer, it is about building partnerships that are part of a wider innovation ecosystem (Kohnová, 2021) and also work with the support of national support schemes, for example in the form of identification and support of key areas of technological development and innovation, which will, on the one hand, receive support on the part of universities from the state, on the other hand, businesses will be motivated to create partnerships and intensify research and development. Our research showed that in using elements of VR the intensively perceived barrier is that cooperation is time and cost intensive, ineffective. This can be used to improve existing mechanisms in the area of this particular cooperation, or for the improvement of the research and development environment of VR at universities, which will enable a better transfer of knowledge and technology to companies.

Within the framework of creating partnerships, it is also important to discuss the impact of digital technologies, which make it possible to break down the barriers of geographical distance, or to support and simplify cooperation. So far, however, research indicates that companies prefer to cooperate with local universities rather than distant ones, even if it could be of better quality (Fitjar, Gjelsvik 2018). Similarly, according to the OECD (2019), an extensive database of patent applications from 35 OECD countries and China from 1992 - 2014 shows that 50% of all industrial inventive activity occurred within 30 kilometers of a university (OECD 2019).

The discussed research on a sample of Slovak companies points to the problems of other countries as well, namely those can similarly lag behind in the world rankings in the area of innovativeness and research and development, and inevitably need to develop the competitiveness of domestic companies in a dynamic environment affected by the fourth

industrial revolution, the pandemic and the economic fluctuations of the current era. This can be improved by analysing and improving mechanisms for academy-industry collaboration, with the respect to the current economic development and technological innovations which need to be implemented to survive on the markets.

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### **References**

- Carayannis, E. G., Cambell, D. F. (2011). Open innovation diplomacy and a 21st century fractal research, education and innovation (FREIE) ecosystem: building on the quadruple and quintuple helix innovation concepts and the “mode 3” knowledge production system. *Journal of the Knowledge Economy*, 2(3), pp. 327-372.
- Choi, H. J. (2009). Technology Transfer Issues and a New Technology Transfer Model. *The Journal of Technology Studies*, Vol. 35, No. 1, pp.49-57.
- Crisan, E. & Chis, D. M. (2020). A framework for technology transfer success factors: validation for the Graphene4Life project. *Journal of Science and Technology Policy Management*, Vol. 11, No. 2, pp. 227-255.
- Etzkowitz, H. and Leydesdorff, L. (2000). The dynamics of innovation: from national systems and “mode 2” to a triple helix of university–industry– government relations. *Research policy*, 29(2), pp. 109-123.
- Fechtelpeter, Ch. et al. (2016). On the road to Industry 4.0: Technology transfer in the SME Sector. OWL Clustermanagement GmbH, Germany.
- Fitjar, R. D., and GJELSVIK, M. (2018). Why do firms collaborate with local universities? *Regional Studies*, 52(1), pp. 1525-1536.
- Gunasekaran, A., Patel, C. and Mcgaughey, R.E. (2004). “A framework for supply chain performance measurement”. *International Journal of Production Economics*, 87(3), pp. 333-347.
- Hockaday, T. (2020). *University, Technology, Transfer – What It Is and How to Do It*. Johns Hopkins University Press, Baltimore. ISBN 978-1421437064.
- Horvat, M. (1995). *Technology Transfer A Nd University-Industry Relations. Institutional, National And European Policies And Strategies*. Cuadernos de Sección Ciencias Sociales y Económicas 2, p. 265-294.
- Inzelt, A. & Hilton, J. (1999). *Technology Transfer: From Invention to Innovation*. Kluwer Academic Publishers, Netherlands. ISBN 0-7923-5622-5.
- Kohnová, L. (2021) *Dynamické prostredie a inovačný manažment. Východiská a výzvy štvrtej priemyselnej revolúcie*. In: *Fakulta verejnosprávnych a ekonomických štúdií v Uherském Hradišti, Vysoká škola Jagielloňská v Toruni*. ISBN 978-80-88328-14-8
- Kooli-Chaabane, H., Boly, V., Yannou, B. (2014). Monitoring Of Technology Transfer Projects In Industrial Clusters. *Journal of Innovation Economics & Management*, Vol 1, No 13, pp. 73-91.
- Kusmin, K-L., Tammets, K. & Ley, T. (2018). University-industry Interoperability Framework for Developing the Future Competences of Industry 4.0. *Interaction Design and Architecture(s) Journal - IxD&A*, No.38, pp. 28 – 45.
- Mazurkiewicz, A. & Poteralska, B. (2017). Technology Transfer Barriers and Challenges Faced by R&D Organisations. *Procedia Engineering*, Vol 182, pp.457-465.

- McDevitt, V.L., Mendez-Hinds, J., Winwood, D., Nijhawan, V., Sherer, T., Ritter, J.F., Sanberg, P.R. (2014). More Than Money: The Exponential Impact Of Academic Technology Transfer. *Technology and Innovation*, Vol 16, Iss 1, pp. 75-84.
- Saad, M. (2000). *Development through technology Transfer*. Intellect Book, USA. ISBN 1-84150-820-9.
- Schartinger, D. a kol. (2002). Knowledge interactions between universities and industry in Austria: Sectoral patterns and determinants. *Research Policy*, 31, pp. 303-328.
- U2B Staff. (2019). What are the business benefits of university technology transfer? [Online]. Available from: <https://u2b.com/2019/05/27/what-are-the-business-benefits-of-university-technology-transfer/>
- WIPO. (2007). *Technology Transfer, Intellectual Property and Effective University-Industry Partnerships*. [Online]. Available from: [https://www.wipo.int/edocs/pubdocs/en/intproperty/928/wipo\\_pub\\_928.pdf](https://www.wipo.int/edocs/pubdocs/en/intproperty/928/wipo_pub_928.pdf)
- Yusuf, S. and Nabeshima, K. (2007). *How Universities Promote Economic Growth. Directions in Development: Human Development* [online]. Washington, DC: World Bank. Dostupné na: <https://openknowledge.worldbank.org/handle/10986/6631> License: CC BY 3.0 IGO.
- Zimmermann, V. (2015). *An international comparison of R&D: Germany benefits from industrial research strength*. KFW Research.

# **E-Leader-Ethics – a New Approach for Forming E-Trust Based on Information Symmetry**

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## **Abstract**

In digital environments, building trust in virtual collaboration is a major challenge for everyone involved. The lack of physical presence leads to difficulties in perceiving gestures and facial expressions, which, among other things, contribute to building trust. The creation of so-called e-trust is therefore dependent on further criteria. This article explores the question of the extent to which information symmetries can contribute to trust building and the conditions under which a future e-trust in the digital leader-follower relationship is subject. To this end, information asymmetries are identified as a threat to trust formation on the basis of an extensive literature review and further theoretical considerations.

**Keywords:** E-Leadership, E-Trust, virtual collaboration, E-Ethics, information(a) symmetries

**Article Classification:** Conceptual / Theoretical paper

## **1 Introduction**

Based on the increasing virtual collaboration, and mainly influenced by the Corona Pandemic, the interest concerning the establishment of trust in virtual environments is big. Already existing approaches mainly focus change processes either to a more open and permeable corporate culture which is based on trust, exchange and cooperation (Schmiech 2018, p. 22) or focuses on specific aspects of employee management and the behaviour of managers by propagating suitable principles for building trust (Werther et al. 2018, p. 54). However, trust is a phenomenon that is ubiquitously relevant and at the same time exclusive. Therefore, in practice and in science, it is often wrongly used synonymously for terms such as familiarity, confidence, predictability or trustworthiness (Mayer et al. 1995). Due to the broad field of trust-research, the concept of trust has obviously attained many-faceted meanings. However, the common aspect in many definitions is trust as a trustor's psychological state, such as

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expectation or confidence (Mayer et al. 1995). Definitions usually contain two parties (trustor and trustee) and emphasize that trust is only necessary in a situation containing risk. However it is still unclear which aspects and key indicators digital trust include and therefore on which key indicators a new understanding of a so-called E-Trust is based on.

This problem results on the one hand from the fact that trust in the digital context often has a very technical component. The literature on information technology, for example, refers a so-called E-Trust primarily to data integrity or trust in technical processes. On the other hand, research in the social sciences, business administration, psychology and communication studies is interested in a different kind of E-Trust (without the terminology having been explicitly mentioned in this context so far) by emphasizing interpersonal and thus mutual trust in digital collaboration and work environments.

Digitization is now contributing to the fact that both components must be brought together so that both trust in technical processes and collaboration as well as communication tools and mutual human trust can develop despite remote work and be maintained and fostered over the period of collaboration. Managing this balancing act is the task of E-Leadership and requires a new type of leadership ethic that is significantly shaped by the digital component.

The question arises as to which criteria favor a so-called E-Trust and, above all, which aspects and conditions hinder the formation of digital trust or threaten its maintaining in the long term. This question will be answered in the following.

## 2 Material and methods

The study focusses a comprehensive literature review concerning the already existing models and concepts of E-Trust. Therefore, all related items were identified in academic databases, categorised and the content of equal values were summarised and compared.

In the first step, a search string was created by focusing the term ‚E-Trust‘. This search string was set up in different manners of writing (E-Trust, E-trust, e-trust, digital trust, Digital Trust) by focusing only literature which explicitly mentions the terms. The search string was not limited concerning years or periods and carried out in SCOPOS, Springer Link, Google Scholar, BusinessSource Complete, Web of Science and conference or academic papers. In the second step, all of these findings were exported via CSV and saved in a file. In the third step, research gaps concerning E-Trust were identified (chapter 2.1). In the fourth step, conditions for a trustworthy leader-follower constellation were extracted (chapter 2.2).

Although the terminology 'E-Trust' is not that new, the scientific literature doesn't offer an equal understanding of its content. As already mentioned, the literature normally uses the term in the context of computer science. Digital Trust or E-Trust as a concrete, human phenomenon in the digital working collaboration hasn't reached a place as an own terminology yet. Therefore the extracted results showed, that E-Trust as a name or concrete meaning concerning human interaction need a new perspective. However, the extracted results underlined, that trust in the virtual environment is determined by the trustworthiness itself and the trustworthiness of the interaction partner. Whether a good leader-follower relationship exists is determined, on the one hand, by the manager's potential to put trust in their own employees and, on the other hand, by creating trust-building behaviors. So, *the ability to trust* and *to be worthy of trust* are two different aspects which influence the understanding of digital trust in a special way (Sommerlatte/Keuper 2016, p. 13; Würzburger 2019, p. 119).

Consequently, the last mentioned aspects highlight the need for a new model of trust in the virtual context as part of a new E-Leadership-Ethic. In a global and networked world, a higher part of people are working together on a purely digital basis. Job interviews or onboarding procedures are more and more in a digital environment, project teams are distributed all over the world or freelancers work temporarily from outside. The daily meeting in the office on site is becoming increasingly obsolete, so that the formation of an interpersonal relationship must now also take place digitally. This places new demands on the establishment of trust, as the appearance and behaviour of a person can only be perceived online. From a purely objective point of view, this means that "half the person" is no longer present, as for example, neither the entire body size, nor the entire style of dress, physical movements such as gait or facial expressions, nor even the live voice intonation are distorted by digital media (e.g. in an online meeting, only the upper bodies of the participants are usually visible, the exchange usually takes place in a seated position and the voice could also be distorted due to poor sound quality as well as the camera might be switched off). Digital collaboration is subject to enforced trust-giving limitations that would be quite significant in a normal face-to-face exchange. For this reason, a new framework for the formation of E-Trust is needed, on which E-Leadership and the activity of the E-Leader can build. This framework should be based on previous research findings on trust-building in the digital context (such as VOPA+ or the research of Jäckel 2018 and Petry 2018) but expand it with a special view on the work of leaders and concretise it using an empirical data basis. Of particular interest are the conditions under which trust arises in the digital context and, above all, how it can be proactively built, promoted and maintained by leaders. The perspective of the followers is decisive for this. Initial results from team research show that the reduction of personal contact impairs affective processes and that digital trust in general is more difficult to develop than in face-to-face collaboration but also that the relationship between trust and performance is obviously stronger due to increasing digitalisation (Breuer et al. 2016). The research gaps resulting from the literature review are therefore presented in the following.

### ***2.1 Trust building in digital environments – research gaps***

Numerous studies and meta-analyses (Avolio et al. 2001) have been able to prove that the above-mentioned points significantly promote trust-building. However, it is still questionable whether transformational leadership in a virtual work context has the same validity for building trust. This has only been researched for a few years (Avolio et al. 2001, pp. 105-106). So far, it has been assumed that managers can use modern communication technologies to vividly present their values and visions and reach many employees at the same time (Antoni/Syrek 2017, p. 253), as well as simultaneously increase the pace of social interactions by, for example, responding more quickly to requests, streamlining work processes through various apps and tools, and redistributing information more quickly (Antoni/Syrek 2017, p. 253). However, the topic of trust-building has not yet been conclusively clarified in the context of the present research. So, Antoni/Syrek (2017, p. 250) recommend looking for the moderating variables. With regard to trust-building per se, Joshi et al. (2009, pp. 248-250) were able to demonstrate that the inspirational leadership component does promote the development of trust and that this is even enhanced by increasing spatial distance (Joshi et al. 2009, pp. 242-243). However it remains unclear through which competencies the leader can maintain the resulting trust over a longer period of time. Even though many questions regarding virtual teamwork are already considered empirically validated and managers can successfully

shape digital collaboration through personal interaction, rich media use, participation opportunities and feedback loops (Antoni/Syrek 2017; Breuer et al. 2016), the actual research is based only on evidence of the general factors mentioned and also does not differentiate between purely virtual teams (have never worked together in presence) and partly virtual teams (team members know each other personally and virtual collaboration is an add-on that occurs occasionally). Finally, it remains questionable how trust can be established in digital teams that are completely unknown to each other personally and how the trustworthiness and ability of all team members can be ensured from the beginning as well as the necessary conditions for a corresponding basis of trust can be created.

## 2.2 Conditions for a trustworthy virtual leader-follower-constellation

The conditions for trust are determined by the personality and therefore by the characters of the interaction partners. Furthermore, in the context of leaders and followers, trust is also influenced by the realized competencies the trust subjects (followers) serve to the trust objects (leaders). The same procedure can be seen other way round. If the leader is able and willing to trust the employees, he offers a ‚leap of faith‘ which can be confirmed or disappointed by the follower. The following figure shows a cycle of trust between the follower and the manager who have already proven themselves to be trustworthy. Both are ready to trust and each see a need to trust.

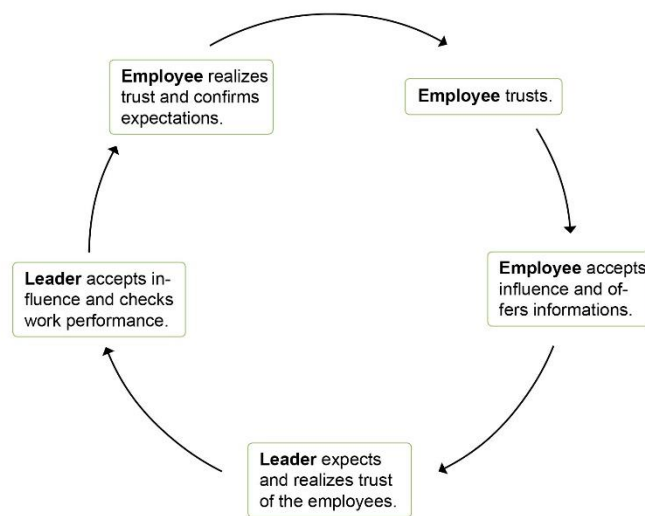


Figure 1 The circle of trust between leader and follower (Zand 1997, Graeff 1997, p. 42)

Zand (1997) draws the conclusion that expectations regarding trust or mistrust do not change as long as hypothesis-compliant behavior is perceived. *The intention to trust is a social reality that significantly influences the collective solution of problems* (Graeff 1997, p. 44). Based on different research works Hurley (2006) developed ten facts for trust in leader-follower constellations. Thereby, *three factors concern the person who is supposed to trust. The remaining seven factors reflect the situation in which the trust-giver [here: trust-subject] and the trust-recipient [here: trust-object] are* (Hurley 2006, pp. 65-66). The personal conditions refer to how willing the trustworthy subject is to take risks, how well it is adapted to the environment and how great its relative power is. The situational conditions are characterized by how safe the trustworthy subject and trustworthy object feel, how many similarities exist between them, how well their



interests are coordinated, whether the trusting object has shown a benevolent interest, whether the trusting object is competent, whether the actions of the trust object are of integrity and predictable and ultimately whether both sides communicate well with each other (Hurley 2006, p. 66). However, in the context of virtual work environments, these ten components get another perspective. Obviously the situation of work has a high influence in the trust building process. Companies are able to design conditions and cultures but they are limited in the context of virtual cooperation. This is mainly due to the fact that the manner of collaboration in virtual environments is mainly influenced by the individual characters of those involved and their way to communicate with each other (Werther et al. 2018). Increasing complexity, changes in structures and processes, spatial and temporal independence as well as flat hierarchies and higher autonomous working conditions in a more and more agile environment require a new way of networking.

In this context, the use of digital media contributes to the emergence of new forms of communication between team members as well as with their managers and to the faster and more effective sharing of information between the participants, e.g. by means of apps, project software, Workflow-applications and newer interaction media such as 'Teams'. The greater the physical distance between the participants, the greater the need for communication and the associated exchange of information. Various studies on the effectiveness of virtual teams have already shown that communication in virtual teams is not only a decisive factor for team performance, but that interpersonal relationships and mutual trust can also be significantly strengthened. Especially when team members primarily work together virtually, the electronic exchange of information replaces direct face-to-face communication. As a result, socio-emotional messages are often lost that would be evident in physical contact, e.g. through gestures, facial expressions and voice intonation. Previous studies also show that physical distance creates communication barriers and is associated with less efficient and less frequent communication between members which in turn leads to more difficult trust building within virtual teams. E-Leaders are therefore particularly responsible for establishing transparent communication channels and promoting the exchange of information – also on an interpersonal level – as a new “e-ethic” in their virtual teams. So, the exchange of information in the virtual context takes on a special significance, because if the flow of information is symmetrical and not obviously disturbed trust building processes will have a higher and longer stability, so that the resulting E-Trust supports digital leaders in their work within virtual teams (Zand 1997). Consequently, a successful leader-follower-constellation depends on and is significantly influenced by a transparent and symmetrical flow of information. However, there has been relatively little research on this topic within this new digital circumstances. So far, information as the mainstay of two interaction partners has been examined primarily from an economic perspective. Theories like the principal agency theory, transaction cost economics or institutional theories deal with the challenges and opportunities based on so called information asymmetries. However, and in relation to an ethical intact leader-follower-relationship (characterized by trust), information, its handling, its distribution and also its transparency play a decisive role (Kempner 2021). Especially digital teams are threatened by so called information asymmetries which influence their level of trust and cooperation. Employees are dependent on receiving regular information from their managers. It is therefore surprising that information asymmetries as a management and leader concept has not been really focused in the surrounding literature and research at all. The corona pandemic in particular has shown the great need for complete information. Messages such as home office duty and applicable corona rules at the workplace as well as the announcement of job cuts or short-time work are difficult information that must be communicated by managers both at the

right moments and in the right tone of voice and through the right media which is part of the so-called E-Leader-Ethic. In practice, however, there is often a lack of information which can be seen as an ‘information asymmetry’. This means that of two cooperating parties – in this case the leader and the followers – one party is comparably better informed than the other, although this information asymmetry can come from both sides (Kempner 2021). This is particularly evident in the context of digital collaboration, as this often has consequences for work organization.

Related to these assumptions, digital work environments should be based on a complete integrity of information which are clearly implemented by leaders and followers in their role as partners. Relationships are stable when everyone feels fully informed and treated with respect. Emotions play a decisive role here, so that it becomes clear that moral factors in the form of subjective information can also be a way of reducing information asymmetries, but must be represented subjectively in the interests of comparability. First studies concerning these aspects show that mainly in digital working areas the physical distance increases the need for clues to assess the risk of a possible breach of trust and digital tools that guarantee a certain transparency are gaining in importance (Lohrmann 2017, p. 53). Transparency is therefore one of the decisive consequences of the digital work context, because it is accompanied by both greater control options and security of the processing progress (Antoni/Syrek 2017, p. 250; Breuer et al. 2016). Knowing who has access to the documents and tools is crucial as the basis for trust (Antoni/Syrek 2017, p. 250) and the documentation of decisions and agreements leads to a reduction in the risk of action and to a compensation for a lack of trust (Breuer et al. 2016). Although digital tools may facilitate the collection of information about other persons (like social media, time control systems, shared project platforms) and may promote trust in the field of digital cooperation, they may also disturb relationships in leader-follower-constellations because of an increase of performing stress, virtual presence and the feeling of power on the part of the manager (Schoorman et al. 2007, p. 351).

Within leader-follower-constellations, each party knows its own behavior, personal intentions, stumbling blocks and weaknesses and this earlier than they are revealed to the other. Individual skills, competencies, diligence, effort, fairness, openness, courtesy and goodwill are behavioral characteristics which lead to information differences in business life as well as in cooperation between people and which are perceived by the other party as behavioral insecurity. Behavioral insecurity is a main cause of the emergence of situations of asymmetrical information and the loss of mutual trust, because people typically react aversive against uncertainty and are willing to pay to reduce it. Concerning digital leader-follower-constellations and the building of a so-called E-Trust, information or the degree of information exchange is obviously one of the most important success factors. However, the previously existing research have not yet examined this aspect in more detail. The question arises whether a higher level of information or, in general, a high information content in digital leader-follower-constellations automatically lead to more trust or whether these two exist independently of one another.

### **3 Results and implications**

Based on the aforementioned literature review as well as the reflections about the influence of information (a)symmetries the following results can be extracted:

Complete and correct action is not possible without information. If there is no information, mistakes occur that impair the success of cooperation and endanger company

and/or team performance. This is particularly evident in the digital collaboration between leader and follower and the development of trust based on information (Graen/Scandura 1987, p. 184). Dulebohn et al. (2008) and Wat/Shaffer (2005) were able to demonstrate a positive connection between trust and a high-quality leader-follower-relationship in their research work. First meta-analyses (Scandura/Pellegrini 2008, p. 102) show that a high level of trust in the manager leads to high performance and positive behavior on the part of the individual in the workplace. If the flow of information between the interaction partners is repeatedly disrupted, there will be no development towards a high-quality relationship and there will be no positive consequences for the company. It is therefore of great importance that a manager makes an offer for the formation of mature information flows and processes and ensures high quality relationships through a transparent E-Ethic (Lang/Rybnikova 2014, p. 139).

If there are no transparent information processes, there is a latent information asymmetry which is in contradiction to an information symmetry already known from national economies. In an economic sense, information symmetry is the basic condition for functioning in the standard model of welfare economics as well as an assumption in the model of perfect competition, in which information is available completely or free of charge – i.e. without procurement costs (Morris 1994). On the other hand, asymmetric information is given when several individuals with different levels of knowledge interact and the procurement of information causes (differently high) costs (Morris 1994). In this context, costs are not to be understood exclusively as purely capital-oriented costs, but also imply aspects such as search and time costs, which must primarily be invested in the acquisition of information on the part of the recipient. For this reason, asymmetrical information is to be seen as a threat to all forms of relationship and can be systematized as follows:

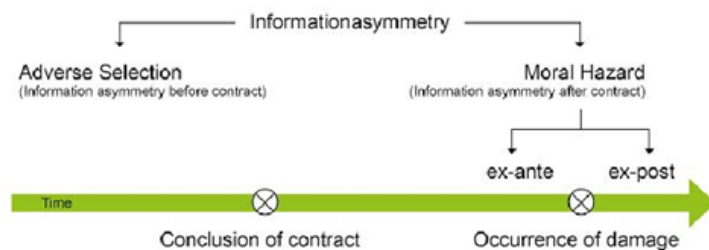


Figure 2 The system of information asymmetries (Kempner 2021)

In microeconomic contract theory, a distinction is made between the existence of information asymmetry before and after the conclusion of a contract. The problem of adverse selection concerns asymmetrical information at the time prior to the conclusion of the contract and is always present when there is different information between two economic subjects, i.e. one has a knowledge advantage over another (Stiglitz 2002, p. 469; Schmidt/Keil 2013, p. 214). According to the principal-agent theory, the agent (sender of the information) has a knowledge advantage over the principal (recipient of the information), which is why he can only assess the agent's performance to a limited extent. In digital leader-follower-constellations, the leader usually has a knowledge advantage over the follower. He has information, e.g. from the organization and in his function as a manager, that the follower does not initially have (van Oosterhout et al. 2006). However, these information are important for the success of the work process. The information asymmetry after the conclusion of the contract denotes a moral hazard. This is the case when people or companies behave irresponsibly or carelessly due to false

economic incentives and thus trigger or increase a risk (Van Oosterhout et al. 2006). In digital collaboration, this is particularly evident in the differentiation and consideration of collective and individual interests. If the manager fears, for example, a loss of motivation of the employees and as a consequence a collapse in work performance (e.g. after the announcement of the introduction of short-time work), the leader will not provide this information. Conversely, there is a risk of moral hazard and therefore of information asymmetry, but also for managers, especially when errors on the part of employees are not openly communicated or difficulties in action processes are not disclosed. Finally, it can be constated that information symmetry is the main indicator for developing and maintaining E-Trust.

#### **4 Discussion and Summary**

Sharing information transparently and as symmetrically as possible, leaders and followers are subjects of a decision-making process (Brown et al. 2005, p. 12). Above all during the Corona crisis leaders had to make morally difficult decision (e.g. about job firing, compulsory vaccinations or short-time work) which needed to be communicated to the followers. In doing so, they often find themselves in a field of tension between a moral hazard and the hold-up. In this context, moral hazard describes the situation of the followers who cannot fully observe the actions of the leader. The leader is better informed about the followers and can therefore act irresponsibly or negligently more easily by not passing on important information at all or passing it on in a falsified manner. The resulting information asymmetry leads to increased opportunity costs on the part of the followers (Stiglitz 2002; Vanhaverbeke et al. 2002, p. 717). The hold-up situation describes the dependence of one partner (the leader) on the performance of the other (the follower).

In advance of any relationship, neither the work performance nor the mutual trust can be precisely determined, so that there is an incomplete contract between the two parties. However, the leader has to make an advanced payment and grant his followers an advance of trust with regard to their work performance. Finally, if this is not met in accordance with the expectations of the leader, the leader will not ex ante make those investments that increase the welfare of the team as a whole. So he will withhold information and will be forced to behave opportunistically (Stiglitz 2002). The hold-up problem describes a situation in which there is incomplete information between the leader and the followers, but which only becomes apparent in the course of the cooperation (ex post) and which leads to the fact that the right investments are not made ex ante.

Based on the previous explanations, it can be stated that various conditions influence successful digital cooperation. It can be assumed that the development of trusting relationships between leader and follower is primarily based on the exchange of information. The higher the symmetry in the circulation of information, the stronger and faster trust is formed in digital teams. In view of the fact that digital media and their use are essential competencies in the context of E-Leadership, it can be further assumed that the handling of media and the sharing of information at the right time and in the right place with the right media to the right followers are decisive conditions for a trustworthy virtual cooperation and a future orientated E-Leader-Ethic.

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## References

- Antoni, C.H., Syrek, C. (2017), Digitalisierung der Arbeit: Konsequenzen für Führung und Zusammenarbeit. Gruppe. Interaktion. Organisation. *Zeitschrift für Angewandte Organisationspsychologie (GIO)* **48(4)**, pp. 247-258.
- Avolio, B. J., Kahai, S., Dum Dum, R., Sivasubramaniam, N. (2001), *Virtual teams: Implications for e-leadership and team development*.
- Brown, M., Trevino, L., Harrison, D. (2005), Ethical Leadership: A Social Learning Perspective for Construct Development and Testing. In: *Organizational Behavior and Human Decision Processes* (**97**), pp. 117-134.
- Dulebohn, J.H., Brouer, R.L., Bommer, W.H., Ferris, G.R., Kato, K. (2008), *A meta-analysis of the antecedents of leader-member exchange: Integrating the past with an eye toward the future* [Working paper]. East Lansing: Michigan State University.
- Graen, G.B., Uhl-Bien, M. (1995), Relationship-Based Approach to Leadership: Development of Leader-Member Exchange (LMX) Theory of Leadership over 25 Years: Applying a Multi-Level Multi-Domain Perspective. In: *Leadership Quarterly* **6(2)**, pp. 219-247.
- Jäckel, A. (2018), *Gesundes Vertrauen in Organisationen. Eine empirische Untersuchung der Vertrauensbeziehung zwischen Führungskraft und Mitarbeiter*. Wiesbaden: Springer.
- Joshi, A., Lazarova, M.B., Liao, H. (2009), Getting Everyone on Board: The Role of Inspirational Leadership in Geographically Dispersed Teams. In: *Organization Science* **20(1)**, pp. 240-252.
- Kempner, F. (2021), The threat of information asymmetries for Supply Chain Management Processes. In: *Innovation management and sustainable economic development in the era of global pandemic: Proceedings of the 38th international business information management association conference / Soliman, K. S.: International business information management association*, pp. 1217-1219
- Lang, R., Rybnikova, I. (2014), *Aktuelle Führungstheorien und -konzepte*. Springer, Wiesbaden.
- Lohrmann, C. (2017), Leadership in a Digital World: New Ways of Leadership for Sustainable Development. In: Osburg, T., Lohrmann, C. *Sustainability in a Digital World – new opportunities through new technologies*, Köln, Springer, pp. 51-58.
- Mayer, R.C., Davis, J.H., Schoorman, F.D. (1995), An integrative model of organizational trust. In: *Academy of Management Review* (**20**), pp. 709-734.
- Morris, P. W. (1994), *The management of projects*. T. Telford.
- Petry, T. (2018), Ansätze zur adäquaten Führung im Digitalen Zeitalter–Darstellung einer Digital Leadership-Toolbox. In: *Digital HR. Smarte und agile Systeme, Prozesse und Strukturen im Personalmanagement*, pp. 311-325.
- Scandura, T.A., Pellegrini, E. K. (2008), Trust and leader-member-exchange: a closer look at relational vulnerability. In: *Journal of Leadership & Organizational Studies* **15(2)**, pp. 101-110.
- Schoorman, F.D., Mayer, R.C., Davis, J.H. (2007), An integrative model of organizational trust: Past, present and future. In: *Academy of Management Review* **32(2)**, pp. 344-354.
- Sommerlatte, T., Keuper, F. (2016), *Vertrauensbasierte Führung*, Gabler/Springer Verlag.
- Schmiech, C. (2018), Der Weg zur Industrie 4.0 für den Mittelstand. In: Schmiech, C. *Digitalisierung: Segen oder Fluch*, Springer, Berlin, Heidelberg, pp. 1-28.
- Schmidt, J., Keil, T. (2013), What makes a resource valuable? Identifying the drivers of firm-idiosyncratic resource value. In: *The Academy of Management Review* (**38**), pp. 206-228.
- Stiglitz, J.E. (2002), *Globalism's discontents* na., pp. a16-a21.
- Vanhaverbeke, W., Duysters, G., Beerkens, B. (2002), Technological capability building through networking strategies within high-tech industries. In: *academy of management proceedings* (**1**) **f1-f6**, briarcliff manor, ny 10510.
- Van Oosterhout, M., Waarts, E., Van Hillegersberg, J. (2006), Change factors requiring agility and implications for IT. In: *European journal of information systems*, **15(2)**, pp. 132-145.
- Wat, D., Shafer, M. A. (2005), Equity and relationship quality influences on organizational citizenship behaviors: The mediating role of trust in the supervisor and empowerment. In: *Personnel review* **34(4)**, pp. 406-422.

- Werther, S., Bruckner, L. (2018), *Arbeit 4.0 aktiv gestalten. Die Zukunft der Arbeit zwischen Agilität, People Analytics und Digitalisierung*, Springer.
- Würzburger, T. (2019), *Die Agilitäts-Falle: wie Sie in der digitalen Transformation stabil arbeiten und leben können*. Vahlen.
- Zand, D. E. (1997), *The leadership triad: Knowledge, trust, and power*, Oxford University Press on Demand.

# Remote Work as a New Standard? Cost Saving and Productivity Increase with Remote Work in the Slovak Translations Services Sector

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## Abstract

The pandemic has changed work trends, and most companies have applied work-from-home called “remote work”. After an extensive review of the literature, we explored the research gap, there has not been a substantial study on the cost and performance analysis of the Slovak translation services sector considering underwriting accounting items. The main contribution of this research was to point out that remote work saves on employers' energy costs and at the same time increases productivity because employees work more efficiently at home. We analyzed two important accounting items horizontally: energy consumption and revenue from the sale of own products and services and the subsequent correlation analysis of 3 key enterprises in the translations services sector in Slovakia was performed. We found out whether the energy costs and the revenue from the sale of our own products and services are correlated. The results of the horizontal analysis confirmed that remote work saves employers money, but on the other side performance of the remotely worked employee is in major not higher than on-site employment. Energy consumption is correlated to revenue from the sale of own products and services at the level of 0,95 which means almost perfect direct proportionality. It can be argued that in the Slovak translation services sector, remote working reduces the employer's energy costs but employee's productivity is higher at on-site work.

Keywords: remote work; cost saving; productivity.

Article Classification: Research article

## 1 Introduction

The spread of the virus that causes COVID-19 is a worldwide event and nations across the world have struggled to contain it. It has shaped how people do business. In times past when work might have stopped altogether, remote work has given businesses

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a way to maintain continuity. Remote work is defined as work that is physically portable and can be done online by using information and communication technologies to aid flexible working practices (Peggy et al., 2022). Remote work is usually performed by employees or self-employed at the home office. A home office is a space disposed of in a person's residence for official business purposes. Since the COVID-19 pandemic, Americans have changed the way they work. According to a Pew Research survey, one in five say they worked from home all or most of the time before the pandemic, but now 71% of those workers are doing their job from home all or most of the time (Parker et al., 2020). Lund and the research team analyzed the potential of remote work across more than 2,000 tasks used in some 800 occupations in the eight focused countries. Considering only remote work that can be done without a loss of productivity, they have found that about 20-25 % of the workforce in advanced economies could work from home. This represents four to five times more remote work than before the pandemic (Lund et al., 2021). Most employees found remote work as a challenge for relational communication (Jämsen et al., 2022; Yang et al., 2022; Hahm et al., 2022). Working together in the same space called co-located work, has historically been fundamental to managerial control and fluent communication. Without that co-location, managers have lost some of their typical sources of influence. Such a circumstance might leave leaders uncertain of their influence with a remote workforce. This fact provides space for learning new leadership techniques to lead remote workforces effectively (Leonardelli, 2022).

Remote work is becoming the new standard, and this trend will continue beyond the pandemic (Hagger et al., 2020; Bamieh and Ziegler, 2022). Maintaining of sustainable work-life balance during this remote work era is a new challenge. Employees must be able to concentrate on their job tasks even when they are disturbed at home. Agreeableness and conscientiousness were found to be protective personality traits against remote work exhaustion (Parra et al., 2022). Remote work gives employees flexibility which enhances organizational performance significantly (Chatterjee et al., 2022). Employees can improve their job performance by creating a comfortable work environment that supports their peace of mind. Dedicated working space and comfortable desks and chairs are associated with improved productivity during remote work, staying productive during remote work leads to better satisfaction (Tleuken et al., 2022). Job satisfaction and a comfortable work environment associated with remote work can positively influence employee performance (Green, 2020). COVID-19-related mobility restrictions increased the cost of on-site work. Unique company data from a large European online labour market have shown that employers are substituting remote employment for on-site employment because of lower energy costs (Mueller-Langer and Gómez-Herrera, 2022). The research team of Global Workplace Analytics has read over 4,000 studies, reports, and articles about Agile work, and here are what they have found to be the most common advantages for the companies that establish such programs. People are eager to take control of their lives and desperate to find a balance between work and life. Remote work improves employee satisfaction because a poll of 1,500 technology professionals revealed that 37% would take a pay cut of 10% if they could work from home. The results have shown productivity increase. Best Buy, British Telecom, Dow Chemical, and many others have shown that teleworkers are 35-40% more productive. Dow Chemical and Nortel have saved over 30% on non-real estate costs. Nearly six out of ten employers have identified cost savings as a significant benefit of telecommuting (Global Workplace Analytics, 2021).

After an extensive review of the literature, it is understood that there has not been a substantial study on the cost and performance analysis of the Slovak translation services sector considering underwriting accounting items. The main contribution of this research



is to point out that remote work saves on energy costs and at the same time increases productivity because employees work more efficiently and to find out whether the energy costs and the revenue from the sale of own products and services are correlated.

The research question is does remote work save on energy costs and at the same time increase productivity in the Slovak translation services sector? Is energy consumption correlated to revenue from the sale of own products and services of 3 chosen enterprises? The aim of this study is horizontal analysis of two items: energy consumption and revenue from the sale of own products and services and subsequent correlation analysis of 3 key enterprises in the translation services sector in Slovakia. The paper is structured as follows: in the introduction was carried out the literature review and were introduced basic research goals, in section 2 are introduced the data used in the analysis and the methodology. In the next step are presented results, which are discussed in section 4.

## 2 Material and methods

The analysis has been performed by using the data from the statistical database FinStat.sk, which monitors enterprises' income and business activities in the Slovak Republic and is the only source of microeconomic data based on harmonized bookkeeping principles. This database provides accounting information that has been necessary for our research. Finstat analyzes the accounting resources of each company. Finstat cooperates with reliable resources such as the Commercial Register, Trade Register, Register of Financial Statements, Register Bankruptcies, Lists of Insurance Borrowers, and Judicial Decisions (Finstat, 2022).

The most important 3 enterprises in the Slovak translation services sector are TETRAS, s.r.o., Translata, spol. s.r.o. and JONCKERS TRANSLATION & ENGINEERING s.r.o. We have chosen these 3 key representatives of the selected sector because of the bigger volume of Operating revenue. Operating revenue including the sale of non-current assets and securities of the sample is presented in Table 1.

Table 1 Operating revenue in 2019-2021 [€]; source: (Finstat 2022)

Operating revenue	2021	2020	2019
TETRAS, s.r.o.	5 281 121	5 106 173	6 682 898
Translata, spol. s.r.o.	2 197 647	2 070 236	2 124 596
JONCKERS TRANSLATION & ENGINEERING s.r.o.	1 436 357	1 408 287	1 049 638

The first research question is does remote work save on energy costs and at the same time increase productivity in the Slovak translation services sector? Income statements and data from translation services companies in Slovakia from 2019 to 2021 have been collected to fulfill the aim of the study. We have horizontally analyzed selected items such as energy consumption and revenue from the sale of own products and services. The horizontal analysis of the income statements is based on a percentage comparison of the values of the same indicator - an accounting item in a time series. Using a time series, we record changes in the economic variable under study - in financial analysis, values for a period of 3 to 5 years are usually taken into account. Horizontal analysis allows users of income statements to easily identify trends and patterns of growth (Paliderová and Bartošová, 2014).

To find out if energy consumption is correlated to revenue from the sale of own products and services of 3 chosen enterprises we have applied correlation analysis. We have used the Calculation Table 2 for auxiliary calculations.

Table 2 Calculation table; source: (Šoltés et al. 2015)

$i$	$x_i$	$y_i$	$x_i y_i$	$x_i^2$	$(x_i - \bar{x})$	$(y_i - \bar{y})$	$(x_i - \bar{x}) * (y_i - \bar{y})$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$
1									
2									
⋮									
$\Sigma$									

Correlation analysis examines the tightness of statistical dependence between quantitative variables. Unlike regression, correlation analysis does not express a cause-and-effect relationship. The variable Y does not depend on the variable X, but the two random variables X and Y change together. The correlation coefficient is a measure of the linear dependence of the two variables (Šoltés et al., 2015). The necessary formulas of indicators are written in Table 3.

Table 3 The formulas of indicators; source: (Šoltés et al. 2015)

Indicator	Formula
Covariance	$cov\ xy = \frac{1}{n} \sum [(x_i - \bar{x}) * (y_i - \bar{y})]$
Dispersion x	$s_x^2 = \frac{1}{n} \sum (x_i - \bar{x})^2$
Dispersion y	$s_y^2 = \frac{1}{n} \sum (y_i - \bar{y})^2$
Correlation Coefficient	$r_{xy} = \frac{cov\ xy}{s_x s_y}$

By dividing the covariance by the standard deviations, a correlation coefficient is calculated, the value of which lies in the interval from -1 to 1. Where -1 means inverse proportionality, 1 means direct proportionality, and 0 means independence of X and Y (Šoltés et al., 2015). This study firstly has horizontal analyzed two selected accounting items to point out that remote work saves on energy costs and at the same time increases productivity because employees work more efficiently. The horizontal analysis has been done of data in the period from 2019 to 2021. This study secondly has analyzed the correlation between the energy costs and the revenue from the sale of own products and services to identify their interdependencies in a remote work environment. The correlation analysis has been done of data in the period from 2020 to 2021 because since that period the translation services sector has applied remote work in major.

### 3 Results

The results of the horizontal analysis of revenue from the sale of own products and services in the period from 2019 to 2021 are aggregated according to individual translation services companies and are presented in Table 4.

Table 4 Horizontal analysis of revenue from the sale of own products and services; source: own elaboration (Finstat 2022)

Revenue from the sale of own products and services	2021	%	2020	%	2019
TETRAS, s.r.o.	5 281 121	4%	5 099 094	-24%	6 674 398
Translata, spol. s.r.o.	2 197 647	6%	2 070 236	-3%	2 124 596
JONCKERS TRANSLATION & ENGINEERING s.r.o.	1 436 357	2%	1 408 287	34%	1 049 638

TETRAS, s.r.o. produced in 2019 the highest volume of revenue from the sale of own products and services in the reporting period. In 2020 there was a significant depression of 24%. In 2021 TETRAS, s.r.o. recorded an increase of 4% compared to the previous crisis year. Translata, spol. s.r.o. produced in 2019 the revenue from the sale of own products and services in the amount above 2 120 000€. In 2020 there was a decline in this item of 3%. In 2021 Translata, spol. s.r.o. recorded an increase of 6% compared to 2020. In 2021 the amount of the revenue from the sale of own products and services was above 2 190 000€, which was even more than in 2019. JONCKERS TRANSLATION & ENGINEERING s.r.o. produced in 2019 the lowest volume of revenue from the sale of own products and services in the reporting period. In 2020 there was a significant increase of 34%. In 2021 JONCKERS TRANSLATION & ENGINEERING s.r.o. recorded an increase of 2% compared to the previous year.

The results of the horizontal analysis of energy consumption in the period from 2019 to 2021 are aggregated according to individual translation services companies and are presented in Table 5.

Table 5 Horizontal analysis of energy consumption; source: own elaboration (Finstat 2022)

Energy consumption	2021	%	2020	%	2019
TETRAS, s.r.o.	31 549	9%	29 022	-47%	55 272
Translata, spol. s.r.o.	17 829	10%	16 178	-58%	38 746
JONCKERS TRANSLATION & ENGINEERING s.r.o.	3 954	-60%	9 770	-19%	12 056

TETRAS, s.r.o. produced in 2019 the highest volume of energy consumption in the reporting period. In 2020 there was a sharp decline of 47%. In 2021 TETRAS, s.r.o. recorded an increase of 9% compared to the previous crisis year. Translata, spol. s.r.o. produced in 2019 the highest volume of energy consumption in the reporting period. In 2020 there was a significant depression in this item of 58%. In 2021 Translata, spol. s.r.o. recorded an increase of 10% compared to 2020. JONCKERS TRANSLATION & ENGINEERING s.r.o. produced in 2019 the highest volume of energy consumption in the reporting period. In 2020 there was a significant depression of 19%. In 2021 JONCKERS TRANSLATION & ENGINEERING s.r.o. recorded a sharp decline of 60% compared to the previous year. All 3 selected enterprises produced 2021 lower amount of energy consumption than in 2019.

Auxiliary calculations which are necessary for correlation analysis of two selected items: revenue from the sale of own products and services and energy consumption are presented in Table 6.

Table 6 Calculation table; source: own elaboration

$i$	$x_i$	$y_i$	$x_i y_i$	$x_i^2$	$(x_i - \bar{x})$	$(y_i - \bar{y})$	$(x_i - \bar{x}) * (y_i - \bar{y})$	$(x_i - \bar{x})^2$	$(y_i - \bar{y})^2$
1	31 549	5 281 121	166 614 086 429	995 339 401	13 498,7	2 365 664,0	31 933 309 781,3	182 214 001,8	5 596 366 160 896
2	17 829	2 197 647	39 181 848 363	317 873 241	-221,3	-717 810,0	158 875 280,0	48 988,4	515 251 196 100
3	3 954	1 436 357	5 679 355 578	15 634 116	-14 096,3	-1 479 100,0	20 849 886 633,3	198 706 613,4	2 187 736 810 000
4	29 022	5 099 094	147 985 906 068	842 276 484	10 971,7	2 183 637,0	23 958 137 285,0	120 377 469,4	4 768 270 547 769
5	16 178	2 070 236	33 492 278 008	261 727 684	-1 872,3	-845 221,0	1 582 535 452,3	3 505 632,1	714 398 538 841
6	9 770	1 408 287	13 758 963 990	95 452 900	-8 280,3	-1 507 170,0	12 479 869 990,0	68 563 920,1	2 271 561 408 900
$\Sigma$	108 302	17 492 742	406 712 438 436	2 528 303 826	0,0	0,0	90 962 614 422,0	573 416 625,3	16 053 584 662 506

The variable Y does not depend on the variable X, but the two random variables X and Y change together. The correlation coefficient is a measure of the linear dependence of the two variables. The results of the necessary statistical indicators for correlation calculation and the correlation coefficient are presented in Table 7.

Table 7 Statistical Indicators; source: own elaboration

Statistical Indicators	
Covariance	15 160 435 737
Dispersion x	95 569 438
Dispersion y	2 675 597 443 751
Correlation Coefficient	0,95

The values range of the correlation coefficient moves between -1.0 and 1.0. A calculated number greater than 1.0 or less than -1.0 means that there was an error in the correlation measurement. A correlation of -1.0 shows a perfect negative correlation, while a correlation of 1.0 shows a perfect positive correlation. A correlation of 0.0 shows no linear relationship between the movement of the two variables. The correlation coefficient counts on 0,95 there is a strong direct linear relationship between revenue from the sale of own products and services and energy consumption.

#### 4 Discussion

The Slovak translation services sector has been greatly affected by remote work employment. 2020 was marked by the arrival of the global Covid-19 pandemic. It has also had a significant impact on the functioning of the selected sector. Covid-19 restrictions had a significant impact on the financial position of companies in the translation services sector. Remote work employment was a good way how to observe health restrictions but also declining energy costs. According to many types of research, there are several reasons why more and more employees and employers are looking for this form of employment. Employees handle time flexibility and have the opportunity to combine their professional and private life much better. They save time by eliminating the daily commute, which in some cases can save employees several hours a day. Remote work offers cost savings on the employee's side in transport costs, and on the employer's side in office rent, energy consumption, and services. Employees perceive the ability to work from home as a great advantage and a benefit for the employer, while at the same time eliminating unnecessary distractions from colleagues. In this research, we wanted to point out that remote work saves on employers' energy costs and at the same time increases productivity because employees work more efficiently at home. We analyzed

two important accounting items horizontally: energy consumption and revenue from the sale of own products and services and the subsequent correlation analysis of 3 key enterprises in the translations services sector in Slovakia was performed. We found out that the energy costs and the revenue from the sale of own products and services are correlated.

Horizontal analysis of revenue from the sale of own products and services showed that in 2019 there was an economic boom. In 2019 companies from selected sectors reported the highest employee productivity and also the highest volume of revenue from the sale of own products and services in the reporting period. The year 2020 had a mostly negative impact on employee productivity and also on the volume of revenue from the sale of own products. Employees were not used to working remotely and they had to learn how to work effectively also at the home office. In 2021 employees had already found out how to work more effectively compared to the previous year. Even though the volume of revenue from the sale of own products and services and employee productivity mostly increased in 2021, this volume was still lower than in 2019.

Horizontal analysis of energy consumption achieved 2019 the highest volume of this item in the reporting period. In 2020 there was a general introduction of remote employment in the Slovak translation services sector and it caused huge cost savings. In 2021 there was persisting remote work and we noticed no or only small costs increase. The results of the horizontal analysis confirmed that remote work saves employers money, but on the other side performance of a remotely worked employee is in major not higher than on-site employment. Energy consumption was correlated to revenue from the sale of own products and services at the level of 0,95 which means almost perfect linear direct proportionality. It could be argued that in the Slovak translation services sector, remote working reduced the employer's energy costs but employee's productivity was higher at on-site work.

We consider the main limitation of our research to be the investigation of the dependence between productivity and costs without a multi-criteria view. We ignore the influence of other factors which had a direct impact on productivity. The performance was also influenced by the environment, the presence of other family members, respectively children, internet connection, number of computers within the family, etc. All the mentioned factors reduce productivity, as they block working performance, increase number of breaks and work interruptions.

On the contrary, the minimization of the time to move to the workplace, the possibility of better organization of work, the transfer of its performance to a time which is usually outside normal working hours has a slightly positive effect on productivity and planned performance.

Future research directions may also be highlighted in the problem of remote work exhaustion in the Slovak translation services sector. There is a huge research gap between remote work in the Slovak industrial sectors and its impact on employee productivity.

By using multi-criteria decision-making methods, we plan to evaluate other impacts on labour productivity in the future, namely in individual sectors of the economy. We expect different results across industries, although the behaviour and situation in some industries may be comparable.

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### References

- Bamieh, O. and Ziegler, L. (2022), "Are remote work options the new standard? Evidence from vacancy postings during the COVID-19 crisis." *Labour Economics*, Vol. 76, ISSN 0927-5371, doi:10.1016/j.labeco.2022.102179
- Chatterjee, S., Chaudhuri, R. and Vrontis, D. (2022), "Does remote work flexibility enhance organization performance? Moderating role of organization policy and top management support." *Journal of Business Research*, Vol. 139, pp. 1501-1512, ISSN 0148-2963, doi:10.1016/j.jbusres.2021.10.069
- Finstat (2022), "Slovak translations services sector", available at: <https://finstat.sk/databaza-firiem-organizacii?sknace=74300&Sort=sales-desc> (accessed 10 September 2022)
- Global Workplace Analytics (2021), "Advantages of Agile Work Strategies For Companies", available at: <https://globalworkplaceanalytics.com/resources/costs-benefits#toggle-id-5> (accessed 10 September 2022)
- Green, N., Tappin, D. and Bentley, T. (2020), "Working from home before, during and after the Covid-19 pandemic: Implications for workers and organisations." *New Zealand Journal of Employment Relations*, Vol. 45, No. 2, pp. 5 - 16, doi:10.24135/nzjer.v45i2.19
- Hagger, M. S. et al. (2020), "Predicting Social Distancing Intention and Behavior During the COVID-19 Pandemic: An Integrated Social Cognition Model." *Annals of Behavioral Medicine*, Vol. 54, No. 10, pp. 713–727. doi:10.1093/abm/kaa073
- Hahm, J. B. et al. (2022), "The show must go on: The mediating role of self-assessment in the relationship between performers' technology acceptance and satisfaction level with remote performances in Korea during the COVID-19 pandemic." *Technology in Society*, Vol. 68, ISSN 0160-791X, doi:10.1016/j.techsoc.2021.101855
- Jämsen, R., Sivunen, A. and Blomqvist, K. (2022), "Employees' perceptions of relational communication in full-time remote work in the public sector." *Computers in Human Behavior*, Vol. 132, ISSN 0747-5632, doi:10.1016/j.chb.2022.107240
- Leonardelli, G. J. (2022), "Lessons from a Crisis: Identity as a Means of Leading Remote Workforces Effectively." *Organizational Dynamics*, Vol. 51, No. 2, ISSN 0090-2616, doi:10.1016/j.orgdyn.2021.100886
- Lund, S. et al. (2021), "The future of work after COVID-19", available at: <https://www.mckinsey.com/featured-insights/future-of-work/the-future-of-work-after-covid-19> (accessed 10 September 2022)
- Mueller-Langer, F. and Gómez-Herrera, E. (2022), "Mobility restrictions and the substitution between on-site and remote work: Empirical evidence from a European online labour market." *Information Economics and Policy*, Vol. 58, ISSN 0167-6245, doi:10.1016/j.infoecopol.2021.100951
- Paliderová, M. and Bartošová, V. (2014), "Horizontálna analýza súvahy a výsledovky – pokračovanie praktického príkladu", available at: <https://www.danovecentrum.sk/odborny-clanok/horizontalna-analyza-suvahy-a-vysledovky-pokracovanie-practickeho-prikladu.htm> (accessed 10 September 2022)
- Parker, K., Horowitz J. M. and Minkin R. (2020), "How the Coronavirus Outbreak Has – and Hasn't – Changed the Way Americans Work", available at: <https://www.pewresearch.org/social-trends/2020/12/09/how-the-coronavirus-outbreak-has-and-hasnt-changed-the-way-americans-work/> (accessed 10 September 2022)

- Parra, C. M., Gupta, M. and Cadden, T. (2022), "Towards an understanding of remote work exhaustion: A study on the effects of individuals' big five personality traits. " *Journal of Business Research*, Vol. 150, pp. 653-662, ISSN 0148-2963, doi:10.1016/j.jbusres.2022.06.009
- Peggy M.L. Ng., Kam K. L., and Cherry T.Y. Ch. (2022), "Remote work as a new normal? The technology-organization-environment (TOE) context." *Technology in Society*, Vol. 70, ISSN 0160-791X, doi:10.1016/j.techsoc.2022.102022
- Šoltés, E. et al. (2015), *Štatistické metódy pre ekonómov*. Wolters Kluwer s.r.o., Bratislava. ISBN 978-80-8168-234-6
- Tleuken, A. et al. (2022), "Effects of the residential built environment on remote work productivity and satisfaction during COVID-19 lockdowns: An analysis of workers' perceptions. " *Building and Environment*, Vol. 219, ISSN 0360-1323, doi:10.1016/j.buildenv.2022.109234
- Yang, L. et al. (2022), "Shadow of cyber ostracism over remote environment: Implication on remote work challenges, virtual work environment, and employee mental well-being during a Covid-19 pandemic. " *Acta Psychologica*, Vol. 225, ISSN 0001-6918, doi:10.1016/j.actpsy.2022.103552

## How to Increase the Motivational Potential of Organizational Culture?

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### Abstract

The aim of the paper is to analyse the organisational culture of the selected organisation in terms of its motivational potential and, based on the results, to identify activities to increase its motivational potential, which may be applicable in other organisations. The questionnaire survey was based on Cartwright's Nine Factors Methodology, which can be used to examine the motivational potential of the organisational culture. The interview with the organisation's management was based on the questionnaire survey results. The questionnaire survey results show that the organisational culture of the surveyed organisation is generally motivating. In the partial analysis of individual factors, we found that they are also motivating. Based on the results and the interview, we identified the organisation's activities to increase the motivational potential of its organisational culture.

Keywords: organisational culture, motivation, motivational potential, nine factors methodology, Cartwright.

Article Classification: Research article

### 1 Introduction

Understanding culture is necessary for the successful functioning of various social communities, including organisations. Generally, the concept of culture has been studied in various scientific disciplines for centuries (Iwes - Kidwell, 2019). Over time, it has become essential to distinguish the specifics of different cultures, whether national, ethnic, or religious (Hofstede et al., 2010). Thus, it is the process of characterising cultures and the subsequent use of information for their better coexistence, functioning, and cooperation (Khan - Panarina, 2017).

Each culture has its own specific set of values and norms that distinguish it from other cultures (Trice - Beyer, 1993). The values that are part of the culture (Šajgalíková et al., 2017) have a significant impact on various aspects of the functioning of

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organisations, such as innovation (Stacho et al., 2016), knowledge sharing (Lee et al., 2016), or the performance of organisations (Nazarian et al., 2017). Furthermore, understanding culture in multicultural organisations contributes to collaboration between employers from different cultures (Tear et al., 2020). At the same time, cultural values are presented externally in various ways as cultural forms (Copuš - Čarnogurský, 2017).

As one of the types of culture, organisational culture also has characteristics that distinguish it across organisations (Klimas, 2016). Moreover, the organisational culture can have a significant impact on the motivation of employees, i.e. on their driving force to perform or not perform a particular activity in connection with work performance (Ritala et al., 2020). There is an evident interdependence between the organisation and its employees, where both parties impact each other's potential to succeed (Sokro, 2012). Correct understanding of organisational culture results in the targeted use of the organisation's workforce because the organisation's management knows what composition of steps to improve culture will be the right one (Šajgalíková - Copuš, 2020). Furthermore, understanding culture allows finding ways to effectively lead the organisation (Schein, 2016) to achieve goals through employee motivation.

Organisations are currently looking for different ways to attract candidates not only during the recruitment and selection process (Koch et al., 2018; Pessach et al., 2020) but mainly to retain them in the organisation after this processes (Firth et al., 2004; Nielsen et al., 2017). It is the reality in all kinds of organisations in the current era of Industry 4.0 (Hecklau et al., 2016; Fantini et al., 2020). Related to this, the ability of organisations to provide employees with suitable working conditions for their work, which also include a motivating organisational culture, is essential (Copuš et al., 2019).

Organisational culture plays a vital role in an organisation in terms of how people perceive their work, levels of motivation and commitment, and, consequently, job satisfaction (Paais - Pattiruhu, 2020). People are also critical factors in competitiveness, and organisations can achieve tremendous results with the right people (Sokro, 2012). Therefore, the organisation needs to understand its culture well and know how to use it (Sezerel - Tonus, 2016), i.e., motivating employees to perform better. Therefore, motivation is a crucial element of organisational culture.

Although the authors focus on various aspects of increasing employee satisfaction and motivation, they usually provide just various general recommendations. For example, Vagn (2016) recommends focusing on the involvement of employees in product innovation. Talapatra (2016) focused on providing opportunities for employees' personal growth through various programs and supporting and valuing employees' work. Čarnogurský et al. (2021) focused on a different area introducing the idea of aromatisation of the internal working environment as an effective tool to stimulate employees to be motivated to work correctly.

However, all these recommendations are not directly connected with motivation through organisational culture. Meanwhile, in the past, the authors' efforts to identify the culture of organisational success (e.g., Ouchi, 1981; Pascale - Athos, 1981) sparked interest in exploring and shaping an abstract phenomenon such as organisational culture. Cartwright (1999) directly looks at shaping the culture to be more motivating (to increase its motivational potential). He measures culture through nine factors based on its impact on employee motivation.

The aim of the paper is to analyse the organisational culture of the selected organisation in terms of its motivational potential and, based on the results, to identify activities to increase its motivational potential, which may be applicable in other organisations.

## 2 Material and methods

The primary source of information was a questionnaire for employees in administrative departments of the researched organisation. Respondents replied to 36 questions based on the Nine factors methodology (Cartwright et al., 1999). It provides the tool to analyse culture by the following factors:

*F1 Identification* (identification with the organisation and its goals)

*F2 Equity* (balance between expectations and reality)

*F3 Equality* (respect for the individuality of all members)

*F4 Consensus* (mutual understanding)

*F5 Instrumentality* (expectations that particular behaviour will lead to specific outcomes)

*F6 Rationality* (systemic approach to solving problems)

*F7 Development* (growth of members)

*F8 Group dynamics* (synergic effect of cooperation)

*F9 Internalisation* (identification with norms and ideas)

There were 108 respondents out of 120 possible, which means a 90% return. Therefore, it is a statistically relevant sample at a confidence level of 95% and a margin of error of 5%. Principles of voluntary participation and anonymity were upheld during data collection. The employees received the link at which the questionnaire could be filled in by email. In each question, respondents answered on a score with values of -6 (in the questionnaire listed as *Strongly disagree*), -3 (in the questionnaire listed as *Disagree*), -1 (in the questionnaire listed as *More disagree than agree*), +1 (in the questionnaire listed as *More agree than disagree*), +3 (in the questionnaire listed as *Agree*), +6 (in the questionnaire listed as *Strongly agree*). Then, these answers can be quantified and evaluated based on numerical values assigned to answers.

There are four questions for each factor (a totally of 36 questions), so it is possible to count the motivation score for each factor and the whole organisation. Based on the responses, we have determined the tendency of each motivating factor and the whole organisation in the interval <-6, 6> with the extremes representing absolute demotivational potential (score -6) and absolute motivational potential (score 6) of the organisational culture in question. The range of scores and the impact of culture on motivation are listed in Table 1.

Table 1 Score and the impact of the culture (Source: adapted from Cartwright, 1999)

Score	Impact on motivation
-6 to -3	Strongly demotivational
-2.99 to -1	Slightly demotivational
-0.99 to 0.99	Neither motivational nor demotivational
1 to 2.99	Slightly motivational
3 to 6	Strongly motivational

The second source of information was a semi-structured interview with the CEO of the researched organisation. Questions were based on the results of the questionnaire survey. Based on the analysis of interview answers, it was possible to identify the activities of organisations leading to make their organisational culture motivating and applicable in other organisations.

### 3 Results

In the following part, we will analyse the individual factors in terms of their impact on employees' motivation and identify activities carried out by the organisation to make its culture motivating.

#### **F1 Identification**

*Identification* is the first factor in Cartwright's methodology. We can define it as a level of identifying the employees with their organisation, organisational goals and activities.

Based on the results of the four particular questions in the questionnaire, this factor has a score of 1.91, which means that this factor is slightly motivating.

During the interview, based on the questionnaire results, the CEO of the researched organisation expressed that it is crucial for them that every employee understand information released by the organisation's management. First and foremost, the organisation aims to keep employees informed of its plans, activities and goals. This is one of the reasons why loudspeakers are located in the production halls, through which their supervisors speak to employees and communicate information to them. Finally, employees are informed about how their effort contributes to the organisational results, which creates a sense of belonging. Furthermore, the organisation seeks to strengthen the relationship between the organisation and employees through team building and other group activities.

#### **F2 Equity**

The second factor is *Equity*, which is a balance between expectations and reality in the context of employees' values and attitudes.

The factor's score is 1.84, which means a slight motivational effect on employees.

During the interview, the organisation's CEO stated that compensation in the organisation is based on the levels. The first is the fixed-wage, which monitors the median salaries in similar positions in the industry and determines the salary levels accordingly. The second level contains a variable wage set individually according to qualitative and quantitative employee performance indicators. At the same time, each employee has his/her own KSI (Key Success Indicator). It contains four areas that the employee should follow. The supervisor monitors their fulfilment level and evaluates the employee's performance, thus minimising the subjective view of evaluation by the supervisor.

#### **F3 Equality**

*Equality* is understood as respect for the individuality of all employees.

The score of this factor is 3.02, so culture has a strong motivating effect on employees.

During the interview, the CEO of the researched organisation ensured that all employees were being treated as equals, and they eliminated discrimination. As a result, the organisation has received the GEEIS certificate, which recognises companies giving equal opportunities to all regardless of gender or health status, as an example. In addition, the conditions and equipment at work are adjusted to make the workplace suitable for people with disabilities. Courses are also available to less experienced people to gain the necessary knowledge and be successful at their positions.

#### **F4 Consensus**

Another analysed factor is *Consensus*, which represents the mutual understanding, i.e. achievement of cooperation, consistency and agreement on a solution associated with the satisfaction of all parties involved.

The factor score is 2.65, so the culture has a slight motivating effect on the motivation of employees in this way.

Within this factor, the organisation's management stated during the interview that there are several possibilities in the organisation how employees can express their opinion and thus support the opportunity to enter into the discussion and bring consensus within the organisation. First of all, the organisation has its web application, through which all employees can address their opinions and comments. The second option is a physical mailbox in the HR department intended for the opinions and suggestions of employees. The organisation also has its staff council, consisting of representatives from each department. Each employee can communicate a comment to their representative, who then consults it with the others at regular meetings. Finally, another option is to email the CEO directly.

#### **F5 Instrumentality**

As the fifth factor, we analysed the *Instrumentality*, which can be described as the expectations that particular behaviour will lead to specific outcomes (the performance will lead to results and organisational rewards).

The factor score is 2.87, so culture slightly affects employee motivation in this way.

During the interview, the CEO said that it is necessary to realise that everyone would like to earn more money, and therefore it is necessary to have healthy limits. As mentioned, the compensation is on two levels (fixed wage and variable wage), and, at the same time, the salary reflects the industry's median. In addition, each employee has a personal meeting with his / her supervisor at least once a year to discuss the salary and career development. As a result, employees are aware that their above-average performance is rewarded and have the opportunity to get a higher position.

#### **F6 Rationality**

The sixth factor is *Rationality*, which introduces the idea of a scientific approach to management and problem-solving. Using systematic and analytical tools and techniques, employees and management can discover the causes of problems and how best to solve them.

The factor score is 2.35, which means a slightly motivational effect on employees.

During the interview, the CEO stated that when a problem with employees occurs, consultations are organised to find the causes of the problem. If an objective investigation found employees' mistakes, there could be some financial penalties.

#### **F7 Development**

The seventh factor is *Development*, i.e. the motivation for self-improvement and growth and continuous improvement of the organisation through employees' development.

The factor score is 3.03, which indicates a strong motivational potential of the culture in this way.

In the context of employee development, during the interview, the CEO stated that they give people the opportunity to be educated in various forms. In the first place, by compulsory training. Employees also have e-learning to acquire the knowledge needed

to do the job. Employee's initiative to educate and increase knowledge and skills could be introduced during an interview with the employee's supervisor, who will find out what the employee's expectations are and in which area he or she would like to improve.

### F8 Group dynamics

The eighth factor is *Group dynamics*, which includes two dimensions: relationships between two or more groups and relationships within a group.

The factor score is 2.12, which indicates a slight motivational potential of the culture in this way.

Based on the interview, the CEO stated that one of the organisational values is group work. Therefore, the organisation tries to apply teambuilding or other group activities, trips, or meetings as often as possible. Building good teamwork is also supported in the 1-week project. The organisational problems are introduced during this week. A group is formed to solve this problem and consists of 1/3 of experts who have an experience with such a problem, 1/3 are employees not involved in the problem, and the last third are employees involved in the problem. Subsequently, all factors causing the problems are identified, and finally, the group introduces a solution and presents it to the management and employees.

### F9 Internalisation

The last factor is *Internalisation*, which focuses on identifying employees with norms, ideas, attitudes and values of the organisation. The ideal situation is when the employee's values are not contradictory to the organisational values.

The factor score is 3.43, which indicates a strong motivational potential of the culture in this way. It is also the highest score of all factors.

The interview with the CEO shows that the organisation strives to make employees feel part of it and identify with its values. Organisation tries actively present organisational values and their strategy. For example, the CEO presents the organisation and its values personally to all the new employees. They are included in organisations' typical behaviour and functioning and, at regular intervals, remarked to employees.

### Summary of results

The organisation's score on the motivational potential of the culture is 2.58, which indicates a slightly motivational potential. Therefore, we can state that despite the factors with lower scores (but still motivational), we evaluate the results of the whole organisation as positive, as they all indicate a positive direction of motivation (culture is motivating). Picture 1 shows the results graphically.

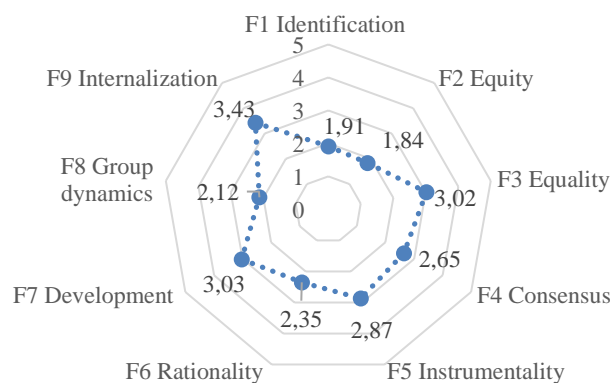


Figure 2 Results (Source: own research)

Researched organisation can be a source of inspiration for other organisations that need to increase their organisational cultures' motivational potential. In Table 2, we list the identified activities applicable in other organisations. Activities are grouped concerning measured factors and ordered based on their motivational potential, from strongly to slightly motivational ones.

Table 2 Identified activities (Source: own research)

Score	Factor	Activities
3,43	<b>F9 Internalisation</b>	upon taking up the job, the CEO himself trains the employees about the values of the organisation regular remarks of organisational values to employees
3,03	<b>F7 Development</b>	compulsory training e-learning employee suggestions for self-education communicated to the supervisor
3,02	<b>F3 Equality</b>	GEEIS certificate confirming equal opportunities working conditions are adjusted so that the job is suitable for people regardless of gender or health status courses for people with less experience
2,87	<b>F5 Instrumentality</b>	once a year, a meeting with a supervisor on salary evaluation and career growth
2,65	<b>F4 Consensus</b>	web application physical box for expressing the opinions and comments of employees staff council
2,35	<b>F6 Rationality</b>	consultations to find the causes of problems financial penalties for proven errors
2,12	<b>F8 Group dynamics</b>	team building, group activities 1-week project to solve organisational problems
1,91	<b>F1 Identification</b>	keeping employees informed of organisational goals, plans, and activities providing feedback on employees' contribution to the organisational results
1,84	<b>F2 Equity</b>	building equity in compensation through clearly defined and communicated performance indicators for each employee, both quantitative and qualitative

#### 4 Discussion

Organisations are currently trying not only to attract suitable candidates, but mainly to keep them in the organisation. One way is to form an organisational culture that is motivating. Cartwright identified nine motivational factors through which the motivational potential of each organisation's organisational culture can be identified. The aim of the paper was to analyse the organisational culture of the selected organisation in terms of its motivational potential and, based on the results, to identify activities to increase its motivational potential, which may be applicable in other organisations.

The questionnaire survey results show that the organisational culture of the surveyed organisation is generally motivating. In a partial analysis of the individual factors, we found that they are also motivating, some to a greater extent and others less. Based on this, the results could be the basis for an interview. We identified the activities that the organisation performs to increase the motivational potential of its organisational culture. These activities can also be applied in other organisations.

The limitation of the research is that the research focuses on only one organisation. In the future, it is, therefore, possible to carry out a similar survey in various other organisations and thus identify activities that are applied in a wide range of different organisations and thus have a general character. A strong potential of using this methodology in the further and broader extent of research lies in applicableness in every organisation – as every organisation has its organisational culture influencing the everyday activities and behaviour of employees and managers. Furthermore, it helps to identify and, consequently, focus on specific activities, giving managers a practical tool for building a motivating organisational culture intentionally. Finally, ever-increasing changes and rapid technology development during the Industry 4.0 transition bring fast changes, complexity and diversity into the workplace. Therefore, developing common/shared cultural values concerning its motivational effect allows setting up conditions that positively stimulate needed effort and growth of different employees performing various organisational activities. Our results support this opinion as factors such as equality and development were those with solid motivational effects on employees.

### **Acknowledgements**

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### **References**

- Brown, A. (1998). Organisational culture. *Financial Times Management*.
- Cartwright, J. (1999). *Cultural Transformation – Nine factors for improving the soul of your business*. Prentice Hall.
- Cartwright, J., Andrews, T. & Webley, P. (1999). A methodology for cultural measurement and change: A case study. *Total Quality Management*, 10(1), 121-128. Retrieved from <https://doi.org/10.1080/0954412998117>.
- Čarnogurský, K., Diačiková, A. & Madzík, P. (2021). The Impact of the Aromatisation of Production Environment on Workers: A Systematic Literature Review. *Applied Sciences*, 11, 1-14, Retrieved from <https://doi.org/10.3390/app11125600>.
- Copuš, L. & Čarnogurský, K. (2017). Intercultural marketing: Culture and its influence on the efficiency of Facebook marketing communication. *Management & Marketing*, 12(2), 189-207. Retrieved from <https://doi.org/10.1515/mmcks-2017-0012>.
- Copuš, L., Šajgalíková, H. & Wojčák, E. (2019). Organizational Culture and its Motivational Potential in Manufacturing Industry: Subculture Perspective. *Procedia Manufacturing*, 32, 360-367. Retrieved from <https://doi.org/10.1016/j.promfg.2019.02.226>.
- Fantini, P., Pinzone, M. & Taisch, M. (2020). Placing the operator at the centre of Industry 4.0 design: Modelling and assessing human activities within cyber-physical systems.

- Computers & Industrial Engineering*, 139. Retrieved from <https://doi.org/10.1016/j.cie.2018.01.025>.
- Firth, L., Mellor, D.J., Moore, K.A. & Loquet, C. (2004). How can managers reduce employee intention to quit? *Journal of Managerial Psychology*, 19(2), 170-187. Retrieved from <https://doi.org/10.1108/02683940410526127>.
- Hecklau, F., Galeitzke, M., Flachs, S. & Kohl, H. (2016). Holistic Approach for Human Resource Management in Industry 4.0. *Procedia CIRP*, 54, 1-6. Retrieved from <https://doi.org/10.1016/j.procir.2016.05.102>.
- Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and Organisations: Software of the Mind*. McGraw-Hill.
- Hu, Q., Dinev, T., Hart, P. & Cooke, D. (2012). Managing Employee Compliance with Information Security Policies: The Critical Role of Top Management and Organizational Culture. *Decision Sciences*, 43, 615-660. Retrieved from <https://doi.org/10.1111/j.1540-5915.2012.00361.x>.
- Ives, C. D., & Kidwell, J. (2019). Religion and social values for sustainability. *Sustainability Science*, 14, 1355–1362 . Retrieved from <https://doi.org/10.1007/s11625-019-00657-0>.
- Lee, J., Shiue, Y., & Chen, C. (2016). Examining the impacts of organisational culture and top management support of knowledge sharing on the success of software process improvement. *Computers in Human Behavior*, 54, 462-474. Retrieved from <https://doi.org/10.1016/j.chb.2015.08.030>.
- Khan, M. A, & Panarina, E. (2017). The Role of National Cultures in Shaping the Corporate Management Cultures: A Four Countries Theoretical Analysis. *Journal of Eastern European and Central Asian Research*, 4(1), 1-25. Retrieved from <https://doi.org/10.15549/jeecar.v4i1.152>.
- Klimas, P. (2016). Organisational culture and coepetition: An exploratory study of the features, models and role in the Polish Aviation Industry. *Industrial Marketing Management*, 53, 91-102. Retrieved from <https://doi.org/10.1016/j.indmarman.2015.11.012>.
- Koch, T., Gerber, C. & Klerk, J. (2018). The impact of social media on recruitment: Are you LinkedIn? *Sa Journal of Human Resource Management*, 16, 1-16, Retrieved from <https://doi.org/10.4102/sajhrm.v16i0.861>.
- Nazarian, A., Atkinson, P. & Foroudi, P. (2017). Influence of national culture and balanced organisational culture on the hotel industry's performance. *International Journal of Hospitality Management*, 63, 22-32. Retrieved from <https://doi.org/10.1016/j.ijhm.2017.01.003>.
- Nielsen, K., Nielsen, M. B., Ogbonnaya, C., Käsälä, M., Saari, E., & Isaksson, K. (2017). Workplace resources to improve both employee well-being and performance: A systematic review and meta-analysis. *Work & Stress*, 31(2), 101–120. Retrieved from <https://doi.org/10.1080/02678373.2017.1304463>.
- Ouchi, W. (1981). *Theory Z: How American Business Can Meet the Japanese Challenge*. Addison-Wesley.
- Paais, M. & Pattiruhu, J. R., (2020). Effect of Motivation, Leadership, and Organizational Culture on Satisfaction and Employee Performance. *Journal of Asian Finance, Economics and Business*, 7(8), 577-588. Retrieved from <https://doi.org/10.13106/jafeb.2020.vol7.no8.577>.
- Pascale, R., & Athos, A., (1981). *The Art of Japanese Management*. Simon & Schuster.
- Pessach, D., Singer, G., Avrahami, D., Ben-Gal, H. C., Shmueli, E. & Ne-Gal., I. (2020). Employees recruitment: A prescriptive analytics approach via machine learning and mathematical programming. *Decision Support Systems*, 134, 2-18. Retrieved from <https://doi.org/10.1016/j.dss.2020.113290>.
- Ritala, P., Vanhala, M. & Järveläinen, K. (2020). The role of employee incentives and motivation on organisational innovativeness in different organisational culture. *International Journal of Innovation Management*, 24(4), Retrieved from <https://doi.org/10.1142/S1363919620500759>.
- Šajgalíková, H. & Copuš, L. (2020). Organizačná kultúra a jej motivačný potenciál. Ofprint.



- Šajgalíková, H., Copuš, L. & Poláková, M. (2017). Where is the Happiness-Generated Optimism Streamed in? European Perspective. In *IBIMA*, pp. 3235-3244.
- Sezerel, H. & Tonus, H. Z. (2016) The effects of the organisational culture on diversity management perceptions in hotel industry. *Journal of Human Resource Management*, 19(2), 1-17.
- Schein, E. H. (2016). *Organisational culture and leadership*. Jossey-Bass.
- Sokro, E. (2012). Analysis of the relationship that exists between organisational culture, motivation and performance. *Problems of Management in the 21st Century*, 3, 106-120.
- Stacho, Z., Potkány, M., Stachová, K., & Marcínková, K. (2016). The organizational culture as a support of innovation processes' management: A case study. *International Journal for Quality Research*, 10(4), 769–784.
- Talapatra P. K., Rungta S. & Jagadeesh A. (2016). Employee Attrition and Strategic Retention Challenges in Indian Manufacturing Industries: a Case Study. *VSRD International Journal of Business and Management Research*, 6(8); 251-261.
- Tear, M. J., Reader, T. W., Shorrock, S. & Kirwan, B. (2020). Safety culture and power: Interactions between perceptions of safety culture, organisational hierarchy, and national culture. *Safety Science*, 121, 550-561. Retrieved from <https://doi.org/10.1016/j.ssci.2018.10.014>.
- Trice H. M. & Beyer J. M. (1993). *The cultures of work organisations*. Prentice Hall.
- Vagn, A. R., Jensen, Ch. S. & Broberg, O. (2016). Participatory Methods for Initiating Manufacturing Employees' Involvement in Product Innovation. Proceedings of the Xxvii Ispim Innovation Conference - Blending Tomorrow's Innovation.
- Vroom, V. H. (1964). *Work and Motivation*. Wiley.
- Wojčák, E., Poláková, M., Copuš, L. & Horváthová-Suleimanová, J. (2021). Organization and Flexibility: How to Build a Resilient Organization in the Context of Industry 4.0? EAI: Management Trends in the Context of Industry 4.0.

# Home Office as an Opportunity to Increase the Flexibility and Performance of Employees

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## Abstract

The term home office has been used more often in our company recently than it was a few years ago. While a few years ago, working from home was mostly perceived as a benefit that only some companies offered, today it is becoming a matter of course, which facilitates the functioning of our company. The trend, which the coronavirus pandemic has spread in the world, brings with it number of advantages and disadvantages. There is also the question of how the management of employees itself changes in this case, since personal contact is lost here, and companies have to monitor and manage their employees remotely. The aim of the article is to point out the pitfalls of remote work associated with a lack of personal contact, which results in risk on the part of managers in connection with the performance provided and risk on the part of employees in connection with a lower level of support and guidance.

Keywords: employees, flexibility, home office, managers, performance.

Article Classification: Research article

## 1 Introduction

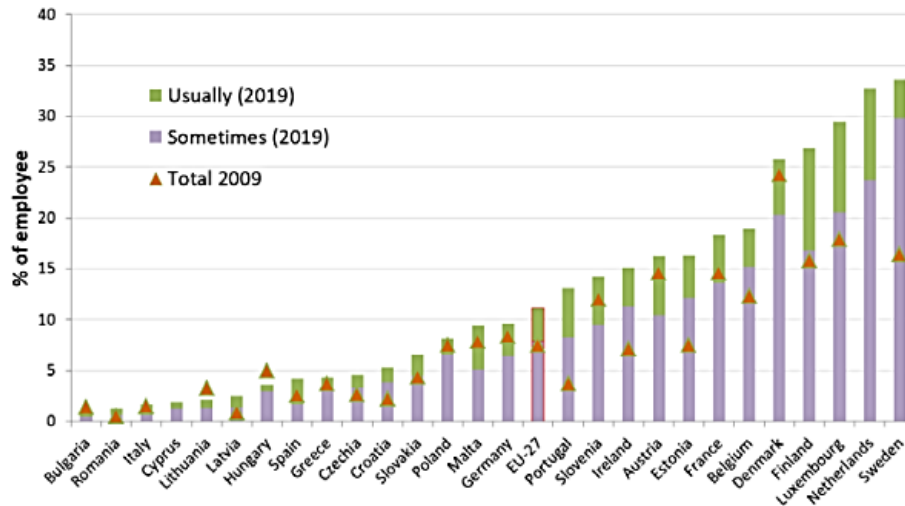
The concept of remote work was developed by the American Jack Nilles. In 1972, he presented the idea that there is no need to keep employees in the office, because modern means of communication make it possible to maintain contact between employees at a distance. Jack Nilles came up with the terms "teleworking" and "telecommuting", which in translation means "working at a distance". In 1982, the first national telework conference was organized by Jill Gordon, who at the time was a former operations and human resources consultant at Johnson & Johnson. Telecommuting began

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to be practiced on a small scale in the 1980s and became more widespread in the mid-1990s. (Penzina, 2016).

As the results shown in figure 1, the home office was most often used regularly in Sweden, Finland and Denmark, which are significantly above the EU27 average. At the same time, the results of the survey point to large differences in the use of home office between individual EU member states (e.g. Bulgaria and Sweden).



Note: Data on the frequency of telework in 2009 are not available for the Netherlands and Cyprus

Figure 1 Prevalence of telework across EU Member States in 2009 and 2019, (% of employees); source: (EUROFOUND 2020, p. 30)

In practice, we encounter several equivalents to the concept of working from home: home office, telecommuting, teleworking, home work. In principle, these are terms expressing specifically the type of work performed, which is not tied to the employer's workplace. Despite this common fact, they have different realizations in practice. According to the authors Lang, Schömann, Clauwaert (2013), Martocha (2012), we also encounter the concept of remote work, which according to them is a synonym of the above concepts. In general, telecommuting is a mobile and flexible form of work where the employee does not have to go to the workplace.

Teleworking, home office or home work are all terms that represent a specific type of work that is not tied to the employer's workplace, but to another agreed place of work, most often the residence (household) of the employee, for the entire working time. The literal translation of the term home work is a home office. It is therefore an office or a room in the house of a worker, equipped with technologies such as a computer, telephone, etc. This term can also refer to the administrative headquarters of the company (Kenton, 2021). As Baker (2020) states home office is currently a growing phenomenon and is any paid work done primarily from home, for at least 20 hours. This definition includes either the self-employed or employees working from home.

Labor Code Act no. 311/2001 Coll. paragraph 1 letter a), b) does not directly define the term homeoffice, but defines the term home work and telework. In order for telework and house work to be carried out, an agreement between the employee and the employer anchored in the employment contract is necessary. Telework and house work have a common basis, and that is the regular performance of a work activity within the scope of the specified weekly working time or part of it from the employee's household.

The basic difference between these two terms is that teleworking requires the use of information technology, which regularly involves the electronic transmission of data at a distance.

Pohořelá (2021), follows on from the Labor Code (§ 52) and points out in more detail two cases that we can encounter in practice within the home office. This is home work as so-called permanent home office and occasional work from home as so-called occasional home office. A permanent home office is characterized by a permanent, regular and permanent nature. Occasional (partially) home office represents occasional work from home that is not regular in nature. The employee performs it, for example, on selected days of the week or under extraordinary circumstances (for example, a pandemic, bad weather, etc.). Occasionally working from home is often offered as a company benefit by the employer.

More and more employers are currently approaching this type of work under the influence of the coronavirus pandemic. According to Ravas (2021): “finally, the work-from-home regime is adapting to the requirements of this time, even in the Labor Code”. From 2021, the Labor Code sets "boundaries" for working from home and teleworking for employers and employees. According to the new legislation, the employee can schedule his own working hours during home work, or he can agree on flexible working hours with the employer. In both cases, an employee performing home work or teleworking has the right to disconnect and not use work equipment during his daily rest and weekly rest. Of course, the aforementioned only applies if he is not ordered or agreed with him to be on standby or work overtime during this time. The employer may not consider it a breach of duty if the employee refuses to perform the work or comply with the instruction within the specified time. The above applies to permanent home work as well as to the occasional home work.

The Workplace platform produced research involving 2,000 US and UK employees and an equal number of managers. It found that only 15% of them feel a connection between themselves and top management, which is influenced by many factors, but also the fact that more than half of them feel they have no voice (The Work Trend Index, 2021). Even this fact can be an exclamation mark when managing employees during work from home, where this "disconnection" can be even more pronounced.

Peter Šimún (2021), holder of the European Commission's Seal of Excellence quality certificate from the Horizon 2020 program, aptly described the basic things that managers should be aware of when working from home. For example, it is about setting work limits, hours worked, regular breaks and paying attention to feedback. Many managers are concerned that employees from home work inefficiently and instead of work, they focus on other household matters. However, a bigger threat can be the fact that employees work much more and over time they may burn out, which the manager may not notice at all. “For business performance measurement are usually used methods of financial analysis (ex post and ex ante), methods of business market position (e. g. PESTE, SWOT, benchmarking – the comparison of our business/product with the best competitors in our branch) and for measurement of marketing indicators portfolio matrix (e. g. BCG, GE)” (Vrábliková 2017, p. 38). In the case of new employees, it is important not to forget about quality training, ideally with the assignment of a colleague who will guide them through the entire process.

According to Fuchsová and Kravčáková (2004), the possibility of working at home using communication networks brings a whole range of advantages, such as: optimization of working conditions, thereby increasing work performance, changing the status of employed mothers, disabled citizens, saving energy, eliminating the problem of

distance to work, etc. Valentová (2018) mentions the possibility of applying for seniors and students as well as a certain degree of freedom for employees among the other advantages of working from home. Freedom to a certain extent can be motivating with a positive impact on performance and loyalty.

Among the biggest disadvantages of working from home are the lack of personal contact, the loss of direct control over work performance, ensuring more effective communication with employees, higher demands for ensuring the protection of personal data, the protection of the employer's business secrets and other confidential information, and a number of advantages to make a person's work more efficient. Prevention of some of the mentioned problems is possible by using, for example, platforms containing an onboarding program, to which employees have unlimited access. Communication tools such as Zoom, Teams or SkypeForBusiness will also help to ensure the smooth functioning of teamwork, on the other hand, GoogleDrive or ShareDrive can be used to share work and documents (Šimún 2021).

## 2 Material and methods

The research focused on assessing the differences that the manager and the employee have to deal with in the case of a home office. In today's information society, the home office makes it possible to increase the degree of flexibility of the parties involved in a given work activity, but questions also come to the fore, or challenges regarding, for example, information security, the specifics of employee management, and their performance. For the purposes of the aforementioned, the article presents part of the research, which is focused on monitoring the connection between performance and the place of performance of the work activity.

As part of the research, the method of interviewing using an anonymous questionnaire was used. The questionnaire was compiled based on the study of relevant literary sources, as well as the results of surveys carried out, for example, by Eurostat, the company Profesia in cooperation with the Open HR forum initiative. As part of the identification feature, the respondents were divided into three groups according to their experience with home office work (worked temporarily or permanently only home office, worked in a hybrid form - partly home office, partly office work, did not work home office at all). For the purposes of our research, the term home office is defined as any work performed outside the physical location of the employer.

To fulfill the goal of the presented research, we defined hypothesis H1, which we wanted to verify the existence of a connection between the employee's performance and the fact whether he works in a home office, in an office or in a hybrid form. Within the framework of research, or explicitly defined null hypotheses, which represent a generally known relationship (there is no connection) to the formulated alternative hypothesis (there is a connection).

*H1 There is a statistically significant relationship between employee performance and place of work*

By conducting a questionnaire survey, we obtained data enabling us to verify the validity of the defined hypothesis. We first processed the results of the survey in the Excel application. Processing consisted of cleaning the so-called raw data from the Google.docs environment. Statistical procedures for testing hypotheses were selected with regard to the types of variables and SPSS software from IBM was used for their processing.

Hypothesis H1 was tested through the Chi-square test of independence, as it was a combination of nominal and ordinal variables.

The test characteristic has the form:

$$\chi^2_P = \sum_{j=1}^k \frac{(o_j - np_j)^2}{np_j} \tag{1}$$

where  $j = 1, 2, \dots, k$  represents the corresponding numerical interval. The test characteristic for  $\chi^2_P$  a sufficiently large  $n$  can be approximated by the chi-square ( $\chi^2$ ) probability distribution. We will make the decision on the hypothesis as follows:

Table 2 Decision on the hypothesis); source: (Lýocsa a kol. 2013)

$H_0: o_j = e_j$	Hypothesis $H_0$ we reject, if
$H_1: \exists_j, o_j \neq e_j$	$\chi^2_P > \chi^2_{(1-a), (k-1-r)}$

where  $r$  is the number of parameters that need to be estimated from the observed data to calculate  $p_j$ . If we assumed that the theoretical probability distribution follows the Poisson distribution  $r = 1$  (parameter  $\lambda$ ), for a normal probability distribution  $r = 2$  (parameter  $\mu$  and  $\sigma^2$ ). Before we perform the test itself, it is generally necessary to ensure that  $e_j = np_j > 5$  (Lýocsa a kol. 2013).

### 3 Results

As mentioned above, hypothesis  $H_1$  was tested through the Chi-square test of independence, since it was a combination of nominal and ordinal variables. The hypothesis is positively oriented, whereby we assume that the place of work performance (independent variable) can influence the level of employee performance (dependent variable).

Table 2 Testing hypothesis  $H_1$ ; source: own elaboration

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	91,672	12	,000
Likelihood Ratio	107,695	12	,000
Linear-by-Linear Association	13,428	1	,000
N of Valid Cases	461		

From the results presented in Table 2 created in the IBM SPSS Statistics 22 program, we can see that the level of significance  $p < 0,05$ , i.e. the statistical significance of the relationships is confirmed and since  $p < 0,001$  we can talk about a statistically highly significant connection between the investigated groups. In the context of the above, it can be stated that the alternative hypothesis *H1 There is a statistically significant connection between the performance of the worker and the place of work* is confirmed.

Table 3 Average rates (performance and experience with home office); source: own elaboration

Q_6	Report			Total
	Home office - full	Home office - partially	Home office - none	
	2,932	2,646	3,322	3,084

Table 3 presents the results of the answers according to the place of work and we can state that it is the hybrid form of the place of work that achieves the lowest average values. Since the questions were positively oriented, it means that it is the hybrid form of the place of work that is characterized by the greatest increase in employee performance. For respondents who did not have a home office, worse assessed results were recorded. The stated results confirm trends from abroad, where a hybrid form of work is coming to the fore to increase flexibility and, consequently, the performance of employees.

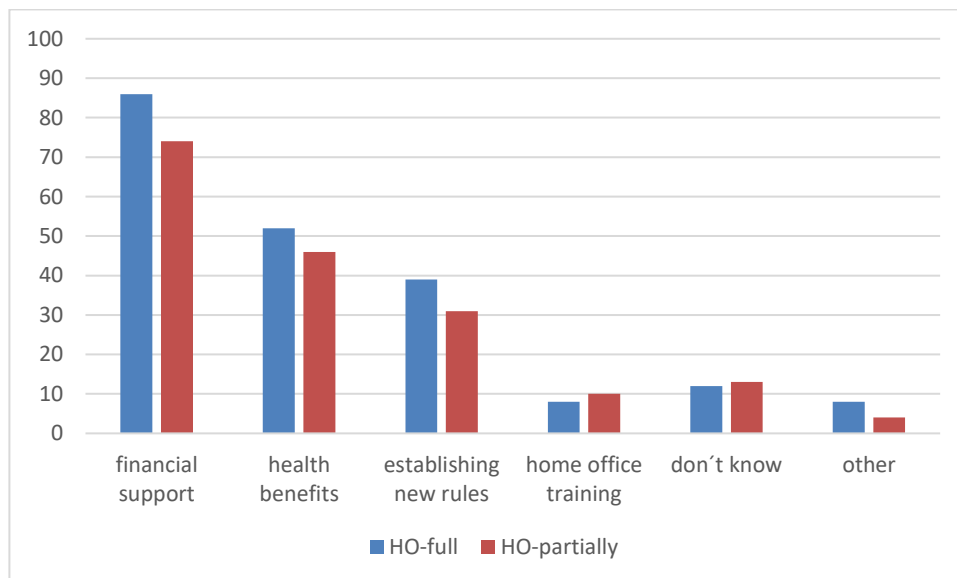


Figure 2 The results of the evaluation of the questionnaire question; source: own elaboration

As a result of the pandemic, many companies had to reorient themselves from the office work system to the work system "at a distance". The work of managers also expanded to include many other functions, for example, they had to be the main source of information for employees at the home office, they became models of the new organizational culture, advisors, and in some cases even IT assistants when employees turned to them with technological problems. Many managers are faced with a new goal of ensuring that their employees, individually or in teams, are getting the same amount of quality work done at home as they did in the office. Questionnaire (question no. 15) we found out what employees lack if they work in the home office or hybrid form. As we can see in Figure 2, the majority of respondents from both groups agreed on a financial contribution to the equipment of the home workplace. As the second most numerous requests, the respondents stated a request in connection with health and establishing rules for the home office. Respondents perceive the mentioned areas as the biggest challenges for their employers in connection with the home office.

## 4 Discussion

Creating that is information society using a wide range of technical and technological conveniences refers to a change in the content and also the forms of work activity. The change occurs in the very existence of work in a specific space and in the area of understanding the meaning of human work as a sphere of human self-realization. The acceleration of the transition to home office processes also occurred due to the global coronavirus pandemic when many businesses had to switch to the home office work system. Many employees and their managers were working outside the office for the first time, and in doing so they were separated from each other.

We can say that the world is on the verge of a change that will be as big as the recent sudden shift to remote work: the transition to hybrid work - a mixed model in which sometimes employees return to the workplace and sometimes continue to work from home. Everyone is learning as they go, but two things are certain: flexible working is here to stay, and the talent landscape has fundamentally changed. Summarizing the presented results, we can confirm that even such a work system can be effective for employees, as many have found that they can work more productively while working at home. Of course, managers must monitor the new needs that arise as a result of the transition to a full or partial home office. At the same time, it is necessary to analyse the investigated issue more deeply, for example regarding the industry, age of employees, etc.

A thoughtful approach to hybrid work will be critical to attracting and retaining diverse talent. It is necessary to realize that the change in working habits has affected not only people's work, but also their private life. Employee expectations are changing, and it is necessary to define performance much more broadly. We see that people are changing their demands. It should be emphasized for managers to listen to people and try to contribute to their satisfaction during a challenging period full of changes.

The big challenge will be to ensure that employees have secure flexibility and at the same time the necessary tools, rules for maintaining or increasing their performance. One of the tasks of the hybrid work environment will be to create offices that connect teams and people, because the reason for their temporary presence in the office is to collaborate, participate in meetings.

Organizations should strive to create more collaboration and video conferencing zones. On the other hand, organizations should clearly define the rules within the home office (reachability, control...) as well as the provision and financing of work aids (laptop, software...) and so on. Every organization will need a plan that includes policy, physical space, and technology. It begins by answering critical questions: How are people doing and what do they need? Who will be able to work remotely and who will have to come? How often? With so many changes occurring, employees are re-evaluating their priorities and if employers want to maintain the reputation and loyalty of their employees, it is essential that they build or maintain a good work environment.

## References

- Baker, K. (2020), "Productivity and Effectiveness of Working from Home", available at: <https://dspace.sunyconnect.suny.edu/handle/1951/71150> (accessed 29. November 2021)
- Eurofound (2020), "Labour market change Teleworkability and the COVID-19 crisis: a new digital divide?", available at: <https://www.eurofound.europa.eu/sites/default/files/wpef20020.pdf> (accessed 12. June 2022)



- Fried, J., Henemeir Hansson D. (2013), *Remote: Office Not Required*, New York, Currency.
- Fuchsová, K., Kravčáková, G. (2004), *Manažment pracovnej motivácie*, Bratislava, Iris.
- Kenton, W. (2021), "Productivity" available at: <https://www.investopedia.com/terms/p/productivity.asp> (accessed 27. november 2021)
- Lang, C., Schömann, I., Clauwert, S. (2013), "Atypical forms of employment contracts in times of crisis", available at: <https://www.etui.org/sites/default/files/13%20WP%202013%2003%20Atypical%20forms%20Lang%20EN%20Web%20version.pdf>. ISSN 1994-4454 (accessed 15. february 2022)
- Lyócsa, Š., Baumöhl, E., Výrost, T. (2013), *Kvantitatívne metódy v ekonómii II*, Košice, Elfa.
- Martoch, M. (2012), "Práce na dálku: jak chytře zvýšit konkurenceschopnost organizace" available at: [http://rodinne-52centrum.cz/provazek/files/prace-na-dalku-web-pdf\\_7b6f96b8f32379c6db701e538a5d1188.pdf](http://rodinne-52centrum.cz/provazek/files/prace-na-dalku-web-pdf_7b6f96b8f32379c6db701e538a5d1188.pdf) (accessed 14. november 2021)
- Penzina, O. (2016), *Manažment*, Moskva, Yurayt.
- Pohořelá, P. (2021), "Práca z domu (tzv. home office) – aké pre ňu platia pravidlá?", available at: <https://www.podnikajte.sk/pracovne-pravo-bozp/praca-z-domu-home-office-pravidla> (accessed 27. november 2021)
- Ravas, F. (2021), "Zmena Zákonníku práce od 2021 – home-office a ďalšie zmeny", available at: <https://www.securion.sk/zmeny-zakonnik-prace-2021-gdpr-a-ine/> (accessed 15. march 2022)
- Šimún, P. (2021), "Manažment zamestnancov pri home office: technológie a dôvera sú kľúčové" available at: <https://www.podnikajte.sk/zamestnanci-a-hr/manazment-zamestnancov-home-office> (accessed 14. january 2022)
- The Word Trend Index (2021), "The Next Great Disruption Is Hybrid Work – Are We Ready?" available at: <https://www.microsoft.com/en-us/worklab/work-trend-index/hybrid-work>, (accessed at 18. august, 2022)
- Vrábliková, M. (2017), "The business performance measurement as a tool of creation of innovative intentions", in *PEMF proceedings of the international conference in Poprad, Slovakia, 2017*, Verbum, Ružomberok, pp. 37-47, available at: [https://www.pemf-conference.com/wp-content/uploads/2022/04/Proceedings\\_PEMF\\_2017.pdf](https://www.pemf-conference.com/wp-content/uploads/2022/04/Proceedings_PEMF_2017.pdf), (accessed 18. august, 2022)
- Valentová, K. (2018), "Práce z domova – výhody a nevýhody, plánované zmeny" available at: <https://www.pravniprostor.cz/clanky/pracovni-pravo/prace-z-domova-vyhody-a-nevyhody-planovane-zmeny>, (accessed 18. August, 2022)
- Zákon č. 311/2001 Z. z. "Zákonník práce", available at: <https://www.zakonypreludi.sk/zz/2001-311>

# Relationship Between Organisational Culture and National Culture on the Example of Classical Management Approach Theories

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## Abstract

The main goal of the paper is to theoretically identify the values that result from the principles of selected classical management approach theories based on the cultural background of their authors. Theoretically, three selected classic theories were analysed: scientific management, administrative theory, and bureaucracy. The results of the theoretical research show that cultural values (organisational culture) manifested in mentioned theories are influenced by the cultural background of its authors (national culture). At the same time, each considered their approach the most appropriate in a given cultural context. Thus, these approaches cannot be considered good or bad but functional or dysfunctional, similar to cultures.

Keywords: organisational culture, national culture, scientific management, administrative theory, bureaucracy, Taylor, Fayol, Weber.

Article Classification: Research article

## 1 Introduction

The current ongoing era of globalisation and internalisation has brought many opportunities for developing business activities and research topics. In the business, suppliers, customers, employees and shareholders from different cultural contexts meet, and the values of the national cultures from which they come significantly influence their behaviour not only in their private life but also in their working life (Campagnolo - Vincenti, 2022). Different national cultural contexts and the values they represent thus bring different ways of working and functioning the organisations (Hung et al., 2022).

Brown (1998) claims that national culture is one of the sources of organisational culture. Therefore, research activities have naturally focused on various areas in which national cultures are manifested in organisations and thus also in their organisational cultures. Both practitioners and theorists try to understand different national cultural

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contexts, their manifestation in the behaviour of individuals and subsequently in the functioning of organisations.

According to Crane (2000), nations have historically found ways of solving the problems they had to deal with. These approaches have developed over time, embedded in their cultural context and influencing human behaviour. Culture does not arise overnight but develops over a long period. According to Trice and Beyer (1993), the formation of a value system (the substance of national culture) is influenced by the experiences of the inhabitants of nations with successful problem-solving. This substance is outwardly manifested through cultural forms (e.g. symbols, language, histories or activities). These developed solutions are deeply rooted in its history. In the process of socialisation, they are presented to the new members of the culture as the most appropriate, and the new members naturally follow them (Hellriegel - Slocum, 2008).

The research focuses on various aspects of manifestations of national culture in organisations' functioning and management. For example, the relationship between national culture and corporate social responsibility (Schefer Roveda et al., 2022; Halkos – Skouloudis, 2017; Kang et al., 2016), national culture and marketing (Lee – Park, 2022; Liyanaarachchi, 2021; Copuš – Čarnogurský, 2017), national culture and ethical behaviour of managers (Westerman et al., 2007; Alas, 2006), or national culture of approaches to HRM functions (Griswold et al., 2021; Nadeem - Tayyab, 2020; Lockhart, 2020; Stacho et al., 2019). The national culture manifested itself in all the investigated areas to a greater or lesser extent. In the mentioned research, for example, it was confirmed that the national culture is one of the predictors of the ethical behaviour of managers and employees, but also the fact that it affects the communication of companies on social networks.

However, cultural differences can also be identified on a theoretical level. For example, literature and research (Robbins – Coulter, 2018) historically describe different approaches to functioning the organisation, which their authors considered the most appropriate, even if they differed significantly in many aspects. Many management approach theories are now included in respected management textbooks. The authors' cultural background is considered one of the factors that influenced the differences between these approaches.

The main goal of the paper is to theoretically identify the values that result from the principles of selected classical management approach theories based on the cultural background of their authors.

## 2 Materials and methods

The research is based on a selection of three classic theories, which are included in several management textbooks (Robbins – Coulter, 2018; Crainer – Dearlove, 2004; Wojčák et al., 2017; Sedlák, 2009; Majtán et al., 2016):

- a. *Scientific management* (Taylor, 1911).
- b. *Administrative theory* (Fayol, 1917).
- c. *Bureaucracy* (Weber, 1947).

First, we will provide a short description of the individual theories. Then, based on the theoretical analysis of the selected theories, we will identify the values that influenced their approaches to organisational functioning. Subsequently, we will present specific manifestations of national cultures on organisational cultures as examples.

### 3 Results

In the following section, we present the results of the theoretical analysis of the above-mentioned selected management approach theories.

#### 3.1 *Scientific management*

The first analysed approach in which the influence of national culture can be identified is *scientific management* and its most famous representative Frederick Winslow Taylor (1911).

This approach arose as a response to the problems of American industry at the turn of the 19th and 20th centuries, which were mainly related to the lack of professional management and weak organisation of work, which led to waste and employee revolts (Witzel, 2012). Scientific management aims to ensure the highest possible prosperity through the highest possible productivity of people and machines in the organisation. According to Taylor (1911), the causes of low employee productivity and slow pace are mainly the natural laziness of the workers and work procedures carried out without rules.

Such procedures were to be replaced by scientific management, which is based on four principles:

1. to create a scientific procedure for the execution of each job, which was supposed to replace the current imprecise and rather by-the-eye procedure
2. to scientifically select, train, educate and develop workers, while previously, the worker chose his work and trained himself as best he could
3. to cooperate with the workers in order to ensure that the work is carried out following the developed scientific principles
4. an equal distribution of work and responsibility between the workers and managers, with managers taking on all the work for which they are better suited than the workers.

In addition, Taylor (1911) advocated that the worker should have several superiors (namely eight). According to him, finding a manager who would meet all the required mental and moral qualities (up to nine in total) was challenging.

Taylor (1895) tried to increase productivity also through remuneration. He proposed a system consisting of two compensation rates for the same work. The first rate included a higher salary for performance if the work was completed flawlessly and in the fastest possible time. The second rate included a lower salary for slower and less accurate work. The goal was thus to ensure a higher salary for workers who work quickly and satisfactorily.

#### **Summary and identification of values**

Thus, the essence of scientific management was increasing productivity and the most efficient use of human resources perceived as parts of industrial machines (Poláková, 2017). These are the values of **pragmatism, productivity, and waste elimination** (Copuš, 2022), which, according to several authors (Crane, 2000; Lewis, 2000; Trompenaars and Hampden-Turner, 2004), in the context of national cultures, are typical for the Anglophone cluster (which also includes the USA), which is the cultural background of the author of this approach.

We may consider them as the values of an organisation (organisational culture) functioning on the principles of this approach.

Hofstede (1993) also addressed differences regarding the influence of national cultures in his study and pointed out also the striking difference in the career path of Taylor and Fayol that led to a different perception of management in an organisation. He gives an example of Fayol's response to Taylor's theory proposing eight leaders for one employee, which contradicts the unity of command that is the essence of Fayol's administrative theory analysed below.

### 3.2 Administrative theory

Another management theory suitable for identifying the influence of national culture is the *Administrative theory* introduced by Henri Fayol (1917).

In his theory, he divided all activities carried out in the organisation into six groups:

1. technical activities (production, processing, transformation)
2. commercial activities (purchase, sale)
3. financial activities (finding and managing capital)
4. security activities (protection of property and people)
5. accounting activities (inventory, balance sheet, statistics)
6. managerial activities (planning, organising, commanding, coordinating, and controlling)

According to Fayol, managerial activities are significantly different from others because management allows for coordinating all other activities.

By defining the basic activities of the organisation, Fayol laid the foundations from which the theory and practice of management still draw. Currently, *planning*, *organising*, *leading*, and *controlling* are generally recognised as the basic functions of management (Poláková, 2017).

Fayol also defined the principles of management, which, according to him, he applied most often. They include, for example, *authority* (the right to command and demand obedience), *unity of command* (an employee receives orders from only one manager), *centralisation* (management gives work instructions to lower levels of the organisation), *scalar chain* (a line of authority over subordinates). These fourteen principles serve as a basic framework from which some current approaches have been developed, such as managerial authority, centralised decision-making and others (Robbins - Coulter, 2018).

#### Summary and identification of values

This approach is mainly characterised by the promotion of centralised management of the organisation and emphasises the role of managers (Poláková, 2017). It is based on values such as **hierarchy, formalisation and centralisation** (Copuš, 2022). These are characteristics that, according to several authors (Crane, 2000; Lewis, 2000; Trompenaars and Hampden-Turner, 2004), in the context of national cultures, are typical for the Latin cluster (including France), the cultural background of the author.

We may consider them as the values of an organisation (organisational culture) functioning on the principles of this approach.

### 3.3 Bureaucracy

The influence of national culture can also be identified in the approach to managing an organisation called *bureaucracy*, represented by the German sociologist Max Weber (1947).

Based on his findings, he claims that the ideal work organisation is bureaucratic administration, in which the delegation of managerial functions is based on the individual's ability to hold the given position. He considered this form to be an ideal, rational and very effective form of organisation (Schermerhorn, 2010), while it is based on the following principles:

1. division of labour - each employee is dedicated only to the area and work for which he is qualified, the work is clearly defined, and workers quickly acquire the necessary skills to perform it
2. authority hierarchy - authority and responsibility are also clearly defined for each position; each position reports to one position at a higher level of hierarchy
3. formal rules and regulations - behaviour and decision-making are governed by guidelines drawn up in written form; written records are created and archived
4. impersonality - rules and procedures are dispassionately and evenly applied; they apply to everyone equally without favouring anyone
5. formal selection. The selection and remuneration of workers take place based on objective criteria, i.e. their abilities, skills and performance
6. career orientation - workers should be educated, professionally and professionally grow; managers are professionals working for the organisation

#### Summary and identification of values

Thus, this approach is characterised by effectiveness and efficiency (Combe, 2014), employs experts primarily and does not allow personal emotions to interfere with work in the organisation. Furthermore, rules lead to consistent and predictable behaviour (Poláková, 2017). From a cultural point of view, these are values such as **discipline, order, rules, and justice** (Copuš, 2022). These are characteristics that, according to several authors (Crane, 2000; Lewis, 2000; Trompenaars and Hampden-Turner, 2004), in the context of national cultures, are typical for the Germanic cluster (including Germany), the cultural background of the author.

We may consider them as the values of an organisation (organisational culture) functioning on the principles of this approach.

It is necessary to note that some administrative theory principles are similar to bureaucracy principles. However, what the authors of the theories imagine under them differs significantly within the cultural context from which they originate.

### 3.4 Values of national cultures and specific external manifestations

Based on the identified values of individual national cultures, which were manifested in different management theory approaches, it is also possible to state their various manifestations in the functioning of the organisation based on the literature (Figure 1).

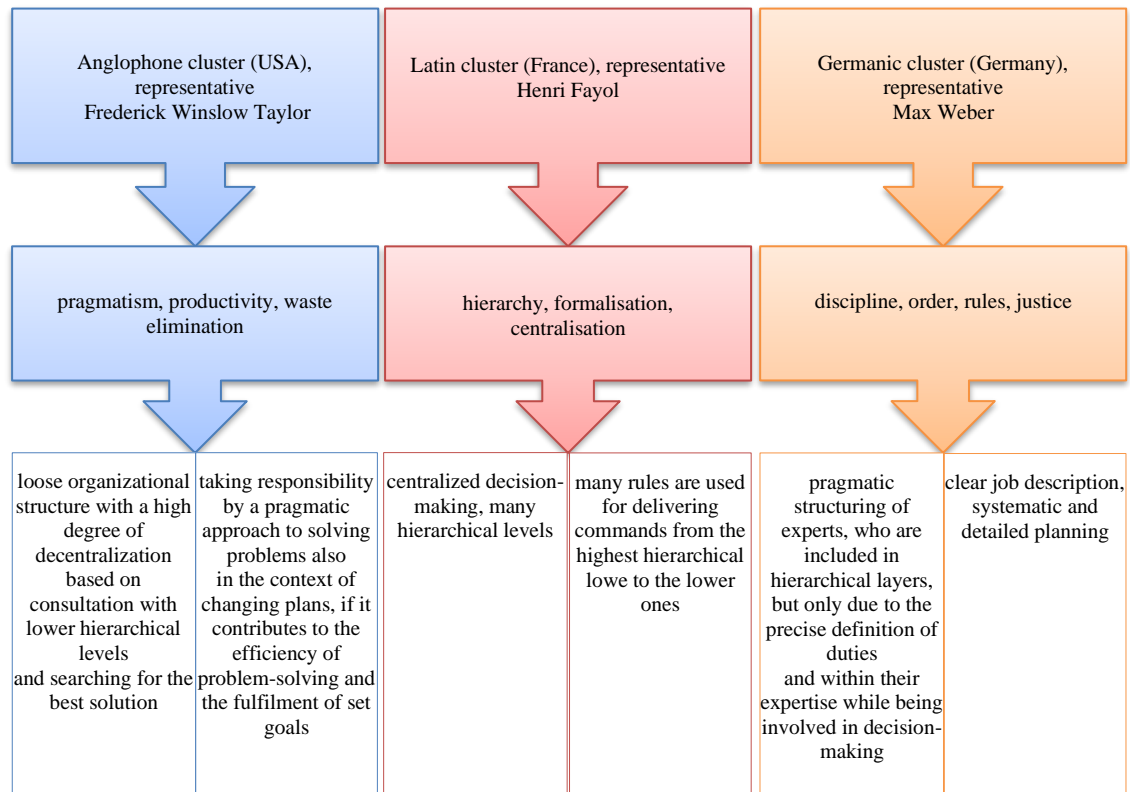


Figure 1 Values of national cultures and its expressions (Source: adapted from Copuš, 2022; Copuš - Šajgalíková, 2020; Copuš et al. 2019; Šajgalíková - Copuš, 2016)

#### 4 Discussion

As seen from the given examples and their analysis, each author presents his approach to management, which he considers to be the most appropriate. It can be agreed that in the cultural context in which the individual authors functioned and from which these approaches naturally emerged, they appeared to be the most appropriate. However, they would probably not be the most appropriate in other cultural contexts. This does not mean that the management approaches are either exclusively good or bad. As they arise from different cultural contexts, it cannot be argued by analogy that some cultures are good and others are bad. Cultures can only be spoken of as functional or dysfunctional (Šajgalíková – Copuš, 2020). The same as analysed approaches.

In international cooperation, we must consider the cultural contexts from which our shareholders, managers, employees or colleagues come. As pointed out in our theoretical research, national culture is a basis for historically proven solutions to problematic situations. It thus manifests itself in behaviour in individuals and organisations through their organisational cultures and the values stemming from them.

It is necessary to add that national culture is not the only factor influencing the authors of mentioned management theories. Within the cultural background, occupational

culture should also be considered in the case of scientific and administrative management authors. Schein (1996) distinguishes three occupational cultures. Firstly, the culture of operators which concerns line managers and workers who make and deliver the products and services to fulfill the organizational goals. Secondly, the culture of engineering which concerns technocrats and core designers in any functional group. Thirdly the organizational culture concerns top managers and executives. Particular assumption of each culture causes each group sees the organization differently. For example, the engineering culture's assumptions are based on formal education, work experience, and job requirements. If we consider Taylor's career path, he will fall into the occupational engineering culture.

Taylor was promoted to foreman and then to chief engineer and also took a degree in mechanical engineering. As a result, he acquired a high degree of theoretical and practical technical knowledge. Scientific management was not the creation of Taylor; it reflects very strongly the characteristics of those who found it. Like Taylor, they were tough-minded rational pragmatists and also idealists believing in the perfection of science and the solution they found in the ultimate form of management, the one best way. Following Fayol's career path, he would belong to an executive culture.

Executive assumptions are formed around maintaining an organization's financial health. Executives move up the hierarchy and oversee many people. Therefore they gradually lose direct and personal contact with subordinates and have to create systems and routines to make the organization effective. (Schein, 1996) Fayol was also trained as an engineer but later became a managing director. His management experience in an organization was different from that of Taylor. Fayol had top-level management experience and ran a huge business. As managing director, he rescued the firm from near-bankruptcy, guided it through the takeover of another firm, and oversaw its steady growth. Unlike Taylor, whose focus was productivity on the shop level, Fayol focused on the entire organization and a set of principles that would lead to efficient management of the whole organization. (Witzel, 2012). Their different focus, as well as their national cultural backgrounds, are reflected in their developed management theories.

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## References

- Alas, R. (2006). Ethics in countries with different cultural dimensions. *Journal of Business Ethics*, 69(3).
- Brown, A. (1998). *Organisational culture*. London: Financial Times Management.
- Campagnolo, D., & Vincenti, G. (2022). Cross-border M&As: The impact of cultural friction and CEO change on the performance of acquired companies. *Journal of International Management*, 28(4).
- Combe, C. (2014). *Introduction to Management*. Oxford University Press.
- Copus, L. (2022). Kultúrne aspekty manažmentu v globálnom prostredí. In Horváthová-Suleimanová, J. et al.: *Manažment v globálnom prostredí*. Bratislava: Comenius University in Bratislava.



- Copuš, L., & Čarnogurský, K. (2017). Intercultural marketing: Culture and its influence on the efficiency of Facebook marketing communication. *Management & Marketing. Challenges for the Knowledge Society*, 12(2).
- Copuš, L., & Šajgalíková, H. (2020). Organizačné kultúry: Európske špecifiká. Bratislava, Ofprint.
- Copuš, L., Wojčák, E., Majtánová, M., & Šajgalíková, H. (2019). Priemysel 4.0 a jeho dopad na organizačné systémy a ľudské zdroje. *The Journal of Culture*, 9(2).
- Craimer, S., Dearlove, D. (2004). Handbook of Management. London, Prentice Hall.
- Crane, R. (2020). European Business Cultures. London: Pearson, 2000.
- Fayol, H. (1917). Administration Industrielle et Générale. Extract du Bulletin de la Société de l'Industrie mineral.
- Griswold, K.R., Phillips, J.M., Kim, M.S., Mondragon, N., Liff, J., & Gully, S.M. (2021). Global differences in applicant reactions to virtual interview synchronicity. *The International Journal of Human Resource Management*, 33.
- Halkos, GE, & Skouloudis, A. (2017). Revisiting the relationship between corporate social responsibility and national culture: A quantitative assessment. *Management Decision*, 55.
- Hellriegel, D., & Slocum, JW (2008). Organisational Behavior. Boston: Cengage Learning.
- Hofstede, G. (1993). Cultural Constraints in Management Theories. *The Executive*, 7(1).
- Hung, Y., Su, T., & Lou, K. (2022). Impact of Organizational Culture on Individual Work Performance with National Culture of Cross-Strait Enterprises as a Moderator. *Sustainability*, 14(11).
- Kang, KH, Lee, S., & Yoo, C. (2016). The effect of national culture on corporate social responsibility in the hospitality industry. *International Journal of Contemporary Hospitality Management*, 28.
- Lee, J., & Park, C. (2022). Social media content, customer engagement and brand equity: US versus Korea. *Management Decision*.
- Lewis, R.D. (2000). When Cultures Collide: Managing Successfully Across Cultures. London: Nicholas Brealey Publishing.
- Liyanaarachchi, G. (2021). Managing privacy paradox through national culture: Reshaping online retailing strategy. *Journal of Retailing and Consumer Services*, 60.
- Lockhart, P., Shahani, N., & Bhanugopan, R. (2020). Do organisational culture and national culture mediate the relationship between high-performance human resource management practices and organisational citizenship behavior? *International Journal of Manpower*, 41.
- Nadeem, S., & Tayyab, Z. (2020). The Interplay between National Cultural Dimensions and Components of a Performance Management System: A Qualitative Study from Pakistan. *Canadian Journal of Administrative Sciences-revue Canadienne Des Sciences De L Administration* , 38(1).
- Majtán, M. et al. (2016). Management. Bratislava: Sprint two.
- Poláková, M. (2017). Vývoj teórie manažmentu. In Wojčák, E., et al. Management. Bratislava: Ofprint.
- Robbins, S, & Coulter, M. (2018). Management. London: Pearson.
- Sedlák, M. (2009). Management. Bratislava: Iura Edition.
- Schein, E. H. (1996). Culture: The Missing Concept in Organization Studies. *Administrative Science Quarterly*, 41.
- Schermerhorn, J.R. (2010). Management. John Wiley & Sons.
- Schefer Roveda, T., Baccin Brizolla, M.M., & Dias Lopes, L.F. (2022). Corporate Social Responsibility And The National Culture in Automotive Dealerships. *Revista de Gestão Social e Ambiental*, 16(22).
- Šajgalíková, H. & Copuš, L. (2020). Organizačná kultúra a jej motivačný potenciál. Bratislava, Ofprint.
- Šajgalíková, H., & Copuš, L. (2016). Vzťah národnej kultúry a vybraných funkcií manažmentu. Proceedings from the international conference Legacy of John Paul II., Ružomberok: Verbum.

- Stacho, Z., Stachová, K., & Raišienė, A.G. (2019). Change in approach to employee development in organizations on a regional scale. *Journal of International Studies*, 2.
- Taylor, F.W. (1895). *A Piece-Rate System*, 1895.
- Taylor, F.W. (1911). *The principles of scientific management*: Harper and Row.
- Taylor, F.W. (1911). *Shop Management*. New York, London, Harper & Brothers.
- Trice, H. & Beyer, J. (1993). *The cultures of work organisations*. Englewood Cliffs: Prentice Hall.
- Trompenaars, F., Hampden-Turner, C. (2004). *Managing People Across Cultures*. Chichester: Capstone.
- Weber, M. (1947). *The Theory of Social and Economic Organization*. New York: Oxford University Press.
- Westerman, J., Beekun, R., Stedham, Y., & Yamamura, J. (2007). Peers versus National Culture: An Analysis of Antecedents to Ethical Decision-Making. *Journal of Business Ethics*, 75(3).
- Witzel, M. (2012). *A History of Management Thought*. Oxon: Routledge.
- Wojčák, E. et al. (2017). *Manažment*. Bratislava, Ofprint.

# Innovative Development in Agriculture 4.0 and the Use of Smart Technologies

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## Abstract

Industry 4.0 represents ongoing automation of traditional production and industrial procedures using the most modern intelligent technologies. There has been an evolution in the industrial field with a societal one reaching all areas of people's lives around the world. Production processes are optimized through devices and technologies that can communicate with each other and work together, which increases overall productivity in the company. Industry 4.0 is connected to a digitization trend that is oriented towards automation and production and building "smart factories" that work on the basis of cyber-physical systems, while they use autonomous machine learning. Agriculture faces the same challenge to implement an effective system as automotive or engineering industry. It is expected that the competitiveness of the industry will largely depend on the implementation of the digital system. Slovakia has not yet fully used these possibilities, which reduce its competitiveness and encourage the expansion of foreign enterprises on the Slovak market. The support for agricultural production in the form of direct payments increases every year, and more than 80% of the funding is allocated to crop production. In order to achieve the goals of digitization, it is necessary to link industrial policy with scientific, educational, technical and innovation policy.

Keywords: Agriculture 4.0; digitization; innovations; smart technologies.

Article Classification: Research article

## 1 Introduction

The fourth industrial revolution is a conceptual term that defines and explicates technological changes occurred in the production, economy, functioning of businesses and another important societal areas which influence the current world. It is partial conception which supplements broader subject of affecting the emergence of technological changes which started running the transformation of society since 18th century, also known as other industrial revolutions. As the concept of industrial revolutions is significantly extensive, together with growing number of studies examining the topic in a more detailed way, there were additional derivatives emerging from the

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definitions of industrial revolutions, separately the fourth industrial revolution (also known as Industry 4.0). One of these areas, which is studied exclusively, is the field of farming and agriculture, which is a key sector that provides food for increasing population and therefore plays an important role in the livelihood of civilization. Thus, there exists the concept of so-called Agriculture 4.0, which, similarly to the topic of Industry 4.0, describes changes influencing latest technological status in the area of agriculture (Beluhova-Uzunova, Dunchev, 2022). Correspondingly to the industrial revolutions, Agriculture 4.0 is complemented by prior concepts of technological changes in agriculture. In addition, there is also a concept of Agriculture 5.0, which represents the perception of future of heading of changes in agriculture. For instance, it describes different robotic systems which will form the operating of farms. Also, it studies the electrification of agricultural vehicles, while some studies claim that on-site renewable energy production could be a possible strategy for efficiency enhancement and energy independence to deliver the power necessary for agriculture.

### ***Concept of Agriculture 4.0***

As it is summarized in Figure 1, Agriculture 4.0 has predecessors in concepts of Agriculture 3.0, Agriculture 2.0 and Agriculture 1.0, while Agriculture 5.0 is considered as its successor. In a simplified manner, it is possible to assign the same principle to the concept of Industry 4.0 (with Industry 3.0, Industry 2.0 and Industry 1.0 as its predecessors and Industry 5.0 as its successor), whose idea was transferred to the Agriculture 4.0. Every temporal concept of farming procedural changes has its specific set of technologies used during them.

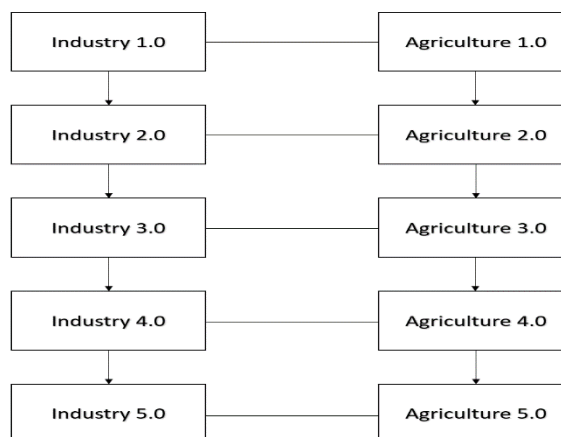


Figure 1 The concept of Agriculture 4.0

Agriculture 1.0, starting around the second half of 18th century (from the point of view of academic research), is characterized mainly by using indigenous tools (for instance the spade, the plough or the seeder) manual work and animal power. In the next stage of Agriculture 2.0, starting around the end of 19th century, there is an occurring of agricultural machinery (for example various forms of tiller, mechanical thresher or mower), first types of tractors, fertilizers and pesticides. With Agriculture 3.0, starting in the second half of 20th century, it is possible to find first signs of production monitoring in farms, usage of Global positioning system in agriculture or variable rate applications (which use to help farmers in order to map different factors about their soil). After this evolution of agricultural technological development, there is a current stage of

Agriculture 4.0, which started in 21st century and admittedly it accordingly has its own technological specifications defining the whole concept.

According to some studies, Agriculture 4.0 goes outside the field variability examination all the way to manage farms based on in-depth knowledge of specific contexts and situations, which are meant to create a value chain that entirely associates technologies and agricultural methods (Ghobadpour et al., 2022). Another view sums this up in proposing that Agriculture 4.0 uses the data to improve agricultural efficiency and provenance or transparency of food supplies (Quealy, Lynch, Hasan, 2022). There are numerous types of technologies that are used in Agriculture 4.0 helping in obtaining above mentioned aims. For instance, during the last years, there was higher rate recorded of Decision Support Systems (DSS) implementation, which are based on extracting mathematical data and resulting in giving precise conclusion to the farmer about what decision they should make operating on their farms. There is also rise of so-called Precision agriculture, which is data-driven approach to farm management designed to reduce the environmental footprint of farming (inputs such as water, pesticides and artificial fertilizers) and therefore it aims to increase the farming productivity too (Lesian Keniyo, 2022). Among many other technologies used in Agriculture 4.0, it is conducive to mention the technology of Smart Irrigation System which thanks to detailed data processing can reduce the effort of farmer almost entirely with activities such as watering or landscape monitoring (Khan et al., 2022).

### ***Smart technologies in Agriculture 4.0***

Some researchers found out that by 2050, farming will have to provide 70% more food than it does today (Beluhova-Uzunova, Dunchev, 2022). Technologies used in Agriculture 4.0 should help to achieve this result, but there are various discussions if trend which is set today, is actually aimed in a suitable way for accomplishing it. There are several statistics which bring thought-provoking views on how technologies in Agriculture 4.0 help farmers and their production.

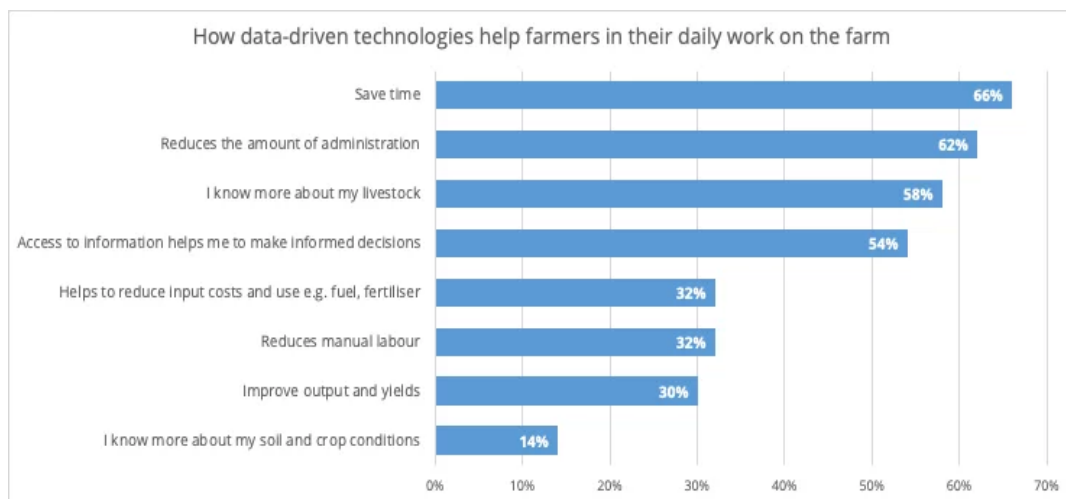


Figure 2 Positive aspects of the use of technologies; source: The Irish Farmers' Association

As it is possible to see in Figure 2, findings provided by Irish Farmers Association, most of the output that farmers get from Agriculture 4.0 technologies is based on information that save time, reduce the amount of administration and provide better

knowledge about livestock of the farmers. The outcome from these technologies does not necessarily increase output itself of farmers, as this factor is among last ranks from this statistic.

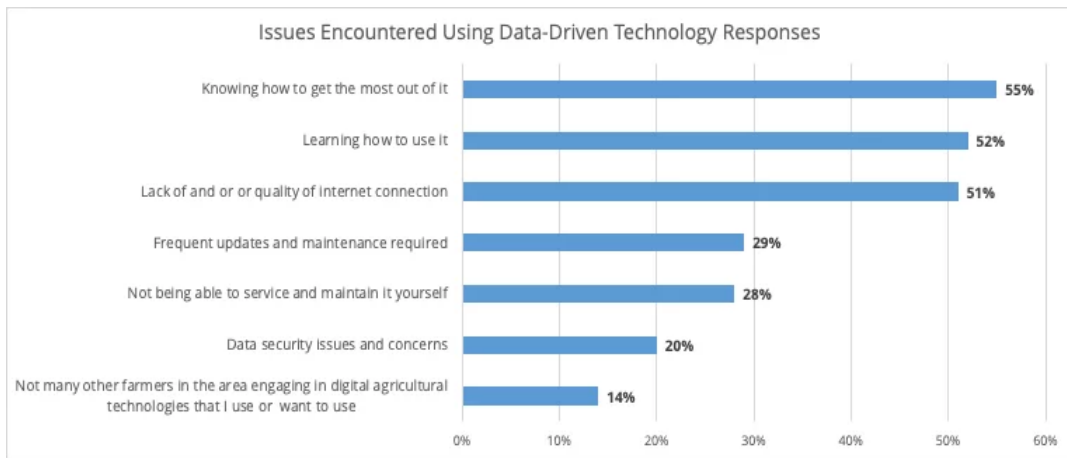


Figure 3 Negative aspects of the use of technologies; source: The Irish Farmers' Association

Another findings published by Irish Farmers' Association describes that even though farmers get a lot of quality information, they lack the knowledge on usage of these data. Research that was made on this topic found out that farmers struggle with the fact, that the cost of assembly for Agriculture 4.0 is too high, considering the fact, that the most beneficial outcome from it is data in the first place, but not causally the higher output too. The question is offered, whether for the future it would aid to help farmers work with the data obtained from Agriculture 4.0 in order to use them for increasing their output or it would be more beneficial to try to lead the development of technologies to increase the productivity instead of gaining data. However, the fact that the concept of Agriculture 4.0 does not need to fulfil the potential of rapid production increasement stays actual according to reached results.

In agricultural enterprises, following machine technologies could be used depending on their financial and technological possibilities:

- automated production - its content is a summary of the physical production of equipped objects digital technologies - sensors, GPS, drones;
- manipulators - technical devices controlled remotely by people;
- robotics - autonomous technical devices manage clearly defined routines functions according to the established program, e.g. production of spare parts, assembly, labeling, sorting and transportation.

Generally, the industrial and digital technologies are expanding in global phenomenon with an emphasis on digitalization, automation, robotics in various operations, related to environmental protection, soil cultivation management, optimization of crops nutrition, crop tending, etc. The benefit of automated robotic systems is the enhancement of their flexibility, concerning farmer decision making to select the optimal technological arrangements during the production process of the field crops, which entails not only economic but also environmental and social aspects. (Palkova et al., 2022) The knowledge about advanced agricultural technologies have therefore become key for the farmers and the success factor, throughout the process of cultivation and harvest.

Organizations will benefit from the new knowledge in the near future that will need to be brought into the internal environment of the organization constantly. According to some authors (Stachová et al., 2018) this will require cooperation with the external environment, and the resulting new education opportunities built on cooperation with external partners, organizations, and educational institutions. Innovations as essential factors in adapting to major changes in the environment will be key in all organizational processes, including educational. This is closely linked to area of Intellectual capital, more precisely with Relational capital, that can further enhance the benefits of Industry 4.0 implementation. (Cabrita et al., 2019) Relational capital is the knowledge embedded in the relationships with external environment – with any stakeholder that influences the organization's life, including customers, suppliers, employees, governments, partners, other stakeholders and, sometimes, even competitors. To build relational capital, it is essential to develop and maintain high-quality relationships with these stakeholders.

## **2 Material and methods**

The aim of the research was to determine the possibilities of innovative development in Slovakia towards the use of smart technologies. The intention was on identifying the usage of smart technologies in agriculture. The paper is based on a research method that involves compiling existing data sourced from a variety of channels. This includes mostly external sources (such as government statistics, organizational bodies, organizational reports, research papers etc.).

We used The Green Paper published by Ministry of Agriculture and Rural Development of the Slovak Republic which informs about the situation in the agriculture, food sector and forestry in Slovakia. Another useful relevant document was the Research and Innovation Strategy for Smart Specialization of the Slovak Republic 2021-2027 (hereinafter only as "SK RIS3 2021+") by Ministry of Investments, Regional Development and Informatization of the SR. After analyzing the documents, we were able to specify problematic areas to be studied more in details for further research purposes. We divided these areas into following:

- the level of use of smart technologies in Slovak agriculture companies;
- the positive and negative aspects of the usage of these smart technologies;
- the preparedness of education system towards the use of smart technologies;
- building partnership possibilities to face Industry 4.0 challenges.

## **3 Results**

As the implementation of Industry 4.0 is a necessity for all industrial facilities that want to maintain their competitive advantage, we focused our attention on the agriculture sector. Firstly, we summed up the innovative development in Slovakia according to research projects and then we narrowed our focus on agriculture as a part of industry in Slovakia.

### ***3.1 The innovative development in Slovakia***

Currently, the Slovak Republic is at the beginning of the fourth industrial revolution. It is necessary for Slovakia to focus on the main challenges and problems that hinder Slovakia business entities and can hinder them in using the potential arising from the Industry 4.0. In order to achieve the goals of digitization, it is necessary to link

industrial policy with scientific, educational, technical and innovation policy. The Slovak Republic must focus on the following areas:

- physical and IT infrastructure support;
- support of educational policy;
- protection of intellectual property;
- legal system support - data protection, trade restrictions, etc.;
- change in the field of labor law policy (working conditions, working hours, etc.).

Slovakia as a country has the potential to massively deploy the elements of Industry 4.0 to practice. Slovak republic belongs to the countries where industry dominates. It produces more than 25% of GDP. According to the Green report, the trends in the development of the basic macroeconomic indicators (gross value added, employment, average monthly wage, foreign trade) of the Slovak Republic's economy and its sectors – mainly the agriculture/ crop cultivation, animal production, hunting and related services; forestry and logging; fishing and aquaculture – were reflected in year-on-year changes in the share of the agriculture in Slovak Republic's economy in 2020 as follows:

- the share of agriculture in Slovak Republic's economy decreased for these indicators: GDP at current prices (0.34 pp), gross production at current prices (0.12 pp), and for employment (0.03 pp),
- the share of agriculture in Slovak Republic's economy increased in terms of the average wage (1.50 pp),
- the share of the agri-food foreign trade of the Slovak Republic in Slovak Republic's foreign trade increased in terms of total import (0.61 pp) and total export (0.42 pp) as well.

The document SK RIS3 2021+ also foresees the strengthening of cooperation between research and development organisations in agriculture and the environment in order to foster enterprises to introduce innovative solutions, to advance finalisation of agri-food production, to increase quality, safety and self-sufficiency in the production of quality, nutritious, safe and healthy food, to create innovative and healthy food and non-food products, to use waste from production in a circular way and as a raw material for further processing, etc. Biomass in the context of the domain is understood as a biological source of production from and on land, it is not a simplistic linear concept of biomass as a resource for energy use, which was used in the past and disregarded circular solutions and a cascading use of biomass. Digital technologies are a cross-cutting area as innovation and the creation of higher value-added products are often achieved precisely through digitalisation and intelligent technologies such as Artificial Intelligence (AI), 5G or distributed ledger technologies (DLT).

Today, bioeconomy sectors have a strong innovation potential because they use a number of scientific fields, such as agronomy, ecology and some social sciences. Individual branches of the bioeconomy also use key industrial and supporting technologies - nanotechnologies, biotechnology, information and communication technologies. (Blicklingová, 2018) Bioeconomy brings changes not only to the processes, procedures and products used, but also consumer behavior. In connection with Industry 4.0, it can be about more open innovations for easy sharing of information and data.

In the bioeconomy sector, the most important initiative is the so-called Bioeconomy Cluster (hereinafter referred to as BEC) supporting the cooperation of various actors in the bioeconomy sectors and makes it easier to connect research and practice. It plays a role in the development of an intelligent bioeconomy - the important



role of BEC, which today implements many activities to support the development of this sector. Based on the implementation of innovation audits, BEC identifies business entities that have development potential. BEC also offers its members advice related to existing national and international financial instruments for financing innovative projects and ideas. (Blicklingová, 2018)

BEC has established cooperation with The Transfer Center of the Slovak University of Agriculture in Nitra and AgroBioTech Research Centre. BEC also uses connections to the network of transfer centers, the so-called Danube Transfer Center Network, which have been established so far in the cities of Novi Sad (Serbia), Cluj-Napoca and Bucharest (Romania), Maribor (Slovenia), Pannon (Hungary), Vukovar (Croatia), Ruse (Bulgaria) and in Nitra. Cooperation with technology transfer centers brings new opportunities for BEC members and the development of their competitiveness, as it brings solutions for their specific problems through innovation activities, technology transfer and knowledge between research and development, academic and business environment. Thanks to them, new partnerships have been created. BEC during implementation of the BIOSMART project involved in the preparation many international projects. These are the following projects: (Bioeconomy Cluster, 2018)

- FarmSafeNet - focuses on safety and health on the farm;
- TAITIN – project focusing on innovative consulting and the agro-sector together with bioeconomy;
- BIOREG - focuses on education in the field of bioeconomy;
- SMART AKIS 2.0 - supports intelligent innovation and knowledge systems in agriculture;
- KETGATE - focuses on helping small and medium-sized businesses access to KET (Key Enabling Technologies) in the areas of food, health and transport.

The bioeconomy is expected to drive the transition to a more sustainable future economy, by solving several major global challenges, which are food security, climate change and resource scarcity (including drinking water). Growing global demand above all for food, but also for raw materials and renewable energy, it requires innovative development in primary sectors. Both technological innovations and innovative methods will be more effective from the point of view of using resources to increase productivity in agriculture, forestry and "aquaculture" without jeopardizing biodiversity and the carrying capacity of planet Earth. Bioeconomy has to use new resources by building on renewable biomass through introduction of innovative production technologies and elements of Industry 4.0 (Lewandowski, 2018).

### ***3.2 The use of smart technologies in Agriculture in Slovakia***

Experience from the private sector shows that the companies are not sufficiently motivated to create new innovations and they are not adequately informed about possible call and projects. Even despite the fact that start-ups create jobs, bring investments and can lead to development of big companies and vice versa, big companies are supporting development and growth of start-ups, the government is not sufficiently supporting existing start-ups, neither occurrence of others, and it is not attracting innovative companies from abroad to relocate to Slovakia.

The public R&D infrastructure in Slovakia consists of highly competitive technical faculties at universities located all around the country, as well as of a wide network of institutes of the Slovak Academy of Sciences. Strong cooperation partnerships of both local and foreign companies, universities and research institutions should be

strengthened and be a key factor for Slovak R&D ecosystem. In the past decade, Slovak R&D has experienced a significant growth, establishing various centres of excellence, research and technology centres. We have already mentioned some, connected to the universities. The R&D expenditures in Slovakia are driven mainly by the business sector and technical sciences. (Sario, 2021)

Even in Slovakia, we already have specialized production of vegetables (tomatoes, peppers, cucumbers), where cultivation takes place in closed spaces on a hydroponic substrate, in conditions with computer-controlled dosing of nutrients, with controlled temperature and air humidity. It is only a matter of time before growers will find it worthwhile to replace fruit picking workers with robots. Similarly, robots for soil processing, sowing, fertilizing, protection and cultivation are gradually entering production. So far, they are also used in practice in the production of vegetables, but their extension to field conditions is only a matter of time. Today, the preparation of information in the field is provided by satellite images available to everyone, or specially created materials taken from drones. (Rataj, 2021) These unmanned UAVs (Unmanned Aerial Vehicles) can also perform a locally targeted application. There are many impulses for further development. From the effort to achieve efficient production through increased environmental pressures and measures to ensure a sustainable environment to the need to produce a sufficient amount of high-quality food (FAO estimates that by 2050 the world will need to produce 70 percent food more than at present).

Fulfillment of the stated goals will require qualified personnel. The labor force in the agricultural sector is decreasing (not only in Slovakia) and the number of jobs for simple manual work is also decreasing. (Rataj, 2021)

#### **4 Discussion and conclusion**

According to previous research, Slovak agricultural units possess of enormous potential regarding implementation of Industry 4.0 technologies into their operational processes. When observing a competition businesses from studies abroad, Slovak agricultural ecosystem is able to become more competitive in case of accurate usage of these technologies, which is often struggling for foreign producers. It might be helpful for farmers to understand how technologies of Agriculture 4.0 can help them to increase the quality and quantity of their production by usage of mentioned technologies.

In general, it is possible to expect that companies, which want to succeed, need to innovate and digitalise their processes and, predominantly, offer services and products with high added value. Therefore, it is important for such companies to receive the following support:

- Support to test and create new business models,
- Support to introduce AI solutions in business processes,
- Support in access to human capital, knowledge and technologies,
- And, last but not least, financial support during the entire innovation cycle from applied research up to innovations scaling.

Best practices from abroad show that an effective cooperation between industry, entrepreneurs, scientific facilities, universities and public administration entities is the key for Slovakia to produce high quality science, research and innovations that can be implemented into practice and, upon that, made accessible to citizens in order to improve their lives as well as improve the general economic performance of the country. Only this knowledge transfer can ensure that the number of qualified labor force will not decrease in the following years and that the attractiveness of agriculture study programs will grow.

Thanks to continuous deployment of automated technologies, majority of industrial and agricultural sectors will experience a growing shift in the nature of skills. When working with new technologies, employees must be able to assume complex, less automated tasks, such as fix problems, come up with new solutions and approaches and think critically.

### **Acknowledgements**

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### **References**

- Beluhova-Uzunova, R., and Dunchev D. (2022), "Agriculture 4.0 – Concepts, Technologies and Prospects." *Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development*, Vol. 22, pp. 97-104.
- Blicklingová, K. et al. (2018), "Stratégia Bioeconomy clustra pre rozvoj inteligentného biohospodárstva: Priemysel 4.0 a biohospodárstvo." Nitra: Bioeconomy Cluster. p. 62.
- Cabrita, M. R., et al. (2019). "Enhancing the Benefits of Industry 4.0 from Intellectual Capital: A Theoretical Approach." pp. 1581-1591. 10.1007/978-3-319-93351-1\_124.
- Cleary, E. (2020), *Factors Impacting Farmers' Adoption of Digital Agriculture*, The Irish Farmers' Association.
- Ghobadpour, A. et al. (2022), "Off-Road Electric Vehicles and Autonomous Robots in Agricultural Sector: Trends, Challenges, and Opportunities." *Vehicles*, Vol. 4, pp. 843-864.
- Khan, M. et al. (2022), "Smart Irrigation System for Agriculture 4.0." Vol. 2, pp. 411-418.
- Lesian Keniyo, R. (2022), "Precision agriculture." *Sustainable Agriculture*, Vol. 2, pp. 2-5.
- Lewandovski, I. (2018), "Bioeconomy: Shaping the Transition to a Sustainable, Biobased Economy." Verlag: Springer International Publishing. 356 p. ISBN 978-3-319-68151-1.
- Palkova, Z. et al. (2022), "Perspective of education in Agriculture 4.0 in selected countries in European Union and Palestine." *2022 8th International Conference on Energy Efficiency and Agricultural Engineering (EE&AE)*, pp. 1-6.
- Rataj, V. (2021), "Vývoj v poľnohospodárskej technike – čo nás čaká a zrejme neminie." Retrieved from <https://www.polnohospodar.sk/sk/polnohospodar-reader/vyvoj-v-polnohospodarskej-technike-co-nas-caka-a-zrejme-neminie/>
- Stachová, K. et al. (2019), "External Partnerships in Employee Education and Development as the Key to Facing Industry 4.0 Challenges." *Sustainability*, Vol. 11, pp. 345-364.
- Quealy, S., Lynch, P.J., and Hasan, N. (2022), *Agriculture 4.0, Digital Agritechnology*, Academic Press.

# The Use of Industry 4.0 Concepts and Technologies in Waste Management Sector

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## Abstract

Based on assumptions and prognoses of many experts, Industry 4.0 is expected to have a huge impact on all areas of society. It already affects many sectors. Significant changes are also predicted for the waste management sector, while this area is progressing rapidly due to high demands in terms of ecology and sustainability both on the part of the state and society. The process of collecting, processing and recycling waste has changed from the days of traditional methods and forms thanks to technology, intelligent systems, digitalization and automation. In the article, we present an evaluation of the use of the selected Industry 4.0 concepts and technologies in the waste management sector based on the research of companies operating in the waste management sector in Slovakia. Although the use of Industry 4.0 technologies is still on the low level, companies expect their situation to be improved within a five-year horizon.

Keywords: Industry 4.0; Waste management; Waste processing; Sustainability; Digitalization.

Article Classification: Research paper

## 1 Introduction

The Fourth Industrial Revolution, also referred to as Industry 4.0, poses a huge challenge to all areas of our lives, just as previous industrial revolutions did. This revolution is characterised by a high degree of automation, but also by interconnectivity and communication between individual systems and devices (Hlušková, 2016).

Industry 4.0 can also be characterised by large-scale technological transformations, artificial intelligence and the digital revolution. Technological innovation is expected to have a long-lasting effect on increasing efficiency as well as on production in countries around the world (Wang et al., 2020). These effects also influence

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the course of business processes, for example faster product innovation, smoother logistics and supply, intelligent data processing, the use of intelligent management systems, and so on (Papula et al., 2018).

The implementation of new ideas and practices is also visible in the waste management sector. The amount of waste produced is constantly increasing year after year. This trend currently represents a serious problem for the environment and also for human health. Within the waste management sector, a number of factors need to be taken into account in order to set up an optimal waste collection and waste treatment process, and these factors can vary not only across countries but also from one city/region to another (Monzambe et al., 2019).

The implementation of Industry 4.0 technologies, digitalization and IoT make sustainability in waste management more likely to be achieved, with more reliable, efficient and optimal results. The use of technology and digitalization brings many economic, social and environmental opportunities for companies in the waste management sector. A smart waste collection and waste treatment system is an automated, integrated and connected system that brings benefits and opportunities also to municipalities and cities where waste management is becoming a real challenge (Fatimah et al., 2020).

Waste bins and containers placed in public spaces, are often overflowing and smell unpleasantly. An efficient waste collection and waste treatment mechanism can not only make processes more efficient and optimised, but it can also reduce costs for businesses and municipalities and bring other benefits that can be classified into five dimensions - governmental, economic, social, environmental and technological (Chen et al., 2018) (Fatimah et al., 2020).

The implementation of smart waste management systems is still in its early stages (Fuss et al., 2018). Several Industry 4.0 concepts are currently being used within the waste management sector, of which the following can be mentioned:

- **Automated robots for waste sorting** – recycling and sorting waste is one of the ways to reduce waste production and help improve the environment (Mao et al., 2021). The efficiency and quality of recycling depend to a large extent on the purity and accuracy of the sorted materials. Accuracy, efficiency, cost savings, safety and speed are the reasons why manual processes are being replaced by automated equipment. Combined with intelligent sensors, robots can identify objects based on various characteristics. Sorting can be done based on material, shape, color or even a specific type of object (Rojko, 2016).
- **Internet of Things in waste management** – IoT includes digital tools such as RFID tags, sensors, wireless antennas, and other highly effective real-time innovations used in the sector that optimize and simplify waste collection. One of the solutions that technology providers have come up with is the so-called smart containers. Sensors of various types are installed in the containers: (Ali et al., 2020)
  - ultrasonic sensor, used to detect the fill level of the container,
  - flame detection sensor, used to warn of a fire inside the container,
  - sensor for measuring temperature and humidity, helps to prevent unwanted situations,
  - weight sensor, used to obtain the actual weight of the waste collected from the collection container.

Collected sensor data is transmitted through IoT networks to a server and cloud storage for further processing and analysis. In addition to the sensors inside the collection

container, tags on the outside of the container based on RFID technology are used to collect data. The entire waste collection process is thus fully automated, accurate and fast (Knoppova, 2020).

- **Cloud-based waste management** – Cloud technology and the provision of storage, databases and servers have a number of applications in the waste management sector. Cloud tools are used to store and process data from monitoring sensors and as a software solution for data management, record keeping and administration (Berg et al., 2020).
- **Big data analysis & data evaluation** – Data collection and analysis play an important role in the waste management sector, although its use may not be obvious at first glance, as data processing is often automated and occurs in background. Evaluating the collected data can help, for example, to adjust the frequency of emptying collection bins from specific collection points and thus optimise waste collection routes (Chauhan, 2021). Evaluated sensor data can also provide valuable information for automatic sorting lines. The technology has also found applications in landfill monitoring through drone data collection (European Environment Agency, 2021). Technology providers in the waste management sector offer a number of solutions in the form of software that collects and evaluates data and uses it to model and optimise processes (Berg et al., 2020).

## 2 Material and methods

The main goal of the research was to analyse the current state of use of selected Industry 4.0 concepts and technologies in the waste management sector.

The object of our research were companies operating in Slovakia in the waste management sector. We used a questionnaire survey to obtain data. To obtain an overview of Industry 4.0 and to develop the questions for the questionnaire survey, we used a literature research and previous published research in scientific databases and professional journals. The questionnaire was sent to 293 respondents from November 2021 to February 2022, with a return rate of 19.80%.

The final survey sample consisted of 58 respondents (companies in the waste management sector). The sample was determined based on the database of firms and organisations according to the SK NACE Statistical Classification of Economic Activities. In terms of company size, the sample consisted of 17% (10) micro companies (1-9 employees), 55% (32) small companies (10-49 employees), 22% (13) medium companies (50-249 employees) and 5% (3) large companies (more than 250 employees).

The sample consisted mainly of established companies with more than 10 years of history in the market (90%), 9% of companies with 5-10 years of history and the rest were companies with less than 5 years of history in the market. Descriptive statistics methods were used to evaluate the questionnaire survey data.

## 3 Results

Based on the literature review, we have identified several Industry 4.0 concepts, approaches and technologies in the context of waste management. We therefore asked respondents which of the Industry 4.0 technologies they use in their company. Among all the technologies, we listed those that have the largest representation in the waste management sector according to the literature reviewed, we also gave the respondents the opportunity to freely list other technologies that are represented in their company.

The results in Figure 1 show that the most represented technologies within the surveyed sample were intelligent data evaluation software and RFID technology for monitoring garbage bins and waste output. Respondents indicated that their company also uses weighing and waste tracking software, custom software for waste logging, biotechnology, and automatic fire suppression. Eleven respondents under the "other" option indicated that they do not have any of the technologies in place in their company or their systems are predominantly manual.

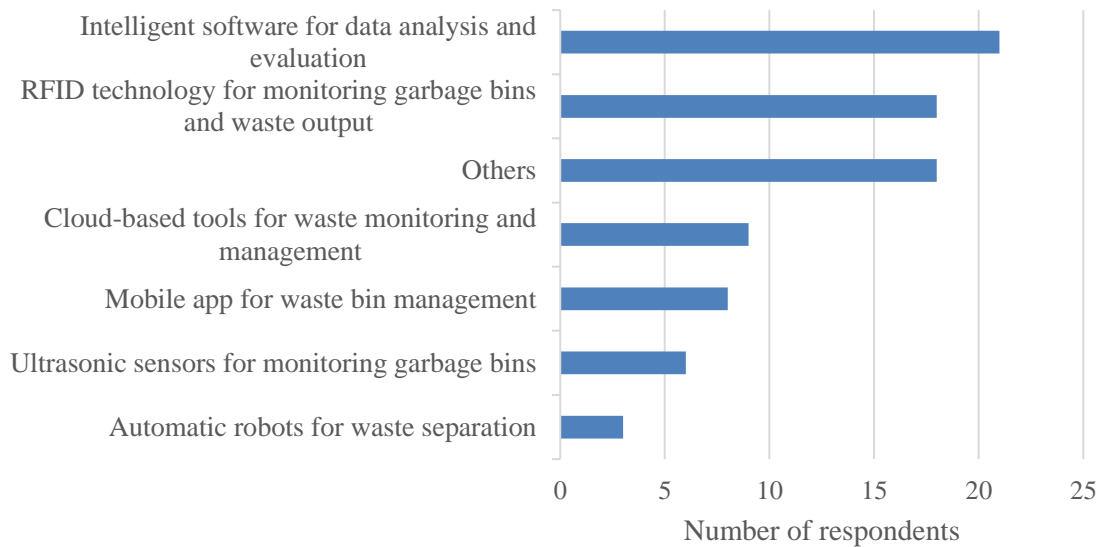


Figure 1 Technologies and concepts within Industry 4.0 respondents use in their companies

In the questionnaire survey, we also asked how respondents perceive the future of their companies in terms of the level of digitalization, and whether they expect it to be higher in 5 years' time. The majority of respondents foresee technological advances in the company and expect a higher to advanced level of digitalization in the future (Figure 2). Only 10% of companies do not expect any advancement in digitalization compared to today. The average value of the digitalization level of the surveyed companies over 5 years is 2.95, i.e. the companies expect a higher level of digitalization by one level compared to today.

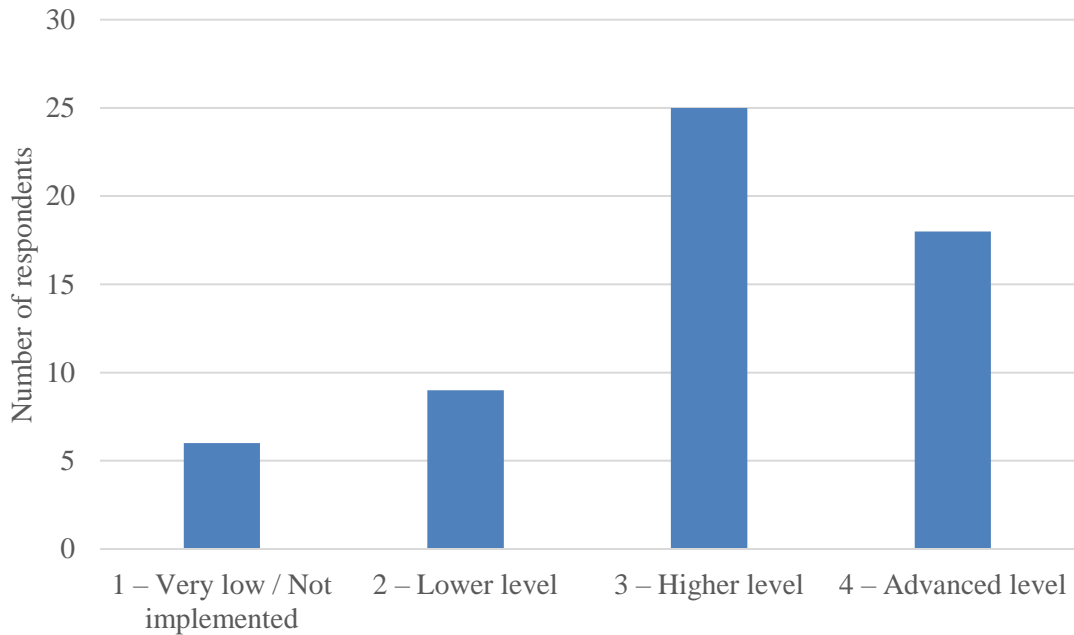


Figure 2 Expected level of digitalization of the surveyed companies in 5 years

As part of our survey, we also investigated opinions on the impact of the external environment on the implementation of Industry 4.0 in companies operating in the waste management sector. We were also interested in exploring the level of knowledge of companies and availability of information about the solutions and supporting technologies offered in this area from the external environment.

From the collected and evaluated data, it can be concluded that companies are aware of the possibilities of digitalization, as 24% of the respondents stated that they are well informed, 50% are more likely to have knowledge and information, and only 2% stated that they have no knowledge of the solutions offered by the external environment.

To better capture the current state of waste management companies in Slovakia, we were interested in respondents' perceptions of the number of available solutions (suppliers) that provide smart waste collection and waste treatment systems. Respondents from the surveyed sample answered as follows - 17% of the respondents thought that there is a shortage of suppliers of smart solutions, 40% could not answer the question and 43% said that there are enough solutions on the market.

Respondents also assessed the impact of the external environment on companies in the waste management sector in terms of digitalization of processes and implementation of new technologies. They were asked to indicate the level of impact exerted on their company from stakeholders on a rating scale from 1 (no impact) to 4 (high impact). The results are visualised in Figure 3, while the average values are presented in Table 1 below.



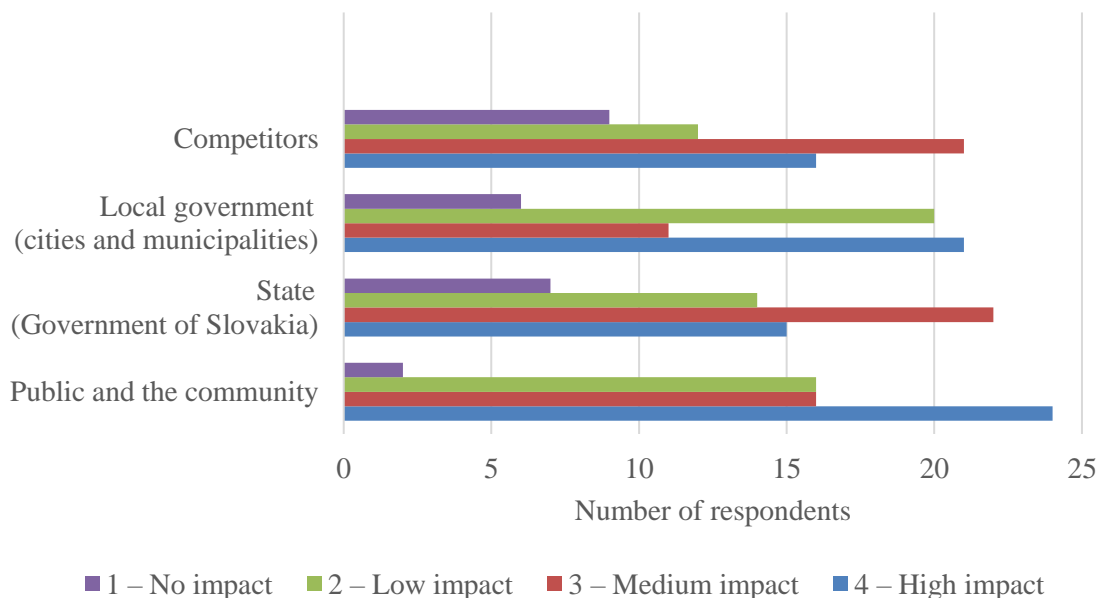


Figure 3 Level of impact on digitalization of processes and implementation of new technologies from external environment (stakeholders) on the surveyed companies

Table 1 Average values of level of impact from the external environment (stakeholders) on the surveyed companies

	Average value	Result
Competitors	2,24	Low impact
Local government (cities and municipalities)	2,19	Low impact
State (Government of Slovakia)	2,22	Low impact
Public and the community	1,93	Low impact

The results in Table 1 show that none of these external stakeholders has a major impact on the implementation of digital technologies in companies in the waste management sector.

#### 4 Discussion

The waste management sector is a sector traditionally focused on the physical and mechanical collection, processing, sorting, treatment and recycling of waste materials. The technologies and concepts associated with Industry 4.0 present opportunities for more efficient and economical waste management. Advances in technology development are enabling more digitalized and automated collection, sorting and recycling of waste (Borchard et al., 2021).

Based on the results and evaluation of the questionnaire survey data, we can evaluate the current level of use of Industry 4.0 concepts and technologies in Slovak companies in the waste management sector as low. The implementation of digital technologies and the implementation of Industry 4.0 elements is still in its very beginning in this sector.

Examples of specific digital technologies that are currently in use and are expected to have a major impact on the efficiency of the waste management sector in the future

include robotics, the Internet of Things, cloud storage provision, and big data analytics (European Environment Agency, 2021). As confirmed in our research, the most widely used digital technologies in this sector are RFID technologies for monitoring garbage bins and waste output, and intelligent software for data evaluation. The use of more advanced technologies, such as automated robots or ultrasonic sensors, is not yet well developed in this sector. However, companies expect their situation to improve over the next five years and foresee the implementation of new technologies and elements of Industry 4.0, which will ensure a higher level of digitalization and competitiveness in the sector.

For successful implementation and adoption of Industry 4.0 technologies, it is essential to know the benefits that digitalization will bring, but also to prepare for threats and problems that can slow down this process. However, companies are aware of the smart solutions offered in the market and consider the number of suppliers offering these technologies to be sufficient. We can also conclude that the external environment does not exert a significant impact on the implementation of Industry 4.0 technologies in companies in this sector. The successful implementation of Industry 4.0 technologies into a company brings the need to train employees to operate the technology. It is important to clarify the opportunities that new technologies bring and to emphasise the streamlining and simplification of internal procedures and practices within the company. Through systematic actions involving trained staff, companies can make business processes more efficient and increase productivity through Industry 4.0.

Sustainability and eco-friendly solutions are becoming more popular not only among the general public, but also in the field of business. A more sustainable approach to waste collection and separation is one of the goals of the Slovak Republic (Potočár, 2021). When introducing new technologies, companies should be aware of environmentally friendly and more sustainable solutions and should take social responsibility towards citizens in waste management with respect to the environment and also to the legislation.

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## References

- Ali, T. et al. (2020), "IoT-Based Smart Waste Bin Monitoring and Municipal Solid Waste Management System for Smart Cities", *Arabian Journal for Science and Engineering*, Vol. 45, pp. 10185–10198. <https://doi.org/10.1007/s13369-020-04637-w>
- Berg, H. et al. (2020), "Digital waste management", available at: <https://www.eionet.europa.eu/etcs/etc-wmge/products/etc-wmge-reports/digital-waste-management> (accessed 8 September 2022).
- Borchard, R. et al. (2021), "Digitalization of waste management: Insights from German private and public waste management firms", *Waste Management & Research*, Vol. 40 No. 6, pp. 775–792. <https://doi.org/10.1177/0734242X211029173>
- European Environment Agency (2021), "Digital technologies will deliver more efficient waste management in Europe", available at: <https://www.eea.europa.eu/themes/waste/waste-management/digital-technologies-will-deliver-more> (accessed 8 September 2022).

- Fatimah, Y. A. et al. (2020), "Industry 4.0 based sustainable circular economy approach for smart waste management system to achieve sustainable development goals: A case study of Indonesia", *Journal of Cleaner Production*, Vol. 269, pp. 5–6. <https://doi.org/10.1016/j.jclepro.2020.122263>
- Fuss, M. et al. (2018), "Designing a framework for municipal solid waste management towards sustainability in emerging economy countries – An application to a case study in Belo Horizonte (Brazil)", *Journal of Cleaner Production*, Vol. 178, pp. 655–664. <https://doi.org/10.1016/j.jclepro.2018.01.051>
- Hlušková, T. (2016), "Porovnanie stratégií Priemyslu 4.0 na Slovensku a vo vybraných krajinách", *Studia commercialia Bratislavensia*, Vol. 9 No. 35, pp. 278–292.
- Chauhan, M. (2021), "Applications of Big Data in Waste Management", available at: <https://www.analyticssteps.com/blogs/4-applications-big-data-waste-management> (accessed 8 September 2022).
- Chen, W. et al. (2018), "A Smart IoT System for Waste Management", 1st International Cognitive Cities Conference, Institute of Electrical and Electronics Engineers, Okinawa, pp. 202–203. <https://doi.org/10.1109/IC3.2018.00-24>
- Knoppova, J. (2020), "Co je RFID a aké využitie má v odpade?", available at: <https://www.sensoneo.sk/blog-o-smart-odpadoch/co-je-rfid-a-ake-vyuzitie-ma-v-odpade> (accessed 10 September 2022).
- Mao, L. et al. (2021), "Recycling waste classification using optimized convolutional neural network", *Conservation and Recycling*, Vol. 164, pp. 105–132. <https://doi.org/10.1016/j.resconrec.2020.105132>
- Monzambe, G. M. et al. (2019), "Statistical Analysis of Determinant Factors and Framework Development for the Optimal and Sustainable Design of Municipal Solid Waste Management Systems in the Context of Industry 4.0", *Procedia CIRP*, Vol. 84, pp. 245–250. <https://doi.org/10.1016/j.procir.2019.04.182>
- Papula, J. et al. (2018), *Ako začať úspešne podnikat'*. Wolters Kluwer, Prague, Czech Republic.
- Potočár, R. (2021), "Vláda prijala Program odpadového hospodárstva na roky 2021 – 2025", available at: <https://www.odpady-portal.sk/Dokument/106431/vlada-prijala-program-odpadoveho-hospodarstva-na-roky-2021-2025-pripusta-aj-nove-zevo.aspx> (accessed 10 September 2022).
- Rojko, M. (2016), "Robot na triedenie odpadu nahrádza ľudí a znižuje náklady", available at: <https://www.odpady-portal.sk/Dokument/103308/robot-na-triedenie-odpadu-nahradza-ludi-a-znizuje-naklady.aspx> (accessed 10 September 2022).
- Wang, L. et al. (2020), "What nurtures fourth industrial revolution? An investigation of economic and social determinants of technological innovation in advanced economies", *Technological Forecasting and Social Change*, Vol. 161, pp. 1–7. <https://doi.org/10.1016/j.techfore.2020.120305>

## **Session D**

# **Entrepreneurship in the Era of Digitalization**

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## The Digital Transformation of Human Resource Management in Greece. A Critical Review

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### Abstract

The development of digital technologies and their multiple applications has brought about changes and upheavals at all levels of operation and businesses, consumers, society and citizens. These conditions lead to the transformation of industries, markets, organizations and companies, the so-called digital transformation. The management of human resources in both public and private sector could not be unaffected by the digital transformation. Digital transformation should not be seen primarily as a matter of digital technologies, tools and instruments, but equally as a change management project. This finding is of particular relevance to Greek society, economy and business community, which are still lagging behind in the adoption of digital technologies, digital maturity and readiness, but also entrenched practices and attitudes that are not conducive to flexibility, extroversion and adaptability. Changes at social, economic and technological levels are under constant pressure and require individuals to develop skills that will enable them to adapt and at the same time integrate smoothly into ever-changing circumstances. The literature review concerns public organizations in Greece, where a new challenge, digital transformation, has come to the forefront mainly due to the covid-19 pandemic. Human resource management is significantly determined by the skills possessed by employees in digital technologies and indeed it is expected that excellent users of digital technologies will take up senior positions as digital transformation will be the key to the evolution of public sector organisations. The article will examine the implementation of digital transformation in the field of human resource management, while referring to the digital state of Greek society and the changes of digital transformation during the COVID-19 pandemic. Finally, some thoughts and suggestions for the coming Quantum Era which will affect and literally change our known world, have been discussed.

Keywords : Digital Transformation, Organizational Development, Quantum Computing, Organizational Performance

Article Classification: Research article

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## 1 Introduction

In the late 1990s and early 2000s, the researchers were still trying to define the boundaries, the scope and the fundamental definitions of Human Resource Development (HRD) lacking consensus on the definition of HRD even within any researcher's definitions. Instead, the researchers agreed about the key components of the field, learning (Ruona, 2016, 2000a) and training (Ghosh et al., 2013). Many researchers argued whether HRD could be regarded as profession (et al., 2003, Saks 2012). In this effort, Freidson (2001) outlined the five elements of professionalism and these elements include specialized work, exclusive jurisdiction, sheltered position, formal training by occupation and ideology of doing good and quality (Ruona, 2016).

The concept of human resources has a relatively short history in Greece both in academic and professional sector. However, the presence of multinational companies in Greece, combined with the ever-changing business and financial environments, added additional incentives for most Greek companies to adopt more modern human resource management practices, with the ultimate goal of ensuring their survival and remaining competitive in the modern work environment (Prouska, 2006).

Since then, many human resources interventions, such as the management of electronic HRM (Human Resource Management), e-learning, were either not available or were unknown to Greek organizations. Nevertheless, the majority of organizations later began to design and implement human resources practices or to ensure existing practices, in relation to recruitment and selection, employee training and development, employee rewards, communication, as well as general administration (Patiniotis & Stavroulakis, 1997).

In general, training programs not only develop the skills and digital skills of employees, but also motivate an organization to make greater use of its human resources in order to gain a competitive advantage. Therefore, it appears mandatory for the company to design effective training programs for its executives, in order to enhance their knowledge and capabilities, in an environment where knowledge is constantly changing and enriched with innovations (Jie, 2005). Corporate executives who are properly trained to meet customer requirements receive greater satisfaction in performing their job duties (Tsai et al., 2007). Training is an important tool for increasing job satisfaction, as long as the better performance of employees goes hand in hand with appreciation from leadership, therefore they feel more adapted to their duties (Rowden, 2002).

It is worth noting that there is a growing demand for modernization of human resources departments, not only in relation to the operation of the company, but also for the design and shaping of its corporate strategy (Prouska & Kapsali, 2011). To date, however, in many organizations, human resources policies and strategies are not implemented through strategy and proactive approach, while maintaining an administrative and reactive role (Yannakourou & Tsimpoukis, 2014).

At the same time, the new leadership should have the ability to enhance the mental mood of employees. It is necessary for them to play the role of advisor in order to be able to provide the tools, advice and resources for the success of the organization. Industry leaders in the digital age should have the ability to promote a friendly working climate, combined with the values of camaraderie, solidarity, respect, with the ultimate goal of motivating employees, especially the talented, to perform to their fullest (Dries, 2013; Festinga et al, 2013).

Furthermore, the maintenance of healthy employee relationships in an organization is a prerequisite for any business or organization in order to achieve growth and long-term success (Sequeira & Dhriti, 2015).

Digital transformation technologies in Greece are performing comparatively well in the areas of productivity and new entrepreneurship, as well as in research and development. On the other, however, the contribution of digital transformation to employment, extroversion and public services certainly needs to be strengthened. Are considered necessary, a clear strategy, the presence of incentives, improvement programmes, a clear legislative and regulatory framework and the production of "talent" in the form of well-trained higher education graduates in areas related to digital transformation (SEV, 2019).

This article does not present a systematic literature review but several studies that can be considered applicable.

The research questions that were caught and gained significance during the literature review are the following:

- What types of research goals did technology studies situated in HRD pursue?
- Over the past 10 years, in what areas and to what extent do technology studies situated in HRD comply with or deviate from the DBR cycle?
- How will the digital transformation affect the new generation of workers?
- How will the digital transformation affect the Human Resource Management?
- Which is the progress of Human Resource Management in Greece?
- How COVID-19 pandemic affected the digital transformation?

The rest of the paper is organized as follows. In Section 2 the Digital Transformation and the Digital Transformation Bible is briefly presented while in Section 3 how Human Resources are involved to the Digital Transformation discussed. Section 4, the status and the challenges in the case of Greece is described and in Section 5, how the Covid-19 Pandemic case influenced the necessity to adopt new digital tools introduced. In Section 6, some future thoughts about Quantum Computing are presented, and finally, we conclude this work in Section 7.

A literature review was used to achieve the objectives of the introduction and to provide a comprehensive approach to the topic. The literature review is based on secondary publications and helps to achieve comparison and grouping of the topics under study and requires critical appraisal and self-reflection. Documented views are presented and new, innovative practices are sought. Texts, studies, reports, articles and publications relevant to the subject matter are selected.

We are gradually moving from a general view of HR to a more specific one based on the implementation of e-Government principles but it should be stressed that the human being remains at the centre of the view.

## **2 Digital Transformation and the Digital Transformation Bible**

The first period of digital transformation appeared in the 1980s, when the terms technology and information technology were introduced, but also due to further automation through e-government. Computers are becoming an essential tool in people's lives and the internet is being introduced into their professional lives. Globally, access to information has become easier and faster. Several processes were automated and in many cases human labor was replaced. New technologies, such as artificial intelligence, were intensively applied and formed the backbone of the second phase of digital transformation (Tsekoura 2018; Brynjolfsson & McAfee, 2016).

The beginning of the second digital transformation is announced with the technical integration of the physical systems of cyberspace in the production, administration and use of the "Internet of Things" and services in the same processes (CPS : Cyber Physical System). Internet connections of all kinds and categories are

clearly defined through the CPS. More specifically, the term Cyber Physical System refers to the consequences of the manner in which goods and services are produced, the sources of value creation and knowledge for businesses, in business models and finally in the restructuring of the work environment (Tsekoura, 2018). The transition of Artificial Intelligence in the service sector will also mark the noticeable difference of the "Fourth Industrial Revolution" (Tsekoura, 2018).

Digital transformation refers to the society of economics and knowledge and develops the internationalization, the innovation, new ideas and successes (Evans, 2019). The first phase of the Industrial Revolution, in the 18th century, was based on handicrafts and industrialization. The second phase in the late 19th century in the United States was based on electricity - typical examples of this period were Charlie Chaplin's films "Modern Times" and "City Lights". The third phase of the Industrial Revolution was based on information technology, the Internet, and the widespread use of computers. Finally, the most recent phase - the Industrial Revolution 4.0 - refers to the phase of automation and data exchange in production technologies and includes cloud computing, the Internet of Things, artificial intelligence and many others (Stamkos, 2019).

The "Digital Transformation Book" describes all the necessary interventions in the technological infrastructure of the state, in the education and training of the population in order to ensure the necessary digital skills/abilities. At the same time, the utilization of technology in public administration (and in countries such as Greece) is ensured. Its dominant act is to present and highlight the vision, philosophy and goals of the national strategy that refer to the digital transformation of our country.<sup>1</sup>

The digital transformation is gradually leading to the creation of a new competitive and flexible generation of workers, a generation that demands more motivation to attract them, retain jobs and ultimately grow. At the same time, these employees seek to harmonize their personal and professional lives. The result of this two-way relationship is that the development of digital tools will contribute to the further utilization of human capital. Deloitte research (SEV, 2019) presents future initiatives and tools that will help utilize the talents of human resources through digital transformation. Such tools are knowledge management platforms, evaluation systems, feedback, remote work tools, human resource management information systems and more. The era of digital transformation requires the use of corporate social networking platforms, the widespread use of elearning and the end of the application of knowledge management and the dissemination of all necessary information to participants (SEV, 2019).

The digital transformation aims at the triptych "man, data and processes", so that the organization becomes competitive. It is obvious that the main activity involved in any digital transformation effort is Human Resource Management. Following the rapid developments of the internet, it has led to designations such as intelligent IBD, electronic IBM (e-HRM / e-HRM) and online IBM (Marler, 2009). In recent years, data have become particularly important for digital transformation. These are extremely numerous, can be combined and used in a variety of ways and lead to quick and immediately applicable conclusions.

It is worth noting that there is an ever-increasing order for the reform of the Human Resources Divisions, in terms of not only the operation of the company but also the strategic planning (Prouska & Kapsali, 2011). Despite the fact that to date, in many organizations, human resources policies and strategies are not implemented through

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<sup>1</sup>On line available on the website <https://digitalstrategy.gov.gr/>.



corporate strategy and approach, while maintaining a conservative and reactionary role for management (Yannakourou & Tsimpoukis, 2014).

It is found that in the coming years, there will be a significant increase in the number of companies that will prefer to develop actions by utilizing digital technologies and will choose a turn in their digital transformation. In fact, human resource management will be largely determined by the skills they will possess in digital technologies. Excellent users of digital technologies and internet marketing techniques, will take senior positions as executives of companies, because the digital transformation will be the key to the evolution of modern businesses (Voumvaki et al., 2020).

### **3 Human Resource Management**

The effects of the Industrial Revolution on Europe affected the demographic map either due to the active aging of the population or due to migration flows. At the same time, the modern age is revisiting outdated views of previous industrial revolutions. For example, we see that organizational charts are flexible, constantly reviewed, and new jobs and objects are created at the same time eliminating the old ones that have been obsolete due to the use of digital technologies and remote access (Vial, 2019). At the same time, the digital transformation will face the problem of demographic aging of the workforce, a workforce that has limited familiarity with new technologies, lack of education and training and reduced digital skills. The digital transformation contributes to human-computer interaction with robots and machines (Ustundag & Cevikcan, 2018). The new generation of employees who will replace the older ones must have the knowledge, skills and abilities to keep their job and at the same time grow through it (Szymczyk, 2020; Vial, 2019). The complementary functions of smart businesses refer to a series of processes such as knowledge management and real time management that includes three sub-categories (data analytics artificial intelligence, cloud, mobile technologies) (Ustundag & Cevikcan, 2018).

Data-driven ICT (intelligent ICT) is the scientific field that uses data in intelligent ways to achieve the most efficient utilization of human resources, achieving the goals of the organization. Excluding the efforts made by Greek organizations to intensify their interventions making their importance in Human Resource Management important, the crisis proved to have significant implications for the business environment and the professional life of employees, requiring them to meet higher standards. At the same time, the new economic conditions have brought about significant changes in the business world and the people who are its members (Aspridis et al, 2013). Cross-border acquisitions are now a popular business practice, representing an alternative growth strategy. A necessary condition for the above development strategy is the digital transformation of the company, in order to complete it with the desired result and to achieve a continuous technological communication from all the corporate executives (NDC, 2021).

In all the functions of Human Resources, various models of forecasting and training can be developed for both employees and the unemployed. An important tool that will contribute to the development of employees of all levels is the gamification of administrative functions, an innovative and pioneering tool that can strengthen the business strategy for the best results. For this reason, podcasts, iphone, soundcloud and others are used, among others (Georgiou et al, 2019; He, 2018). The benefits of gamification are varied both for the candidates and for the organization itself. The "immersion" and "commitment" caused by the game automatically reduces stress, motivates the candidate to complete the game while offering him a pleasant experience

with the image of the candidate remaining himself. For example, candidates involved in a recruitment process with a playful evaluation method are likely to form positive perceptions and be satisfied both with the process and, consequently, with the organization itself, creating incentives for those who influence the intentions and their behaviors.

A literature search using well-known digital libraries (Web of Science, Scopus and EBSCO) and limited to English-language publications (Murauski, 2020), showed that gaming can enhance employee commitment and motivation to have high levels of job satisfaction. In addition, it can increase the attitude of candidates towards the organization and perceive it as an attractive workplace. Finally, gaming has a positive impact on organizational characteristics such as: networking opportunity, fun and engaging environment and teamwork opportunity. No research has been found to measure the impact of gamification on employee training and knowledge management

#### **4 The Case of Greece**

The emergence of Human Resources Management is a relatively recent story for the Greek reality, both academically and professionally. With the entry of Greece into the European Union, in the early 1980s, significant changes took place. Businesses, and then public sector organizations, have adopted and sought to implement best human resources practices that have been used in the past, mainly by multinational corporations. At the same time, the emergence of multinational companies in Greece, in combination with the changing economic environment, added additional incentives to several companies to adopt modern human resource management practices ensure their survival and remain competitive in modern business and employment environment (Prouska, 2006 & 2011).

A case study of digital transformation was performed in Greek public sector and more specifically, in the local government in order to identify the current status and the dynamics of digital transformation, as well as the challenges of adopting digital technologies in this field (Bousdekis & Kardaras, 2020). The study was based on empirical data collected in a municipality of Attica region in Greece. Among the obstacles regarding the digital transformation of local government is the resistance to change, complex procedures and bureaucracy (Bousdekis & Kardaras, 2020). These findings are replicated in the context of a study conducted by the Association of Businesses and Industries of Greece. Indeed, Greek companies are facing obstacles in terms of implementing initiatives, carrying out projects and fulfilling investments in digital transformation. The four main obstacles are the inadequacy of the appropriate culture and resistance to change, the almost insufficient support, limited incentives from the state, the limitations of the existing technology infrastructure, and finally the lack of digital skills/know-how (BSE, 2005).

However, the progress in the digital transformation of central government of Greece is much better than this of the local government. In this direction, the Bible of Digital Transformation 2020 - 2025 of the Ministry of Digital Governance was adopted, which has as an immediate necessity and priority the process of development and transition of the country to the digital economy and society, optimizing its position in all indicators of digital the pending issues that appear from the 3rd Industrial Revolution (Fotakis & Selemis 2017).

Another application of digital transformation was reported in the case of designing a “digital city” model in the Municipality of Kavala (Charalabidis et al 2020). The ultimate goal of this project was the increase of social, economic and environmental

benefits that contribute to the improvement of the quality of life of the citizens, the services and the protection of the natural environment.

Except e-banking which is widely used by the majority of Greek businesses (73%) a large portion of Greek private businesses do not use digital technologies (Karekla et al. 2021). Based on the findings of Karekla et al (2021), among the Greek private businesses which use digital technologies, the most widely used digital technologies are the social networks (61%), synchronized and unsynchronized educational platforms, communicative technologies, time management technologies and emails (54%), as well as Cloud services (47%) and mobile applications (44%), digital marketing techniques such as Ads in Google, YouTube and social media (44%), data collection and analysis (43%) and e-commerce (34%). The percentage of the Greek businesses which use just a few digital technologies or not at all are higher than this reported in the international research by MIT Sloan and Deloitte (Kane et al. 2015). However, the Greek health care services and providers sector appears to have better rates than the international average (Karekla et al, 2021). Therefore, the levels of digital maturity of Greek businesses are low, as only 33% of these position themselves as digitally “maturing” (Karekla et al, 2021).

Regarding the most lacking abilities from companies’ leaders and employees from both early – and developing-stage businesses are the lack of realization that digital technologies can affect them in either positive or negative way, the intention to take initiatives and risks, the ability to understand the business dynamics and also teamwork and cooperation (Karekla et al, 2021).

## **5 The Application of Digital Transformation During the Covid-19 Pandemic**

Worth mentioning is the fact that the digital transformation has emerged as a necessity due to the recent pandemic. Large organizations and companies have demanded the improvement of technological infrastructure and digital transformation, in order to be able to fulfill their overall obligations to the fullest extent. Globally, countries have been forced to suspend large parts of their economies as a necessary and urgent solution to tackling the spread of the Covid-19 pandemic (Krasadaki, 2020). Therefore, the pandemic creates new challenges, one of which is the implementation of digital transformation in companies and various organizations. However, it is established that the digital transformation of companies should have been developed much earlier as a measure of crisis prevention and no longer as a dynamic solution for overcoming the crisis (Iossiphides et al, 2020). In fact, one research points out that the pandemic may have a lasting impact on employment-related behaviors and priorities (Baert et al, 2020).

## **6 Quantum Computing : A Sneak Peek at the (Distant?) Future**

While quantum mechanics is something old and mature, Quantum Computing (QC) (Nielsen & Chuang, 2011) is quite new. New algorithms and generally the theoretical approach of QC started back in 90s when quantum computing devices were only in the imagination of the researchers. But, the last decade big vendors like IBM, Google, Rigetti, Honeywell, Microsoft, Intel, Alibaba and many others started to design and implement quantum computers with many problems but real! In addition, Governments, Research centers and big vendors invest billions of dollars to this new technology. And here is the big thing! Quantum Computing Devices (QDC), when they will become accurate and reliable, will shake our World (Galanis et al., 2021). It is not

an evolution in Information Technology but it is a revolution which will transform us from the Information Era to a brand new Quantum Era. Almost all branches of science will be affected by this new technology. From Chemistry and Pharmacology to the prediction of climate change and Geology, quantum computing promises fast-paced and instantaneous solutions to problems that are still considered unsolvable. On the other hand, the Digital Transformation will be affected also and unfortunately not prepared and the same applies to Human Resources.

The main question is what exactly is QC and why it is so promising. Quantum computing actually take advantage of the principles of Quantum Mechanics and apply them constructing new algorithms and techniques. The main attributes of a QC which allow it to outperform a classical one are as follows:

- Super-position: Instead of bits which represent the memory unit in a classical computer which are either 0 or 1, qubits are used which can be both 0 and 1 at the same time (this is called as super-position) and qubits are represented as vectors in a Hilbert vector space. That is, qubit 0 =  $|0\rangle$  (ket zero) =  $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$  while  $|1\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ . And the interesting thing is when two or more qubits are combined into a quantum register they result a 4-

dimension vector, i.e.  $|00\rangle = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1 \end{pmatrix}$ , and so on. As a result of this attribute one can notice

that n qubits can store information equivalent to  $2^n$  bits and the most important is that this information can be accessed simultaneously in parallel. This observation leads to a dramatically reduce of time needed to perform calculations.

- Entanglement : One of the most distinguishing quantum phenomena that allows quantum states of one or many particles to be linked even if they are separated by a great distance. This is another quantum attribute with nothing analogous in classical systems.

- No-cloning theorem: it is impossible to make a copy of an unknown quantum state and this leads to the questioning of existing cryptographic techniques.

- Interference : intervening in quantum probabilities to lead to the correct answer.

- Decoherence : The ability of qubits to lose information over time (therefore the lifespan of information is important).

Thus, the above quantum mechanics attributes lead to the –so called- quantum supremacy which is the ability of QC to solve problems that cannot be solved by classical computers. As some of the many results of the quantum supremacy are the ability to search to enormous data pools within seconds (Grover L. K 1992) and the breaking of cryptographic keys again within seconds when a classical computer needs decades or even centuries (Shor, 1997).

So, when the Quantum Era will be alive and kicking many issues will arise positively and negatively. No cryptographic scheme will be secure resulting in the disclosure of personal and non-personal data worldwide. The World Wide Web, as we know it up to now, will be changed unless a chaotic outcome will be released. So new cryptographic algorithms must be rendered before the coming new era in order to be prepared. But since to date such techniques have not been developed and the quantum age is approaching dangerously fast, perhaps some safe havens should be created just in case such as a) data protection : organizations and businesses may need to start keeping their sensitive data offline while b) private networking should be considered and of course, c) quantum techniques for encrypting data is an immediate problem that must be solved before the upcoming quantum revolution.

On the other hand, search techniques will take off. In real time the HR office will be able to find the right person to hire in a very specific field while a new vaccine or drug will now be ready for production and use in a very short time.

## **7 Conclusion**

Digital transformation is an innovation whose integration into modern businesses is a one-way street. Innovation is the successful exploitation of new ideas. Indeed, many argue that innovation combined with technological change describes the evolutionary process and the introduction of new products, services, technical processes and organisational forms. And of course the way organisations are managed will be affected and will evolve. The influence of digital transformation on human resources management can be seen, among other things, in the preference for recruiting talented young people with expertise and very good knowledge of digital technology. We take it for granted that the foundations have been laid for the production of an information abundance that far exceeds what we have seen in the past.

It is undeniable that the technology also involves many risks, also due to the inexperience of users in the constantly evolving electronic information systems. As a result, the detection of risks becomes indistinguishable and more difficult. Despite the risks that may be involved, the universal use of electronic information systems in the public and private sectors can only bring positive benefits to all the citizens who benefit from them and their officials.

With the adoption of digital technology in organisations at the level of administrative functions, is expected that human resources in all management categories will be freed from outdated attitudes, perceptions and behaviours, which lead to dysfunctional administrative operations with a moderate to low degree of efficiency. Reforming these outdated attitudes with the introduction of digital transformation will allow for a more integrated and differentiated perception and will lead to a management reform that is more liberating for each person using it. Digital knowledge and the familiarity with electronic information sources and modern technologies, transformative learning will be the "lenses" for change in the overall vision and the transformation of administrative practices and functions, as well as patterns of employee behaviour. According to the latest Eurostat data, Greece is one of the oldest countries in the European Union and since we are moving into the 4th industrial revolution, this results in a continuous mobility which brings about changes in the form and content of work while at the same time pursuing job satisfaction and well-being of employees. In addition, on the one hand that the number of middle-aged workers and those approaching retirement is quite high, on the other hand, perhaps a management that aims to make positive use of valuable experience, inactive potential, the skills that workers possess and the application of transformative learning can make change more acceptable on an individual and organisational level.

Quantum Computing is now present and when reliable and large-scale quantum computers appear, our world will be shaken. A brief description of it is described in this paper as well as some suggestions for the very near future are given. Data security of computer systems will be the first priority to cope with the new era of States, Organizations and companies and the adoption of solutions such as the creation of private networks may be a solution until the discovery of new techniques and algorithms that will not be easy prey for quantum computing.

Finally, the shortage of specialized literature in the Greek language should be noticed and for this reason it is suggested that a future research should be conducted in the Greek public sector, regarding the level of development of technological transformation, the digital maturity of the public sector and the creation of a long-term vision on e-government issues.

## References

- Aspridis G., Kazantzi, D. and Kyriakou, D., (2013). Social networking websites and their effect in contemporary Human Resource Management. A research approach. *Mediterranean Journal of Social Science*, 4(1). 29 - 46.
- Babbie, E. (2018). *Εισαγωγή στην κοινωνική έρευνα*. 2η έκδοση, Αθήνα: Κριτική.
- Baert, S., Lippens, L. Moens, E., Weytjens, J. & Sterkens, P. (2020). The COVID-19 Crisis and Telework : A Research Survey on Experiences, Expectations and Hopes. IZA Discussion Paper No. 13229.
- Bousdekis, A., & Kardaras, D. (2020). Digital Transformation of Local Government: A Case Study from Greece. In 2020 IEEE 22nd Conference on Business Informatics CBI(2), 131-140.
- Hellenic Federation of Enterprises (SEV), (2005). The level of e-Government in Greece, Impact on competitiveness. Athens : Association of Businesses and Industries.
- Charalabidis, Y., Papadopoulos, C., & Davalas, A. (2020). Defining a digital city strategy in a collaborative way: the case of Kavala, Greece. In *Proceedings of the 13th International Conference on Theory and Practice of Electronic Governance*, 254-262.
- Dries, N. (2013). The psychology of talent management: A review and research agenda. *Human Resource Management Review*, 23, 272-285.
- NDC, (2021). The Digital Transformation of Greek companies, 2020: The impact of the COVID-19 pandemic. Athens: National Center for Documentation and Electronic Content.
- Evans, P., (2019). Making an HRD domain : Identity work in an online professional community. *Human Resource Development International*, 22:2, 116-139.
- Festinga, M., Schäfera, L. & Scullion, H. (2013). Talent management in medium-sized German companies: an explorative study and agenda for future research. *The International Journal of Human Resource Management*, 24(9), Special Issue: Talent management.
- Fotakis, K., and Selemis A., (2017). Greece in the face of the 4th Industrial Revolution. Study, Industrial Revolution. Study, Ministry of Foreign Affairs - Research & Innovation (in Greek).
- Freidson, E. (2001). *Professionalism: The third logic*. Chicago, IL: University of Chicago Press.
- Galanis I.P., Savvas I. K., Chernov A. V., and Butakova M. A., (2021). Reliability Testing, Noise and Error Correction of Real Quantum Computing Devices, *Telfor J.*, 13 (1), 41–46
- Georgiou, K., Gouras, Ath., and Nikolaou, I., (2019). Gamification in employee selection : The development of a gamified assessment. *International Journal of Select Assess*, 27, 91-103.
- Ghosh, R., Callahan, J., Kim, S., & Kim, M. (2013, February). Examining the dominant, emerging, and waning themes featuring in HRD publications: Is it time to redefine HRD? Paper presented at the Academy of Human Resource Development Conference in the Americas, Alexandria, VA.
- Grover L. K., (1996). A fast quantum mechanical algorithm for database search. *ArXivquant-Ph9605043*, Nov. 1996, [Online]. Available: <http://arxiv.org/abs/quant-ph/9605043>
- He, E., (2018). Can artificial intelligence make work more human?. *Strategic HR Review*, 17(50), 263-264.
- Hellenic Federation of Enterprises (SEV) & Deloitte (2019). Digital and technological maturity of the economy and businesses. Digital Transformation Observatory, 1st edition. Athens

- Iossiphides, T., Pechlivanidis, C. & Thanaskos, K. (2020). COVID-19 Industry Pulse Report: Tourism. Greece, December, EY.
- Jie, S. (2005). International Training and Management Development, Theory and Reality. *Journal of Management Development*, 24 (7), 656-666.
- Kane, G.C. Palmer, P., Phillips, A.N., Kiron, D. and Buckley, N. (2015). Strategy, Not Technology, Drives Digital Transformation. *MIT Sloan Management Review*, 14, 1–25.
- Karekla, M., Pollalis, Y., & Angelopoulos, M. (2021). Key Drivers of Digital Transformation in Greek Businesses: Strategy vs. Technology. *Central European Management Journal*, 29 (2), 33-62.
- Murawski, L., (2020). Gamification in human resource management—Status quo and quo vadis. *German Journal of Human Resource Management (GHRM)*. 35(3), 337-355
- Patiniotis, N. & Stavroulakis, D. (1997). The Development of Vocational Education Policy in Greece: A Critical Approach. *Journal of European Industrial Training*, 21(6/7), 192-202.
- Prouska, R. (2006.) Outsourcing Human Resource Activities: An Analysis of Firms in Greece., PhD Thesis. University of Manchester.
- Prouska, R. & Kapsali, M. (2011). *Business and Management Practices in Greece*. Springer. London Palgrave Macmillan, 300-303
- Rowden, R.W. (2002). The relationship between workplace learning and job satisfaction in small and mid-sized businesses. *Human Resource Development Quarterly*, 13(4), 407-26.
- Ruona, W. E. (2016). Evolving human resource development. *Advances in Developing Human Resources*, 18(4), 551-565.
- Ruona, W. E. A. (2000a). Core beliefs in human resource development: A journey for the profession and its professionals. *Advances in Developing Human Resources*, 7, 1-27.
- Saks, M. (2012). Defining a profession: The role of knowledge and expertise. *Professions & Professionalism*, 2(1), 1-10. doi:10.7577/pp.v2i1.151
- Saunders, M., Lewis, P. & Thornhill, A. (2009). *Research Methods for Business Students*. 5th edition, New Jersey : Harlow - Financial Times/Prentice Hall
- Sequeira A.H. and Dhriti A. (2015). Employee relations and its impact on employee performance: A Case study. s.l.:s.n.
- Shor P. W., (1997). Polynomial-time algorithms for prime factorization and discrete logarithms on a quantum computer. *SIAM journal on computing*, 1484-1509
- Stamkos, G., (2019). The second Industrial Revolution. available on the website <https://tvxs.gr/news/taksidia-sto-xrono/h-deyteri-biomixaniki-epanastasi>, accessed at 18/1/2022.
- Szymczyk, K., (2020). Industry 4.0 from the point of view of HRM. *Scientific Papers of Silesian University of Technology – Organization and Management Series* 149, 695-703.
- Tsai, P., Yen, C.Y., Huang, L., & Huang, I. (2007). A study on motivating employee's learning commitment in the post-downsizing era: job satisfaction perspective. *Journal of World Business*, 42(2), 157-169.
- Ustundag, A., and Cevikcan, E., (2018). *Industry 4.0 : Managing the digital transformation*. Switzerland : Springer International Publishing.
- Yannakourou, M. & Tsimpoukis, C. (2014). Flexibility without security and deconstructions of collective bargaining: The new paradigm of labor law in Greece in *Comparative Labor Law & Policy*. *Journal (CLLPJ)*, 35, 331-370.

## Ethical Behavior of the Employees Working in SMEs

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### Abstract

The purpose of the research was to assess the workplace ethics of individuals working at small and medium-sized enterprises in Slovakia. To achieve this, a questionnaire was used to which 543 evaluable responses were received between April and June 2022. The snowball method was found to be the most suitable for collecting data. With the help of this, it was learnt that the vast majority of employees believe that it is worth behaving ethically at work. It also turned out that more than half of the companies do not have any ethical institutions. The majority of respondents find their own workplace behavior to be ethical, while those who act unethically usually behave this way towards their colleagues. In most cases, the reason behind unethical behavior is the fear of anger of others. In our opinion, it would be worthwhile to introduce a code of ethics in companies, and to draw the attention of employees to the fact that ethical behavior can be an advantage for everyone.

Keywords: ethical behavior; employees; small and medium enterprises; Slovakia; business ethics.

Article Classification: Research article

### 1 Introduction

Enterprises need a lot of sources to maintain their businesses, however the most important of them all are employees (Mura et al., 2019; Mura et al., 2021). On the other hand, employees should not be seen only as a resource, because they also have feelings, expectations and not just material needs, so they make their decisions not only based on rational principles (Hajduová, Sebestyén, 2021; Poór et al., 2021; Baša, Baša, 2022; Strugar Jelača et al., 2022). Unethical behavior can occur not only between companies, but also within them (e.g. between employees or during subordinate-superior interactions). There have been many studies on ethics, but the majority of them examined

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the management attitude. This research, however, want to examine the ethical behavior of employees.

Employees are usually aware of the concept of ethical behavior and the regulations, rules or informal expectations within the organization. However, it may happen that in a critical situation they only deal with the possible consequences of their actions – while ethics takes a back seat. Bencsik and Machová (2012) pointed out that in certain situations, employees only focus on achieving the goal set by the manager or superior, while individual and company values are pushed into the background. They sometimes resort to unethical tools in order to achieve the economic result or to fulfill a task. One of these situations is when employees need certain knowledge to perform a specific task. It may happen that they try to obtain the necessary information and knowledge in an unethical way, or they unethically try to cover up their shortcomings and mistakes.

According to Hobfoll (2001), another example of an employee's unethical behavior is when he/she refuses to “hand over” his/her personal knowledge to others. Individuals will not share their knowledge if they are afraid that it will threaten their identity at work. This view is supported by Kalkan's (2005) research, as he states that the attitude of employees is key to knowledge sharing, as it is internally motivated. As a result, subordinates may purposely not share their knowledge in order to remain irreplaceable. Webster et al. (2008) have a similar opinion, they believe that employees can develop a sense of ownership, and since "knowledge is power", they can consider not sharing it with others. Following the previous train of thought, it can be said that in some cases the "withholding" of knowledge (or any important information and data) can be considered unethical behavior, as the employee puts his individual interests before the interests of the enterprise.

However, the ethical behavior of employees can be improved. According to Kessel, Kratzer, and Schultz (2012), individuals are more likely to share their knowledge when they feel safe and have a certain level of trust in their workplace and managers. Another factor that can facilitate knowledge sharing is emotional intelligence. Fox and Spector (2000) states, that people with more developed emotions interact more successfully with others because they achieve their goals by recognizing and adapting to the emotions of others. Therefore, emotional intelligence is closely related to success within the organization. They (Fox, Spector, 2000) also state that self-management, empathy and interpersonal skills are also needed as they help to recognize, regulate and express emotions. Thus, individual ethics are related to the success of companies (Dénes, Berke, 2015).

Gaudine and Thorne (2001) drew attention to the role of emotions in ethical decision-making. Based on their research, ethical debates in organizations are based on emotions. However, they also add, that the relationship between emotions and ethics is not professionally well-founded, as relatively little research has dealt with the relationship between the two areas. Mesmer-Magnus et al. (2010) also concluded that an emotionally intelligent individual will behave less unethically in order to achieve success. According to them, the relationship between ethics and emotional intelligence is to be found in self-esteem. Individuals with higher self-esteem are aware of their own competence and believe in themselves. Their research found that individuals' ethics, self-esteem, and emotional intelligence greatly influence how individuals view unethical behavior as a means to success.

Cabral and Oliveira Carvalho (2014) continued the previous line of thought, concluding that people with higher emotional intelligence do not feel the need to use unethical tools. These individuals have higher ethical standards, yet do not consider

themselves more ethical than their peers. In contrast, emotionally less developed individuals perceive their colleagues as less ethical and even more unethical. Cabral and Oliveira Carvalho (2014) found no evidence that self-esteem played a mediating role between ethics and emotional intelligence. All of this confirms Morgan's (1993) previous research, according to which people who behave unethically believe that the people around them are much more unethical than them.

## **2 Material and methods**

The aim of this paper is to assess the ethical behavior of the employees working in SMEs in Slovakia.

The research was conducted between April 7 and June 30, 2022. For the survey, the questionnaire research technique was chosen which belongs to the group of quantitative methods. During the query, the Google Forms platform was used. The snowball methodology was chosen to reach out the subjects, since the subjects were the employees working at SMEs in Slovakia, and there is no public integrated list that includes all employees in Slovakia who can be contacted. The questionnaire was sent to some of the subject based on our connections and were asked to forward it to some of their connections. Companies without subordinates were not taken into account – where only the owner works alone – because the research wanted to assess the opinions of the employees. In the end, 543 properly completed questionnaires were used during the processing. The questionnaire consisted of 12 questions, however, in the case of one question, 2 additional sub-questions were used. The questions included demographic ones, and the research also aimed to assess the size and scope of activities of the enterprises serving as workplaces for the respondents. The further questions wanted to assess the frequency and reasons for ethical/unethical behavior. We were curious about the employees' attitudes, behavior and opinions. (Malhotra, 2019)

In some cases, the questionnaire also used a Likert scale type of questions, which were treated as data measured on an interval scale and not as metrics. The reason for this is that the distances between the individual answer options are not necessarily the same. With the numbering (1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly agree) we only wanted to achieve the technological implementation of the questionnaire, to simplify the coding, and also to make the questionnaire more transparent for the respondents. (Frankfort-Nachmias, Leon-Guerro, 2011; Malhotra, 2019)

The Microsoft Excel program was used to analyze the data, with the help of which frequency tests were performed. Also, mode and median calculations were done, as the nature of the data made this possible.

## **3 Results**

### ***3.1 Characteristics of the sample***

Based on the information indicated earlier, the number of the respondents was 543. Based on the results, the ratio of the genders is almost the same – the ratio of women (53,5%) was slightly higher than that of men (46,5%). In terms of age, the youngest participant was 18, while the oldest was 65 years old. Regarding the place of residence, the majority of respondents (56,5%) live in a town - and the remaining 43,5% lives in a village. In terms of education, 53,0% have a secondary education (vocational school, high

school), while 47,0% have a degree (BSc., MSc., PhD., etc.). No response was received from an applicant who only had a primary school education.

Regarding the position, the majority of our employees (73,7%) work as subordinates. The proportion of employees working in middle and senior management positions is 26,3%. The proportion of those employed full-time is 84,4%, while 15,6% work part-time. It can be said that more than half of our applicants (60,2%) have been working at their current workplace for less than 5 years. Regarding net income, most (46,2%) earn between €501 and €1,000 per month.

Regarding the grouping of the companies, it can be said that 48,2% of the employees – participating in the research – work for medium-sized, 27,5% for small, and the remaining 24,3% for micro-enterprises. For the sake of simplicity, the grouping of the enterprises was done based on the number of employees. The employers (the enterprises) of the employees in the sample deal with trade (27,0%), manufacturing (13,5%), education (9,1%), and construction (7,5%). The answers were extremely varied, so we will refrain from listing them in detail.

### 3.2 Questions about ethical behavior

In the first question, we asked our respondents whether there are ethical institutions at the enterprise they work for. 56,5% of our respondents indicated that the enterprise – for which they work for – does not have a single ethical institution, while the remaining 43,5% indicated that there is at least one such institution at the given enterprise. If the size of the company is also taken into account, it can be seen that the occurrence of ethical institutions is higher in the case of medium-sized enterprises (57,3%) than in the case of small (29,5%) and micro-enterprises (31,0%).

After that, the employees were asked whether they believe ethical behavior is advantageous. The majority of our respondents (95,2%) believe that it is worthwhile to behave ethically at work, while 4,8% think the opposite.

In the next question, the respondents had to indicate (on a 5-point Likert scale) that how ethical they consider their own behavior at work.

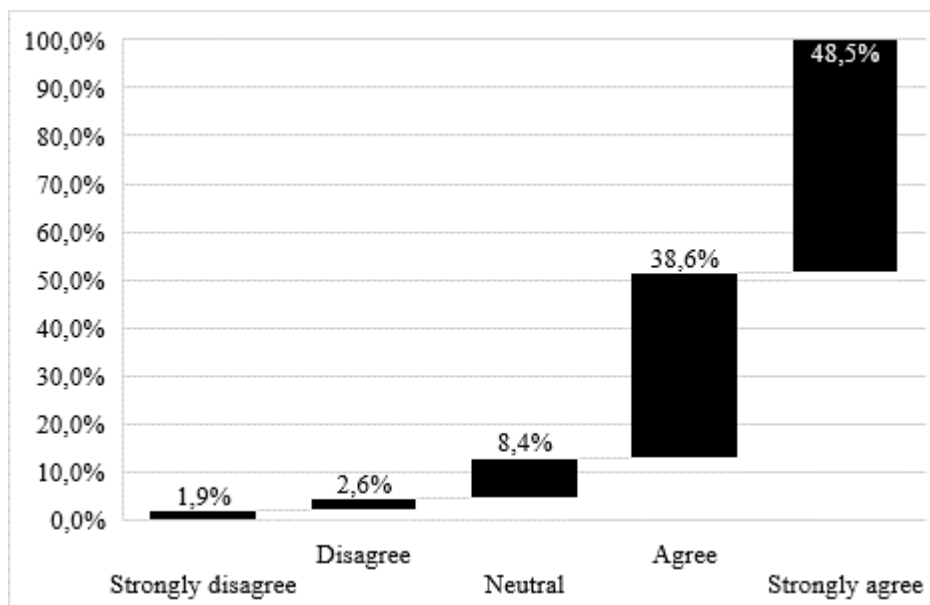


Figure 1 Degree of agreement with the question “Do you find your workplace behavior ethical?”; source: own elaboration

Based on Figure 1, the value of the mode is 5, which means that the majority of our respondents (48,5%) find their workplace behavior to be completely ethical. Summing up the options "Strongly agree" and "Agree" (which is the median value too), it can be said that 87,1% of the respondents behave ethically. Summing up the "Strongly disagree" and "Disagree" options, the value obtained is 4,5%. This is roughly the same as the results of our previous question, where we found that 4,8% of respondents do not consider ethical behavior to be beneficial. The minor difference can also be caused by the fact that there are individuals who, although they do not always see the meaning of ethical behavior, still behave ethically.

We were also interested in what the employees think about which actor shapes the ethics of the other. One actor is "individuals", while the other is "organization". We expanded this possibility with a third one, in which we claimed that both influence each other. In this case, we started from the point of view that organizations have a so-called organizational memory (Nelson, Winter, 1982; Bögel, 2005). We thought that all of this could also be manifested in organizational ethics, since new employees tend to learn from colleagues who have been employed for a long time in order to fit into the organization properly. However, this is not only true for positive behavior. Existing employees may behave less ethically towards the new employee, who may also resort to unethical actions in the future. Based on the results, 35,0% believe that only individuals shape the organization's ethics. In contrast, 19,4% of the respondents think, that the organization shapes the ethical behavior of individuals. However, the majority of respondents (45,6%) believe that both influence each other.

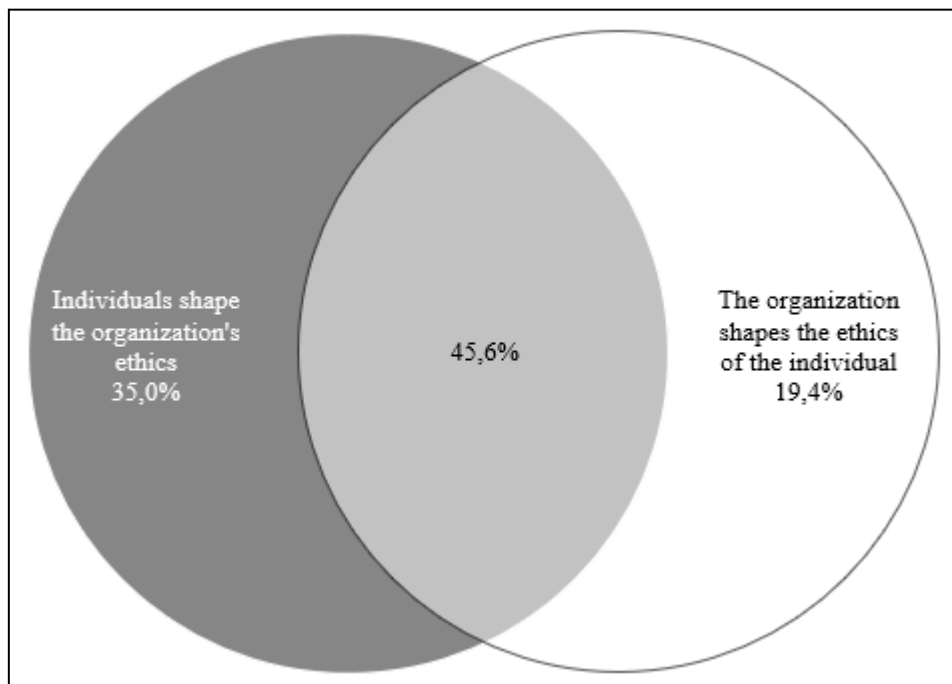


Figure 2 The influence of the organization and the individual on each other – from ethical aspect; source: own elaboration

The next question examined the ethical/unethical behavior more closely. Our question consisted of several parts, first of all we wanted to know if it had ever happened to the employees that they behaved unethically at their workplace. Almost a quarter of our respondents (24,3%) stated that they had behaved unethically during their work. On the other hand, three quarters of the employees (75,7%) claimed that they have never

behaved unethically – so they always act ethically during their work. It is important to mention that this ratio is much higher than the ratio (48,5%) of those who consider their own behavior at work to be completely ethical in the case presented above. The reason behind this is that while previously (Figure 1) we listed several options for our respondents, here they could choose between 2 options ("Yes" and "No").

Staying with this question, in the next sub-question we asked those who behaved unethically (n = 132) to indicate why they behaved that way. We have given our respondents four predefined choices, including the "Other" option. Based on Figure 3, it can be seen that 8,6% of all the respondents (n = 543) were afraid of the anger of others and therefore resorted to unethical means. This is 35,5% of those who behave unethically (n = 132). Another 6,2% of the respondents (n = 543) feared material damage, and 4,5% feared losing their jobs. This is 25,5% in the case of “afraid of material damage” and 18,4% in the case of “Afraid of losing a job” – if we take into account the respondents (n = 132) who answered that they have already behaved unethically at their workplace. 4,9% of the respondents (n = 543) marked the option "Other" (while 20,6% of those behaving unethically). Respondents had the opportunity to write down their specific answer. We tried to summarize the answers we received into a few main categories. Based on this, it can be said that most people indicated that "disagreement", "recklessness and emotional agitation" or "physical fatigue, inattention and stress" were the reasons for the unethical behavior. A further 1,3% of the respondents wrote answers that we could not group due to the diversity.

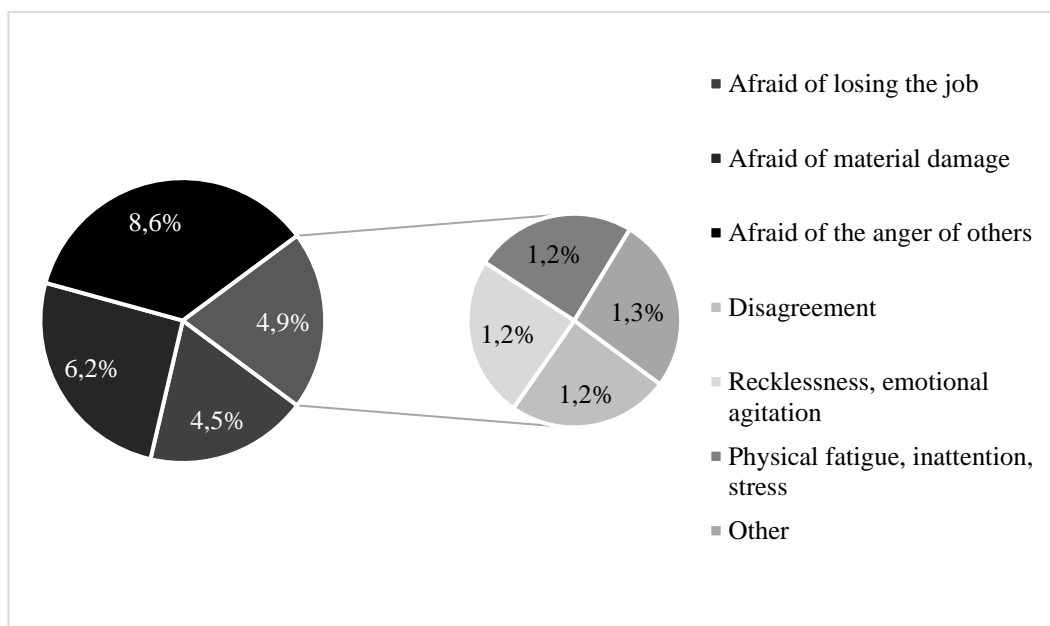


Figure 3 The reason behind the unethical employee behavior; source: own elaboration

Continuing to examine ethical/unethical behavior, in the next sub-question we asked those who behaved unethically (n = 132) to indicate who they were unethical towards. We created 4 answer options. Based on Figure 4, employees most often behave unethically towards colleagues – 49,6% of those who committed an unethical offense (n = 132), while 12,0% of all respondents (n = 543) indicated this option. This is followed by unethical actions committed against superiors/owners (24,8% of those who committed unethical offences, while 6,0% of all respondents) and customers/consumers (20,6% of those who committed unethical offences, while 5,0% of all respondents).

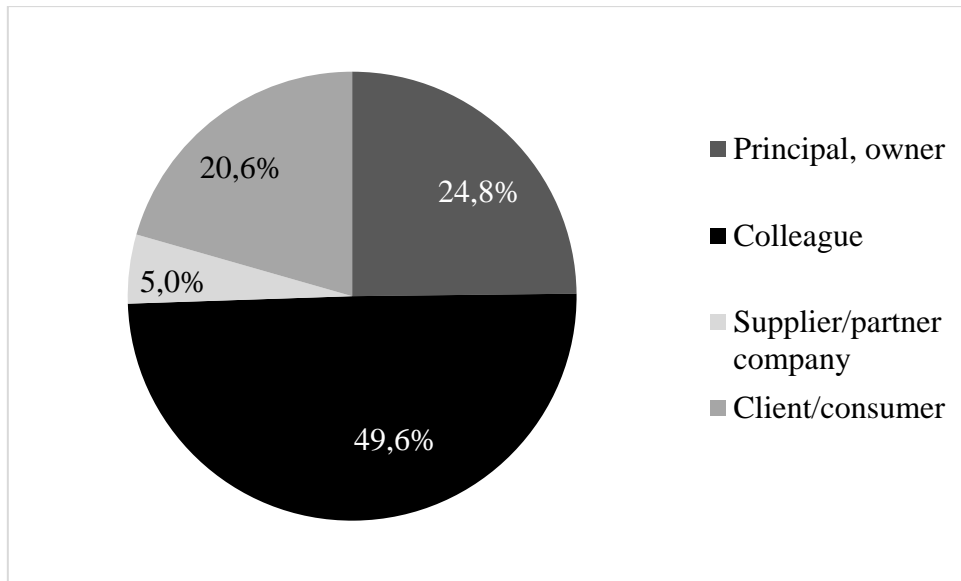


Figure 4 The “targets” of the unethical employee behavior; source: own elaboration

Suppliers were nominated in the last place by our respondents – 5,0% of those who committed an unethical offense, while 1,2% of all respondents.

#### 4 Discussion

In our opinion, in overall positive results were obtained regarding the attitude to ethics, or in terms of behavior. Even a small number of unethical persons can cause extremely large financial and other damages to an organization. That is why we think that in the future it would be worthwhile for business owners to explore why nearly 5% of individuals think that it is not worth being ethical.

Based on the theory of organizational memory, our opinion is that it also appears strongly in the case of ethics. However, in order to be able to state that this is absolutely true, further investigations will be necessary in the future. It is very important to highlight the organizational size as an important influencing element of organizational memory. An example of this is a micro-enterprise that simply employs only one person. In the case of such an enterprise, it is difficult to talk about organizational memory, because when the employee is replaced, the organizational memory also ceases.

We believe that it is not surprising that – among the listed stakeholders – employees are generally less unethical (i.e. behave ethically) with suppliers, as they interact relatively infrequently, the relationships are also more impersonal (e.g. via telephone or e-mail) and at the same time the functioning of the organization is greatly influenced by them. On the other hand, we could think that a person with a lighter conscience is unethical with those with whom he has less frequent contact and the relationship is not too close. Based on the results, however, we conclude that the law of large numbers prevails, so they are usually unethical with colleagues, since they are in contact with them throughout the day.

In accordance with the aforementioned, we believe that the introduction of a code of ethics is highly recommended – as unethical behavior was common between the employees, and the code of ethics is one of the simplest organizational ethical institutions to implement. Employees should be made aware that by sharing their knowledge, they can make their work easier, and that ethical behavior can be an advantage for everyone.

Discussing the possible future directions of the research, our goal is to observe significant correlations with the help of deeper statistical methods, e.g. taking into account demographic characteristics. Another possibility would be to expand the research to other countries. In addition, it would be worthwhile to examine the opinion of the owners of small and medium-sized companies – e.g. using a questionnaire or an interview.

We had to face some limitations during the research. One of them was lack of time. In addition, it can be mentioned that only people with secondary and higher education took part in the research. In our opinion, the reason for this is that the survey took place online, so filling it out required a certain level of computer skills, and it could be accessed by employees who have this kind of knowledge in the course of their work duties. Generally, these positions are filled by individuals who have a certain level of education. At the same time, all of this can also be the effect of the snowball methodology, which may have a certain level of distortion. In addition, we can also mention the fact that during the self-completed questionnaires, we can only rely on the honesty of the respondents. We can only hope that the employees answered the individual questions conscientiously and truthfully, and that they did not have any fear. Of course, anonymity was ensured, so we believe that this fear did not appear. Another disadvantage of the self-completed questionnaires is that the people who complete them may misunderstand or misinterpret the questions. The use of an interviewer is used to eliminate this, but due to the nature of our topic, we believe that the respondents would have felt tense and would have been less honest.

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### References

- Baša, K. and Baša, P. (2022), “Attitudes Towards Work in Visegrad Group Countries” in *Hradec Economic Days 2022*. University of Hradec Králové, Hradec Králové, pp. 49-58.
- Bencsik, A., and Machová, R. (2012), “Knowledge Management and Ethics from the Business Point of View” in *The 6th International Days of Statistics and Economics*. Vysoká škola Ekonomická, Praha, pp. 124-136.
- Bógel, GY. (2005), “Tudás, pénz, hatalom, avagy miért nem szerette Rózsa Sándor a vasutat? – I.” *CEO magazin*. Vol. 6 No. 1, pp. 8-15.
- Cabral, A. M. R., and De Oliveira Carvalho, F. M. P. (2014), “Emotional Intelligence and Ethics on Organizations.” *Open Journal of Business and Management*, Vol. 2 No. 1, pp. 5-23.
- Dénes, E. Gy., and Berke, Sz. (2015), “The role of the Emotional Intelligence in managerial success”, in Csata, A, Fejér-Király, G, György, O, Kassay, J, Nagy, B, Tánzos, L-J (Eds.), *Global Challenges, Local Answers: Challenges in the Carpathian Basin*. Risoprint, Cluj-Napoca, Románia, 392-398.
- Fox, S., and Spector, P. E. (2000), “Relations of Emotional Intelligence, Practical Intelligence, General Intelligence and Trait Affectivity with Interview Outcomes: It’s Not All ‘G’.” *Journal of Organizational Behavior*, Vol. 21 No. 2, pp. 203-220.
- Frankfort-Nachmias, C., and Leon-Guerro, A. (2011), *Sociaal Statistics for a Diverse Society*. SAGE Publications Ltd., London.
- Gaudine A., and Thorne, L. (2001), “Emotion and Ethical Decision-Making in Organizations.” *Journal of Business Ethics*, Vol. 31 No. 2, pp. 175-187.

- Hajduová, Z., and Sebestyén, F. (2021), "Analysis of selected factors affecting the increase of employee performance." *Acta Oeconomica Universitatis Selye*, Vol. 10 No. 1, pp. 19-30.
- Hobfoll, S. E. (2001), "The influence of culture, community, and the nested self in the stress process: Advancing conservation of resources theory." *Applied Psychology: An International Review*, Vol. 50 No. 3, pp. 337-370.
- Kalkan, V. D. (2005), "Organizational Intelligence: Antecedents and Consequences." *Journal of Business and Economics Research*. Vol. 3 No. 10, pp. 43-54.
- Kessel, M., Kratzer, J., and Schultz, C. (2012), "Psychological safety, knowledge sharing, and creative performance in healthcare teams." *Creativity and Innovation Management*, Vol. 21 No. 2, pp. 147-157.
- Malhotra, N. (2019), *Marketing Research: An Applied Orientation*. Pearson, London.
- Morgan, R. B. (1993), "Self- and Co-Worker Perceptions of Ethics and Their Relationships to Leadership and Salary." *Academy of Management Journal*, Vol. 36 No. 1, pp. 200-214.
- Mura, L., Hajduová, Z., Smorada, M., and Jakubová, Z. (2021), "Employee motivation and job satisfaction in family-owned businesses." *Problems and Perspectives in Management*, Vol. 19 No. 4, pp. 495-507.
- Nelson, R. R., and Winter, S. G. (1982), *An evolutionary theory of economic change*. Belknap Press of Harvard University Press, Cambridge.
- Poór, J., Szalai, S. M., Jenei, S. and Molnár, J. (2021). "Responsibility of the Employers and Employees in Hungary: The Importance of Hygiene During the Pandemic." *Acta Oeconomica Universitatis Selye*, Vol. 10 No. 2, pp. 85-109.
- Strugar Jelača, M., Bjekić, R., Berber, N., Aleksić, M., Slavić, A. and Marić, S. (2022), "Impact of Managers' Emotional Competencies on Organizational Performance." *Sustainability*, Vol. 14.
- Webster, J., Brown, G., Zweig, D., Connelly, C. E., Brodt, S., and Sitkin, S. (2008), "Beyond knowledge sharing: Withholding knowledge at work." *Research in Personnel and Human Resources Management*, Vol. 27, pp. 1-37.



## Planned Obsolescence with the Eyes of University Students

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### Abstract

The purpose of the research is to assess the awareness of Slovak university management students, belonging to X and Y generations, regarding the planned obsolescence. Another goal was to draw consumers' attention to the phenomenon of planned obsolescence and its consequences. For the implementation of the research, we considered online questionnaire research to be the most appropriate, and the snowball methodology was used. With the help of this, we managed to collect 203 relevant responses. Based on the results, it can be stated that less than half of consumers are aware of the concept of planned obsolescence. At the same time, the members of the Y generation know more about what planned obsolescence means than the members of the X generation. Members of the younger generation are more receptive to replacing their old product with a new one because of more functions. It can be said that the members of the older generation try to repair or try to have their broken products repaired. In addition, they trust the manufacturers to a greater extent. At the same time, it can be stated that members of both generations see themselves as conscious customers. In our opinion, further education is necessary so that university students – studying management – are aware of the concept of planned obsolescence.

Keywords: Planned obsolescence, consumer behavior, electronic waste, generation X, generation Y

Article Classification: Research article

### 1 Introduction

A product that does not break or become obsolete in the short to mid-term is the nightmare of capitalism, as it impairs trade. Consumption is the driving force of the economic system, and that is why people throw away the old and instead of repairing it, they buy a new one – because nowadays the latter is often cheaper. All of this is inherent in the "planned obsolescence" system, which requires a deliberate shortening of the

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lifespan of the products. Thanks to cheap mass production and the use of wasteful raw materials, this principle has become the pillar of the abundant society and economic growth. The consequence is the welfare garbage flooding the entire world and the depletion of resources. (Reuss, Dannoritzer, 2017; Polónyi Karaffová, Kusá, 2018; Graa, Abdelhak, 2020)

One of the best-known examples of planned obsolescence is the light bulb. Today, an average, modern light bulb can illuminate for approx. 750 hours. Light bulbs manufactured in the past worked for more time. A good example of this is the famous light bulb in Livermore, California, which has been lit almost continuously for more than 120 years (Smith, 2021, online; Centennial Light, 2022, online). In 1924, at a meeting of light bulb manufacturers in Genoa, an agreement between competitors (should be called a “cartel”), named Phoebus at the time, was concluded to deliberately shorten the life of light bulbs. By making the filament more fragile than it should have been, the light bulbs burned out sooner and companies were able to sell more of them. Making thinner filament helped in lowering the costs too. This agreement was taken so seriously that manufacturers whose light bulbs burned for more than 1,500 hours were fined. Before 1924, the average light bulb lasted for about 2,500 hours. A century later, their lifespan was only 1,500 hours, which has since decreased to today's 750 hours (Paricio, Peña, Miralbes, 2019; Sielska, 2019).

The same thing happened with nylon stockings. DuPont's first nylon stocking prototypes were so strong that you could pull a car with them. But durable tights don't encourage frequent purchases, so scientists have developed a weaker material. In addition to light bulbs and nylon stockings, similar thing happened with several products. For example, some consumers reported that inkjet printers also have a counter chip built into them that shuts down the printer after the given number of pages have been printed – even if the inkjet would be still functional. In 2004 and 2005, there were several class action lawsuits against Apple for deliberately reducing battery life. The company's policy was to tell iPod owners to buy a new model if the battery went bad. During the lawsuits, it was revealed that Apple knowingly designed the batteries in such a way that they would defunct within a year or two. New phones also have batteries which cannot be replaced with a new one by an average user (Sielska, 2019; de Andrade, de Mendonça Barroso, Lavôr, 2021; Bisschop, Hendlin, Jaspers, 2022).

At the same time, there were news about companies that offer different quality products to their consumers in some countries. For example: it is said that the Coca-Cola bought in Czech Republic does not contain as much natural sugar as in Western countries, but only a cheaper artificial sweeteners and other sugar substitutes. Same was the case with Milka and Jacobs – but numerous other FMCG products and brands were affected (Karlíček, 2013; Livingstone, 2019, online; Bartková, 2019)

Planned obsolescence is perhaps the biggest injustice that manufacturers commit against consumers. Manipulating consumers through ever-changing fashion is a tried-and-true method, but selling products that are designed to break relatively early is another. (Szaky, 2014; Kuppelwieser et al., 2019) The durability of light bulbs and nylon stockings was deliberately degraded, but the phenomenon can be easily observed in modern communication devices. Planned obsolescence is a vicious circle that on the one hand, "preserves jobs", but at the same time it means unnecessary costs due to the purchase of goods and the neutralization of waste. And here we come to the issue of sustainability. Most people live in blissful ignorance, they think that technical progress is an upward, straight line that is only for them. This would only be possible with unlimited sources of raw materials. To quote Gandhi's famous saying, "Earth provides enough to satisfy every man's needs, but not every man's greed." Some consider planned obsolescence a

conspiracy theory and an urban legend, but there are some questions which need to be answered. These are the following:

- Why are repair guides copyrighted?
- Why are different devices incompatible with each other?
- Why do manufacturers put plastic gears in machines?
- Why can't you take something apart and get parts for it?
- Why have we all come across products that fail immediately after the warranty expires?

Allegedly, the companies want to protect home repairs and their negative consequences – e.g.: financial and material damages, accidents. It is also often heard that products break down because they are cheap, and if we buy expensive, professional, “high quality” products, they will last for a longer period of time. But as we mentioned above, there are many branded products that break down quickly (e. g.: iPod, printers, cars etc.). (Király, 2015; Sielska, 2019; Bisschop, Hendlin, Jaspers, 2022)

In the 1950s, Brooks Stevens – an American industrial engineer – helped to popularize the theory of planned obsolescence. According to him, planned obsolescence is defined as “instilling in the buyer the desire to own something a little newer, a little better, a little sooner than is necessary.” His idea wasn't really about producing a product that breaks down quickly, or about making it mandatory to deliberately destroy products after a certain period of time, but about frequently creating a desire in consumers for something new.

Although the theory of planned obsolescence did not rise to the force of law in business life many times, it nevertheless became a fairly widespread and effective principle to this day. (Szaky, 2014; Paricio, Peña, Miralbes, 2019;)

### ***1.1 Types of planned obsolescence***

The most basic distinction comes from whether the product has become unusable due to some kind of failure or not. Based on this, we can say that *absolute obsolescence* exists, when it is no longer possible to use the product because it cannot fulfill its original function. On the other hand, there is *relative obsolescence*, when – although the product does not fail functionally – it still appears to be obsolete due to various other reasons (detailed below) and is replaced.

Absolute obsolescence is difficult to break down into further parts, since the product breaks and usually becomes completely unusable. However, relative obsolescence can be divided into three important categories.

The first is *psychological obsolescence*. It is about the consumer being dissatisfied with a still functional product, because he/she feels that it no longer meets his/her needs, is no longer fashionable, is no longer attractive enough, or he/she “can't identify with it” anymore. It is mainly about the appearance and symbolic characteristics of the products, and not so much about the real functionality. An interesting and perhaps a sad change can be pointed out: how certain products fulfill a role today than at the time of their release. In today's world, most products are replaced due to this type of obsolescence. Countless research (Spinney et al., 2012; Santiago, Andrade, 2016) have been done about psychological obsolescence, but it is enough to think about the huge amount of discarded functional phones, computers, clothes and other products, which ended up in the garbage only because they were “out of fashion” or because someone was “bored” of them. In this connection, we can think of social pressure or – the main engine of the whole process – the unfocused amount of advertising and other marketing activities. The main underlying purpose of most of which is to generate dissatisfied consumers.

The second category is *technological obsolescence*. Basically, we can mention new functions, greater efficiency and better quality, or even new products that make the old ones less attractive. We don't have to think negatively about this obsolescence – the main source of which is innovation – since this kind of development enables, for example, the appearance of more environmentally friendly and economical products, or even the rise of the standard of living in many regions. These are obviously advances to be appreciated. However, we need to look at this process from a distance to understand the greater picture. The root of the problem is that, in a for-profit company, most of the developments are handled by the marketers, they “distribute” the innovations and “serve” them to the consumers, and they “prove” that these are necessary and useful in every case. It would definitely be a serious question to start the discussion, how much the new functions – which consumers otherwise consider useful – actually help and lead humanity towards living a better a life.

The third category is *economic obsolescence*. We can talk about this if it is no longer worth keeping a product financially. The main reason for this may be that a new replacement product appears that is cheaper, or that is cheaper to maintain and easier to buy than to repair the old one. There are countless cases where companies deliberately set prices for repair costs or the necessary parts in such a way that it is not financially worth it to the consumer, thus encouraging the purchase of a completely new product. Other special example for that are the paper vacuum cleaner bags, which are changed after a certain time, so that they do not fit with the older models. Paper bags are green, but changing the shape forces the consumers to throw out old – but working – vacuum-cleaners to buy the new ones which are compatible with the new bags. (Cooper, 2004; 2010; Aladeojebi, 2013; Satyro et al., 2018)

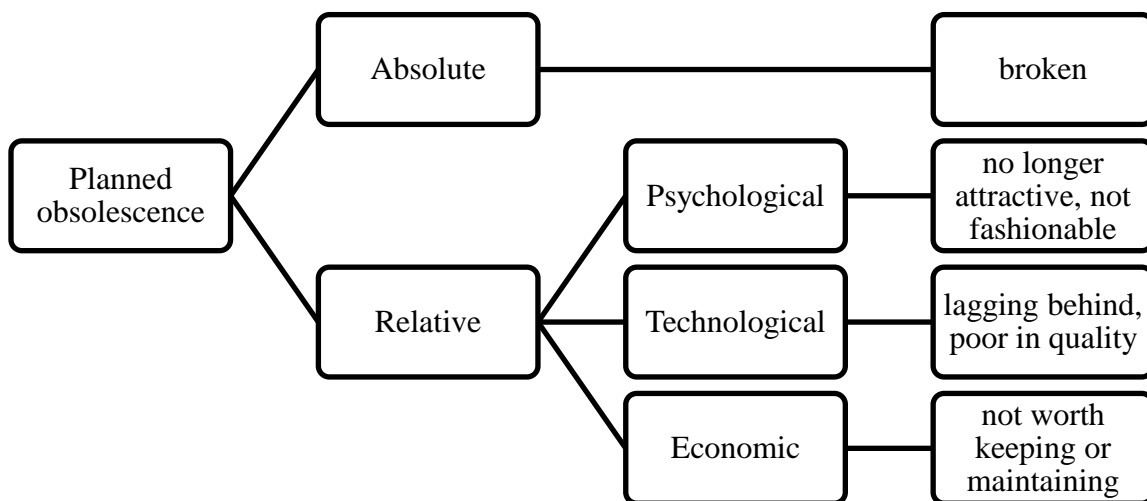


Figure 1 The types of planned obsolescence; source: own elaboration based on Cooper (2004) and Cooper (2010)

In October of 2019, the European Commission adopted the regulation according to which, from 2021, manufacturers will be obliged to extend the life of some household appliances and to manufacture spare parts. They have to produce parts that we can replace ourselves. The European Commission adopted and is introducing the new provision with the aim of “more repairs, less throwing away”. According to the decree, the spare parts must be available at the manufacturers for 7-10 years from their appearance on the market, and the manufacturers must also ensure that the individual parts are available to the customers within a maximum of 15 working days.

The new regulation of the European Commission affects refrigerators, washing machines, dishwashers, transformers, electric motors and other electrical devices. The new rules establish requirements for manufacturers in order to improve repairability and recyclability for the first time of the history of EU. Thanks to the measures, the lifespan of the devices, their maintenance, reuse and the management of waste will be improved. (Detersová, online, 2019)

## 2 Material and methods

The aim of the research is to reveal how Slovakian university management students belonging to Generation X (1960-1979) and Generation Y (1980-1994) feel about the presence of planned obsolescence today. Another goal is to compare the opinions of the two generations about the quality of electronic products manufactured today. When classifying the generations, we went off of the classification of Berkup (2014).

To prepare the research, we chose questionnaire research, which belongs to the group of quantitative methods. The questionnaire contained closed, open and semi-closed questions. At the beginning, we opened with a survey of demographic characteristics, and then we moved on to a survey of opinions about obsolescence. We used several questions as a basis for the comparison of individual consumer layers. With the help of a set of these, we got a complex picture of consumers' opinions. The two generations have different views on planned obsolescence, as Generation X grew up in a completely different social system (socialism) than Generation Y (Csiszárík-Kocsir, Garai-Fodor, Varga, 2021). That is why it is important to contrast the two generations. The questionnaire was created on the Google Forms online platform. The questionnaire was sent out via the internet using the snowball method (Malhotra, 2019), and we only took into account those respondents who stated that they are studying management at a higher education institution in Slovakia. In the end, 203 appropriate answers were received. During the research, the following hypothesis was formulated:

H1a: "Generation X is more aware of the concept and effects of planned obsolescence than generation Y."

H1b: "Generation Y is more aware of the concept and effects of planned obsolescence than generation X."

To test the hypothesis, a Z-test was used, which tests the mean of a distribution:

$$Z = \frac{(\bar{X} - \mu_0)}{\sigma} \quad (1)$$

## 3 Results

A total of 203 evaluable responses were received, of which 60.2% was male (62 respondents) and 39.8% was female (41 respondents). The two generations are relatively equally represented, as 49.5% of all respondents belong to the X, while 50.5% belong to the Y generation.

The majority of respondents (41.7%) are fully aware of the concept of planned obsolescence, 33.0% are somewhat aware and 25.2% are not at all aware. 39.2% of Generation X are fully aware of the concept of planned obsolescence, 29.4% are somewhat aware of the concept, and 31.4% are not at all aware of the meaning of the concept. Of the respondents belonging to the younger (Y) generation, it can be said that almost half (48.1%) are aware of the concept. 36.5% of them have already come across

the term somewhere, but they are not fully aware, and only 15.4% are completely unaware of the concept of planned obsolescence.

The formulated hypothesis was also related to this question. The hypothesis we set up examines whether Generation X is more aware of the concept of planned obsolescence than Generation Y. During the z-test, a critical value of 1.64 was obtained, and the value of the test function was 1.92(alpha level of 0.05). Since the value of the trial function exceeds the critical value, it falls into the critical region. Thus, it can be said that Generation Y knows more about planned obsolescence than Generation X. Thus, we reject the H1a and accept the H1b hypothesis.

Table 1 Z-test

Conf. level (alpha)	0,05
Critical (z) value	1,64
St. error.	0,083
Z-score	1,92
Accept H1a	Accept H1b
	1,64
	1,92

After examining the extent to which the respondents were aware of the concept of planned obsolescence, we surveyed what they really meant by this concept. Here, the respondents could choose several answers from the four options. The largest proportion of respondents (73.8%) understand “Designing a vulnerable product” under the concept of planned obsolescence. It can be said that both generations equally chose that option. The second most common answer was the “Inclusion of a deliberate error” (58.3%), which ended with a result above 50% in the case of both generations. 44.7% of the respondents indicated that manufacturers are “Making the repair more difficult”. Looking at the two generations, this answer option shows the greatest agreement. “Frequent changes of the design” were marked only by 20.4% of respondents. Examining the two generations, the biggest difference can be seen here. In our opinion, this is due to the fact that the older generation (X) cannot be convinced just by the sight, for them the effectiveness of the given product is much more important.

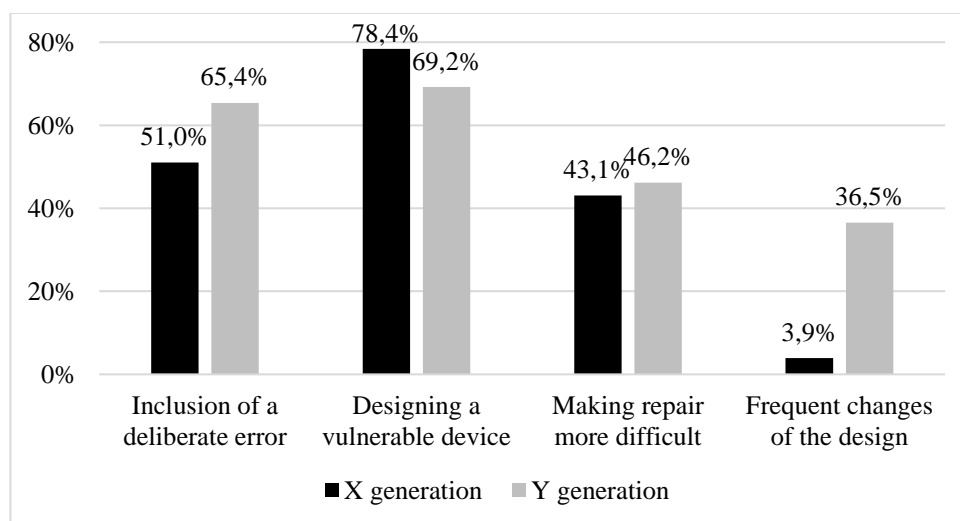


Figure 2 The meaning of the planned obsolescence concept according to Generation X and Y; source: own elaboration based

Next, we examined the reasons behind buying new electronic products among the representatives of both generations. Our research revealed that most consumers (73.8% of all respondents) buy a new device when the old one is broken. A small percentage of those surveyed (3.9%) buy new products for fashion reasons. The main differences between the two generations are illustrated in the Figure 3 below.

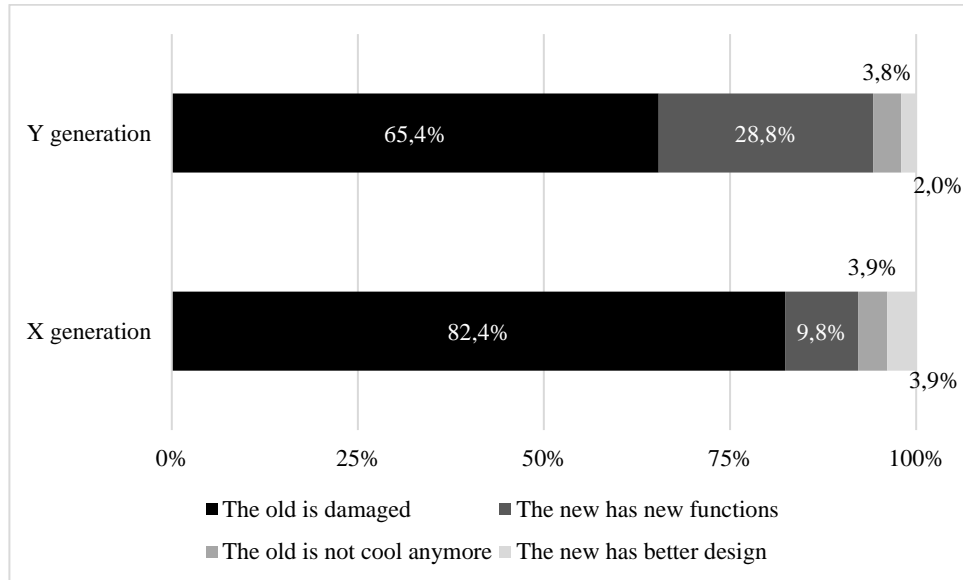


Figure 3 The reason behind buying new electronic products – by generations; source: own elaboration based

Next, we examined how each generation felt about planned obsolescence and electronic waste. Most of both age groups agree that electronic devices manufactured more than 20 years ago are more durable than those manufactured today.

In some cases, we can discover similarities (e.g.: “I shop consciously”, “I plan to use the devices for a longer period of time”, “The product breaks down shortly after the end of the warranty”), while in some cases moderate differences (“Intentional bugs in new products” and “Older products are more durable”) can be observed between the members of the 2 generations. In the case of “I try to repair or try to have repaired the broken product”, it can be stated that this applies more to members of Generation X. On the other hand, the members of the X generation believe to a lesser extent that “Manufacturers make low-quality product” – therefore, to some extent, they trust the manufacturers more.

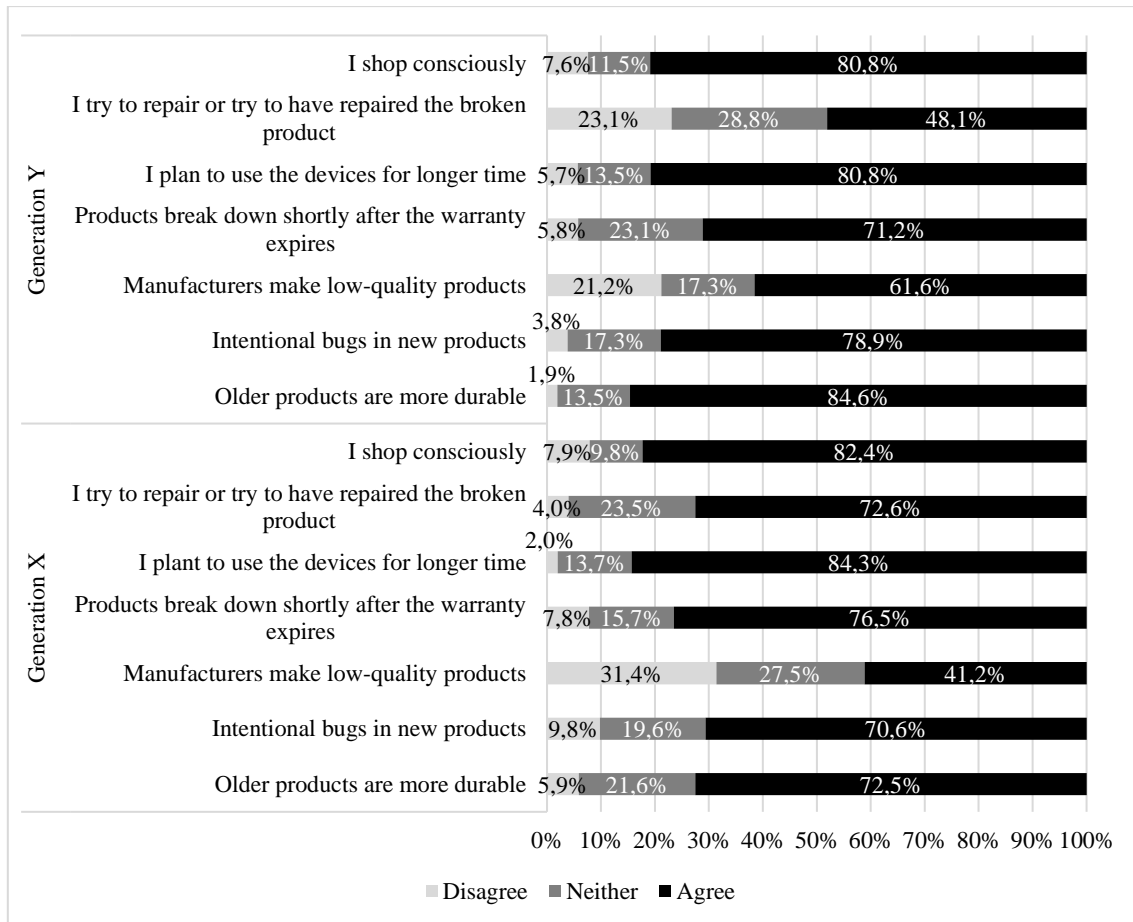


Figure 4 The degree of agreement with statements – by generations; source: own elaboration based

#### 4 Discussion

The aim of the research was to assess the knowledge of Slovak university students – studying management – belonging to the X and Y generations regarding the topic of planned obsolescence. Another goal was to draw consumers' attention to the phenomenon of planned obsolescence and its consequences. In addition, we hope that the research will stimulate other researchers to further investigate the topic.

Based on our results, it can be stated that less than half of consumers are aware of the concept of the planned obsolescence. At the same time, members of the younger (Y) generation are more likely to know what planned obsolescence means. We also proved all this with the help of Z-test (Table 1). The above confirms the necessity of the goal we have set, that it is advisable to draw the attention of researchers and consumers to the concept of planned obsolescence. In our opinion, further education would be necessary in order for university students dealing with management in the future to know the concept even more.

It also turned out (Figure 2) that most people – in the case of both generations – believe that “Designing a vulnerable product” means planned obsolescence. In the case of the design, we experienced the biggest difference between the two generations. At the same time (Figure 3), we noticed that the vast majority of the members of the Y generation do not replace their product with a newer one, due to its modern design. Based on this, it can be said that according to the younger (Y) generation, although manufacturers often try to influence consumers with modern design, they still cannot really convince them.



However, the difference can be highlighted that younger people (Y) are more receptive to replacing their old product with a new one, because it has more functions (Figure 4). Members of both generations are considered conscious buyers and plan to use electronic products in the long term. At the same time, relatively many respondents think that the products are designed in such a way that they break down shortly after the warranty expires. Members of the X generation prefer to repair or have their products repaired and trust in manufacturers.

The authors had to face several limitations during the study. Firstly, the lack of time can be mentioned. Also, the snowball methodology had great impact on the sampling, although our subjects were consumers belonging to Generation X and Y, so we do not have a list consisting all of the consumers living in Slovakia. Thanks to this fact this method was the most suitable for our research. In addition, we can also mention the fact that during the self-completed questionnaires, we can only rely on the honesty of the respondents. Of course, anonymity was ensured, so we truly believe that this fear did not appear in our subjects. The self-completed questionnaires have another disadvantage: of the respondents may misunderstand some questions. The use of an interviewer is used to eliminate this, but due to the lack of time we relied on online survey method. Also, the use of an interviewer would make impossible to use the snowball methodology, which would increase monetary and time costs.

In the future our goal is to observe significant correlations with the help of deeper statistical methods. Another possibility is to expand the research to other countries – for e.g.: V4 countries.

### Acknowledgements

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### References

- Aladeojebi, T. K. (2013), “Planned Obsolescence.” *International Journal of Scientific & Engineering Research*, Vol. 4 No. 6, pp. 1504-1508.
- de Andrade, M. D., de Mendonça Barroso, A. B., and Lavôr, A. R. (2021), “A Obsolescência Programada nas Relações Consumeristas E O Caso das Baterias dos Telefones da Apple/The Planned Obsolescence in Consumers Relations and the Case of Apple's Telephone Batteries.” *Quaestio Iuris*, Vol. 14 No. 2, pp. 975-1000.
- Bartková, L. (2019), “How do consumers perceive the dual quality of goods and its economic aspects in the European Union? An empirical study.” *Problems and Perspectives in Management*, Vol. 17, No. 3, pp. 382-394.
- Berkup, S. Z. (2014), “Working with generations X and Y in generation Z period: Management of different generations in business life.” *Mediterranean Journal of Social Sciences*, Vol. 5 No. 19, pp. 218-229.
- Bisschop, L., Hendlin, Y., and Jaspers, J. (2022), “Designed to break: planned obsolescence as corporate environmental crime.” *Crime, Law and Social Change*.
- Centennial Light. (2022), “Livermore, California's Centennial Light.” available at: <https://www.centennialbulb.org/photos.htm>
- Cooper, T. (2004), “Inadequate Life? Evidence of Consumer Attitudes to Product Obsolescence.” *Journal of Consumer Policy*, Vol. 27, pp. 421-449.
- Cooper, T. (2010), *Longer Lasting Products: Alternatives to the Throwaway Society*. Gower Publishing Limited, Aldershot.

- Csiszárík-Kocsir, Á., Garai-Fodor, M., and Varga, J. (2021). "What has Become Important during the Pandemic? – Reassessing Preferences and Purchasing Habits as an Aftermath of the Coronavirus Epidemic through the Eyes of Different Generations." *Acta Polytechnica Hungarica*, Vol. 18 No. 11, pp. 49-74.
- Detersová, K. (2019), "Jednoduchšia oprava práčok či chladničiek má pomôcť klíme a znížiť plytvanie." available at: <https://euractiv.sk/section/obehova-ekonomika/news/jednoduchsia-oprava-pracok-ci-chladniciek-ma-pomocet-klime-a-znizit-plytvanie/>
- Graa, A., and Abdelhak, S. (2020), "The determinants of electronic word of mouth' influence in Algerian consumer choice: The case of restaurant industry." *Acta Oeconomica Universitatis Selye*, Vol. 9 No. 2, pp. 35-47.
- Karlíček, M. et al. (2013), *Základy marketingu*. Grada Publishing a.s., Praha.
- Király, K. (2015), "Tervezett elavulás?" *108.hu Magazin*, Vol. 6 No. 9, pp. 40-41.
- Kuppelwieser, V. G., Klaus, P., Manthiou, A., and Boujena, O. (2019), "Consumer responses to planned obsolescence." *Journal of Retailing and Consumer Services*, Vol. 47, pp. 157-165.
- Livingstone, E. (2019), "Eastern Europe wins battle over double food standards." available at: <https://www.politico.eu/article/eastern-europe-wins-battle-over-double-food-standards/>
- Malhotra, N. (2019), *Marketing Research: An Applied Orientation*. Pearson, London.
- Polónyi Karaffová, D., and Kusá, A. (2018), "Value-driven concept and aspects of marketing communication in premium gastronomy." *Acta Oeconomica Universitatis Selye*, Vol. 7 No. 2, pp. 122-140.
- Paricio, J.M., Peña, J.A., Miralbes, R. (2019). "Well Planned Obsolescence and the Eco-Design", in Cavas-Martínez, F., Eynard, B., Fernández Cañavate, F., Fernández-Pacheco, D., Morer, P., Nigrelli, V. (Eds.), *Advances on Mechanics, Design Engineering and Manufacturing II. Lecture Notes in Mechanical Engineering*, Springer, Cham.
- Reuss, J., and Dannoritzer, C. (2017), *Vásárlás a szemétdombra – A tervezett elavulás elve*. L'Harmattan Kiadó, Budapest.
- Santiago, M. R., and Andrade, S. L. (2016). "Planned and Psychological Obsolescence as a Form of Biopower: Law Perspectives of Consumerism/A Obsolescencia Programada E Psicologica Como Forma de Biopoder: Perspectivas Juridicas do Consumismo." *Quaestio Iuris*, Vol. 9, No. 4, pp. 1771-1786.
- Satyro, W. C., Sacomano, J. B., Contador, J. C. and Telles, R. (2018), "Planned obsolescence or planned resource depletion? A sustainable approach." *Journal of Cleaner Production*, Vol. 195, pp. 744-752.
- Sielska, A. (2019), "Planned Obsolescence: Gain or Loss to the Consumer?" *Scientific Papers of The Silesian University of Technology. Organisation and Management Series*, No. 134, pp. 215-224.
- Smith, T. (2021), "This 120-Year-Old Lightbulb in Livermore Is Still Burning Strong." available at: <https://thebolditalic.com/this-120-year-old-lightbulb-in-livermore-is-still-burning-strong-9e3ae60109b0>
- Spinney J, Burningham K, Cooper G, Green N, and Uzzell D. (2012), "What I've found is that your related experiences tend to make you dissatisfied: Psychological obsolescence, consumer demand and the dynamics and environmental implications of de-stabilization in the laptop sector." *Journal of Consumer Culture*, Vol. 12 No. 3, pp.347-370.
- Szaky, T. (2014), *Hulladék Tudatosan*. Unio Mystica Kiadó, Fót.

## Model for the Emotional Intelligence's Development in Entrepreneurship

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### Abstract

Emotional intelligence has become a critical soft skill in achieving success in the modern world. Studies of the emotional intelligence of workers and managers testify to its positive impact on the performance of enterprises and organisations. This fact justifies the development of emotional intelligence in the entrepreneurial environment. The purpose of the research paper is to highlight a logical, easy-to-use, effective, and systematic approach to the development of emotional intelligence of entrepreneurs in the educational environment. The research paper contains 1) the 4-component instrumental model for emotional intelligence development adapted to the entrepreneurial environment; 2) testing, which allows for tracking the dynamics of the development of emotional intelligence; 3) the training course, which allows for developing each component of the model. The 4-component instrumental model was developed based on the D. Goleman model and contains a new set of competencies adapted to the entrepreneurial environment. Our proposed model allows us to build a convenient graphical display of the results in the form of an EI diagram of four quadrants – emotional intelligence profile. 158 people took part in the psychometric verification of the test, and a demonstrator and confirmation analysis was carried out using the programs MS Excel, SPSS, STATISTICA, FACTOR, and R-Studio. The educational training course on the development of emotional intelligence was tested in 2021-2022 as part of Erasmus+ staff teaching mobility at universities in Ukraine, Poland, and Slovakia.

Keywords: model, test; emotional intelligence; training course; entrepreneurship.

Article Classification: Research article

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## 1 Introduction

The topic of the development of emotional intelligence (EI), as one of the soft skills necessary for success in modern society, is relevant not only in psychology but also in management and entrepreneurship. Emotions play a significant role in business and entrepreneurship as a crucial irrational factor. Emotions significantly affect consumers' decision-making in the market and all organisational-level managers. Managers make decisions using the latest information technologies and personal emotions. In entrepreneurship, emotions play a crucial role, and more and more researchers are focusing on the need to develop emotional intelligence further.

During the coronavirus pandemic, the role of emotional intelligence has increased. Leaders with high emotional intelligence are essential during a crisis because the climate of their teams can change rapidly and significantly impact the psychological safety of organisations (Semenets-Orlova et al., 2021). The scientific literature shows significant positive correlations between leadership performance and all four EI competencies clusters: self-awareness, self-management, social awareness, and relationship management (Haricharan, 2022).

The scientific literature has already proved that the developed emotional intelligence of employees allows the increase in sales, cash receipts and customer loyalty in various areas of business (Bayighomog, 2021; Zhang, 2022). The EI of project managers increases team cohesion and saves time in achieving the desired results (Qi Zhang and Shengyue Hao, 2022). Managers' adaptability and optimism positively affect financial, employee and operational performance (Strugar Jelača et al., 2022).

Çetin and Karakaş (2021) concluded that individuals with high emotional intelligence exhibit more knowledge-sharing behaviour and are more prone to disseminate information in the organisation. After identifying 72 relevant research publications, researchers have proven the influence of emotions on knowledge management (Hornung and Smolnik, 2021).

The authors (Xifeng Lu et al., 2022) analysed all existing studies on the influence of emotions in entrepreneurship. They identified five main categories, the most promising for further research are: research on the impact of specific emotion on entrepreneurship, research on employee emotion and entrepreneurship, research on emotion in various entrepreneurial types, and research on the role of emotional support in entrepreneurship.

Emotional intelligence also plays an essential role in family enterprises. It is crucial to work with people to reach higher performance and make them feel more loyal and satisfied (Minárová, 2020).

Thus, the number of studies of emotional intelligence in management, business, and entrepreneurship is constantly increasing. This fact justifies the development of emotional intelligence in the entrepreneurial environment.

The foundation of modern EI research was the non-cognitive theory of EI (R. Bar-Ona, 2000), the theory of emotional and intellectual abilities of J. Edgar Hoover, Meyer and P. Salovey (1997), and the mixed theory of emotional competence of D. Goleman (1995).

However, the proposed models and testing were not adapted to the entrepreneurial environment. Therefore, we have developed a 4-component instrumental model for developing emotional intelligence in the entrepreneurial environment (4EI model), testing 'Emotional Intelligence in Business' and training courses 'Emotional Intelligence in Entrepreneurship' appropriate for learning.

This scientific work aims to highlight the logical, easy-to-use, effective, and systematic approach to the development of emotional intelligence of future entrepreneurs based on the results of the introduction in the educational environment.

## 2 Material and methods

This study has applied both explanatory and descriptive research designs. Despite a sufficient number of approaches to the development of emotional intelligence, a convenient model for the development of emotional intelligence has not yet been proposed, which would be easily used in the educational process to develop the abilities of future entrepreneurs. Thus, our research was narrowed down to designing a model for developing entrepreneurs' EI. The 4EI model was developed as a result of the generalisation of fundamental and recent scientific publications, including Goleman's model.

D. Goleman defines emotional competence as an acquired property based on emotional intelligence. Initially, D. Goleman identified 25 emotional competencies, sorted into five clusters: I) Self-awareness (knowledge of one's states, preferences, abilities and opportunities); II) Self-management (ability to use one's mental resources and to cope with internal states); III) Motivation (emotional inclinations that lead to achieving goals and facilitate this process); IV) Empathy (awareness of other people's feelings, needs and concerns); V) Social skills (the art of evoking the desired reaction in others) (Goleman, 1995). Nevertheless, D. Goleman reduced his model to 18 competencies over time, sorted into four clusters (Ackley, 2016). These competencies were described by Wolff (2005) and are shown in Table 1, 'The structure of emotional intelligence according to D. Goleman's model'.

Table 1 The structure of emotional intelligence according to D. Goleman's model; modified by (Wolff, 2005 and Ackley, 2016)

EI Components	Emotional competencies of the components
Self-awareness (concerns knowing one's internal states, preferences, resources, and intuitions)	<i>Emotional awareness</i> (recognising one's emotions and their effects) <i>Accurate self-assessment</i> (knowing one's strengths and limits) <i>Self-confidence</i> (a strong sense of one's self-worth)
Self-management (refers to managing one's internal states, impulses, and resources)	<i>Emotional self-control</i> (keeping emotions in check) <i>Transparency</i> (maintaining integrity, acting congruently with one's values) <i>Adaptability</i> (flexibility in handling change) <i>Achievement</i> (striving to improve or meet a standard of excellence) <i>Initiative</i> (readiness to act on opportunities) <i>Optimism</i> (persistence in pursuing goals despite obstacles and setbacks)
Social awareness (refers to how people handle relationships and awareness of others' feelings, needs, and concerns)	<i>Empathy</i> (sensing others' feelings and perspectives and taking an active interest in their concerns) <i>Organisational awareness</i> (reading a group's emotional currents and power relationships) <i>Service orientation</i> (anticipating, recognising, and meeting customers' needs)
Relationship management (concerns the skill or adeptness at inducing desirable responses in others)	<i>Developing others</i> (sensing others' development needs and bolstering their abilities) <i>Inspirational leadership</i> (inspiring and guiding individuals and groups) <i>Change catalyst</i> (initiating or managing change) <i>Influence</i> (wielding effective tactics for persuasion) <i>Conflict management</i> (negotiating and resolving disagreements) <i>Teamwork and collaboration</i> (working with others toward shared goals, creating group synergy in pursuing collective goals)

Following the 4EI model, a test called ‘Emotional Intelligence in Business’ was developed. The first psychometric testing was attended by 158 people (120 women, 38 men), as reflected in work by Lutsenko et al. (2021). Testing was carried out online (can be found at: <https://testing-system-nure.herokuapp.com/auth>). Data processing was performed in programs MS Excel, SPSS, STATISTICA, FACTOR, and R-Studio. In the first version of the test, there were 80 statements – 20 statements for each of the 4 clusters (self-awareness, self-management, social awareness, relationship management). They are accompanied by a 5-point grading scale: 0 - never, 1 - very rarely, 2 - sometimes, 3 - often, 4 - always. Analysis of the answers made it possible to reach the psychometric properties on a 10-point scale. During the design of the new questionnaire, the analysis and screening of tasks were carried out, and 50% of the most effective ones were kept. Exploratory and confirmatory factor analysis was carried out, which confirmed the 4-components proposed structure of emotional intelligence, verification of the reliability, discriminability and validity of the test, which showed promising results. Thus, the effectiveness of the new test ‘Emotional Intelligence in Business’ has been empirically proven, allowing the diagnosis and recording of emotional intelligence dynamics (Lutsenko et al., 2021).

Our proposed model allows us to build a convenient graphical display of the results in the form of an EI diagram of four quadrants – emotional intelligence profile. Testing is convenient to carry out in the Smart Sender program (the link to the chatbot: [https://t.me/SEID\\_balanceEI\\_bot?start=ZGw6MzM5Njk](https://t.me/SEID_balanceEI_bot?start=ZGw6MzM5Njk)).

An example of the respondent's emotional intelligence profile and a survey fragment in the chatbot are shown in Fig. 1.

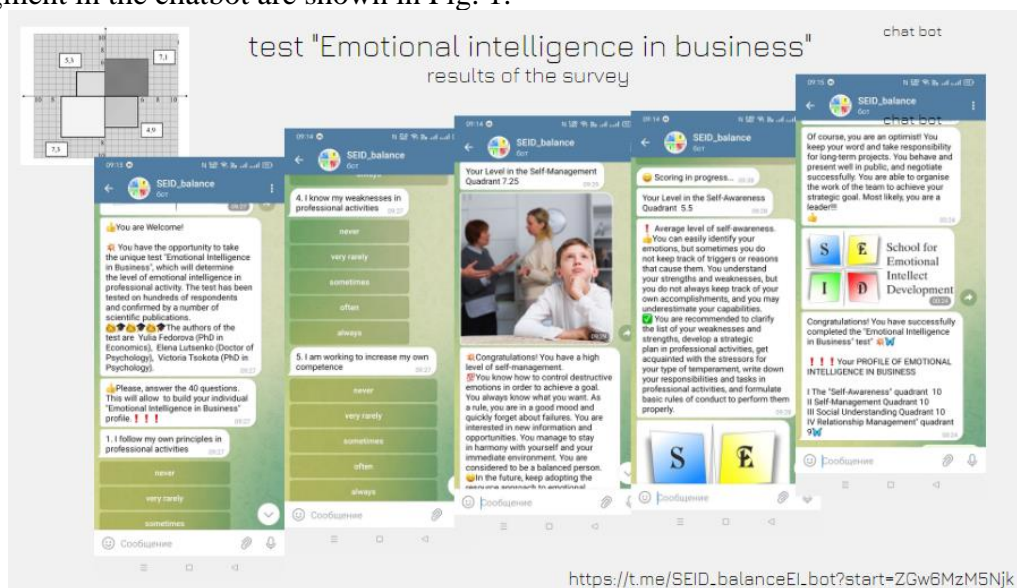


Figure 1 An example of a respondent's emotional intelligence profile and a survey fragment in the program's chatbot Smart Sender; own elaboration

Over 500 students of all age categories from Ukraine, Poland, and Slovakia participated in the survey. The proposed tool allows tracking the dynamics of development of each component of the 4-component instrumental model of the development of EI.

### 3 Results

The research paper presents a logical, easy-to-use, effective, and systematic approach to the development of emotional intelligence of entrepreneurs in the educational environment, which includes three tools:

- the 4-component instrumental model for the development of emotional intelligence adapted to the entrepreneurial environment;
- the testing, which allows tracking the dynamics of the development of emotional intelligence;
- the description of the training course, which allows the development of each component of the model.

The basis and *the first tool* of an integrated approach to the development of EI is the 4-component instrumental model for the development of EI. It is based on four essential components (factors): self-awareness, self-management, social awareness and relationship management. The 4-component instrumental model for the development of EI is shown in Figure 2.

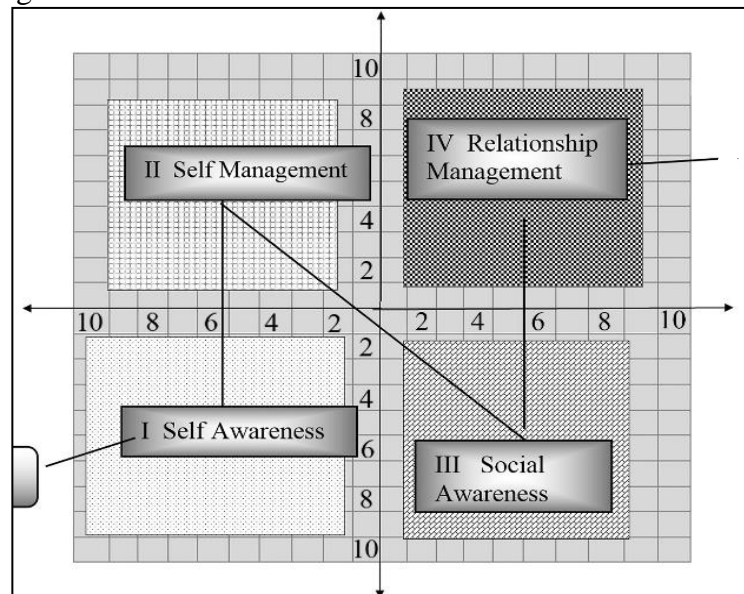


Figure 2 4-component instrumental model for the development of EI; own elaboration

The horizontal axis from left to right shows the direction of latitude of the EI cover: from the individual to the team level. The vertical axis from the bottom up shows the degree of control of the EI: from only understanding one's own emotions and the emotions of others to managing emotions (own and others). Each quadrant size in the model corresponds to the quantitative characteristics of the corresponding component of the 4-component instrumental model of the EI. This approach allows the learning process and demonstrates the dynamics of each component of the EI by increasing the area of the corresponding quadrant. The quadrant size can vary from 0 to 10. This is in line with the standard stan test scale. According to the stan scale, the results from 0-3 are a low level, 4-7 is an average level, and 8-10 is a high level of development of the components of the 4-component instrumental model of the EI.

Based on the model of D. Goleman, we proposed a 4-component instrumental model for the development of EI adapted to the entrepreneurial environment. Table 2 shows the emotional competencies of each component of the 4-component instrumental model of EI.

Table 2 The structure of emotional intelligence according to the 4-component instrumental model of EI; own elaboration

EI Components	Emotional competencies of the components
Self-awareness (self-reflection)	1. Emotional awareness: awareness of one's emotions, consequences and reasons for their occurrence.
Self-management (management of one's mental states)	2. Accurate self-assessment: understanding of one's strengths and weaknesses in professional activity.
	3. Understanding one's basic attitudes: a strong sense of self-worth and awareness of one's principles and moral qualities.
	4. Ability to focus on tasks in stressful situations.
	5. Ability to manage one's mood when working in a team.
	6. Ability to switch attention or concentrate (as needed).
	7. Ability to overcome fear, anger, and other negative emotions to achieve a goal.
	8. Ability to work with others to achieve common goals.
Social awareness (cognitive empathy)	9. Ability to stay positive and focused.
	10. Attention to and acceptance of feelings and points of view of other people, a manifestation of a genuine interest in them.
	11. Orientation towards servicing others: the ability to anticipate, recognise and meet customers' requests.
	12. Ability to be open, listen without prejudice and be ready to help.
	13. Correct interpretation of connections between other people or social processes.
Relationship management (emotional influence)	14. Possession of effective tactics of persuasion.
	15. Ability to resolve conflicts, inspire, and lead individuals and groups.
	16. Ability to lead changes, manage projects and take responsibility.
	17. Ability to create additional opportunities based on the analysis of new information.
	18. Ability to build and maintain valuable relationships.
	19. Ability to create group synergies to achieve common goals.

The 4EI model includes components: self-awareness, self-management, social awareness, and relationship management adapted to the entrepreneurial environment.

Using *the second tool*, the 'Emotional Intelligence in Business' test specially developed for this model, we can obtain a graphic image of the emotional intelligence profile. The emotional intelligence profile is the 4EI model with quadrants, the size of which is equal to the value of the component obtained during testing (from 0 to 10). The test can be taken in the Smart Sender program in Telegram messenger following the link to the chatbot [https://t.me/SEID\\_balanceEI\\_bot?start=ZGw6MzM5Njk](https://t.me/SEID_balanceEI_bot?start=ZGw6MzM5Njk).

The advantage of using the 4EI model is that it can graphically demonstrate the degree of development of each model component. Building an emotional intelligence profile allows one to determine each component's development level and focus on developing the necessary emotional intelligence skills. At the same time, an integrated approach involves tracking the results before the start of training and after training.

*The third tool* for developing emotional intelligence is a training course for future entrepreneurs. Its content is shown in Table 3.



Table 3 Content of the course 'Emotional Intelligence in Entrepreneurship'; own elaboration

The topic of the seminar	Work with quadrant	Testing	Number of hours
Emotional intelligence is a resource of the XXI century	Self-awareness	Initial	2
How to be successful in conditions of turbulence	Self-management		2
From emotions to emotional capital	Social awareness		2
Effective communication and leadership	Relationship management	Final	2

In 2020-2022, the educational training course was presented and conducted for management and entrepreneurial specialities students at the universities of Ukraine, Slovakia, and Poland. The participating institutions were: Ukrainian Engineering-Pedagogics Academy, Ukraine (2020-2021); University of Applied Sciences in Nysa, Poland (in the framework of the Erasmus+ KA107 Programme, 2022); Constantine the Philosopher University in Nitra, Slovakia (in the framework of the Erasmus+ KA107 Programme, 2022); and Comenius University, Slovakia (2022).

#### 4 Discussion

Some limitations of our research should be considered. Biases might have occurred due to our choice of key emotional intelligence competencies in the entrepreneurial environment. The subjective influences possibly affected the selection and classification of incorporated studies. Other researchers can select and classify emotional intelligence differently in the business environment.

Additionally, restrictions occurred in the respondents' surveys due to the online education format introduced in response to the Covid-19 pandemic. There were problems with interviewing respondents from Poland and Slovakia because they preferred WhatsApp and did not use telegram messenger. Due to the inability to adapt the Smart Sender software to WhatsApp, most participants remain not covered.

Further areas of research are to diagnose the level of emotional intelligence of students from different European countries and analyse the results of the introduction of training courses for students of economic and managerial specialities. Also, the proposed integrated approach can be used to build project teams and optimise the composition of startup project participants or existing R&D teams in enterprises. Complexity, consistency, convenience, adaptability to the entrepreneurial environment, visualisation of results and the ability to track the dynamics of the development of emotional intelligence of entrepreneurs opens wide horizons for applying the proposed approach in the countries of the European Union.

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## References

- Ackley, D. (2016), Emotional intelligence: A practical review of models, measures, and applications. *Consulting Psychology Journal: Practice and Research*, No. 68(4), pp. 269–286. doi: org/10.1037/cpb0000070
- Bar-On R. (2000), *Emotional and social intelligence: Insights from the Emotional Quotient Inventory Handbook of emotional intelligence*, San Francisco, Jossey-Bass.
- Bayighomog, S. and Arasli H. (2022), "Reviving employees' essence of hospitality through spiritual wellbeing, spiritual leadership, and emotional intelligence", *Tourism Management*, Vol. 89. doi: org/10.1016/j.tourman.2021.104406
- Çetin, S. and Karakaş, A. (2021), "Effects of emotional intelligence on knowledge sharing among employees: A study of HoReCa companies in Turkey". *Upravlenets – The Manager*, Vol. 12, No. 3, pp. 44–55. doi: 10.29141/2218-5003-2021-12-3-4
- Goleman, D. (1995), *Emotional intelligence*. Bantam Books, New York.
- Haricharan, S.J. (2022), "Is the leadership performance of public service executive managers related to their emotional intelligence?" *SA Journal of Human Resource Management/SA Tydskrif vir Menslikehulpbronbestuur*, Vol. 20(2022), a1773. doi: org/10.4102/sajhrm.v20i0.1773
- Hornung, O. and Smolnik, S. (2022), "At the mercy of our emotions? A multi-dimensional analysis of emotions in knowledge management research", *Knowledge Management Insights in Times of Global Challenges*, Vol. 29 No. 2, pp.109-120. doi: org/10.1002/kpm.1701
- Lu, X., Xiong, Y., Lv, X. and Shan, B. (2022), "Emotion in the Area of Entrepreneurship: An Analysis of Research Hotspots", *Frontiers in psychology*, Vol. 13, 922148. doi: org/10.3389/fpsyg.2022.922148
- Lutsenko, O., Fedorova, Yu. and Tsokota, V. R. (2021), "Emotional intelligence as a general personality self-regulation resource – design of a new test “Emotional Intelligence in Business”, in: *Pro-ceedings on Problems of personal resources in educational and professional activities, FOP Brovin O.V., Kharkiv, Ukraine, 2021*, pp. 51-55. available at: <http://dspace.univer.kharkov.ua/handle/123456789/16260>, (accessed 28 August 2022).
- Mauer, J. D. and Salovey, P. (1997), *What is emotional intelligence? Emotional development and emotional Intelligence*, Educational Implications, New York.
- Minárová, M., Malá, D. and Smutný, F. (2020), "Emotional Intelligence of Managers in Family Businesses in Slovakia". *Administrative Sciences*, Vol. 10 No. (4):84. doi: org/10.3390/admsci10040084
- Qi Zhang and Shengyue Hao (2022), "Construction Project Manager's Emotional Intelligence and Team Effectiveness: The Mediating Role of Team Cohesion and the Moderating Effect of Time". doi: org/10.3389/fpsyg.2022.845791
- Semenets-Orlova, I.A., Klochko, A., Shkoda, T., Marusina, O. and Tepliuk, M. (2021), "Emotional intelligence as the basis Emotional Intelligence as the Basis for the Development of Organizational Leadership During the Covid Period (Educational Institution Case) the development of organisational leadership during the Covid period (educational institution case)". doi:10.25115/EEA.V39I5.5074
- Strugar Jelača, M., Bjekić, R., Berber, N., Aleksić, M., Slavić, A. and Marić, S. (2022), "Impact of Managers' Emotional Competencies on Organizational Performance", *Sustainability*, No. 14(14):8800. doi: org/10.3390/su14148800
- Wolff, S. (2005). *Emotional Competence Inventory: Technical manual*. Boston, MA, The Hay Group.
- Zhang, W. and Adegbola, O. (2022), "Emotional intelligence and public relations. An empirical review". *Public Relations Review*. doi: 10.1016/j.pubrev.2022.102199

## Motivation of Employees in Family and Non-family Business

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### Abstract

The identification of differences in managers' approach to motivation, ways of motivation of employees and their application in selected family and non-family businesses is the issue that we address in this paper. The main goal of the contribution is to bring a proposal for improving the motivation of employees in these two companies, considering their nature. We will fill its essence with partial objectives, which include the analysis of the current state of motivation in both types of companies, the identification of differences in the approach of managers and their mutual comparison, and last but not least, the proposal of a solution. The methods used include: questionnaire survey, analysis, synthesis and comparison. The benefit of the contribution is the proposal of solutions that can improve motivation in family and non-family businesses and the proposal of the optimal selection of the motivation variant using multicriteria analysis.

Keywords: motivation; employees; family business; non-family business; multicriteria analysis.

Article Classification: Research article

### 1 Introduction

Employee motivation is an important part of their management and contributes significantly to the performance of employees in the company and is an important part of the quality of working life. Seková (2013, p. 109) defines motivation as "an interactive process influencing internal drives (motives) that direct human behavior, i.e. activate or move them into action with the intention of achieving a goal." Kubáni (2011) states that the factors that contribute to the creation of motivation are called sources of motivation. They are very diverse and include: ideals, needs, values, interests, habits and goals.

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Theories of motivation are a source of knowledge about the characteristics of people's behavior and thinking. Through them, we can predict how people will behave in different conditions under the influence of motivational stimuli and how they will behave without them. We can divide them into two categories: theories of needs and theories of the motivational process. Needs theories have connectivity with human needs and their fulfillment. We include e.g. Maslow's theory of needs, Alderfer's ERG theory, Herzberg's two-factor theory and McClelland's theory of achievement needs. Theories of the motivational process are related to the processes that motivate people, that is, how motivation is stimulated, corrected, followed and how it disappears. We include e.g. equity theory, expectancy theory, reinforcement theory, theory X and Y, theory Z. (Droppa, 2010).

The purpose of work motivation is to create such a form of belief and behavior of managed people that it is in line with the mission of the company. That is why employee motivation is one of the tasks of managers, who are supposed to stimulate employees' desire, attention and willingness to participate in the fulfillment of every activity that is linked to the company's goals (Alexy, Boroš, Sivák, 2004, Janošková, Ubrežiová, 2021). Various motives operate in the work process, because even motivation as such is relative, unstable. Employees are affected by the following motives:

- suppressive → we include among them motives that distract the employee from work, e.g. various debates,
- supporting → refer to the creation of prerequisites for the effective effectiveness of the third group of motives, the so-called activation e.g. creation of a pleasant atmosphere in the workplace
- activation → create a positive effect directly at work and cause the effectiveness of the work activity, e.g. the motive of success, appreciation and recognition (Alexy, Boroš and Sivak, 2004).

Dvořáková et al. (2012), Ubrežiová and Mošat'ová (2019) and Bučková (2021) point out that employee motivation creates satisfaction both on the part of the employee and on the part of the employer. From the employer's point of view, a properly motivated employee strives to perform as well as possible at work, to persevere at work and, in general, creates positivity around him. From the employee's point of view, motivation is if he is adequately rewarded with a reward in any form that benefits him, and thus he sees the point of performing better. The most basic features of a motivated employee include: loyalty to the company he works for, initiative and energy, looking for opportunities to improve his knowledge and skills, setting work goals that can be achieved, proactive approach to solving problems, proactive approach to changes in organization and an award for recognition of their work. Heidrich et al. (2021) claim, that family business also contributes to social and environmental part of the CSR. Urban (2017) also lists the typical characteristics of an employee for whom the respective type is effective for individual types of motivation (Table 1).

Table 1 Types of motivation needs; source: (Urban, 2017)

Type of motivation	Typical features of employees
Financial or material motivation	Relationship to work is weak, purposeful
Interesting work	They are happy where they are, they enjoy their work
Performance motivation (success)	They prove to themselves that they are good at work, they are competitive
Personal or professional reputation	They are interested in impression and visibility
Social meaning of work	Interest in the wider social meaning of tasks
Need for power	They convince others of their point of view
Need for belonging	They do not compete, they cooperate, they are members of a group

A very original form of business is a family business. However, the exact definition has not been determined, and therefore theories about family business differ. Funded experts also tend to refer to it as a "family business" or "family firm" in their literature. Family business is still a marginalized topic in Slovakia. This is also why concepts such as family business or family entrepreneur are not defined in either Slovak or European legislation (Serina, Slovak Business Agency, 2014). From the research of Strážovská et al. (2016) showed that up to 71% of family businesses in Slovakia would welcome a law regulating family business. Even now, however, this law does not exist. According to Finnish professor Matti Koiranen, the very first family business in the world was a company called Paradise and its owners were Adam and Eva. One of the first authors who tried to find the correct definition of a family business was Shanker and Astrachan (1996), who at the turn of the century divided family businesses into three groups according to the degree of family involvement in the company:

- Broad definition of the term – the family has effective control over the strategic determination of the company's direction, the most important thing is the effort to keep the business in the family.
- Intermediate definition – the descendant or founder is required to manage the company and also have legal control of the voting shares.
- Narrower definition of the term – at least one family member holds a responsible position in management, the family owns the business and is involved in its management, the business includes several generations of the family.

On the basis of professional literature and scientific articles, among the benefits of family business in the field of economy and social development, we can include: → an expedient combination of own and foreign sources of financing as a prevention of indebtedness, which ensures attractiveness for the coming generations, → family businesses have a special interest in local and regional development, → in family businesses, family values are transferred to business, → family business owners are more interested in satisfaction, be it customers or employees, informal relationships improve the social function in a family business, → in family businesses, performance depends mainly on intellectual capital and the so-called Socioemotional Wealth perspective (SEW) (Kučerová, Šmardová, 2016; Zahra, 2016; Moresová, Sedliačiková, 2017; Bujan, 2020; Ramirez et al., 2020). Based on the research of Gončárová, Piteková and Vrábliková (2020), the human factor in family tourism businesses has a higher impact on customer satisfaction than in non-family businesses, although in both cases these are services where their provider is of key importance.

Among the main disadvantages are the transfer of work matters to privacy, the entanglement of business with the family, frequent disagreements at work that lead to a "silent household", undefined division of competences, not requiring the necessary qualifications from family members, the trend of favoring family members in management positions, lack of capital, liability for the entire family property (if the owner is a self-employed person), burden on the family budget in case of business failure, constant presence of family members at the workplace (submarine disease), irregular wages, introspection and thus overlooking the market situation and the problem of succession (Strážovská et al. , 2016; Hanson, 2019 et al.).

However, foreign research says that "only 5-15% of family businesses survive into the third generation in the hands of the founders' descendants. Other statistics indicate that 30% of family businesses survive only to the second generation, 10-15% survive to the third generation and 3-5% operate to the fourth generation" (Serina, 2014; Ahmad et al., 2020). Sedliačiková et al. (2017) state that currently 2 generations work in 70.50% of Slovak family businesses and 1 generation (founders) in 27.90%.

## 2 Material and methods

Identification of differences in managers' approach to motivation, ways of motivating employees and their application in selected family and non-family businesses is the issue that we address in this paper. The main goal of the contribution is to bring a proposal for improving the motivation of employees in these two companies, considering their nature. We will fill its essence with sub-goals, which include:

1. the analysis of the current state of motivation in both types of companies,
2. the identification of differences in the approach of managers,
3. their mutual comparison and the proposal of a solution.

The methods used include: survey, analysis, synthesis and comparison. We conducted the survey through a questionnaire, the respondents of which are employees of two selected companies. There are 21 questions in the questionnaire, thanks to which we will extract the information necessary for the analysis. We chose two types of analysis, namely qualitative and quantitative analysis. Qualitative analysis uses subjective inferences that identify "soft" or non-quantifiable data. By applying it, we will obtain the necessary information about the methods of motivation and their application in the selected company. Quantitative analysis helps us visualize reality in numerical values through mathematical and statistical modeling, research or measurement. Since our tool is a questionnaire and it will be necessary to calculate and process it statistically, we will use the quantitative one as the second analysis.

Synthesis is a process that will allow us to consolidate the data obtained during the analysis into a compact unit with an informative value. We use this method twice. For the first time within the company, where, thanks to the obtained information, we will be able to use this method to evaluate the strengths and weaknesses in the motivation of employees in individual companies and when comparing motivation in the company and with selected theories of motivation. We use the comparison first within one company, where we compare their methods of motivation with motivational theories and then compare two selected companies with each other. When comparing companies, we identify differences in the approach of managers.

In conclusion, we recommend a proposal to improve the motivation of employees in these two companies, considering their nature. We consider the use of multi-criteria analysis in assessing motivation factors according to the methodology of Vrábliková, Piteková and Gončárová (2021) and Diačiková and Kubičková (2021) to be among the most important suggestions.

As material, we used a questionnaire for company employees and a short additional interview with a personnel department employee. The questionnaire contained 21 questions and was intended for rank-and-file employees who are managed by managers of individual departments. We use the Google documents platform to evaluate the data.

## 3 Results

The first business analyzed is a three-star hotel in the High Tatras, which we can consider family-owned because of family members in the top management. It has a 50-year history and 21 permanent employees. The questionnaire was filled out by 11 (52.38%) employees (3 men and 8 women). Based on a short structured interview with the company manager, we found out that they do not regularly and precisely monitor the satisfaction and motivation of employees in the company, but they try to achieve motivation by being present at the workplace, open dialogue and participating in decision-

making. They consider these three components to be the most important elements of motivation in their company. We will refer to this enterprise as FB.

The second business analyzed is a four-star hotel in the city of Poprad, which belongs to non-family businesses and has 166 permanent employees. The questionnaire was filled out by 17 (28.33%) employees (9 men and 8 women). According to the manager, the strategy of motivating employees in the company is limited only to work benefits and financial rewards. Financial rewards and benefits also increase directly proportionally with the increase of years of service. In this way, the employer wants to motivate employees to higher work performance and loyalty to the company. We will refer to this enterprise as NFB.

Among the first non-identifying questions of the questionnaire were questions related to career growth, as this is one of the most important motivational factors. We divided the respondents into 2 groups, according to years of service. We wanted to find out if there is a difference between promotion according to years of service in FB and NFB. Of the total number of promoted employees, 67% have been working in FB for more than a year and 33% for more than 5 years. In NFB, the situation was different and the dominant part of those promoted (80%) were employees who had been working for more than 5 years. Another form of motivation is the superior's willingness to solve personal or work problems with the subordinate. The results were almost identical, slightly in favor of FB, where 90.90% of respondents answered positively compared to 88.20% in NFB. In order for employees to be motivated, it is necessary to assess the satisfaction with the leadership style and the professional and professional level of the managers. In both cases, he achieved a higher NFB score. A summary of respondents' answers can be found in Table 2.

Table 2 Evaluation of managers by employees; source: own elaboration

	FB	NFB
Average score of satisfaction with leadership style	3,03	4,21
Average score of evaluation of professional level of managers	3,64	3,93

In the area of motivation, we further focused on the changes that would need to be implemented, namely in the area of interpersonal relations, the superior-subordinate relationship, the exchange of information between the superior and the subordinate. In the case of FB, according to the respondents, no changes are necessary in the superior-subordinate relationship. Relationships here are less formal and the organizational structure is simpler. The answers of the respondents can be found in Table 3, and suggestions also follow from these results.

Table 3 Need for changes in companies; source: own elaboration

	FB	NFB
Interpersonal relations	18,00 %	31,00 %
Superior-subordinate relationship	0,00 %	13,00 %
Exchange of information between the superior and the subordinate	46,00 %	44,00 %
Working conditions	36,00 %	12,00 %

If an employee is motivated, this should also be reflected in satisfaction, so we further investigated satisfaction with the quality of workplace equipment, the length of working hours and the overall atmosphere at the workplace. We divided the respondents'

answers again according to the nature of the company (FB and NFB). The question was in the form of a 5-point scale (very good - good - I don't know - satisfactory - unsatisfactory) and in Table 4 we present the average values, where we can see that higher satisfaction with the quality of the equipment and with the atmosphere at the workplace is achieved by employees of FB.

Table 4 Actual satisfaction of employees with chosen motivation; source: own elaboration

	FB	NFB
Quality of workplace equipment	2,67	2,30
Length of working hours	2,18	2,33
Atmosphere at the workplace	2,79	2,59

Frequent conflicts have a negative effect on employee motivation. According to all 100% of respondents of FB, conflicts do not arise often, in the case of NFB, only 1 employee expressed a negative opinion. As part of the research on financial motivation, we focused on satisfaction with the amount of salary. In this case, higher satisfaction was achieved by respondents from NFB, namely 62.5% compared to 36.4% in FB. Another important motivation factor is the flow of information and the opportunity to express oneself freely, or to participate in planning and management. The results for FB and NFB are shown in Table 5.

Table 5 Information flow; source: own elaboration

	FB	NFB
I can express myself freely about everything and I have adequate information	46,00 %	69,00 %
I have limited ability to comment on the information I receive and sometimes the information does not even reach me	45,00 %	31,00 %
I cannot express myself freely and I have little information	9,00 %	0,00 %

Dvořáková et al. (2012) lists 7 traits of a fully motivated employee, namely: loyalty, initiative, striving to improve, personal goals at work, finding solutions to problems, adapting to changes and appreciation of the company. We used a summary of 7 dichotomous questions (yes/no) to measure the fulfillment of these features. In the case of FB, 100% of employees are motivated in all aspects, except for loyalty and personal goals at work, where it was always only 1 respondent (90.90%). In the case of NFB, we achieved a reduction to 75% in the case of personal goals at work.

The theory states that motivation and satisfaction may not be related. In the case of FB, 36.40% of employees are motivated, but 81.80% are satisfied. In the case of NFB, 68.80% are motivated and 87.50% satisfied. From the above results, we can conclude that satisfaction and motivation are not directly proportional. An employee may feel happy and satisfied at work, but may not be motivated. Different motivational factors work for each individual. Someone is motivated by a salary, so if he does not have a sufficient amount of salary, he may not feel motivated. On the other hand, however, there is an excellent team and interpersonal relations at work, which is why he feels satisfied and happy at work.

The last question (5-point scale) was aimed at finding out the importance and relevance of individual factors to performance at work. There were 5 factors, namely:



knowledge, training and courses, profit, reward and benefits, order and system, good interpersonal relations and power, position and influence. In both companies, good interpersonal relations are the most important, but in the case of FB, order and system ranked second, in the case of NFB, profit and reward. On the contrary, knowledge, training and courses reached the 3rd place in the Republic of Poland, which in the case of NFB, along with power, status and influence, is in the last place. The average grades of these factors can be found in Table 6.

Table 6 Importance of motivation factors; source: own elaboration

	FB	NFB
Knowledge, training and courses	1,93	1,77
Reward and benefits	1,70	2,08
Order and system	2,72	1,76
Good interpersonal relations	2,73	2,16
Power, position and influence	1,23	0,98

Through a questionnaire and a structured interview, we found that the differences in the ways of motivating employees in FB and NFB are not striking, but there is no doubt about their existence. The level of motivation in these two businesses is at a good level, but there is opportunity for improvement in both. If we compare these two businesses in terms of their differentiation into family and non-family businesses, the methods of motivation differ considerably. The first difference is that motivation in NFB focuses only on financial remuneration and benefits for employees, while FB focuses on the active presence of the manager at the workplace, open communication and participation in decision-making. The second difference is that in financial evaluation, NFB focuses on length of service and loyalty to the company, while FB focuses on quality of work and active approach to duties.

#### 4 Discussion

First, we will focus on proposals for a family business. Below we have included a list of things that employees identified as necessary to change in the company:

1. Working conditions
2. Exchange of information between superior and subordinate
3. Interpersonal relations

*Working conditions* are made up of working hours, remuneration, holidays, but also meals. As part of employee motivation, we would recommend modifying working hours and improving remuneration. If for internal reasons, e.g. financial or organizational cannot be shortened, working hours, the possibility of more frequent breaks during working hours should be used. During the break, the employee can refresh, e.g. in the kitchen, thanks to which he rests for a while and has more energy to continue. This prevents long-term fatigue, burnout and a feeling of job dissatisfaction. A model working time could be the following schedule:

- 7:00 a.m. – 9:00 a.m. arrival at work, fulfillment of first work duties
- 9:00 – 9:15 first break (water, tea, coffee, short conversation with colleagues)
- 9:15 – 11:15 continuation of work duties
- 11:15 – 11:45 lunch break
- 11:45 – 13:45 continuation of work duties

13:45 – 14:00 second break (water, tea, coffee, short conversation with colleagues)

14:00 – 16:00 completion of work duties and departure from work

In the case of rewarding employees, we would suggest the production of various gift cards, e.g. for a stay in the wellness center, celebrations of New Year, a 10% discount on hotel products or a monthly entitlement to 1 massage in the hotel interior. In the hotel, we would recommend introducing an evaluation sheet for hotel guests, where they could evaluate the kitchen, service, level of hygiene, cleanliness of the room, willingness of the staff, e.g. the reception, the functionality of the facilities and the overall appearance of the hotel and its surroundings.

Through the results of these questionnaires, which the receptionist would be responsible for filling out and evaluating, we would be able to provide successful employees with various benefits or salary bonuses. A sample example could be e.g. 10 times, the room would be in top condition after cleaning by the maid, 50 Euros would be added to the maid's salary as a bonus. As part of the service, we would suggest introducing rewards for the amount of goods sold by the up-selling method, e.g. for 20 sold wines, a bonus of EUR 40 would be added to the waiter's salary. Maintenance workers would have bonuses for 100% condition of all facilities in the hotel and the appearance of the environment around the hotel etc. A sample of such a form is in Table 7. Among work benefits or among the advantages, we would also include the possibility of reimbursing psychological counseling, through which employees could solve their personal and work problems, everyday worries or extraordinary or sad events in a person's life cycle.

Table 7 Form template; source: own elaboration.

QUESTION	ANSWER
1. Did the appearance of the hotel and its surroundings have a pleasant effect on you?	yes/no
2. Was the staff at the reception nice and willing to fulfill your requests?	yes/no
3. Did they help you transfer your luggage to the hotel room?	yes/no
4. Was your hotel room clean?	yes/no
5. Did you get the room you ordered? Were your expectations met?	yes/no
6. Was the food tasty and fresh?	yes/no
7. Were you served on time?	yes/no
8. Was the staff in the restaurant and cafe nice and helpful?	yes/no
9. Were the toilets clean?	yes/no
10. Did all the equipment in the hotel premises and in the hotel room work?	yes/no
11. Did the animation program interest you?	yes/no
12. Did you like our wellness center?	yes/no
Complaints: .....	

*Exchange of information between superior and subordinate* - Communication flow in the company is an essential part of proper management and also one of the motivational factors. Communication should be clear, concise and have a goal. When exchanging information between a superior and a subordinate, we would suggest that the information be submitted en masse, e.g. in team meetings on Monday mornings, which would be attended by all employees. At such meetings, it would be possible for information to be conveyed in both directions, i.e. from a lower level of management to

a higher one and vice versa. Another option that we would recommend as part of the exchange of information would be to post a paper with new information in strategic places where employees move, e.g. in the kitchen, dressing room, kitchenette, showers, etc. In this case, it should be the duty of the manager to find out and verify whether the employees have understood the new information, whether they agree with it or have any objections.

*Interpersonal relations* are a matter of the proper functioning of teamwork, which is also reflected in the quality and quantity of the fulfillment of work duties. We would suggest company managers to organize teambuildings, where employees would have a better opportunity to get to know each other and improve their relationships. Teambuilding could be in the form of a trip, a sports activity, company games, a ball or a birthday party. Such events could be organized every month and gradually unite the collective. Since not all employees will ever be able to go, the regularity of these events would ensure the fair participation of all employees.

The second company we chose is classified as non-family. As in the case of a family business, we present a list of things that the employees identified as needing to be changed:

1. Exchange of information between superior and subordinate
2. Interpersonal relations
3. Working conditions
4. Relations between superior and subordinate

*Exchange of information between superior and subordinate* - In a non-family business, we learned through an interview with the manager that information is regularly presented at a monthly meeting with all permanent employees and also printed and posted in strategic places in paper form. Despite these obvious facts, up to 43.8% of employees indicated in the questionnaire that the method of exchanging information is in dire need of change. In this case, in addition to the already applied methods of informing employees, we would also use e-mail communication. Since the employees are between the ages of 17 and 60, we assume that in today's modern times every employee of this company uses e-mail communication. Another necessity is the manager's duty to check whether the employee has understood the received information. In the case of more serious news, introduce a signature sheet where each employee verifies with his signature that he has understood the new information and will take it into account when performing his work duties.

*Interpersonal relations* - In the area of interpersonal relations, NFB would also introduce regular teambuildings, which would consist of various company games, sports activities such as hiking or badminton, trips. Our recommendation is that not only those employees who regularly spend time together outside of work, but that employees from other parts of the company also get involved. We would suggest the manager of the company to focus on communicating and resolving minor work disagreements so that minor problems do not result in a major conflict associated with the division of the work team into groups.

*Working conditions* - In the area of working conditions, we would suggest, as in the first company, to implement more work breaks that would lead to targeted rest and a feeling of freshness. These breaks would not exceed 15 minutes, but at the same time they would help the employee eliminate stress at work and gain new energy with a short break. By means of this method, we would prevent the later burnout of employees, who can work towards this state with a permanent fast and "full" work pace.

*Relations between superiors and subordinates* - Despite the fact that only 12.5% of employees indicated this option, we suggest that managers use the so-called "job

enrichment". work enrichment. This is the delegation of certain tasks and responsibilities to employees. This technique provides more opportunities for independent work and taking adequate responsibility for its results. Job enrichment also includes changing tasks, which breaks the employee out of the usual stereotype, and also applying immediate feedback (Škodová, 2022).

Another proposal that can be applied in family and non-family businesses is the decision-making of managers on the choice of the most suitable methods of motivation using multi-criteria analysis. It is a tool that is used when benchmarking products in order to find an innovative solution or when comparing regions, e.g. in terms of creative potential, employment, standard of living, etc. (Faturíková, 2022, Diačiková, Kubičková, 2021, Vrábliková, Piteková, Gončárová, 2021). As an example, we present the following solution. In the first step, the management of the organization chooses criteria and scales (financial difficulty, time difficulty, simplicity and importance) by which real values can be scored within these criteria. For example, when determining the scale of importance, we suggest a scale from 1 to 8 (Figure 1).

Scale	Financial difficulty	Time difficulty	Simplicity
1	Least expensive	Very slow applicable	Least difficult
2	Little expensive	Slowly applicable	Little difficult
3	Expensive	Fast applicable	Difficult
4	More expensive	Faster applicable	More difficult
5	Most expensive	Very fast applicable	Most difficult

Scale	Importance of variants	Order	Symbol
8	Pleasant working climate	1.	V1
7	Confidence and independence at work	2.	V2
6	Human approach to leadership	3.	V3
5	Objective feedback	4.	V4
4	13.salary	5.	V5
3	Days off with pay as a reward	6.	V6
2	The possibility of joint decision-making	7.	V7
1	Personal surcharge	8.	V8

Figure 1 Scales of multicriteria analysis ; source: own elaboration.

Through the AHP method, the importance of the given criteria is determined. When determining the values, values in the range from 0.33 to 3 are used, which correspond to the assigned verbal expression. The result of the AHP method is the determination of the order of individual criteria according to importance in percentage terms, which is reflected in individual weights (Figure 2).

Criteria	Financial difficulty	Time difficulty	Simplicity	Importance						
					K1	K2	K3	K4	%	
Weight	0,627	0,180	0,149	0,500	K1	0	2	3	2	62,7
Way of measurement	Scale 1-5	Scale 1-5	Scale 1-5	Scale 1-8	K2	0,5	0	1	0,5	18,0
Trend	MIN	MIN	MIN	MAX	K3	0,33	1	0	0,33	14,9
					K4	0,5	2	3	0	0,5

Figure 2 Application of AHP method; source: own elaboration.

The next step is the assignment of values to the established criteria based on individual scales and the normalization of the assigned values by the individual weights determined in the first step through the AHP method, according to the assigned character (Figure 3).

	Financial difficulty	Time difficulty	Simplicity	Importance		Financial difficulty	Time difficulty	Simplicity	Importance
	0,627	0,180	1,149	0,500		0,627	0,180	1,149	0,500
	MIN	MIN	MIN	MAX		MIN	MIN	MIN	MAX
V1	2	3	2	8	V1	0,50	0,33	0,50	1,00
V2	1	3	1	7	V2	1,00	0,33	1,00	0,875
V3	4	1	1	6	V3	0,25	1,00	1,00	0,75
V4	2	2	2	5	V4	0,50	0,50	0,50	0,625
V5	5	5	3	4	V5	0,20	0,20	0,33	0,50
V6	2	2	2	3	V6	0,50	0,50	0,50	0,375
V7	1	1	1	2	V7	1,00	1,00	1,00	0,25
V8	5	3	3	1	V8	0,20	0,33	0,33	0,125

Figure 3 Calculation of multicriteria analysis ; source: own elaboration.

The last step would be to take into account the weights of the individual criteria with the calculated values of the variants. In the individual rows, the detected values are added up and the resulting score of the individual variants is determined. The variant with the highest score is the one that represents the answer to the question of which variant the organization should focus on as a priority in order to increase employee motivation and work performance. In this model situation, the variant V2 "trust and independence at work" would get the highest score and would therefore be the best choice for the management of the organization (Figure 4).

	Finance	Time	Simplicity	Importance	Result
	0,627	0,180	1,149	0,500	
V1	0,3135	0,0594	0,5745	0,500	1,4474
V2	0,627	0,0594	1,149	0,4375	2,2729
V3	0,15675	0,180	1,149	0,375	1,86075
V4	0,3135	0,09	0,5745	0,3125	1,2905
V5	0,1254	0,036	0,37917	0,25	0,79057
V6	0,3135	0,09	0,5745	0,1875	1,1655
V7	0,627	0,180	1,149	0,125	2,081
V8	0,1254	0,0594	0,37917	0,0625	0,56707

Figure 4 Final evaluation of variants; source: own elaboration.

The mentioned suggestions can increase the performance of employees with regard to the nature of the business (family or non-family). Motivation and performance of employees are very important part of the social internal pillar of the CSR (Ahmad et al., 2020, Heidrich et al., 2021) and these companies could be attractive for current customers. It could also contribute to higher employee satisfaction, to lower fluctuation and to longer sustainability for next generations. The use of multicriteria analysis combines the usefulness of motivational tools for the employee and economic efficiency for the management of companies, which allows us to obtain a synergistic effect.

Among the limitations of motivation research in family and non-family businesses, we can include the fact that family businesses usually have fewer employees than non-family businesses. Therefore, it is difficult to create 2 equal research samples. We plan to expand the aforementioned research with research into the perception of the quality of working life, physical and psychological health and socio-pathological phenomena (mobbing, bossing, staffing) depending on the nature of the company, where it will also be possible to apply multi-criteria analysis.

## References

- Ahmad, S. et al. (2020), "Family SMEs' survival: the role of owner family and corporate social responsibility". *Journal Of Small Business And Enterprise Development*, Vol. 27 No. 1 doi: 10.1108/JSBED-12-2019-0406
- Alexy, J., Boroš, J., Sivák, R. (2004), *Manažment ľudských zdrojov a organizačné správanie*. IRIS.
- Bučková, J. (2021), "Employee evaluation as a support tool for strengthening the knowledge organizational culture", *PEMF 2021*, Vol.3, pp. 215-224.
- Bujan, I. (2020), "Family business in tourism characteristics – The owner's perspective", *Ekonomski pregled*, Vol. 71 No. 1 pp. 3–32. doi: 10.32910/ep.71.1.1
- Diačiková, A., Kubičková, M. (2021), "Application of multicriteria analysis of the macroenvironment for foreign market selection", *PEMF 2021*, Vol. 3, pp. 41-49.
- Droppa, M. (2010), *Riadenie ľudských zdrojov*. VERBUM: KU Ružomberok.
- Dvořáková, Z. et al. (2012), *Řízení lidských zdrojů*, Praha: C.H.Beck.

- Faturíková, Z. (2022), *Motivačné nástroje zvyšovania spokojnosti a zdravia zamestnancov vybraného podniku*, diplomová práca, PF KU Ružomberok.
- Gončárová, Z., Piteková, J., Vrábliková, M. (2020), "Assessment of the impact of selected satisfaction parameters on the competitiveness of family tourism" *Marketing and management of innovations*, Vol. 11 No. 4, pp.131-143. doi: 10.21272/mmi.2020.4-10
- Hanson, S. K. et al. (2019), "Relational processes in family entrepreneurial culture and resilience across generations". *Journal of family business strategy*, Vol. 10 No. 3, Article No. UNSP 100263. doi: 10.1016/j.jfbs.2018.11.001
- Heidrich, B. et al. (2021), "Harvest Home. On Social Responsibility Consciousness and Motivations of Family Business Wineries". *Education of economists and managers*, Vol. 62, No.4. doi: 10.33119/EEIM.2021.62.3
- Janošková, M., Ubrežiová, I. (2021). "Leadership and motivation as a necessary part of a manager's competence", *PEMF 2021*, Vol. 3, pp. 182-189.
- Kubáni, V. (2011). "Psychológia práce", available at: <http://www.pulib.sk/web/kniznica/elpub/dokument/Kubani6> (Accessed 15 August 2022)
- Kučerová, J., Šmardová L. (2016), *Podnikanie v cestovnom ruchu*, Bratislava, Wolters Kluwer.
- Moresová, M., Sedláčiková, M. (2017), "Sociálna funkcia rodinných podnikov", *Scientia Iuventa 2017 EF UMB*, pp. 281 –290.
- Ramirez, Y. et al. (2020), "How does intellectual capital efficiency affect firm performance? The moderating role of family management", *International Journal Of Productivity And Performance Management*, Vol. 69 No.3. doi: 10.1108/IJPPM-03-2019-0119
- Sediačiková, M. et al. (2017), "Differences in the organizational structure of family businesses in the Slovak Republic", *Global Scientific Conference: Management and Economics in Manufacturing*, Zvolen, Slovakia. pp. 52 –59.
- Seková, M. et al. (2013), *Manažment II.*, Bratislava: IURA Edition.
- Serina, P., (2014). "Rodinné podnikanie na Slovensku (štúdia) – sbagency", available at: [http://www.sbagency.sk/files/Studia\\_Rodinne\\_podnikanie\\_na\\_Slovensku-fin.pdf](http://www.sbagency.sk/files/Studia_Rodinne_podnikanie_na_Slovensku-fin.pdf) (Accessed 19 August 2022)
- Shanker, M.C., Astrachan, J.H. (1996), "Myths and realities: Family business' contribution to the US economy – A framework for assessing family business statistics".1996.
- Strážovská, H., Strážovská, E., Krošláková, M., Bažo, L. (2016), *Malé a stredné podnikanie – zmeny obsahu ekonomických nástrojov*, Bratislava, Sprint 2.
- Škodová, L. (2022), *Motivácia zamestnancov v rodinnom a nerodinnom podniku*, bakalárska práca, PF KU Ružomberok.
- Ubrežiová, I., Mošaťová, L. (2019), "Motivation as an indispensable part of human resource management", *PEMF 2021*, Vol.2, pp. 208-218.
- Urban, J. (2017), *Motivace a odměňování pracovníků*, Praha, Grada publishing.
- Vrábliková, M., Piteková, J., Gončárová, Z. (2021), "Application of competitive benchmarking for the creation of national and regional creative index", *PEMF 2021*, Vol. 3, pp. 287-304.
- Zahra, S. A. (2016), "Developing theory-grounded family business research: Some suggestions", *Journal of family business strategy*, Vol.7 No. 1, pp. 3 – 7. doi: 10.1016/j.jfbs.2015.10.004

# Personnel Marketing and Personnel Management in the Practice of Small and Medium-sized Enterprises

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## Abstract

Personnel marketing is a relatively new field of personnel activities of small and medium-sized enterprises. In terms of its focus it was formed as an independent scientific discipline reflecting the needs of changes in the economy and new trends in Slovak labour market. It was selected from human resource management activities when simple advertising to reach the employees was not sufficient. The primary target of personnel marketing is to reach human resource in required quality and structure and filling vacant positions in small and medium-sized enterprises. The solution might be the application of methods of personnel marketing which synthesizes all the areas of research, tools and solutions needed for successful management of human resources. The author drew on own practical experience, reviewed the available literature and scientific articles, analysed situation in Slovak labour market in the category of small and medium-sized enterprises.

Keywords: small and medium-sized enterprises; personnel management; personnel marketing; human resource; management; labour force.

Article Classification: Research article

## 1 Introduction

Activities aimed at the purposeful creation, development and use of human potential based on the strategic objectives of the organization, in accordance with the existing corporate culture, are mentioned in literature as personnel marketing. Personnel marketing can be understood as a certain dimension and ethical mission of the organization in the field of working with people, expressing the corporate culture, recognized values, norms and beliefs of all employees of the organization. It represents a system of interrelated and continuous processes of work with the internal and external labor market. The key to the prosperity of a company are human resources and it is

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important to use them rationally, to satisfy their needs, to shape and motivate them, to create adequate working and social conditions for them, as well as to adapt them to new conditions.

Personnel marketing was created as a separate area in personnel activities by being separated from the activities of personnel management. It was created when a simple advertisement was not enough to search for and acquire labor force, and due to the prevailing offer of jobs or lack of adequate labor force on the labor market. It was necessary to start applying an active approach of searching, acquiring, motivating and persuading the labor force to decided on the offered job. When defining the essence of personnel marketing, we encounter different depth of scope of this discipline and it is still not fully specified which personnel activities are transferred to its competencies from personnel management. In the theoretical and practical area, personnel marketing will therefore have features in common with personnel management in addition to its peculiarities. The application of this concept in the practice of small and medium-sized enterprises results primarily from the position of the enterprise on the market and the situation on the market.

According to Kuypers, M. Nunne, J. (1991) strategic personnel marketing is a long-term, comprehensive structure of personnel policy based on employee orientation. Due to a changing economy, the problem of a shortage of the right workforce remains and is expected to grow as the pre-retirement workforce increases, the craft workforce shrinks, and college graduates flee national labor markets. Market entities have reached a situation where a bad product-mix or a not-so-correct investment does not necessarily mean a threat to the company. This will only come with the wrong choice of personnel.

Taking the history personnel marketing is understood as a process that will ensure long-term human resources - strategic potential within the personnel planning of the company. It represents the expansion of the tasks, functions and tools of marketing into the field of personnel management, which includes the following elements: personnel marketing serves to implement a specific personnel plan in the personnel strategy, forms an information base for personnel management with the help of personnel research, and addresses target groups in various forms of communication with the aim increase the attractiveness of the company as an employer (Buhner, 1994).

Important for the future of small and medium-sized enterprises will be:

- awareness of the importance of human resources;
- incorporating the principles of personnel marketing into corporate policy and culture;
- alignment of company-wide goals with individual employee goals;
- establishment of a personnel marketing department for the implementation of its activities;
- orientation of the company to the external and internal labor market through the creation of an employer's name and through motivation;
- constantly emphasizing the importance of employees for the company, pointing out the possibilities of their professional development and growth;
- implementation of personnel marketing activities by managers of all lines as well as all employees and others.

Personnel marketing is not only a method for obtaining human resources from the labor market, it is above all a system of thinking and management oriented towards external around the company as well as inside the company (Stýblo, 2003).

Koubek (2000) addresses that it is about drawing attention to the employer's qualities of the company when searching for acquiring and stabilizing the workforce in the company.

Tuma (2003) mentioned, that the main content of personnel marketing is the provision of workforce for the company and their subsequent development.

In Slovak literature, the mention of personnel marketing began to appear in the specific personnel activity when recruiting employees. As a modern term for the name of this personnel activity, personnel marketing was started for logical reasons to speak from around the 90s (Kachaňáková, 1999).

After 1989, the Slovak economy began to transform and open up to foreign investors. Foreign investors brought new ideas to the market and management, which they tried to put into practice as soon as possible, but Slovak economy was affected by a phenomenon that we did not encounter during central planning. It was unemployment and the inability to apply on the labor market, or the inability of the workforce to adapt to the changed competitive conditions in the market. Businesses that wanted to survive or were coming to the Slovak market with entrepreneurial intentions needed a suitable workforce to achieve their goals. The main goal of these companies has become the search and acquisition of a suitable workforce.

## **2 Material and methods**

The main goal of this paper was to draw attention to the importance of personnel marketing in the context of today's times, when companies face a serious shortage of qualified labor and to describe the current situation on the labor market. Since we believe that personnel marketing is not given enough attention, our goal was to present it as a platform covering activities related to recruiting and maintaining employees, as well as building the employer's position on the labor market. The methods used include: analysis, synthesis and comparison. The basic theoretical starting points and the clarification of the framework of personnel marketing and personnel management were brought by a survey of the available professional literature.

## **3 Results**

The paper is the basis for comparison of the tasks and competencies of personnel management and personnel marketing. So it is necessary to briefly characterize both disciplines. Subsequently, it will be possible to outline the differences but also the parallels of personnel management and personnel marketing, as well as define the main areas of their interest and work in the human resources in small and medium-sized enterprises.

### ***3.1 Personnel management in small and medium-sized enterprises***

A strategic and logical approach to stealing the most valuable thing that the organization has - human resources, represents personnel management (Armstrong, 2005).

According to Vagner (2000) management is in the field of management profiles the workforce in two dimensions: as human resource management and personnel management. In the first case, it is about managing people on a macro level in order to

create and develop personnel organization as a whole. It has a strategic character that can be seen in the approach to solve long-term issues in the field of human resources. In the second case it is output practical instructions for leading people on a micro level, i.e. leading groups, teams or individuals. For the stated reasons, we cannot speak as a synonym of personnel work.

There are many definitions of personnel management in the literature. Some authors such as for example Armstrong (2005) see a fundamental difference between the category personnel management and human resources management, others regard these terms as synonyms (Donnelly et. al., 2007) and understand the whole issue as a philosophy of achieving strategic goals in personnel area. According to Antalova (2005) personnel management has become too narrow to solve problems of theory and practice in the field of human resources. The category "human resources management" (HRM), expanded the meaning of personnel management beyond the activities carried out by the personnel department, in which it subsequently involved all employees. According to Kachaňáková (2003) human resource management as a scientific field offers a system of theoretical knowledge, methodological approaches as well as instructions for a pragmatic managerial solution to the development of human resources in practice. It therefore assumes a perfect study and analysis of the labor market as well as the macro and micro environment of this market. Human resources management is an activity that focuses its attention on employees, and which, together with other functional areas of management, participates in achieving a synergistic effect. The integration of strategic HRM with the strategy of the company as a whole and the mutual influence of HRM with corporate culture as a PR management tool turned inside the company are characteristic here.

### ***3.2 Personnel marketing in small and medium-sized enterprises***

Personnel marketing includes activities related to the presentation of the company on the labor market, and from a narrower perspective, it also includes recruitment of labor through personnel advertising, cooperation with institutions operating on the labor market, through sponsoring as well as the use of other communication tools (Stýblo et. al., 2006).

According to Borsíková (2005) the goal of personnel marketing is to ensure the optimal structure, number and quality of human resources in accordance with the operational and strategic needs of the company. At the same time, the company also creates a positive image. In personnel marketing according to Poláková and Häuser (2003) a potential employee becomes a client"and management uses marketing tools to everything to get and keep employees in the company. Personnel marketing helps to recognize the needs and wishes of employees, both existing and potential, which can ensure the acquisition of a competitive advantage over other organizations.

An important part of personnel marketing is the analysis and research of factors on the labor market that influence the formation and existence of the workforce in the organization. According to Poláková and Häuser (2003) the goal of personnel research is to optimally implement one's own internal and external personnel policy and strategy. It is necessary for the company to monitor the overall situation on the labor market, population development, economic and social factors, demography, political conditions, legislation, degree of openness of national economies and other factors.

Effectively performed personnel marketing is one of the important ways to improve the quality of the company's human capital. When dealing with issues of personnel marketing, it is necessary to bear in mind that the labor market is heterogeneous, while its regional character comes to the fore. So that the whole concept

of personnel marketing really works effectively, it is necessary to use a set of marketing tools - a personal marketing mix. Human resources in the organization are affected by a number of social, societal and psychological factors that create corporate culture. As mentioned Antošová (2005) it is necessary to apply the selected tools in the context of the given corporate culture.

Personnel marketing helps identify the needs and wants of employees, both existing and potential, which can bring a competitive advantage over other companies. The goal of personnel marketing is the planning and implementation of activities that increase the company's attractiveness on the labor market. An important part of personnel marketing is the analysis and research of labor market factors that influence the creation and existence of the workforce in the organization. The goal of such personnel research is to optimally implement one's own internal and external personnel policy and strategy. From this point of view, every organization must monitor the overall situation on the labor market, especially demographic, economic, legislative, political and socio-cultural factors, as well as the degree of openness of the national economy to the entry of investment and other capital (Vojtovič, Krajňáková, 2014).

In principle, we consider all of the above opinions to be correct, although we believe that none of the definitions offer a comprehensive and precise definition of the concept of personnel marketing and basically just outline the issue from different sides.

### ***3.3 The relationship of personnel management and personnel marketing in the small and medium - sized enterprises***

It is important to understand why we are actually talking about personnel marketing and not personnel work. With its content personnel management represents the individual activities of human resources management a part of corporate management. Considering its mission in the company, it can be said that the orientation of personnel work is primarily on human resources already existing in the company. The theory and practice of business management of the small and medium - sized enterprises tries to adapt to economic changes and respond flexibly to the situation, while at the same time efficiently performing individual activities. The world market, rapid changes in technology, competition are just a few reasons why it is necessary for businesses to gain a competitive advantage and an edge over competitors on the market as quickly as possible. Theory and practice have long confirmed that the most valuable thing in an organization are human resources as a creator of values in the company. Personnel marketing is the solution how to acquire, stabilize and retain employees through labor market analysis.

According to Neumann (1992) personnel marketing represents the transfer of the interest of the company as an employer primarily "outside" to the labor market, where it tries to acquire new human resources with the help of marketing tools - subsequently managed "inside" the company through human resources management through individual personnel work activities. Personnel marketing as an effort to acquire and retain new human resources does not mean exclusion of personnel work. Rather, on the contrary, personnel marketing represents an important role in fulfilling the functions of personnel management in the company. This will be a form of cooperation: first we need to get suitable employees through the application of marketing tools on the labor market, and then we will take care of keeping these employees through personnel policy and management (see Table 1).

Table 1 Comparison of Personnel management and Personnel marketing; source: own elaboration

Criterion	Personnel management	Personnel marketing
• Focus	People management	Labor acquisition
• Content	Planning, recruitment, selection of workforce	Personnel planning, acquisition, selection, motivation
• Target	It uses the potential that the company has at the given time	Development of the current potential as well as targeted formation of the future workforce
• Labor market	Formal cooperation with the external labor market and management of the internal labor market	Active cooperation with the external labor market, purposeful formation, management and motivation of the internal labor market
• Segmentation	Extensive segmentation, weak systemic approach	Segmentation according to carefully selected criteria, emphasis on system approach, address search
• Tools	Using existing tools for working with people and simpler selection methods	Using existing personnel and marketing tools, identification and application of new tools or older ones with new content
• Responsibility Shifting	responsibility to personnel workers in the company and subsequently to managers	Balanced distribution between Management, employees and external personnel experts
• Planning	Human resources plans derived from sales plans, often lacking strategy	Temporal and substantive connection with other plans, the necessity of creating a strategy for human resources management

## **4 Discussion**

As we have mentioned personnel management and personnel marketing will have some common features, while others will differ. The difference between them in terms of labor recruitment is evident. Personnel marketing places more emphasis on communication with a potential employee. Recruiting employees is not only based on a previous analysis of workforce needs and a plan to cover them, but much more requires the development of a detailed job description and person specification. Communication with the external labor market is focused on the presentation of the company as an employer, on the presentation of the corporate culture, the constant building of the employer image and presentation of the employee's professional growth opportunities. The goal is not to select those who do not correspond to the predetermined ideas of the company, but contact them with the ideas of the applicant and the company about filling the job coincide. In addition to communication with the external labor market, the company also focuses on the internal market, where the main tool is employee motivation. In motivation, in addition to traditional tools such as employee training and social care, emphasis is placed on the participation of the workforce with the company, on open and active communication with the workforce and supporting teamwork. Communication with the workforce in personnel matters is not left only to personnel specialists, but this task is transferred to a direct superior or another employee, who help in the orientation of the acquired workforce. In addition to the traditional tools that personnel management uses to fill vacancies, personnel marketing also turns to new opportunities for acquiring human potential.

As can be seen from the above facts, communication is primary importance and forms the basis of the entire process. The communication tools used in recruitment are the decisive difference between personnel work and personnel marketing. It can be said that precisely because of the already mentioned megatrends of today's society, the need for open and effective communication is increasing, and at the same time, communication has shifted personnel management to personnel marketing: it has brought management theory closer to the labor market.

In the end, let's just repeat the basic idea of personnel marketing, that it represents an independent part and at the same time a specific connection of the concept, functions and tools of marketing to the conditions of personnel management. Personnel marketing means acquiring high-quality human capital, placing them in the right workplace in the company in the right way of orientation, motivating them to stay in the company.

Further development in the field of human resources requires new approaches and methods of working with people and striving for optimal application and use of human potential. However, the truth remains that Slovak small and medium - sized enterprises do not adequately respect new trends in human resources management, in the area as starting with job analysis and selecting employees and ending with their training and evaluation. Practice has proven that more successful the small and medium - sized enterprises differ from less successful ones in their ability to shape their human potential, as well as motivate them to higher performance and a positive relationship with the company, which is also reflected in increasing the growth of the company and providing the company with a long-term competitive advantage in the form of workforce.

## References

- Antalová, M.: Trh práce a manažment ľudských zdrojov, seminárne cvičenia. Bratislava: Ekonóm, 2005, s. 67-71. ISBN 80-225-1954-5.
- Antošová, M.: Marketing-mix v personalistice. In: Moderní řízení, roč. 40, 2005, č. 11, s. 42-44. Praha: Economia. ISSN 0026-8720.
- Armstrong, M.: Řízení lidských zdrojů. Praha: Grada Publishing, 2005, s. 27. ISBN 80-247-0469-2.
- Armstrong, M.: Řízení lidských zdrojů. Praha: Grada Publishing, 2005. ISBN 80-247-0469-2.
- Borsíková, B.: Personálny marketing - výzva personálnemu manažmentu. In: Zborník z medzinárodnej konferencie FMK UCM: Nové trendy v marketingu. Trnava: FMK UCM, 2005. ISBN 80-89220-21-5.
- Bühner, R.: Personalmanagement. Landsberg am Lech: Moderne Industrie Verlag, 1994, ISBN 3-478-39610-7.
- Donnelly, J., H., Gibson, J., L., Ivancevich, J., M.: Management. Praha: Grada Publishing, 2007. ISBN 80-7169-422-3. ISBN 80-225-1206-0.
- Kachaňáková, A.: *Riadenie ľudských zdrojov*. Bratislava: Vydavateľstvo EKONÓM, 1999, 227 s. ISBN 80-225-1206-0.
- Kachaňáková, A.: *Riadenie ľudských zdrojov*. Bratislava: Sprint, 2003, s. 10. ISBN 80-89085-22-9.
- Koubek, J.: Personálny marketing a marketing personálnej práce. In: *Personálny a mzdový poradca podnikateľa*, 2000, č. 8, s. 86-104. Žilina. ISSN 1335-1508.
- Kuypers, M., Nunne, J.: Personalmarketing. In: Maier, W., Fröhlich, W.: *Personalmanagement in der Praxis*. Wiesbaden: Gabler Verlag, 1991, s. 63. ISBN 3-409-13852-8.
- Neumann, T.: *Ganzheitliches Qualifikationsmanagement*. Wiesbaden: Gabler Verlag, 1992, s. 21. ISBN 3-409-13861-7.
- Poláková, I., Häuser, S.: Personální marketing. In: Moderní řízení, roč. 38, 2003, č. 8, s. 46-47. Praha: Economia. ISSN 0026-8720.
- Stýblo, J., Urban, J., Vysokajová, M.: *Personalistika 2006*. Praha: ASPI, 2005, s. 82. ISBN 80-7357-148-X.
- Stýblo, J.: Uplatňování personálního marketingu v praxi. In: *Práce a mzda*, 2003, č. 4, s. 18-19. Praha: ASPI Publishing. ISSN 0032-6208.
- Tuma, M.: Kritériá rozpoznávania manažérskeho potenciálu. In: *Personálny a mzdový poradca podnikateľa, Poradca podnikateľa*, 2003, č. 3-4, s.172-189. Žilina. ISSN 1335-1508.
- Vágner, I.: Vydavateľstvo Brno: MUNI, 2000, s. 150. ISBN 80-210-2459-3. 39610-7.
- Vojtovič, S., Krajňáková, E., 2014. Development of new economy human capital Vadyba: Journal of management., vol.25, iss. 2, pp. 145-150, ISSN 1648-7974.

# Clustering of Slovak Consumers According to Their Attitudes Towards Advertising

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## Abstract

Advertising is an integral part of today's modern life. The implementation of an advertising campaign can be quite expensive for the contractor, and therefore it is important to know how advertising affects consumers. Since consumer attitudes can differ from each other, it is necessary to correctly identify and know individual types of consumers of advertising. The outputs of the conducted primary research are focused on the characterization of consumers based on their attitudes towards advertising and purchases influenced by advertising messages. It deals with the typology of consumers in the capital of the Slovak Republic based on whether and to what extent advertising is a source of information for them in the purchase decision-making process and whether it influences them so much that they made a purchase based on advertising. The result is the distribution of consumers into four basic types - ignorant, lovers, opponents of advertising and rational consumers. 726 respondents living in Bratislava were involved in the research.

Keywords: advertising, consumer attitudes, customer segments, comparison of attitudes

Article Classification: Research paper

## 1 Introduction

Marketing communication, specifically advertising, is a critical aspect of a company's marketing mission and a major determinant of its success or failure. Companies are becoming more and more aware of the need to know their customers, understand their purchasing behavior and their relationship to marketing communication, adapt to them and thus win in the competitive battle (Ližbetinová et al., 2019).

Consumer behavior is a set of mechanisms based on which individuals or groups make decisions when they analyze the possibilities of choosing, purchasing and using

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products or services in order to satisfy their needs (Ali and Anwar, 2021; Viksne et al., 2016). This behavior is influenced by a wide range of factors, such as cultural (culture, subculture, social class), social (reference groups, family, roles and status), personal, or demographic (Age, Gender, Marital status, Education, Occupation, Economic situation, lifestyle, personality) and psychological (motivation, perception, beliefs and attitudes) (Gajjar, 2013; Jisana, 2014; Kumar and Kumar, 2019). In addition to them, there are also factors that are stimulated by the external environment surrounding the consumer (Vilčeková, 2014). One of these external factors is advertising.

Despite the fact that advertising is a notorious term and occurs in our everyday life, everyone can imagine something different under this term, which causes that there is a large number of different definitions for the term advertising in the scientific literature. A common feature for all definitions is the fact that it is communication through various types of media between the client and the one to whom the product or service is offered for a commercial purpose (Vysekalová and Mikeš, 2018; Durmaz, 2011). However, probably the most famous is the definition according to Kotler, who defines advertising as a paid form of non-personal presentation and support of ideas, products or services, which is paid by an identifiable sponsor (Kotler and Armstrong, 1992). Advertising serves primarily to inform and persuade consumers to purchase the offered product or service and is the main tool in creating product awareness. Moreover, it conditions the mind of the potential consumer to finally decide which of the products to purchase (Adelaar et al., 2003). However, in today's world, the main goal of advertising may not be only the specific act of purchase, but the goal of the advertising message may also be to build a basic awareness of the product or service in the mind of the potential consumer (Niazi et al., 2012; Brierley, 1995).

Despite the fact that advertising should lead consumers to buy, this is not always the case. The reason is the unpredictable and diverse behavior of consumers, which is the result of the interaction between the many factors we mentioned above, each of which in a certain way affects the individual's purchase decision (Arnold and Thompson, 2005). One of the reasons why advertising may not always lead to the desired result may be the feeling of being oversaturated with advertising or disagreement with controversial topics (Jantová and Štarchoň, 2020a; 2020b). In recent years, the feeling of being oversaturated with advertising has caused a cynical attitude towards advertising, especially among the younger generation of customers (Bulanda et al., 2020). For example, in the Czech republic, the number of people who hate advertising grows every year, and the population is becoming increasingly critical of advertising (Michl, 2022).

That is why customer segmentation is an increasingly important part of customer relationship management, which contributes to a better understanding of the characteristics of customer behavior in the market and helps sellers create appropriate marketing strategies according to different customer groups (Raju et al., 2006). Consumer segmentation is an essential element of marketing activities that take into account customer needs and at the same time recognize their heterogeneity (Lee and Cho, 2020). The essence of market segmentation is therefore the division of a large number of diverse customers into smaller segments in which customers have similar characteristics and respond similarly to various products and marketing strategies. Thanks to this, marketers can create marketing mixes that are particularly attractive to selected segments (Ernst and Dolnicar, 2018). From the point of view of the effectiveness of the funds spent on advertising, it is fundamentally important to identify consumer segments that respond positively to advertising and for them, advertising is more likely to lead to the desired result, which is mostly the purchase of the promoted product or service (Sharma et al., 2022).

The process of consumer segmentation can be done based on various criteria. The most used are geographic, demographic, psychographic or behavioral criteria (Pitt et al., 2020). Individual types of consumer segmentation criteria can also be combined with each other in order to obtain a richer description of consumer segments (Štarchoň et al., 2017). In this article, we were inspired by the research conducted annually in the Czech Republic under the name 'Czechs and advertising', where one of the outputs is the psychographic segmentation of Czech consumers based on their attitudes towards advertising together with the description of the created segments through demographic indicators (Vysekalová, 2018).

This article aims to analyze attitude of Bratislava consumers towards advertising not only as part of the marketing mix, but also as an important part of modern life and to identify types of consumers in relation to advertising, on the basis of which it is possible to get to know and address customers better. The main research questions are: 1. What are the types of consumers in Bratislava based on their attitudes towards advertising? 2. Is there a relationship between attitudes toward advertising and demographics? The first chapter contains an overview of the relevant literature related to the given issue and the formulation of research questions. Subsequently, the research methodology and hypotheses are described. At the end, the research results are presented.

## 2 Material and methods

The subject of investigation in this paper is the attitudes of consumers, residents of the capital of Slovakia – Bratislava older than 15 years, towards advertising. To find out the attitudes of consumers towards advertising, we used quantitative research, specifically an anonymous online questionnaire, which was created after consultations with doc. PhDr. Jitka Vysekalová, PhD., director of the Czech Marketing Society, and it is taken from the Czech research 'Czechs and advertising'. The questionnaire contained a total of fifteen questions, the first eleven questions mapped the respondents' attitudes towards advertising and four specified demographic data about the respondents. The entire research was focused on the attitudes of consumers living in Bratislava towards advertising, and the presented article is a partial output of this research.

The survey was performed online between 7th and 22nd February 2020. Responses from 726 randomly interviewed respondents were collected, of which 18 responses were discarded from respondents, who were not residents of Bratislava. The examined sample consists of 708 responses.

Respondents in the survey were selected randomly and the distribution of respondents according to their gender, age and education can be found in the Appendix A. The answers of individual respondents were weighted to meet a representative sample with respect to gender, age, education and for more reliable results. We obtained data from the last census of inhabitants, houses and flats from 2011 from the Slovak Statistical Office, in which, among other things, the education of the entire population is monitored. Thanks to this, we were able to find out the percentage distribution of 24 categories, which are all combinations of gender, age and education among the inhabitants of Bratislava. The weights were calculated:

$$weight = \frac{(\text{the expected number of respondents in the given category})}{(\text{real number of respondents in the given category})},$$

while the expected number means the percentage representation of the given category in the population census for 2011 multiplied by the number of respondents (708) and the real number is the number of respondents in the given category who filled out the

questionnaire. We therefore worked with weighted data in the next part of the paper. The distribution of respondents based on gender, age and education after weighting can be found in the Appendix B.

The data were evaluated in the statistical program SPSS, and two-step cluster analysis was used for segmentation with respect to categorical variables. In the cluster analysis, we considered the answers to the selected questions as input variables:

- To what extent does the information obtained from advertising help you personally when purchasing or using the service?
- Have you recently bought a product or used a service based on an advertising?
- To what extent do you agree with the statement 'advertising helps people orient in the range of goods and services'?
- To what extent do you agree with the statement 'when shopping, I often look for goods that I know from advertising'?
- To what extent do you agree with the statement 'when shopping, I often follow promotional materials at the point of sale'?

These variables were chosen because they do not only express respondents' attitudes towards advertising, its quantity or characteristics, but describe the respondents' specific purchasing behavior based on advertising. In the first question, the respondents expressed the degree of help to the information from the advertising on a 5-point scale from 'they help me a lot' to 'they don't help me at all'. Next question was analyzed the closed question, where the respondents answered 'yes' or 'no'. For the last three questions, respondents expressed their level of agreement on a Likert scale ranging from 'completely agree', 'rather agree', 'rather disagree' to 'do not agree at all'. Using the selected variables, four groups, or clusters, were created by cluster analysis, which we will describe in the next section. In order to verify that the responses of consumers in individual clusters differ significantly, with respect to the input categorical variables of the segmentation, we used the Pearson Chi-square test of independence with the given hypotheses at the  $\alpha=5\%$  significance level, while testing the hypotheses:

H0: There is no statistically significant relationship between clusters and responses to selected input variables.

H1: There is a statistically significant relationship between clusters and responses to selected input variables.

For all 5 input variables, the p-value came out to be less than 0,001 and we can say that the clusters are statistically significantly different within all the segmentation variables.

At the beginning of the analysis, it was necessary to verify that the given clusters were created correctly by cluster analysis. The so-called silhouette of similarity and difference serves us for this. The silhouette value is a measure of the similarity of objects with their own cluster and the difference with other clusters. The silhouette gives a value from -1 to 1, where a value of 1 would mean that all objects are located directly in the center of a given cluster, -1 would mean that all values are located directly in the center of another cluster, and 0 would mean that the given responses are on average equidistant between the center of its cluster and the center of the nearest other cluster. It is therefore true that the higher the value, the more the given objects match with their own cluster and

less with other clusters (Supandi et al., 2021). In our case, the quality of the test was 0,4, which is sufficient.

Based on the silhouette of similarity and difference and also the Chi-square test of independence, we verified the results obtained from the Two-step cluster analysis. We can consider the clusters as significant and we can work with them further.

### 3 Results and discussion

Before we characterize individual clusters, we look at the overall characteristics of the model. As mentioned, two-step cluster analysis created four clusters based on five variables. In the analysis, we verified that all variables have a significant effect on the entire model. As for the size of individual clusters, the largest cluster, consisting of 222 – 35,9% respondents, is cluster number 2. Conversely, the smallest cluster, which consists of 88 respondents, is cluster 3.

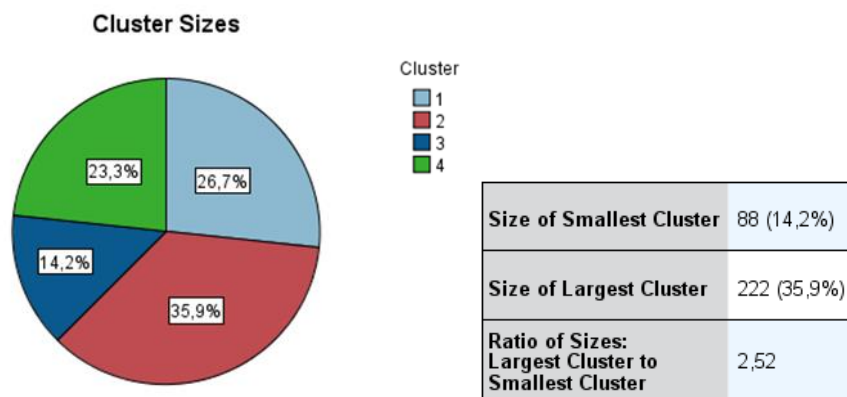


Figure 1 Size of individual segments in cluster analysis; source: own elaboration

We characterize individual clusters not only on the basis of input variables, but also on the basis of demographic characteristics such as gender and education. Age did not turn out to be statistically significant for respondents in individual clusters. We tested the dependence using the Chi-square test at the significance level  $\alpha=5\%$ , while the individual p-values are listed in the following table.

Table 1 Resulting p-values in the analysis of dependence between demographic variables and clusters; source: own elaboration

Dependence of variables	p-value
Gender x Clusters	<0,001
Education x Clusters	<0,001
Age x Clusters	0,966

Table 2 Characterization of clusters based on demographic factors; source: own elaboration

		1 - Advertising ignorants	2 - Rational consumers	3 - Advertising lovers	4 - Opponents of Advertising
Gender	Male	37,3%	46,7%	33,3%	57,4%
	Female	62,7%	53,3%	66,7%	42,6%
Education	Primary education	17,1%	5,7%	13,5%	5,1%
	Complete secondary education with GCSE / Secondary vocational without GCSE	50%	50,9%	62,5%	66%
	Higher education	32,9%	43,4%	24%	28,8%
Age	15-29 years	22,8%	18,9%	17,7%	18,6%
	30-44 years	31%	28,3%	27,1%	28,8%
	45-59 years	22,8%	25,9%	26%	26,9%
	60 years and more	23,4%	26,9%	29,2%	25,6%

### 3.1 Cluster 1 – Advertising ignorants

In the first cluster we can include respondents who could be characterized as 'ignorants of advertising'. Their opinion on whether advertising helps them in making a purchase decision is largely neutral. At the same time, however, 100% of respondents belonging to this group deny that they have recently made a purchase based on advertising. When asked whether the information from advertising helps them personally in the process of making a purchase decision, the most common vague answer was 'I can't say'.

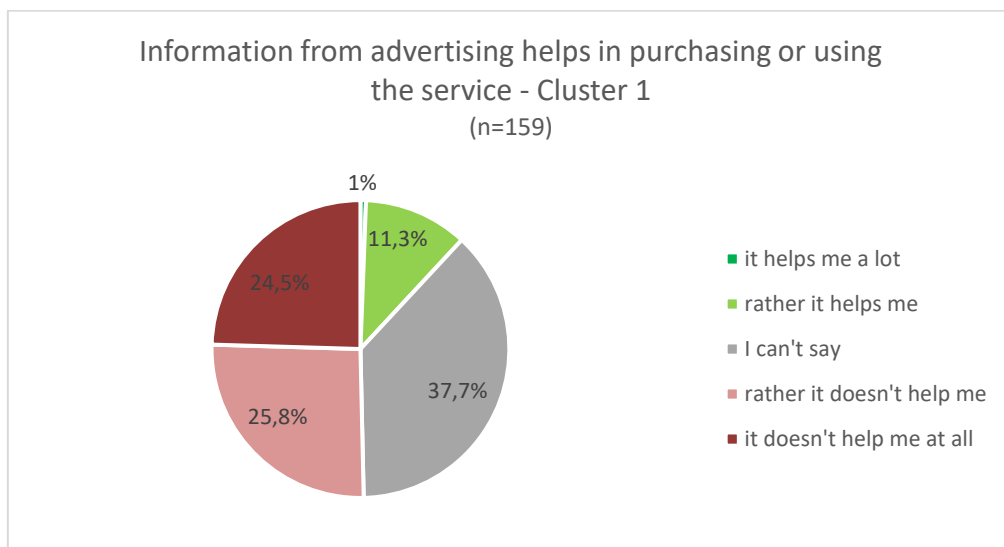


Figure 2 How information from advertising helps in purchasing or using the service - Cluster 1; source: own elaboration

In the question where we asked respondents whether they often follow promotional materials at the point of sale when shopping, the most frequent answer in the first cluster was 'rather disagree' - 49,4%. The same answer also prevailed when we asked whether they often look for goods that they know from advertising when shopping. Specifically, 60% of respondents from the first group marked it. At the same time, 56,3% rather disagree that advertising helps people orient in the range of goods and services. They could be characterized by the statement 'the economy needs advertising, but I don't'. In this group of respondents, there is a slightly higher representation of women and respondents with the primary education.

Table 3 Description of cluster 1 based on their attitudes towards selected statements; source: own elaboration

	I totally agree	I rather agree	I rather disagree	I don't agree at all
Advertising helps people orientate in the offer of goods and services	1,3%	32,9%	56,3%	9,5%
When shopping, I often look for goods that they know from advertising	0%	26,6%	60,1%	13,3%
When shopping, I often follow the promotional materials at the point of sale	12,7%	23,4%	49,4%	14,6%

### 3.2 Cluster 2 – Rational consumers

The second group consists of respondents who accept the help of advertising for purchasing decisions, but are not completely influenced by it. They are characterized by the statement 'advertising is a good servant but a bad master' and we can also call them rational consumers. These respondents are aware of the importance of advertising in today's world, they take information from them as a helper, but they do not strictly adhere to advertising and materials at the point of sale when shopping. Nevertheless, they admit that recently, that is, in the last three months, they bought a product or used a service based on an advertising (95,8% of positive answers). At the same time, 53,8% state that information from advertising about new products and services, their features and discounts rather help them when purchasing goods.

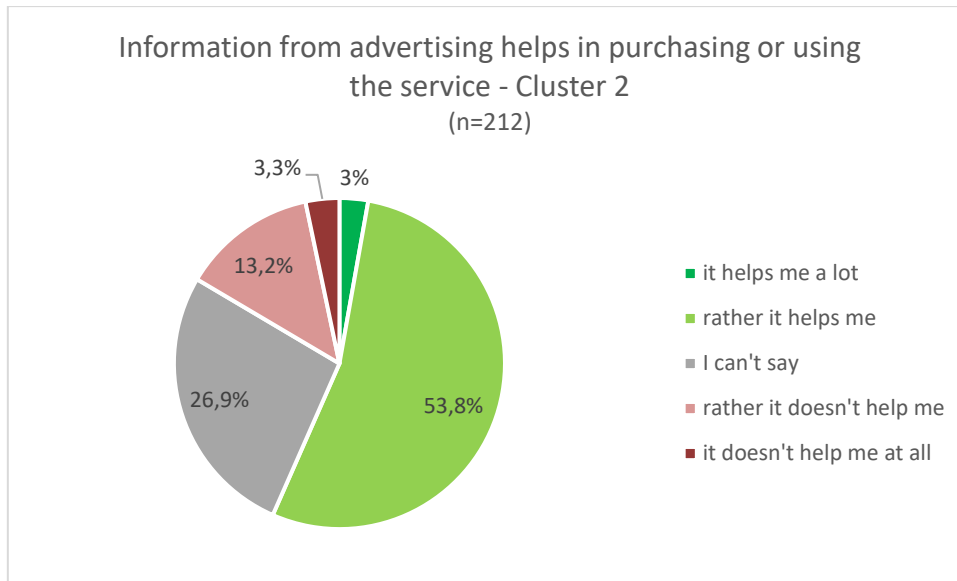


Figure 3 How information from advertising helps in purchasing or using the service - Cluster 2; source: own elaboration

The same representation of answers 'I rather agree' in the second cluster was also achieved by the statement 'when I am shopping, I often look for goods that I know from advertising'. More than half of the respondents in the second cluster also agree with the statement that advertising helps people orient in the range of goods and services. When it comes to saying whether the respondents often follow the promotional materials at the point of sale when shopping, the ratio between the answers 'rather agree' and 'rather disagree' is very balanced with a slight preponderance of the more negative answer.

Table 4 Description of cluster 2 based on their attitudes towards selected statements; source: own elaboration

	I totally agree	I rather agree	I rather disagree	I don't agree at all
Advertising helps people orientate in the offer of goods and services	12,3%	51,2%	30,8%	5,7%
When shopping, I often look for goods that they know from advertising	0%	53,8%	30,2%	16%
When shopping, I often follow the promotional materials at the point of sale	9%	39,8%	36,5%	14,7%

Rational consumers realize that advertising often manipulates people and does not always tell the truth, so they take it with a certain reserve. There is a slightly higher representation of women in the given group, but the difference is only 6 percentage points. As for education, this group has the largest representation among university-educated Bratislavans. The age distribution is not statistically significant in individual groups.

### 3.3 Cluster 3 – Advertising lovers

The respondents in the third cluster can be characterized as 'advertising lovers'. The inhabitants of Bratislava in this group perceive advertising very positively, as an aid

in making decisions. Not only do the overwhelming majority of respondents admit to making a purchase based on advertising, but also up to half of the respondents marked the answer 'completely agree' to the question of whether they often look for goods that they know from advertising when they are shopping. Information from advertising rather helps 45,4% of the respondents in this group and another 23,7% indicated that this information helps them a lot.

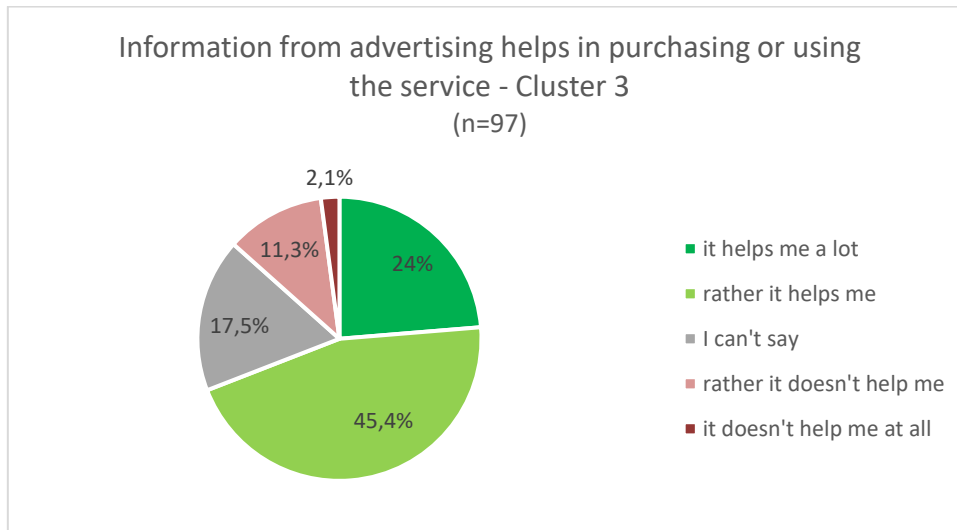


Figure 4 How information from advertising helps in purchasing or using the service - Cluster 3; source: own elaboration

Most of the respondents in the third group – 52% rather agree with the statement that advertising helps people orient in the range of goods and services, and another 47,9% completely agree with this statement. When asked whether respondents often follow promotional materials at the point of sale, positive answers again prevail. The most frequently chosen answer was 'rather agree' with 41% representation, and another 30% of respondents from this group completely agree.

Table 5 Description of cluster 3 based on their attitudes towards selected statements; source: own elaboration

	I totally agree	I rather agree	I rather disagree	I don't agree at all
Advertising helps people orientate in the offer of goods and services	47,9%	52,1%	0%	0%
When shopping, I often look for goods that they know from advertising	50%	0%	31,3%	18,8%
When shopping, I often follow the promotional materials at the point of sale	29,9%	41,2%	2,1%	26,8%

Among advertising lovers, we also most often encountered the opinion that they enjoy advertisements and that they are an important part of modern life, which enables the existence of the media. Respondents in this group also perceive a positive trend in the development of advertising. Among the lovers, there is clearly the largest representation of women and secondary-educated inhabitants from Bratislava.



### 3.4 Cluster 4 – Opponents of Advertising

The fourth cluster can be characterized as 'opponents of advertising'. There is complete disagreement on all questions regarding the impact of advertising on purchasing decisions. When asked whether information from advertising helps respondents in making a purchase decision, 61% of respondents indicated the answer 'they do not help me at all' and another 27,6% said that this information rather does not help them.

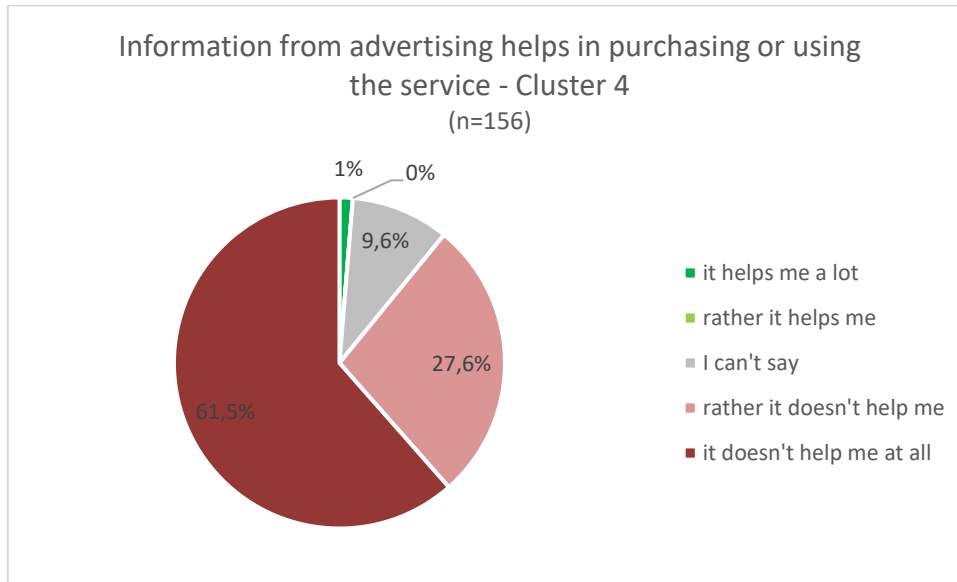


Figure 5 How information from advertising helps in purchasing or using the service - Cluster 4; source: own elaboration

The overwhelming majority of respondents - up to 98,7% - refuse to buy based on advertising. Respondents in this segment also do not think that advertising would help people orient in the range of goods and services. Almost 60% of them strictly reject it. These respondents, with a significant preponderance of men and secondary school-educated Bratislava respondents, strictly deny that they would look for goods they know from advertising when shopping. Each of the respondents in this cluster marked the answer 'do not agree at all'. Also, a large majority – 87,8% do not agree at all that they often follow promotional materials at the point of sale when shopping. They perceive advertising in all directions much more critically and also do not feel that advertising is an important part of the market economy or modern life. On the contrary, they perceive it as a great manipulator who supports unnecessary consumption.

Table 6 Description of cluster 4 based on their attitudes towards selected statements; source: own elaboration

	I totally agree	I rather agree	I rather disagree	I don't agree at all
Advertising helps people orientate in the offer of goods and services	4,5%	17,4%	21,3%	56,8%
When shopping, I often look for goods that they know from advertising	0%	0%	0%	100%
When shopping, I often follow the promotional materials at the point of sale	0,6%	4,5%	7,1%	87,8%

### 3.5 Summary of results

Customer segmentation based on their attitudes towards advertising enables marketing managers to plan marketing communication towards consumers more effectively. Four basic types of consumers living in the capital of Slovakia (ignorant, lovers, opponents of advertising and rational consumers) were identified and characterized using the results of cluster analysis. Thanks to the demographic description of the individual segments, we found that advertising is better perceived and accepted especially by women and residents with higher education, and on the contrary, male residents of Bratislava or residents with primary education are more likely to be opponents or ignorants of advertising. Marketing communication through advertising achieves the highest effectiveness when communicating with segments of advertising lovers and rational consumers. Research results can bring valuable information to marketing managers and help them in marketing decision-making.

### Acknowledgements

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### References

- Adelaar, T., Chang, S., Lancendorfer, K. M., Lee, B. and Morimoto, M. (2003), "Effect of Media Formats on Emotion and Impulse Buying Intent", *Journal of Information Technology*, Vol. 18, No. 4, pp. 247-266. doi: 10.1080/0268396032000150799.
- Ali, B. J. and Anwar, G. (2021), „Marketing Strategy: Pricing strategies and its influence on consumer purchasing decision”, *International Journal of Rural Development, Environment and Health Research*, Vol. 5 No. 2, pp. 26-39. doi: 10.22161/ijreh.5.2.4.
- Arnold, E. J. and Thompson, C. J. (2005), „Consumer Culture Theory (CCT): Twenty Years of Research”, *Journal of Consumer Research*, Vol. 31, No. 4, pp. 868-881. doi: 10.1086/426626.
- Brierley, S. (1995), *The Advertising Handbook*, Routledge, London.
- Bulanda, I., Kádeková, Z., Košičiarová, I. and Vavrečka, V. (2020), „Perception of Commercial and Social Advertising by Generation Y in the Czech Republic”, *Ekonomicko-manazerske spektrum*, Vol. 14, No. 2, pp. 63-77. doi: 10.26552/ems.2020.2.63-77.
- Durmaz, Y. (2011), „A theoretical approach to the concept of advertising in marketing”, *International Journal of Economic Research*, Vol. 2, No. 6, pp. 46-50.
- Ernst, D. and Dolnicar, S. (2018), „How to Avoid Random Market Segmentation Solutions”, *Journal of Travel Research*, Vol. 57, No. 1, pp. 69-82. doi: 10.1177/0047287516684978.
- Gajjar, N. B. (2013), „Factors affecting consumer behavior”, *International Journal of Research in Humanities and Social Sciences*, Vol. 1, No. 2, pp. 10-15.
- Jantová, M. and Štarchoň, P. (2020), „Postoje obyvateľov hlavného mesta Slovenskej republiky voči vybraným témam reklamy. Časť I.”, *Marketing Science & Inspirations*, Vol. 15, No. 2, pp. 49–55.

- Jantová, M. and Štarchoň, P. (2020), „Postoje obyvateľov hlavného mesta Slovenskej republiky voči vybraným témam reklamy. Časť II.“, *Marketing Science & Inspirations*, Vol. 15, No. 3, pp. 48-57. doi: 10.46286/msi.2020.15.3.4
- Jisana, T. K. (2014), „Consumer Behaviour Models: An Overview“, *Sai Om Journal of Commerce & Management*, Vol. 1, No. 5, pp. 34-43.
- Kotler, P. and Armstrong, G. (1992), *Marketing*, Slovenské pedagogické nakladateľstvo, Bratislava.
- Kumar, R., and Kumar, R. (2019), „Impact of various Demographic Factors on Consumer Behaviour — An empirical study of electronic products in rural Himachal (India)“, *Indian Journal of Economics and Business*, Vol. 19, No. 1, pp. 109-127.
- Lee, Y., Cho, S. (2021), „User segmentation via interpretable user representation and relative similarity-based segmentation method“, *Multimedia Systems*, Vol. 27, No. 1, pp. 61-72. doi: 10.1007/s00530-020-00702-4.
- Ližbetinová, L., Štarchoň, P., Lorincová, S., Weberova, D. and Průša, P. (2019), „Application of Cluster Analysis in Marketing Communications in Small and Medium-Sized Enterprises: An Empirical Study in the Slovak Republic“, *Sustainability*, Vol. 11, No. 8, pp. 2302. doi: 10.3390/su11082302.
- Michl, P. (2022), „Studie: Češi a reklama 2022“, available at: [https://www.focus-age.cz/m-journal/aktuality/studie--cesi-a-reklama-2022\\_\\_s288x16469.html?fbclid=IwAR1R7LKn9Bs6KvzPKIIE21zF8bwo2NT5BTybWJ0Swu2SLxBs2bkDCJmRwtY](https://www.focus-age.cz/m-journal/aktuality/studie--cesi-a-reklama-2022__s288x16469.html?fbclid=IwAR1R7LKn9Bs6KvzPKIIE21zF8bwo2NT5BTybWJ0Swu2SLxBs2bkDCJmRwtY) (accessed 10 September 2022).
- Niazi, G. S. K., Siddiqui, J., Alishah, B. and Hunjra, A. I. (2012), „Effective advertising and its influence on consumer buying behavior“, *Information management and business review*, Vol. 4, No. 3, pp. 114-119.
- Pitt, C. S., Bal, A. S. and Plangger, K. (2020), „New approaches to psychographic consumer segmentation: Exploring fine art collectors using artificial intelligence, automated text analysis and correspondence analysis“, *European Journal of Marketing*, Vol. 54, No. 2, pp. 305-326. doi: 10.1108/EJM-01-2019-0083.
- Raju, C. V. L., Narahari, Y. and Ravikumar, K. (2006), „Learning dynamic prices in electronic retail markets with customer segmentation“, *Annals of Operations Research*, Vol. 143, No. 1, pp. 59–75. doi: 10.1007/s10479-006-7372-3.
- Sharma, A., Dwivedi, R., Mariani, M. M. and Islam, T. (2022), „Investigating the effect of advertising irritation on digital advertising effectiveness: A moderated mediation model“, *Technological Forecasting and Social Change*, Vol. 180. doi: 10.1016/j.techfore.2022.121731
- Štarchoň, P., Weberová, D. and Ližbetinová, L. (2017), „Clustering Czech Consumers According to Their Spontaneous Awareness of Foreign Brands“, in *Soliman, K. S., Education Excellence and Innovation Management through Vision 2020: From Regional Development Sustainability to Global Economic Growth*, International Business Information Management Association (IBIMA), Vienna, pp. 1719-1730.
- Supandi, A., Saefuddin, A., and Sulvianti, I. D. (2021), „Two step Cluster Application to Classify Villages in Kabupaten Madiun Based on Village Potential Data“, *Xplore: Journal of Statistics*, Vol. 10, No. 1, pp. 12–26. doi: 10.29244/xplore.v10i1.272.
- Viksne, K., Salkovska, J., Gaitniece, E. and Puke, I. (2016), „Comparative analysis of customer behaviour models“, in *Proceedings of the 2016 International conference on Economic Science for Rural Development*, pp. 231-238
- Vilčeková, L. (2014), „Comparison of Brand Buying Behavior of Slovak Consumers at the Beginning of Economic Crisis and at Its End“, *Journal of Advanced Management Science*, Vol. 2, No. 4, pp. 306-309. doi: 10.12720/joams.2.4.306-309.
- Vysekalová, J. (2018), „Češi a reklama 2018“, available at: [casopis.cms-cma.cz/CesiAREklama2018/Vysledky\\_Vyzkumu\\_Cesi\\_A\\_Reklama\\_2018.htm](http://casopis.cms-cma.cz/CesiAREklama2018/Vysledky_Vyzkumu_Cesi_A_Reklama_2018.htm) (accessed 12 September 2022).
- Vysekalová, J. and Mikeš, J. (2018), *Reklama: Jak dělat reklamu*, Grada, Praha.

# Design of Advertising Campaign on a Social Network for the Educational project

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## Abstract

Recent years, marked by the pandemic, have brought several new possibilities in communication between organizations and customers, especially in the online environment. Modern digital technologies make it possible to create new communication platforms that organizations use to their advantage or contribute to creating a competitive advantage. More and more companies are orienting their sales to the online environment and social networks, bringing even greater customer comfort. On the other hand, we see mainly in young people that they can look at the smartphone display for hours and ultimately get nothing out of it. We realize that they rarely use their mobile phones for anything other than social networks. They do not know how to use them, so they grow thanks to them and use their information potential. Of all the possibilities a smartphone offers, they are often used only for taking pictures or scrolling. Therefore, the aim of the presented contribution is to show a non-violent way of enriching knowledge through social networks.

Keywords: advertising; digital marketing; influencer marketing; social media

Article Classification: Research article

## 1 Introduction

Proper communication with the selected target group is the key to the organisation's success, regardless of its size or industry. It is a management process through which products and services are promoted from the first concept to the end user in the most efficient way possible. It includes identifying the product or service, determining demand, deciding on its price, and choosing distribution channels. Last but not least, it is related to developing and implementing the promotional strategy. The company's long-term success depends on knowing its target group's current needs. It then looks for ways to add value through different approaches. (Merz, M.A. et al., 2018) In

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general, communication refers to the exchange of information between people. On the other hand, in the business environment, marketing communication fulfils an essential function in acquiring, maintaining or consolidating the company's market position, which can differentiate the company from its competitors and thus create a competitive advantage. Communication is not only about informing the market about products, their properties, value, utility or quality, but also ensures acceptance of the requirements of the selected target group. (Felix, R. et al., 2017), (Lukáč, M. et. al., 2021)

Information technology has dramatically affected and influenced the business field. It is a great help for the customer to access such information and choose their target product or service. Thanks to databases, the business has a clientele which can quickly inform current new products or services. (Yim, M.Y.C. et al., 2017), (Ližbetinová, L.et. al., 2020) Also, advertising in the online environment is a constantly developing process that needs to be constantly monitored and adapted to its communication tools. (Baldwin. CH., 2021)

However, social networks offer a massive space in the online environment. Therefore, if a business wants to be successful on social networks, we must use its potential to the maximum extent possible. Therefore, it is not enough to create content but to use all methods to spread it as efficiently as possible and thus achieve the most significant possible impact. Otherwise, they will create content only for themselves. (Swani, K. et al., 2017)

### ***1.1 Communication in an online environment***

The use of online marketing tools depends on the business sector. Nowadays, few businesses do not use this option. Just as customers subscribe to newsletters or new offers, we can already consider its use. (Etter, M. et al., 2019) As we said, it depends on the nature of the business and where we want to go in the future. Much of the customer base is still online, and more are added daily. The potential customer, therefore, relies on the offer being always up-to-date and will always be informed about the news. (Meire, M. et al., 2019)

Businesses use different methods and strategies to attract customers. Technological progress ensures that buyers can be attracted in various non-traditional forms. The consumer is becoming more demanding, making it increasingly difficult to attract him. Traditional forms are becoming insufficient, so businesses should use new trends that are more efficient and increase purchasing power. (Izogo, E. E., Mpinganjira, M., 2020)

Digital marketing is integral to every business and can be understood as a tool that uses all technologies, media from the Internet, communication, etc. (Garcia, J., 2020)

With the help of digitization, customers have become closer to the range of goods and services from day to day. They have the opportunity to compare price offers, reviews, delivery speed, etc. Digitization has created more channels and ways for customers and companies to respond to each other, leading marketing experts to focus more on market segmentation and thus increasing competition between individual companies. At the same time, customers expect personalized communication between them. (Meire, M. et al., 2019)

Table 1 Advantages of the online environment; source: own elaboration

	Characteristics
Reach	With the help of the internet, we can do marketing locally and globally. In addition, it gives businesses access to many potential consumers.
Availability	Unlike brick-and-mortar stores, where there is a designated time for shopping, we can shop 24 hours a day in the online environment.
Measurability	We can use various tools to measure traffic to our website, the most well-known being Google Analytics, with which we can evaluate traffic to our website, demographic data, etc., but mainly how successful our marketing strategy is.
Individual approach	Social networks offer businesses a way to get as close as possible to their potential customers. With the help of communication, we can segment customers and adapt advertising to them.
Low costs	Online advertising can be paid or unpaid. However, even unpaid advertising can attract customers. Therefore, it is important to choose a suitable strategy. In addition, online advertising is cheaper than various radio or television forms of marketing.

## 1.2 Social media and their use in communication

Nowadays, social networks have become a phenomenon in marketing and communication. Social networks connect people with similar or identical interests and serve as a communication channel. This connection between people gradually began to be used not only by merchants. (Lee, D. et al., 2018)

Social media marketing goals can differ, but the most common goal is to acquire customers, attract them to products and make a profit. Other goals may include, e.g., increasing brand awareness, the e-shop, or deepening relations with customers to show them that they come first. (Etter, M. et al., 2019) As with other online marketing tools, it's important to have a clear plan for what to post, when, and whether it makes sense. It is helpful because writing creative articles and posts take much time, and you must adhere to a comprehensive marketing plan schedule. This depends on the type of post, whether it is a photo or new special offers. (Etter, M. et al., 2019)

Long articles, boring statuses, and information that does not interest anyone leads to the worst enemy of social networks, and that is boredom. The form in which we publish articles must interest the customer, and images are more interesting than the text. Social networks are a source of new information for many, and it is good to know, also for marketing purposes, what the world is doing. (Swani, K. et al., 2017)

Therefore, social media is the dominant online communication channel through which customers obtain and share information about selected brands (Hudson, 2016) They allow businesses to offer as much up-to-date information as possible, for example, about products, services, or upcoming events (Icha, 2016) By leveraging two-way communication, businesses gain important customer insights much faster than ever. While such cooperation contributes to an even better understanding of their needs. (Copus, L., Čarnogurský, K., 2017) Customers can access information virtually anywhere by expressing personal opinions, sharing recommendations, and talking to others before, during, and after purchasing a product or service. (Schultz, 2013)

There are two main reasons for the growing influence of social networks. The first view says businesses are more than ever looking for new ways to communicate effectively, as reaching a select generation of customers is more complicated. For

example, Generation Y or Z are less likely to respond to traditional media such as TV, print and other traditional media. They are more likely to follow digital marketing communication tools. (Hamilton, 2016)

A second view suggests that customers are increasingly influenced by their friends and colleagues in forming brand attitudes and purchasing decisions. (Yim, M.Y.C. et al., 2017)

Through social platforms such as Facebook, Instagram and Youtube, businesses began to promote their interests and moved sales to the online sphere. Businesses can attract customers through social networks directly through videos, contests, and published experiences. In this way, they not only influence the consumer's behaviour but also build a relationship with him. (Lee, D. et. al, 2018)

Five critical parts of social media marketing:

- **Strategy** – this step involves determining the goals, social media channels to be used, and the type of content that will be shared.
- **Planning and publishing** – businesses should design plans for what their content will look like (i.e. will there be videos or photos) and decide when it will be published on a given social platform.
- **Listening and engaging** – monitoring what users, customers and the public say about posts, branding and other business activities.
- **Analyzes and reports** – because businesses are on social networks, it is necessary to know how many potential customers follow the business's activity and how they evaluate it.
- **Advertising** – social media advertising is a great way to promote and grow brand (Gola M., 2019)

## 2 Material and methods

The aim of the post is to show a practical model of promoting the Slovak educational project "Udialosa" on the Instagram social network. The main idea of the project is to improve the general overview by acquiring useful knowledge from history, where followers can learn something more or improve the general overview.

### *2.1 Possibilities of promoting an educational project through Instagram*

The "Udialosa" project offers several options to improve your general overview, either:

- a daily infographic that recalls an event from the past,
- a regular interactive quiz that tells the story of an event or a specific personality,
- a fascinating Q&A, in which the audience can ask questions of various personalities from the past,
- videos that point to events or personalities that we should never forget



Figure 1 Online ads typology; source: own elaboration

Among other things, in addition to education, it offers its followers the opportunity to get books, shopping vouchers for their purchase, or participate in an auction, the proceeds of which are donated to charity. For the growth of any profile, the most important data is the reach of the posts. It can be influenced mainly by the direct activity of users, which in practice means that we need to:

- people on the social network used the option of the "like" button
- commented on the posts in the comment section,
- shared posts with their audience,
- saved our posts, which they can view later in the save section.

Each of the activities mentioned above has a different impact on the reach of our contributions and, thus, on the overall growth of the project. Furthermore, the algorithm that affects all of this changes from time to time, and if creators want to succeed, they have to adapt to it. The following image shows the current algorithm affecting the reach of posts.

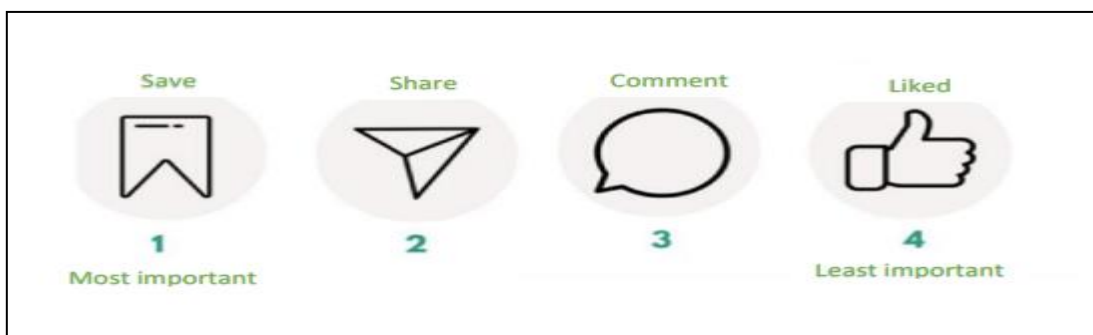


Figure 2 Algorithm on Instagram; source: own elaboration



### 3 Results

Instagram offers several main options for getting the work out among the users of this social network, and the following table shows which ones they are and how they were used.

Table 2 Used forms of project promotion; source: own elaboration

	Characteristics
<b>Paid promotion</b>	Instagram offers every creator the opportunity to invest in visibility. It is enough to set the parameters of the audience we want to reach and the amount we want to invest in promoting the application. A forecast that shows the approximate number of people contacted for a specific invested amount helps us with these steps.
<b>Time management</b>	Each creator has the opportunity to monitor their statistics, which show, in addition to data such as the gender or age of followers, when they are most active. From this statistic, we know when it is best to publish or when as many people will see our posts as possible. According to our statistics, early evening is the ideal time.
<b>Hashtag #</b>	The # core function makes it easier to find what we like to watch. Instagram allows us to insert them under each post and thus increase the reach of posts or the possibility of discovering our posts even by people who do not follow us yet. Since our posts are focused on the field of education, we primarily use the following essential hashtags when publishing: #vzdelavanie, #vyznamneudalosti, #skola, #zaujímavosti, #fakty. We select the other # according to the focus of the post.
<b>Sharing</b>	Spreading content by sharing is the most effective unpaid form of exposure. If the post's content is interesting or a topic that is currently relevant and sought after, people will automatically spread it, and then we can talk about organic growth. Another option is to directly reach people who have a profile with a similar focus and already have a community that could be interested in our content. Therefore, our strongest means of communication with potential followers are sharing by influencers who have already created their communities.
<b>Competition</b>	We can allow our audience to get something extra, some added value, which also strengthens our community. We express gratitude to our regular fans for their affection and attract other potential followers' attention. However, we do not want people to follow our profile just for contests, so the gifts must be close to our profile. Since we count on our followers, mainly people who like to read, we give them books or vouchers for their purchases.

#### 3.1 Advertising campaign evaluation

When the project was founded, expectations were not high, but the audience's interest was not long in coming. With the gradually increasing number of followers, the goal of 1000 followers was set. The profile currently has more than 16.7k followers, which is a huge success.

The following data shows the change in profile during the promotion in selected periods from August 5, 2020, to March 28, 2022.

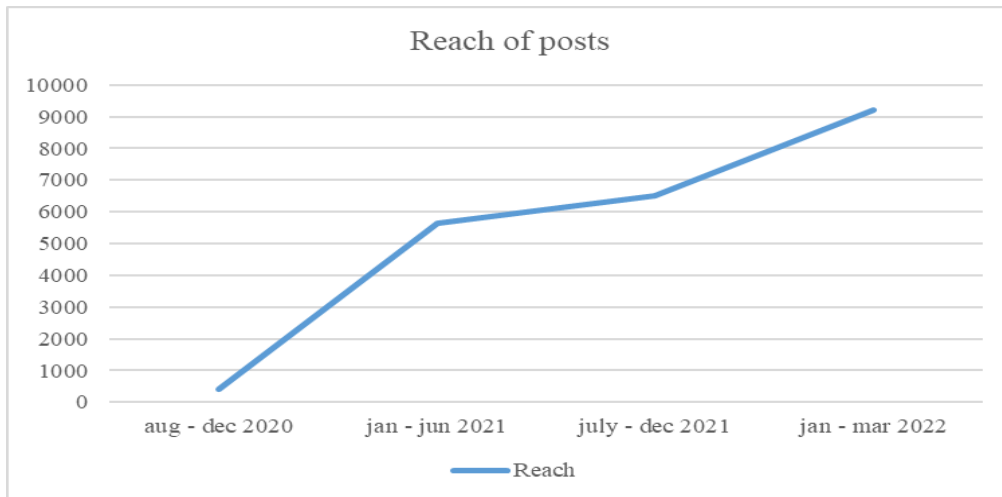


Figure 3 Reach of posts; source: own elaboration

The following image shows the most successful posts during the implemented campaign.

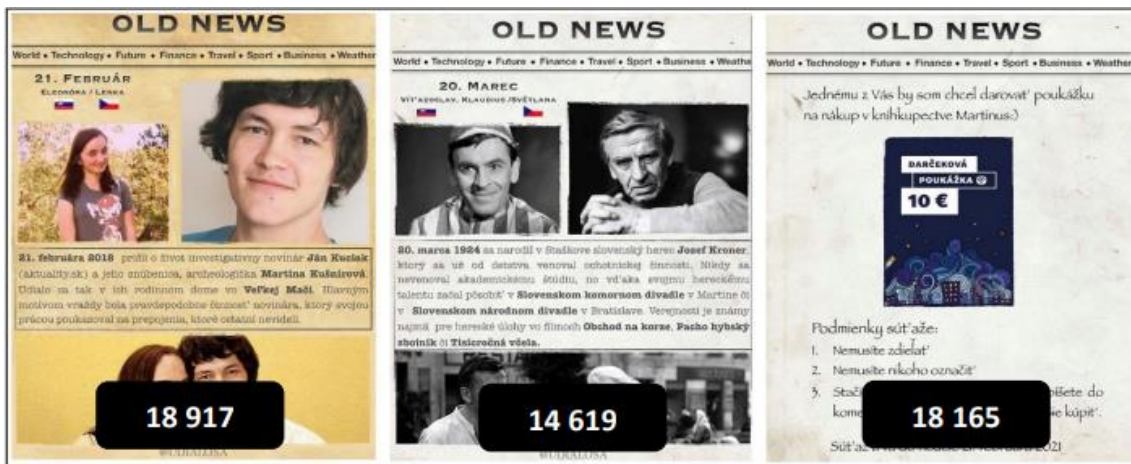


Figure 4 The most successful posts; source: own elaboration

Interactions had an upward trend until July 2021. From this period, we can see from the graph that, as far as interactions are concerned, rather stagnation. There are several reasons. First, our posts are not and cannot always be interesting enough for our followers to leave a "like" every time because not everyone finds the event we publish interesting. The second reason is that the number of users on Instagram increased enormously during the pandemic. It means that people have started following a more significant number of accounts, and thus, they often do not even get to posts. So Instagram itself decides what space is on the platform. The fact that over 15,000 people follow the profile does not mean everyone will see our posts. Instagram uses this to its advantage and encourages us to invest in advertising.

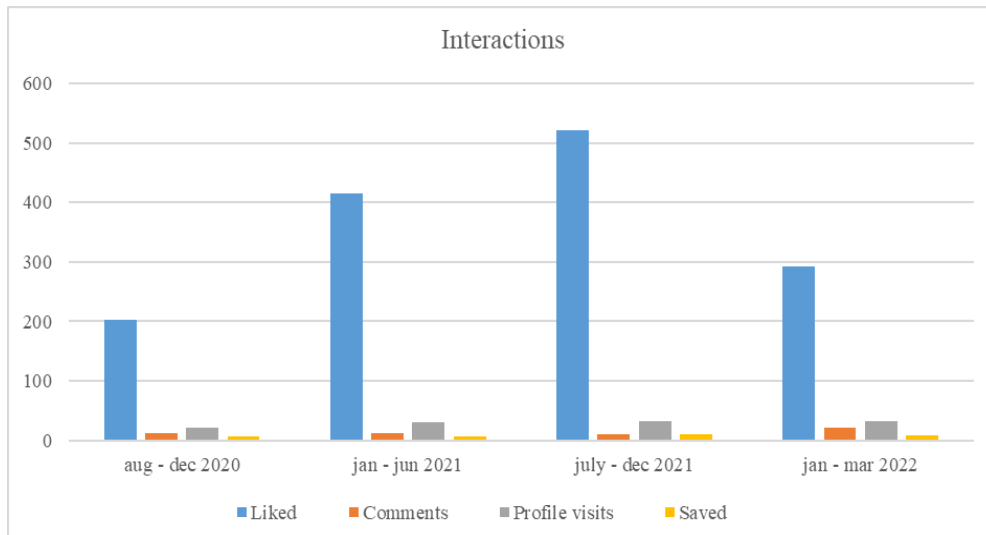


Figure 5 Interaction of the posts; source: own elaboration

Another metric that significantly affects the reach of posts is comments. Our posts are generally not designed to encourage this interaction, except in contests. According to the current algorithm, the strongest element affecting posts' reach is saved. Our posts have 20 saves on average, but it is very individual. Some of the posts have no saves. Others have more than 50.



Figure 6 Posts with the most saves and clicks; source: own elaboration

If a user who does not follow decides to click through a post on a profile, there is a good chance that the profile will start following. There are an average of 40 people per post on our profile. The following graph will give us a closer look at the growth of our profile during the entire project operation period. It will be from August 5, 2020, to March 20, 2022.

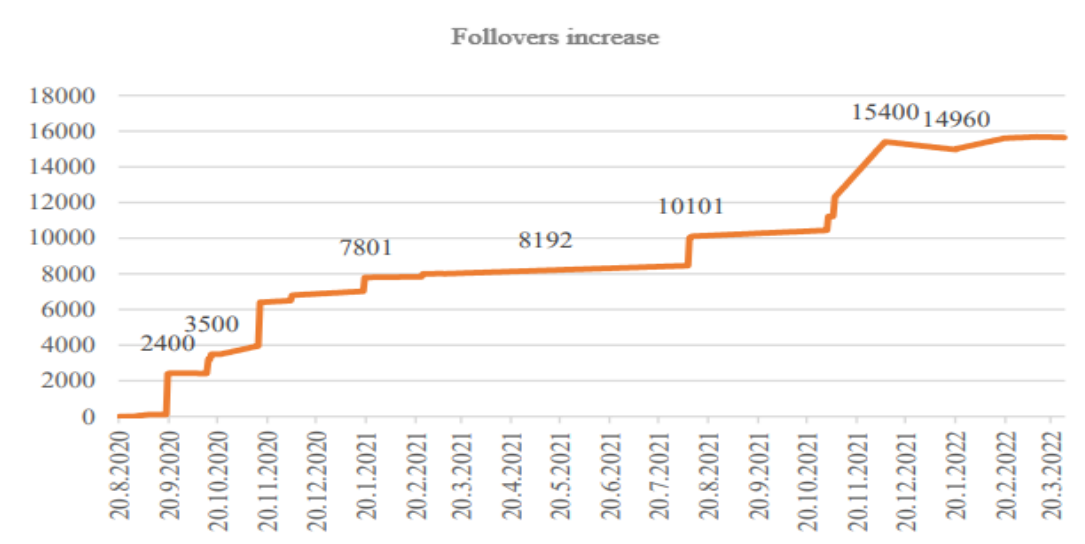


Figure 7 Profile reach; source: own elaboration

From the mentioned statistics, it is clear that the “Udialosa” educational project has a perspective and the possibility of further growth, but there is room for improvement. We are aware of several shortcomings that complicate or slow down the project's growth. The first shortcoming, which we consider to be our biggest weakness, is regularity. Preparing posts, quizzes, and videos requires many hours spent on education, material preparation and time for the actual creation of the posts, which we try to move to a higher level. The only possible solution is to work on time management. Our project could also be successful abroad, and foreign language contributions could significantly expand our audience. Expanding our team is the best way to solve this problem. If we get another member to the team, we would also like to transfer “Udialosa” to TikTok, known for its short videos, which we could use to share important events or personalities. A significant shortcoming we cannot influence very much is the influence of Instagram on the creator's profile. At the moment, it can be seen that Instagram is pushing creators into paid promotion, which we completely rule out for now.

#### 4 Discussion

The influence of modern technologies, the Internet and social networks has a significant impact on us. However, just as this modern world can benefit us, it can endanger us, or it may not bring us anything at all. Today's huge advantage is that all the information we need is just one click away and is overlooked by a large part of the younger generation. We do not want to trivialize it, but we often see when we deliberately make assignments for students where it is necessary to search for information on the Internet. Many times, they are clueless. They do not know how to use the internet as a helpful medium. They do not know how to search and select information. On the social network Instagram, we decided to create an educational project that will bring valuable content to users of social networks in the form of educational posts, thanks to which its use can have a different educational dimension.

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## References

- Baldwin, CH. (2021). *How voice search will change the digital marketing landscape*. <https://www.wsiworld.com/blog/how-voice-search-will-change-the-digitalmarketing-landscape/>>
- Copuš, L., & Čarnogurský, K. (2017). *Intercultural marketing: Culture and its influence on the efficiency of Facebook marketing communication*. *Management and Marketing*, 12(2), 189–207. <https://doi.org/10.1515/mmcks-2017-0012>
- Etter, M., Ravasi, D. and Colleoni, E. (2019). *Social media and the formation of organizational reputation*. *Academy of management review*, 44(1), pp.28-52.
- Felix, R., Rauschnabel, P.A. and Hinsch, C. (2017). *Elements of strategic social media marketing: A holistic framework*. *Journal of Business Research*, 70, pp.118-126.
- Garcia, J. (2021). *Social commerce and shoppable posts guide*. <https://www.spiralytics.com/blog/social-commerce-and-shoppable-posts-guide/>>
- Gola, M. (2019). *Aké sú 5S digitálneho marketingu*. <[https://www.curvearro-com./blog/what-are-the-5sof-digital-marketing/?\\_x\\_tr\\_sl=en&\\_x\\_tr\\_tl=cs&\\_x\\_tr\\_hl=cs&\\_x\\_tr\\_pto=sc](https://www.curvearro-com./blog/what-are-the-5sof-digital-marketing/?_x_tr_sl=en&_x_tr_tl=cs&_x_tr_hl=cs&_x_tr_pto=sc)>
- Hamilton M., Kaltcheva, V.D., Rohm, A.J. (2016). *Social Media and Value Creation: The Role of Interaction Satisfaction and Interaction Immersion*. *Journal of Interactive Marketing*. - [s.l.] : Elsevier Limited. 36. - s. 121-133. - 1094-9968.
- Icha O., Edwin, A. (2016). *Effectiveness of social media networks as a strategic tool for organizational marketing management*. *Journal of Internet Banking and Commerce*. - [s.l.] : JIBC Publisher, 21. - s. 20. - 1204-5357.
- Izogo, E. E., & Mpinganjira, M. (2020). *Behavioral consequences of customer inspiration: the role of social media inspirational content and cultural orientation*. *Journal of Research in Interactive Marketing*, 14(4), 431–459. <https://doi.org/10.1108/jrim-09-2019-0145>
- Lee, D., Hosanagar, K. and Nair, H.S. (2018). *Advertising content and consumer engagement on social media: Evidence from Facebook*. *Management Science*, 64(11), pp.5105-5131.
- Ližbetinová, L.; Štarchoň, P.; Weberová, D.; Nedeliaková, E.; Juříková, M. (2020). *The Approach of SMEs to Using the Customer Databases and CRM: Empirical Study in the Slovak Republic*. *Sustainability*, 12, 227. <https://doi.org/10.3390/su12010227>
- Lukáč, M.; Stachová, K.; Stacho, Z.; Bartáková, G.P.; Gubiniová, K. (2021). *Potential of Marketing Communication as a Sustainability Tool in the Context of Castle Museums*. *Sustainability*, 13, 8191. <https://doi.org/10.3390/su13158191>
- Meire, M., Hewett, K., Ballings, M., Kumar, V. and Van den Poel, D. (2019). *The role of marketer-generated content in customer engagement marketing*. *Journal of Marketing*, 83(6), pp.21-42.
- Merz, M.A., Zarantonello, L. and Grappi, S. (2018). *How valuable are your customers in the brand value co-creation process? The development of a Customer Co-Creation Value (CCCV) scale*. *Journal of Business Research*, 82, pp.79-89.
- Schultz D.E., Peltier, J. (2013) *Social media's slippery slope: challenges, opportunities and future research directions* / ed. Ltd. Emerald Group Publishing. *Journal of Research in Interactive Marketing*, 7 : Zv. 2. - s. 233-237. - 2040-7122.
- Swani, K., Milne, G.R., Brown, B.P., Assaf, A.G. and Donthu, N. (2017). *What messages to post? Evaluating the popularity of social media communications in business versus consumer markets*. *Industrial Marketing Management*, 62, pp.77-87.
- Yim, M.Y.C., Chu, S.C. and Sauer, P.L. (2017). *Is augmented reality technology an effective tool for e-commerce? An interactivity and vividness perspective*. *Journal of Interactive Marketing*, 39(1), pp.89-103.

## Measuring the Wage Gap from a Gender and Regional Perspective among University graduates 2013 in Slovakia

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### Abstract

Many economists have investigated the widespread phenomenon of gender inequality in income. The rapid development of education in the last 40 years had a significant impact on narrowing the gender gap in income. The study model the wage gap between the sexes through a regression model and performs a decomposition of the wage gap. The Bratislava region is a key employer and wages are significantly higher for both sexes in this region compared to others. The private sector is also an important determinant of the graduate wage gap. The decomposition of the wage gap pointed more to the contribution of unexplained factors to the gender wage gap.

Keywords: gender pay gap, university student, employment, discrimination, start pay

Article Classification: Research article

### 1 Introduction

Many studies have investigated the widespread phenomenon of gender inequality in income, where the initial study can be considered the article by Becker (1957) and Mincer (1958), who claim that gender inequality in income is mainly caused by two factors, the first the difference in labor productivity between men and women, and the second the market discrimination against women from the point of view of the employer, employee and customer.

Authors such as Bergmann (1974), Bielby and Baron (1986) and Meng (2004) point to the fact that the segregation of women and men in jobs, industries, businesses and workplaces significantly contributes to gender wage inequality. Blau and Kahn (1992, 1996, 1997) show that since 1970 the gender wage gap has narrowed in most developed countries. The biggest decrease was recorded in the last 30 years, which was shown by Even and Macpherson (1993) and Leonard (1996) on the example of the USA (data from the 1980s), Blundell et al. (2007) using the example of Great Britain (data sample from 1978-2000), Flabbi (1997) reports an observable decrease from 30% to less than 20% of the difference between the incomes of men and women in Italy during the

period from 1977 to 1995, Jolliffe and Campos (2005), using the example of Hungary, found that the gap between the incomes of both sexes fell from 31% to 19% between 1986 and 1998. Fitzenberger and Wunderlich (2002) found that the gender wage inequality narrowed significantly between 1975 and 1995, especially for groups with low incomes. Other studies that investigated and modeled gender wage inequalities were conducted by Newell and Reilly, (2001), Blau and Kahn (1992), Blau and Kahn (1999), Mandel and Semyonov (2014). Juhn, Murphy and Pierce (1991) investigated wage differences on groups distinguished by racial characteristics.

The important factor contributing to the gender wage gap is education. The rapid development of education in the last 40 years had a significant impact on narrowing the gender gap in income. The growing share of women with completed tertiary education in the decades of the 1980s and 1990s (Morris and Western, 1999, Welch, 2000) may have led to a reduction in the wage gap, but studies by various authors have pointed to the opposite effect (Juhn et al., 1993, Blau and Kahn, 1997, 1999; Katz and Autor, 1999). In general, in EU countries, education is considered a source or a path to a higher salary. Various authors (Paglin and Rufolo 1990, Blau and Kahn 1992, Meulders et al. 1993, Teichler and Kehm 1995, Brown and Corcoran, 1997) have pointed out that if women achieve the same level of education as men, then the wage gap closes. Women with higher education invest more in skills and competences required by the market, which narrows the wage gap in professions that require higher education and we can currently consider them as non-gender-specific professions.

In our study, we gathered link employee-employer data with information bearing a higher education degree and study of graduates. We deal with wage disparities of university graduates. The aim of the study model the wage gap between the sexes through a regression model and to perform a decomposition of the wage gap.

The study is divided into the following parts. In the first part, we deal with the current state of the gender wage gap. In the second part, we discuss the methodology used to calculate the wage gap and describe the data sources, the method of processing and the descriptive statistics of the monitored data. In the third and fourth parts, we illustrate the achieved results and discuss findings, and in the last part, we draw the conclusions of the study.

## **2 Material and methods**

With models of wage differences, economists try to measure the effects of selected factors on the differences in wages of two compared groups, which differ from each other by a certain characteristic, such as gender, race, origin, educational attainment, and the like. One of the groups is always considered disadvantaged. Economists in history have been mostly concerned with measuring the wage gap between the sexes, where women, as we have already mentioned above, are considered a disadvantaged group. The model based on the works of Oaxaca (1973) and Oaxaca and Ransom (1994) is most commonly used to measure the gender wage gap in the economic literature, which we also apply in our study on university graduates.

## 2.2 Pay gap methodology

If we denote  $W_m$  and  $W_f$  as wages (W from the English word wage) of men (index m from the English word "man") and women (index f from the English word "female"), then the often used measure to determine the position of women on the labor market is the ratio between by the average wage of women and the average earnings of men, expressed as:

$$\frac{\bar{W}_f}{\bar{W}_m} \quad (1)$$

where  $\bar{W}_i$ ,  $i=m,f$  indicates the average monthly wage of men and women. This ratio is called the gender wage gap. Men's wages are seen by economists as a premium to women's wages. This premium  $\bar{D}$  can be derived from equation (1). If we apply the natural logarithm to equation (1), we get:

$$\bar{D} = \ln\left(\frac{\bar{W}_f}{\bar{W}_m}\right) = \ln(\bar{W}_m) - \ln(\bar{W}_f) \quad (2)$$

Although equations (1) and (2) provide an estimate of the gender wage gap, they do not say anything about the impact of the contributions of various factors, such as productivity factors, among which we include education, age, length of experience, etc., on the gender wage gap. In order to better capture gender wage effects, we will use multivariate statistical analysis, which allows measuring the possible effects of selected productivity factors on a selected characteristic or property (in our case, gender). The influence of productivity factors and other qualitative variables on wages can be written in the following equation:

$$w = \mathbf{X}^T \boldsymbol{\beta} + \delta G + e \quad (3)$$

where  $w$  is the natural logarithm of the monitored wage,  $\mathbf{X}$  is the vector of productivity characteristics,  $G$  is a qualitative variable representing the relevant gender of the monitored worker and takes the value 1 if the worker is a man and the value 0 if the worker is a woman,  $\delta$  is the coefficient expressing the effect of gender on the monitored logarithm of wages,  $\boldsymbol{\beta}$  is the column vector of production characteristics and  $e$  is the random error term. The most common technique for estimating coefficients  $\boldsymbol{\beta}$  and  $\delta$  is the method of least squares ("OLS" - ordinary least square method).

According to the methodology of Oaxaca (1973), Blinder (1973), Oaxaca and Ransom (1994), we will estimate the regression coefficients  $\boldsymbol{\beta}$  separately for men and women, and we will use the significant feature of the OLS estimation that the regression plane also passes through the average values of the observed data, and thus equation (3) can be calculated using the following two equations:

$$\bar{w}_m = \bar{X}_m^T \hat{\boldsymbol{\beta}}_m \quad (4)$$

$$\bar{w}_f = \bar{X}_f^T \hat{\boldsymbol{\beta}}_f \quad (5)$$

where the straight line above individual quantities expresses the average value of the given variable. If we return to equation (2), then the difference of the natural logarithms of wages of men and women can be written using equations (4) and (5) as:



$$\ln(\bar{W}_m) - \ln(\bar{W}_f) = \bar{w}_m - \bar{w}_f = \bar{X}_m^T \hat{\beta}_m - \bar{X}_f^T \hat{\beta}_f \quad (6)$$

after algebraic adjustments, we get the decomposition of gender wage differences proposed in the work of Oaxaca (1973) as:

$$\ln(\bar{W}_m) - \ln(\bar{W}_f) = [\bar{X}_m^T - \bar{X}_f^T] \hat{\beta}_m + \bar{X}_f^T [\hat{\beta}_m - \hat{\beta}_f] \quad (7)$$

where the first term on the right side of equation (7) measures differences in production characteristics, the so-called explainable effects in differences, and the second term corresponds to differences captured in quantified relations between men and women, the so-called unexplained effects on wage discrimination. In the literature, explainable effects are usually referred to as favoring men, and the unexplained part is mostly attributed to various discriminatory effects, or it is also usually referred to as the so-called residual component according to Blidner (1973) and Oaxaca (1973).

## 2.2 Data

We used data from the Social Insurance Agency (SIA), where we processed data for the 2013 year students/graduates and their assessment bases for the calculation of insurance premiums from which it is possible to derive wages. In the Social Insurance Company, data matching was carried out through the list of university graduates from 2013 provided by gender wage gap gender wage gap gender wage gap gender wage gap Slovak Centre of Scientific and Technical Information (SCST) via the unique identifier social security number. Provided for statistical processing was the final anonymized database of students/graduates from which the social security number identifier was removed and replaced with a random anonymous identifier that defined each graduate. We selected only those graduates who were registered with the SIA for the year of graduation 2013 from June 2013 to June 2014 inclusive. The data from the social insurance company included the wage, year of birth, gender, municipality of permanent residence, year of graduation, born place, records of registrations in the SIA, NACE rev.2 of the premium payer and other.

There were a total of 47,798 paired graduates of various degrees of higher education in 2013, of which 17,058 were men and 30,740 were women. The data of the SIA for each record and each registration contained wage, the type of the insured, which defined the type of insurance and the type of employment relationship with the employer. Within the graduates, only registrations with the employee insurance type, which form a group of anonymized graduates with permanent income, were included in the result. In the calculation, we only included wages that were higher or equal to the minimum wage in the given year, for 2013 it was 337 EUR and in 2014 the minimum wage was 352 EUR. Based on the chosen criteria, we finally selected 10,877 graduates for the year of graduation in 2013, of which 4,193 were men and 6,684 were women.

As can be seen, out of the total number of 47,798 paired graduates in 2013, only 10,877 met the criterion with the type of insurance as an employee and found a job within one year after finishing school. A total of 24,305 graduates from 2013 had a record in the social insurance company with a different type of insurance than an employee or their assessment bases were lower than the minimum wage for the given year. We can state that only 22.75% of graduates from 2013 found a job with a stable income within one year of leaving school, exceeding the minimum wage in that year.

### 2.3 Regression model

The dependent variable in modelling gender inequalities in wages is the natural logarithm of wages. We considered the wage for the month of first registration after finishing school to be the graduate salary.

Graduate's age at the time of leaving school, denoted as Age in the equation. This variable was chosen to monitor the effect of age on wages after obtaining a diploma, whether the gap between gender inequality closes or, on the contrary, opens with increasing age. We can also look at the variable Age of the graduate from the point of view of possible years of experience and thus whether the older age of graduates also means a higher salary.

The variable FirstReg is the ratio between the number of days from leaving school and the first registration in SIA after leaving school to 360 days (1 year of the monitored period). This variable is intended to quantify flexibility graduates are on the labor market, means how quickly they are able to find their first job after graduation. We are interested in whether less flexible graduates, after the frustration of not finding a job in the first months, are willing to accept even offers with lower offered incomes.

The motivation for monitoring the ownership type variable lies in the fact that we monitor the differences in salaries mainly between the public and private sectors. From the point of view of gender inequalities in wages, we are interested in whether inequalities are more prevalent in the private sector than in the public sector. The predictor in question is supposed to model regional dependencies in graduates' salaries, and we are interested in whether gender differences in wages are significant between individual regions of Slovakia.

We use the following regression model for men and women to estimate the graduate wage gap:

$$w_{ij} = \beta_{0j} + \beta_{1j} \ln(Age_{ij}) + \beta_{2j} FirstReg_{ij} + \beta_{3j} BA_{ij} + \beta_{3j} WS_{ij} + \beta_{4j} CS_{ij} + \beta_{5j} P_{ij} + \beta_{6j} PU_{ij} \quad (8)$$

where  $w_{ij}$  is the natural logarithm of the salary of graduate  $i$  and gender  $j$ , where  $j=0$  are men, and  $j=1$  are women. The variable  $\ln(Age_{ij})$  is the natural logarithm of the graduate's age at the time of education. The variable  $FirstReg_{ij}$  is the ratio of the first registration, i.e. the number of days from the end of school to the first registration to 360 days (we monitored all registrations from June of the year of the end of school until the next June of the following year). When the graduate made the first registration already in June in both monitored years, then  $FirstReg_{ij} = 0$ , for the reason that we chose the date of the end of the studies on 30.6 of the respective year and we always counted the registration from the first day of the given month.

Regions is a variable that is defined through 4 dummy variables: Bratislava region (BA), Western Slovakia (WS), Central Slovakia (CS) and Eastern Slovakia (ES). The dummy variable  $BA_{ij} = 1$  if graduate  $i$  with gender  $j$  works for an organization that belongs to the Bratislava region, otherwise the value of the variable was 0. In that case, another regional artificial variable  $WS_{ij} = 1$ , if the graduate was employed in an organization from the West Slovak region, otherwise it had a value of 0, and similarly for  $CS_{ij} = 1$ , if the graduate obtained the first registration in an organization from the Central Slovak region. In addition, we considered an artificial variable in the original model  $ES_{ij}$ , which was intended for graduates who were employed in the East Slovak region. The variable  $P_{ij} = 1$  if the graduate was employed in an organization from the private sector, otherwise it had a value of 0, and  $PU_{ij}$  it acquired a value of 1 if the graduate was

employed in the public sector. Here, too, we prepared a third dummy variable Oij, which was for graduates who were employed in an organization with a different type of ownership than private or public.

### 3 Results

Basic statistics for graduates' salaries from 2013 are shown in Table 1. The average salary for men was higher than for women. A higher standard deviation for men indicates more dispersed values with increasing wages. A lower standard deviation for women signals a higher compactness of the female population in graduate wages, which means that salary differences in the sample of women alone will vary less compared to men. High positive values of the skewness statistic for each gender as well as for both indicate that the distributions are skewed to the right and the right end of the distribution is longer compared to the left end. Graduate selection at the left end was limited by the minimum wage. Higher positive skewness values also point to asymmetric distributions that widen more with increasing salary. High positive kurtosis values indicate more spiky distributions compared to a normal distribution. This results in a larger number of graduates being around the mean and median, and the numbers of higher-income graduates falling more sharply, creating a long and fatter right tail of the distribution. The average wage disadvantage or inequality of women versus men was 12.16% and the median was 11.43%.

Table 1 Basic statistics for graduates from 2013. Wages are given in EUR.

Gender	Mean	Median	Standard Error	Skewness	Kurtosis
Both	686 €	609 €	325 €	4.04	45.21
Male	742 €	668 €	375 €	3.93	38.59
Female	652 €	591 €	283 €	3.9	49.78
Gender inequality	12 %	11 %			

Table 2 expresses the wage percentiles for graduates from 2013. It can be seen that up to half of men earned less than 668 EUR (19% lower than the average wage for 2013) and half of women less than 591 EUR (28% lower than the average wage for 2013). It can also be seen that as the percentile increases, women's wages have decreased to the level of 75%. Women graduates have a significantly lower income than men. Wage inequality between women and men is significant in the higher earning group, from the 75% percentile and above, where the inequality gradually deepens through individual percentiles from 13% to 25%.

Table 2 Wage percentiles of graduates from 2013. Wages are shown in EUR.

Percentiles	Both	Men	Women	Wage ratio of women/men
10%	385 €	398 €	380 €	95 %
25%	472 €	500 €	460 €	92 %
50%	609 €	668 €	591 €	88 %
75%	835 €	900 €	786 €	87 %
90%	1030 €	1106 €	1000 €	90 %
95%	1198 €	1303 €	1100 €	84 %
99%	1724 €	2000 €	1496 €	74 %

We used the method of least squares to define the regression model, and we present the regression coefficient estimates in Table 3. The model from equation (8) was used for both sexes separately. Beta coefficients indicate changes in logarithms of wages, changes are interpreted in the so-called logarithmic points. If the beta coefficient is small enough, then these changes are approximately equal to percentage changes, that is, if the coefficient has a value of, for example, 0.01, then we can interpret it so that a unit change in the explanatory variable is associated with approximately a 1% change in the logarithm of wages. To calculate the percentage change from the logarithmic points, we will use the relation  $e^{\beta}-1$ .

For men, logarithmic wages responded more to the age variable than for women. When we compare men and women of the same age, then men had on average 32% more than women. Older graduates, both for men and women, had higher salaries on average. The variable  $\ln(\text{Age})$  is the natural logarithm of age, i.e., a change of this quantity by one unit means an increase in age by 2,718 years, which can be interpreted in the way that the change in salaries for graduates changed almost every three years of the age scale by 68% for men and 35% for women. Slower salary growth for women across age cohorts is evident.

The control production characteristic *FirstReg* was not significant for men and had no effect on the logarithms of wages. For women, this coefficient was significant and had a negative effect on the wages of female graduates. Thus, the unit of this coefficient was one year, and on a monthly basis, it meant a decrease in wages by an average of 0.44% for a specific applicant on the labor market.

The regional effect on log wages is also evident for both sexes. Male graduates working in the Bratislava region had an average of 17% higher income than men working in the West Slovak region. While women working in the Bratislava region earned on average 15.61% more than women from the West Slovak region. There were similar percentage changes between the Bratislava Region and the Central Slovak Region for both sexes. The Bratislava region clearly dominates in the parameter of salary offered to graduates. The difference between the West Slovak and Central Slovak regions is no longer so striking for both sexes and ranges from 1 to 2%. When we compare men and women from the Bratislava region, we find that men surpassed women in average wages by 5%. The differences between the earnings of men and women in the other regions are at the level of 1.85% for the West Slovak region, 2.52% for the Central Slovak region.

The influence of the type of ownership of the organization in which the graduates found employment is statistically significant. Men working in the private sector earn on average 10% more than men working for the public sector. For women, this difference was not so evident and was only at the level of less than 1% in favor of the private sector. If we compare men and women working in the private sector, then men earned 11% more on average. In the public sector, this difference is not so striking, only at the level of around 2% in favor of men. This fact is also confirmed by other above-mentioned empirical studies by foreign authors.

Table 3 Estimates of the regression coefficients of equation (17) for 2013.

	Men		Women	
	$\beta$ (Std. error)	Change to the logarithm of wages	$\beta$ (Std. error)	Change to the logarithm of wages
tercept	4.52 (0.18)***	-	5.24 (0.10)***	
ln(Age)	0.52 (0.05***)	68.37%	0.30 (0.03)***	35.62%
FirstReg	-0.007 (0.02)	-0.77%	-0.06 (0.01)***	-6.08%
BA	0.23(0.01)***	26.86%	0.19 (0.01)***	21.55%
WS	0.07 (0.02)***	7.79%	0.05 (0.01)***	5.94%
CS	0.05 (0.02**)	5.89%	0.03 (0.01)*	3.37%
P	0.19 (0.0***)	20.96%	0.09 (0.02)***	9.59%
PU	0.10 (0.04*)	10.91%	0.08 (0.02)**	8.72%
R-squared	0.082		0.067	
N	4193		6684	

#### 4 Discussion and conclusion

The production characteristics of the graduate, age, had a significant effect on the amount of wages. In the lower age cohorts, a certain differentiation in the amount of average wages for each age category was observable from the above results. According to the outcomes, this phenomenon is not characteristic of older age cohorts, but the number of graduates with older ages was significantly lower. Of the monitored number of graduates selected for analysis in 2013, there were only 845 graduates over the age of 30 out of a total of 10,877. We can attribute the high values of the beta coefficients to significant wage differences in the age cohorts under 30. The region in which the graduate found a job was also an important qualitative factor. The Bratislava region is a key employer and wages are significantly higher for both sexes in this region compared to others. The private sector is also an important determinant of the graduate wage gap. The majority of graduates, 7894 out of 10877, were employed in the private sector and 2698 in the public sector. Therefore, it is expected that the wage gap will be driven by this sector as well.

The Blinder-Oaxaca decomposition from Table 4 says that explainable factors contributed 3.13% to the wage gap. In the first case, 96.9% and in the second 98.1% are attributed to unexplained and residual factors affecting the wage gap.

Table 4 Decomposition of gender wage differences of graduates according to Oaxaca - Blinder (1973).

	Oaxaca-Blinder decomposition equation (8)
Total gap	0.440
Explainable gap	0.0138
Unexplainable gap	0.4261

In the study, we dealt with the measurement of the gender wage gap among university graduates. By comparing the wage quantiles between women and men it was evident that a significant part of female graduates earned less compared to their male counterparts. In salaries above 1000 to 2000 EUR, the salary gap has opened from 10% to 25%. In lower income groups below the level of the average wage in the economy, the wage gap between male and female graduates opened gradually to the level of 10%. The regression model confirmed that the coefficients for the measured product characteristics are more in favor of men. Men generally earned more with increasing age and

employment in the Bratislava region and in the private sector. The decomposition of the wage gap pointed more to the contribution of unexplained factors to the gender wage gap.

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## References

- Acemoglu, D. (1998), “Why do technologies complement skills? Directed technical change and wage inequality”, *Quarterly Journal of Economics* 113, pp. 1055–1089. doi: 10.1162/003355398555838
- Allen, J. and Velden, R. Van der (2001). “Educational mismatches versus skill mismatches: effects on wages”, *job satisfaction and on-the-job search*, Oxford Economic Papers 53(3), 434–452. <http://dx.doi.org/10.1093/oep/53.3.434>
- Becker, G. S. (1957). “The Economics of Discrimination“. *Chicago: University of Chicago Press*. <https://doi.org/10.2307/2230052>
- Bergmann, B.R. (1974). “Occupational segregation, wages and profits when employers discriminate by race or sex“, *Eastern Economic Journal* 1, 103–110.
- Berman, E., Bound, J. and Machin, S. (1998). “Implications of skill-biased technological change: international evidence“, *Quarterly Journal of Economics* 113, 1245–1279. <https://dx.doi.org/10.2139/ssrn.89488>
- Bielby, W.T. and Baron, J.N. (1986). “Sex segregation within occupations“, *American Economic Review* 76(2), 43–47. <https://doi.org/10.1086/228350>
- Blau, F.D. and Kahn, L.M. (1992). “The gender earnings gap: learning from international comparisons“, *American Economic Review* 82(2), 533–538.
- Blau, F.D. and Kahn, L.M. (1996). “Wage structure and gender earnings differentials: an international comparison“, *Economica* 63(250), S29–S62. <https://doi.org/10.2307/2554808>
- Blau, F.D. and Kahn, L.M. (1997). “Swimming upstream: trends in the gender wage differential in the 1980s“, *Journal of Labor Economics* 15(1), 1–42. <https://doi.org/10.1086/209845>
- Blau, Francine D., Kahn, Lawrence M., 1999. “Analyzing the gender pay gap“. *Q. Rev. Econ. Finance* 39, 625e646.
- Blinder, A.S. (1973). “Wage discrimination: reduced form and structural variables“. *J. Human Resourc.* 8, 436–455. <https://doi.org/10.2307/144855>
- Blundell R., Gosling A., Ichimura H. and Meghir C. (2007). “Changes in the distribution of male and female wages accounting for employment composition“, *Econometrica*, Vol. 75, No. 2 (March, 2007), 323–363 <https://dx.doi.org/10.2139/ssrn.605246>
- Brown, C. and Corcoran, M. (1997). “Sex-based differences in school content and male- female wage gap“, *Journal of Labor Economics* 15(3), 431–465. <https://doi.org/10.1086/209867>
- Catanzarite, L. (2003). “Race-gender composition and occupational pay degradation“. *Soc. Probl.* 50, 14e37. <https://doi.org/10.1525/sp.2003.50.1.14>
- Cotton, J. (1988). “On the decomposition of wage differentials“, *Review of Economics and Statistics* 70, 236–243. <https://doi.org/10.2307/1928307>
- Even, W.E. and Macpherson, D.A. (1993). “The decline of private-sector unionism and the gender wage gap“, *Journal of Human Resources* 27(2), 279–296. <https://doi.org/10.2307/146204>

- Fitzenberger, B. and Wunderlich, G. (2002). "The changing gender gap across the wage distribution in the UK", *Mimeo*. <https://dx.doi.org/10.2139/ssrn.441703>
- Flabbi, L. (1997). "Gender discrimination and return to education: estimations on individual data", *Rivista di Politica Economica* 12, 173–213. <https://doi.org/10.1111/j.1468-2354.2010.00600.x>
- Grogger, J. and Eide, E. (1995). "Changes in college skills and the rise in the college wage premium", *Journal of Human Resources* 30(2), 280–310. <https://doi.org/10.2307/146120>
- ITMS 26110230120. Etapa 3, "Národný projekt Vysoké školy ako motory rozvoja vedomostnej spoločnosti", *spolufinancovaný zo zdrojov EÚ*, <https://vysokoskolacidopraxe.cvtisr.sk/>
- Jolliffe, D. and Campos, N.F. (2005). "Does market liberalisation reduce gender discrimination? " *Econometric evidence from Hungary, 1986–1998*, *Labour Economics* 12, 1–22. <https://dx.doi.org/10.2139/ssrn.542702>
- Juhn, Ch, Murphy K. M. and Pierce B (1991) "Accounting for the slowdown in black-white wage convergence. In: Costas MH (eds) *Workers and their wages*". *AEI Press*, Washington DC, 107–143.
- Juhn, Ch., Murphy, K. M. and Brooks, P. (1993). "Wage inequality and the rise in returns to skill". *J. Polit. Econ.* 101, 410e442. <http://dx.doi.org/10.1086/261881>
- Katz, Lawrence F. and Autor, David H. (1999). "Changes in the wage structure and earnings inequality. In: Ashenfelter", *O., Card, D. (Eds.), Handbook of Labor Economics*, vol. 3A. Elsevier Science B.V., Amsterdam, pp. 1463e1555. [https://doi.org/10.1016/S1573-4463\(99\)03007-2](https://doi.org/10.1016/S1573-4463(99)03007-2)
- Leonard, J. (1996). "Wage disparities and affirmative action in the 1980's", *American Economic Review Paper and Proceedings* 86(2), 285–289.
- Mariachristina, P., Santarelli, E. and Vivarelli, M. (2003). "The skill bias effect of technological and organisational change: evidence and policy implications", *IZA Discussion Paper Series*, Discussion Paper, 934.
- Mandel, H., Semyonov, M. (2014). "Gender pay Gap and employment sector: sources of earnings" *disparities in the United States, 1970-2010*, *Demography* 51, 1597e1618. <https://doi.org/10.1007/s13524-014-0320-y>
- Meng, X. (2004). "Gender earnings gap: the role of firm specific effects", *Labour Economics* 11, 555–573. <https://doi.org/10.1016/J.LABECO.2003.09.006>
- Meulders, D., Plasman, R. and Vander Stricht, V. (1993). "Position of Women on the Labour Market in the European Community". *Vermont: Dartmouth Publishing*. ISBN1855214199
- Mincer, J. (1958). "Investment in human capital and personal income distribution". *Journal of Political Economy* 66 (4), 281–302. <https://doi.org/10.1086/258055>
- Morris, M. and Western, B. (1999). "Inequality in earnings at the close of the twentieth century". *Annu. Rev. Sociol.* 25, 623e657. <https://doi.org/10.1146/annurev.soc.25.1.623>
- Newell, A. T. and Reilly, B. (2001). "The Gender Pay Gap in the Transition from Communism: Some Empirical Evidence," *IZA Discussion Papers* 268, Institute for the Study of Labor (IZA). <https://dx.doi.org/10.2139/ssrn.267201>
- Oaxaca, R. (1973). "Male–female wage differentials in urban labor market", *International Economic Review* 9, 693–705. <https://doi.org/10.2307/2525981>
- Oaxaca, R. and Ransom, M. (1994). "On discrimination and the decomposition of wage differentials", *Journal of Econometrics* 61(1), 5–21. [https://doi.org/10.1016/0304-4076\(94\)90074-4](https://doi.org/10.1016/0304-4076(94)90074-4)
- Oaxaca, R. and Ransom, M. (1999). "Identification in detailed wage decompositions", *Review of Economics and Statistics* 81, 154–157. <https://doi.org/10.1162/003465399767923908>
- Paglin, M. and Rufolo, A.M. (1990). "Heterogeneous human capital, occupational choice, and male–female earnings differences", *Journal of Labor Economics* 8(1), 123–144. <https://doi.org/10.1086/298239>
- Petersen, T. and Morgan, Laurie A. (1995). "Separate and unequal: occupation-establishment sex segregation and the gender wage gap". *Am. J. Sociol.* 101, 329e365. <https://doi.org/10.1086/230727>

- Teichler, U. and Kehm, B. (1995). "Towards a new understanding of the relationships between higher education and employment", *European Journal of Education* 30(2), 115–132. <https://doi.org/10.2307/1503524>
- Tomaskovic-Devey, D. and Skaggs, S. (2002). "Sex segregation, labor process organization, and gender earnings inequality". *Am. J. Sociol.* 108, 102e128. <https://doi.org/10.1086/344214>
- Welch, F. (2000). "Growth in women's relative wages and in inequality among men: one phenomenon or two?" *Am. Econ. Rev.* 90, 444e449. DOI: 10.1257/aer.90.2.444



## Cooperation Between University and Coworking Space in the Process of Education and Technology Transfer

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### Abstract

In the literature, the transfer of knowledge from academia to commercial companies, i.e. enterprises engaged in industrial production, is mainly encountered. However, there is a collaboration established between academia and an institution called coworking, which is currently seen as innovative in the way of teaching and knowledge transfer. Coworking spaces started to be found in Slovakia in 2011, and it dates back to 2017 when the first cooperation between the Faculty of Management, Comenius University Bratislava and the Campus coworking was established in the teaching of entrepreneurship subject. The main goal of the research is to map the existing literature on the topic of university technology transfer in connection with coworking spaces and to present a case study that characterizes the cooperation of the Comenius University, Faculty of Management with Slovak coworking space. This article enriches the literature on the issue focusing on the university's relationship with coworking spaces as a new trend of collaboration in knowledge and technology transfer.

Keywords: university technology transfer, coworking, knowledge transfer, entrepreneurship, cooperation

Article Classification: Literature review and case study

### 1 Introduction

Universities represent a relevant source of knowledge for organizational and commercial innovation, which makes them an essential part of technology transfer (Audretsch and Caiazza, 2016). With increased efforts by universities to commercialize academic science, technology transfer ecosystems have developed near universities. The ecosystems consist of various organizational units such as science parks, incubators,

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coworking spaces, and technology transfer offices (Good et al., 2020). These innovation spaces offer an early access point to technological innovations that can originate from academic research to accelerate business development through support resources and services (Kruger and Steyn, 2020). In addition, universities have established policies and programs to support technology transfer and commercialization in the form of early-stage venture capital funds (Hayter et al., 2020).

The literature and sources on flexible work arrangements in academic settings explore the possible applications of coworking spaces at universities. Given the minimal empirical research on this topic and on the issue related to knowledge transfer, this paper opens a discussion on coworking spaces in a scholarly context and its potential benefits for universities. Based on this, our work will focus on university-coworking space collaborations. Coworking space is a new approach to flexible working conditions and knowledge exchange. It creates opportunities for real-world collaborative environments between academia and industry, social learning, and informal feedback from other students and professors with experts in various fields outside the university (Orel and Bennis, 2020). The main goal of our research is to present the results of a literature mapping of university technology transfer concerning coworking spaces. Its emphasis is on knowledge transfer and the application of coworking in teaching a selected course focused on entrepreneurship at the Faculty of Management, Comenius University Bratislava.

## 2 Material and methods

The primary purpose of our research, as stated in the objective, is to map the literature on the university technology transfer and coworking space and to share our experience of our faculty on coworking space in teaching the course Strategies and Financing of New Ventures through a short case study. In this chapter, we present the process of searching, selecting, analyzing, and categorizing publications in entrepreneurship and management, which is visualized in Table 1 and described in detail in the following sections. We have chosen the two most well-known scholarly online databases relevant to the research area: SpringerLink, Web of Science. The databases above were critical sources for searching the literature for the necessary information.

Table 1 Systematic literature review procedure

	Steps	Chapter	Activity
Step 1	Online databases	Subchapter 2.1	Search for articles with key terms in databases
Step 2	Data sample	Subchapter 2.2	Search, select, analyse and categorise publications
Step 3	Full-text literature review	Subchapter 2.3	Removing duplicates, evaluating titles and abstracts, checking articles for relevance

In the process of searching articles for keywords, we encountered several problems. The main problem was little consistency in the terminology used to describe partnerships and collaborations between the university and coworking space and knowledge transfer. Second, few studies focus on knowledge transfer and managing these collaborations. As a result, keywords such as university coworking space, coworking

education, and university technology transfer and coworking have been combined. Research partnerships with knowledge transfer between coworking spaces and universities have provided limited results.

### ***2.1 Online databases of relevant articles***

We selected articles from two of the most common scholarly online databases in the social sciences, Springerlink and Web of science. Springerlink is a full-text database providing access to more than 1600 journals in science, technology and medicine, and Web of science is a database of complete, integrated, multidisciplinary research. The reason for selecting these two databases was that they contain numerous high-quality literature (impacted journals) and contributions from research articles, primarily in business and management.

In the first step, we identified keywords related to the topic. The keywords were as follows: university technology transfer and coworking, coworking education and university coworking space. The second step was to enter the keywords into online databases to find out and have an overview of the approximate number of articles. Without any selections and filters, the resulting number of pieces with 4159 was too high, so we started filtering and selecting relevant articles.

### ***2.2 Data sample***

In our research, we mainly focus on business management and entrepreneurship studies as research areas. The initial selection used an article cleaning process with 4159 articles that emerged from the online databases. The purpose of article cleaning was to find and remove multiple occurrences of publications in the databases and evaluate and re-evaluate titles and abstracts from other publications for their thematic relevance. The next step was to narrow the sample using the following selection criteria:

- a) Discipline: social sciences
- b) Subdiscipline: business and management
- c) Document type: article (usually research articles)
- e) Language: English
- f) Year: 2012-2022

We have selected social sciences as our primary research area as our topic is considered to be research in the field of entrepreneurship, which is closely related to management in general. The shortlisted area is business and management. The type of document is an article, which focuses more on research articles or journals. We selected articles in English language as Slovak literature was not available. For the purpose of obtaining up-to-date information, we defined the year of publication as from 2018 to the present (2022). As there were no articles in such a time span with keywords as coworking education, we defined published articles from 2012 onwards. Subsequently, articles were selected according to the relevance of the text to the topic as well as the abstract and keywords. Overall implementation of the activity and thus the search, selection, analysis and categorization of publications resulted in a consistently high number and thus 166 articles.

### 2.3 Full text literature review

In this step, we critically reviewed the full text of 166 publications according to the following criteria, at least one of which had to be met:

- The publication is related to the topic of university technology transfer and coworking.
- The publication is related to the topic of university coworking space.
- The publication is related to the topic of coworking education.
- The publication contains some of the keywords namely: university technology transfer, university coworking space, university knowledge transfer, coworking education.

First, we carefully read the abstract as well as the title of the paper itself to see if it is thematically related to the keywords above. Then we tried to understand and read the content thoroughly. The last step was to remove duplicate articles. After this check, we selected 5 articles, all of which were only available from the Web of Science database. The resulting number of articles with 5 articles were mainly related to the keyword coworking education and university coworking space, and articles with keywords such as university technology transfer and coworking spaces and coworking collaboration with universities were not found. Based on our analysis, 5 publications formed the final sample (see Table 2).

Table 2 Number of articles depending on keywords

Activity	Activity 1	Activity 1	Activity 2	Activity 2	Activity 3	Activity 3
Keywords/Databases	Springer Link_ number of articles	Web of science_ number of articles	SpringerL ink_ number of articles	Web of science_ number of articles	Springer Link_ number of articles	Web of science_ number of articles
University cooperation with coworking spaces	648	29	24	5	0	0
University technology transfer and coworking	906	1	19	0	0	0
University coworking space	1 635	252	36	50	0	1
Coworking education	627	61	26	35	0	4
Total	4159		166		5	

### 3 Results

In the following sections, we present our results in three areas: university coworking space, the current state of a collaboration between coworking space and university in entrepreneurship education as contained in the literature, and an illustration of a collaboration between Campus coworking Bratislava and the Comenius University, Faculty of Management in entrepreneurship education.

### ***3.1 University coworking space***

The term coworking is used in collaborative environments not only in business and entrepreneurship and public spaces such as libraries and learning spaces (Bilandzic and Johnson, 2013; Bueno et al., 2018). Coworking spaces can be provided by a coworking firm, a public institution (e.g., a chamber of commerce or library), or a university (Bouncken, 2016). Public coworking spaces (e.g., firms, institutions, universities, libraries) offer memberships to all. University coworking spaces can purposefully assist and advance entrepreneurial programs, improve venture team formation and the exchange of ideas and knowledge, and provide training (Bouncken, 2018). Pittaway and Cope (2007) emphasise entrepreneurship education that promotes the formation of interdisciplinary teams, usually involving students from different faculties, offers continuous coaching for new venture projects and provides contacts with companies. University coworking spaces provide entrepreneurial education using knowledge and resource sharing within the coworking space and with external staff (Pittaway and Cope, 2007). The services offered within a university coworking space provide a reasonable basis for initiating and progressing entrepreneurial activities (Bouncken, 2018). Coworking space enables action-based entrepreneurial learning as students are directly and actively involved in developing ideas. In addition, entrepreneurial universities can build collaborative structures with incubators and accelerators that provide additional infrastructure, coaching, and financial resources for selected new ventures (Bouncken, 2018).

### ***3.2 Collaboration between coworking spaces and universities in teaching entrepreneurship as one of the technology transfer activities***

Currently, the topic of coworking spaces is trendy in the business community and is also attractive to many researchers, but little is presented in publications. In the final version, we retrieved four relevant articles from the Web of Science database (shown in Table 3). These articles describe interactions and collaborations between academia and coworking. Nowadays, interactions between the business environment and universities are considered one of the critical elements of technology transfer and knowledge transfer. Due to the small number of articles, each will be discussed separately.

The first article, "Open coworking enabling engineering students to develop innovative skills: the UTEC GARAGE" introduces a coworking implemented by the University of Technology and Engineering, Kuala Lumpur. This coworking space is equipped with electrical, mechanical and industrial tools that allow students, faculty and industrial engineers to create engineering projects or products that solve real-world problems and repair and customize their engineering products by developing their innovative skills. They have named the coworking space 'GARAGE', which changes according to the different projects designed to provide learning and collaboration between industry-academia - society.

The second article, "New challenges for universities in France in the field of innovation and entrepreneurship" in which a group of creators of economic activities and coworking spaces analyses two learning experiences at the University of Paris East Marne-la-Vallee (UPEM) in the field of service innovation. The subject of their research is an entrepreneurship programme for unemployed young people in disadvantaged urban areas and a coworking space created at the university. In both cases analyzed, service innovation appears to contribute to value creation by encouraging student entrepreneurship and facilitating collaboration between actors in the following ways in particular:

1. Personal renewal of the creators during the development of their economic activity,
2. The emergence of new forms of collaboration between different and heterogeneous actors fosters new types of relationships and thus promotes service innovation.

The third article, "University coworking: mechanisms, examples and suggestions for entrepreneurial universities", discusses how university coworking spaces can enrich entrepreneurial universities by leveraging the development of a new venture community, entrepreneurial self-sufficiency, inspiration, autonomy and knowledge flows, even international ones. Examples highlight pioneering universities working with coworking spaces. The paper also suggests how university coworking spaces can integrate entrepreneurship education, links to companies and exploit synergies through public administration.

In the fourth paper, "A Perspective on the Coworking Model in the Scientific Environment," the authors discuss coworking in the scientific context and its potential benefits for higher education institutions. They consider why coworking has not taken off in universities as in business. They argue that adopting the scholarly coworking model by higher education institutions would increase participation in lifelong learning through increased interaction among university colleagues and effectively influence transdisciplinary research efforts and knowledge outputs. Further, establishing scientific co-working units in a broader sense of scope would enhance the development of a regional dimension in education by promoting student and academic staff mobility and fostering collaboration between different educational institutions. Increased collaboration between scientists could also be seen as opening up additional channels of communication that could lead directly and indirectly to the exchange of experiences and information on common issues in education systems. Finally, they stress that further systematic research is needed as educational institutions become more eager to open coworking units (or a hybridized form) in different scientific settings.

Based on the above articles, we can conclude that the recent global trend of coworking spaces has also started to develop in academia-university collaborations. This new concept of integration between coworking and universities is considered an innovation in entrepreneurship education and is gradually beginning to emerge in different regions of the world.

Table 3 Final overview of articles from the Web of science database

Article	Source	Authors	Year
An open coworking space to allow engineering students to develop innovative competences: UTEC GARAGE	Web of science	Murray Victor, Bejarano Alberto, Matsuno Cecilia	2016
New Challenges For Universities in France Around Innovation and Entrepreneurship: Groups of Economic Activities Creators and Coworking Spaces	Web of science	Christian Bourret, Claudie Meyer, Ingrid Fasshauer	2014
University coworking-spaces: Mechanisms, examples, and suggestions for entrepreneurial universities	Web of science	Ricarda B. Bouncken	2018
The perspective of a coworking space model in scholarly settings	Web of science	Marko Orel, Will Bennis	2020

### ***3.3 Cooperation of Campus coworking and Comenius University, Faculty of Management in teaching the subject Strategies and financing of new ventures***

In the first part of this sub-section, we briefly describe the Campus cowork in terms of its founding history and then focus on a more detailed description of its two branches. We will compare the branches based on size, price, and finally, we will characterize the users who visit the space. In the second part of the sub-section, we will discuss a specific example of a collaboration between Campus cowork and the Faculty of Management of Comenius university (FMCU) on one of the entrepreneurship courses.

#### ***3.3.1 Characteristics of the Campus cowork***

Campus cowork is an international workspace based in Bratislava, with two branches, namely Campus City and Campus Mlyny. This cowork is categorized as a corporate spin-off according to the founder's typology of coworking spaces. It belongs to 0100 venture holding. Its founders are Marek Zámochník, Dušan Duffek, Martin Hauge and Michal Paško. Campus Mlyny was founded in November 2016, and Campus City in December 2018. Campus Mlyny has a capacity of 100 people, with fixed desks for 36 people, flexible desks for 13 people and private offices for 50 people. Campus city is almost three times bigger. The space has a capacity of 241 people and, together with Campus Mlyny is categorized as an ample coworking space. The fixed desks are comprised of 40 people, the flexible desks are for 36 people, and the private offices are for 165 people. Campus City is close to the city centre, and Campus Mlyny is close to the student dormitories. The original vision of Campus cowork was to create a solid entrepreneurial community while being a non-profit project. Over time, the project has been so successful that the business model of Campus cowork is now profitable. Both offices are attractive and relatively close to the railway station, being easily accessible for mobile workers commuting to Bratislava. Campus users are primarily freelancers, i.e. freelancers, sole traders, micro-enterprises, start-ups and small and medium-sized enterprises, which are the latest to be found in hybrid offices. In the past, Campus cowork has also worked with corporate companies such as Tatrabanka and Nay. The sectors where users' professions fit are mainly IT, marketing, architecture, and lawyers.

#### ***3.3.2 Description of the cooperation between coworking and FMCU***

FMCU has been cooperating with the coworking Campus for the past five years in teaching the subject of Strategies and financing new ventures. This is a subject taught in the Master's degree, in the study block Entrepreneurship. In conducting this subject, the Department of Strategy and Entrepreneurship applies a practice-based approach to entrepreneurship.

The main objective of this course concerning students is to apply a method of learning based on following:

a/ providing theoretical and practical insight into the strategic development and financing of new ventures according to the main stages of their stage of development,

b/teaching the following topics:

- Applying selected tools and methods through practical problem solving in collaboration with start-ups,

- Practicing the acquired knowledge directly in the community of start-ups operating in coworking by contributing to the solution of sub-problems in specific projects,

- Working on tasks focused on solving partial problems of financing specific projects.

c/ building a network with start-ups operating in coworking.

The benefit of the course for start-ups operating in coworking and collaborating with students is:

- Getting familiar with new methodology and best practices on how to build a successful start-up,
- Getting new ideas/solutions to partial problems identified by start-ups - inspiration.
- Having chances and opportunities to collaborate with international students and learn about foreign markets,
- Getting to know/recruiting potential employees.

Before the pandemic crisis, this subject was taught by a combined method of teaching in the lecture room at the faculty and in the coworking Campus, which has two premises: in Mlynska dolina and in Staromestska street in Bratislava. At the time of the pandemic crisis, the teaching and the meetings with startups took place online. Throughout the semester, students collaborate with the startups - in teams, they participate together in their specific and above all real-world assignments. As the objectives imply, this form of teaching intends to use as much as possible of the knowledge and practical tools that students get acquainted with in lectures and seminars covered by the Department of Strategy and Entrepreneurship of the FMCU in solving the assigned tasks. The publication *Disciplined Entrepreneurship* (both textbook and exercise book) by Professor Bill Aulet from the prestigious Massachusetts Institute of Technology (MIT) Sloan School of Management, which is actively used in this course, is also instrumental in this respect.

All startups that the students have worked with represent exciting and innovative projects. They included, for example, the winners of the UberPITCH competition from SourceCall, that create a platform of the same name to bring celebrities and people together to crowdfund various projects, especially those with a social focus. Other startups were: Zero2Hero, which profiles itself as an online magazine for young people about entrepreneurship; DECENT - a Slovak blockchain platform that managed to raise 2.3 million euros from investors in two days in bitcoin crowdfunding; MINDWORX - a firm that deals with consulting in the field of behavioral economics; Slovensko.Digital - a civic association that strives for better digital services for the state; Adstate, which provides online services in the field of funerals, Startup Den- the first online incubator in Slovakia, Bolt- European super app whose mission is to make urban mobility more affordable, safer and more sustainable and many others.

The final presentations of the students' solutions took place at the Campus coworking space before the pandemic crisis. During the pandemic, presentations were made through ms teams online, with representatives from startups invited to present as well. Startups valued the student proposals and their collaboration as a valuable source of inspiration for the next phase of building their companies. This experience is beneficial and equally inspiring for students and startups.

#### **4 Discussion**

The main goal of the research was to map the literature on the topic of university technology transfer in connection with coworking space as a new trend of cooperation and to illustrate the practical cooperation of FMCU with a particular coworking space. Currently, the topic of coworking space is trendy in the business community as well as in research. By collaborating coworking spaces with universities, students and teaching staff gain personal projects in a motivating environment, practical experience from a community of experts, and generally put theories into practice. Universities are increasingly experimenting with multi-purpose workplace concepts related to technology and knowledge transfer activities to help students, academics and coworking users and enable them to benefit from enhanced collaboration opportunities. We also presented our



approach to collaborating with coworking spaces in teaching entrepreneurship. From the literature analysis, we learned that very few studies focus on the collaboration of coworking spaces with universities and, in general, on topics focused on technology and knowledge transfer between universities and coworking spaces. Three key findings emerged from our literature research: very few articles focus on coworking spaces and teaching entrepreneurship, which is evidence that this topic is new, under-researched and still in development. The analysis further revealed that the integration and collaboration between coworking spaces and universities are already spreading in several countries and is thus considered a new trend of collaboration between academia and the business environment. However, in the future, it is necessary to explore how universities and coworking spaces can integrate entrepreneurship education through knowledge transfer and linkages to companies.

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### References

- Audretsch, D., and Caiazza, R. (2016), “Technology transfer and entrepreneurship: cross-national analysis”, *The Journal of Technology Transfer*, Vol. 41 No. 6, pp. 1247-1259. doi: 10.1007/s10961-015-9441-8
- Bilandzic, M., and Foth, M. (2013), “Libraries as coworking spaces: Understanding user motivations and perceived barriers to social learning”, *Library Hi Tech*, Vol. 31 No. 2, pp. 254-273. doi: 10.1108/07378831311329040
- Bueno, S., Rodríguez-Baltanás, G., and Gallego, M. D. (2018), “Coworking spaces: a new way of achieving productivity”, *Journal of Facilities Management*, Vol. 16 No. 4, pp. 452-466. doi: 10.1108/jfm-01-2018-0006
- Bouncken, R. B. (2018), “University coworking-spaces: Mechanisms, examples, and suggestions for entrepreneurial universities”, *International Journal of Technology Management*, Vol. 77 No. 1-3, pp. 38-56. doi: 10.1504/IJTM.2018.091709
- Bouncken, R. B. and Reuschl A. J. (2018), “Coworking-spaces: how a phenomenon of the sharing economy builds a novel trend for the workplace and for entrepreneurship”, *Review of Managerial Science*, Vol. 12 No. 1, pp. 317-334. doi: 10.1007/s11846-016-0215-y
- Bourret, C., Meyer, C., and Fasshauer, I. (2014), “New Challenges for Universities in France around Innovation and Entrepreneurship: Groups of Economic Activities Creators and Coworking Spaces”, in *7th International Conference of Education, Research and Innovation 2014, proceedings of the international conference in Seville, Spain, 2014*, pp. 2837-2844.
- Good, M., Knockaert, M., and Soppe, B. (2020), “A typology of technology transfer ecosystems: how structure affects interactions at the science–market divide”, *The Journal of Technology Transfer*, Vol. 45 No. 5, pp.1405-1431. doi: 10.1007/s10961-019-09745-w
- Hayter, C. S., Rasmussen, E., and Rooksby, J. H. (2020), “Beyond formal university technology transfer: Innovative pathways for knowledge exchange”, *The Journal of Technology Transfer*, Vol. 45 No. 1, pp. 1-8. doi: 10.1007/s10961-018-9677-1

- Kruger, S., and Steyn, A. A. (2020), “Enhancing technology transfer through entrepreneurial development: practices from innovation spaces”, *The Journal of Technology Transfer*, Vol. 45 No. 6, pp. 1655-1689. doi: 10.1007/s10961-019-09769-2
- Murray, V., Bejarano, A., and Matsuno, C. (2016), “An open coworking space to allow engineering students to develop innovative competences: UTEC GARAGE”, in *IEEE 8th International Conference on Engineering Education 2016 proceedings of the international conference in Kuala Lumpur, Malaysia, 2016*, pp. 109-114. doi: 10.1109/ICEED.2016.7856053
- Orel, M., and Bennis, W. (2020), “The perspective of a coworking space model in scholarly settings”, *On the Horizon*, Vol. 28 No. 2, pp. 101-111. doi: 10.1108/OTH-10-2019-0074
- Pittaway, L. and Cope, J. (2007), “Entrepreneurship education: a systematic review of the evidence”, *International Small Business Journal*, Vol. 25 No. 5, pp.479–510. doi: 10.1177/0266242607080656

## Modeling Online Consumer Behavior to Shape Shopping in E-Market

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### Abstract

This research, focuses on options available in an online market menu to predict the last selection for each customer based on their buying behavior. Last choice is the point that other details become important, however recommender systems suggest some options but end user (last consumer) would decide about the final choice. This usability study approach is able to gathering data by online questionnaire technique from system and measuring important concepts using analysis techniques. Consumer Behavior, in its broadest sense, which concerned with how consumers select, decide, use and dispose of goods and services, gives a good idea and insights about consumer's emotions, attitudes, and preferences which affect buying behavior. Any details about customers such as age, sex, major ande etc are useful to model as a group segmentation. Consequently, this research aimed to model consumer behavior by considering/analyzing multi-dimension big data, with an aim to influence/shape consumer's behavior - e.g., in shopping/dietary. However, we cannot force our customers to buy very different items that they are not used to buy them, but we can start by omitting unhealthy items. This study aims to an instrument that can make decisions on behalf of human, and its method is based on each person which is different to all existing methods, because modeling this decision support system is providing an application that works as a food assistant like other assistant apps.

Keywords: Consumer behavior; Online market; System learning; E-Commerce; Decision making.

Article Classification: Conceptual paper

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## 1 Introduction

Consumer Behavior, in its broadest sense, which concerned with how consumers select, decide, use and dispose of goods and services, gives a good idea and insights about consumer's emotions, attitudes, and preferences which affect buying behavior. Big companies understand that predicting customer behavior fills the gap in the markets and identifies products that are needed and which could generate bigger revenue. However, this research attempts to use consumer behavior model to make some changes in order to shape a healthy shopping behavior. In this study for start model we have access to data of a university which offers few types of food for each meal and students can choose one of them. In this data sample it is obvious if student selected chicken or beef for lunch in any special day of year. Other details about students such as age, sex, major and even their classmates to model as a group segmentation, is available. We also can make some model examination after simulation by offering salad & French fries or fish & burger menu and test their behavior. This means part of our segmentation process is related to foods, that we can offer in menu or system can suggest in online restaurant. In this process there are some other variables such as volume of food, calories, fat, sugar and other details. This data is valuable to analyze and provide personalized recommendations to customers based on their likes and dislikes, most frequently purchased items, previous searches, correlations between item purchases, and many more.

Consequently, this research aimed to understand/model consumer behavior by considering/analyzing multi-dimension big data, with an aim to influence/shape consumer's behavior. Indeed, when trust gained to this system, it can shape a healthy diet.

Information technology age brought many benefits to various aspects of human life, and IT managers not only focus on the new technologies available in computer science but also try to find the usage of them in organizations and business. The reality is that business people enjoy the advantages of computer application technology to make work easier and more efficient than ever. Currently, digital marketing has changed the way brands and businesses use technology for marketing (Argyris et al., 2020). On the other hand, there was always a big question that how to cover consumers requirement by producing better products, however not only there are variety of desirers among costumers but also there is a difference between costumers' desired products and purchasable ones in the market.

Consumers are constantly connected digitally all the time, through their smart devices, tablets, gaming consoles and every application, service and channel accessible through these devices. Retail banks use big data analytics for fraud prevention. Big data sets are generated around customers based on their online purchase behavior, website clicks, social media activities log, smart connected devices, geo-location attributes, etc. Sophisticated analytics solutions for big data provide new approaches to addressing some of the key each customer's behavior. Analyzing this large amount of data in motion enables marketers to fine-tune customer segmentation models and apply the insights to develop customer engagement strategies and improve the value of customer. Although the massive increase in the number of choices has been an opportunity for consumers to choose the most interesting products, however, this has led to the problem of Choice Overload, i.e., the problem of having unlimited number of choices, especially when they do not differ significantly from each other (Bollen et al., 2010; Anderson 2006).

This similarities among products, take same product from various brands, as an example, causes some flexibilities become available in satisfying the costumers' demand and Recommender Systems (RSs) utilize it, while shopping. RS systems are able to mitigate Choice Overload problem by choosing and suggesting a short list of items for

users, based on their personal needs and constraints (Resnick & Varin 1997; Ricci et al., 2011; Jannach et al., 2010; Liu & Chen., 2021).

In this research, we focus on options available in an online market menu to predict the last selection for each customer based on their buying behavior and also take some actions to provide some other healthy options, close to their final decision. In another point of view, this works like that, when parents want to order outdoor food for a kid, since they know his feeding behavior, they know the last options but still try to select a healthy one for their child.

### **1.1 Research background**

State of the art reveals there are some researchers who doing some with the idea looking at if/how recommendation systems can be improved with more direct consumer input (i.e., asking more about consumer preferences rather than just relying on passively collected data about past purchases, views, etc.). There is definitely scope for complementary projects within that general area. What specific information from users would be most useful (values, attitudes, intentions, etc.), in what situations they would be willing to provide it, how much better (if at all) healthy recommendations generated this way would be from those derived purely from inference, and how such a system could work from a UI and technical standpoint in digital marketing.

Improper marketing behavior can affect a company's brand to varying degrees. Therefore, a company can only achieve better and sounder development if it fully understands the importance of honest behavior in marketing decisions and takes corporate social responsibility seriously. It is also an important way to protect your corporate brand. (Cui, Hu & Xie, 2021; Sohail & Hasan, 2020; Yu, Lu & Shen, 2021)

Especially for corporate brands, both corporate managers and social researchers have reached a consensus on brand awareness (Li, Song, Lu, Zeng & Shi, 2020; Lu, Mitra & Musto, 2020). They believe that corporate branding is not only an important intangible asset formed during business operations, but also the most vulnerable asset of a company.

The fast growth of information technology has generated new potential in marketing science predictive significance, effectiveness, and performance. In order companies to gain such business competitive advantage and conduct effective marketing strategies, are essential to gather and store consumer information that will help analyze, model, personalize, predict, and influence their potential customers behavior and intention to purchase products or services. Due to technological progress, people's lives have changed along with their purchasing behavior. Societies are constantly changing and evolving, they are improving their structures, communications, and working environment in daily basis. Consumers' habits change and differ accordingly, based on a set of factors that seem to affect consumer choices and reactions. Such factors are considered to be cultural, social, financial, geographical, political and tend to affect customers behavior when coming to decide to purchase a service or a product (Sankaran,2019).

Consumer satisfaction through consumer behavior and user experience define the level of success. Sophisticated tools powered by artificial intelligence are required to reveal customer purchasing patterns and turn consumer decision making and predicting into simple decision making for marketers, retailers, and companies (Gochhait et al.,2020).

Nowadays, customer behavior model's generation are usually based on customer data analysis using data mining algorithms. However, this is a difficult task for researchers because the risk of misinterpreted or biased data and results may mislead the outcome of the research. Thus, applying data mining techniques on customer behavior

models requires the right approach. Nevertheless, several studies reveal how consumer behavior prediction using data mining techniques was successful in developing association rule mining models to predict customer behavior managing to export new sets of rules value (Orogun and Bukola,2019). Compared to similar consumer behavior prediction attempts there is one which demonstrates an alternative use tree-based feature transformation and machine learning algorithms, instead of using ensemble algorithms, a simple algorithm is used to predict purchase behavior based on transformed features (Hou et al., 2018). Another approach in predicting consumers' behavior this time using random forest data mining technique proved to be effective since it has managed to succeed high accurate results (Valecha et al., 2018).

In the same spectrum of consumer behavior prediction there is a substantial number of studies which refer to in-store behavior monitoring using eye tracking and embedded sensors technology. Different processes like scene perception, reading, visual attention and decision making can perform high accuracy prediction. Factor such as focus time, positioning, shopper motion, total fixation duration, fixation count affect consumer's final decision (Goyal et al., 2015; Liciotti et al., 2017).

Consumer behavior examines the factors that affect consumers' choice, under a free will spectrum, to purchase the product or service which satisfies their need. To be successful at any moment in a such a dynamic environment, the customers' journey must be pleasant, easy, and constant. In marketing science, the customers' journey, behavior, free will, decision making, and customer experience are bound inextricably together. This trend of product exchange has reduced the influence of middlemen over sales thereby gaining profit to the business and satisfaction to the consumers (Mani,2019).

The American Marketing Association presented "consumer behavior" as the "study of how customers, both individual and organizations, satisfy their needs and wants by choosing, purchasing, using and disposing of goods, ideas and services". When it comes to offline or online purchase, consumers behavior remains the same. But one some major differences are shopping environment and marketing communication. Consumers purchase decisions pass through certain stages including presale awareness, information retrieval, evaluation, decision, and post-sale behavior called engagement. Among these steps of there are certain factors that affect consumers decision to finally convert to customers (AMA, 2020) As prementioned, customers journey is trivial and complex. Thus, there can be many reasons why consumers buy online. These have been summarized into four main categories including convenience, information, availability, and cost (Asamoah,2012)

In a constantly changing world the emerging role of technology's disruptive nature is imperative to be highlighted. Since the world has changed the key to success lies on the sophisticated solutions that will be able to provide fast and accurate solutions. Humans and companies will be both benefited by this technological evolution. Purchase procedures and retail game changes. Businesses who will fail to adopt the new technological current will more than likely cease to be competitive (Olmez,2018).

## ***1.2 Literature Review***

Xu et al. (2022) in paper titled "Machine learning based customer meta-combination brand equity analysis for marketing behavior evaluation" wrote, at present, the focus of marketing research is mostly on the influencing factors, composition, and measurement of brand equity. It was a detailed study of the current state of brand marketing strategies and customer satisfaction, found key indicators of brands that could improve customer satisfaction, and presented corresponding suggestions for optimizing

marketing strategies. It shows that. It has the importance of good guidance and references to improve customer satisfaction in the industry.

Jain et al. (2021) in a paper titled “Consumer recommendation prediction in online reviews using Cuckoo optimized machine learning models” indicated, digital technology and social media have delivered many advantages in understanding human psychology, which is essential to industrial growth. This paper main goal is to use our proposed cuckoo optimized machine learning model to predict airline recommendations. Results show that the proposed extreme gradient boosting classifier optimized by Cuckoo Search (CS-XGB) outperforms other state-of-the-art techniques.

Alantari et al. (2021) in paper titled “An empirical comparison of machine learning methods for text-based sentiment analysis of online consumer reviews” indicated, the amount of digital text-based consumer review data has increased dramatically and there exist many ML approaches for automated text-based sentiment analysis. Consequently, future selection of methods to process text reviews is likely to be based on analysts’ goals of prediction versus diagnostics.

Ramachandran et al. (2021) in the paper titled “Machine learning and role of artificial intelligence in optimizing work performance and employee behavior” said, in today’s business world, firms are using analytics to diving deeper into their data to improve productivity, acquire a competitive edge, and boost their bottom lines. That is why businesses are eager to integrate machine learning and artificial intelligence because they want a faster, more accurate result.

Jain et al. (2021) in the paper titled “A systematic literature review on machine learning applications for consumer sentiment analysis using online reviews” indicated, consumer sentiment analysis is a recent fad for social media-related applications such as healthcare, crime, finance, travel, and in academia. This research has significant implications for service providers in terms of developing managerial strategies for consumers in terms of selecting services that meet their needs. Furthermore, there is high impact for researchers in terms of prospective research directions.

Various research studies have used twitter as an information source to investigate the consumer’s opinion regarding brands (Jansen et al.,2009); the social media platform twitter is a rapid and useful mode for the company to find out, that how consumers feel regarding their business and managers (Saif and Alani,2012).

## **2 Material and methods**

This study aims to an instrument that can make decisions on behalf of human, and its method is based on each person which is different to all existing methods, because modeling this decision support system is providing an application that works as a food assistant like other assistant apps. In this system for example you do not have permission to eat hotdog for dinner while you had burger for lunch, hence your food assistant will contact with restaurant menu system and your healthy order is output of this machine-to-machine communication, this is what happens in a simulated digital environment of WEB 3.0. Indeed, nowadays as explained in this research, some restaurants decided to enter to metaverse and there are many other study possibilities in the future of this research which starts from this modeling point.

Data Science and ML have enabled businesses to make the right decisions. In simpler words, for improving the revenue of an eCommerce store, we could analyze and provide personalized recommendations to customers based on their likes and dislikes, most frequently purchased items, previous searches, correlations between item purchases, and many more.

Consumer Behavior, in its broadest sense, is concerned with how consumers select, decide, use and dispose of goods and services. It covers individuals, groups, or organizations of any verticals. It gives a good idea and insights about consumer's emotions, attitudes, and preferences which affect buying behavior. Thus, helping marketers to understand the needs of customers, bringing value to the customers, and in return generating revenue for the company. Big companies understand that predicting customer behavior fills the gap in the markets and identifies products that are needed and which could generate bigger revenue. However, we want to model consumer behavior and make some changes to shape a healthy shopping behavior.

The most important problem in our research is the data. For this kind of research, collecting good datasets is important but very challenging. Unless we have some open datasets to work with. Since maybe collecting data, ourself may not be a feasible solution due to its nature, researcher planned to use online restaurants dataset, however, if we do not have access to all detailed data, we still can start the modeling.

### **3 Results**

This usability study approach that in any case study with various samples, is able to gathering data by online questionnaire technique from system and measuring important concepts using analysis techniques (both qualitative and quantitative). It is believed that, there is potential not only to address the cold start problem, but also in situations in which consumer preferences change for some reason (moved, newly married, new child, new job, new hobbies or habits...). Given there are a lot of calls for regulation to limit the data large tech platforms collect, it could also be that the current approach will start to degrade due to data limitations, and so some sort of alternative that involves more direct participation from users may become necessary. It could also be useful for 'long tail' content in that existing systems have a lot more data to use to figure out which people to recommend popular content to, but people don't need recommendations for that type of content (because they're likely to hear about it through word of mouth, media coverage, etc.) as much as they do more obscure content that is more difficult to recommend in purely inferential systems because there isn't enough data.

By studying in these research areas during the time, it is found out there is a same problem in new users of recommended systems that is still challenging, and there is not yet a unique solution that can be applied in any domain or situation. Actually there are variable solutions to the new user problem in collaborative filtering that are based on the exploitation of user personality information such as personality-based collaborative filtering, which directly improves the recommendation prediction model by incorporating user personality information; or personality-based active learning, which utilizes personality information for identifying additional useful preference data in the target recommendation domain to be elicited from the user; and personality-based cross-domain recommendation, which exploits personality information to better use user preference data from auxiliary domains which can be used to compensate the lack of user preference data in the target domain.

What is being talked about is an alternative (and potentially complementary) approach to solving the same issue that managers have also been thinking about, that means to use recommendation system to predict what details of a product is suitable to show to each customer, for example which ingredients of a product is important for special customer. For a diabetes customer we should omit sugary products from their list or insert an alert shape or text to make them aware. What we wish to achieve, is extracting of customer requirements based on their preferences, behavior and last actions and



products details to build a standard which improves recommendation systems performance and makes it able to suggest healthy items.

There were various methods and behavioral framework in the state-of-the-art, but in this research, we use a new frame work plus healthy factors and machine learning method to improve and shape consumer behavior diet.

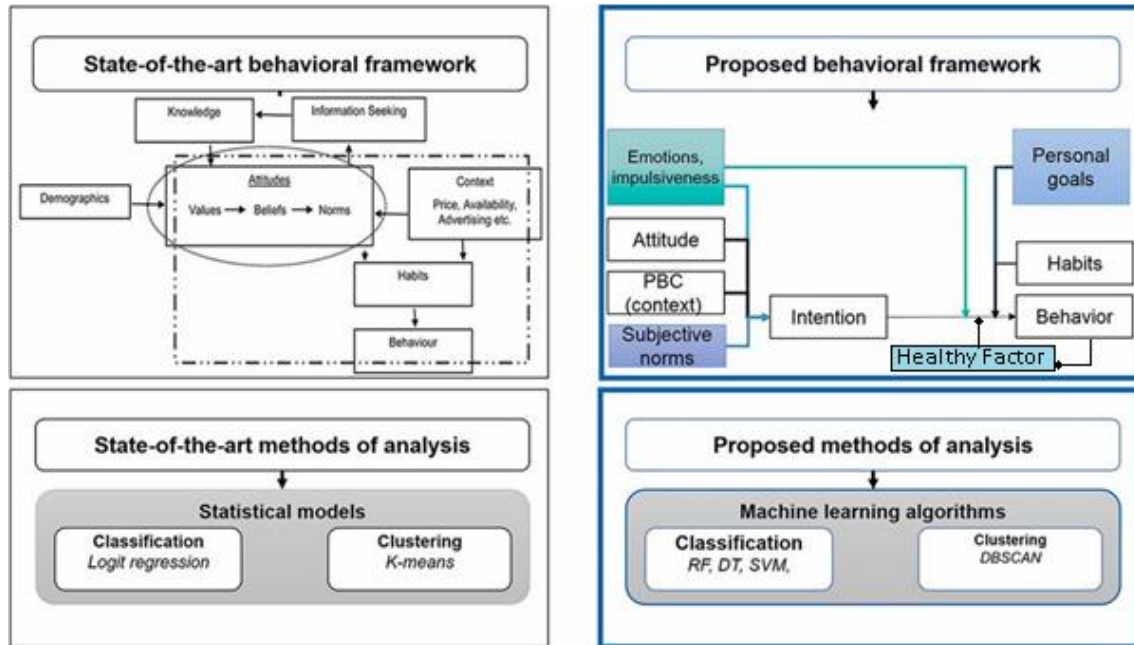


Figure 1 Behavioral framework plus healthy factors, (Tagikhah et al., 2021)

#### 4 Discussion

Consumer behavior is defined as a complex and challenging field to be explained as preferences constantly vary. The traditional way of acquiring goods has been replaced with online selling which rapidly grows. The traditional marketing ways have been replaced by digital mediums and trends whereas the retailers and consumers meet online (Baumeister et al., 2008; Mani, 2019).

There are some suppositions that is not obviously recognized till we start the research in a real examination and it depends on the level of coordination that our customers and market owners would have with us. Furthermore, sometimes our customers family or loved ones are stricter about their health and are ready to explain their attitudes and healthy and unhealthy products for them. Although, such information and details could be stored in a block chain infrastructure to be secure, useful as well as safe enough for personal privacy. It is better to start our research with voluntary customers and markets in an individual based sample, because some family order products in various types and it is difficult to model such complex buying behavior. If customers do not want to share their desires or information about their health, maybe we need to make some demo characters which can explain their circumstance and selecting such character is easier and more attainable to have each person's information.

In a Blackbox machine there is no priority among various types of data and only final results are important. Thus, there is no boundaries to add data after steps and model could be improved by importing more data. It should be noticed that, there are different types of data based on accessibility, for example some people do not want to say if they

are in a diet and do not eat fried foods, but on the other hand if someone have food allergies, they will explain it voluntarily. Therefore, we can have such segmentation among customers, e.g., vegan, diabetics, kids, girl, man, elderly, students etc. In this study for start model we have access to data of a university which offers few types of food for each meal and students can choose one of them. In this data sample it is obvious if student selected chicken or beef for lunch in special day of year. Other details about students such as age, sex, major and even their classmates to model as a group segmentation, is available. We also can make some model examination after simulation by offering salad & French fries or fish & burger menu and test their behavior. This means part of our segmentation process is related to foods, that we can offer in menu or system can suggest in online restaurant. In this process there are some other variables such as volume of food, calories, fat, sugar and other details. This part is more accessible and we can make aware our customers about carbohydrates, vitamins, oil, fried or row cooked details of each meal. This information easily would be reported in a virtual space compare to real restaurants. When enough information published and explained clearly, everyone would be able to make the best decision for their healthy diet. It is like our behavior and decisions regard a virtual character in a game, based on information determined by system.

## References

- P. Mani. (2019). "Consumer behaviour". *Int. J. Innova. Res. Comput. Commun. Eng.* 8 4 (2019), <https://doi.org/10.35940/ijitee.L1127.10812S19>
- AMA. (2020). "Consumer Behavior". <https://www.ama.org/topics/consumer-behavior>. Accessed 15 Aug 2020
- G. Asamoah. (2021). "Factors Which Influence the Buying Behaviours of Customers with Multiple Regular Customer Cards". (2012), <https://core.ac.uk/download/pdf/38067117.pdf>. Accessed 15 Jan 2021
- M. Olmez. (2018). "How to Use AI in E-Commerce" <https://www.accenture.com/nl-en/blogs/insights/how-to-use-ai-in-e-commerce>. Accessed 15 Aug 2020
- R.F. Baumeister, E.A. Sparks, T.F. Stillman. (2008). "Free will in consumer behavior: Self-control, ego depletion, and choice". *J. Consum. Psychol.* 18, 4–13 (2008). <https://doi.org/10.1016/j.jcps.2007.10.002> CrossRefGoogle Scholar
- M.Sadiq Sohail, Mehedi Hasan. Azlin Fathima Sohail. (2020). "The Impact of Social Media Marketing on Brand Trust and Brand Loyalty: An Arab Perspective". *International Journal of Internet Marketing*, 10 (1) (2020), pp. 15-31.CrossRefView Record in Scopus.
- Chu SC, Chen HT, Gan C. (2020). "Consumers' engagement with corporate social responsibility (CSR) communication in social media: evidence from China and the United States". *J Bus Res.* 2020;110:260–71.
- Jansen BJ, Zhang M, Sobel K, Chowdury A. (2009). "Twitter power: tweets as electronic word of mouth". *J Am Soc Inf Sci Technol.* 2009;60(11):2169–88.
- Saif H, He Y, Alani H. (2012). "Semantic sentiment analysis of twitter". *International semantic web conference*. Springer, Berlin, Heidelberg; 2012. pp. 508–524.
- Praphula Kumar Jain, Ephrem Admasu Yekun, Rajendra Pamula, Gautam Srivastava. (2021). "Consumer recommendation prediction in online reviews using Cuckoo optimized machine learning models", *Computers & Electrical Engineering*, Volume 95, 2021, 107397, ISSN 0045-7906, <https://doi.org/10.1016/j.compeleceng.2021.107397>.
- Huwail J. Alantari, Imran S. Currim, Yiting Deng, Sameer Singh. (2021). "An empirical comparison of machine learning methods for text-based sentiment analysis of online consumer reviews", *International Journal of Research in Marketing*, 2021, ISSN 0167-8116, <https://doi.org/10.1016/j.ijresmar.2021.10.011>.

- Zheng Xu, Guiyan Zhu, Noura Metawa, Qingyuan Zhou. (2022). "Machine learning based customer meta-combination brand equity analysis for marketing behavior evaluation", *Information Processing & Management*, Volume 59, Issue 1, 2022, 102800, ISSN 0306-4573, <https://doi.org/10.1016/j.ipm.2021.102800>.
- Praphula Kumar Jain, Rajendra Pamula, Gautam Srivastava. (2021). "A systematic literature review on machine learning applications for consumer sentiment analysis using online reviews", *Computer Science Review*, Volume 41, 2021, 100413, ISSN 1574-0137, <https://doi.org/10.1016/j.cosrev.2021.100413>.
- K.K. Ramachandran, A. Apsara Saleth Mary, Shibani Hawladar, D. Asokk, Bandi Bhaskar, J.R. Pitroda. (2021). "Machine learning and role of artificial intelligence in optimizing work performance and employee behavior", *Materials Today: Proceedings*, 2021, ISSN 2214-7853, <https://doi.org/10.1016/j.matpr.2021.11.544>.
- Young Anna Argyris, Zuhui Wang, Yongsuk Kim, Zhaozheng Yin (2020). "The effects of visual congruence on increasing consumers' brand engagement: An empirical investigation of influencer marketing on instagram using deep-learning algorithms for automatic image classification". *Computers in Human Behavior*, 112 (2020), p. 10644.
- F. Cui, H. Hu, Y. Xie. (2021). "An intelligent optimization method of E-commerce product marketing". *Neural Computing & Applications*, 33 (2021), pp. 4097-4110. CrossRefView Record in Scopus.
- V. Sankaran. (2019). "Empowering consumer research with data science", *Amity International Conference on Artificial Intelligence (AICAI)* (Dubai, United Arab Emirates, 2019), pp. 340–344, <https://doi.org/10.1109/AICAI.2019.8701356>
- S. Gochhait, O. Mazumdar, S. Chahal. (2020). "Role of artificial intelligence (AI) in understanding the behavior pattern: a study on e-commerce", *ICDSMLA 2019. Lecture Notes in Electrical Engineering*, vol. 601, eds. A. Kumar, M. Paprzycki, V. Gunjan (Springer, Singapore, 2020), [https://doi.org/10.1007/978-981-15-1420-3\\_166](https://doi.org/10.1007/978-981-15-1420-3_166)
- A. Orogun, O. Bukola. (2019). "Predicting consumer behaviour in digital market" *a machine learning approach*. 8:8391–8402 (2019). <https://doi.org/10.15680/IJRSET.2019.0808006>
- C. Hou, C. Chen, J. Wang. (2018) "Tree-based feature transformation for purchase behavior prediction", *IEICE Transactions on Information and Systems*, vol. E101.D (5), pp 1441–1444, Released, Online ISSN 1745-1361, Print ISSN 0916-8532, (2018), <https://doi.org/10.1587/transinf.2017EDL8210>
- H. Valecha, A. Varma, I. Khare (2018). "Prediction of consumer behaviour using random forest algorithm", *5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON)* (Gorakhpur, 2018), pp. 1–6, <https://doi.org/10.1109/UPCON.2018.8597070>
- S. Goyal, K.P. Miyapuram, U. Lahiri. (2015). "Predicting consumer's behavior using eye tracking data", *2015 Second International Conference on Soft Computing and Machine Intelligence (ISCMI)* (Hong Kong, 2015), pp. 126–129, <https://doi.org/10.1109/ISCMI.2015.26>
- D. Liciotti, E. Frontoni, A. Mancini (2016). "Pervasive system for consumer behaviour analysis in retail environments, in Video Analytics". *Face and Facial Expression Recognition and Audience Measurement. VAAM 2016, FFER 2016. Lecture Notes in Computer Science*, ed. K. Nasrollahi et al. vol. 10165 (Springer, Cham, 2017), [https://doi.org/10.1007/978-3-319-56687-0\\_2](https://doi.org/10.1007/978-3-319-56687-0_2)
- Shugang Li, Xuewei Song, Hanyu Lu, Linyi Zeng, Miaoqing Shi, Fang Liu. (2020). "Friend recommendation for cross marketing in online brand community based on intelligent attention allocation link prediction algorithm" *Expert Systems with Applications*, 13 (2020)
- Bollen D, Knijnenburg BP, Willemsen MC, et al. (2010). "Understanding choice overload in recommender systems". *In: Proceedings of the fourth ACM conference on Recommender systems*. ACM; 2010. p. 63–70.
- Anderson C. (2006). "The Long Tail". *Random House Business*; 2006.
- Resnick P, Varian HR. (1997). "Recommender systems". *Commun ACM*. 1997;40(3):56–58.

- Ricci F, Rokach L, Shapira B, (2011). "Recommender Systems Handbook ". *Springer*; 2011.
- Jannach D, Zanker M, Felfernig A. (2010). " Recommender Systems: An Introduction". *Cambridge University Press*; 2010.
- Yishu Liu, Weixiong Chen. (2021). "Optimization of Brand Marketing Strategy of Intelligent Technology under the Background of Artificial Intelligence". *Mobile Information Systems*, 2021 (2021). 9507917:1-9507917:.
- Y. Yu, J. Lu, D. Shen, et al. (2021). "Research on real estate pricing methods based on data mining and machine learning". *Neural Computing & Applications*, 33 (2021). 3925–3393
- Yan Lu, Debanjan Mitra, David Musto. (2020). "Sugata Ray. Can Brands Circumvent Marketing Regulations?" *Exploiting Umbrella Branding in Financial Markets*. *Mark. Sci.*, 39 (1) (2020), pp. 71-91. CrossRefView Record in Scopus

## Factors Influencing the Student Entrepreneurship: Where Is Economic and Financial Literacy?

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### Abstract

This article deals with the analysis of factors that influence student entrepreneurship. By analyzing several new and relevant scientific studies, we gained an overview of the factors that influence student entrepreneurship. We then synthesized the findings from our analyzes to create summary conclusions. We found that the factors can be divided into six groups: personality factors, skills factors, psychological factors, sociological factors, factors related to education and factors related to external environment. The discussion section outlines the implications of the findings. In the future research section, we subsequently offer options for further work related to the economic literacy factor.

Keywords: student, entrepreneurship, financial and economic literacy, factors, determinants, review.

Article Classification: Research article

### 1 Introduction

Entrepreneurs are an integral part of the economy of every country. In general, entrepreneurship is associated with starting a business in order to make a profit. Howard Stevenson defines entrepreneurship as the pursuit of opportunities outside of controlled resources, (Seth 2021). According to the Commercial Code of the Slovak Republic, §2, paragraph 1 of Act 513/1991 Coll. z., entrepreneurship is understood as "a continuous activity carried out independently by an entrepreneur in his own name and on his own responsibility for the purpose of making a profit."

Economic growth represents one of the main macroeconomic indicators in creating the well-being of society. One of the factors that contribute to increasing

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economic growth is entrepreneurship (Carree, Thurik 2010). Even though the influence of entrepreneurship on the economic growth of a country is undeniable, many other factors must also be taken into account, such as the economic level of the country, regional differences, social conditions and others.

Not only the impact of business on the economic well-being of the country, but especially the impact of business education, which affects business and consequently innovation and economic growth, are the subject of this paper. In the following text, the authors in selected studies deal with how business education affects the economic performance of companies, and therefore the overall economic growth of the country. In their study, Suparno, Saptono (2018) draw attention to the importance of financial literacy for entrepreneurs, whether it is budget management, credit management or financial risks. In the results of the study, the authors state the direct and positive impact of business education on financial literacy and, subsequently, the direct impact of financial literacy on business skills.

Financial literacy is defined as the ability to use knowledge, skills and knowledge to effectively manage financial resources from the point of view of an entrepreneur and consumer, to understand various financial operations and use them in personal and professional life.

Ali Norrish writes in his blog about a broader concept, namely economic literacy, which talks about connections. Here he quotes economist and bank president Gary Stern: "Economic literacy is key because it is a measure of whether people understand the forces that significantly affect the quality of their lives."

## **2 Literature review**

The following chapter provides an overview of studies that deal with factors that influence student entrepreneurship or the inclination to it.

In their article, Zhang et al. (2014) paid attention to the influence of various factors on entrepreneurial intention. A sample of 494 students from ten universities showed a significantly positive effect of business education on this variable. The authors were based on Ajzen's theory of planned behavior and Shaper's model of business events.

Attention was also paid to Ajzen's theory in the publication by Jansen et al. (2015). They propose a model for effective support of entrepreneurship among students. The model contains fifteen offers for education and support in the field of entrepreneurship. This model is evaluated at three different universities. The authors identify specific factors that make offerings successful for students and startups.

Gielnik et al. (2015) drew attention in their study to action regulatory mechanisms and their important role in entrepreneurship and entrepreneurial education. Based on the theory of action regulation, they managed to create action-based business training.

A study by Wu et al. (2019) focuses on tracking and evaluating students' experiences using CRS (Classroom Response Systems) technology. Mobile devices play an important role in the business course. The results of the study show that for most students, the CRS tools effectively improved their conceptual understanding and knowledge creation. These tools also supported their participation in group and discussions and helped them to increase their motivation and attention to learning.

The paper published by Bellotti et al. (2013) presents experiences with a short gamified course to support entrepreneurship. The students' experience with the course was positive. It was able to meet the objectives regarding engagement, learning and promoting interest in entrepreneurship.

The authors Voda and Florea (2019) discuss the importance of entrepreneurship for society, examine personality factors and their influence on the decision to become an entrepreneur, and also discuss the importance of business education. The target group of their research was 270 students from two Romanian universities. The observed variable was the entrepreneurial intention in the context of the influence of several selected variables, such as the need for success, entrepreneurial education, or sex.

Ferández-Pérez et al. (2017) rely on the extended model of Ajzen's theory of planned behavior. In their contribution, they focus on the analytical thinking of emotional competences and their influence on the formation of business intentions. 751 Spanish university students participated in the study. Through the structural equation model and analysis of differences, the authors managed to show the positive influence of emotional competences on students' entrepreneurial intention.

The entrepreneurial intention of Serbian tourism and hotel management students was the subject of research by the authors Dragin et al. (2022). The authors pay special attention to the influence of the sociodemographic characteristics of students and their parents on the entrepreneurial intention. Their main findings show that entrepreneurial intention is higher among men and among students whose parents are entrepreneurs or whose fathers are retired. Their conclusions indicate equally significant differences in the business intentions of respondents depending on their place of residence, age, year of study, work experience, employment status of parents, as well as other factors.

Demirer et al. (2010) investigated the association between the universal human values of undergraduate students (success, benevolence, conformity, hedonism, power, self-management, security, stimulation, tradition, universalism) and their entrepreneurial traits.

In their study, Castano et al. (2015) analyze three groups of factors influencing entrepreneurship and the perception of opportunities by entrepreneurs: social, cultural, and economic variables. The subject of the study are two groups of countries, namely European countries and the second group consists of Latin American and Caribbean countries. Their results show that economic, social, and cultural factors influence entrepreneurship, while they correlate differently depending on the group of countries studied. Countries with high values of the degree of economic freedom and (enforceability of law) the rule of law stimulate entrepreneurial activity among people.

Dhong and Zhang (2021) are devoted to the identification of factors influencing the entrepreneurial ability of students in higher vocational education. This paper works with existing research. It uses in-depth interviews with students at higher vocational schools who have already started a business. The authors created a targeted model of influencing factors of entrepreneurial abilities. They show that four factors, including entrepreneurial drive, managerial ability, potential exploitation ability, and entrepreneurial equipment, have a significant positive effect on entrepreneurial ability.

In their study, Li and Islam (2021) investigate the impact of entrepreneurship education and government policies on the entrepreneurial intention of students who receive higher vocational education. Their empirically based model tests the effects of perceived entrepreneurial education and perceived entrepreneurial policy on entrepreneurial self-efficacy and entrepreneurial intention.

Entrepreneurial intention is also the subject of research by Wu and Tian (2022). Their goal is to examine the main factors that influence entrepreneurial intention. The results showed that the variables such as entrepreneurial attitude, subjective norms, entrepreneurial self-efficacy, emotional competence among selected Chinese students significantly influence entrepreneurial intention.

In their study, Moralista and Delariarte (2014) analyze the entrepreneurial self-efficacy and entrepreneurial intention of senior national high school students in the municipality of Calinog, Iloilo.

The aim of the contribution of the collective of authors Belás et al. (2017) is to analyze the propensity of university students towards entrepreneurship resulting from state support for entrepreneurship and the quality of higher education. The authors compare this effect on samples of Slovak and Czech students. Z-scores and regression modeling were used to verify scientific hypotheses. Differences were found in both groups. Czech university students rate state support for entrepreneurship and the quality of the educational system more positively, yet they show a statistically significantly lower propensity for entrepreneurship.

Baubonienė et al. (2018) pay attention to factors that influence students' intentions to start their own business at Dongseo University (South Korea) and at Mykolas Romeris University (Lithuania). In the context of countries with different cultures, their research identifies what knowledge, competences or practical skills should be acquired at universities.

Students' interest in entrepreneurship is the subject of research by the authors Ayuni and Sari (2018). By means of factor analysis, they examine the influence of selected factors on the interest in entrepreneurship of the students of the state polytechnic from Bali. They identify some of them, namely: contextual factor (including entrepreneurial training, academic support, perceived self-confidence and economic challenge), self-efficacy factor (including leadership, mental maturity, relationship with entrepreneur and family role) and attitudinal factor (including self-actualization).

Through confirmatory factor analysis, the authors Rapa and Chomeya (2021) identified six components in undergraduate students, namely: internal locus of control, need for success, risk-taking, innovativeness, proactivity and autonomy.

The research of Cano and Tabares (2017) identifies that the personal motivations of university students that influence the choice of entrepreneurship in Colombia are related to the fulfillment of a dream, the ability to make decisions, use their creative needs and create something. Therefore, according to them, entrepreneurship represents a lifestyle and gives them independence in decision-making. They can also use their talent and skills to create new products and services.

The paper by Yang et al. (2018) deals with the research of factors influencing the entrepreneurial intention of university students. Data obtained from a questionnaire survey of Chinese students of economics and management are the basis for the structural model. Here, the authors pay attention to the influence of personality traits, social networks, and the business environment on entrepreneurial intention.

Another researched perspective on academic entrepreneurship is the examination of relevant institutional factors. The findings of Yadolahi et al. (2014) revealed that such factors can include the rules, structure and governance of the university, entrepreneurship training programs, business relationships between the university and industry, intellectual property laws as well as the educational and research structure of the university. From the informal institutional factors, the authors select the method of enforcement of rules, political considerations and, for example, the attitudes of academics towards business. In their contribution, they used the means of factor analysis.

Kim and Kwon (2015) from South Korea deal with undoubtedly interesting problems of entrepreneurship in the field of technology. Their study examines the effects of the business environment of domestic institutions, but especially the behavior of individual scientists working here from the point of view of business intent.



Xi and He (2020) deal with factors affecting entrepreneurship and entrepreneurial activities of Chinese students, respectively, graduates in the selected province. The subject of interest is the analysis of the perception of the business support policy by university students. Based on their conclusions about low effects, they propose measures, for example, in the field of optimizing the support system and improving financial policy.

Zamrudi and Yulianti (2020) analyze the external and internal factors of students' entrepreneurial intentions in Indonesia. The research was carried out in the context of the interests of the developing country in the creation of small businesses in the pursuit of economic independence. One of the identified problems is the passive attitude of women towards their own business in developing countries, which is based on the fact that a woman relies on a man, who is often considered the head of the family in a developing country, and the responsibility for meeting the family's needs is therefore on him. They also talk about the need to improve cooperation with educational institutions and local entrepreneurs.

Undoubtedly, relationships are a new element in the research of factors affecting students' entrepreneurship and their motivations for it. The authors of Xiao et al. (2019) follow up on previous research, here they pay attention to the influence of university students' peer relationships. This study argues that college students' education, social capital, prior experience, and peer relationships are positively correlated with entrepreneurial intention. They highlight the role of information sharing among close friends and its impact on young people's entrepreneurship.

In their work, Wu and Ye (2022) analyze the internal and external factors affecting the entrepreneurial intention of university students, emphasizing the need to cultivate talents as a source of innovation. Based on their research studies, the authors selected 16 main factors, and determined their weight. Their results pointed to a greater weight of internal than external factors. Based on consideration of the current situation, they present countermeasures and proposals to improve the willingness of university students to innovate and do business.

In his study, Yin (2022) deals with the internal mechanism of the relationship between work pressure and entrepreneurial motivation of Chinese university students. Several interesting conclusions emerged from the evaluation of the questionnaires that were sent to 1,187 university students from 14 colleges and universities across the country. For example, the study confirmed the mediating role of entrepreneurial values in the relationship between job pressure and entrepreneurial motivation. Likewise, if the entrepreneurial environment is encouraging, entrepreneurial pressure can significantly improve the necessity of entrepreneurship and the entrepreneurial opportunity of university students.

### 3 Discussion

#### 3.1 Summary of main findings

Through the analysis of scientific studies, we found that the inclination to student entrepreneurship depends on many factors. The main findings, which we distilled from our analyzes, are as follows:

- ***The intention to start a business is influenced by a large number of psychological factors*** of the student, such as emotional competence (Ferández-Perez et al., 2017), success, benevolence, conformity, hedonism, power, control,

security, stimulation, tradition, universalism (Demirer et al., 2010), attitude to business (Wu and Tian, 2022), subjective norms (Wu and Tian, 2022), entrepreneurial self-efficacy (Wu and Tian, 2022; Moralista and Delariarte, 2014), perceived self-confidence, mental maturity, attitude, self-realization (Ayuni and Sari, 2008), personal motivations (Cano and Tabares, 2017), need for success (Voda and Florea, 2019), women's attitude (Zamrudi and Yulanti, 2020)

- An individual's ***skills have an impact on student entrepreneurship***. These skills and knowledge include, for example, analytical thinking (Ferández-Perez, 2019), work experience (Dragin et al., 2022), emotional competence (Wu and Tian, 2022) or experience (Xiao et al., 2019).
- ***Student entrepreneurship*** also depends ***on personality factors***, which are often unchangeable. Examples of the mentioned factors are, for example, gender (Voda and Florea, 2019), age (Dragin et al., 2022), year of study (Dragin et al., 2022) or personality traits (Yang et al., 2018).
- ***The student's society and social relations also shape students' inclination towards entrepreneurship*** (Castano et al., 2015). Examples of such sociological factors that we have identified are, for example: parents, place of residence (Dragin et al., 2022), culture (Castano et al., 2015), role in the family (Ayuni and Sari, 2008), relationship with an entrepreneur (Ayuni and Sari, 2008), social networks (Yang et al., 2018), social capital or peer relationships with classmates (Xiao et al., 2019)
- ***A very strong influencing factor that influences student entrepreneurship is also education***. Within the framework of education, this includes, for example, explicit support of entrepreneurship such as entrepreneurship education (Zhang et al., 2014; Voda and Florea, 2019; Li and Islam, 2021; Ayuni and Sari, 2008).
- ***It is possible to influence students' inclination towards entrepreneurship implicitly through education***, e.g. through action regulatory mechanisms in education (Gielnik et al., 2015)
- ***To support student entrepreneurship, it is also possible to use modern ICT tools in education***, such as mobile devices in teaching (Wu et al., 2019) or gamification of courses (Bellotti et al., 2013)
- In addition to education, ***other external factors also affect business, or business intention of students***. These include business facilities (Dhong and Zhang, 2021), government policies (Li and Islam, 2021), governmental business support (Belás et al., 2017), academic support (Ayuni and Sari, 2008), university structure (Yadolahi et al., 2014), perception of business support policy (Xi and He, 2020), job pressure (Wu and Ye, 2022) or business environment (Wu and Ye, 2022)

We then divided all the factors that we distilled from the mentioned studies into groups according to similarity. Based on the review, the determinants affecting student entrepreneurship can be divided into six categories, which are listed in Table 1.

Table 1 Identified groups of factors influencing

Group of factors	Source
personality	Voda and Florea (2019), Dragin et al. (2022), Yang et al. (2018)
psychological	Ferández-Pérez et al. (2017), Demirer et al. (2010), Wu and Tian (2022), Zamrudi and Yulianti (2020)
skills	Ferández-Pérez et al. (2017), Dragin et al. (2022), Wu and Tian (2022), Xiao et al. (2019), Moralista and Delariarte (2014), Ayuni and Sari (2018), Cano and Tabares (2017), Voda and Florea (2019)
social	Dragin et al. (2022), Castano et al. (2015), Ayuni and Sari (2018), Yang et al. (2018), Xiao et al. (2019)
education	Zhang et al. (2014), Jansen et al. (2015), Gielnik et al. (2015), Wu et al. (2019), Bellotti et al. (2013), Voda and Florea (2019), Li and Islam (2021), Ayuni and Sari (2018), Xiao et al. (2019)
External environment	Castano et al. (2015), Dhong and Zhang (2021), Li and Islam (2021), Belás et al. (2017), Ayuni and Sari (2018), Yang et al. (2018), Yadolahi et al. (2014), Xi and He (2020), Wu and Ye (2022)

### 3.2 Implications and future research

Based on the review, it can be concluded that a number of factors influence student entrepreneurship. It is obvious that some of the mentioned factors cannot be influenced (personal, psychological), some can only be influenced with great difficulty (e.g. sociological factors). But it turns out that there are groups of factors that can be influenced and thereby improve student entrepreneurship (both quality and quantity). Of the groups of factors identified above, skills, environment, and education appear to be such.

Many of the factors in these groups can be influenced by a systematized educational process. One way is to add explicit business-related courses. However, the support of student entrepreneurship is also possible through implicit interventions in the educational process. In this case, we mean, for example, the systematized linking of education with the work sector (also at universities), courses to develop emotional competence, or courses focused on logical and analytical thinking. Moreover, it would be appropriate to start with these suggestions at high school. This would indirectly increase the experience factor and thus encourage student entrepreneurship even more.

By changing the environment, it would also be possible to improve the attitude towards entrepreneurship and thus support entrepreneurship. In this case, it is support from the government (such as improving economic freedom, reducing the bureaucratic burden, government policies to support business, intellectual property laws). However, as it was found, the environment that influences student entrepreneurship can be partially influenced at the university as well. Universities should thus provide more academic support for starting a business or mentoring from experienced entrepreneurs.

As mentioned in the introduction, entrepreneurship has several positive effects on society and the economy. In addition, the findings of the Chinese authors Zhang and Wang (2022) are also very interesting. In their article, they investigated the impact of innovation and entrepreneurship on the modern art teaching model. In their model, they evaluated six dimensions of creativity, initiative, interest, ideas, independence and concentration of art university students. Their results showed that the spirit of innovation

and entrepreneurship plays a significant role in improving the current model of art education in these areas.

An interesting finding from the performed analysis is the fact that we identified no study that would demonstrate the explicit impact of financial or economic literacy on student entrepreneurship. Certainly, financial and economic literacy is closely related to education as such. However, we think that higher economic literacy could contribute to an increased level of student entrepreneurship. However, this is only a hypothesis. Therefore, in the future, it would be appropriate if this hypothesis were verified. The above could be solved by means of structural equation modeling, when we would indirectly, through a latent factor, find out whether our variable economic literacy affects the variable student entrepreneurship. The first step would be to define the latent factor economic literacy, which we would verify through confirmatory factor analysis.

An interesting finding is also an insight from the study by Castano et al. (2015). In their study, the authors analyzed three groups of factors influencing entrepreneurship and the perception of opportunities by entrepreneurs: social, cultural and economic variables. Two groups of countries were the subject of research, namely European countries and the second group consists of Latin American and Caribbean countries. Their results showed that economic, social and cultural factors influence entrepreneurship, while they correlate differently depending on the group of countries studied. Culture as a factor influencing entrepreneurship is an interesting finding. In the future, it would therefore be appropriate to analyze the culture of countries where there is a high rate of student entrepreneurship, to find out why this is so, and in this way to support student entrepreneurship in other countries as well.

#### **4 Conclusion**

Many studies deal with the issue of entrepreneurship, but especially student entrepreneurship, with undoubtedly interesting results. We tried to research this knowledge, summarize it and also set other goals. In addition to other variables affecting the willingness to take risks and start a business, in our view it is possible to influence entrepreneurial education in individual countries, where the rate of application is different. At many secondary schools and universities, subjects are created directly with the aim of positively influencing students' willingness to do business, elsewhere selected facts are incorporated into existing curricula. We believe that improving the quality of education in this area, new procedures, and the use of modern technologies will bring a positive effect in the future not only for the students themselves, but especially as a result of business, affecting the work, social and economic spheres, and therefore the well-being of the respective country.

Based on the analysis of relevant sources, dealing with the issue of student entrepreneurship, entrepreneurial intention, but especially the factors that influence them, we came to several interesting conclusions in our article. We identified the key factors affecting student entrepreneurship and, based on the summarization of our knowledge, we created 6 groups from them. They are personal, psychological, skills, sociological, educational and environmental factors.

Student entrepreneurship and entrepreneurship in general are influenced by many factors, more or less influenceable. The impact of student entrepreneurship on entrepreneurship in general, as well as the positive impact of entrepreneurship on the economic growth of a given country in connection with education, are the subject of this article.

In the following research, we would like to focus our attention on a deeper investigation of financial and economic literacy in relation to student education and also to student entrepreneurship. We start from our hypothesis of the direct influence of economic literacy on student entrepreneurship, from the studied literature and our own experience from teaching economic subjects at our faculty.

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## References

- Ayuni, N. W. D., & Sari, I. G. A. M. K. K. (2018), "Analysis of factors that influencing the interest of Bali State Polytechnic's students in entrepreneurship." *Journal of Physics: Conference Series*, 953, 012071. <https://doi.org/10.1088/1742-6596/953/1/012071>
- Baubonienė, Ž., Hahn, K. H., Puksas, A., & Malinauskienė, E. (2018), "Factors influencing student entrepreneurship intentions: the case of Lithuanian and South Korean universities." *Entrepreneurship and Sustainability Issues*, 6(2), 854–871. [https://doi.org/10.9770/jesi.2018.6.2\(26\)](https://doi.org/10.9770/jesi.2018.6.2(26))
- Belás, J., Dvorský, J., Tyll, L. and Zvaríková, K. (2017), "Entrepreneurship of University Students: Important Factors and the Propensity for Entrepreneurship," *REVISTA ADMINISTRATIE SI MANAGEMENT PUBLIC*, Faculty of Administration and Public Management, Academy of Economic Studies, Bucharest, Romania, vol. 2017(28), pages 6-25, June
- Bellotti, F., Berta, R., De Gloria, A., Lavagnino, E., Antonaci, A., Dagnino, F. M., & Ott, M. (2013), "A Gamified Short Course for Promoting Entrepreneurship among ICT Engineering Students." 2013 IEEE 13th International Conference on Advanced Learning Technologies. <https://doi.org/10.1109/icalt.2013.14>
- Cano, J. A., & Tabares, A. (2017), "Determinants of university students' entrepreneurial intention: GUESSS Colombia study." *Espacios*, 38(45), 22
- Carree, M., Thurik, R. (2010), "The Impact of Entrepreneurship on Economic Growth." doi:10.1007/978-1-4419-1191-9\_20
- Castaño, M. S., Méndez, M. T., & Galindo, M. Á. (2015), "The effect of social, cultural, and economic factors on entrepreneurship." *Journal of business research*, 68(7), 1496-1500.
- Demirer, H., Okulu, Y., Memis, H. (2010), "The Relationship Between Entrepreneurial Traits and Universal Human Values: An Application on University Students," *Journal of Academic Researches and Studies*, Vol. 2(3), 65 – 77
- Dong, Y., & Zhang, W. (2021, January), "Identification of Influencing Factors of Students' Entrepreneurship Ability in Higher Vocational Colleges." In *2021 10th International Conference on Educational and Information Technology (ICEIT)* (pp. 200-203). IEEE
- Dragin, A. S., Mijatov, M. B., Muntlak Ivanović, O., Jovičić Vuković, A., Ivkov Džigurski, A., Košić, K., Nedeljković Knežević, M., Tomić, S., Stankov, U., Vujičić, M. D., Stojanović, V., Ivanović Bibić, L., Đerčan, B., & Stoilković, A. (2022), "Entrepreneurial Intention of Students (Managers in Training): Personal and Family Characteristics." *Sustainability*, 14(12), 7345. <https://doi.org/10.3390/su14127345>
- Fernández-Pérez, V., Montes-Merino, A., Rodríguez-Ariza, L., & Galicia, P. E. A. (2017), "Emotional competencies and cognitive antecedents in shaping student's entrepreneurial intention: the moderating role of entrepreneurship education."

- International Entrepreneurship and Management Journal*, 15(1), 281–305. <https://doi.org/10.1007/s11365-017-0438-7>
- Gielnik, M. M., Frese, M., Kahara-Kawuki, A., Wasswa Katono, I., Kyejjusa, S., Ngoma, M., Munene, J., Namatovu-Dawa, R., Nansubuga, F., Orobia, L., Oyugi, J., Sejjaaka, S., Sserwanga, A., Walter, T., Bischoff, K. M., & Dlugosch, T. J. (2015), “Action and Action-Regulation in Entrepreneurship: Evaluating a Student Training for Promoting Entrepreneurship.” *Academy of Management Learning and Education*, 14(1), 69–94. <https://doi.org/10.5465/amle.2012.0107>
- Jansen, S., van de Zande, T., Brinkkemper, S., Stam, E., & Varma, V. (2015), “How education, stimulation, and incubation encourage student entrepreneurship: Observations from MIT,” IIT, and Utrecht University. *The International Journal of Management Education*, 13(2), 170–181. <https://doi.org/10.1016/j.ijme.2015.03.001>
- Kim, J., & Kwon, Y. (2015, August), “An empirical study on the factors affecting academic technology entrepreneurship in South Korea.” In *2015 Portland International Conference on Management of Engineering and Technology (PICMET)* (pp. 992-1001). IEEE
- Li, Z., & Islam, A. A. (2021), “Entrepreneurial Intention in Higher Vocational Education: An Empirically-Based Model With Implications for the Entrepreneurial Community.” *SAGE Open*, 11(4), 21582440211059179
- Moralista, R. B., & Delariarte, G. C. (2014), “Entrepreneurship as a career choice: an analysis of entrepreneurial self-efficacy and intention of national High School senior students at the municipality of Calinog, Iloilo.” *Asia Pacific Journal of Education, Arts and Sciences*, 1(2), 12-15
- Norish, A. (2017), “What is ‘economic literacy’?” <https://blog.ecnmy.org/what-is-economic-literacy-577e05c378b6>
- Rapa, P., Chomeya, R. (2021), “Confirmatory Factor Analysis of Entrepreneurship for Undergraduate Students,” *Review of International Geographic Education*, Vol. 11(8), 1859 – 1865
- Seth, S. (2021), “How Entrepreneurship Affects the Economy. It promotes economic growth, even if positive effects are sometimes overhyped,” <https://www.investopedia.com/articles/personal-finance/101414/why-entrepreneurs-are-important-economy.asp#citation-26>
- Suparno, Saptoro, A. (2018), “Entrepreneurship Education and Its Influence on Financial Literacy and Entrepreneurship Skills in College.” *Journal of Entrepreneurship Education*. <https://www.abacademies.org/articles/entrepreneurship-education-and-its-influence-on-financial-literacy-and-entrepreneurship-skills-in-college-7455.html>
- Vodá, A., & Florea, N. (2019), “Impact of Personality Traits and Entrepreneurship Education on Entrepreneurial Intentions of Business and Engineering Students.” *Sustainability*, 11(4), 1192. <https://doi.org/10.3390/su11041192>
- Wu, B., & Ye, S. (2022), “The Influencing Factors of Innovation and Entrepreneurship Intention of College Students Based on AHP.” *Mathematical Problems in Engineering*, 2022
- Wu, X., & Tian, Y. (2021), “Predictors of Entrepreneurship Intention Among Students in Vocational Colleges: A Structural Equation Modeling Approach.” *Frontiers in Psychology*, 12, 797790-797790
- Wu, Y. C. J., Wu, T., & Li, Y. (2019), “Impact of using classroom response systems on students' entrepreneurship learning experience.” *Computers in Human Behavior*, 92, 634-645
- Xi, W., & He, L. (2020), “Research on influencing factors and effect of entrepreneurship policy of Chinese college students--Empirical analysis based on S province.” In *E3S Web of Conferences* (Vol. 214, p. 03011). EDP Sciences
- Xi, W., & He, L. (2020), “Research on influencing factors and effect of entrepreneurship policy of Chinese college students--Empirical analysis based on S province.” In *E3S Web of Conferences* (Vol. 214, p. 03011). EDP Sciences
- Xiao, Z., Huang, X., and Huang, X. (2019), "Research on the influencing factors in college students' entrepreneurship and innovation intention-base on the information exchange"

- (2019). *ICEB 2019 Proceedings (Newcastle Upon Tyne, UK)*. 39. <https://aisel.aisnet.org/iceb2019/39>
- Yadolahi, F., J., Modarresi, M., Motavaseli, M., & Salamzadeh, A. (2014), Institutional factors affecting academic entrepreneurship: The case of university of Tehran." *Economic Analysis*, 47(1-2), 139-159
- Yang, J., Jin, X., & Zhou, L. (2018), "Research on Factors Influencing University Students' Entrepreneurial Intention and Model of Entrepreneurship Education." *2018 9th International Conference on Information Technology in Medicine and Education (ITME)*, 567-571
- Yin, L. (2022), "From Employment Pressure to Entrepreneurial Motivation: An Empirical Analysis of College Students in 14 Universities in China." *Frontiers in Psychology*, 13
- Zamrudi, Z., & Yulianti, F. (2020), "Sculpting factors of entrepreneurship among university students in Indonesia." *Entrepreneurial Business and Economics Review*, 8(1), 33-49
- Zhang, X., & Wang, L. (2022), "The influence of entrepreneur's innovation and entrepreneurship on modern art teaching model." *Frontiers in Psychology*, 13
- Zhang, Y., Duysters, G., & Cloudt, M. (2014), "The role of entrepreneurship education as a predictor of university students' entrepreneurial intention." *International entrepreneurship and management journal*, 10(3), 623-641
- Bhattacharya, A., Sarkar, B., and Mukherjee, S. K. (2005), "Integrating AHP with QFD for robot selection under requirement perspective." *International Journal of Production Research*, Vol. 43 No. 17, pp. 3671-3685. doi:10.1080/00207540500137217
- Calabrese, F.A. (2005), "The early pathways: theory to practice – a continuum", in Stankosky, M. (Ed.), *Creating the Discipline of Knowledge Management*, Elsevier, New York, NY, pp. 15-20. doi: 10.1016/b978-0-7506-7878-0.50006-5
- Castle, B. (2005), "Introduction to web services for remote portlets", available at: <http://www-128.ibm.com/developerworks/library/ws-wsrp/> (accessed 12 November 2007)
- Jakkilinki, R., Georgievski, M. and Sharda, N. (2007), "Connecting destinations with an ontology-based e-tourism planner", in *Information and communication technologies in tourism 2007 proceedings of the international conference in Ljubljana, Slovenia, 2007*, Springer-Verlag, Vienna, pp. 12-32. doi: 10.1007/978-3-211-69566-1\_3.





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