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Digitalization and human capital

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ABSTRACT

Purpose – Industry 4.0 is changing the way the world works (the way we communicate, shop, entertain, learn, work and so on). Digitalization, one of the pillars of Industry 4.0, also has an impact on human capital and the labour market. On the one hand, some jobs are being lost and, on the other hand, new jobs arise. Businesses will need highly qualified staff to remain competitive in the market. The purpose of this article is to point out the differences in the perception of the elements of Industry 4.0 and their effects on human capital in different countries.
Aim – The article aims to identify, analyse, and compare the results of various research studies that have been carried out abroad in the last five years.
Methodology – The article methodology consists of content analysis, comparison, and synthesis of eight research studies from different countries in the world.
Findings – The most significant findings are the different readiness of countries for Industry 4.0 (digitalization) and the need to increase the qualification of employees through education (focus on digital knowledge).
Limitations of study – This article consists of content analysis and can be a theoretical basis for a specific survey, e. g. in determining the readiness of companies for digitization in Slovakia.
Practical implications – Businesses should start investing in human capital through training as soon as possible. It will prevent potential problems when implementing digitalization into business processes.
Originality/value – The originality of the article lies in a detailed content analysis of research studies comparing the readiness of Eastern and Western countries for digitization in the last five years.

KEY WORDS

digitalization, human capital, industry 4.0, skills, abilities

JEL Code: E24, J24, M12

1 INTRODUCTION

The issue that the article deals with is very voluminous. The topic of this article consists of two parts - Industry 4.0 and human capital (human capital management). Industry 4.0 represents the fourth industrial revolution in a row, combining modern technology with human capital (employees, managers, students, teachers, etc.). On the other hand, there is human capital which includes all the knowledge, knowledge, skills, competencies, abilities with which a person is born, but also those that a person acquires during his life, e. g. by learning, interacting with other people or getting a job.

The reason for creating this article is mainly the fact that digital technologies are increasingly becoming part of people's lives - in personal and professional life. The interconnection of modern technologies with human capital has also been shown in COVID-19 when employees started working from home (as far as the nature of their work allows). At this time, companies also had to adapt to the situation. They also used digital technologies directly to recruit new employees - instead of a personal interview they switched to digital recruitment through various online platforms (MS Teams, Zoom, Google Meets, etc.).

For this reason, the article aims to identify, analyse, and compare the results of various research studies that have been carried out abroad in the last five years.

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2 THEORETICAL REVIEW – DIGITALIZATION AND HUMAN CAPITAL

The Fourth Industrial Revolution (Industry 4.0) is a German initiative based on digitalization and focused on the emergence of new intelligent factories. In these factories, individual machines and devices use three elements, namely cyber-physical systems (CPS), Internet of Things (IoT) and cloud computing (Zhong et al., 2017; Lee et al., 2015; Lasi et al., 2014; Sima et al., 2020; Pilichowska, 2021).

The authors look at the term „Industry 4.0"differently. The authors claim that the Fourth Industrial Revolution is based on the concept of an intelligent factory. Such factories provide a completely new, hitherto unknown, approach to production (Crnjac et al., 2017, s. 21). This revolution is characterized by three factors, namely the rapid exponential pace of development, the emergence of unprecedented paradigms in the economy, business, society and finally the internal transformation of all systems (Schwab, 2016, s. 12).

Other authors point out that this type of industrial revolution will change the way people live, work, and communicate very much. According to him, there is a gradual relocation of individual areas of people´s lives from the current (physical) to the digital environment. It is important to note that human no longer has full power and control over this environment because it is controlled by various algorithmic rules (Polačko, 2020, pp. 107-130; Mařík et al., 2016, pp. 262; Gilchrist, 2016, pp. 259; Zakharov et al., 2020, pp. 457-462; Neumann et al., 2021).

Another team of authors argues that Industry 4.0 used the maximum of IS/ICT to develop various production technologies (Sima et al., 2020; Kagermann et al., 2013, pp. 20-26; Wang et al., 2016). Author Neumann and his team consider Industry 4.0 as another form of digitalization and integration of information and communication technologies (ICT) (Neumann et al., 2021).

Industry 4.0 is based on several pillars such as IoT (Internet of Things), additive manufacturing or Big Data analysis (Jamwal et al., 2021). According to the author Erboz, the main elements of Industry 4.0 include Big Data analysis, autonomous robots, simulations, horizontal and vertical system integrations, the Internet of Things, 3D printing, additive manufacturing, cloud systems, augmented reality and cyber data protection (Erboz, 2017, s. 761-767; Machado et al., 2020, s. 1462-1484; Vaidya et al., 2018, s. 233-238; Oztemel & Gursev, 2020, s. 127-182). Another author also added sensors and related technologies and cybernetics with artificial intelligence (Záležáková, 2018). Another element of Industry 4.0, Business Intelligence, is cohered to Big Data analysis and cloud systems (Ustundag & Cevikcan, 2018, s. 20).

Erboz (2017) and Demir with his team (2019) have also identified elements associated with Industry 4.0, such as the Internet of Things, artificial intelligence, digitalization, vertical and horizontal integrations, augmented and virtual reality, or 3D printing or robotics (Erboz, 2017; Demir et al., 2019).

Other authors associate Industry 4.0 with Society 5.0 and claim that they have the same foundation (human) and use the same elements, such as Big Data, artificial intelligence, the Internet of Things, and the cloud (Sima et al., 2020).

Digitalization is considered an element of Industry 4.0, but the question is what impact this element is expected on the role and position of human capital in the future.

Human capital is considered to be innate and acquired skills, knowledge, abilities owned by an individual. Human capital is now becoming a central source of development for businesses and the economy as a whole. At the time of the digitalization of the economy, it is considered one of the tools of competition policy. However, it is not a physical asset but an intangible capital of employees (Kichigin & Gonin, 2020; Balashova & Gromova, 2017).

The authors Kichigin and Gonin argue that human capital is the basis in today´s world that develops the competitiveness of companies and allows them to gain certain competitive advantages (Kichigin & Gonin, 2020).

Digitalization requires highly qualified staff with the necessary IS/ICT and digital knowledge and skills. Only in this case will it bring added value for the company but also for the national economy itself (Polat & Erkollar, 2020). The nature of the work will also change normal routine activities will be performed by machines and equipment (modern IS/ICT) for this reason, employees will have to complement their education or retrain (Agolla, 2018; Pereira et al., 2020).

Digital skills are the most relevant group of people´s abilities, skills, and knowledge concerning Industry 4.0. Thanks to them, employees can use digital technologies (IS/ICT) so that they understand them. Working with computers and other IS/ICT (data retrieval, processing, storage, and presentation) is more simple than before (Flores et al., 2020). If one wants to develop one´s skills, one should focus on the five areas that the author Flores and his team have defined. These include information and data literacy, communication and collaboration, digital content creation, security, problem-solving (Flores, et al., 2020).

Digitalization then inevitably changes the demands on the quality and structure of human capital components (skills, abilities, knowledge) in the future, so the ambition of the authors is to find out what research studies have been carried out in this area and what their results are.

3 METHODOLOGY

The article aims to identify, analyse, and compare the results of various research studies that have been carried out abroad in the last five years. Scientific methods of content analysis, comparison, and synthesis were used in this article for achieving the aim. Studies from different countries were selected to compare the impact of digitalization on human capital in various regions.

The research studies were selected based on keywords. When we entered the keywords "digitalization, human capital" into the renowned Web of Science database together with the year limit (2016-2021), 174 articles were displayed, of which only 76 had access to "open access". Russia (82), Romania (14), Ukraine (13), Germany (11) and Poland (10) have articles with these keywords. Due to the broadening of the view on the researched issue, studies from other countries in Asia and Europe (Hungary, Kosovo, Republic of Mauritius, Indonesia) were also included in the article. The results of the surveys are in the studies of this article.

Because after analysing the scientific literature, we found that the authors have different views on the issue. It can also be caused by their country of origin. However, we concluded that companies should be familiar with the term "Industry 4.0", we wanted to find out more about how they perceive it concerning human capital and the labour market in individual countries in the world without further geographical limitation. It is assumed that there is a difference in the implementation of digitalization into business processes in terms of the size of the company, the type of company or the industry in which it operates.

4 RESULTS

In this article, we identify and analyse several research studies, the authors of which conducted surveys aimed at examining the impact of digitalization as one of the elements of Industry 4.0 on the position of human capital in various countries and companies. Studies from different countries have been selected for the article to compare digitalization on human capital in varied regions over the last five years.

The analysed studies are arranged chronologically from oldest to recent to observe how the authors' views on the expectations and readiness of people and companies concerning the impact of digitalization and other elements of Industry 4.0 on human capital gradually change over time.

4.1 RESEARCH STUDY 1 – INDUSTRY 4.0: BUILDING A DIGITAL COMPANY

The analysed study (PwC, 2016) points to the benefits that companies derive from the introduction of digitalization, mainly horizontal and vertical (internal processes) chains or digital products. The importance of preparing companies for digitalisation is also supported by the fact that a company´s digital revenues can increase by 2.9 % per year. Thanks to modern and digital technologies, the company can shorten its delivery times, raise the quality of its products and services and, finally, save money (cost savings).

The study was conducted based on a survey (questionnaire) in 26 countries (USA, Canada, Mexico, Brazil, Portugal, Spain, France, Great Britain, the Netherlands, Italy, Switzerland, Germany, Denmark, Sweden, Finland, Austria, Poland, South Africa, Middle East, India, China, Japan, Singapore, Australia). Of these countries, more than ten 2,000 respondents (enterprises) in nine dominant industries (industrial production; construction; chemical industry; electrical engineering; transport and logistics; automotive industry; metallurgy; other industries; wood and paper industry; aviation, aerospace, defence, and security).

The survey revealed that in 2016 only 33 % of respondents were ready to digitize processes. Interestingly, four years later, their number was to increase to 70 %. Companies from different industries are planning to invest up to $ 907 billion a year in their operations (each company up to 5 % of its annual revenue). The purchase would mainly concern sensors, software applications or production management systems. With the introduction of digital technologies, survey participants expect costs to fall by as much as $ 421 billion annually and annual revenue to increase by $ 493 billion. When investing, it is relevant to monitor their return. Many companies (55 %) expect this within two years. Up to 37 % of businesses anticipate returning investment in the range of two to five years and the remaining 8 % of business return estimates first after five years of implementing technologies to the company.

The surveyed companies had the highest level of digitalization in product development and lifecycle; in the integration of the vertical value chain and sales and marketing in 2016. Five years later, the level of digitalization in companies should exceed 60 % in all areas. During examining the increase in sales and cost reductions in the companies surveyed, it was concluded that up to 10 % of companies (196) could increase their sales by at least 30 % while reducing their costs by at least 30 %.

The highest savings in terms of annual costs (4.2 %) are expected in the wood and paper industry, followed by the automotive industry (3.9 %) and the chemical industry (3.9 %). Industrial production alone expects savings of 3.6 %. The most cost reductions in US dollars per year should be in the construction ($ 78), electrical engineering ($ 62), and transportation and logistics ($ 61) sectors. The implementation of elements such as integration planning or

production scheduling can bring the company savings because these elements can effectively use all the information and pass it on to other departments.

Businesses in the United States expect additional revenue of 37 %, while in Japan only 22 % and in Germany 30 %. Companies expect costs to be reduced by 37 % in the US, 65 % in Japan and 42 % in Germany. Efficiency should increase by 51 % in the United States, by 67 % in Japan and by 62 % in Germany.

The survey also found out what returns companies expect in the future. Almost half of the respondents (47 %) expect to digitize their existing product portfolio. Slightly less, 44 % of companies think that they will introduce a new product portfolio thanks to digitalization. 42 % of respondents will provide new digital services for customers. Finally, 38 % of respondents will also provide Big Data analysis for their customers, thanks to digital technologies.

And Big Data analytics should help businesses improve their customer relationships (as many as 72 % of respondents) because these analyses can create new opportunities that will allow the company to work with customers in the production of products.

However, this survey also points out that within Industry 4.0, the challenge for companies is not modern technology but people, the workforce, human capital. This is because the success of the business does not guarantee the modern technology that the company purchases but the workers who have digital intelligence. At the same time, up to 38 % of respondents are satisfied with the average ad-hoc skills of their employees. It is very important that the company acquires and has a workforce that is qualified in the field. Raising the level of digital technologies in the company while increasing the qualifications and expertise of employees is considered by up to 69 % of companies to be the most relevant task in Industry 4.0.

The survey data shows that the problem also occurs with the lack of vision and management support (40 %), unclear and poorly defined economic benefits from the implementation of elements of Industry 4.0 in practice (38 %), but also in the lack of funds (36 %). Despite this problem, up to 50 % of companies think that the decision-making process in the company is increasingly influenced by data processing tools and creating different analysts.

In connection with Industry 4.0, the security of corporate data is also discussed. Within this group of risks, up to 54% of respondents fear cyber-attacks that will interrupt the company's operations for a certain period. Problems also include the complex determination of liability for loss and damage to company data (40 %), unauthorized modification and manipulation of company data within the company (40 %), or damage to the company's goodwill due to the loss of sensitive data (39 %).

The maturity of companies from different territories in the field of digital technologies varies. Asia-Pacific has a digitalization level of 36 %, while businesses in the Americas have 32 %, and within Europe, the Middle East and Africa, only 30 % of companies have maturity.

4.2 RESEARCH STUDY 2 – DIGITAL REVOLUTION IN THE MAURITIAN PUBLIC SERVICE: A HUMAN RESOURCE DEVELOPMENT PERSPECTIVE IN TWO UNRELATED COMPANIES

The digital revolution (Industry 4.0) has an impact on human capital. It is thanks to people and their knowledge, skills, and abilities businesses can better use technology. If companies but also employees see the positive impact of technology on human capital, it will also affect their work performance and motivation. Therefore, the study focuses on the impact of digital technologies on human capital management.

The author (Kumar, 2016) used scientific approaches such as observation, comparison, and questionnaire in the study. He is from Republic of Mauritius. He considered two public universities and several post offices to be a sample. The reason for choosing these institutions was that both universities and post offices use different technologies, just with different numbers of employees. The questionnaire was filled in by 30 respondents consisting of 20 people from universities (eight teachers, six administrative staff, six students) and ten people from post offices (post managers, other administrative staff). In the questionnaire, the respondents answered three questions, which related to the three hypotheses that the author of the study chose. The answers were in the form of a Likert scale, in which values were set from one to four (strongly disagree - strongly agree).

At universities, they replied that they partially agreed (the average was 3.2) that the digital revolution was developing their knowledge at work. They shared this issue with the issue of developing cognitive knowledge through digital technologies. On the other hand, universities partially disagree that digital technologies will enhance their career progression. However, thanks to technology, they consider their work creative and see the changes they have had to go through. They also monitor the added value that these technologies bring to the work. Surprisingly, employees do not consider technology essential in preparing them for career advancement.

The study suggests that digital technologies have a positive impact on the management and development of human capital. However, companies need to choose the technologies that are right for their needs. Different systems and technologies will be used by multinational corporations and other large or medium-sized enterprises. It is also important to realize that the company's employees should be introduced to the technologies and further characterized to understand that the managers in the company do not want to replace them but want to make their work easier and simpler.

4.3 RESEARCH STUDY 3 – PILOT STUDY OF READINESS OF CZECH COMPANIES TO IMPLEMENT THE PRICIPLES OF INDUSTRY 4.0

The study focuses on the readiness of companies from the Czech Republic for the fourth industrial revolution. The reason for this study was also that the document, which deals with global trends up to 2030, points to the importance and importance of IS and ICT in the functioning of companies. Industry 4.0 technologies can improve business production processes and save business costs.

The author (Basl, 2017) also analysed secondary sources (a survey conducted by the Institute for Industrial Management at the University of Aachen in Germany). A questionnaire survey was also created in electronic form. Data were collected in June and July 2016. The survey was filled out by 161 companies. These are companies from the automotive and engineering industries (52 % of respondents). The remaining less than half of the companies represent areas, such as furniture production, production of electric motors and plastics, or the provision of consulting services. Enterprises with 250 or more employees (up to 2/3 of respondents) took part in the survey. The questionnaire was filled by managers from the top management level.

More than 400 companies from countries such as China, France, Germany, the United Kingdom, and the United States took part in the German survey. They found that up to 85 % of manufacturing companies are aware of the potential of new modern technologies, but only 15 % of them have been able to create a strategy to support the implementation of modern elements in business processes.

The author points out that companies in the Czech Republic are inspired by companies from Germany during the transition to Industry 4.0. At the same time, the survey showed that only 21 % of German companies are ready for Industry 4.0.

The first question in the questionnaire was whether the company is trying to implement elements of Industry 4.0. As many as 40 % of respondents implemented pillars of Industry 4.0 into their business processes a year ago, 20 % of them are still trying to implement, 20 % of respondents know the concept of Industry 4.0 but have not yet considered implementing its elements. 8% of companies claim that they have already encountered the term Industry 4.0 but do not know how its pillars could improve their business processes, and finally, up to 12 % of respondents do not even know the term Industry 4.0.

The author found why the company is not planning to implement pillars of industry 4.0 to their processes by the second question.

Respondents were able to give more than one answer. As many as 75 % of companies said they do not implement any element because they have little knowledge of Industry 4.0. Slightly less than half of the managers (37.5 %) say they avoid implementations because Industry 4.0 solutions are costly or because they see no positive benefits from putting them into practice. Other reasons were insufficient knowledge and skills of employees, lack of knowledge in the field of security, absence of government incentives, and lack of methodological support.

The author was also interested in the reasons that motivate managers to implement elements of Industry 4.0. It was found that they are most motivated by the company's vision, with up to 60 % of companies surveyed and 56 % of companies motivated by buyer pressure. Furthermore, 48 % of managers answered that they are motivated by the company's activities, market demand, reduced costs and increased employee creativity. Other factors included pressure from competitors and suppliers (12 %), pressure on sustainable business development (32 %), products and marketing strategies (28 %), and good experience (20 %).

The final question of the questionnaire focused on the creation of a strategy that determines how the enterprise is to proceed in the future if the company has already encountered industry 4.0.

The striking fact is that up to 39.1 % of managers stated that their companies did not have a strategy in place. The good news is that 30.4 % of companies do not yet have a strategy but are working on it.

Some companies (17.4%) have already developed an Industry 4.0 strategy, which is part of the overall corporate strategy. 8.7% have a strategy but are not part of the overall corporate strategy, and finally, 4.3 % of respondents stated that they have a strategy and other comprehensive analyses that can implement modern technologies without the concept of Industry 4.0 (Basl, 2017).

This study shows that business managers in the Czech Republic do not have enough information about Industry 4.0 and therefore do not implement any of its pillars in their business processes. On the other hand, corporate management is motivated enough to move to Industry 4.0. The aspect that drives them the most is their corporate vision and pressure from their customers.

4.4 RESEARCH STUDY 4 – DIGITALIZATION OF HUMAN RESOURCE MANAGEMENT PRACTICES AND ITS IMPACT ON EMPLOYEES´ WELL-BEING

The study (Fedorova et al., 2018) focuses on the perception of the digitalization of human capital management from the perspective of corporate employees. It was found out how the modern technologies that Industry 4.0 brings with it have affected the lives of employees but also whether they are afraid that they will lose their jobs because of them.

The team of authors is from Russia and Italy. The study uses narrative analysis, which belongs to the methods of qualitative research. The addressed employees wrote their thoughts on paper. The topic "Describe how information and communication-digital technologies have affected your work and how their implementation in the company could affect your future" (Fedorova et al., 2018). Through these interviews the authors obtained the necessary data, which they further analysed, processed and interpreted. The interviews were participated by 57 respondents (35 women and 22 men) in the age category of 22-41, who work in various sectors and industries of the economy.

The level of using digital technologies in companies varies, as the author points out through another survey. One company can implement the technology, but the other does not want to use it and is moving to another. A survey was conducted in Russia, which involved up to 159 companies in 2017, which were divided into 13 groups by sector "(retail, manufacturing, banking and finance, IT, transport, energy, metallurgy and mining, telecommunications, construction, oil and gas, services, hotel and restaurant, other)" (Fedorova et al., 2018). Each of these industries used different HR technologies. E. g. HR analyses are used by companies from the transport, energy, telecommunications and oil and gas sectors. E-learning of employees is used in the retail, transport, oil and gas sectors. Together, several HR digital technologies have been identified, including e. g. workplace automation, e-learning, e-recruitment, agile methodologies, talent management, etc.

Interestingly, 15 % of respondents have given up unnecessary administration and use modern technology instead of paper. But only 5 % of companies were able to automate calculations. An equal number (5 %) of companies have introduced electronic employee appraisals. Even 4 % of companies do not evaluate the performance of employees at all, and only 2. 5% of companies use personal questionnaires. 4 % of companies try to avoid a personal interview when choosing a new employee. The same number of companies (4 %) do not evaluate employees even in the annual performance evaluation. And even 3 % of companies are considering the complete termination of personnel records.

The questionnaire shows that 59.6 % of respondents are aware of the positive and negative effects of digitalization on the performance of their work. The rest (40.4 %) say that digitalization has only a positive impact on their workplace. Among the positive factors, the respondents mentioned speeding up and simplifying the production process, saving time, better communication with colleagues, increasing flexibility, simple access to information, etc. On the contrary, they included among the negative health problems related to working with a PC, impaired vision, reduction or absence of physical activity and dependence on modern technologies.

Surprisingly, as many as 86 % of respondents are afraid of forced downtime, which will be caused by power outages or "freezing" of modern technologies. More than half of respondents (52.6 %) fear that older people will lose their jobs because they will not want to learn to use modern technology.

A concrete example of digitalization in this study is the Ural University in Russia which has more than 35,000 students. They want to implement digitalization for effective internal communication, automatic exchange of information, reduction of operating costs, but also to increase the efficiency of employees (Fedorova et al., 2018).

The study shows that most respondents consider the introduction of new modern technologies in the company to be positive. Although, some of them are also concerned about the negative effects, especially on their health. However, even this does not discourage them from using these new technologies in their work. The positives outweigh the possible negatives, so businesses should not be afraid to introduce the new technologies that Industry 4.0 brings.

4.5 RESEARCH STUDY 5 – INDUSTRY 4.0 READINESS IN MANUFACTURING COMPANIES: CHALLENGES AND ENABLERS TOWARDS INCREASED DIGITALIZATION

The study (Machado, 2019) focuses on business readiness for Industry 4.0. Concepts such as digitalization and the digital revolution are associated with the Fourth Industrial Revolution. It is the implementation of new modern technologies into business processes.

The authors are from Sweden. They used an "automated checking tool called Industry 4.0 Online Self-Readiness Check" in a data collection study. The survey involved seven companies belonging to various sectors of the national economy. In terms of size, they can be divided as follows: 4 belong to large (more than 500 employees), one medium-sized enterprise (100-499 employees) and two small enterprises (up to 99 employees).

As part of the survey, the author tried to confirm or refute what he found in the analysis of the literature. From the analysis of professional articles, were identified ten main perspectives that influence companies in the implementation of Industry 4.0. A survey conducted in seven companies confirmed that selected perspectives from the literature affect companies in practice. Interestingly, the lack of skills and knowledge of employees has confirmed only a medium-sized company and two out of three large companies (Machado, 2019). It can be understood that

small businesses do not have much information about the Industry 4.0 concept, so they do not yet know whether their employees are ready for such a change.

In examining how individual companies are doing in terms of 5 factors (strategy, smart factory, intelligent business processes, data needs and employees), it was found that a medium-sized enterprise is the fastest to transform into a smart factory (Machado, 2019).

4.6 RESEARCH STUDY 6 –THE IMPACT OF DIGITALIZATION ON HUMAN RESOURCES DEVELOPMENT

The study points to the importance of modern technologies in the development of human capital. As the impact of technology is irreplaceable, human capital must develop along with technology. Every company that wants to be competitive knows that it must employ the best employees with the required knowledge and skills. Therefore, great emphasis is placed on the selection, recruitment, management, and evaluation of employees. These processes are linked by technology, so it is important to monitor the impact of technology on human capital.

The author (Lumi, 2020) comes from Kosovo. He uses secondary sources in the study, which he processes with basic scientific methods such as analysis, synthesis, induction, deduction, classification.

In the study, the author also draws on the views of other authors, who also point out the importance of digitalization in the field of human capital. Several authors have already addressed the issue of human capital in connection with technology. In particular, they aimed to "identify the importance of digitalization in increasing employee performance and efficiency" (Lumi, 2020). The impact of digitalization on the labour market is emphasized - a change in the nature and organization of work, the creation of new jobs, the disappearance of some jobs.

The author points out the importance of involving modern technologies when recruiting new employees. Electronic recruitment is more efficient and more interesting than the classic one. Candidates already send their information electronically when contacting the company. So, the company can determine whether the candidate in question has at least basic computer skills. Various communication platforms such as Skype, MS Teams, Google Meets were used for interviews during the COVID-19 illness.

In the field of professional development, it is possible to use these modern technologies, e. g. for training and courses for employees. Employees have access to training materials in electronic form, they can participate in the course through online platforms, so it does not matter where they are.

The use of modern technologies in the process of human capital management is the emergence of e-HRM. It involves an online evaluation of the employee's work performance. The manager has access to the data, but also the employee. However, critics of e-HRM point to a lack of written evidence. On the other hand, it is positive that the company's administrative costs are reduced.

The secondary survey found that up to 86 % of respondents do not believe in modern technology because they are afraid of frequent downtimes due to power outages or computer malfunctions. Digitalization is also perceived negatively because almost 53 % of respondents fear that older employees will lose their jobs because they will not be able to learn to master new technologies. Only almost 18 % of respondents perceive the problem of implementing modern technologies in companies in terms of finance. 21 % of people expect high unemployment due to robotization. Only 14 % of managers are afraid of data loss and database corruption risks.

The fact that companies have a problem or fear of e-HRM is also confirmed by a survey by Deloitte. According to his data, only 38 % of companies are planning to innovate digital human capital management, and only 9 % of them are ready for such a change. At the same time, up to 7 2% of companies are aware of the importance of connecting digital technologies with human capital.

The author sees the disadvantages of digitalization, especially in creating inequality between people and social groups or companies. It is because not everyone has the same opportunity to procure the latest technology.

4.7 RESEARCH STUDY 7 – DIGITALIZATION IMPACT ON GROWTH & HUMAN CAPITAL: INDONESIA BROADBAND PLAN CASE STUDY

The importance of information and communication technologies increased at a time when the world is suffering from COVID-19. As one of the main elements of Industry 4.0 is the Internet of Things and digitalization, this study focuses on these two pillars.

Djunaedi (2021) drew data for the study from a 9-year survey by the Ministry of National Development Planning (2011-2019). These were data from 33 provinces of Indonesia (only one province was involved, which was not officially established until 2013). The author performed the calculations using panel data.

The author sees the meaning of broadband (Internet) mainly in five sectors, namely public administration, healthcare, education, logistics and procurement. In Indonesia, up to 89.7 % of students use the Internet. As for employees, it is only 58.4 %. However, the government's goal is to promote broadband so that every citizen has access to the Internet whether for education or work. This fact is also confirmed by the United Nations, which

considers access to the Internet to be a fundamental human right. In Indonesia, up to 30 % of the population use the Internet for various purposes, such as purchase, sale, banking, work, etc.

The study states that a 10 % increase in broadband can increase the economy's output by 1.3 %. If the number of Internet users in Indonesia increases by 1 %, the province's GDP will increase by 0.01. Therefore, the author emphasizes the importance of investing in human capital through education. He argues that through education, people will gain the necessary qualifications to carry out their profession and will thus be better prepared for the fourth industrial revolution. According to the author, human capital itself can be assessed through the HDI (the human development index).

The development of ICT in the countries improves the quality of life of the population (skills upgrade and income increases). If an individual or household has a higher income, its purchasing power also increases.

The study points to the impact of broadband on human capital and the overall output of the economy. Through the Internet, people can learn easier because they have access to a variety of learning materials and aids. Work is also easier because it can be done anytime and anywhere, you just need to have an information and communication device with an Internet connection, and a person can work, for example, from a vehicle or waiting room at the doctor.

4.8 RESEARCH STUDY 8 – FOREIGN DIRECT INVESTMENT, DIGITAL INVESTMENT, DIGITAL SKILLS AND EMPLOYABILITY – COMPARISON BETWEEN EASTERN AND WESTERN EUROPE

The study points out that Europe needs highly skilled workers with the required digital skills to create a digital single market and a competitive continent. According to the team of authors, education is considered a source of human capital, and it enables the achievement of economic success for individuals as well as companies.

The team of authors (Angeloska et al., 2021) is from Hungary. They analyse secondary data from Eurostat for the period from 2015 to 2019. The data is relating to ten countries of the European Union, which were divided into two groups: eastern countries (Bulgaria, Romania, Hungary, the Czech Republic, Slovak Republic), and western countries (Austria, Germany, the Netherlands, Denmark, Sweden). The study aimed to find out whether the two groups of countries differ from each other or are similar. A T-test was used for evaluation, which consists in comparing the average score of certain variables. In addition, Levene's F-test (statistics for testing the assumption of homogeneity of selected deviations) was used, which speaks of the equality of several variants.

However, the digital knowledge and skills of Europe's citizens are behind the planned goals of digitalization. Surveys show that many job seekers in Europe cannot find a suitable job because they do not have the required knowledge and skills. There is also a problem with the workforce on the part of the employer. As many as 40 % of companies are unable to fill vacancies because they are unable to find suitable candidates.

Also striking are reports that one in five Europeans struggles with reading and writing. COVID-19 has also highlighted people's unpreparedness for digital knowledge and skills. With his arrival, people from all over the world started working from home in the form of a home office. Students learned distance learning from home only with the ICT, and shopping also took place online.

Despite these negative reports, only four out of ten adults are interested in the education, additional training, courses, and training that are offered to them. This fact also affects the insufficient digital knowledge and skills of employees of banking institutions or workers in factories (up to 37 % of them do not have the required knowledge).

A comparison of basic and advanced digital knowledge in selected European countries found that the Netherlands has the highest population with basic digital knowledge (39 %). At the bottom of the ranking is Bulgaria, where only 13 % of the population has basic digital knowledge. Slovakia has 25 % of the citizen with element knowledge and is ranked 7th in the ten countries.

Sweden leads in advanced digital knowledge, where up to 34 % of the population has the necessary advanced knowledge in ICT and digitalization. Slovakia has only 16 %, which moves it to the last 10th place.

This survey showed a significant difference between Eastern and Western Europe. The best results were achieved by five countries, which were included in the group of Western countries, and on the contrary, the worst results were reported by five countries from Eastern Europe.

The low value of digital knowledge in European countries only points to the need to improve the skills of employees. The demand for people with such knowledge is also increasing. Because highly qualified employees can perform special work tasks, they cannot be so easily replaced by modern technologies. There are mainly two types of professions, namely managers and technicians.

In the European Union, 37-69 % of jobs are automated, meaning human capital is being replaced by modern technologies brought to the country by the Fourth Industrial Revolution (Angeloska et al., 2021).

The study showed a significant impact of Industry 4.0 technologies on the labour market, jobs, and human capital, but the authors concluded that it is not yet possible to automate most jobs. It may be due to a lack of funds to purchase modern technology or a lack of highly qualified staff with the required digital knowledge. Whether there will be a workforce on the labour market with the required knowledge is, to a certain extent, also determined by the government, respectively bodies that create curricula, accreditation plans, implement economic policy, and so on.

The significance and importance of human capital in digitization in enterprises have been demonstrated in all studies. If a company wants to use modern technologies effectively, it must also develop human capital. In such a case, there should be no situation where human capital will be substituted by technology.

5 DISCUSSION AND CONCLUSION

The analysed studies are arranged in a clear table (Table 1), which makes it easier to compare them for the methods used and the main findings.

Table 1: Summary of research study

Author (Year) Country	The name of the study	Used methods; number, and structure of respondents	Findings
PwC agency. (2016) 26 countries	Industry 4.0: Building of digital company.	- Questionnaire survey, - interviews, - 2,000 respondents from 26 countries, - 9 main industries.	- 33 % of respondents said they were ready for Industry 4.0 as early as 2016, - investments in Industry 4.0 instruments amounting to up 5 % of annual sales, - 55 % of companies expect a return on investment within two years, - cost reduction, increase in business revenues, - mutual improvement of customer relations through Big Data, - exist for employees´ companies and not for technology, - lack of vision, money, no management support, - cyber-attacks, data loss, unauthorized manipulation of sensitive company data, - companies based in Asia and the Pacific have a level of maturity.
Kumar, B. N. (2016) Republic of Mauritius	Digital Revolution in The Mauritian Public Service: A Human Resource Development Perspective In Two Unrelated Companies.	- Observation, - questionnaire survey, - comparison, - 30 respondents from universities, post offices.	- Two public universities and several post offices, - 30 respondents, - three hypotheses that were confirmed, - examining the impact of digital technologies on human capital management and development, - digital technologies have a positive impact on HR, but respondents do not see their meaning in career growth.
Basl, J. (2017) Czech Republic	Pilot Study of Readiness of Czech Companies to Implement the Principles of Industry 4.0.	- Analysis of secondary sources, - questionnaire survey, - 400 companies from developed countries, - 161 companies from Czech Republic, - only 25 companies (from 161) provided complete answers.	- 161 companies from the Czech Republic, - inspiration comes from Germany, - four elemental questions, - 40 % of respondents have already implemented elements of Industry 4.0, - 75 % of managers do not have sufficient knowledge of Industry 4.0, - 60 % of companies are motivated by the company´s vision and 56 % by customer pressure, - 39 % of companies do not have a strategy for Industry 4.0.
Fedorova, A., et al. (2018) Russia, Italy	Digitalization of human resource management practices and its impact on employees´ well-being.	- Narrative analysis, - analysis, - synthesis, - interviews, - 57 respondents on interview, - 159 companies from Russia (questionnaire survey) and 250 respondents from the Ural University.	- The impact of modern technologies on staff works and human capital, - 159 Russian companies from various sectors of the economy, - each sector uses different types of modern HRM technologies, - 57 respondents from different enterprises, - 59.6 % of respondents perceive Industry 4.0 with its technologies positively.

Machado, C. G., et al. (2019) Sweden	Industry 4.0 readiness in manufacturing companies: challenges and enablers towards increased digitalization.	- Data collection using an online control tool, - survey, - semi-structured interviews, - observation, - 7 companies.	- seven companies (two small, one medium, three large) - ten factors identified from expert articles, - factors from the literature have also been identified and confirmed by enterprises, - small businesses do not experience the insufficient skills of employees.
Lumi, A. (2020) Kosovo	The impact of digitalisation on human resources development.	- Analysis of secondary sources, - synthesis, - classification.	- Selection, recruitment, and evaluation of staff = eHRM, - 86 % of respondents do not believe in digital technologies, - 53 % of respondents expect older people to lose their jobs, - 21 % of respondents expect high unemployment, - only 14 % of managers are afraid of data loss.
Djunaedi, A. Z. (2021) Indonesia	Digitalization impact on growth & human capital: Indonesia broadband plan case study.	- Survey, - analysis, - synthesis, - panel data, - statistics, - Hausman´s test.	- ICT development during COVID-19, - the impact of the Internet on economic output GDP, - in Indonesia, up to 90 % of students use the Internet for education, and up to 60 % of people use it in their profession, - investing in human capital (education) is of great importance.
Angeloska, A. et al. (2021) Hungary	Foreign direct investment, digital skills, and employability – comparison between Eastern and Western Europe.	- Analysis of secondary sources, - T-test, - Levenson's F-test, - 10 countries of EU.	- The division of the ten EU countries into western and eastern, - an enormous difference between „west" and „east" has been demonstrated, - only 25 % of the population in Slovakia has basic digital knowledge, - only 16 % of Slovaks have advanced digital knowledge, - up to 69 % of jobs in the EU should be automated.

Source: compiled by authors

Based on the analysis and comparison of research studies, we found that the readiness for Industry 4.0 and its pillars has changed over time. At the beginning (in 2016), few companies were ready for Industry 4.0 and digitalization. This fact is also confirmed by the PwC survey from 2016, which says that only 33 % of companies were already able to implement digitalization into their processes in 2016 (PwC, 2016). The author Basl found similar results in his research. He pointed out that in 2016, 40% of companies implemented elements of Industry 4.0, and the remaining 60 % of companies have not yet implemented pillars of Industry 4.0 or do not even know the term "Industry 4.0" (Basl, 2017). In 2018, up to 15 % of companies were able to use digitization, albeit only in human capital management (Fedorova et al., 2018).

The studies also showed a difference between eastern (Bulgaria, Romania, Hungary, Czech Republic, Slovak Republic) and western (Austria, Germany, the Netherlands, Denmark, Sweden) countries. It is confirmed, for example, by the results of a PwC survey but also by Angeloska and her team research (PwC, 2016; Angeloska et al., 2021). PwC points out that in Western countries (the United States 37 %, Germany 30 %), companies expect higher additional revenues from the implementation of digitalization than companies in Eastern countries (Japan 22 %). Conversely, at the expected reduced costs, companies in Japan expect up to 65 % cost reductions due to digitalization. The further west, the lower the cost reduction expected (Germany by 42 %, the United States by 37 %) (PwC, 2016). There is also a difference between East and West in the level of digitalization. Again, the further west it goes, the lower the level of digitalization in countries (Asia and the Pacific 36 %, Europe and the Middle East 32 %, the Americas 30 %) (PwC, 2016). The survey of the author Angeloska and her team included ten countries, five from the west and five from the east. In all the parameters that the authors compared, Western countries performed better (Angeloska et al., 2021).

The common feature of all analysed research studies was human capital and investing in it in the form of education. Each study highlighted the need for higher skills and retraining of employees as a result of implementing Industry 4.0 elements, regardless of the country. This fact was pointed out by the PwC agency already in 2016, and it was not different in the surveys from 2021 by the author Angeloska and her team and the author Djunaedi (PwC, 2016; Kumar, 2016; Basl, 2017; Fedorova et al., 2018; Machado et al., 2019; Lumi, 2020;

Angeloska et al., 2021; Djunaedi, 2021). The fact that digitization requires highly qualified staff with digital knowledge is also confirmed by the authors Polat and Erkollar (2020), Pereira together with his team (2020), the author Flores (2020), or the author Agolla (2018).

The article found that different countries around the world view Industry 4.0 differently. They also have various conditions for implementing digitalization into enterprises. An important finding was that if a business wants to develop technologically, it must not forget human capital. It is thanks to human capital that companies can grow and gain competitive advantages. It is important to monitor and develop human capital because if employees with digital skills do not work in the company, the company will not be able to use modern technologies.

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