Artificial intelligence as a tool in human research management – potential and current use

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ABSTRACT

Purpose – The purpose of the paper Artificial Intelligence (AI) as a tool in Human Resource Management (HRM) - Potential and Current is to map the current knowledge based on the published scientific studies in the Web of Science database.

Aim – Based on the systematic search, were selected fifteen studies, published within majority groups and selected attributes (year, location, research methods, focus) that were further analysed and compared according to company size and further implementation of AI, HR-bot in HRM.

Design/methodology/approach – systematic literary search of selected fifteen studies was used for the qualitative evaluation of the analysed works.

Findings – The outcome of the work was the selection of individual directions by years, areas, research location and findings in the papers, where most of them are focused on AI implementation in large companies and reflection of micro, small and medium-sized companies standing behind.

Limitation of the study – The limiting conditions of the survey can be seen in the number of published research in the area of small and medium-sized companies.

Practical application – The conducted research can provide guidance and facilitates the search for professional articles on AI as an HRM tool in various size companies.

Originality/value – The search facilitates and provides the insight in the published studies where micro, small and medium-sized companies stand behind, thus the goal of comparing AI, HR-bot implementations in HRM according to the size of the company was met.

1 INTRODUCTION

With the advent of fourth industrial revolution has been growing the use of artificial intelligence in human resource management due to the fact that more and more companies have been trying to increase their efficiency and competitiveness in the market. The artificial intelligence becomes an effective tool for HR, as it facilitates recruitment procedures and internal communication in the company. New possibilities to involve and utilise artificial intelligence in the field of human resources management tends to streamline the productivity of employees. The HR department becomes the key for the company performance. The effective adoption of AI allows to improve recruitment strategies, reduce the employee turnover, and speed up the implementation into company performance. The paper focuses on the analysis of published scientific studies from the Web of Science database with the intention to facilitate the search for professional papers on the tool of AI in HRM environment, where the goal was achieved by the search for professional publications based on stated keywords, and subsequent analyses of the majority groups in published studies, found common features of AI, HR-bot implementation in HRM reflecting the company size.

Human Resource Management can be defined as personnel and managerial activities within an organization or a company that focuses on human resource management. AI stands for English expression Artificial

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Intelligence. Chatbot - communication robot, is a program created for the purpose of automated communication, where the main use of chatbots are as virtual, digital and personal assistants with artificial intelligence to provide and facilitate a number of HRM tasks. Industry 4.0 denotes the trend of digital revolution, where the main Industry 4.0 features include the automation of production technologies and the development of the company's digital environment. HR 4.0 is a combination of the industrial revolution and human resource management to rejuvenate the work of HR managers with AI support.

1.1 LITERARY SEARCH

The use of artificial intelligence (AI) at workplaces has been rising, but only few people understand how it affects our work. Can it be an obstacle, a threat, or a solution of current productivity dilemma? As a new, and mainly untested technology, AI brings challenges and opportunities we must be aware of (Hogg, 2019).

There exist only a few academic research on AI as a tool in HRM. AI can be thought of an effective tool in HRM; during the recruitment process, the artificial intelligence can be used not only for the benefit of hiring organizations, but also for the employees as well as the applicants. i.e., AI technology can streamline the application processes and create easy-to-use forms that can eliminate applicants, effectively reducing the number of rejected applications (Pan et al. 2021).

Artificial intelligence technology becomes the new standard because everything is driven by artificial intelligence today. It has changed our way of life, widespread AI adoption in businesses and corporations helps to streamline the processes, increase productivity, increase efficiency, and reduce costs. The integration of artificial intelligence in human resource management practices has been changing the way how organizations address, manage, and engage their workforce. Artificial intelligence allows machines to make decisions more accurately than people according to existing data sets and behaviour patterns; thusransformation has caused to take over all manual work by machines, and leading HR professionals to take on more strategic roles. It is paramount for companies and professionals to understand how this technology works together with its role in various human resource management functions. The paper summarizes the work of many leading researchers finding out how artificial intelligence is making a difference in human resource management, it reviews highlights, the key benefits and hidden challenges of AI during the application in human resource management as well as illustrates its future potential (Tewari and Pant 2020).

Digital transformation in human resource management shows how various technologies can serve HR functions, and their employees. The study of Trivedi and Pillai (2020) is essentially descriptive, where the secondary data such as company news, web resources, professional blogs and research articles were used. The study examined the concept of "SMACI" practices of artificial intelligence (AI), HR Chatbots, machine learning, robotic process automation (RPA) in formulating the basic functions of human resource management (recruitment, screening, interviews, onboarding). The study also intervened in the literature by recognizing various tools that companies use to develop and expand HR departments. The benefits of digital transformation in human resource management, the possibilities of overcoming obstacles, the challenges that society faces were also examined based on examples in Indian companies and their development (Trivedi and Pillai 2020).

Via AI in HRM, the organizations are enabled to increase the recruitment efficiency, selection process and gain the access to more employees; with AI use subjective criteria such as nepotism and favouritism are less likely to come into play in recruitment and employee selection. AI in HRM also has a potentially positive impact on the development, retention, and productive use of employees (Kshetri, 2021).

The invention of chatbots, which are major domains in AI, organizations have become more technology oriented; bot is considered an effective communication system that can be used between employees and customers to perform certain communication activities within the organization without any human intervention. Artificial intelligence has become an emerging technology in the technological advancement domain of business practices that helps organizations to grow in a large scale. The AI technology makes from complex problems simpler solutions. Chatbots not only influence the decision-making process in organizations, but also allow better understanding of AI among employees within the organization (Mujumder and Mondal 2021).

Industry 4.0 is characterized by smart manufacturing, the implementation of Cyber Physical Systems (CPS) in manufacturing, i.e. built-in actuators and sensors, microcomputer networks and the interconnection of machines with a value chain; also digital product enhancements and reengineering considered. It also features highly differentiated customized products and a well-coordinated combination of products and services, as well as value-added services with a real product or service and an efficient supply chain. All these challenges require constant innovation and learning, which depends on the people and skills in the company environment. Appropriate access approach can play a key role in dynamic skills development, effective learning and innovation climate. This paper tends to offer insight into the best management practices that can support the climate of innovation and learning in the organization, thus facilitate businesses to match the pace of Industry 4.0; it is one

of the first attempts to highlight the important role of managerial practices in Industry 4.0, as most recent studies have addressed technological aspects, but this paper also proposes an empirical and quantitative study of the management approaches in the context of Industry 4.0 (Shamn et al. 2016).

1.2 DATA AND METHODS

The goal of the paper "AI as a tool in HRM - potential and current use" is to map current knowledge based on the published scientific studies in the WoS database where the systematic research was chosen for this purpose. Systematic research can be characterized as a systematic, explicit and repeatable procedure designed to identify, evaluate and synthesize the results created by researchers, academics and practitioners (Fink, 2014, p. 3). This procedure allows the author of the research to minimize his own subjectivity to influence the content of the text by his opinions (Fink 2014, p. 14; Petticrew and Roberts 2008, p. 6). The systematic search is characterized by a clearly stated goal, a research question, a described search procedure, an indication of the selection criteria and a described procedure for the qualitative evaluation of the analyzed works (Jesson et al. 2011, p. 12).

Research questions:
1. What are the major groups of analysed published studies according to selected attributes (year, locality, research methods, area of focus)?
2. Common features of publications - What is the implementation of AI, HR-bot in HRM according to the company size?

The website as follows was used to collect data: Web of Science. The keywords are divided into three main groups: 1. The use of artificial intelligence in the field of human resource management, 2. The influence of Industry 4.0 in human resource management, 3. The influence and use of HR-bot and chatbots in HRM.

Table 1 Used studies

Key word	Number of studies	Criteria / common features
AI in HRM	6	AI impact on HRM
Industry 4.0 /HR 4.0	4	Industry 4.0 and its impact on HR
Chatbot, HR-bot	6	Connection of Chatbots in HRM, its use

2 RESULTS

Fifteen Web of Science resources in total (listed in Table 2) were selected, with futher division into six columns based on selected atributes : author, research area, year, locality, research methods and focus area. The found results are individually divided according to the atributes presented in Tables 3 to 7, where the results are always described above the given table. Common features of all publications described together in Table 8 are as follows : the implementation of AI, HR-bot in HRM according to the company.

Table 2 List of Resources

Author	Research area/ common features	Year	Area/ locality	Research methods	Focus area
Baldegger, Caon, Sadiku	Business economy	2020	Europe	Empirical research (questionnaire)	AI implementation in HRM
Arslan, Cooper, Khan, Golgeci, Ali	Business economy	2021	Europe (Finland, England, Scotland)	Theoretical insight	AI (chatbot) implementation in HRM
Kshetri	Business economy	2021	Global South (India)	Case study	Development and use of AI in HRM
Malik, Budhwar, Patel, Srikanth	Business economy	2020	Asia (India)	Empirical research (Dialogues)	AI Implementation aimed at HR
Pan, Froese. Liu, Hu, Ye	Business economy	2021	Asia (China)	Empirical research	Acceptance of AI in recruitment
Majumder, Mondal	Engineering	2021	Asia (India)	Theoretical insight	Chatbots in HRM
Olajide, Sposato	Business economy	2021	Global	Empirical research	AI implementation for recruitment and selection functions in HRM
Skjuve, Folstad, Fostervold	Computer science, Engineering, Psychology	2021	Europe (Norway)	Empirical research	Study on a person and chatbot relation
Bozic, Tazl, Wotawa	Computer engineering	2019	Europe (Austria)	Theoretic insight	Chatbot testing via AI planning
Majumder, Mondal	Engineering	2021	Asia (India)	Theoretic insight	Usefulness of chatbots for HM
Vereycken, Ramioul, Desiere, Bal	Engineering Company economy	2021	Europe	Empirical research	HR procedures accompanying Industry 4.0
Stankeviciute, Staniskiene	Business economy	2020	East Europe	Empirical research	Role of sustainable HRM in Industry 4.0
Liboni, Cezarino, Jabbour	Business economy	2019	Latin America	Theoretic insight	Smart industry and ways to HRM 4.0
Pillai, Yadav, Sivathanu, Kaushik	Public administration	2021	Asia (Indie)	Empirical research	Utilization of technology 4.0 in HRM
Vrontis, Christofi, Pereira, Tarba, Makrides, Trichina	Business economy	2021	Global	Theoretic insight	AI, robotics, advanced technology and HRM

Percentage in research areas. According to the table below can be observed that the primary focus of AI tools for HRM lies in Company economics with the value of almost 56%. The values in the table distort the areas focused on HR-bots and chatbots, which examine the development and psychological implementation of AI in HRM. These studies focus more on the research areas of engineering and computer science.

Table 3 Research areas

Research area/ common features	Percentage %
Business economy	55,55
Engineering	22,22
Computer science	11,11
Public administration	5,55
Psychology	5,55

The continental division in the study provides three main locations: Europe (40%), Asia (40%) and Global Research (13%). The main representatives in Asia are China and India, where India has been becoming one of the major pioneers in searching the use of AI in HRM. In Europe, Western countries are ahead of Eastern European countries; namely Norway, Finland and England are the main representatives of the research.

Table 4 Localities

Research area/ common features	Percentage %
Business economy	55,55
Engineering	22,22
Computer science	11,11
Public administration	5,55
Psychology	5,55

Division based on research methods. Most of the studies focus on empirical research (60%) with the help of a questionnaire survey, interviews with HRM executives, and case studies. Theoretical research (40%) in the field focuses on the implementation of HR-bots in HRM, and the study of the relationship between human and chatbot in industry 4.0.

Table 5 Research methods

Research methods	Percentage %
Empirickal research	60
Theoretical research	40

Keywords are divided into three main sections. AI in HRM and Chatbot / HR-bot represent the value of 37.5%, what is a new topic where the emergence of new studies is expected. The sections of Industry 4.0 / HR 4.0 with a value of 25% shows the reflection of implementation of industry 4.0 into the HR area, but studies were created as early as 2019 and the topic is not very well developed.

Table 6 Keyword sections

Keywords sections	Percentage %
AI in HRM	38
Industry 4.0 / HR 4.0	25
Chatbot, HR-bot	37

Publishing Year shows the last three year development. AI as a tool in HRM is still a new and unexplored topic, what is evidenced by the large share 67% of research in 2021, where much of the papers from 2021 are still in the preliminary approach, what means that in 2022 and beyond can be expected the growth in the searched area.

Table 7 Publishing year

Publishing year	Percentage %
2019	13,33
2020	20
2021	66,66

Out of selected fifteen papers, six of them discuss the implementation of AI, HR-bots in HRM according to the enterprise size. Most of them focus on multinational corporations and their implementation in total amount of 67%. Other papers focus on the issue how important is it for SMEs to invest in information technology and create a basis

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for their further development (Ghobakhloo et al. 2012). Table 8 shows that SMEs together represent 33%. The remaining articles that do not focus directly on the company size thus are not included in the calculation.

Table 8 Company size and AI,HR-bot implementation

Implementation of AI, HR-bot in HRM based on the company size	Percentage %
Large enterprises	66,66
Middle enterprises	16,66
Small enterprises	16,66
Macro businesses	0

4   RESULTS AND DISCUSSION

Business economics is a major research area in the use of AI as a tool for HRM. As it was already mentioned, the values distort the areas focused on HR-bots and chatbots, which examine the development and psychological implementation of AI in HRM. The values in Table 3 show that 56% of the studies focus on business economics, the remaining 44% is divided into engineering, computer sciences, public administration and psychology, where Europe and Asia are among the major research localities. The study by Liboniet et al. (2019) reveals that developed countries play a leading role in research production, while Latin America and Asia are far behind, what is partly not true, because the surveys may come from 2019 (see the percentage of representation Table 4), and Asia has the same share as the developed western countries.

The evidence are the studies coming from 2020 and 2021, where India and China themselves represent a large share in the research.

The majority of studies focus on empirical research (Table 5) with the help of a questionnaire survey, interviews with HRM executives, case studies. Theoretical research is focused on HR-bots implementation in HRM, the study of the relationship between human and chatbot in industry 4.0. The evidence is provided by the systematic research of Vrontis, Christofi, Pereira, Tarba, Makrides, Trichina (2021) where 13,136 potentially relevant studies were published in top journals on human resource management, international trade (IB), general management (GM) and information management (IM). Here were found 45 articles studying AI, robotics and other advanced technologies within the HRM.

The area focused on AI in HRM (Table 6) with the results of the Baldegger, Caon and Sadiku study (2020) indicates the perceived positive value of introducing AI into HRM and the correlation between the company's EO level and the introduction of AI into HRM. This means that the more business-oriented a company is, the more it tends to implement or incorporate already implemented AI projects and tools into HRM processes. By deploying AI in HRM, organizations can increase recruitment and selection efficiency and gain access to a larger recruitment fund. With the use of artificial intelligence in human resource management, subjective criteria such as nepotism and favouritism are less likely to come into play in recruiting and selecting employees. The deployment of AI in HRM also has a potentially positive impact on the development, retention and productive use of employees (Kshetri 2021). On the other hand, the findings of Olajide, Sposato (2021) revealed that the adoption of AI technology in recruitment and selection is also full of risks to create fear and mistrust among recruiters. Effective AI adoption can improve recruitment strategies ; however, cynicism exists due to fears of job loss due to automation. Due to the great interest in the use of AI in HRM, the studies are predominantly represented in the focus field.

Industry 4.0 is a central topic of the literature analyzed and is achieved through the development of employment, qualifications, skills and learning frameworks. The results show that most of the work is conceptual, while there is still lack of quantitative studies (Liboni, Cezarino, Jabbour 2019). Between 2020 and 2021 more studies were added on the topic of Industry 4.0 / HR 4.0, but compared to the areas focusen on AI in HRM and Chatbot, HR-bot growth is not so noticeable and therefore does not reach a high proportion of the total selection of sources.

With the invention of chatbots, which are a major AI domain and natural language processing, organizations have become more AI-focused. Bot is considered an effective communication system that can be used between employees and customers to perform certain communication activities within the organization without any human intervention. Artificial intelligence technology makes complex problems as simpler solutions. Chatbots not only influence the decision-making process in the organization, but also allow for a better understanding of AI among employees within the organization (Majumder, Mondal 2021). There has been a sharp increase in interest in social chatbots in recent times, and people-to-people (HCR) relationships are still prevalent, but there is little

knowledge on how HCRs are evolving and may have an impact on the wider social context of users (Skjuve et al.,2021). The claims of Mojumder and Mandal are also confirmed by the high percentage share (Table 6).

Research Year (Table 7) shows that AI as a tool in HRM is a new and only little academically explored topic, therefore, from 2019 to 2021 was observed a gradual increase in the published studies. The topics on HR-bots and chat bots use are still a little-studied area in the field of HRM, although academic production in the field of intelligent automation (AI, chatbot) has been growing rapidly, neverthless there is a lack of a comprehensive understanding of the impact of the technologies use in HRM on companies and employees is (Vrontis et al. 2021).

Common features of publications - Implementation of AI, HR-bot in HRM according to the size of the company are given by Table 8. The company size is one of the most commonly discussed organizational contextual factors (Baker, 2011; Oliveira & Martins, 2010; Zhu, Dong, et al., 2006) ; although some research has found that company size is not relevant to the technology adoption (Oliveira & Martins, 2010), but numerous studies have found that company size has a positive effect on AI adoption (Baker, 2011; Hsu et al., 2006; Rogers, 2003 Wang et al., 2010). Zhu, Kraemer et al. (2006) found that company size is not relevant to the use of technology in the later stages of adoption, large companies have advantages in the early stages of adoption due to financial resources, therefore for larger companies is expected to introduce more recruitment-related artificial intelligence tools. (Bughin et al., 2017; Ransbotham et al., 2017). For SMEs is important to invest in information technologies and create a basis for their further development. Due to the increased competitive pressures and the need to enter global markets, SMEs are gradually using information technologies (IT) to create significant benefits. Most of previous research was focused more on IT deployment in large organizations, but taking into account the limited resources of SMEs, the IT deployment process is very different. (Ghobakhloo et al. 2012). Despite the statement that the size of the company is not relevant for technologies adoption, we can complain about the mentioned statement correctness. The insufficient funds is the main issue in the AI, HR-bot adoption and implementation in HRM within micro, small and medium enterprises, as there is no guaranteed the key to AI and bots for businesses. Development and implementation is still the future for SMEs, that is why multinational companies and large companies are the main pioneers in the field. Development and implementation of AI, HR-bot in HRM is a time and money saving solution even at the expense of initial investments. HR-Bot is considered as an effective communication system to be used between employees and customers to perform certain communication activities within the organization without any human intervention, where artificial intelligence technology makes from complex problems simplified solutions (Majumder and Mondal 2021).

5   CONCLUSION

The aim of AI as a tool in HRM - potential and current use was to map current knowledge based on the published scientific studies in the Web of Science database. A total of fifteen sources were selected and analysed for most published studies according to selected attributes (year, location, research methods, area of focus) and for the AI, HR-bot implementation in HRM according to the company size. The task of the first research question was to analyse the majority of published studies according to selected attributes (year, location, research methods, area of focus). The main issue in the analysis of the majority publications was the finding that this is a new topic in HRM, where is still not sufficient number of professional papers directly focused on AI as a tool in HRM. In the analysed majority groups were found all selected attributes provided in Tables 3 to 7. The outcome of the work was the selection or individual directions by years, area, and research location. The task of the second research question was to find the common features of publications, namely the implementation of AI, HR-bot in HRM according to the company size. The six papers of the fifteen selected publications, were focused on the topic, where the main issue was the implementation of AI, HR-bot in HRM in small and medium enterprises. The outcomes based on the company size (Table 8) indicate that only a small proportion of scientific studies are aimed at micro, small and medium-sized enterprises. The contribution of the work was the finding that the most professional articles focus on the implementation of AI in large companies where micro, small and medium-sized companies stand behind, thus the goal of comparing AI, HR-bot implementations in HRM according to the size of the company was met.

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