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Artificial Intelligence in Human Resources Management

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Abstract

Artificial Intelligence (AI) began to emerge in the mid-20th century. However, there has been a lack of consistency in views regarding AI within the scope of Human Resource Management (HRM). Initially, AI and HRM were two separate streams of research. Currently, AI and HRM have been analyzed together to gather knowledge and identify common patterns of interaction between the two. The research method employed in this study is a systematic literature review of 65 scientific articles published in international journals, with primary sources from Scopus Elsevier, Web of Science (WOB), and Google Scholar. This paper outlines the analysis of how HRM influenced by AI and describe a concept of AI within HRM. Furthermore, many application of AI within HRM are also analyzed. Subsequently, the development of AI-based robotics technology and its impacts are discussed. Finally, a literature review framework for future research will be presented.

Keywords: *AI, HRM, robotika.*

INTRODUCTION

The article on Artificial Intelligence (AI) and Human Resource Management (HRM) was initially published by Lawler & Elliot (1996), presenting the findings of an experimental study on an expert system. Initially, AI and HRM were two distinct research streams. Currently, four disciplines, namely Information Management (IM), HRM, General Management (GM), and International Business (IB), have begun to merge. Despite being initiated 27 years ago, there is still a lack of consensus regarding the integration of AI into HRM, as noted by Tufahha & Perello-Marin (2021).

The lack of consensus regarding the definition of AI in HRM can be found in the publication by Wang (2018), who states that AI in HRM refers to machines that can mimic human thinking, reasoning, and learning abilities. On the other hand, Bharwadj, Singh & Kumar (2020) explain AI as the interaction between humans and computers that helps improve organizational functional procedures.

In the era of HRM, AI has truly transformed and redefined work processes and governance within organizations (Derous & Fruiyt, 2016; Black & Feroli, 2019). Administratively, HRM has been disrupted and advanced due to the influence of AI, automation, and robotics (Wang & Lin, 2018; Matsa & Gullamajji, 2019). AI appears significantly different from its predecessor technologies. AI have

a great potential to change the scope of work, society management and HRM (Baylei & Jelai, 2019). The digital HRM era holds great promise when the direction of development focuses on maximazing the colaboration between automation and manual work (Brewster & Chung, 2016). This will be a great opportunities for top management to build AI application that is more personalized, humanistic, and intuitive (Meister, 2019). On the other hand, there has been a significant increase of application of AI within HRM, but without strategy of adoption (Abdeldayem & Aldulaimi, 2020). Hence, re-exploring the concept of AI in HRM that has not been agreed upon is of utmost importance. Similarly, the exploration of recent AI applications developments, along with strategies of adoption, must not be neglected.

This systematic literature review in this paper will explore the concepts, applications, adoption strategies, and advancements in robotics technology within HRM, along with the accompanying impacts.

METHOD

In this paper, the author utilizes the recommendations of Thomé&Scavarda (2016) and Fisch&Blok (2018), to conduct a systematic literature review, which highlights the most relevant issues to consider: (1) focusing on the research topic and questions; (2) finding and identifying relevant article; (3) reaching a proper balance between depth and breadth when selecting criteria for pertinent descriptions; (4) making work breakdown structure from totally activity to several little parts; (5) describing conclusions and summary.

Poin 1 (one) has described in introduction. The objectives of the research are presented and questions have been stated. In selecting articles, the review conducted by Hewet et al. (2018) was utilized. First, the main databases were selected. In this paper, three primary database sources were chosen: Scopus Elsevier, Web of Science (WOS), and Google Scholar. To obtain a comprehensive and in-depth understanding of the topic while ensuring relevance and up-to-date information, a publication time limit was set after the year 2017.

To find relevant articles, a suitable keyword formula was developed. Operators of Boolean (“AND” & “OR”) used to creat simple combination of search algorithm (Pisani,2017). Spesific keywords were choosen for identification purposes, that is to identify qualifying publication (Balaid,Rozan,Memon&Hikmi,2016). Örtenblad (2010) combining keywords (AI and HRM) to increase flexibility to get relevant publication.

The initial sample of potentially relevant studies for this research consisted of 11,000 articles. After applying the publication year limitation to articles published after 2017, a total of 174 articles remained. The review of titles further narrowed down the selection to 81 articles. Finally, after reviewing the abstracts, 65 articles were chosen for the systematic literature review. However, due to page limitations, only 30 articles were included in the reference list.

All the articles that relevant with this research were downloaded. Then, carefully screened to extract relevant information (Andresen & Bergdolt, 2017). This step to minimize technical error and for the sake of replication

(Tranfield,2003). The aim of this systematic review is mapping and classification those were conducted into several categories, namely the definitions, effects of AI in HRM and directions for next research.

RESULTS AND DISCUSSION

AI Concept in HRM

AI has a great potential in HRM. But, this prospect has not been yet understanding by practitioner and academic. This situation become main reasons why there is no same conception about AI in HRM (Kaplan & Haenlein,2019; Arco, Presti, Resciniti&Marino,2019;). Furthermore, Researchers using different approaches to analyse AI. Some refer to studies that define AI from general perspective, focusing on technical aspects. Different researchers concentrate on the high level of conception. One definition states that AI is a powerfull system, which able to interpret data accurately, learning and utilizing to finish tasks and get the target with high level flexibility(Kaplan & Haenlein, 2019). Another definition describes AI as a knowledge and technique with fully intelligent behavior, mimicking process of thinking, and reaction (Gherghina,2015). Furthermore, AI viewed as an engineering to process information that imitates human capability (Popkova & Sergi, 2020).

There are two support system for AI, that are Deep & Machine Learning (DL & ML) (Lee & Shin, 2020). The DL & ML functions will be the core of transformation that driven by the latest advancements of AI. New methodologies and transformation in management of data indicate fresh approach to defining and understanding AI (García-Arroyo & Segovia, 2019).

Based on the analysis of existing literature, the definition of AI in HRM is a technology comprising DL & ML that is capable of mimicking human capabilities This definition can be upheld in the current situation by examining the path in which AI is integrated into decision-making processes in HRM.

AI Aplication in HRM

One of the challenges impacting AI in HRM is the sheer number of applications. Researchers argue that AI technology brings about several radical changes in HRM practices that affect business operations (Nawaz, 2019; Ojha & Chitranshi, 2017). AI is already shaping workforce patterns and the way companies handle employee recruitment, performance management, and employee development (Michailidis, 2018). AI is completely transforming HRM practices by providing easier recruitment methods and innovative solutions to a multitude of problems (Bafna, Pramod & Shirwaikar,2019; Chakraborty, Biswas, Aich & Giri, 2020).

Chung&Chen (2019) explain text mining's function to analyze main capability of professional by processing data from institution and advertisements. Shanmugam&Garg (2015) states that AI as a tool to minimize assessment deviation. Furthermore, AI can support management and employees to understand every employee's performance progress. Padmashini, Parameswaran&Manjusha (2018) underline the use of vision-based concept to utilize deep learning in managing human resources.

Strohmeier&Piazza (2015) assumpting there are six scenario to classify AI applications in HRM: 1) using search engine with knowledge-based; 2) extract information to resume data; 3) using voice to response and support interactive systems; 4) using text mining to analysis sentiment of HRM; 5) using generic algorithm to rotate position of staff; and 6) using artificial neural networks to predict turnover of employee. poin 1 until 4 are directly focus on recruitment and development, while the rest focus on employee's performance.

In terms of candidate search, it can be noted that search engines with knowledge-based are the main support system of AI (Chakraborty, Biswas, Aich & Giri,2020; Lochner & Preuß, 2018). This process also involves the digitization of assessment methods and recruitment (e-recruitment). Geetha and Bhanu Sree Reddy (2018) state five key aspect to summarized the benefits of AI in recruitment phase: 1) AI reduce time by minimizing records to avoid repetitive incidents; 2) AI helps HRM to hire the best candidate needed by institution (Daramola, Musa&Oladipupo,2010); 3) reducing costs are from minimize recruitment agency fees and hire the best talent (Kundhavai,Ahamed&Sumathi,2020); 4) Applications of AI rely on analysing of Big Data that starting from good screening, during the process of recruitment (Wang,Zhang&Liang,2018); 5) trust and loyalty between organization and candidates are enhanced through interactive communication among them.

Rab-Kettler&Lehnervp (2019) in resume acquisition, exploring the role of AI by describing the ML's function, that are capable of: a) designing descriptions for any job positions; b) filtering resumes by choosing keywords and hiring new employee in the appropriate job openings; c) automated welcoming activities (pre-onboarding); d) interviewing candidates with chatbots potentially replace human interviewers (Kundhavai,Ahamed&Sumathi,2020).

Chatbots are part of AI technology. It can simulates dialogue of human. Not only answer employees' questions. Chatbots also serve as facilitators, career coaches and employee personal support (Kamal,Bae,Lim&Sutrisnowati,2018). Chatbots also help in planning of career. They can guide officer in interpreting results of many test, track path of career based on job experience, and comparing alternative job position. Practitioner very appreciate the convenience. Even though, personalized respon is not given by a human. It increase demand the availability of chatbots.

Interactive voice response in the form of a virtual assistant is a part of AI applications that can answer user queries and engage in extended conversations with them (Pradana, Nyanyikan, & Kumar, 2017), enhancing e-communication effectiveness and interaction between them (Biswal, Ganesh, & Madhavan, 2020). With this application, interaction between computers and human through voice, can be served as a channel. Implementation of this channel is Employee Self-Service (ESS) systems. ESS system very applicable in the area of HRM (Strohmeier & Piazza,2015).

Sentiment analysis in HRM (opinion mining), aims to analyze attitude, opinions and sentiments of employees in various aspect such as organizational product and services (Khan, Qamar&Bashir, 2016). Identification differences in

opinions about entity (event, decision, service and product) enables stabilization, withdrawal, improvement and revision of the entity to maintain recipient satisfaction (Murali&Lava,2019). Sentiments' description of stakeholder, applicants, manager and employees about HRM practices such as leadership style, management, training quality, prospect of career and compensation ratios can give meaningful insights into SWOT analysis of human resources division (Patel & Jha, 2015). Nowadays, sentiment and opinions about employee and workplace are increasingly expressed and easily can be found in web-based documents and social media networks (Strohmeier&Piazza,2015).

Van Esch, Harder, Franklin & Stewart Black (2020) combined genetic algorithms and biometrics with AI technology. This combination to analyse data that generated from voice & facial recognition and fingerprints (Kamal, Bae,Lim&Sutrisnowati,2018; Dong,Zheng,Chen&Wei,2020;), as well as system that capable to create biometric profile. Suen,Lin&Hung (2020) implemented decision making system based on AI with biometrics, enabling the development of automated interview platforms.

The next AI application is Artificial Neural Networks (ANN). This is based on knowledge categories and provide task solving, clustering, classification and prediction (Biswal,Madhavan&Ganesh, 2020). ANN helps officer predicting employee turnover and uncover unknown factors (Strohmeier&Piazza, 2015). This feature will be leveraged by officer to determine rates of turnover. To improve satisfaction through identifying these factors will provide a competitive advantage. ANN also generate several list of complaints and provide appropriate solutions (Dickson&Nusair,2010).

AI Adoption Strategy in HRM

In the context of adoption strategy, there is very big uncertainty regarding solution to be take(Strohmeier&Piazza,2015). Several practitioner have identified factor-factor for implementing AI successfully. Successful in implementation should include commitment of management (Kim,2019), corporate strategy, infrastructure system, organizational, human resource aspects and end-user support. Huang&Rusty (2018) states AI theory job substitution based on 4 (four) intelligences aspect : emphatic, intuitive, mechanical and analytical. From all article that have been analyzed, only two articles giving recommendations about strategy of adopting AI.

Clear strategies for adopting, primarily focused in recruitment phase. Van Esch&Black(2020) identified several suggestion for implementing recruitment tools: 1) focus on specific job positions. Managers will identify best talent candidate and use supported feature to make limitation; 2) Beware of bias. If there has been unintentional bias in the last period, it is worth to neutralize it promptly, then let the system fixed it; 3) Integrated grand design. Institutions offer better solutions, when recruitment process focus on comprehensive solutions that still inefficient and ineffective; 4) Be transparent and open. AI-supported recruitment systems have fewer biases and have more option to choose. Hiring and adopting AI in recruitment will increase company branding seen as advance in technology; 5) last impression

back to human. For final interview, it is necessary to conduct by human. This strategy to show the candidates real company culture and working atmosphere.

Van Esch, More, Franklin and Black Stuart (2020) describing how management can designing, implementing and marketing AI applications in recruitment program, namely 1) always avoid negative aspects of technology that unsupports; 2) taking into account the digital ecosystem, social and physical domains that represent the candidate's potential experience in the context of service delivery; 3) trend as a critical limitation situation in recruiting process; 4) focusing the relationships linking trends, that is social media usage and biometrics.

Robotics in HRM

Robotics is a multidisciplinary field. It consist of electronics, nanotechnology, AI, ML and many others. Robotics is a machines man-made. It can perform like human, even imitate behavior and movements. Discussions focusing on advancements in robotic technology highlight the implications of robots for jobs and the workforce. High optimism about the opportunities for training and learning, arise from the presence of robotics in HRM.

Scope of work on robotics technology classified into collaboration robot-human, learning opportunities and job replacement. Studies on robotics technology predict that several jobs will be lost and replaced by robotics and automation. Skill-based jobs are most likely to experience the greatest impact (Chao&Kozlowski,1986). Humanoid robots, such as restaurant-serving robots and virtual assistant robots, will replace human frontline officer (Van Doorn,2017). But, Van Doorn (2017) also still state, this conditions characterized by a need for empathy, the requirement for creative and original solutions, or requirement of high-level social intelligence. These conditions are at low risk of being replaced by robotics.

There are a need to combine robotics technology with human capabilities to develop human-centric solutions. In this condition, educated and skilled officer are required for this symbiosis. Collaboration between robots and humans harness existing opportunities and mitigate potential threats (Aleksander, 2017). Jonson (2018) underlining that human knowledge still remain a vital component, although robotics can enhance precision and reduce human error.

Literatur Review Framework

Based on the thematic analysis that has been described, the following framework is made:

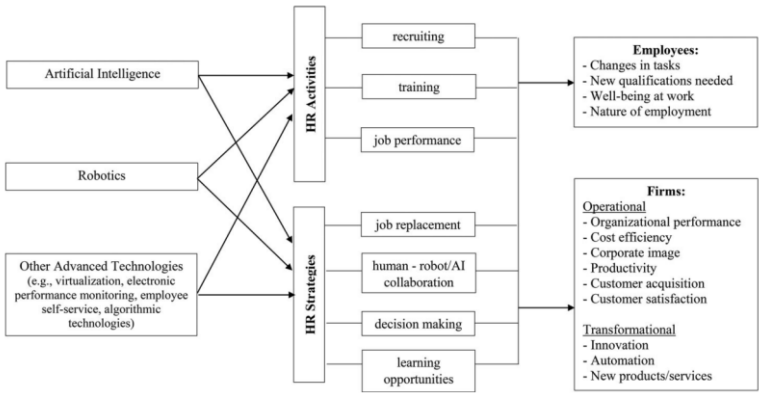

Figure 1. Literatur Review Framework

Grand Theory and Theoritic Implication

The grand theory underlying the analysis of HRM in this paper is management. Meanwhile, the middle-range theory is HRM. The grand theory underlying AI is expert systems, with the middle-range theory being artificial intelligence. One of its application domains is robotics. The difference in these grand theories underscores the statement that initially AI and HRM were two separate research streams.

Observing the HRM functions as middle-range theory and AI as a subdivision of expert systems, it is evident that AI has deeply penetrated the HRM functions. Out of the 11 HRM functions, namely 1) planning; 2) organizing; 3) directing; 4) controlling; 5) staffing; 6) development; 7) compensation; 8) integration; 9) maintenance; 10) discipline; and 11) termination, only the development function (point 6) has not been found to be discussed in the articles.

At the applied level, AI has started to venture into the realm of customer service, with robotics playing a significant role. Supported by the rapid development of information technology and the availability of seemingly unlimited data, the potential for robotics to perform HRM functions is no longer a mere dream or impossibility.

There are several theoretical implications that need to be underlined, namely 1) decision-making theory. AI algorithms and expert systems have facilitated better decision-making processes. Thereby increasing the accuracy of decision making by less competent HR managers and eliminating decision-making time. 2) AI and advanced technology is a multifaceted theme that closely related to various disciplines. Therefore, it is advisable to study it by adopting a multidisciplinary approach. 3) involves moral and ethical theory. Several researchers have analyzed ethical aspect in decision-making process and the factors influence how employees accept AI technology. 4) involves risk management theory. The development of AI in HRM requires a complex process and must concider all the challenges and risk that may occur.

Grand theory tabulation and its implications can be seen below.

Tabel 1. Grand Theory

Grand Teori	Expert System	Management		Moral
Middle Range	AI	HRM	Risk	Ethics
Applied	Robotics			Business ethics

CONCLUSION

There are 2 (two) reasons for the absence of standardized definition of AI in HRM, namely inadequate understanding of potential AI in HRM. There are still several different approaches among researchers.

So many AI applications HRM has brought about radical changes in HRM practices. AI has established a new management pattern in HRM, from start to finish.

AI adoption strategy in HRM still faces high uncertainty. This is because managers are still waiting for the results of research on the determinants of successful AI implementation. Within the scope of development, no papers clearly state with considerations about strategy of adoption for AI in HRM.

The presence of robotics in HRM has made many positive contributions. On the other hand, it also creates new anxiety and uncertainty about the future of HRM. It takes a creative mindset to turn robotics threats into opportunities.

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