# Volume 11, Issue 10, October 2023

# International Journal of Advance Research in Computer Science and Management Studies

Research Article / Survey Paper / Case Study Available online at: www.ijarcsms.com

A Monthly Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories

Artificial Intelligence and Recruitment: Identifying Future Research Agenda using PRISMA Framework

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Abstract: Technology use is pervasive and significantly alters how some tasks are carried out. The transition from desktop computers used in businesses to mobile gadgets like smartphones and PDAs is evidence of the change brought on by advanced technical advancement. The launch of the 4G network and the subsequent influenza epidemic enhanced the use of AI tools, such as Alexa by Amazon or Google Assistant by Google, and made them a staple of modern life. The growth of AI and automation has automated the workforce's repetitive and boring labor tasks, giving them more time to focus on developing their skills. A PRISMA framework is used in the current study to offer a literature review on the effect of artificial intelligence (AI) on recruitment. The Scopus database was utilized to access 38 publications published between 2013 and 2023 that focused on the effects of automation, robotics, and artificial intelligence on hiring. According to the user, John McCarthy's term ''artificial intelligence'' might mean several things. Typically, it refers to the extensive use of technological equipment to carry out tasks that were previously completed by humans. Even though AI has made many significant contributions to the productivity and efficiency of an organization, it also has some drawbacks that cannot be ignored. It is anticipated that AI will soon supplant people. Simply, it has been perceived as a negative aspect of technology that has caused a significant decrease in the hiring process & unemployment.

Keywords: Artificial Intelligence (AI), Automation, Unemployment, Recruitment.

# I. INTRODUCTION

# 1.1 Artificial Intelligence (AI)

As the Internet has grown, everything in our surroundings has given way to electronic substitutes, changing the way we live. The development of the Internet has altered how we live, with electronic alternatives taking the place of everything in our environment. Artificial intelligence (AI) and automation are two examples of recent technological developments that are gaining popularity. The blazing flame of technology has not spared any area. AI is the biggest innovation the world has ever seen. AI is therefore the possibility for cutting-edge technology to have intellect comparable to that of a person. In other words, it is capable of making decisions in a similar way to how people do. However, different areas have defined AI differently based on their needs (Wang, 2019). John McCarthy, the pioneer of artificial intelligence, stated that "artificial intelligence is the science and engineering of making intelligent machines, brilliant computer programs" (Hemalatha, 2022). The creation of computer-based systems that can replicate human intellect and perform specialized activities without requiring human involvement is the aim of AI development (Gupta, 2022). The use of AI is far broader than merely robots; it has much more to

offer. There is no denying that Artificial Intelligence has a future. It will always be there (Hemalatha, 2022). Whether intentionally or not, it has invaded personal space, which may occasionally be a source of intimidation.

It is essential to have more knowledge about the various forms of AI before continuing. Natural language processing, machine learning, and robotics are sometimes mistaken for artificial intelligence, but they are subfields. The kinds listed below make it easier to determine how much AI is employed.

- Weak/ Narrow AI: The most prevalent and basic of the three forms of AI is weak/narrow AI. Weak AI is what is commonly seen in everyday situations. It confines itself to a certain region by emphasizing one or more specialized areas at once. (Goertzel,2014) Its primary duty is to carry out a single designated task successfully. heavily involved in modeling human cognition using patterns & predictions. Being categorized as weak doesn't indicate that a form's powers are necessarily inferior to those of other forms; rather, it only signifies that it emphasizes a certain duty.
- General/Strong AI: This type of AI might be compared to human intelligence in that it is capable of thinking, problemsolving, and analysis in a similar way to humans. However, as it is lacking on the emotional and intuitive fronts, it cannot fully subjugate humanity. (Kurzweil, 2014) described AI as a comprehensive solution that provides a wealth of human intellect. It has a long way to go before it reaches its full potential.
- Super AI: At this time, super artificial intelligence is more of a theory, an assumption based on study, since no one can affirm with certainty if it will exist in the future or how it will develop (HEMALATHA, 2022). This is such that super AI, as described by Bostrom, can even exceed the most brilliant human mind on the planet in terms of cognitive ability (Thorn, 2015). Indeed, every time such revolutionary technology is created, human life is put at risk. According to a poll by Muller and Bostrom, 35% of specialists believed that Super AI posed an existential threat to the general populace.

## **1.2** Automation

The concept "automation" comes from the Greek phrase "automatos," which means "acting for oneself" and, in turn, refers to something that runs independently of human intervention. Therefore, it is the technology that enables a process to be carried out with the least amount of human help (Groover, 2014). The process of replacing humans working on systems and equipment with automated technologies controlled by computers is also known by other names such as robotization, industrial automation, numerical control, and self-study. It demands that workplaces be mechanized permanently.

It operates so that all electronics and computer-based systems are used through procedures that are set up by instructional programs, and it is combined with automatic control to guarantee that instructions are followed correctly (Gupta, 2022). It is thought that Ford Motors was where it first became popular. Automation is the process of converting every piece of mechanical equipment into a reliable production line (Nozari, 2021).

Automation would steadily increase productivity and efficiency at work, improving living standards worldwide (Dabik, 2022). It is, in fact, a gift from scientific cultivation. However, the very fact that it does away with people from the workplace seems like the end of the worried workforce. Since a large portion of the process would become automatic, the operators would be wholly unnecessary. However, full mechanization is still not feasible since some capabilities are needed for intuitive responses, which is where cutting-edge technology still lags.

# **1.3 Recruitment**

Automation, artificial intelligence (AI), digitalization, and robotization are disrupting the labor market. This is a doubleedged sword since, on the one hand, it has increased entrepreneurship and output while, on the other, it has made millions of people unemployed. Previous predictions that AI will increase employment prospects turned out to be false (Frey and Osborne, 2017; Winick, 2018; Gruetzemacheret et al., 2020). Instead, it caused polarization and hurt the non-technical population. Lowskilled workers are the easiest prey, and they are the only ones who can survive in a climate that is always changing. Automation, artificial intelligence (AI), digitalization, and robotization are disrupting the labor market and are mostly utilized in hiring, training, employee engagement, and retention, which assists in lowering costs, saving time, and accurately accomplishing HR duties (McDonald et al. 2017; Pillai and Sivathanu 2020). According to Edwin B. Flippo, "The concept of Recruitment is to seek out prospective employees and motivate them to submit applications for positions within the organization is a crucial personnel role.

Work that was previously done by people can be done more effectively by artificial intelligence or human-like intelligence. With the assistance of both machines and algorithms, it can address human problems. It poses a danger to occupations since it can manage and evaluate massive volumes of data in a split second (McClure, 2018; Rust and Huang, 2014). According to Huang and Rust (2018), researchers, AI cannot completely replace humans since it lacks intuitive and sympathetic intelligence. But as the fourth industrial revolution (industry 4.0) has progressed, the internet and smart gadgets have replaced and are still replacing humans in several sectors, including IT, manufacturing, and customer service. It will soon affect transportation employees' employment prospects as well.

Previously performed quality inspections by people are now carried out by machines. The bank teller position has been replaced by ATMs. Customer assistance has been replaced with a chatbot. The list above is not comprehensive and merely scratches the surface. In previous industrial revolutions, machines displaced blue-collar workers, but with Industry 4.0, the middle hierarchy has been devoured and white-collar employees are mostly replaced by robots or other technology applications.

#### 1.4 Impact of AI, Robotization, and Automation on Recruitment:

The rise of the gig economy, the decline in employment prospects, and the polarization of the workforce have been shown as the negative effects of AI.

- Gig Economy: These results in the direct result of automation, digitalization, robotization, artificial intelligence (AI), and automation. Nowadays, businesses prefer to recruit contract workers over permanent ones since it is simple to hire and dismiss highly competent contractual workers who are eager to work for any pay scale under any circumstance to avoid unemployment.
- Work Polarization: It is the shrinking of middle-skilled occupations in favor of high-skilled jobs, according to Kuriakise & Iyer (2020). Because AI has separated job scenarios into two categories—highly skilled or low-skilled—it represents the dark side of AI.
- Reduction in Recruitment: Asch agreed with Riley that economics is a significant influence. According to them, military recruiting becomes much harder to enlist the kind of people which results in a very low unemployment rate.

This research attempted to define the terms automation, robotization, and artificial intelligence by a thorough assessment of the literature. A description of the methodology used in this investigation comes next. A commentary is offered along with the results. The researcher concludes by making a few closing observations and suggestions for more study.

# **II. RESEARCH METHODOLOGY**

This study presents the literature on the Impact of Artificial Intelligence on Recruitment. Data for this review article was gathered from Science Direct using the keywords automation, robotization, and recruitment on 3<sup>rd</sup> September 2023. The Preferred Reporting Items for Systematic Literature Review (PRISMA) approach based on four steps: Identification, Screening, Eligibility, and Included was adopted for the selection of final records for systematic review. Under the screening stage exclusion and inclusion criteria were followed. The articles obtained by using filters like Open access; 2013–2023; Research

Articles; Business, Management, and Accounting; Journal connected to Business Research were employed in the numerous steps of data filtering, and 38 articles were included out of the 12368 original records. The researcher wants to do research in the management field so the Business Research Journal is appropriate for this type of study.

After identifying articles for systematic review description of literature based on year and citation was presented through charts. Literature was presented in both ways: author-centric (Review summary table) and content-centric (Content analysis).



**Description of Literature** 

Table 1: Year- Wise Publication

Year	No. of Publications		
2020	2		
2021	4		
2022	10		
2023	22		

Source: Science Direct Database





Source: Processed through MS Excel (Secondary Data)

Chart 1 of the year base presented the number of publications related to the search term mentioned in the methods section. According to Table 1, 2023 saw the most research completed, followed by 2022 and 2021, with the least amount of studies completed in 2020.



**Chart 2: Citation Base** 

**Chart 2** of citation shows that the most cited article (267 times) titled "Corporate digital responsibility" was authored by Lobschat et.al. (2021). The second most cited article included in the study was authored by Black and Esch (2019) and titled "AI-enabled recruiting: What is it and how should a manager use it?" with citation 243. Geetha and Reddy's (2018) article "Recruitment through Artificial Intelligence: A Conceptual Study" was found third most cited article with 138 citations. The fourth article got 135 citations and the fifth article was cited 98 times.

# III. LITERATURE ANALYSIS AND FINDINGS

Initially, an author-centric analysis of the literature was done followed by content analysis. Below table 1 presents the summary of articles included in the study by following author centric approach.

Authors	Title	Contribution	Cited by
Olan et. al. (2015)	Artificial intelligence and knowledge sharing: Contributing factors to organizational performance	The application of fuzzy set theory in this research is supported by the conceptualizations of artificial intelligence, knowledge sharing (KS), and organizational performance (OP). The findings implied that using AI technologies on their own is insufficient to boost organizational performance.	61
Geetha and Reddy (2018)	Recruitment through Artificial Intelligence: A Conceptual Study	The goal of this study was to investigate how AI affects recruitment tactics. The report shed insight into the AI recruiting strategies employed by businesses. This study only used secondary sources of information to explore the idea further.	138
Nawaz (2019)	How Far have we come with the study of Artificial Intelligence for the Recruitment Process	A thorough review of papers was carried out to evaluate the uses of artificial intelligence (AI) in the employment process and their real-world implications. By creating a more thorough grasp of the topic and related domains, the findings support research on AI- based hiring practices.	50
Black and Esch (2019)	AI-enabled recruiting: What is it and how should a manager use it?	The researcher discussed the causes of development in this study. This paper gave details about the crucial strategic actions taken by managers to reap the benefits of AI-enabled recruitment systems, as well as the pressures that have turned them from desirable to required.	243
Oswal et.al. (2020)	Recruitment in the era of Industry 4.0: Use of Artificial Intelligence In Recruitment and its Impact	This research looked at the use of AI applications throughout the employment process. The study covered the effects of using AI and the benefits of digital recruiting over traditional recruiting. The study's sole foundation was an examination of several theoretical frameworks.	24
Votto et. al. (2021)	Artificial Intelligence in Tactical Human Resource Management: A Systematic Literature Review	The literature and published sources considered in this study address the usage of AI in HRM. The tactical HRIS (T-HRIS) components were identified by the researcher using a systematic literature review technique, and each T-HRIS component's representation was examined. This paper revealed that the tactical HRM/HRIS component is prioritized and highlights the need for more research to determine future research priorities.	93
Allal- Cherif et. al. (2021)	Intelligent recruitment: How to identify, select, and retain talents from around the world using artificial intelligence	This study looked at the role that digital technologies play in locating, choosing, and keeping talented workers throughout the recruiting process. Grounded theory, participant observation, and the gathering of qualitative data served as the technique's foundation. These technologies include (1) a social network with LinkedIn; (2) a MOOC with Udacity; (3) a serious game called Reveal from L'Oréal; (4) a chatbot named Ari from Text Recruit; and (5) a massive data analysis matching system with Randstad. tech. hiring. Managerial recommendations were created to help employers execute e-recruitment	85

Lobschat et.al. (2021)	Corporate digital responsibility	The researcher suggested that as digital technology and related data become more common, ethical issues start to surface. Researcher broadened their conversation by emphasizing the managerial implementation of CDR-compliant behavior from an organizational culture viewpoint. Future research possibilities were opened up by their approach, particularly in terms of relevant antecedents and outcomes. From a managerial perspective, this paper provides the first insight into how the CDR-related shared	267
		values and norms of an organization might be converted into instructions that users can follow.	
Pereira et. al. (2021)	A systematic literature review on the impact of artificial intelligence on workplace outcomes: A multi- process perspective	This was the first systematic review to investigate the link between job outcomes and artificial intelligence. The primary facets of human resource management and the 'antecedents, phenomenon, outcomes' process framework were used by the researcher to conduct a study on the relationship between AI and workplace outcomes at various levels of analysis.	98
Kaushal et. al. (2021)	Artificial intelligence and HRM: identifying future research Agenda using systematic literature review and bibliometric analysis	In the context of numerous organizational roles and practices, this research sought to identify key contributions, current dynamics, domains, and advocates for future study paths in integrating artificial intelligence (AI) with human resource management (HRM). To find existing research on this topic, the authors used a technique that included bibliometric, network, and content analysis (CA) on a sample of 344 documents taken from the Scopus database. A thorough literature study was conducted in addition to the bibliometric analysis to suggest the Artificial Intelligence and Human Resource Management Integration (AIHRMI) framework.	29
Delecraz et. al. (2022)	Responsible Artificial Intelligence in Human Resources Technology: An innovative inclusive and fair by-design matching algorithm for job recruitment purposes	This study introduced a unique machine learning-based employment matching technique and applied a fair-by-design approach to algorithm building. The researcher talked about how fairness ought to be a top priority in HRM and highlighted the important issues and research gaps that come up while creating algorithmic solutions to match job hopefuls with offers. The model that was provided was the initial stage in the process of making sure that the outcomes of machine learning algorithms used for hiring jobs were fair.	11
Hopkins and Schwanen (2022)	Recruiting research participants for transport research: Reflections from studies on autonomous vehicles in the UK	This study depends on participants' willingness to take part in the planned activities, including interviews, surveys, diary writing, and photo taking, regardless of whether they are compensated for it. Three interconnected methodological issues were addressed in this viewpoint: locating and gaining access to participants; participant self-selection and identification within the context of the research; and topical weariness. This study talked about these issues in light of current changes in transportation, particularly the emergence of driverless cars.	4
Rampersad (2022)	Robot will take your job: Innovation for an era of artificial intelligence	The main goal of this study was to pinpoint the key factors influencing students' creativity. In contrast to past research that has been mostly qualitative or based on a single snapshot, this quantitative, longitudinal study examines student abilities before and after participation in a placement at a business. After that, skills before and after placement were compared using confirmatory factor analysis. The study found that the development of innovation, which was essential in the age of artificial intelligence, is greatly influenced by critical thinking, problem-solving, communication, and teamwork.	135
Opland et.al. (2022)	Employee-driven digital innovation: A systematic	The model described in this study of how digital innovation impacts organizations and society has been established via research. Through this thorough literature review, the researcher	64

	review and a research agenda	proposed the idea of employee-driven digital innovation and shed light on how employee-driven innovation and digital innovation interact. The findings indicated a rapidly developing field of research that was divided into two main lines of inquiry: one focused on the outcomes of employee-driven digital innovation, and the other on the use of digital technology to employee-driven innovation processes.	
Volkmar et. al. (2022)	Artificial Intelligence and Machine Learning: Exploring drivers, barriers, and future developments in marketing management	The researcher used a mixed-method approach (a Delphi study, a survey, and two focus groups), and they came up with several research hypotheses that addressed the issues that marketing managers and organizations face in three different areas: (1) Culture, Strategy, and Implementation; (2) Decision-Making and Ethics; and (3) Customer Management. The results sought to encourage multidisciplinary research spanning marketing, organizational behavior, psychology, and ethics and helped to a deeper understanding of the human aspect driving AI and ML.	22
Hunkenschroer and Luetge (2022)	Ethics of AI- Enabled Recruiting and Selection: A Review and Research Agenda	This research conducted a thorough evaluation of the prior literature on the morality of AI-enabled recruiting. The researcher found 51 papers on the subject and summarized them by mapping the ethical possibilities, hazards, and ambiguities as well as the suggested strategies for reducing ethical risks in actual practice.	80
Horodyski (2023)	Recruiter's perception of artificial intelligence (AI)- based tools in recruitment	This study extended the unified theory of acceptance and application of technology (UTAUT) to incorporate the frequency of AI usage and education to investigate recruiters' intentions to utilize AI. Data were collected from a web-based survey with 238 demographically balanced participants. Hierarchical regression analysis was used for data analysis and hypothesis testing. The results showed that behavioral intention was significantly and positively influenced by performance expectancy, an aspect of the UTAUT that was extended to include the frequency of AI use and education.	3
Hajkowicz et. al. (2023)	Artificial intelligence adoption in the physical sciences, natural sciences, life sciences, social sciences and the arts and humanities: A bibliometric analysis of research publications from 1960-2021	In this analysis, the researcher looked at how AI technology was adopted globally in 333 different scientific topics between 1960 and 2021. The Lens database's 137 million peer-reviewed papers were used for the bibliometric study that was used to achieve this. They use 214 terms from the Organisation for Economic Cooperation and Development (OECD) glossary to define artificial intelligence. They discovered that, throughout the study, 3.1 million of the 137 million peer-reviewed research publications dealt with AI, with the use of AI increasing recently in almost all research fields (physical science, natural science, life science, social science, and the arts and humanities).	1
Ameen et.al. (2023)	It's part of the "new normal": Does a global pandemic change employees' perception of teleworking?	This study fills a significant information gap about how employees viewed teleworking before, during, and following the COVID-19 epidemic. The information received from 483 workers was used to construct and empirically test a novel model that incorporates task-technology fit and work/family border theories. According to the research, social well-being, work-family balance, and task-technology fit during the pandemic all benefited from teleworking performance. Additionally, this study provides proof of the moderating effects of the causes causing the digital gap in this situation.	3
Vomberg et. al. (2023)	The cold-start problem in nascent AI strategy: Kickstarting data network effects	The researcher examined how the CSP in developing AI strategy may be understood in terms of its technological and economic characteristics, and finally be overcome to begin a positive feedback loop of data NEs. This was done by analyzing the CSP in this paper. By drawing inferences from the corpus of prior literature and practitioner interviews, this study established a research agenda to inspire more investigations toward overcoming the CSP.	0

	1		
Rodgers et. al. (2023)	An artificial	In the context of algorithmic human resource management, this	
	intelligence	study developed a foundation for a throughput model that	
	algorithmic	describes people's decision-making processes. To address	
	approach to ethical	questions about the impact and acceptance of artificial intelligence	20
	decision-making in	(AI) integration in HRM, this study used multidisciplinary	29
	human resource	theoretical lenses, such as those that concentrate on AI-augmented	
	management	(HRM(AI)) and HRM(AI) assimilation processes, AI-mediated	
	processes	social exchange, and the judgment and choice literature.	
Murugesan et. al.	A study of	This research showed how AI is influencing HR digitization and	
(2023)	Artificial	industry practices 4.0. Three aspects of HR preparedness and five	
	Intelligence	AI applications in HR capacities were the focus of this review,	
	impacts on Human	which included 271 HR professionals from the industrial,	
	Resource	information technology (IT), and administration sectors. The data	7
	Digitalization in	was analyzed using the Analysis of Moment Structures (AMOS)	
	Industry 4.0	program and the Statistical Package for Social Sciences (SPSS)	
	-	tool. The results demonstrated that investigating hierarchical	
		organization is essential for attaining long-term growth.	
Nanath and Onley	An investigation of	This study focused on a particular case of online recruitment fraud	
(2023)	crowdsourcing	(ORF) and investigated several machine-learning techniques. The	
	methods in	article looked at several crowdsourcing techniques (examined	
	enhancing the	online as human signals) that were evaluated using the same ML	2
	machine learning	algorithms to see how well they could detect bogus job posts. By	Z
	approach for	contrasting hybrid machine learning and crowdsourcing input	
	detecting online	models, the testing was done. This study showed that the hybrid	
	recruitment fraud	model and automated model used distinct optimal ML algorithms.	
	Sources Com	riled by the researcher based on a review of the literature	

Source: Compiled by the researcher based on a review of the literature

After presenting author centric review, content analysis was done and four key themes were identified.

#### **Digital Technology**

Frisk and Bannister (2017) talked about how rapidly advancing digital technologies are still using creative methods to gather and analyze data. Such specific CDR guidelines should direct the organization's actions around what is proper and inappropriate for the development and deployment of digital technology and data (Maignan & Ferrell, 2004). To get CDR, managers and staff members of a company must match their behavior with certain standards set by the organization. Achieving corporate objectives has been made possible by digital technology, whose widespread impacts have allowed whole industries to change (Nylen and Holmstrom, 2015), giving rise to creative goods, services, procedures, and business models.

#### **Employee Engagement**

AI technology helps to lower costs, save time, and accomplish HR duties more effectively. It is mostly utilized in recruitment, training, employee engagement, and employee retention (McDonald et al. 2017; Pillai and Sivathanu 2020). Relevant and applicable datasets are necessary for decision-making. In this particular setting, HRM accountability and involvement in the evaluation and enhancement of employees' performance are influenced by data literacy, the size of the data sets, and the integration of external data. (Bekken, 2019; Tambe et al., 2019).

#### **Employee Performance**

(Guest, 2002; Naithani, 2010) have demonstrated a good direct association between work-life balance and job performance. Therefore, by demonstrating that work-life balance enhances employees' teleworking performance, our findings add to the body of research on teleworking and work-life balance conducted before the pandemic (Dima et al., 2019; Akbari & Hopkins, 2019; Thulin et al., 2019). In a way that challenges our knowledge of HRM ideas and practices, Duggan et al. (2020) emphasize algorithm management that facilitates work interactions via incentives, HRM access to online platforms, dispute mediation, and app-focused performance.

#### **HRM Practices**

Organizational evolution is significantly impacted by the use of intelligent and well-organized approaches in HRM and people processes inside an organization, according to Mehrabad and Brojeny's 2007 conclusion. Workers' opinions of AI tools as having high degrees of accuracy and up-to-date information (Nguyen & Malik, 2021a) indicate that for HRM practitioners to utilize these tools effectively, it is necessary to thoroughly investigate the ethical implications of these views.

#### **IV. RESEARCH GAPS**

From diverse angles and across various periods, several scholars from various nations have investigated artificial intelligence. Divergent perspectives on AI, including its effects on sustainability, the environment, entrepreneurship, workplace flexibility, freelancing, and emotional intelligence, have been offered by a thorough examination of the current literature, however, there is little research on the effects of AI on hiring. As a result, we have attempted to explain how artificial intelligence has affected the human resources industry, particularly the idea of recruiting.

#### V. CONCLUSION

The working environment has changed due to artificial intelligence (AI), a forerunner of Industry 4.0, robotization, automation, and cutting-edge technology. Modern technology is always establishing new standards for effectiveness and efficiency. Unquestionably, AI has demonstrated its value in terms of improved performance, but it has also caused people to express concerns about their hiring. The employment stability of earlier times has gradually been taken away by fast modernization. Even current skill updates on schedule are no longer enough to guarantee job security as a recruiter. But AI is a double-edged sword, and its application in the workplace comes with its own set of risks.

#### VI. LIMITATION OF THE STUDY

The study's limitation is that, despite the advances achieved in the field, it still has several problems. First off, the present analysis only took into account 38 open-access publications from the Science Direct database that were published between 2013 and 2023. The major limitation of this study was time, which forced the analysis of a few related papers. Second, there is a need for more research because several human resources-related factors were neglected.

#### **VII. FEATURE SCOPE**

The thorough study identifies several crucial areas for future research. To identify new subjects, the researchers first mapped the trend of publishing by year, disciplinary distribution, and keyword and content analysis. The study themes are divided into four categories: technological advancements in AI, impact, and strategic use of AI technology. There are several potential issues in each dimension that need more research. For instance, the first dimension includes a variety of AI-based technologies. Such cutting-edge technology for data collection, storage, and analysis supports the integration of diverse HRM operations. Companies may now attain and use the potential of collective intelligence thanks to current research.

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