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## Review Article

# Artificial intelligence and human capital: A review

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### ABSTRACT

Artificial Intelligence (AI) has primarily impacted the global human capital. The human capital has been elucidated, focusing on their developing relationship with AI. The complex facets of human capital, including aptitude, proficiency, and competence, have been examined in this review, concentrating on the intricate association between AI and human capital. A secondary data analysis was conducted for this study, incorporating 16 studies that were meticulously chosen from online search engines. Key search words such as "Human Capital and AI" and "AI and Human Resource Management" were employed for collecting the articles. Compelling data was extracted from these articles to uncover the linkage between AI and human capital. The study yielded both affirmative and negative outcomes following a thorough review of articles. The research identified major concerns associated with AI-powered HR processes concerning bias, fairness, privacy, and security. It underscores the urgency for incorporating responsible AI practices and harnessing the potential of AI while mitigating risks and ensuring equitable human capital development. The connection between AI and human capital provides an invaluable resource for researchers, practitioners, and policymakers navigating the evolving landscape of workforce development in an era of AI-driven innovation.

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## 1. Introduction

Human capital, consisting of knowledge, skills, and competence possessed by the labour force, is crucial for economic growth and considered as the driving force of economic growth in economic growth theories (Aldieri et al., 2023). It refers to the inherent productive abilities of individuals that can be enhanced by investing in education, on-the-job training, and health (Eide & Showalter, 2010). Its per capita and human capital per worker is measures of human capital quality that represent the average human capital intensity for the total population and labour force, respectively.<sup>1-7</sup> Both measures impact current economic activities, while the human capital quality of the population

also affects future economic activities when younger generations enter the labour force (Xiong et al., 2021).

The term human capital is difficult to define and measure, and has been studied by social scientists from various perspectives. Its significance in economic well-being cannot be overstated. It includes knowledge, talents, skills, experience, intelligence, judgment, and wisdom possessed by individuals, and is a form of wealth that can be used to achieve national or state goals (Srivastava & Das, 2015). It has become an important indicator to boost economic growth (Jing, 2019).

Human capital refers to the accumulation of skills and talents within the workforce of a region, which can be measured through education and training. Human capital is not limited to formal education, but includes practical experience and non-traditional technical training. It has a

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positive impact on economic development (Ogunade, 2011).

AI involves making computers perform tasks that were previously limited to humans. Its rapid development has brought about changes in people's lifestyles, making it an important strategy for countries to enhance competitiveness and maintain security (Zhang & Lu, 2021).

AI is a recent critical development in electronic markets and a growing topic for information systems research. While some focus on creating AI to replace humans, information systems and decision support systems research prioritize using AI to support humans. Recent research on hybrid intelligence and human-AI collaboration aims to synthesize AI research across fields, achieve synergy and complementarity between human and artificial intelligence (Kühl et al., 2022).

We have gained understanding on human capital and AI. The review concentrates on the relationship between AI and human capital.

## 2. Materials and Methods

A secondary analysis of the data was conducted in the present study. Sixteen articles were included to explore the link between AI and Human Capital. The analysis was conducted following a four-step process:<sup>1</sup> Defining the objective of the study,<sup>2</sup> Conducting a thorough search using online search engines with specific keywords such as "Human Capital and AI" and "AI and Human Resource Management"<sup>3</sup> Shortlisting articles based on relevance and<sup>4</sup> Analysing each of the 16 chosen articles in-depth. The data obtained from the secondary analysis was utilized to evaluate the scope of AI in human capital, investigate trends, and identify challenges.

## 3. Results and Discussion

### 3.1. AI and human capital: The following literatures are linking with AI and human capital

A recent study explored the use of artificial intelligence to identify suitable candidates for specific positions and create cohesive teams with aligned goals. The research utilized machine-learning models to cluster and analyse personality traits of applicants to determine weaknesses and strengths. The study used a publicly available dataset of Big-Five personality traits, with pre-processing and Pearson's correlation testing applied. Results indicated a positive correlation between agreeableness, conscientiousness, extraversion, and openness, and a negative correlation with neuroticism. K-means clustering was performed to label the dataset, and supervised machine-learning models, including random forest (RF), support vector machine (SVM), K-nearest neighbour (KNN), and AdaBoost, were applied to classify applicants. The SVM model had an accuracy of 98%, outperforming other models, and the study contributes to the literature on the application of artificial intelligence

in human-resource management. This research may benefit companies, organizations, and human-resource executives seeking to improve their hiring decisions and team cohesion (Ammer et al., 2023a).

A research on how human capital and the use of artificial intelligence in the fourth industrial revolution augment the relationship between them took a qualitative approach and analysed 79 relevant articles for the proposed model's variables. The findings suggest that humans should be re-educated and trained to take on the roles that artificial intelligence requires. In industrial revolutions, jobs may disappear, but other positions will arise where human skills like judgment, knowledge, decision making, and critical thinking outperform automation (Huertas-Lopez et al., 2021).

A study on AI's contributions to HR digitalization and practices, focusing on five AI applications and three HR readiness elements examined the input of 271 HR experts in IT, manufacturing, and administration, the data was analysed through SPSS and AMOS. Results indicate a fundamental role for organizational analysis in acquiring sustainable development, with adaptability and human capability supported by AI applications. (Murugesan et al., 2023).

A study applying data-labelling techniques, were used to identify an applicant's weaknesses and strengths. This contributed to the development of artificial intelligence in human-resource management, which can positively impact companies and organizations in selecting the right individuals while achieving their goals (Ammer et al., 2023b).

AI is a computer science field that aims to solve human intelligence and cognitive problems. It gives machines the ability to think like humans, perform tasks such as problem-solving, learning, reasoning, and language processing and is driven by two basic technologies- machine learning and deep learning. Integrating AI intelligence with human resource management can help companies save costs, improve the quality of talent, and enhance the effectiveness of employee team plans. The study offers a new approach to human resource management in the age of AI, emphasizing its impact on human resource management (Balu & Sowmya, 2022).

A study aimed to establish best practices for integrating human capital with artificial intelligence in organizations revealed that artificial intelligence has become a new category of human capital. Additionally, there needs to be a transformation of job processes and position redesigns to enable collaboration between employees and technology for more efficient outcomes (Burton, 2019).

Use of machine learning in knowledge-based industries and the biases that can arise from ML predictions study conducted an observational and experimental analysis in the patent examination context and found that ML is biased

towards finding prior art textually similar to focal claims and that domain expertise is needed to find the most relevant prior art. It also highlights the importance of vintage-specific skills and discusses the implications for artificial intelligence and strategic management of human capital (Starr & Agarwal, 2020).

Study on the implementation of artificial intelligence in human resources, as most companies in the IT industry are using it for various purposes, such as automating recruitment, performance appraisal and administering employee benefits.<sup>5–11</sup> The aim is to improve overall employee experience, as leaders and executives believe that integrating AI into HR functions could increase efficiency. It provides examples of top companies using AI and explores the challenges and limitations they face in implementing this technology. Finally, the study provides insights into the future of AI in human resources (Verma & Bandi, 2019).

The article on challenges associated with using data science techniques for HR tasks proposes three principles to address: causal reasoning, randomization and experiments, and employee contribution (Tambe et al., 2019).

More advanced generative AI tools have escalated the "AI arms race," creating uncertainty for workers while expanding business applications and heightening risks related to well-being, bias, misinformation, privacy, ethics, and security.<sup>12–19</sup> These research pathways to extend HRM scholarship in the realm of generative AI, contributing to shaping the future of HRM research (Budhwar et al., 2023).

The usage of Machine Learning is prevalent in Human Resources to automate processes, enhance decision making, and improve efficiency. However, the lack of interpretability may hinder its efficacy in Human Resources, as transparency is crucial in decision-making affecting people's lives directly. A study applies Anchors, a model-agnostic post-hoc explanation technique, to a Human Resources dataset. The results suggest that by using Anchors, Decision Makers can act prescriptively and retain valuable resources, with each decision easily interpretable by a non-expert (Abonamah et al., 2022).

The study on the influence of AI (Machine Learning Algorithm, Deep Learning and Big Data) on Human Capital Management in Indonesia aimed to examine the effects of AI on Human Capital Management.<sup>20–23</sup> The results indicated that the adoption of Deep Learning and Big Data had a significant positive impact on Human Capital Management (Purwaamijaya & Prasetyo, 2022).

Impact of AI on economic growth and household utility study in both short and long run finds that the development of AI can increase economic growth and household short-run utility if it leads to rising productivity in the goods or AI sector. The study also finds that the long-term effects of AI on household welfare are uncertain (Purwaamijaya & Prasetyo, 2022).

### 3.2. Trends and challenges of AI and human capital

In the digital economy's fresh regulations are demanded to impede a further escalation of the market's concentration, guarantee suitable data protection and privacy, and assist in sharing the advantages of productivity growth through the combination of profit sharing, (digital) capital taxation, and a curtailment of working hours. The paper advocates for a moderately affirmative outlook on the opportunities and hazards brought about by artificial intelligence, provided they are squeezed in light of these technologies' distinctive features by policy-makers and social partners (Ernst et al., 2018).

A review article endeavours to present a comprehensive portrayal of contemporary deliberations in the field of social sciences regarding the foreseen effect of artificial intelligence on the domain of labour. The topics encapsulated comprise technological joblessness, algorithm-driven administration, platform-based labour, and the political aspects of AI-enabled work. The analysis is successful in identifying the principal scholarly and methodological viewpoints emphasize two determinants incentivizing the emergence and implementation of AI in the economy: the capitalist drive and the influence of nationalistic viewpoints (Deranty & Corbin, 2022).

A recent study employs a dataset spanning from 2005 to 2021, covering 24 high-tech developed countries, and explore the correlation between a country's Google Trend Index related to AI and its unemployment rate. Employing a dynamic panel data and GMM-system estimation approach, it accounts for the dynamic effect of unemployment and establish the effect of AI on it (Guliyev, 2023).

## 4. Findings and Future Scope

The aforementioned articles have examined the various linkages between artificial intelligence and human capital. The investigation delves into the intricate interplay between these two entities and illuminates their evolving relationship in contemporary society. The research reveals that AI is not an independent force but rather a transformative instrument that can significantly impact human capital. The argument forwarded by this study suggests that AI can positively contribute to the development of human capital.

### 4.1. Conclusion

To harness the potential of AI for human capital growth, it is crucial to prioritize learning and up skilling initiatives. Additionally, ethics is a fundamental element that must be considered concerning the connection between AI and human capital. Issues such as job transformation, research, and policy making should be actively discussed in the context of AI and human capital. The research underscores the importance of a proactive approach to AI integration that emphasizes continuous education, and strategic investments

for unlocking the full potential of AI in enhancing human capital in the digital era.

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None.

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