

The impact of applying artificial intelligence-based systems on human resource costs in the light of environmental challenges

Suhail Abdullah Al-Tamim¹, Majid Ahmed AL Anssari², Mohanad Dheyaa Al-Tameemi³

¹Department of Accounting, College of Administration & Economics, University of Basrah, Basrah, Iraq

²Accounting Department, Shatt Al-Arab University College, Basrah, Iraq

³College of Administration & Economics, University of Basrah, Basrah, Iraq

*Corresponding author E-mail: suh2001971@yahoo.com

Received Dec. 3, 2024

Revised Feb. 27, 2025

Accepted Mar. 3, 2025

Online Mar. 27, 2025

Abstract

This study aims to discover the impact of applying and analyzing artificial intelligence (AI) systems on cost in several companies across the energy, oil, and gas sectors. The information collected for this study was examined using a sample of executives, experts, management accountants, and engineers. A questionnaire was designed to investigate a random sample of 132 questionnaires. A statistically large impact was found on the relationship between systems based on artificial intelligence and the costs of human resources given the occurrence of certain environmental challenges. The implications of the study reveal a need to provide the knowledge and skills that are quite essential for creating new jobs among individuals working to apply artificial intelligence at work, in a way that helps them use smart technologies to evade the occurrence of certain nonconformities in reports and to undermine the undesirable effect on the decisions of the company and related parties involved.

© The Author 2025.

Published by ARDA.

Keywords: Artificial intelligence, Artificial intelligence-based systems, Human resource costs

1. Introduction

When the scientific and industrial revolutions began, the globe saw significant changes in several sectors. For instance, the field of technological advancement, and particularly the uses of artificial intelligence, is revolutionizing both society and human life. While the use of artificial intelligence (AI) become widespread at private and public levels, its supreme aim is to identify, describe, and classify human intelligence using creating programs [1, 2]. Since computers are highly intelligent machines that can execute a wide range of processes electronically and swiftly give users the data and knowledge they need to make decisions, they may mimic human conduct [3]. For that reason, artificial intelligence represents a modern generation of technologies. In the early 21st century, man started to deepen the field of machine learning and built models that could think and act in compliance with man's feelings and actions. Stated differently, the vast army of machines reflects a tremendous capacity for self-learning and accomplishing some of the tasks carried out by the human brain, such as creating and acquiring useful knowledge, making decisions, coming up with novel ideas or images, and recognizing multiple networks of relationships. Artificial intelligence comprises four different aspects: the

dimensions of intelligence, programming, research, and business [4, 5], a delegation that has emerged applications for artificial intelligence, and the multiple systems it contains. It can be used in managing human resources functions and costs, and in light of those developments in the field as mentioned above many challenges have emerged that hinder the application of these innovations, which require addressing them overcoming these challenges leads to increased efficiency, productivity, flexibility, security, and improved performance and achieving a competitive advantage for companies [6, 7]. New technologies based on artificial intelligence will also significantly transform current professional jobs within a very short period, software robots have automated processes and routine work. It will also play a major role in unfamiliar tasks, which dictate making decisions regarding intricate and novel situations [8]. Therefore, the current study seeks to address and clarify the impact. The use of intelligence shown by computer-based systems reduces human resources costs, as developments necessitate them these technologies result in similar developments in the procedures for these costs required by the nature of those developments.

1.1. Research problem

The technological revolution has massively contributed to altering the perception of several corporations concerning the way of planning and managing their own business. Because of that, this led to constructive effects on the conventional tasks of man resources, which are embodied in activities such as development, compensation, training, and recruitment. Even though artificial intelligence-based systems are not actually brand new, the implementation of such kinds of systems requires hard work to reach advanced stages along with the availability of sophisticated tools and skills to cope with such vast developments.

1.2. Research objectives

This study seeks to:

1. Identify artificial intelligence's nature and the systems based on it.
2. Identify the requirements for applying techniques of artificial intelligence.
3. Identify the relationship between artificial intelligence-based systems and the costs of human resources.
4. Identify the cons and pros of applying artificial intelligence-based systems.

1.3. Significance of the study

This study aims to understand the impact of artificial intelligence-based systems on human resource costs. Given the novelty of this topic and the limited number of existing research articles, this study is considered one of the few that have explored it. As a result, it can enhance theoretical understanding and provide information for future research on the topic of artificial intelligence and its effects on the costs of human resources.

1.4. Research hypotheses

Two primary hypotheses form the basis of this study:

H1: As the subsequent sub-hypotheses diverge from them, there is a statistically significant influence link between the artificial intelligence-based systems and the expenses of human resources:

There is a statistically significant relationship between artificial intelligence-based systems and [complete the sentence with the specific dependent variable or outcome being analyzed.

H1a: Recruitment and employment.

H1b: Training and development.

H1c: Compensation.

H2: When environmental difficulties are present, there is a statistically significant influence link between the cost of human resources and artificial intelligence-based systems.

2. Literature review

The integration of AI into human resource management (HRM) has garnered significant attention in recent years, particularly concerning its impact on human resource costs amidst environmental challenges. This section

reviews contemporary literature, focusing on the dual facets of AI's influence: the transformation of HR activities and the environmental implications of AI deployment.

AI's infusion into HRM has revolutionized traditional practices, offering both opportunities and challenges. In (2024) conducted a comprehensive analysis of AI's effects on HR activities, identifying five primary impacts: task automation, optimized HR data utilization, augmentation of human capabilities, redesign of work contexts, and transformation of social and relational work aspects. While AI streamlines the process and enhances decision-making efficiency, it also presents challenges such as potential job displacement and the necessity for upskilling employees to adapt to AI-enhanced roles. The study emphasizes the importance of preparing the HR triad employees, line managers, and HR professionals—for these technological shifts to harness AI's benefits effectively [9].

The environmental footprint of AI technologies has become a critical area of concern. The United Nations Environment Programmer (2024) highlights that the proliferation of AI infrastructure, particularly data centers, contributes significantly to electronic waste and consumes substantial water and energy resources. This environmental cost is exacerbated by the continuous demand for computational power required for AI operations, leading to increased greenhouse gas emissions. This report calls for the development of sustainable AI practices, including the optimization of data center efficiency and the adoption of renewable energy sources to mitigate AI's environmental impact [10]. Kate Crawford delves into the often-overlooked ecological consequences of AI in her work, "Atlas of AI." She elucidates how AI systems, from their inception to deployment, entail significant environmental costs, including resource extraction for hardware production and energy-intensive data processing. Crawford advocates for a comprehensive understanding of AI's material impacts, urging stakeholders to consider environmental sustainability in AI development and policy-making [11].

The deployment of AI in HRM and other sectors raises pertinent ethical and regulatory questions. Concerns about privacy, surveillance, and potential biases in AI-driven decision-making processes necessitate robust governance frameworks. A 2023 policy brief discusses the environmental and ethical challenges posed by AI, emphasizing the need for international cooperation to establish standards that ensure AI development aligns with environmental sustainability and ethical norms. The brief recommends the formation of expert commissions to explore AI's energy demands and environmental costs, aiming to balance the benefits of AI with its ecological and societal impacts [12].

The study examined how SMEs accomplish the size in central China has developed an intelligent transformation using the use of AI. Given the fact the distribution is not entirely comparable to resources, several restrictions were imposed on the intelligent transformation of this sort of company in comparison to technologically and economically cutting-edge companies. The study's focus revolves around identifying obstacles and drivers. This study indicated that a few external factors such as policy support market and weakness in external AI technology relevance along with internal factors such as organizational development needs, cost implementation, senior management involvement, human resources, and prevent smart transformation [13, 14]. The integration of AI into human resource management presents a complex interplay of opportunities and challenges. While AI has the potential to enhance efficiency and promote sustainability within organizations, it also brings forth significant environmental costs and ethical considerations. Addressing these challenges requires a multifaceted approach, including the development of sustainable AI practices, investment in digital skill development, and the establishment of robust regulatory frameworks to guide ethical AI deployment.

3. Methodology

Artificial intelligence (AI) refers to the ability of computer systems to replicate and execute functions similar to human intelligence, such as learning from past data and experiences, making decisions based on acquired knowledge, reasoning, and deduction, and accumulating knowledge to enhance performance and achieve objectives. AI is widely applied in various fields, including data science and analysis, image recognition,

machine translation, planning and decision-making, and automation systems [15]. AI is part of computer science or cloud computing that generates genetic algorithms, systems, and specialized programs [16]. Intelligence viewed as artificial intelligence is the most influential application of information technology, it is a technology that has undergone unparalleled development over the past decades. Technology like such, however, has been expressed as how machines react to unlike situations and stimuli or in ways that are in full compliance with how human beings start to respond to identical situations or stimuli. In this vein, machines can emerge in a way that can carefully make judgments or make reasonable decisions that are in harmony with human decision-making and judgment [17].

The various uses of artificial intelligence exemplify a paradigm shift in the way the relationship between companies and their customers is organized through the combination of the physical environment and the digital environment [18, 19]. Artificial intelligence aims to find new ways to extract information and develop the necessary methods for constructing and using information and maintaining it. It allows machines to process different kinds of information in a manner that is associated with human ways, to achieve a better understanding of the nature of human intelligence through simulation, which cannot be done by the human mind, let alone finding advanced ways to translate needs into programs that can be implemented [18].

There are two primary categories into which artificial intelligence is divided. First, there is weak artificial intelligence, which is entirely focused on a small number of activities that are either restricted or particular. One example would be the operation of driverless vehicles. Second, artificial general intelligence (sometimes referred to as powerful artificial intelligence). According to [20], strong intelligence is primarily capable of carrying out nearly all cognitive tasks in humans, engaging in creative expression, and learning problem-solving techniques. The utilization of artificial intelligence technology yields several advantages [21, 22]. The application of intelligence helps artificial technology increase the use of digital processes instead of physical processes, which allows for increased satisfaction with customers, improving an increasing d productivity, creating new business models, and reaching new markets. Moreover, improving the performance of operations and reshaping the commercial and organizational processes of companies and automation is considered one of the most important advantages resulting from the use of artificial intelligence [23]. It provides higher production and productivity rates in various sectors allows for the use of raw materials more efficiently and improved it improves the quality of products and reduces human errors. In addition, artificial intelligence can be used to help companies make better decisions, we conclude that there are many benefits to be gained when working with artificial intelligence techniques. This requires searching for means that help in achieving those benefits by providing the requirements or working with artificial intelligence applications and techniques.

3.1. Artificial intelligence-based systems

Expert systems are computer programs that can imitate how people think in various contexts. It works to solve problems and it can store the knowledge extracted from human experts; it can be used in accounting, especially in the areas of auditing, personal financial planning, and accounting administration [24]. In the auditing field, a valuable tool for accountants is the expert systems to improve the quality of auditing in several areas such as planning audit programs, evaluating internal control systems, and identifying risks auditing. For the personal financial planning field, the function of expert systems is represented by developing a plan to manage personal financial matters efficiently and effectively, along with managing expenses and income. Achieving sound borrowing, managing investments, organizing taxes, and regarding management accounting expert systems enhance financial analysis and decision-making processes in companies, and could provide expert systems with guidance in several areas, including cost analysis, forecasting, risk analysis, and management projects and quality as well as providing financial advice to improve work in companies.

3.2. Neural networks

The method of neural networks, in the field of artificial intelligence, teaches computers to process data in a way that is particularly motivated by the human brain. It demonstrates the capacity to learn in a computer program

through structural simulation by any automated device because of the neural network [25]. For robots to carry out the tasks that the human brain does, neural networks are necessary.

3.3. Robots

Robots deal with science and technology and are created to transfer materials, parts, tools, materials, or devices using several reprogrammable and programmed movements to implement diverse and different tasks. Robots are specially built and prepared with the facility to examine their atmosphere as humans do [26].

3.4. Fuzzy logic

Fuzzy logic deals with thinking processes that are like human thinking, as it usually takes a decision-making approach that includes a partial truth ranging from false to completely true. Fuzzy logic depends on fuzzy set theory, which shows that a single element is either a member of the set or is not a member of the set group. Since fuzzy logic is capable of automated judgment and decision-making, it is highly valuable for practical and commercial applications. Although it is not accurate, it may be acceptable [27]. We conclude from this that many systems are based on artificial intelligence, each of which has characteristics certain matters require their use in a way that suits the nature of the work and in a way that achieves significant benefit at the cost necessary to use it. Human capital is a vital element in the process of influencing the success of units operating in various sectors of economy and service, as the high level of human capital performance necessarily leads to an increase in the level of effectiveness of the units.

With the development of technology, it was necessary to exploit this development in the process of human resources management [28]. The process of exploiting technology and its applications serves organizations in managing human resources functions, including recruitment, recruitment, training and development compensation, and other functions, and the use of advanced technologies helps to reduce costs and performance improvement as well as improving the quality of services provided, and among the advanced technologies is the emergence big data and digital technologies, which are the product of Industry 4.0 [29]. The pressing need and the horizon of possibilities of building quite valuable analytical abilities crafted for human resources have drawn unprecedented attention [30]. More accurately, big data could be utilized at each stage. In particular, from the recruitment process stages, containing attraction, acquisition, training, and development, and after intelligence. Indeed, artificial intelligence is nothing but a product of advanced technology. Furthermore, human resource management is the principal domain where artificial intelligence is used, and this area of study only considers the influence of expert systems on job appraisal.

Nowadays, the potential of intelligence can be discovered. There are different and numerous scenarios. This includes the search for obtaining CV data, candidate employee lists, job turnover, employee self-service and extracting information [31]. Artificial intelligence applications might help with sophisticated analytics to find expectations and insights related to human resources. New models would have effects and are critical for training the required competencies.

In the field of recruitment, computers are used as a recruitment tool by advertising jobs on a bulletin board service that applicants connect to potential employers, but the tremendous growth in online recruitment requires hiring employers' skills and competencies in human resources management to overcome great difficulties [32]. As for training and development, it is used in electronic devices, applications and processes for creating, managing, and transferring knowledge. There are two types of training: synchronous training and asynchronous training [33]. Synchronous training necessitates the attendance of the learners together in front of the computers to start a debate and discussion between the learners and trainee via chat rooms and/or virtual classes. Regarding the second type, an exchange of information at succeeding times was found. Concerning compensation, special compensation is found in place to perform many functions as insurance taxes and calculating compensation for wages by means of issuing payment receipts. Besides, compensation systems notify employees concerning issues and controversies which is closely associated with their financial aspects. Managers can brand estimates related to wages. Undeniably, providing employees with benefits via the Internet will achieve substantial

savings for human resources management, while electronic procedures management can process changes fast [34]. The environmental infrastructure accompanies the application of systems based on artificial intelligence; despite the many benefits that can be gained from artificial intelligence applications, there are many challenges that may stand in the way of this application [13, 35].

Notwithstanding the role of artificial intelligence in many companies is not clearly defined, the lack of sufficient skills has been left behind. The capabilities of working individuals to deal with these technologies, financial constraints, and incompatibility with existing systems solutions to artificial intelligence with the company's old IT systems, a high investment with a return slow, as working with artificial intelligence applications requires a huge capital investment in designing the system. It is indispensable to modify the forms of human resources because of the redistribution of tasks and specializations, as well as conducting a series of training on using the features of the new system. Since preparing to work with artificial intelligence applications pose a threat to many jobs and employees, as many industries have witnessed the introduction of robots to replace human workers. From this, we can say that there are many challenges facing AI applications this requires the management of companies that wish to use these applications to conduct an extensive study accordingly, it makes decisions regarding whether or not to apply artificial intelligence according to what it deems appropriate.

4. Practical aspect

The study population consists of a group of categories that include executive directors, experts, management accountants, and production engineers in oil companies. 150 questionnaire forms were distributed, amounting to of these, 132 questionnaires that were valid, i.e. 88%, which is a good percentage suitable for statistical analysis and hypothesis testing. A five-point Likert scale was adopted in an effort to assess the respondents' reaction towards the questionnaire, and it was adopted as a principal tool for information collection. It included the following values: (1) Strongly Disagree, (2) Disagree, (3) Agree, (4) Somewhat Agree, and (5) Strongly Agree. Using the statistical program (SPSS), several statistical techniques were used to meet the study's objectives. The level of honesty and reliability in the measures was verified, as well as testing the honesty and reliability of the items of the questionnaire form through Cronbach's alpha test.

4.1. Questionnaire's validity and reliability

In statistical analysis, internal consistency tests for agreement between each survey question and its respective dimension. Internal consistency was calculated through the computation of each item and its respective subdimension's overall score and between each sub-dimension and its respective overall for its respective overall dimension. In Table 1, each human resources cost item's correlation coefficients with its respective sub-dimension, and between each sub-dimension and its respective overall for its respective overall dimension, have been displayed. Given that the threshold of significance was Sig, it was discovered that all correlation coefficients are significant. Interestingly, the corresponding correlation coefficients are below the test's designated significance level, $\alpha = 0.05$. Consequently, we deduce that the dimension accurately represents the object it was intended to measure.

Table 1. Correlation coefficients for individual items of human resource expenses, Rayya dimensions, and overall score of respective dimensions

Pearson correlation coefficients	Item & its coding	Sub-dimension and its coding	Main dimension and its coding
0.898**	0.690**	X111	Recruitment & recruitment x11 Cost HR x1
	***0.662	X112	
	**0.729	X113	
	**0.529	X114	
	*0.628	X115	

Pearson correlation coefficients	Item & its coding	Sub-dimension and its coding	Main dimension and its coding
**0.734	X116		
**0.625	X117		
**0.632	X118		
**0.736	X 121		
**0.756	X 122		
**0.602	X 123		
**0.278	X 124		
**0.723	X 125	Training & development	
**0.453	X 126	X 12	
**0.764	X 127		
**0.479	X 128		
**0.853	X 129		
**0.301	X 131		
**0.278	X 132		
**0.418	X 133		
**0.660	X 134	Compensation	
**0.731	X 135	X 13	
**0.903	X 136		
**0.870	X 137		
**0.876	X 138		

Note: ** indicates the level of significance associated with the correlation coefficient (Sig.) less than $\alpha=0.05$.

Construct validity is a key metric for evaluating an instrument's validity. It assesses how well the tool achieves its intended objectives and examines the strength of the correlation between each study dimension and the overall score of the questionnaire.

Table 2 presents the correlation coefficients for all survey tool dimensions. All coefficients have a significant level, whose values (Sig.) in relation to items' overall score in the survey tool are below the level of predetermined significance for the test $\alpha = 0.05$.

Table 2. Correlation coefficients between each dimension of the study and the total score of the questionnaire items

Dimensions	Pearson correlation coefficient
Cost of human resources	0.638**
Artificial intelligence-based systems	0.827**

Note: ** indicates that the significance level (Sig.) associated with the correlation coefficient is less than $\alpha = 0.05$.

4.2. The questionnaire's stability

The reliability of a questionnaire is its capacity to yield consistent responses when administered repeatedly. The Cronbach's alpha coefficient was used to determine the research questionnaire's reliability; the findings are shown in Table 3.

Table 3. Results of Cronbach's alpha coefficient and self-honesty

Dimensions of the study	Number of paragraphs	The value of Cronbach's alpha coefficient	Self-honesty
Cost of human resources	25	0.85	0.92
Artificial intelligence-based systems	18	0.72	0.85

Self-honesty = the positive square root of Cronbach's alpha

According to the data in Table 5, Cronbach's alpha coefficient has a high value for each dimension. For example, it is around 0.85 for human resource expenses and roughly 0.72 for artificial intelligence-based systems. Additionally, it was discovered that the study's dimensions gave the value of self-honesty a high appearance, reaching 0.85, and 0.92.

5. Results and discussion

To test the study hypotheses, the statistical software SPSS was used to estimate a linear regression model and perform a path analysis. The analysis focused on the dependent variable, human resource costs, and the independent variable, artificial intelligence-based systems. Two hypotheses (H1, H2) were tested. The results revealed a strong correlation between artificial intelligence-based systems and the three sub-dimensions of human resource costs: recruitment and employment, training and development, and compensation, as shown in Table 4.

Table 4. The results of the linear regression model estimation between the recruitment and employment variable and the artificial intelligence-based systems variable

Variable	Estimates	Sig	R2	Adjusted R2	F	Sig
Fixed limit	$\widehat{\beta}_0$ 1.757	0.000				
Recruitment and recruitment	$\widehat{\beta}_1$ 0.548	0.000	0.25	0.246	45.069	0.000

Source: Made by the researcher based on the outputs of the SPSS v.22 program.

As shown in Table 5, the model's coefficient of determination (R^2) is 0.25, indicating that the model accounts for 25% of the variations in the dependent variable, while the remaining 75% can be attributed to other factors not included in the model. Additionally, the model demonstrated statistical significance, as evidenced by the F-test, where the significance level (Sig. = 0.000) is lower than the predetermined threshold of $\alpha = 0.05$. Moreover, the artificial intelligence-based systems variable exhibited a significant positive impact on the recruitment and employment variable, with a coefficient value of 0.548 and a significance level (Sig. = 0.000), which is below the 0.05 threshold.

Table 5. Results of estimating the linear regression model for the artificial intelligence-based systems variable and the training and development variable

Variable	Estimate	Sig	R2	Adjusted R2	F	Sig
Fixed limit	$\widehat{\beta}_0$ 3.149	0.000				
Compensations	$\widehat{\beta}_1$ 0.156	0.001	0.073	0.066	10.579	0.001

Source: Prepared by the researcher based on the outputs of the SPSS v.22 program.

The model was essentially successful in explaining 7.3% of the changes in the dependent variable, according to Table 5's coefficient of determination ($R^2 = 0.073$). The remaining changes (92.7%) were caused by other variables that were not included in the model. A random error term is added to the model. Furthermore, the

model appeared significant since the F test's significance level (Sig = 0.001) is higher than the test's $\alpha = 0.05$ significance level.

The Johanson-Neyman method was employed to test the second hypothesis, which examined the relationship between artificial intelligence-based systems and human resources assignments in the presence of environmental challenges. The results of this test are clearly shown in Table 6 below.

Table 6. The link between the expenses of human resources and artificial intelligence-based technologies in the context of environmental concerns

	Coefficient	se	t	p	LLCI	ULCI
Constant	2.3423	0.0463	50.5896	0000	1.2324	3.4453
Cost of human resources	0.3769	0.1413	2.6670	0.0518	-0.0035	0.5551
Environmental challenges	0.7761	0.112	6.3614	0000	0.6392	1.0443
Int_1	0.2812	0.0861	3.2659	0.000	-0.0332	0.6326

Source: Prepared by the researcher based on the findings of the Johnson-Neyman analysis.

Table 6 presents findings that suggest a significant relationship between the independent variable and the direction of human resource costs within the context of environmental challenges. This conclusion is supported by the t-test value ($t = 3.2659$), which confirms the presence of the stated effect and leads to the acceptance of the second hypothesis. Additionally, the β coefficient for the variable (Int_1) was calculated at 0.2812, indicating a value within an acceptable range.

6. Conclusions

The application of AI technology in human resource practice has redefined processes by reducing costs, streamlining processes, and responding to environmental challenges. New organizational jobs that have emerged from AI adoption demonstrate the need to train employees to take on these jobs to fulfill their demands. AI not only mechanizes processes as human capability substitutes but further increases work accuracy and work speed at a lower cost. AI technology further plays a crucial role in containing HR spending in all functional aspects of training and development, compensation, and recruitment. Through AI technology, organizations have the potential to make cost-effective decisions that align with cost savings while enabling general operating efficiency. As AI technology continues to evolve further, integration of AI technology in human resource practice shall play a crucial role in enabling enduring business models in responding to the challenges of a transforming work environment and population.

7. Recommendations

1. There is an urgent need to provide the knowledge and skills necessary for new jobs among working individuals when applying artificial intelligence at work.
2. There is a call for conducting a feasibility study by the units that wish to implement intelligence-based systems artificial analysis in which the expected benefits are compared with the costs necessary for that application and decisions are made according to the results achieved.
3. The need to conduct development programs and courses for working individuals to enable them to work with artificial intelligence applications had to be addressed.
4. There is an undeniable need for developing artificial intelligence applications in the field of managing human resources costs in a way that leads to sound results and rational decisions.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

Funding information

The authors declare that they have received no funding from any financial organization to conduct this research.

Author contribution

Suhail Abdullah Al-Tamimi: Conceptualization of the study, methodology design, and overall supervision of the research paper. Majid Ahmed AL Anssari: He contributed to the writing and editing of the manuscript. Mohanad Dheyaa Al-Tameemi: Discussed the first draft of this paper and checked all the journal requirements.

References

- [1] H. Shimizu and K. I. Nakayama, "Artificial intelligence in oncology," *Cancer science*, vol. 111, no. 5, pp. 1452-1460, 2020.
- [2] A. H. M. Alaidi, Z. A. Ramadhan, J. S. Alrubaye, H. A. Mutar, and I. Svyd, "AI-based monkeypox detection model using Raspberry Pi 5 AI Kit," *Sustainable Engineering and Innovation*, vol. 7, no. 1, pp. 1-14, 2025.
- [3] K. T. Kozhakhmet, G. K. Bortsova, and L. B. Atymtayeva, "Some Issues of Development of Intelligent System for Information Security Auditing," in *Proceedings of the World Congress on engineering*, 2012, vol. 2.
- [4] E. Carol and D. J. R. o. O'Leary, "Introduction to artificial intelligence and expert system," vol. 6, no. 10, p. 2017, 2013.
- [5] A. Al Rubaye , S. Kadhim , and I. M. Abed "The Butterfly Effect and Earnings Management: Analysis of Long-Term Consequences of Short-Term Adjustments," *Heritage and Sustainable Development*, vol. 4, no. 1, 2025.
- [6] G. Dalmarco, F. R. Ramalho, A. C. Barros, and A. L. Soares, "Providing industry 4.0 technologies: The case of a production technology cluster,"*The journal of high technology management research*, vol. 30, no. 2, p. 100355, 2019.
- [7] A. NEAMAH AL RUBAYE, and R. N. Rashed, "Sustainable Taxes: A Tool for Economic Justice and Sustainable Development," *Montenegrin Journal of Economics (MNJE)*, vol. 22, no. 1, 2026.
- [8] S. Leitner-Hanetseder, O. M. Lehner, C. Eisl, and C. Forstenlechner, "A profession in transition: actors, tasks and roles in AI-based accounting," *Journal of Applied Accounting Research*, vol. 22, no. 3, pp. 539-556, 2021.
- [9] J. Dima, M.-H. Gilbert, J. Dextras-Gauthier, and L. Giraud, "The effects of artificial intelligence on human resource activities and the roles of the human resource triad: opportunities and challenges," *Frontiers in Psychology*, vol. 15, p. 1360401, 2024.
- [10] M. H. Soueidan and R. Shoghari, "The impact of artificial intelligence on job loss: risks for governments," *Technium Soc. Sci. J.*, vol. 57, p. 206, 2024.
- [11] T. Şaan, "The Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence," *Tüketici ve Tüketim Araştırmaları Dergisi= Journal of Consumer and Consumption Research*, vol. 16, no. 1, pp. 181-187, 2024.
- [12] A. Katirai, "The Environmental Costs of Artificial Intelligence for Healthcare," *Asian Bioethics Review*, pp. 1-12, 2024.

-
- [13] J. Wang, Y. Lu, S. Fan, P. Hu, and B. M. Wang, "How to survive in the age of artificial intelligence? Exploring the intelligent transformations of SMEs in central China," *International Journal of Emerging Markets*, vol. 17, no. 4, pp. 1143-1162, 2022.
- [14] A. R. N. Al Rubaye, D. Foroghi, and S. A. Hashemi, "The effect of firm size on the relationship between tax avoidance and cash holdings," *Montenegrin Journal of Economics*, vol. 20, no. 1, pp. 165-173, 2024.
- [15] H. Jin, L. Jin, C. Qu, C. Fan, S. Liu, and Y. Zhang, "The impact of artificial intelligence on the accounting industry," in *2022 8th International Conference on Humanities and Social Science Research (ICHSSR 2022)*, 2022: Atlantis Press, pp. 570-574.
- [16] P. Dhamija and S. Bag, "Role of artificial intelligence in operations environment: a review and bibliometric analysis," *The TQM Journal*, vol. 32, no. 4, pp. 869-896, 2020.
- [17] A. R. Wheeler and M. R. Buckley, "The current state of HRM with automation, artificial intelligence, and machine learning," in *HR without People?: Emerald Publishing Limited*, 2021, pp. 45-67.
- [18] R. Hasan, S. Weaven, and P. Thaichon, "Blurring the line between physical and digital environment: The impact of artificial intelligence on customers' relationship and customer experience," in *Developing digital marketing: Emerald Publishing Limited*, 2021, pp. 135-153.
- [19] H. Alsammak, H. A. Mutar, and A. M. Alaidi, "Using artificial intelligence for enhancement of solar cell efficiency in the south of Iraq," *Heritage and Sustainable Development*, vol. 4, no. 1, 2025.
- [20] Y. Ma and K. L. Siau, "Artificial intelligence impacts on higher education," 2018.
- [21] S.-L. Wamba-Taguimdje, S. F. Wamba, J. R. K. Kamdjoug, and C. Wanko, "Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation projects," *Business process management journal*, vol. 26, no. 7, pp. 1893-1924, 2020.
- [22] A. M. Tortora, A. Maria, R. Iannone, and C. J. P. C. S. Pianese, "A survey study on Industry 4.0 readiness level of Italian small and medium enterprises," vol. 180, pp. 744-753, 2021.
- [23] K. Ramachandran, A. A. S. Mary, S. Hawladar, D. Asokk, B. Bhaskar, and J. J. M. T. P. Pitroda, "Machine learning and role of artificial intelligence in optimizing work performance and employee behavior," vol. 51, pp. 2327-2331, 2022.
- [24] A. R. Hasan, "Artificial Intelligence (AI) in accounting & auditing: A Literature review," *Open Journal of Business and Management*, vol. 10, no. 1, pp. 440-465, 2021.
- [25] S. Shubhendu, and J. E. Vijay, "Applicability of artificial intelligence in different fields of life," *International Journal of Scientific Engineering and Research*, vol. 1, no. 1, pp. 28-35, 2013.
- [26] G. Graetz and G. Michaels, "Estimating the impact of robots on productivity and employment," 2015.
- [27] A. Taghizadeh, R. Mohammad, S. Dariush, and M. Jafar, "Artificial intelligence, its abilities and challenges," vol. 3, no. 12, pp. 30-34, 2013.
- [28] A. O. Al-Rawahna, "The impact of the quality of electronic human resources management systems on the efficiency of employee performance," masters, College of Business, Middle East University, 2013.
- [29] M. R. Edwards, "HR metrics and analytics," in *e-HRM: Routledge*, 2018, pp. 89-105.
- [30] D. Kryscynski, C. Reeves, R. Stice-Lusvardi, M. Ulrich, and G. J. H. R. M. Russell, "Analytical abilities and the performance of HR professionals," vol. 57, no. 3, pp. 715-738, 2018.
- [31] S. Strohmeier, F. Piazza, and Applications, "Artificial intelligence techniques in human resource management—a conceptual exploration," pp. 149-172, 2015.

- [32] T. V. Bondarouk and H. Ruël, "Electronic Human Resource Management: challenges in the digital era," vol. 20, no. 3, pp. 505-514, 2009.
- [33] W. C. J. Mau, R. Ellsworth, and D. J. I. J. o. E. M. Hawley, "Job satisfaction and career persistence of beginning teachers," vol. 22, no. 1, pp. 48-61, 2008.
- [34] A. M. Khashman and H.. R. Al-Ryalat, "The impact of electronic human resource management (E-HRM) practices on business performance in Jordanian telecommunications sector: The employees perspective," vol. 7, no. 3, pp. 115-129, 2015.
- [35] P. Goel, N. Kaushik, B. Sivathanu, R. Pillai, and J. J. T. R. Vikas, "Consumers' adoption of artificial intelligence and robotics in hospitality and tourism sector: literature review and future research agenda," vol. 77, no. 4, pp. 1081-1096, 2022.