

THE IMPACT OF APPLYING ARTIFICIAL INTELLIGENCE TECHNIQUES IN DEVELOPING HUMAN RESOURCES IN SAUDI UNIVERSITIES: A FIELD STUDY

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Abstract:

Objectives: This study aimed to identify the impact of applying artificial intelligence techniques on human resources development in public universities from the point of view of a sample of administrative employees in those universities.

Methods: To achieve the objectives of the study, a questionnaire was used, which included a set of questions: To survey the opinions of the study sample, (n = 352) administrative employees were randomly selected from Saudi public universities in the Kingdom of Saudi Arabia. Results: The study concluded that there is a positive moral impact of hardware, programs and effectiveness in developing human resources in universities in the Kingdom of Saudi Arabia, and the absence of A positive moral effect of knowledge and reasoning, and it was also found that there are statistically significant differences in the average answers of the respondents regarding the application of artificial intelligence techniques and human resource development due to (gender, educational qualification, years of experience).

Conclusion: The study concluded that there is a positive moral impact of applying artificial intelligence techniques in human resources development in Saudi universities from the point of view of the study sample.

Keywords: Artificial intelligence, human resources development, Saudi universities.
Methodological Framework of the Study

INTRODUCTION

The scientific advancements in communications and information technology witnessed globally in the third millennium of the 21st century have led to profound and radical transformations, accelerating communication processes and improving performance. The world is now moving towards the adoption of 5G, or the Internet of Things (IoT), by connecting all objects that can be recognized by the internet through established internet protocols (Al-Muqaiti, 2021). This has also led most organizations to adopt modern methods that rely on the application of advanced technologies, particularly artificial intelligence (AI), which enhances the efficiency of organizations in general, and universities in particular (Luo, 2018). Universities strive to improve their performance by enhancing the capabilities of their staff, both employees and faculty members, to achieve positive outcomes that benefit individuals and society by providing a suitable organizational environment and climate. Ma & Saiu (2018) and Chang (2019) indicated that artificial intelligence saves time, effort, and cost, and that the performance level of AI-based management systems is highly effective, thus qualifying them to perform various administrative tasks with high efficiency. In light of this, organizational trends have encompassed various aspects of the administrative process, with a primary focus on its dimensions related to human resource management and development, and the promotion of modern technology and information technology applications. Therefore, human resource management and improving employee performance are among the top priorities and concerns of management in general, as raising the level of employee performance leads to improved and increased efficiency at the organizational level, ultimately resulting in the delivery of services quickly and with the required quality (Hashemiya, 2023). Many countries around the world have been racing to implement artificial intelligence technologies in all sectors of the state, including the education and human resources sector. These countries, led by China, America and Canada, have developed an artificial intelligence strategy. The American company IBM announced a new company called Telant & Transformation, which aims to develop human resources functions by applying artificial intelligence technologies. As for the level of Arab countries, the United Arab Emirates established a Ministry of Artificial Intelligence in 2017 with the aim of enabling students, the government and companies to develop artificial intelligence technologies (Al-Dawood, 2021). Recognizing the Kingdom's civilizational and pioneering role on a global and Islamic level, the Kingdom of Saudi Arabia launched Vision 2030 to embody the immense aspirations and hopes placed upon it. The Vision affirms the Kingdom's openness to the latest contemporary technological revolutions and its commitment to leveraging them across all fields and sectors. The strategic direction of Vision 2030 emphasizes the necessity of digital transformation within organizations through changes in work models and the utilization of technology to foster innovation, enhance efficiency, reduce expenses and errors, and boost performance and productivity levels. Vision 2030 has also

supported digital transformation by adopting information and communication technology systems, promoting the concept of electronic transactions, and activating their implementation (Al-Saleh, 2022). To achieve the objectives of Vision 2030, including attaining advanced rankings in the e-government index, overseeing their realization through data governance, providing data-related capabilities and foresight, and enhancing them through continuous innovation (Saudi Data Authority). (Artificial Intelligence, 2019). Saudi universities are considered distinguished institutions due to the knowledge and science they provide, and the positive results they achieve that benefit both the individual and society as a whole. This is accomplished through their pursuit of their established goals, their adoption of advanced and modern systems, and the presence of human resources that strive to provide a suitable organizational environment and climate that fosters job satisfaction and enhances employee performance. The FIRST LEGO League competitions, which are part of the plans to transform society into an innovative knowledge-based society, represent one of the most important applications of artificial intelligence in education in the Kingdom of Saudi Arabia. These competitions focus on enabling students to apply all their skills in designing and creating robots at various educational levels (Al-Fifi & Al-Dalala, 2022). Finally, this study aims to identify the impact of applying artificial intelligence technologies on human resource development in Saudi universities, from the perspective of a sample of administrative staff in those universities.

Study Problem

Al-Qurashi (2021) and Naji (2021) consider human resources to be one of the most important components of intellectual and knowledge capital, represented by employees and specialists in systems and communications management. They are also considered a crucial factor in achieving competitive advantage and a source of organizational and technological innovation and creativity. Modern human resource management is based on an administrative methodology that relies on the optimal application of information technology in human resource functions. This methodology depends on computer systems, communication networks, and artificial intelligence technologies in implementing human resource strategies and policies (Hussein et al., 2022). Many organizations in our time strive to perform their work in ways that enable them to deliver their products or services quickly and with high quality. This requires them to interact with and adapt to the data and keep pace with it. For these organizations, there is no alternative but to implement advanced technology, including artificial intelligence applications (Al-Azzam, 2021). The topic of human resource development has garnered the attention of numerous organizations and researchers due to the positive impact that effective management can have on achieving many desired organizational outcomes, perhaps the most important of which is equipping employees with the skills required to perform their duties (Bay'ah, 2016).

Universities in general, and Saudi universities in particular, face numerous challenges arising from technological changes that have created a global system heavily reliant on advanced technology. This necessitates the development and modernization of systems, policies, and all practices related to human resource management and development, ensuring that universities can overcome their problems and address their weaknesses. Several studies, such as Al-Azzam's (2021) study, indicate that despite numerous research efforts on human resource development at both the Arab and international levels, attempts at the Arab level remain modest and require further enrichment. This is due to the importance of administrative changes resulting from technological advancements, which rely heavily on the application of artificial intelligence technologies. Therefore, the current study aligns with the trend calling for more Arab studies and research in the field of artificial intelligence technologies and their applications in human resource development within universities. The problem addressed by this study is that, given the rapid advancements in information and communication technology and in line with Saudi Arabia's Vision 2030, artificial intelligence (AI) applications are a powerful driver for developing administrative processes in Saudi universities, thereby enhancing and improving the efficiency of human resources. Therefore, it is necessary to examine the current state of AI application in Saudi universities and to identify its impact on human resource development. Based on the above, the study problem can be formulated in the following questions:

1. To what extent are AI technologies applied in Saudi universities?
2. To what extent are human resources developed in Saudi universities?
3. Is there a significant impact of AI application on human resource development in Saudi universities?
4. Are there statistically significant differences ($\alpha \leq 0.05$) between the mean responses of the study sample regarding the impact of AI application on human resource development in public universities, attributable to demographic variables (gender, academic qualification, years of experience)?

Study Significance

This study offers numerous contributions on both the theoretical and applied levels. Theoretically, it enriches the literature on artificial intelligence and human resource development by highlighting the application of AI technologies by Saudi universities and their impact on human resource development, as well as the findings in this field. To the best of the researcher's knowledge, this study is among the first to address the impact of AI technologies on human resource development. Therefore, the researcher anticipates that it will make significant contributions to both the Saudi and Arab libraries and may open new avenues for researchers to explore this topic from different perspectives. The researcher hopes that this study will contribute to raising the efficiency of human resources at Saudi universities by providing information that will help those in charge understand the importance of adopting and implementing artificial intelligence (AI) technologies in the field of human resources. On the

practical side, the study offers universities in general, and Saudi universities in particular, an understanding of the impact of applying AI technologies on human resource development. The researcher also expects that the study's findings will guide Saudi university administrators in understanding the relationship between applying AI technologies and human resource development, as the study provides them with feedback on the current state of AI application in Saudi universities.

Study Objectives

The main objective of this study is to identify the impact of applying AI technologies on human resource development. The following sub-objectives stem from this main objective:

1. To determine the extent of AI technology application (hardware, software, effectiveness, knowledge, and reasoning) in Saudi universities.
2. To determine the extent of human resource development in public universities in the Kingdom of Saudi Arabia.
3. To identify the relationship between independent and dependent variables regarding the impact of applying AI technologies on human resource development in Saudi universities.
4. To provide developmental recommendations to relevant stakeholders, such as the Ministry of Education and the Ministry of Human Resources, that would encourage Saudi universities to adopt and implement artificial intelligence (AI) technologies in the field of human resources.

Study Variables

1. Independent Variable: AI technologies and their dimensions (hardware and software, effectiveness, knowledge and reasoning).
2. Dependent Variable: Human resource development and its dimensions (training, encouraging commitment to implementing AI technologies, promoting teamwork).

Study Limitations

The current study is limited by the following:

1. Subject Matter: The current study is limited to identifying the impact of implementing AI applications on human resource development in Saudi public universities. It does not include private Saudi universities.
2. Population Limit: The study was conducted on a sample of administrative staff in Saudi public universities.
3. Time Limit: The study was conducted during the year 2024. Theoretical Foundation of the Study

Artificial Intelligence

Al-Hujaili and Al-Farani (2020) define the term Artificial Intelligence (AI) as the simulation of the human mind by systems or devices, based on the information they collect. It is considered a branch of computer science that deals with the design of intelligent systems, which exhibit a set of characteristics linked to intelligence related to various human behaviors. Popenici and Kerr (2017) defined AI as the process of directing computers to perform tasks that humans can do better. Based on the above, researchers can define AI as a branch of computer science concerned with the concepts and methods of symbolic reasoning by computers, and the representation of symbolic knowledge for application in reasoning. Artificial intelligence possesses numerous characteristics and features, which Al-Najjar (2012), Jawdat (2015), and Matay (2012) have attempted to summarize as follows:

A. Knowledge Representation Capability: Unlike statistical programs that rely on information representation, artificial intelligence applications use a specific structure to describe knowledge. This structure involves linking facts and relationships to cognitive frameworks to provide the most comprehensive information about the problem being solved.

B. Optimistic Experimental Approach: One of the most prominent characteristics of artificial intelligence is its ability to tackle problems that lack a general, well-defined solution. This means that the programs do not use a sequential approach leading to an optimal solution. Instead, they choose a specific solution method while retaining the possibility of changing it if the initial choice does not yield a quick solution. In other words, they focus on sufficient solutions and do not insist on optimal (precise) solutions, as current traditional programs do.

C. Ability to Handle Incomplete Information: Another characteristic of artificial intelligence is its ability to find solutions even when information is not fully available at the time the solution is required. Incomplete information can lead to less realistic conclusions, although these conclusions may still be correct.

D. Learning Capacity: One of the important characteristics of artificial intelligence is its ability to learn from past practices and experiences, as well as its capacity to improve performance by taking past mistakes into account. AI's learning capacity is linked to its ability to generalize information, infer similar and selective cases, and discard redundant information.

E. Reasoning Capacity: This refers to the ability to deduce possible solutions to a specific problem from existing data, especially problems where traditional methods cannot be applied. This capacity is achieved by storing all possible solutions and applying reasoning principles or strategies, as well as the laws of logic.

From the above, the researcher concludes that artificial intelligence has the ability to process vast amounts of information by observing and analyzing similar patterns in data more effectively than human brains. It can find solutions to unfamiliar problems by applying its cognitive abilities.

Developments in the application of artificial intelligence technologies have intensified discussions about its importance from industrial, economic, and social perspectives. Kate et al. (2016), Al-Hadi (2018), and Bryan & James (2016) argue that the importance of artificial intelligence (AI) is evident in the following:

- a. The spread of AI technologies leads to the promotion of equality and transparency among individuals.
 - b. AI technologies contribute to changing the quality of life and developing social and organizational frameworks by fostering progress in all areas of life and significantly contributing to innovation.
 - c. AI technologies store and preserve information, helping organizations protect their data from leaks and loss.
 - d. AI contributes to finding solutions to complex problems by analyzing and processing them in a timely manner.
 - e. AI enhances well-being in all areas of social life, leading to economic prosperity and growth by creating new markets, more efficient logistics services, and improving the quality of goods and services.
 - f. AI enables vision-based leadership systems, leading to increased productivity through more flexible and reliable demand forecasting.
- From the above, the researcher concludes that artificial intelligence is one of the most important modern technologies that significantly contributes to rapid technological development by increasing opportunities for innovation and growth in various fields. It also plays a crucial role in enhancing quality, increasing business efficiency, and improving productivity.

Al-Rawi and Al-Sarraf (2020) believe that artificial intelligence seeks to achieve several objectives, most notably the following:

- A. Optimal utilization of knowledge and expertise through the storage of information related to artificial intelligence.
- B. Application of scientific and applied methods, overcoming numerous problems and obstacles such as data loss, incompleteness, and corruption.
- C. Generating and developing new expertise and knowledge by activating computerized knowledge and its applications in decision-making.
- D. Working to store and analyze knowledge, and to store methodological rules for dealing with it and reaching its conclusions. The researcher can add some goals that artificial intelligence applications can achieve, such as determining the quality of training programs by identifying gaps in the content of those programs, based on the performance of employees. It also provides huge data on human resources in various establishments, which allows for a comprehensive view of identifying their needs and strengths. Thus, artificial intelligence can be used in many areas such as cooperation, security, services, and infrastructure by encouraging wider and more comprehensive adoption of the technology.

Rozki and Valte (2020) argue that universities' application of artificial intelligence (AI) technologies supports human cognitive abilities and can reduce the need for human knowledge, skills, and experience. They contend that AI accelerates cognitive development and creates cognitive capabilities that would not be possible without technology, as automation has enabled some activities that were previously impossible. The application of AI technologies in universities yields numerous benefits. Karsenti (2019) and Puppenici & Kerr (2017) attempted to summarize these benefits as follows:

- A. Efficiency: AI equips university staff with the necessary competencies to achieve desired success by providing smart platforms for distance learning and delivering appropriate and intelligent training content tailored to staff characteristics.
- B. Improved Productivity: AI is an essential strategic technology that enhances the efficiency of users and can quickly become a competitive advantage for universities. The application of AI technologies enables universities to accomplish many tasks in less time, leading to higher quality educational services.
- C. Management Effectiveness: Artificial intelligence (AI) technologies enable universities to handle all events with the required ease and speed.
- D. Accelerating Decision-Making: AI technologies have the potential to enhance decision-making processes by proposing effective decision tree techniques.

Human Resource Development: Human resources are defined as the inherent resources of any organization. They are the source of its success if well-managed, and the source of its failure if poorly managed. These resources consist of individuals capable of performing work and willing to do so seriously and with commitment. Capability and desire must interact and integrate harmoniously through systems that improve opportunities to utilize these resources. This is achieved through training, development, and maintenance (Mustafa, 2015). According to the 2020 Human Development Report, human resource development refers to the process of mapping human capabilities and potential, including economic potential, to make opportunities and choices accessible to everyone through two elements:

- A. Capacity building and capacity development through education, training, and skills acquisition.
 - B. The application of these capabilities by individuals, enabling them to utilize them in various life activities.
- Nicole (2015) and Al-Rawi and Al-Sarraf (2020) view human development as purposeful procedures integrated into the learning process. This process motivates individuals to adopt and develop mental behaviors by increasing knowledge and enhancing abilities and skills across all fields. These skills are selected and chosen based on future assessments and adaptation to any new developments or changes in the surrounding environment that affect organizational activity. Based on the above, the researcher concludes that the concept of human resource development is an individualized approach focused on helping employees develop their knowledge and skills,

which contribute to achieving their organizations' goals. It is also a comprehensive concept encompassing several aspects, most notably:

- Scientific qualification and practical training on the latest technological advancements through artificial intelligence applications.
- Transforming traditional education and training into a digital format for remote application through artificial intelligence applications.
- Providing employees in organizations with knowledge and skills, and developing them by positively changing their behavior and attitudes, leading to increased performance and productivity through the application of artificial intelligence.

According to Mandour and Ammar (2017), the importance of human resource development lies in its connection to the organization's short- and long-term strategic plan. Therefore, it is an ongoing process resulting from the anticipated needs of employee capabilities and the objectives that help human resources enhance their strengths and personal creative talents, and address areas requiring improvement. The concept of human resource development is based on what human resources can do and how to develop them further. In this context, the researcher believes that the importance of human resource development is evident through the efficient and effective performance of employees, which contributes to increased productivity or the provision of high-quality services. It also motivates employees by providing them with intrinsic motivation through equipping them with the necessary knowledge and skills to perform their assigned tasks, as well as ensuring job stability to meet the needs and requirements of various organizations.

Firdous (2016) and Jarwa (2014) believe that human resource development requires consideration of the following:

- The proper organization of the human resource development function, in a way that achieves compatibility between individual characteristics and the needs of the organization.
- The availability of personnel and expertise is at three levels: the senior management level, which requires vital and fundamental characteristics such as a thorough understanding and conviction of the importance of the strategic approach, a willingness to invest in it, and the creation of a suitable environment for it; the department or unit level, which enables close work with direct managers (the first line of supervision) to contribute to the development of human resource development plans and policies, given that the direct manager is one of the most important elements in human resource development and the closest to observing the actual behavior of human resources; and finally, the operations level, which is based on identifying the skills related to human resource relationships, such as technical expertise in specific jobs and processes.
- Linking human resource development to the organization by identifying the needs of the strategic, administrative, and operations levels, and developing plans to meet those needs.
- Defining human resource development goals and policies, ensuring they align with the organization's future vision, and expressing that vision through policies that clearly define the purpose of human resource development within the organization. Based on the above, the researcher believes that human resource development requires organizations to have a future-oriented vision and culture regarding the development of their human resources. This involves fostering positive values about the importance of human capital and having a future vision for continuous contribution to the training and development of these resources, thereby achieving the goals that organizations strive to attain. Frank (2015) views human resource development as an investment rather than a burden on organizations, considering it to be a culture based on increasing knowledge through developing employee capabilities in a way that serves future performance. Makhnan (2016) and Firdous (2016) attempted to identify the methods through which human resource development is achieved, including:

A. Training: This involves efforts aimed at providing employees with the knowledge and skills that contribute to developing and improving their skills, thus increasing their efficiency in performing their current work or performing high-level work in the future. Fotios (2016) argues that training and education can be practically distinguished. Education is broader in scope, aiming to expand individuals' knowledge and understanding, while training is narrower, focusing on developing individuals' capabilities in specific areas. Training also differs from development in terms of timeframe. Training is linked to daily needs, focusing on the individual's current job and aiming to develop skills and abilities to improve current performance. Employee development, on the other hand, focuses on future roles, seeking to expand and enhance skills to achieve a higher level of performance than the current one.

B. Participation in Work: Since human resource development plays an integral role in the organization's mission and objectives, and is viewed as proactive in shaping and responding to organizational strategies, human resources operate as partners in various work units and as facilitators of change within the organization. This requires organizations to operate on the principle that human resource development plays a key role in defining the organization's vision through its ability to address risks and foster organizational growth. From the foregoing, the researcher concludes that there are numerous methods for developing human resources, not limited to those mentioned above. These include, but are not limited to, delegation of authority, teamwork, job rotation, value-added activities, quality circles, and other methods.

Previous Studies

The researcher reviewed several recent foreign and Arab studies and research papers related to the topic of the current study. This section of the study is dedicated to presenting some of these studies, highlighting their

objectives and key findings, and offering commentary on their points of agreement and disagreement with the current study. The researcher also identifies the scientific gap that the current study is expected to address. In this regard, the researcher can distinguish between two types of these studies and research papers, as follows:

A. Studies that addressed the relationship between artificial intelligence and human resource development

Al-Huwayan (2024) conducted a study that aimed to identify the challenges facing the implementation of artificial intelligence systems in sports science faculties at Jordanian universities from the perspective of faculty members. The study employed a descriptive survey methodology, utilizing a questionnaire for primary data collection. Eighty (80) questionnaires were distributed to faculty members in the colleges under study. Among the most significant findings were the existence of substantial material and legislative challenges, as well as moderate human and technical challenges, that hinder the implementation of artificial intelligence systems in sports science colleges at Jordanian universities.

The study by Al-Oqaily & Rwash (2022) aimed to identify the reality of artificial intelligence (AI) implementation and its impact on human resource management processes in private companies in Jordan. This was achieved through three dimensions: cybersecurity, system capacity, and the availability of experts and training, as well as system development processes. The study employed a descriptive-analytical approach and utilized a questionnaire as its primary data collection tool. The questionnaire was distributed to a sample of 150 administrative employees in private companies. One of the study's key findings was a significant positive relationship between cybersecurity and administrative processes in Jordanian private companies.

The study by Al-Muqaiti and Abu Al-Ala (2022) aimed to identify the reality of AI implementation and its relationship to performance quality from the perspective of faculty members in Jordanian universities. This study also employed a descriptive-analytical approach and used a questionnaire as its primary data collection tool. The questionnaire was distributed to a sample of 370 faculty members. The study concluded that the degree of AI implementation in Jordanian universities and its relationship to performance quality was moderate, according to faculty members. Al-Dawood's study (2021) aimed to identify the reality of artificial intelligence (AI) applications in the Deanship of Human Resources at Imam Muhammad ibn Saud Islamic University. The study used a descriptive approach through a survey methodology. A questionnaire was used in the primary data collection phase and distributed to a sample of 65 managers and administrative staff members in the Deanship. The study concluded that AI applications in the Deanship of Human Resources at Imam Muhammad ibn Saud Islamic University contribute to human resource development, but that the Deanship faces some technical difficulties in implementing AI applications.

Richter et al. (2019) conducted a theoretical study aimed at identifying AI applications in higher education. This was achieved by highlighting AI concepts and its role in enhancing human capabilities, particularly effective collaboration among employees and the application of technology in the workplace. The study concluded that the use of AI applications in higher education has positive effects on enhancing human resource capabilities.

B. Studies Addressing the Relationship Between Information Technology and Human Resource Development

Al-Saraji (2023) conducted a study aimed at identifying the reality of information technology application in human resource management, focusing on the libraries of the University of Science and Technology in Sana'a, Yemen. The study used a questionnaire as a data collection tool, which was distributed to 16 employees in those libraries. The study concluded that the infrastructure for implementing information technology in human resource management at the studied libraries was very high, but that some difficulties hindered the application of information technology in human resource management and development at the University of Science and Technology libraries.

Abdel-Aal's study (2022) attempted to reveal the impact of information technology application on developing human resource skills in tourism companies in Port Said, Egypt. The study adopted a descriptive approach, developing a questionnaire that was distributed to the managers of 10 tourism companies in Port Said, and 25 questionnaires that were distributed to employees in those companies. The study concluded that the information technology system has a direct positive impact on the efficiency and effectiveness of human resource performance in the companies studied.

Zarrouk's 2020 study aimed to identify the role of information technology in improving human resources, focusing on Sonelgaz Biskra in Algeria. The study employed a descriptive methodology and used a questionnaire as its primary data collection tool. The questionnaire was distributed to a sample of 81 employees at the company. The study concluded that the application of modern technology contributes to identifying the strengths and weaknesses of human resources, thereby determining available alternatives for work performance. This is achieved through training employees on information systems and their various applications.

Aqili et al. (2020) conducted a study to identify the impact of information technology on human resource development from the perspective of staff at the Faculty of Arts and Humanities at King Abdulaziz University. The study employed a survey methodology, utilizing a questionnaire as the primary data collection tool. The questionnaire was distributed to a sample of 32 employees. The study concluded that the information technology used at the faculty contributes to improving employee performance through the implementation of electronic human resource management.

Jamal and Tunis (2020) conducted a study to identify the relationship between electronic management and improving the quality of higher education services in Algeria across its various dimensions. To achieve the study's objective, a descriptive methodology was used. A questionnaire was employed as the primary data collection tool, distributed to a sample of 204 female administrative staff members at Algerian universities. The results demonstrated a positive impact of electronic management on improving the quality of higher education in aspects related to teaching, scientific research, job performance, and financial performance.

Commentary on Previous Studies

Based on the presented studies, the researcher concludes that the commonality between this study and previous research lies in their exploration of the relationship between artificial intelligence (AI) technologies and human resource development. Most previous studies reached nearly identical conclusions regarding the positive impact of information technology (IT) in general, and AI in particular, on human resource development, despite the varying contexts in which these studies were conducted. The current study shares a similar methodology with most previous research, namely the descriptive-analytical approach. While there are similarities between this study and previous research, the main difference lies in the application context. The current study was conducted in Saudi Arabian universities, and the researcher found no existing studies addressing the same topic. This represents a research gap that the study aims to fill. Previous studies provided a rich source for the researcher by enriching its theoretical framework and defining its problem and methodology.

Study Procedures

Study Methodology

The study employed the descriptive-analytical approach, as it is suitable for the nature of the research in identifying the impact of AI technologies on human resource development in Saudi Arabian universities. This approach relies primarily on a precise description of the phenomenon under study, achieved through data collection, analysis, and interpretation to arrive at conclusions. This methodology aligns with the approaches used in most previous studies, which the researcher presented in the literature review section of this study. The data collection phase of this study relied on:

A. Secondary Sources: Books, journals, reports, articles, previous literature, and the internet were used for the theoretical framework of the study.

B. Primary Sources: The researcher developed a questionnaire to identify the impact of artificial intelligence applications on human resource development in Saudi Arabian public universities from the perspective of administrative staff in those universities.

Study Population and Sample: The study population consists of all administrative staff in the 29 public universities in Saudi Arabia. Due to the large size of the study population and considerations of time, effort, and cost; The researcher employed a random sampling method, distributing a questionnaire directly to a random sample of administrative staff in 14 public universities, representing 48% of the total number of public universities. A total of 376 questionnaires were distributed, and 352 were returned, representing 93.61% of the distributed questionnaires. Table 1 shows the status of distributed and returned questionnaires according to the universities.

Table 1 Questionnaire distribution to the study sample

%ratio	Number of returned questionnaires	Number of distributed questionnaires	the university	M
%8.81	31	34	Northern borders	1
%5.11	18	19	The courtyard	2
%5.40	19	21	blond	3
%5.97	21	23	Al-Qassim	4
%8.81	31	32	Al-Jawf	5
%8.81	31	34	King Abdul Aziz	6
%7.67	27	29	King Faisal	7
%6.25	22	23	Najran	8
%8.24	29	31	Hail	9
%7.10	25	26	King Khalid	10
%4.83	17	17	Jazan	11
%9.94	35	37	Islamic University	12
%7.38	26	29	Umm Al-Qura University	13
%5.68	20	21	Tabuk	14
%100	352	376	the total	

Source: Prepared by the researcher, 2024

Demographic Characteristics of the Study Sample

Table (2) shows the frequencies and percentages of the demographic characteristics of the study sample, according to gender, educational qualification, and years of experience.

Table 2 Demographic Characteristics of the Study Sample

% ratio	number	Level of the variable	variable
%73.86	260	Male	Sex
%26.14	92	Female	
%100	352	the total	
%24.72	87	secondary	Academic qualification
%17.61	62	Diploma in Mediation	
%42.05	148	Bachelor's	
%15.62	55	Master's	
%100	352	the total	
%19.60	69	Less than (5) years	Years of experience
%36.36	128	From (5-10) years	
%44.04	155	More than (10) years	
%100	352	the total	

Source: Prepared by the researcher based on the analysis of study data (2024)

Table (2) shows that the majority of the study sample were male, numbering 260 individuals, representing 73.86% of the total sample. The female sample numbered 92, representing 26.14%. The researcher attributes this to the fact that most administrative positions in universities are held by men. It is also evident that the majority of the study sample held a bachelor's degree or higher, numbering 203 individuals, representing 57.67% of the total sample. This indicates that most participants were aware of and understood the questions posed to them. Regarding years of experience, 69 participants had less than 5 years of work experience, representing 19.60% of the sample, while 283 participants had more than 5 years of work experience, representing 80.40% of the sample. This suggests that most participants understood the nature of the questionnaire questions.

Regarding years of experience, 69 participants had less than 5 years of work experience, representing 19.60% of the sample, while 283 participants had more than 5 years of work experience, representing 80.40% of the sample. This indicates that most participants understood the nature of the questionnaire questions. Study Instrument
The researcher developed a questionnaire to identify the impact of applying artificial intelligence technologies on human resource development in Saudi universities. This was done after reviewing several studies and research papers, including those by Al-Azzam (2021), Al-Qurashi (2021), Al-Hujaili (2020), and Al-Rawi and Al-Sarraf (2020). The researcher adapted the questionnaire to suit the subject matter, specialization, and implementation environment of this study. The study comprised two sections:

Section One: This section included the personal data of the study sample, namely gender, academic qualifications, and years of experience.

Section Two: This section contained questions related to the study variables, consisting of 36 items distributed across two axes as follows:

Axis One: (Independent Variable): Dimensions of artificial intelligence (hardware, software and effectiveness, knowledge and reasoning), consisting of 21 items.

The second axis (dependent variable): Dimensions of human resource development in Saudi universities (training in the application of artificial intelligence technologies, encouraging commitment to the application of artificial intelligence technologies, promoting teamwork), consists of (15) items.

The questionnaire items were answered according to a four-point Likert scale (Strongly Agree = 4, Agree = 3, Disagree = 2, Strongly Disagree = 1). To determine the range of the Likert scale categories, the range was calculated by subtracting the highest value from the lowest ($3 = 1 - 4$), then dividing by the highest value on the scale ($74 = 3 \div 4$), and then adding this value to the lowest value on the scale (1) to determine the upper limit of this category. The resulting range is shown in Table (3).

Table 3: Likert Scale Categories (Limits of Response Means)

Category limits		Category
4.00	3.25	Strongly agree
3.24	2.50	Agreed
2.49	1.75	Disagree
1.74	1.00	Strongly disagree

Source: Prepared by the researcher, 2024

Face Validity

The questionnaire, in its initial form, was presented to four expert reviewers specializing in Human Resource Management at Saudi universities. These reviewers held the ranks of Professor and Associate Professor. Their feedback, including deletions, additions, and modifications to the questionnaire items, was incorporated. Based on these suggestions, the questionnaire was finalized.

Internal Consistency Validity

To measure the internal consistency of the questionnaire items, the researcher calculated the correlation coefficients between each item and the total score for the axis to which it belonged, as shown in Table 4 below.

Table 4: Correlation Coefficient between the score of each questionnaire item and the total score for the axis to which it belongs

Probability value	Probability value (sig)	Distance
0.000	*0.904	Devices
0.000	*0.654	Programs and Events
0.000	*0.714	Knowledge and reasoning
0.000	*0.931	Training in the application of artificial intelligence technologies
0.000	*0.754	Encouraging commitment to the application of artificial intelligence technologies
0.000	*0.639	Enhancing teamwork
0.000	*0.657	Dimensions of artificial intelligence
0.000	*0.819	After human resource development

The correlation is statistically significant at a significance level of $\alpha \leq 0.05$. Source: Prepared by the researcher based on the analysis of the 2024 study data.

Table (4) shows that all correlation coefficients are statistically significant at a significance level of $\alpha \leq 0.05$. Therefore, the questionnaire items are considered valid for what they were designed to measure.

Construct Validity

The construct validity of the questionnaire was verified by calculating the correlation coefficients between the score of each dimension of the questionnaire and the total questionnaire score. Table 5 illustrates this.

Table 5: Correlation coefficient between the score of each dimension of the questionnaire and the total questionnaire score

Probability value	Probability value (sig)	Distance
0.000	*0.703	Devices
0.000	*0.910	Programs and Events
0.000	*0.748	Knowledge and reasoning
0.000	*0.821	Training in the application of artificial intelligence technologies
0.000	*0.684	Encouraging commitment to the application of artificial intelligence technologies
0.000	*0.806	Enhancing teamwork
0.000	*0.698	Dimensions of artificial intelligence
0.000	*0.675	Dimensions of Human Resource Development

The correlation is statistically significant at a significance level of $\alpha \leq 0.05$. Source: Prepared by the researcher based on the analysis of the 2024 study data.

Table 5 shows that all correlation coefficients are statistically significant at a significance level of $\alpha \leq 0.05$. Therefore, the questionnaire dimensions are considered valid in measuring what they were designed to measure. Questionnaire Reliability: The researcher verified the questionnaire's reliability by applying Cronbach's Alpha Coefficient, which reached a value of (0.749) for the entire questionnaire. This indicates a high reliability coefficient. Based on the validity and reliability tests, the researcher concludes that the questionnaire is valid in measuring what it was designed to measure and is highly reliable, making it a suitable measurement tool for this type of study.

Source: Prepared by the researcher based on the analysis of the study data (2024). Normality Test

The researcher used the Kolmogorov-Smirnov (K-S) test to determine whether the data followed a normal distribution. The test value was 0.597, which is greater than the significance level of 0.05, indicating that the data distribution follows a normal distribution.

Statistical Methods

The study data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS 26). The following statistical tests were applied:

- Percentages and frequencies.
- Arithmetic mean, relative weight, and standard deviation.
- Cronbach's Alpha.
- Kolmogorov-Smirnov (K-S) test.
- Multiple regression analysis.

Discussion of the Study Data Analysis Results

Question 1: "To what extent are artificial intelligence technologies applied in Saudi universities?" Table (6) provides the answer.

Table 6

Application of Artificial Intelligence Technologies in Saudi Universities, ranked in descending order

Degree of approval	Number	standard deviation	arithmetic mean	Artificial intelligence technologies	Rank
Very high	2	0.597	3.89	Programs and Events	1
Very high	1	0.634	3.83	Devices	2
Very high	3	0.716	3.79	Knowledge and reasoning	3
Very high	-	0.634	3.84	The overall application of artificial intelligence technologies	

Source: Prepared by the researcher based on the analysis of study data, 2024

Table 6 shows that the level of AI application in Saudi universities is very high, with an overall mean score of 3.84. The analysis indicates that the "Programs and Effectiveness" dimension ranked first in AI application at Saudi universities, with a mean score of 3.89. The researcher attributes this to the attention given by the Saudi Ministry of Higher Education to computer-based programs, providing universities with the latest technological advancements. The "Hardware" dimension came in second place, with a mean score of 3.83. The researcher attributes this to the availability of modern equipment at Saudi universities, which is regularly maintained. The knowledge and reasoning dimension ranked last, with a mean score of 3.79. The researcher attributes this to the need for further training of administrative staff in the application of artificial intelligence (AI) techniques so that computers can represent symbolic knowledge for use in reasoning. Comparing this result with the findings of previous studies, it aligns with the results of AL-Ogaily & Rwash (2022), which found a significant positive relationship between cybersecurity and administrative processes in Jordanian private companies. It also agrees with the findings of Richard et al. (2019), which demonstrated positive effects of using AI techniques in higher education, most notably enhancing human resource capabilities. However, this result differs from that of Al-Huwayan (2024), which identified legislative and material challenges hindering the implementation of AI systems in Jordanian universities. It also differs from the findings of Al-Daoud (2021), which indicated that AI applications in the Deanship of Human Resources at Imam Muhammad ibn Saud Islamic University face some technical difficulties. This also differs from the findings of Al-Muqaiti and Abu Al-Ala (2022), which concluded that the use of artificial intelligence by Jordanian universities and its relationship to performance quality is moderate, from the perspective of faculty members.

The second question, "To what extent are human resources developed in Saudi universities?", is answered in Table (7).

Table 7: Human Resources Development in Saudi Universities (Descending Ranking)

Degree of approval	Number	standard deviation	arithmetic mean	Human Resources Development	Rank
Very high	1	0.459	3.71	Training in the use of artificial intelligence technologies	1
Very high	2	0.539	3.63	Encouraging commitment to the application of artificial intelligence technologies	2
Very high	3	0.694	3.59	Enhancing teamwork	3
Very high	-	0.579	3.48	The overall application of artificial intelligence technologies	

Source: Prepared by the researcher based on the analysis of study data, 2024

Table 7 shows that the level of human resource development in universities is very high, with an overall arithmetic mean of 3.48. The analysis indicates that training in the use of artificial intelligence (AI) technologies ranked first in human resource development in Saudi universities, with an arithmetic mean of 3.71. The researcher attributes this to the Saudi Ministry of Higher Education's commitment to providing diverse training programs in the use of advanced technologies, keeping pace with the latest developments in information and communication technology. Furthermore, universities in Saudi Arabia offer training opportunities at the Institute of Public Administration, with its branches spread across the Kingdom's regions and cities, in line with the goals of Vision 2030 in the field of human resource development. Encouraging commitment to the application of AI technologies came in second place, with an arithmetic mean of 3.63. The researcher attributes this to Saudi universities' efforts to motivate their human resources to be innovative in applying AI technologies. The dimension of enhancing teamwork ranked last, with a mean score of 3.59. The researcher attributes this to the fact that teamwork is considered a crucial area in human resource development, especially when dealing with artificial intelligence technologies. The use of AI applications leads to increased skills among administrative staff, making the work environment more competitive and efficient. Comparing this result with the findings of previous studies, we find it consistent with the results of Abdel-Aal's study (2022), which found that information technology systems have a direct positive impact on the efficiency and effectiveness of human resource performance in tourism companies in Port Said, Egypt. It also aligns with the results of Zarrouk's study (2022), which found that the application of information technology contributed to identifying available alternatives for completing tasks by training employees on information systems and their various applications at Sonelgaz Biskra, Algeria. This result is consistent with the findings of Aqili et al. (2020), which found that the use of information technology in the Faculty of Arts and Humanities at King Abdulaziz University contributed to raising the level of employee performance through the application of electronic human resource management. It also aligns with the findings of Jamal and Tunis (2020), which demonstrated a significant positive impact of electronic management on improving the quality of higher education in the areas of teaching and scientific research, as well as job performance and financial management. However, this result differs from the findings of Al-Siraji (2023), which indicated difficulties in implementing information technology for human resource management and development in the libraries of the University of Science and Technology in Yemen.

The third question is: "Is there a significant impact of applying artificial intelligence technologies on human resource development in Saudi universities?" As a prelude to conducting regression analysis to answer this question, the researcher verified the independence of the application of artificial intelligence technologies (independent dimensions) using the tolerance and variance inflation factor (VIF). Table 8 illustrates this.

Table 8: Tolerance and Variance Inflation Factor for Artificial Intelligence Technologies

Variance inflation coefficient	Permissible variation	Artificial intelligence technologies
2.673	0.358	Programs and Events
4.597	0.267	Devices
3.549	0.483	Knowledge and reasoning

Source: Prepared by the researcher based on the analysis of study data, 2024

Table (8) shows that the allowable variance values for artificial intelligence technologies are greater than (0.05), ranging from (0.267 to 0.483). The analysis results also show that the variance inflation coefficient for these technologies was less than (10), ranging from (2.673 to 4.597). This indicates the independence of these technologies (independent dimensions) and the lack of a significant correlation between them. To determine the impact of using artificial intelligence technologies on human resource development, the researcher developed a multiple linear test model, as illustrated in Table (9).

Table 9 Multiple linear regression analysis (dependent variable: human resource development)

Level of significance (0.05) at	Probability (sig) value	value of t	معاملات الانحدار المعيارية Bate	standard error	Regression coefficients	Independent variables
Dal	0.001	1.094	-	0.157	0.426	The constant
Function	0.007	4.217	0.318	1.480	0.627	Devices
Function	0.008	4.361	0.221	0.081	0.143	Programs and Events
Non-functional	0.010	2.648	0.019	0.069	0.206	Knowledge and reasoning
Analysis of variance ANOVA						
0.00	Probability value			86.462		Test value F
0.597	Model correlation coefficient R			0.718		Value of the adjusted interpretation factor R2

Source: Prepared by the researcher based on the analysis of study data, 2024

The results of the multiple linear test reveal the following:

- Human resource development in Saudi universities is significantly affected by hardware, software, and effectiveness.
- The analysis showed that the coefficient of determination (explanation of variance) was 0.718, indicating that 71.8% of the change in human resource development is due to the application of artificial intelligence technologies. The correlation coefficient was 0.597, and the p-value was 0.00, indicating a positive correlation and highlighting the impact of hardware, software, and effectiveness on human resource development in Saudi universities.
- There is a statistically significant impact of hardware on human resource development in Saudi Arabian universities. The researcher attributes this to the universities' continuous efforts to introduce and develop modern and advanced software, as well as their provision of necessary support from experts and consultants to develop their information systems. This result differs from the findings of Al-Huwayan (2024) and Al-Doud (2021).
- The study found a statistically significant impact of AI programs and their effectiveness on human resource development in Saudi Arabian universities. The researcher attributes this to the fact that the application of artificial intelligence technologies in Saudi universities contributes to increased efficiency and effectiveness in human resource performance, and helps in completing tasks with the required accuracy and speed. This result is consistent with the findings of Abdel-Aal (2022), Zarrouk (2022), Aqili et al. (2020), Jamal and Tunis (2020), and Al-Siraji (2023).

Question 4: "To what extent are there statistically significant differences at the significance level ($\alpha \leq 0.05$) between the mean responses of the study sample regarding the impact of applying artificial intelligence technologies on human resource development in public universities, attributable to the demographic variables (gender, academic qualification, years of experience)?"

To answer this question, the differences were tested using the following method:

1. Two-sample t-test to test differences according to the gender variable:

The researcher used an independent samples t-test to determine the differences in respondents' answers regarding both administrative empowerment and organizational loyalty, attributable to the gender variable. Table (10) illustrates this.

Table 10 Test of the t-test to test differences between genders (male, female)

Result	Level of significance	T	deviation	average	number	Sex	variable
There are no differences	0.840	0.719	0.763	3.657	258	male	Artificial intelligence technologies
			0.509	3.638	94	feminine	
There are no differences	0.694	0.16	0.627	3.580	258	male	Human Resources Development
			0.649	3.693	94	feminine	

Source: Prepared by the researcher based on the analysis of study data, 2024

Table (10) shows that the significance level of the mean responses of the respondents regarding the variables of artificial intelligence technologies and human resource development is greater than (0.05). This indicates that there are no statistically significant differences in the respondents' responses regarding the impact of applying artificial intelligence technologies on human resource development in Saudi universities that can be attributed to the gender variable. The researcher believes this is because males and females perform the same job tasks, work in the same work environment, and provide the same services, regardless of gender.

2. One-way ANOVA to test for differences according to the variables of (academic qualification, years of experience).

A. Testing for differences regarding the mean ratings of the respondents regarding the dependent variable (human resource development):

Table 11 Testing for differences regarding the mean ratings of the respondents regarding the dependent variable (human resource development):

Result	Level of significance	value of F	Averages	Degree of freedom	Sum of squares	Sources of Variation	variable
	0.000	7.563	3.713	5	23.523	Among the groups	

There are differences			0.864	198	69.127	Within the groups	Academic qualification
				203	92.650	the total	
There are differences	0.000	5.639	3.567	5	29.487	Among the groups	Number of years of experience
			0.489	198	89.394	Within the groups	
				203	118.881	Result	

Source: Prepared by the researcher based on the analysis of study data, 2024

Table (11) shows that the significance level for the mean responses of the respondents regarding the dependent variable (human resource development) is less than (0.05). This indicates statistically significant differences in the respondents' responses regarding human resource development in Saudi universities according to the variables of academic qualification and years of experience.

B. Testing for Differences Regarding the Mean Ratings of Respondents Regarding the Independent Variable (Artificial Intelligence Technologies)

Table 12 Testing for Differences Regarding the Mean Ratings of Respondents Regarding the Independent Variable (Artificial Intelligence Technologies)

Result	Level of significance	value of F	Averages	Degree of freedom	Sum of squares	Sources of Variation	variable
There are differences	0.000	8.269	3.320	5	36.268	Within the groups	Academic qualification
			0.609	146	77.203	Within the groups	
				151	113.471	Result	
There are differences	0.000	7.457	3.743	5	31.364	Among the groups	Number of years of experience
			0.537	146	79.105	Within the groups	
				151	197.986	Result	

Source: Prepared by the researcher based on the analysis of study data, 2024

Table (12) shows that the significance level of the mean responses of the respondents on the independent variable (artificial intelligence technologies) is less than (0.05). This indicates statistically significant differences in the respondents' responses regarding human resource development in Saudi universities, according to the variables of academic qualification and years of experience.

Based on the results of the second hypothesis test, the researcher concludes the following:

- There are differences in the respondents' responses according to the variable of academic qualification: This indicates a difference in the respondents' perceptions of human resource development. The researcher believes this is due to the fact that administrative staff with a bachelor's degree or higher have a different perspective than those with lower qualifications. This may be attributed to a difference in their assessment of the importance of the methods used in human resource development.

- There are differences in the respondents' responses according to the variable of years of experience: The researcher attributes this to the fact that administrative staff in public universities with extensive practical experience are considered more experienced than others. Consequently, their perspective on the impact of applying artificial intelligence technologies on human resource development differs. They may also believe that other factors can significantly influence the development of administrative staff's skills. Conclusion

The past few years have witnessed tremendous advancements in information and communication technology. Technology has become an essential and indispensable element across various disciplines and fields. This has been reflected in the names given to our current era, such as the age of the knowledge explosion, the information age, and the knowledge revolution. A nation's progress is no longer measured solely by its information resources, but also by its ability to utilize that information to serve humanity. The most advanced countries in the field of information technology are the most economically and financially powerful. Universities are among the most important educational institutions and play a vital role in economic and social development. Universities constantly require qualified personnel, both academically and practically, to perform their assigned duties optimally and in a modern and advanced manner. This necessitates fundamental changes in university management styles and the adoption of modern administrative methods that align with the evolving work environment. Traditional methods

and tools are no longer adequate to address these changes. This can be achieved through the application of artificial intelligence (AI) technologies in human resources departments. These technologies automate tasks quickly and efficiently using computers. The current study aimed to examine the impact of AI technology on human resource development in Saudi universities from the perspective of a sample of administrative staff. The study concluded with several findings and developmental recommendations that can contribute to addressing the challenges of implementing AI technologies in these universities, as follows:

RESULTS

- A. There is a statistically significant positive impact of the hardware dimension on human resource development in Saudi Arabian universities.
- B. There is a statistically significant positive impact of the program and effectiveness dimension on human resource development in Saudi Arabian universities.
- C. There is no statistically significant positive impact of the knowledge and reasoning dimension on human resource development in Saudi Arabian universities.
- D. There are statistically significant differences in the average responses of respondents regarding the application of artificial intelligence technologies attributable to (gender, academic qualification, and years of experience).
- E. There are statistically significant differences in the average responses of respondents regarding human resource development attributable to (gender, academic qualification, and years of experience).

It is worth noting that there are some limitations that may restrict the generalizability of the results of this study. These include its reliance on a sample of administrative staff in some Saudi universities, its limitation to public Saudi universities only (excluding private and non-profit universities), and the failure of some administrative staff to complete the questionnaire, with some submitting incomplete questionnaires, which led to their exclusion from the validity of the analysis.

Recommendations

In light of the study's findings, the researcher recommends the following:

- A. Developing the administrative environment in Saudi universities to align with the requirements of transitioning to AI-based e-governance.
- B. Encouraging administrative staff to develop their capabilities and skills in applying AI technologies, which will positively impact their performance of assigned tasks with efficiency and effectiveness.
- C. The Ministry of Education in the Kingdom of Saudi Arabia should conduct a study of the challenges facing the application of AI technologies in all universities (public, private, and community-based).
- D. Universities in the Kingdom of Saudi Arabia should implement training courses and workshops to promote awareness of AI technologies and their applications in human resource development within public universities.
- E. Learning from the experiences of developed countries that have made significant progress in applying AI technologies to human resource development.

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