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Artificial intelligence in work environments: its impact on the efficiency and effectiveness of human resource management and productivity enhancement

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Abstract---This study explores the role of artificial intelligence (AI) in enhancing human resource management. It examines how AI contributes to core HR processes: recruitment, performance appraisal, training, and planning. We applied a descriptive Analytical approach to study the connection between AI and HR activation. Our key finding shows that AI constitutes a fundamental shift in HR management. AI automates routine tasks, streamlines, procedures and delivers customized solutions. This leads to more efficient recruitment, training, performance management, and compensation. The study concludes with recommendations for businesses to adopt AI in HR, aiming to save time, reduce costs, and enhance excellence.

Keywords---Artificial intelligence, human resources, HR management, work environments.
JEL Classification: O15, L2.

Introduction

Today's world experiences rapid and sweeping changes due to scientific and technological revolutions. Among the most important innovations is AI. It involves designing systems and software capable of tasks that mimic or resemble human intelligence. Public and private organizations must adapt to these changes and leverage this technological revolution. They increasingly rely on AI, especially in HR management. AI improves precision, flexibility, and creates a simpler environment. This boosts worker

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performance, productivity, and institutional performance. Ultimately, organizations can deliver services accurately and at lower cost.

Research Problem

Organizations have introduced new HR management methods. They found AI to achieve a simpler work environment and more accurate, flexible outcomes. Based on that, this study addresses the following core question: To what extent does AI contribute to activating human resources within business organizations?

Research Hypotheses

To respond to the main question, we formulated two hypotheses:

1. AI significantly influences the efficiency of resource use in business organizations.
2. AI represents a fundamental transformation in HR management.

Research Methodology

We adopted a descriptive-analytical method. The descriptive component helped us capture theoretical aspects of AI and HR. The analytical component allowed us to examine the positive relationship between AI and HR activation.

Literature Review: Human Resources

Janetet et al. (2015) stated that psychologists view human resources as a fundamental starting point for any organization. Stośoegmandif et al. (2017) argued that human resources are among the key assets determining the success or failure of systems. Key elements such as knowledge, skills, abilities, and behaviors play a vital role in improving organizational performance. Human resources are the main assets able to drive growth and development across any institution. HR is a strategic asset, regardless of an organization's nature—whether industrial, commercial, or service-based. Yet, many public institutions do not fully appreciate this importance. Indeed, the success and sustainability of any organization depends on the efficiency and effectiveness of its human resources. Mental intelligence constitutes both human capital and intellectual capital (Tarfa Mohamed, 2020).

1. Definition of Human Resource Management (HRM)

Human Resource Management (HRM) is a process aimed at optimizing the use of individuals within an organization to achieve its strategic goals. This process includes developing human competencies and enhancing collaboration among employees. It involves a set of activities that focus on building employee skills and aligning them with organizational needs to ensure effective performance (Ben Semcha Amal, 2018).

Several definitions of HRM can be found in the literature, among them:

- Sherman and Chruden describe HRM as a set of essential processes and rules that must be followed. They note that the primary role of the HR manager is to assist other managers in the organization and provide them with the necessary advice and guidance to manage their teams more effectively (Elham Chelli, 2023).
- HRM is a sequence of integrated processes concerned with improving relationships between individuals in the organization to enhance their work effectiveness.
- HRM is a process aimed at developing human capital within the organization to ensure the achievement of its strategic goals (Baya Ben Achour & Hussein Kadri, 2020).

2. Importance of Human Resource Management

- HRM focuses on managing human capital as one of the organization's most vital assets.
- It contributes to building an efficient organizational structure that supports internal work processes.

- It plays a key role in developing employee skills and ensuring ongoing performance improvement.
- HRM supports strategic planning efforts that focus on employee training and development.
- It helps assess employee performance by tracking and analyzing work results.
- HRM creates a work environment that encourages cooperation and interaction among employees (Koullar Mostafa et al., 2019).
- It plays a central role in boosting productivity through skills development and effective task organization.
- HRM has a direct impact on strategic decision-making by providing information that supports institutional performance improvement.

3. Objectives of Human Resource Management

3.1 Job Design and Analysis: This function involves identifying the core elements of each position, including tasks, duties, and responsibilities. It also determines the qualifications and requirements needed to perform the job effectively.

3.2 Human Resource Recruitment: Recruitment is one of the most critical factors influencing organizational success. It involves attracting and selecting highly qualified individuals who match the organization's needs and culture. Effective recruitment is not limited to filling vacancies; it also focuses on identifying the skills and experience necessary to achieve the organization's strategic objectives. Thoughtful recruitment practices can improve overall performance, increase productivity, and promote innovation, thereby enhancing the organization's capacity to adapt and grow in a dynamic environment (Omar Wasfi Oqaili, 2005).

3.3 Job Evaluation: Job evaluation involves determining the degree of responsibility and difficulty associated with each role, along with the qualifications of job holders. It serves as the basis for determining fair and appropriate compensation for each position.

3.4 Compensation System Design: This includes establishing a structure for salaries and wages, along with benefits such as health insurance and social security. These are considered direct financial rewards. Indirect compensation is based on job and performance evaluations and is designed to ensure fairness and employee motivation in line with the organization's goals and needs.

3.5 Human Resource Development: This function focuses on building a knowledge system that enhances employees' skills, knowledge, and attitudes. The goal is to improve productivity, meet customer needs more effectively, and increase overall efficiency and satisfaction.

3.6 Human Resource Maintenance: This function is concerned with ensuring the safety, security, and health of employees. It aims to protect them from workplace accidents and hazards (Fariha Ben Krouch & Adel Kaid, 2024).

Section Two: Artificial Intelligence

Artificial Intelligence (AI) refers to the simulation of human intelligence by machines programmed to think and learn in ways that resemble human behavior. It is a broad field focused on developing smart software systems capable of performing tasks that typically require human intelligence—such as visual perception, speech recognition, decision-making, and language translation. These systems are designed to learn and adapt based on experience, and can be trained to perform specific tasks by analyzing large volumes of data. AI technologies include machine learning, natural language processing, computer vision, robotics, and more (Noureddine Saddar, 2023).

AI is also a multidisciplinary field that brings together different technologies and approaches to create machines capable of intelligent behavior. Over the years, experts and institutions have provided various definitions of AI, reflecting the evolving nature of the field and the diversity of opinions within it.

1. Definitions of Artificial Intelligence

Some of the widely recognized definitions of AI include:

- According to the Oxford Dictionary, AI is the study and development of computer systems that can imitate intelligent human behavior (Ibrahim, 2023).

- In The Handbook of Artificial Intelligence, Avron Barr and Edward Feigenbaum define it as "a branch of computer science aimed at designing intelligent computer systems—that is, systems that exhibit the characteristics of intelligent human behavior" (Al-Husseini Osama, 2012).
- AI is also described as the automation of activities related to human thinking, such as decision-making, problem-solving, and learning. A widely accepted definition is attributed to John McCarthy (1965) at MIT, who described AI as a branch of computer science concerned with making machines behave and think like humans.
- Barnett (1991) argued that AI is the science that enables computers to perform tasks usually done best by humans. AI operates by modeling representations of objects, events, and processes using their qualitative properties and logical or computational relationships. It is a field that investigates how to enable machines to perform human-like tasks (Saleh, 2021).
- Another definition sees AI as a subfield of computer science focused on designing systems and programs capable of tasks that simulate or approximate human intelligence. AI relies on algorithms and mathematical models to analyze data, make decisions, and solve problems. Its goal is to develop systems that can learn, reason, and make decisions in ways similar to human intelligence (Issam, 2024).

2. Importance of Artificial Intelligence

AI plays a significant role across many sectors. Its key benefits include:

- Enhancing organizational knowledge through proposing solutions to complex or well-defined problems that may otherwise take humans considerable time to analyse.
- Preserving expertise that could be lost due to employee turnover, outsourcing, or retirement.
- Eliminating repetitive and unsatisfying tasks.
- Helping businesses that adopt AI achieve better results.
- Reducing physical strain and handling dangerous tasks on behalf of humans.
- Transferring accumulated human expertise into smart machines, ensuring long-term knowledge retention (Chenna, 2016).

3. Characteristics of Artificial Intelligence

AI has several defining characteristics, such as:

- The ability to use intelligence to solve problems and demonstrate reasoning and perception.
- The capacity to acquire knowledge and apply it, including learning from past experiences.
- The ability to adapt previous knowledge and use it in new contexts.
- The use of trial and error to explore and understand unfamiliar situations (Dhafra, 2022).

4. Differences between Artificial and Human Intelligence

The main distinctions between AI and human intelligence can be summarized as follows:

- AI can be more cost-effective than human intelligence. In many cases, using AI services is less expensive than employing the number of people needed to perform the same tasks over time.
- AI-based decisions can be trusted and traced by tracking the system's activities, whereas human reasoning is difficult to replicate.
- AI can outperform most people in certain specific tasks.
- Human intelligence is creative, while AI is rigid and lacks emotion.
- Humans benefit from direct sensory experiences, whereas AI systems process symbolic information to simulate understanding (Cherirou, 2022).

A comparison table summarizing the main differences between artificial and human intelligence is presented below:

Table 1: A Comparison Between Artificial Intelligence and Human Intelligence

Properties	Artificial intelligence human	artificial intelligence
The ability to use the senses: ear, eye, touch, and smell.	High	low
The ability to be creative and imaginative	High	low
Ability to learn from experience	High	low
adaptability	High	low
Affordability of intelligence acquisition	High	low
Ability to use different sources of information	High	low
The ability to acquire a large amount of external information	High	low
Ability to perform complex calculations	low	High
ability to transfer information	low	High
The ability to perform a series of calculations quickly and accurately	low	High

Source: Najm Aboud Najm (2007)

1. Limitations of Artificial Intelligence

The disadvantages of artificial intelligence can be summarized in the following points:

- It can be expensive and time-consuming to build, rebuild, and maintain. Automated repairs might reduce the need for human labor, but they still require high financial and resource investments.
- Although AI systems can store large volumes of data, access and retrieval processes may not always support meaningful memory connections.
- AI systems cannot function beyond the tasks they were specifically programmed to perform.
- Even when encoded with logic and reasoning, AI struggles to reach the level of human common sense or intuition.
- The replacement of jobs by robots could lead to widespread unemployment unless new jobs are created to absorb the workforce.
- As seen partly with smartphones and other technologies, people may become overly dependent on AI and risk losing critical cognitive abilities.
- Machines, if misused or controlled by the wrong hands, can cause serious harm. This is one of the common fears surrounding advanced AI systems (Bouteille, 2004).

Section Three: Artificial Intelligence and Human Resources

1. The Importance of Artificial Intelligence in Human Resource Management

AI offers many benefits in the field of human resource management. These advantages apply to employees, organizations, and society at large:

1.1 For Employees

Automating repetitive and time-consuming tasks allows HR managers to focus on value-adding responsibilities that require unique skills and judgment. AI helps reduce errors through machine learning and supports better decision-making by providing accurate information and faster processing. It also saves time and effort.

1.2 For Organizations

AI contributes to increased efficiency and effectiveness. It streamlines HR processes and reduces operational costs. It enhances internal communication and interaction and supports talent identification, selection, and retention. The integration of technologies such as the Internet of Things (IoT), expert systems, machine learning, genetic algorithms, and Just-In-Time (JIT) methods can improve supply chain management in manufacturing, boost productivity, enhance decision-making, and lower costs. AI also serves as a tool to mitigate supply chain risks.

1.3 For Society

The growing presence of AI has led to the creation of new jobs and professions, such as robotics specialists, data scientists, and experts in deep learning and machine learning. It contributes to public welfare by introducing new services and opportunities. AI is expected to play a key role in solving urgent global challenges, including climate change, food security, healthcare, and education. It also promotes creativity and innovation. Moreover, it supports investment in training and digital literacy programs, helps address social challenges, and supports environmental sustainability and long-term development. AI also contributes to strengthening HR processes, promoting cultural engagement, and improving environmental outcomes through knowledge-based technologies, dynamic methods, and machine learning (Abdullah Abdullah Ahmed Al-Tabbal, 2024)

1. Applications of Artificial Intelligence in Human Resource Management

1.1 Expert Systems

Expert systems are knowledge-based systems and represent one of the earliest research areas in artificial intelligence. They are defined as software systems rich in knowledge, capable of performing tasks that usually require human expertise. The process of building expert systems with specialized knowledge is known as knowledge engineering.

These systems store knowledge gathered from scientific journals, books, or interviews with human experts in a specific domain. An expert system typically consists of two main components: the knowledge base and the inference engine. The knowledge base contains domain-specific information, which may be represented through simple facts or more complex structures like frames. It also includes rules that reflect the expert's skills or understanding of the domain in question.

1.2 Knowledge Discovery in Databases (KDD)

KDD refers to the automatic and exploratory process of analyzing and modeling large datasets. It is a structured process used to identify valid, novel, useful, and understandable patterns in complex and large-scale data collections.

At its core is data mining (DM), which involves developing algorithms that explore datasets, generate models, and detect previously unknown patterns. KDD models are used to derive insights and explain phenomena observed within data.

1.3 Data Mining

Data mining is a growing field that focuses on developing methods to explore large-scale information represented across various data types. Data mining techniques are generally classified into two main types: predictive and descriptive.

Predictive techniques include:

- Classification
- Regression
- Time series analysis

Descriptive techniques include:

- Clustering
- Summarization
- Association rule analysis

It is important to note that knowledge discovery and data mining are closely related. Researchers describe knowledge discovery as an automatic process that extracts valuable and relevant knowledge from large datasets. Data mining supports this by developing techniques to manage and analyze vast information using methods such as classification, regression, clustering, summarization, and rule analysis.

1.4 Big Data Analytics

Big data analytics is a field that focuses on extracting and analyzing complex data that cannot be processed using traditional data processing systems. It deals with extremely large volumes of structured and semi-structured data that are beyond the capacity of conventional software tools to handle efficiently.

1.5 File Conversion

The need for file conversion arises from the diversity and complexity of digital file formats and the rapid changes in information technology. These changes may render some formats obsolete over time. File conversion is defined as the process of changing a file from its original format into another using specific software or services.

This process ensures accessibility and compatibility across different operating systems, software environments, and display devices (Imane Maqdad & Nassim Hamouda, 2024).

3. The Role of Artificial Intelligence in Human Resource Management

Artificial intelligence (AI) technologies have seen significant advancements, making them a vital tool for improving human capital management. Their main value lies in their ability to analyze large datasets with precision, which supports effective strategic decision-making and improves operational efficiency. This, in turn, contributes to better organizational performance and strengthens competitiveness. AI's role in human resource management can be observed in the following key areas:

3.1 Employee Recruitment

AI has become an increasingly used tool for automating recruitment processes. It starts with screening and analyzing resumes through platforms such as CrowdedInc, which helps streamline hiring and select suitable candidates more efficiently. This is followed by conducting interviews and choosing the best-fit applicant. Since these are repetitive and labor-intensive tasks, AI is employed to speed up manual processes that would otherwise require significant time and effort.

3.2 Performance Evaluation

AI contributes to performance management by helping HR professionals make more transparent and data-driven decisions. It reduces the influence of personal bias and supports decision-making across all performance management stages. Techniques such as data mining improve the accuracy of evaluations and enhance employee satisfaction by minimizing human intervention.

Moreover, tools like voice sentiment analysis and AI-powered chat systems support continuous engagement and real-time performance tracking. These tools deliver timely feedback and offer detailed insights into completed tasks, employee achievements, and progress levels. This contributes to greater institutional efficiency and better performance outcomes (Ilham Chiali, 2023).

3.3 Human Resource Planning Strategy

Strategic planning of human resources serves as a foundation for managing human capital in organizations. Managers are increasingly relying on AI to support strategic decision-making, enabling them to design more accurate and comprehensive plans. This process involves advanced techniques such as data mining and knowledge discovery, used to gather and analyze large volumes of data.

By integrating both internal and external data sources, organizations can forecast future trends, assess their strategies, and adapt management practices to achieve goals effectively in dynamic environments.

3.4 Training and Development

In organizational training, AI is applied to personalize the learning experience and adapt to individual employee needs. By analyzing big data, AI helps identify which employees require training in specific areas, based on an expanded knowledge base.

This enables the design of tailored training programs that match employee skill gaps, while also assessing overall competence levels. These technological tools enhance the effectiveness of training

sessions, improve organizational performance, increase productivity, and support competitiveness (Qiong Jia, Yue Guo, Rong Li, Yurong Li, Yuwei Chen, 2018).

3.5 Compensation Management

Artificial intelligence can play a key role in promoting fairness in compensation management. By applying advanced techniques such as Backpropagation (BP) neural networks—one of the supervised AI methods—organizations can process data in a structured and accurate way. These tools help ensure fair compensation distribution based on objective criteria and improve the quality of decisions related to rewards and incentives.

Traditional neural networks, grounded in fields such as biology, neuroscience, psychology, and statistics, can simulate the structure of the human nervous system and generate organized computational models. By integrating several neural network layers, such models can support intelligent decision-making systems. These systems help design fair salary evaluation models by analyzing large-scale data inputs.

3.6 Communication Management

AI tools can assist in managing complex and repetitive tasks. They support managers and teams by handling scheduling, registration, reporting, and performance indicator tracking. A notable example is the "virtual assistant" system, which helps organize meetings by managing emails, scheduling participants, and coordinating calendars.

Through these tasks, intelligent systems gradually improve their relevant knowledge and expand service delivery by learning from their own experiences and those of others. This continuous development strengthens organizational processes and has a positive impact on performance and productivity (Imane Maqdad & Nassim Hamouda, 2024).

4. Advantages of Artificial Intelligence in Human Resource Development

Artificial intelligence resources offer significant benefits in advancing human. Key advantages include:

4.1 Increased Efficiency and Productivity in HR Operations

AI has improved efficiency and productivity in HR activities, especially in recruitment and selection. It speeds up resume analysis, enhances accuracy, and reduces bias. AI also automates administrative tasks such as payroll processing and performance appraisals, allowing professionals to focus on strategic initiatives.

Additionally, AI provides analytics that support forecasting skill gaps and potential risks related to employee turnover. This enables proactive planning and workforce management.

4.2 Improved Decision-Making and Strategic Planning

AI contributes to better decision-making and strategic planning in HR by analyzing large-scale data and offering accurate insights into performance and talent. It helps identify high-potential employees, detect skill shortages, and predict future workforce needs. These capabilities allow for optimal resource allocation and the design of effective succession plans.

4.3 Personalized Learning and Development Opportunities

Artificial intelligence has significantly improved employee learning and development by providing personalized training programs tailored to individual needs. Unlike traditional programs, which follow a one-size-fits-all model, AI platforms analyze employee data to identify strengths and weaknesses. Using AI-powered algorithms, targeted training modules can be designed to bridge skill gaps and promote personal growth. In addition, virtual assistants and chatbots offer continuous support, reinforcing a culture of lifelong learning and enabling employees to manage their career development more effectively *(Mawahib A. Selman Ibrahim, 2024)*

Conclusion

The emergence of artificial intelligence has transformed many sectors, with far-reaching applications across industries. One of the most significant areas impacted is public administration—particularly human resource management. This study has highlighted AI's growing importance in simplifying

administrative processes and offering effective solutions for HR functions, such as recruitment, training, and employee development.

The study reached the following conclusions:

- The use of AI technologies yields more accurate and adaptable results.
- AI enhances employee productivity and supports positive behavioral outcomes.
- AI contributes to more informed decision-making by relying on precise, data-driven insights.
- AI represents a fundamental shift in human resource management by automating routine tasks, streamlining processes, and offering tailored solutions in recruitment, training, performance evaluation, and compensation.
- AI has proven effective in optimizing resource use by reducing time, effort, and operational costs. It achieves this through the automation of traditional processes and restructuring of HR practices.
- AI tools have become a core component in modern economic organizations, reflecting a strategic transformation in business models and management approaches aimed at improving efficiency and innovation in increasingly competitive environments.

Artificial intelligence offers significant opportunities for organizations to enhance performance and efficiency. Through data analysis, pattern recognition, and forecasting of market changes, it supports strategic decision-making and strengthens competitiveness.

Recommendations

- Training employees on the applications of artificial intelligence, especially in the field of human resource management, helps enhance administrative system efficiency and improves the performance of HR functions.
- Conducting further research on the impact of artificial intelligence and its relationship to the effectiveness of administrative systems in HRM is essential for understanding how to optimize managerial performance and operational efficiency.
- Strengthening management's commitment to AI implementation by promoting a digital work culture and focusing on its advantages supports both efficiency and effectiveness.
- Reviewing and updating regulations in both public and private institutions to align with the requirements of AI-based systems has become necessary, particularly in light of the ethical challenges that call for such reforms.
- Human resource departments should be prepared to adapt to current and future developments in AI. Strategic use of these technologies can support organizational goals and enhance competitiveness.

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