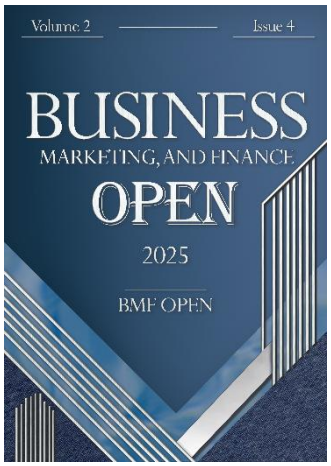
Identifying Strategies for Enhancing Efficiency and Optimizing Human Resource Processes in Government Organizations Based on Artificial Intelligence



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Abstract: The present study aims to identify strategies for enhancing efficiency and optimizing human resource processes in government organizations based on artificial intelligence. The research method is library-field-based in terms of environment, applied in terms of purpose, cross-sectional in terms of data collection time, descriptive-survey in terms of research implementation method, and of a correlational and causal type. Additionally, considering the study's objectives and nature, a mixed-methods approach integrating qualitative and quantitative methods was employed. The statistical population in the qualitative section of the study consists of 30 experts and senior managers of government organizations in Tehran. In the quantitative section, the opinions of all employees of government offices in Tehran were utilized for statistical analysis. Cochran's formula was used to determine the sample size for the quantitative section, resulting in a selection of 385 participants. For data analysis in the qualitative section, the fuzzy Delphi technique was employed. In the quantitative section, descriptive analyses utilized tests such as the one-sample t-test, while inferential analyses were conducted using SPSS software and the fuzzy Analytical Hierarchy Process (AHP) technique. The results indicated that strategies for enhancing efficiency and optimizing human resource processes in government organizations based on artificial intelligence include process automation, big data analysis, intelligent performance management systems, AI-based recruitment, and workforce needs prediction and analysis. Additionally, among these components, process automation ranked as the top priority, followed by workforce needs prediction and analysis in second place, AI-based recruitment in third place, big data analysis in fourth place, and intelligent performance management systems in fifth place.

Keywords: Efficiency, Optimization, Human Resource Management, Artificial Intelligence

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1. Introduction

Employees, as a crucial part of a company's intangible assets, undoubtedly have a significant impact on corporate strategy and operations. No company can sustain its activities without the active participation of its employees [1]. Human resources, as the most valuable asset of an organization, have always been a focal point for both for-profit and non-profit organizations [2]. Undeniably, human resources represent the greatest capital of any organization and have long been the foundation of its progress. The improvement and development of human resources to enhance organizational productivity has always been a priority for both for-profit and non-profit organizations [3].

Today, productivity, efficiency, and organizational excellence have become key considerations for management in organizations of all sizes. Experienced managers have realized that to achieve success in the highly competitive global market and increase profitability, it is essential to focus on factors related to workforce productivity and labor efficiency [4]. Efficiency, a concept in both economics and management, has multiple definitions: the amount of goods or services produced relative to each unit of energy or labor expended without compromising quality, or the combination of effectiveness and efficiency. In other words, productivity refers to obtaining maximum possible benefits through the optimal use of labor, power, talent, and skills of human resources, land, machinery, capital, equipment, time, space, and other resources to enhance societal well-being. Productivity is defined as the ratio of work performed to the work that should have been performed [5, 6].

Identifying strategies for increasing efficiency and optimizing human resource processes in government organizations based on artificial intelligence is now an essential necessity in organizational management. According to global reports, government organizations, on average, utilize only 30% of their potential in human resource management [7, 8]. However, the integration of modern technologies and artificial intelligence can increase this figure to 70%, leading to improved public services and greater citizen satisfaction [9]. Furthermore, given the increasing volume of data and managerial complexities, neglecting process optimization can result in resource wastage and reduced efficiency [6].

In the present era, government organizations face multiple challenges in human resource management. AI-based strategies for increasing efficiency and optimizing human resource processes can assist organizations in analyzing big data and identifying employee behavioral patterns, enabling better decision-making and, consequently, improving efficiency and productivity [10]. For instance, machine learning algorithms can be instrumental in identifying employee training needs and improving recruitment processes [11].

Moreover, these strategies can enhance the employee experience and increase job satisfaction. Through AI integration, organizations can automate administrative processes, freeing up employees' time and energy for creative and strategic tasks [12]. These changes not only contribute to efficiency improvement but also facilitate talent attraction and retention.

Despite AI's high potential in optimizing human resource processes, several challenges persist. One key challenge is organizations' lack of readiness to adopt modern technologies. Many government organizations, due to traditional structures and resistance to change, struggle to implement AI-driven strategies [8]. This issue can lead to resource wastage and inefficiencies in organizational performance. Another challenge involves privacy and data security concerns. As AI usage expands, concerns regarding the collection and utilization of employees' personal data are also increasing [7]. This can reduce employee trust in the organization, ultimately diminishing efficiency. Additionally, the lack of necessary skills among employees to work with modern technologies is another critical challenge that must be addressed [13].

Several factors can influence the improvement of AI-driven strategies for increasing efficiency and optimizing human resource processes in government organizations. One such factor is employee training and empowerment. By providing appropriate training and enhancing employees' digital skills, organizations can effectively leverage AI capabilities [14]. This not only improves efficiency but also fosters a culture of innovation within the organization.

Furthermore, developing appropriate IT infrastructure is also crucial. Organizations must invest in modern technologies and create integrated systems for data collection and analysis [15]. Such infrastructure can help organizations maximize the use of their data and make informed decisions.

The existing inefficiencies and challenges in AI-driven strategies for increasing efficiency and optimizing human resource processes in government organizations have led to serious performance issues. The lack of process optimization and AI integration can result in resource wastage, decreased service quality, and citizen dissatisfaction. For example, reports indicate that 40% of citizens are dissatisfied with the quality of government services. This dissatisfaction can reduce public trust in the government and increase social unrest. The unresolved issues in this area can have negative cultural, social, economic, and political consequences. From a cultural perspective, the lack of optimization can lead to decreased employee motivation and commitment, ultimately affecting service quality. Socially, citizen dissatisfaction may escalate social discontent and public protests. Economically, inefficiency in government organizations can increase public expenditures and reduce governmental investments.

To address the existing challenges in AI-driven strategies for increasing efficiency and optimizing human resource processes in government organizations, it is necessary to foster a culture of innovation, invest in modern technologies, and train employees. Additionally, establishing transparent and effective policies regarding data privacy and security is of paramount importance. These measures can enhance organizational performance and improve citizen satisfaction.

The research question posed is: "How can AI-driven strategies be utilized to increase efficiency and optimize human resource processes in government organizations?"

2. Methodology

The present study employs a library-field research approach in terms of the research environment. It is applied in terms of purpose, cross-sectional in terms of data collection timing, and descriptive-survey in terms of execution, with a correlational and causal nature. Furthermore, considering the study's objectives and nature, a mixed-methods approach was adopted by integrating qualitative and quantitative methods.

The qualitative research population consists of experts and senior managers of government organizations in Tehran who have executive experience at decision-making levels and are referred to as knowledgeable experts. In this regard, based on the principle of theoretical saturation and purposive sampling, 30 participants were selected as the sample.

In the quantitative section, the statistical analysis was based on the opinions of all employees of government offices in Tehran. The Cochran formula was used to determine the sample size for the quantitative section, resulting in the selection of 385 participants.

For identifying components and indicators, the fuzzy Delphi technique was utilized. Through the Delphi process, the following strategies were identified for increasing efficiency and optimizing human resource processes in government organizations based on artificial intelligence:

- Process Automation
- Big Data Analysis
- Intelligent Performance Management Systems
- AI-Based Recruitment
- Workforce Needs Prediction and Analysis

To collect field data, a researcher-developed statistical questionnaire was used, which was assessed for reliability and validity. The results are presented in the following table.

Table 1. Average Variance Extracted (AVE) and Composite Reliability Coefficient

Component	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Process Automation	0.812	0.835	0.55
Big Data Analysis	0.862	0.883	0.52
Intelligent Performance Management Systems	0.753	0.750	0.53
AI-Based Recruitment	0.790	0.711	0.51
Workforce Needs Prediction and Analysis	0.811	0.793	0.59

As shown in the above table, the AVE values for all variables are above 0.5, and the composite reliability coefficient for each variable is greater than the corresponding AVE. Additionally, the Cronbach's alpha values exceed 0.7, confirming the reliability of the research instrument. Moreover, since the indicators were reviewed and refined based on expert opinions, they inherently possess the required validity and can be considered trustworthy.

For data analysis, the fuzzy Delphi technique was used in the qualitative section. In the quantitative section, descriptive analyses were conducted using tests such as the one-sample t-test, while inferential analyses were performed using SPSS software and the fuzzy Analytic Hierarchy Process (AHP) technique.

3. Findings

As previously mentioned, the qualitative section initially focused on identifying components using the fuzzy Delphi method. Based on the results from the first stage of the fuzzy Delphi process involving 30 experts who participated in the study, the Delphi process was conducted in three stages, and the mean differences were calculated. The difference in the mean opinions of experts between the second and third stages showed that the mean difference in the table was less than 0.2. Therefore, the Delphi process was terminated, indicating that consensus among experts had been reached. The strategies for increasing efficiency and optimizing human resource processes in government organizations based on artificial intelligence can be identified as follows.

Table 2. Expert Opinions on Strategies for Increasing Efficiency and Optimizing Human Resource Processes in Government Organizations Based on Artificial Intelligence

Component	Indicator	Expert Opinion
Process Automation	Reduction in process completion time	High
	Reduction in human errors	High
Big Data Analysis	Accuracy of predictions	Medium
	Number of extracted insights	Medium
	Data processing time	High
	Diversity of data sources	High
Intelligent Performance Management Systems	System acceptance rate	High
	Time spent on evaluation	High
	Performance evaluation accuracy	Medium
AI-Based Recruitment	Diversity in hiring (gender, race, etc.)	High
	Managerial survey on the quality of selected candidates	Medium
	Recruitment success rate	High
Workforce Needs Prediction and Analysis	Workforce needs fulfillment rate	High
	Number of workforce needs identified within a specific period	High
	Positive changes in HR planning based on predictions	Medium

In the quantitative section of the study, the research variables were first described. The mean and standard deviation of the research variables are presented in the table below.

Table 3. Mean and Standard Deviation of Variables

Variable	Mean	Standard Deviation
Process Automation	3.31	0.662
Big Data Analysis	3.84	0.547
Intelligent Performance Management Systems	3.37	0.784
AI-Based Recruitment	3.76	0.688
Workforce Needs Prediction and Analysis	3.68	0.931

The above table indicates that the highest mean belongs to the variable "Big Data Analysis" (3.84), while participants scored the lowest for "Process Automation" (3.31). A comparison of standard deviations also reveals that "Big Data Analysis" has the least dispersion among the variables.

To further examine the status of the identified factors in the model, the t-test was conducted, considering the normal distribution of data and the interval scale of variables. Since a 5-point Likert scale was used, a numerical value of 3 was considered as the benchmark for comparison in the t-test. The results of the one-sample t-test are presented in the following table.

Table 4. One-Sample t-Test for Evaluating Strategies for Increasing Efficiency and Optimizing Human Resource Processes in Government Organizations Based on Artificial Intelligence

Component	t-Value	Sig.	Mean Difference	95% Confidence Interval of the Difference
				Lower Bound
Process Automation	10.88	0.000	0.43	0.35
Big Data Analysis	7.02	0.000	0.30	0.22
Intelligent Performance Management Systems	2.05	0.041	0.09	0.00
AI-Based Recruitment	-15.10	0.000	-0.62	-0.70
Workforce Needs Prediction and Analysis	6.33	0.000	0.27	0.19

As shown in the table, the significance level for all variables is less than 0.01, indicating that the null hypothesis is rejected with 99% confidence, confirming the research hypothesis. Moreover, the negative mean difference for some variables suggests that their observed mean is not in a favorable condition. Conversely, the positive mean difference for other components indicates that they are in a satisfactory state.

Next, the prioritization of influential components was conducted using expert opinions. The results obtained from the fuzzy AHP (Analytic Hierarchy Process) technique are presented below.

Table 5. Pairwise Comparison Matrix of Strategies for Increasing Efficiency and Optimizing Human Resource Processes in Government Organizations Based on Artificial Intelligence

Component	X1max	X2max	X3max	Defuzzy	Normalized
Process Automation	0.306	0.303	0.299	0.306	0.291
Big Data Analysis	0.201	0.199	0.196	0.201	0.191
Intelligent Performance Management Systems	0.137	0.135	0.133	0.137	0.130
AI-Based Recruitment	0.204	0.201	0.198	0.204	0.194
Workforce Needs Prediction and Analysis	0.205	0.203	0.200	0.205	0.195
Total				1.053	1.000

Based on the results:

- **Process Automation**, with a normalized weight of **0.291**, is the top priority.
- **Workforce Needs Prediction and Analysis**, with a normalized weight of **0.195**, ranks second.
- **AI-Based Recruitment**, with a normalized weight of **0.194**, ranks third.

- **Big Data Analysis**, with a normalized weight of **0.191**, ranks fourth.
- **Intelligent Performance Management Systems**, with a normalized weight of **0.130**, ranks fifth.

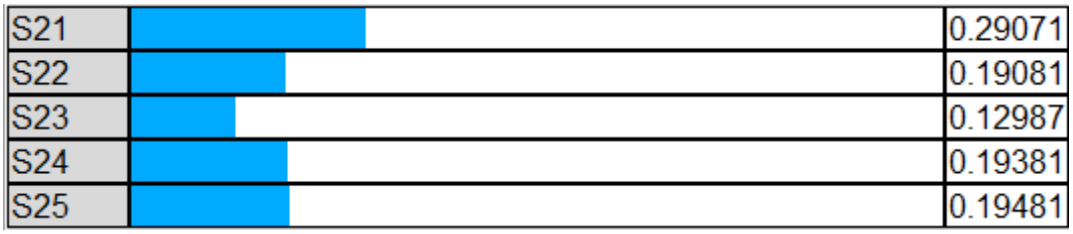

Figure 1. Defuzzified Weights of Strategies

The inconsistency rate of the comparisons was 0.079, which is smaller than 0.1, confirming that the conducted comparisons are reliable.

4. Discussion and Conclusion

The present study aimed to identify strategies for increasing efficiency and optimizing human resource processes in government organizations based on artificial intelligence, analyzing various dimensions of this topic. The findings indicate that the implementation of artificial intelligence in human resource processes can significantly enhance efficiency and effectiveness. According to the results, Process Automation ranks first with a normalized weight of 0.291. Workforce Needs Prediction and Analysis ranks second with 0.195, AI-Based Recruitment ranks third with 0.194, Big Data Analysis ranks fourth with 0.191, and Intelligent Performance Management Systems ranks fifth with 0.130.

The identified strategies and their impact on human resource processes are discussed as follows. Process Automation is one of the most important strategies for increasing efficiency in government organizations. AI tools can automate repetitive and time-consuming tasks, reducing time spent on tasks while increasing accuracy and quality. For instance, processes related to request registration and processing, performance evaluation, and attendance management can be automated, leading to a reduction in human errors and increased employee satisfaction.

Big Data Analysis plays a crucial role in optimizing human resource processes. By analyzing data related to employee performance, training needs, and hiring trends, organizations can gain deeper insights into their workforce. These insights help managers make informed decisions regarding human resource development and respond effectively to employee needs. Additionally, advanced machine learning algorithms can identify hidden patterns and predict future workforce needs.

Intelligent Performance Management Systems serve as key tools for evaluating and improving employee performance in government organizations. These systems leverage collected data to provide more accurate performance evaluations. Consequently, appropriate training and development programs can be designed to enhance employee performance. Furthermore, these systems contribute to transparency and fairness in evaluations and provide constructive feedback to employees.

AI-Based Recruitment enables organizations to optimize hiring processes. AI algorithms can identify suitable candidates based on specific criteria and existing data, reducing hiring time and costs while improving diversity

and recruitment quality. Additionally, these systems can identify job-specific needs and align them with available skills in the labor market.

Workforce Needs Prediction and Analysis allows organizations to proactively address their future needs. Predictive models can help organizations identify labor market changes, employee training and skill requirements, and design appropriate programs to meet these needs. This approach helps prevent workforce crises and optimizes human resource management.

Overall, the findings suggest that implementing AI-driven strategies in human resource processes can significantly enhance efficiency and optimization in government organizations. Given the rapid changes in the modern work environment and the necessity of adapting to emerging technologies, organizations must pay special attention to these strategies. This study serves as a guide for human resource managers in government organizations to leverage artificial intelligence in improving performance and efficiency. Finally, it is recommended that organizations continuously evaluate and refine these strategies to capitalize on technological advancements.

To optimize human resource processes in government organizations using artificial intelligence, the following recommendations are proposed for government agency managers:

1. **Investing in AI Technologies**: Managers should invest in AI tools and technologies capable of automation and data analysis. These investments may include performance management software, AI-based recruitment systems, and big data analytics platforms.
2. **Employee Training and Empowerment**: Conducting training programs for employees on AI applications and new tools is essential. These trainings should cover the use of new systems, data analysis, and automation tools, ensuring employees can effectively adapt to these technologies.
3. **Developing a Data-Driven Organizational Culture**: Managers should foster a culture of data-driven decision-making within their organizations. This culture should emphasize using data for performance evaluation, workforce needs prediction, and process improvement. Regular data collection and analysis should inform key decision-making processes.
4. **Enhancing Smart Recruitment Strategies**: Managers should leverage AI tools to optimize hiring processes. These tools can help identify suitable candidates based on relevant skills and experiences. Additionally, AI algorithms can enhance diversity in recruitment and mitigate biases in candidate selection.
5. **Continuous Performance Analysis and Process Improvement**: Managers should regularly assess the performance of AI systems and analyze collected data. These evaluations should identify system strengths and weaknesses and suggest improvements to ensure continuous process optimization.
6. **Addressing Future Workforce Needs**: Managers should focus on forecasting and analyzing future workforce needs. This includes identifying essential skills for the future and planning employee training and development accordingly. Predictive models can help organizations stay ahead of labor market changes.
7. **Establishing Effective Communication Channels**: Managers should create effective communication channels between employees and management to facilitate the exchange of opinions and suggestions regarding process improvements and technology adoption. These interactions can foster a sense of ownership and engagement in organizational change.
8. **Developing Ethical AI Policies**: Managers should establish ethical policies for AI implementation and data analysis. These policies should address employee privacy protection and transparency in data usage, fostering trust among employees.

9. **Forming Interdisciplinary Teams**: Creating interdisciplinary teams comprising human resource specialists, data scientists, and IT professionals can enhance HR processes. These teams can analyze data, identify needs, and implement AI-driven solutions effectively.
10. **Learning from Successful Case Studies**: Managers should examine successful case studies of AI implementation in human resource management from other organizations. These examples can serve as models for improving their own HR processes in government agencies.

By implementing these recommendations, government organizations can optimize human resource processes, increase efficiency, and ultimately improve public service delivery and citizen satisfaction.

Authors' Contributions

Authors equally contributed to this article.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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Conflict of Interest

The authors report no conflict of interest.

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