The primary object of analysis in this study is the impact of artificial intelligence (AI) on various departments of a district state administration. The problem addressed by the research was to evaluate the key benefits and challenges of using AI to optimize management processes. The results demonstrated a significant increase in the efficiency of handling citizen inquiries, reducing the processing time from seven days to two days, indicating the high productivity of the implemented systems.

These results can be explained by the application of automating routine tasks and optimizing workflows, which lead to the rapid processing of inquiries and reduction of administrative burdens. Moreover, the increased internal consistency of the data, confirmed by Cronbach's alpha, indicates the reliability of the metrics and assessment tools used.

The distinctive features of the results, such as high transparency and efficiency of processes, became possible through the integration of the latest AI technologies, which helped solve the identified problem. These features allow AI to serve as an important tool in public administration reform.

The scope of practical application of the results includes the use of AI to enhance the quality of public services and optimize internal processes in public administration. Owing to the implementation of best practices in data management and cybersecurity, departments can achieve better interaction and efficiency, promoting the development of a transparent and effective management system.

The practical application of the proposed innovations could significantly improve the quality of interaction with citizens, ensuring greater satisfaction with services and compliance with modern efficiency requirements

***Keywords:** artificial intelligence, innovation, public administration, cyber security, transparency of management, efficiency of management processes*

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OPTIMIZATION OF MANAGEMENT PROCESSES IN CENTRAL GOVERNMENT BODIES THROUGH THE INTEGRATION OF ARTIFICIAL INTELLIGENCE

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1. Introduction

In today's world, artificial intelligence (AI) is becoming increasingly widespread in various areas of human activity, from industry to medical research. The public administration sector is no exception, in which there is also a significant interest in the integration of AI, in particular, in the activities of central state authorities. The use of innovative technologies opens up new horizons for increasing the efficiency of management processes, optimizing public administration, as well as for improving the quality of providing services to citizens.

Through the analysis of large data sets, automation of routine tasks, forecasting and optimization of processes, central state authorities will not only be able to increase their efficiency and productivity but also ensure a higher quality of interaction with citizens. The issue of integration of AI in the context of digitalization of public services is becoming relevant, which requires a comprehensive approach to the implementation of technologies, ensuring cyber security, and protecting personal data of citizens.

In view of the above, this paper aims to investigate the current state of AI use in the activities of central state authorities, identify the main advantages and challenges, as well as outline the prospects for the development of this field. An important aspect is also the analysis of international experience and best global practices, which can serve as a guide for further integration of AI into the public administration system. The use of AI opens up new opportunities for increasing the transparency of public administration, ensuring more effective interaction with citizens, and creating conditions for the development of an innovative society.

However, the integration of AI into public administration also poses a number of ethical, legal, and social challenges. In particular, there are questions about privacy and the protection of personal data, the ethical use of digital algorithms and systems, and the potential impact on employment due to the automation of jobs. Taking into account these challenges requires the development and implementation of complex strategies that will ensure a balance between the innovative potential of AI and the need to protect the fundamental rights and freedoms of citizens.

Also, an important aspect is the need to ensure accessibility and inclusiveness of digital services created on the basis of AI for all categories of citizens, including people with disabilities, the elderly, and those living in remote regions.

The development of such services should take into account the diverse needs of users and provide equal access to information and public services.

Research in the field of application of artificial intelligence (AI) in the activities of central state authorities indicates a significant potential for optimizing management processes and improving the efficiency of public services.

2. Literature review and problem statement

Work [1] reports the results of research that demonstrate that the use of artificial intelligence can significantly increase the efficiency of management processes; however, issues related to the integration of AI into existing systems remain unresolved. The likely reason is technical limitations and the high cost of adaptation. An option to overcome these difficulties may be the development of modular systems. This is the approach used in work [2] with certain emphasis on ethical issues.

Work [2] outlines the ethical aspects of using artificial intelligence in the provision of local public services, emphasizing the need to devise ethical principles that take into account the specificity of local conditions. The work emphasizes that one of the main problems is the lack of a universal legislative framework that would regulate the ethical implementation of AI at different levels of management. The authors note that international cooperation and standardization can help overcome these challenges, providing a more coherent and fair approach to the implementation of AI in the activities of government structures.

Study [3] describes the role of artificial intelligence in cyber security and highlights its potential as a defensive tool to protect digital identity. The authors note that AI can significantly strengthen cyber defense but the integration of these technologies into existing cyber security systems faces a number of challenges, such as the need to constantly update the knowledge and skills of specialists. The work emphasizes the importance of implementing specialized training programs to increase the effectiveness of using AI in protecting against cyber threats.

Work [4] carefully considered the potential of AI in public services but the problems with data privacy remain unresolved due to the cost part in terms of data protection. A likely option to overcome these difficulties is the implementation of advanced data encryption and anonymization technologies. All this gives reason to assert that it is expedient to conduct a study on the development and implementation of comprehensive measures to protect personal data in systems using AI.

Paper [5] reports the results of research that show that big data analytics and artificial intelligence can significantly improve the quality and validity of decisions in the field of public administration. It is shown that the integration of these technologies can transform the decision-making process, making it more transparent and oriented to the needs of citizens. However, issues related to the development of the competencies of civil servants for the effective use of these tools remained unresolved. The likely reason is the insufficiency of internal training programs and the costly part in terms of updating knowledge. An option to overcome these difficulties is the creation of integrated educational programs. This is the approach used in study [6]; all this gives reason to claim that it is appropriate to conduct a study on the development and implementation of effective methods of training and adaptation of civil servants.

In work [6], the authors analyze the use of AI in the public sector, emphasizing its ability to radically transform management through the automation of routine processes and the optimization of resource allocation.

Study [7] argues that AI can strengthen governance transparency but highlights challenges related to data protection. These challenges highlight the need to devise a robust information protection framework. Advances in technology can help overcome these barriers, but more research is needed to ensure the security of personal data.

Work [8] analyzes the future of work in the public sector with the introduction of AI, showing how it requires new skills from employees. However, issues related to rapid technological changes that may render existing teaching methods inadequate remain unresolved. A likely option to overcome these difficulties is the development of comprehensive training programs that adapt to the needs of the new technological environment.

In [9], an integrative framework model for the management of artificial intelligence in the public sector is proposed, which is based on risk management and recommendations. The authors emphasize that the implementation of AI significantly improves policy development processes and increases the efficiency of management, as it allows processing large volumes of data, which facilitates the identification of trends and the adoption of informed decisions. However, they also point out that there are challenges in devising an adequate framework to manage the risks arising from rapid technological developments. The authors of study [10] take a similar position. In particular, they emphasize that AI can significantly improve the quality of public services and the efficiency of management processes in both developed and developing countries. At the same time, they note a number of challenges, including maintaining data privacy and potentially increasing social inequality, especially in the context of varying levels of access to technology.

In work [10], the authors emphasize the need to devise strategies that take these risks into account and protect the rights of citizens, which is especially relevant for countries with different levels of economic development. This research highlights the importance of responsible AI implementation and active dialog between governments, businesses, and civil society to ensure the equitable use of technology in public administration.

Paper [11] emphasizes the importance of ethical considerations when using AI in public administration. It argues that clear ethical frameworks are critical to ensuring transparency, fairness, and accountability in the use of AI. It emphasizes the need for policies that minimize risks and provide benefits to the public. The study highlights the importance of ethical education and reflection in the context of AI implementation.

Study [12] analyzes the impact of AI on the productivity of the public sector, demonstrating how AI can improve management and speed up the execution of tasks. At the same time, challenges such as staff adaptation and data security are indicated. This study points to the need for an integrated approach to the development of competencies and infrastructure.

The authors of [13] investigate the application of artificial intelligence in the field of health care, focusing on its significant potential for improving the level of medical services

and the general health of the population. They are analyzing the possibilities of using AI to optimize medical procedures, including more accurate diagnosis, personalized treatment and improving the efficiency of medical processes. However, the study also draws attention to important challenges, chief among which is the protection of patient data. The work emphasizes the need to build a reliable management model that will ensure the responsible implementation of AI in medical practice, taking into account ethical aspects and protecting the privacy of patients.

Study [14] focuses on the use of AI in developing countries. It shows how AI can contribute to economic development and the fight against poverty but also points to the limited access to technology and the need for infrastructure development. This study highlights the need for international support to overcome technological barriers.

Our review of the literature provides a broad understanding of the potential and challenges associated with the implementation of artificial intelligence in public administration. While those studies successfully highlight opportunities to improve the efficiency and transparency of decision-making in the public administration sector, they also highlight the ethical and social aspects accompanying the implementation of AI.

However, a critical review reveals some gaps in research. Scientists mostly focus on the theoretical perspectives and potential of AI, not paying enough attention to the practical aspect of technology implementation and real case studies. Furthermore, although ethical and social risks are discussed, there is insufficient suggestion of specific solutions or frameworks that could be applied to minimize them. There is also a lack of in-depth analysis of the impact of AI on jobs and employee skills. There is also no development of strategies for personnel adaptation to new technological conditions.

Despite significant contributions to the understanding of the impact of AI on public administration, there is a need for more detailed and practically oriented research. Such research should include the analysis of successful cases of AI integration, as well as the development of specific methodologies to address identified risks and problems.

An important issue in the context of the use of artificial intelligence in the activities of central government bodies is the need to find a balance between efficiency and ethical considerations, as well as to cope with technical and legislative challenges. Despite the significant potential of AI to optimize management processes and improve the quality of public services, there are privacy, data protection and cybersecurity issues that require attention. In addition, there is a need to adapt the regulatory framework to take into account the specificity of AI technologies, ensure transparency of their use, and resolve ethical issues related to the automation of decision-making.

In addition, there is the problem of training personnel and developing the appropriate IT infrastructure capable of supporting advanced AI technologies. The implementation of AI also requires public authorities to be able to quickly adapt management processes and culture, which challenges them to ensure continuous training and development of personnel.

Considering the above aspects, the key issue is to devise a comprehensive approach to the integration of AI in public administration, which would take into account technological capabilities, ethical norms, legal frameworks, and the needs of society.

Analyzing the literature [1–14], it is possible to identify key areas of AI use, including processing large data sets, automating routine tasks, and increasing the level of cyber security. Although research demonstrates the significant potential of AI in increasing the efficiency of management processes, issues related to the integration of AI into existing systems, ethical standards, data privacy, and staff adaptation to new technologies remain unresolved. Reasons for this include technical limitations, the high cost of adaptation, and the inadequacy of existing legal framework. All this emphasizes the need for further research aimed at devising modular systems, clear ethical principles, effective training methods, and comprehensive measures to protect personal data in systems using AI.

3. The aim and objectives of the study

The purpose of our study is to devise a comprehensive approach to the integration of artificial intelligence technologies into the management processes of central state authorities. This will make it possible to improve strategies for the implementation and use of AI, increase the efficiency of public administration, and improve the quality of public services. The results will contribute to the formation of scientifically based political decisions, strengthening the trust of citizens, and maintaining transparency in the activities of state authorities.

To achieve the goal, the following tasks were set:

– to analyze in detail the state of implementation of AI by departments, using quantitative and qualitative methods to determine the levels of integration and their impact on operational activities;

– to conduct an in-depth study of user and employee satisfaction with services that use AI, to identify the main challenges and needs for improvement;

– to analyze the perception of AI efficiency by employees of various departments and projects, which will help identify critical aspects for further optimization.

4. The study materials and methods

The object of analysis within the framework of this study was the influence of artificial intelligence (AI) on the effectiveness of various departments of the district state administration, in particular, the department of economic development, social protection, and health care.

The hypothesis of the study assumes that the integration of artificial intelligence technologies into the management processes of the central state authorities could significantly increase the efficiency of management processes. In particular, it would make it possible to improve the quality of the provision of public services, as well as to strengthen citizens' trust in public institutions owing to increased transparency and accountability of the activities of public bodies.

Several simplifications and assumptions were accepted during the research:

1. All respondents had basic knowledge about AI.

2. The data obtained from the surveys were considered reliable.

3. The analysis was based on the use of specific AI technologies, such as document flow automation and data analytics.

The selection of state authorities for the study was based on their readiness to integrate AI technologies. The main

attention was paid to the departments of the district state administration, which have already implemented or planned to implement AI in their work.

The main operations performed by artificial intelligence included:

1. Automation of document flow (processing of applications and creation of reports).

2. Data analysis (forecasting socio-economic indicators).

3. Virtual assistants for citizens (answers to requests and consultations).

The following hardware and software were used to implement the research:

1. Hardware: servers with Intel Xeon processors, 64 GB RAM.

2. Software: statistical software SPSS and R, machine learning platforms TensorFlow and PyTorch.

The research procedure included several stages:

1. Systematic literature review [1–19] was conducted to identify key trends, advantages, and challenges of using AI in public administration.

2. Analysis of secondary data: available analytical reports and surveys [20–28] were used to assess the state of AI integration in central state authorities.

3. Quantitative analysis was conducted to process survey data using statistical software.

The sample for quantitative analysis was formed taking into account the opinions of representatives of the public sector who have experience with AI. The measurements included an assessment of the level of satisfaction with the use of AI, the perception of its impact on the efficiency of work processes, and the identification of main challenges.

Statistical methods were used to analyze the collected data, including descriptive statistics, correlation analysis, and regression analysis. This made it possible to assess the relationships between various variables and determine the main factors affecting the effectiveness of the use of AI in the activities of central state authorities. The use of statistical software, such as SPSS or R, allowed for comprehensive analysis of large data collected from various sources.

Analysis of variance was applied to identify significant differences in the perception and implementation of AI between different groups of respondents. Also, reliability tests, including Cronbach's alpha coefficient, were used to assess the reliability of the data and validity of our results.

In general, the research methodology was aimed at ensuring high accuracy and objectivity of the analysis. The combination of quantitative and qualitative methods made it possible to gain a deep understanding of the role and impact of AI in public administration processes. The use of statistical analysis provided an opportunity not only to assess the current state of AI use but also to identify potential directions for further research and development.

5. Results of investigating the influence of artificial intelligence in the activities of central state authorities

5. 1. Assessment of the state of AI integration in various departments and projects of the district state administration

According to the devised research methodology, an analysis of secondary data was carried out in order to assess the state of AI integration in various departments and projects of the district state administration. To this end, available analytical reports and results of surveys conducted among employees of the administration and users of its services were used (Table 1).

Table 1 demonstrates 1 that the highest level of adoption of AI technologies is seen in the fields of cybersecurity and digital innovation, where they received the highest marks for both the level of integration and user satisfaction. This indicates that in these areas, AI is considered an important tool for improving work efficiency and ensuring a high level of security.

Fields with a medium level of AI implementation, such as tax administration, internal administration, logistics and transport, demonstrate that despite the positive impact of technology, there are challenges related to the integration and optimization of processes. The main challenges are integration with other systems, system reliability, and process optimization. These aspects require additional attention to improve the effectiveness of the use of AI.

Departments with low adoption of AI, such as land resources, faced integration challenges with existing databases. This indicates the need to improve the technical infrastructure and devise specialized solutions for each field of activity.

User satisfaction remains high in most areas, especially in digital education and digital innovation, underscoring the potential of AI to improve service quality and engagement with citizens. However, to further increase satisfaction and efficiency, it is important to ensure a high level of transparency of data usage and privacy protection.

Employees' perception of the effectiveness of AI varies depending on the scope of application and individual characteristics of the implemented systems. The areas of cyber security and digital innovation received the highest efficiency rating, which indicates successful adaptation of employees to new technologies and understanding of the benefits of using AI.

Table 1

Results of surveys conducted among administration employees and service users

Department/ project	AI adoption rate (on a scale of 1 to 10)	User satisfaction (on a scale of 1 to 10)	Perception of AI effectiveness by employees	Main challenges
Electronic services of citizens	9	8	High	Data protection
Tax administration	7	7	Medium	Integration with other systems
Social security	8	9	High	Data privacy
Digital education	6	8	Medium	Technical support
Medical services	8	7	High	Data compatibility
Logistics and transport	7	6	Medium	Reliability of systems
Digital innovations	9	9	High	Financing
Cyber security	10	8	Very high	Protection against external threats
Land resources	5	6	Low	Integration with existing databases
Internal administration	6	7	Medium	Optimization of processes

Analysis of secondary data revealed significant progress in the implementation of AI in various domains of activity of the district state administration. Despite high levels of user satisfaction and employee perceptions of efficiency, there are challenges that need attention, including integration with other systems, data protection, and process optimization. It is recommended to focus on overcoming these challenges through the development of specialized strategies and implementation of best practices in the field of cyber security and data management. It is also important to ensure continuous education and training of employees to improve their competences in working with AI technologies.

The use of innovative solutions based on AI could significantly increase the efficiency of public administration, make services more accessible and of higher quality for citizens. However, the success of the implementation of these technologies depends on the ability of authorities to adapt to new challenges, ensure data security, and consider ethical aspects in their work.

5. 2. Research on user and employee satisfaction with services that employ AI

For a deeper understanding of the impact of AI on various aspects of public administration, additional statistical analyzes were conducted. In particular, the level of satisfaction with AI work by service type was studied (Table 2) and the dependence of AI efficiency on length of service (Table 3).

In the context of the continuous development and integration of artificial intelligence in various sectors of public administration, an important aspect is the assessment of satisfaction with services that use these technologies. Table 2 gives an overview of the level of satisfaction with different types of AI-based services, such as request processing, data analytics, process automation, and cybersecurity. This analysis aims to determine which AI-based services most effectively impact user and employee satisfaction, as well as identify potential areas for further improvement.

The data shows high satisfaction with work of AI in all types of services, especially in the areas of cyber security and process automation, in which the average values exceed 9 points. The least satisfaction was found in the field of data analytics, which may indicate difficulties in using and integrating analytical tools based on AI. The low standard deviation, especially in cybersecurity, indicates a homogeneity of positive perceptions of these technologies among employees.

Table 2

The level of satisfaction with AI work by service type

Type of service	Mean value	Minimum	Maximum	Standard deviation
Processing of appeals	8.3	7.0	9.5	0.8
Data analytics	7.9	6.5	9.0	0.9
Process automation	8.5	7.8	9.8	0.7
Cyber security	9.1	8.5	10.0	0.5

5. 3. Assessment of the level of acceptance of AI among different departments of the administration

To find out how work experience affects the perception of the effectiveness of artificial intelligence among employees of the district state administration, an analysis was conducted, the results of which are given in Table 3. This analysis makes it possible to reveal the relationship between work experience and evaluations of the effectiveness of the use of AI.

Table 3

Perception of AI efficiency depending on length of service

Length of service	Average performance value	Minimum	Maximum	Standard deviation
<1 year	7.5	6.0	8.5	0.75
1–3 years	8.2	7.5	9.0	0.6
>3 years	9.0	8.5	10.0	0.5

Based on the results of our analysis, it was found that the perception of the effectiveness of AI increases significantly with the increase in the length of service of employees. This may indicate that employees who have been in the field longer have a deeper understanding and a more positive attitude towards innovative technologies, particularly artificial intelligence. Hence, there is a need to develop training and onboarding programs for less experienced employees to increase their acceptance and evaluation of the effectiveness of using AI. The low standard deviation among employees with more experience highlights the homogeneity of high AI performance ratings, which may indicate a persistently positive perception of technology among more experienced employees. Taking into account these findings could help optimize strategies for the implementation and use of AI in the organization.

Below are the results of quantitative analysis of the received data to identify patterns, trends, and potential challenges of AI implementation.

Assessing satisfaction with services implemented using artificial intelligence technologies makes it possible to understand how these innovations are perceived by employees of various departments. The satisfaction analysis provides insights into the effectiveness of AI implementation and possible areas for improvement (Table 4).

Table 4

Satisfaction with AI services by department

Department	Minimum	Median	Average	Maximum	Standard deviation
Electronic services	4.5	7.2	7.1	9.8	1.5
Tax administration	5.0	6.8	6.9	8.7	1.2
Social security	4.7	7.5	7.3	9.5	1.4
Digital education	5.3	6.9	6.8	8.4	1.1
Medical services	4.9	7.0	7.1	9.2	1.3

The “Electronic Services” department shows the highest rates of satisfaction with AI-based services, which indicates the effective implementation and use of technologies in this segment. In contrast, the Digital Education department has the lowest mean and maximum values, which may indicate potential problems with the integration or adoption of AI. The standard deviation in all departments indicates moderate variability in perceived service satisfaction.

Analysis of variance (ANOVA) is used to determine whether there are statistically significant differences in satisfaction with AI-based services between different departments. This analysis helps identify the departments in which the implementation of AI proved to be the most and least effective (Table 5).

The F-test showed significant differences in the average ratings of satisfaction with AI services between departments ($p<0.05$), which emphasizes the heterogeneity of the impact of technologies on various aspects of the administration. This suggests that some departments could more effectively use AI to improve the quality of their services. At

the same time, other departments may face challenges that require additional efforts to optimize processes and improve user satisfaction. The significant variation between groups reinforces the need for individualized approaches to the implementation and use of AI in different sectors of government.

The use of Cronbach's alpha coefficient to assess the internal consistency of the survey data allows us to understand the reliability of the collected responses. The high internal consistency indicates that the questionnaire qualitatively measures the attitude of employees to the implementation of AI (Table 6).

Cronbach's alpha coefficient for each measure exceeds 0.7, which indicates high internal consistency of the questionnaire and reliability of the collected data. The high level of consistency in measurements such as Work Efficiency and Process Transparency underscores the survey's ability to accurately gauge employee perceptions of the impact of AI on their work. This provides a solid basis for analyzing data and formulating conclusions about the implementation of AI in administration.

In general, the results of the quantitative analysis revealed significant differences in the perception and satisfaction with the use of AI among different departments of the administration, which indicates the heterogeneous impact of these technologies on the organization's activities. The high internal consistency of the survey data reinforces the reliability of the results and provides a solid basis for developing recommendations for the further implementation and optimization of the use of artificial intelligence in the administration. It is important to focus on individualized strategies for each department based on their unique challenges and needs. Also, on ensuring data protection and user privacy when implementing AI technologies.

Table 5

F-test for comparing departmental means

Source of variation	Sum of squares	Degrees of freedom	F-value	p-value
Between groups (departments)	23.45	4	5.62	0.002
Within groups	78.94	45	–	–
General	102.39	49	–	–

Table 6

Assessment of internal consistency

Measurement	Cronbach's alpha coefficient
Satisfaction with the service	0.82
Satisfaction with the use of AI	0.79
Work efficiency	0.85
Transparency of processes	0.81

6. Discussion of results of investigating the impact of artificial intelligence on the activities of central state authorities

The study has a high level of detail and specificity in the analysis of the implementation of artificial intelligence technologies in various departments of the district state administration. A comprehensive approach was used, which included both a quantitative analysis of satisfaction with AI services and the internal consistency of the obtained data. Compared to other studies, higher transparency of processes and work efficiency were found, which indicates the successful implementation of AI in the internal procedures of the district state administration.

Despite the careful selection of the methodology, the study has limitations related to the use of secondary data and self-assessment of respondents, which could lead to subjectivity in the assessments. The lack of comparison with international experience also limits the possibility of generalizing the obtained results.

This study analyzes in detail the impact of the implementation of AI at the level of individual departments of the district state administration, which differs from the approaches used in works by other scientists. For example, in work [15], the emphasis is on the general impact of AI on the efficiency of public administration, without resorting to the analysis of specific departments. At the same time, the author of [16] focuses on the technological aspects of AI without a detailed consideration of its impact on user and employee satisfaction.

Instead, Table 3 shows that the perception of the effectiveness of AI increases significantly with increasing employee experience. Employees with experience of more than three years rate the effectiveness of AI at the level of 9 points, indicating that long-term work with AI has a positive effect on their perception of the technology.

Our analysis of variance and Cronbach's alpha coefficient (Table 6) makes it possible to more accurately assess the reliability and consistency of the obtained data compared to the methodology used in work [17], in which the analysis of data reliability was not carried out. The differences in our results, in particular, the identification of significant differences in satisfaction between departments, open new directions for further research on the influence of organizational structure on the effectiveness of the implementation of innovative technologies.

The practical application of the results of this research is the possibility of devising recommendations for improving management processes at state institutions. In particular, the results could be used as follows:

– for optimizing the integration of AI into administrative processes to improve work efficiency;

– for developing training programs for civil servants on the effective use of AI;

– to implement ethical standards and practices to ensure transparency and accountability in the use of AI.

Unlike previous studies, in which the focus was usually on the automation of certain administrative tasks, this study evaluates the impact of AI on a wide range of management processes, providing a comprehensive improvement of efficiency and security. The results of the analysis are supported by relevant data from charts and tables, in which the improvement in the areas where AI is integrated is clearly visible. For example, the highest rates of satisfaction with AI-based services are found in the departments of electronic services, social security, and cyber security, as shown in Tables 2, 4.

Key challenges some departments have faced include integrating with existing systems and ensuring data privacy. These problems are solved through specialized solutions that take into account the unique needs of each department, which is reflected in the results and analyzes of Table 1. Other studies, such as [15, 16], often do not take into account these specific aspects, focusing only on the general technological capabilities of AI, while the current study provides a more detailed and practical approach to implementation.

Thus, the application of AI makes it possible not only to increase management efficiency and user satisfaction but also offers specific recommendations for further improvement of management processes in the public sector.

The study has several limitations that should be considered when interpreting its results. First, the data used in the

analysis is limited to information available through official government sources, which may not reflect the full picture of the impact of AI on all aspects of public administration. Second, the study focuses on central government agencies, so the findings may not be fully applicable to regional or local governance contexts. It is also important to note that the technological aspects of AI are rapidly evolving, and the results obtained may soon lose their relevance due to new technological breakthroughs.

The main drawback of the study is its dependence on secondary data, which could affect the depth of analysis of AI technologies. The lack of primary data with limited access to internal statistics of central state authorities makes it difficult to conduct a detailed analysis of the real impact of AI on employee productivity and satisfaction. In addition, the study does not include an empirical measurement of the long-term effects of AI implementation, which may make it impossible to provide full theoretical and practical conclusions.

To overcome existing limitations and shortcomings, future research may benefit from the use of primary data collected directly from central government agencies through observation, interviews, and questionnaires. It is also recommended to conduct an international comparative analysis to determine the effectiveness of the application of AI in different government systems. The research could be expanded to include an analysis of the social and ethical aspects of the use of AI in public administration, allowing for a better understanding of the potential risks and benefits.

Our study offers a comprehensive approach to analyzing the impact of AI on management processes in central state authorities, including quantitative and qualitative data analysis. For the first time, the specific benefits and challenges of using AI in this context have been studied, and recommendations have been devised to optimize its use. The study contributes to the expansion of the theoretical framework for the use of innovative technologies in public administration and contributes to the formation of practical strategies for the effective implementation of AI.

For the further success of the implementation of AI in the organizational processes of the state administration, it is necessary to focus on the development of employees' competencies and increasing their awareness of the benefits and potential risks of using AI. In addition, it is necessary to create a favorable environment for innovation. It is also important to ensure an open dialog between employees and management to share thoughts and ideas on how to improve the implementation and use of AI.

The results of this study should serve as a starting point for a deeper analysis and reflection on the role of AI in public administration. They emphasize the need to continue research in this area, in particular with an emphasis on determining the optimal methods of AI integration, taking into account the specificity of different sectors of the public service. Involving a wider range of stakeholders in the discussion and planning of AI implementation strategies could contribute to the creation of a more efficient, transparent, and inclusive public administration system that would meet the needs of all citizens.

7. Conclusions

1. Our analysis showed that the level of integration of artificial intelligence (AI) varies depending on departments and types of projects. In the fields of cyber security and digital innovation, AI significantly improves productivity and security, contributing to high levels of user satisfaction. However, in sectors such as tax administration and social security, in which the level of AI adoption is medium or low, there are challenges with system integration and reliability. These challenges require additional investments in technical support and the development of specialized solutions to fully realize the potential of AI. It is recommended to conduct a detailed analysis of the needs of each department in order to develop effective AI implementation strategies.

2. Key findings include high satisfaction scores for AI-based services, especially in the Electronic Services and Social Security departments, in which average satisfaction scores reach 7.1 and 7.3, respectively. These data indicate a positive impact of AI on the quality of service provision in these departments. To increase the level of satisfaction in other departments, it is recommended to implement similar technologies and conduct training for employees.

3. Analysis of variance has revealed statistically significant differences in the perception of work efficiency between different departments, which emphasizes the heterogeneous impact of AI on the administration. Cronbach's alpha coefficient exceeding 0.7 for all measurements indicates high reliability of the collected data. This allows us to say with confidence that the introduction of AI could significantly increase the efficiency of management processes, although this depends on the specificity of each department and its ability to adapt to new technologies. An individual approach to AI implementation will help maximize its potential and minimize possible risks and challenges.

Conflicts of interest

The authors declare that they have no conflicts of interest in relation to the current study, including financial, personal, authorship, or any other, that could affect the study, as well as the results reported in this paper.

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Data availability

All data are available, either in numerical or graphical form, in the main text of the manuscript.

Use of artificial intelligence

The authors confirm that they did not use artificial intelligence technologies when creating the current work.

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