ISSN 1648-2603 (print)
ISSN 2029-2872 (online)

VIEŠOJI POLITIKA IR ADMINISTRAVIMAS
PUBLIC POLICY AND ADMINISTRATION
2024, T 23, Nr. 4 / 2024, Vol. 23, Nr. 4

ARTIFICIAL INTELLIGENCE-BASED DECISION-MAKING IN PUBLIC ADMINISTRATION

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DOI: 10.13165/VPA-24-23-4-01

Abstract. *This article considers the possibilities and challenges of using artificial intelligence (AI) for decision-making in the public administration system. The aim of the study is to analyze the possibilities of using AI for decision-making in public administration. The research employs the following methods: correlation analysis, the least squares method, the White heteroscedasticity test, and the Chow test. The results of the study demonstrate the significant benefits of using AI technologies to increase the efficiency and transparency of public*

authorities and improve the quality of public services. Empirical research proves a positive correlation between the level of use of AI in public administration and the quality thereof. The model built demonstrates a significant correlation at the level of almost 60%. The least squares method establishes the main parameters of the model. The White heteroskedasticity test confirms the null hypothesis. The Chow test confirms the absence of structural shifts. The growing trend of using AI in the spheres of public services, social protection, economy and health care in Central and Eastern Europe is revealed. It is recommended to develop a comprehensive strategy in order to successfully realize the potential of AI as follows: create a favorable environment, ensure the transparency of AI systems, and develop the appropriate regulatory and legal framework. It is planned to study the results of using AI for decision-making in public administration in countries with different levels of economic development, which will contribute to the provision of more universal recommendations.

Keywords: *artificial intelligence (AI); public administration; decision-making; e-government; big data; modelling; simulation.*

Reikšminiai *žodžiai***:** *dirbtinis intelektas (DI); viešasis administravimas; sprendimų priėmimas; e. valdžia; didžiųjų duomenų modeliavimas; simuliacija*

Introduction

In recent years, AI has undergone significant development and found wide application in various fields, including public administration. AI technologies, such as machine learning, robotics, natural language processing, and others, can help public authorities to focus on new goals (Ulnicane et al. 2021), make more informed and effective decisions, improve public service provision, and increase the transparency and accountability of state institutions.

As AI is increasingly being used in various fields, researchers are paying more attention to the possibilities of innovative solutions in the public sector (Wang, Teo and Janssen 2021). The gradual penetration of ICT into the public administration system has improved the capabilities of public authorities, providing modern tools for operating data, such as e-government (Malodia et al. 2021).

Authorities see significant potential for major opportunities in the use of AI for decision-making in public administration and various areas of the public sector, such as e-governance, social innovation, predictive modelling, and resource optimization. These approaches create opportunities for increasing efficiency and effectiveness based on automated solutions (Wang et al. 2021).

The complexity of these issues involves determining the features of using AI in public administration for decision-making and providing recommendations to overcome potential risks and barriers to the introduction of modern technologies.

The aim of this study is to analyze the possibilities of using AI for decision-making in public administration, which can increase the efficiency of administrative processes.

This aim involves the fulfilment of the following research objectives:

1. Identify the key advantages of using AI for decision-making in the public sector.
2. Analyze the main challenges associated with the implementation of AI systems in the field of public administration.
3. Develop recommendations and ways for the successful integration of AI technologies into decision-making processes in the public administration system.

These approaches will contribute to the adoption of more justified and transparent management decisions, increase the efficiency of public services, and strengthen the accountability of authorities.

Literature Review

The current state of AI use requires the development of regulatory and legal acts to oversee this activity. Analysis of the legislation of individual countries shows a significant increase in the number of AI-related draft laws (by 6.5 times since 2016), because both the use of technology and state investments in the sector are growing rapidly. For example, the cost of using AI by the US government has increased by approximately 2.5 times (Maslej et al. 2023). In most cases, national AI strategies emphasize the need to use AI to implement tasks in public administration, with an emphasis on minimizing existing risks (OECD/CAF 2022; Berryhill et al. 2019). State authorities are expanding the scope of using AI to enact positive changes in the decision-making system, service provision, and control functions in public administration (OECD 2023).

The issue of using AI in public administration is the subject of active research and discussion. Since 2010, the number of studies on various aspects of AI application has more than doubled (Maslej et al. 2023). Many scholars and experts are studying the potential of AI to transform decision-making and public service delivery, as well as the possible challenges associated with the implementation of innovative technologies (Tyler et al. 2023, 28).

Among the key directions of using AI in the public sector are electronic governance (e-governance) and public service provision. Big data analysis is another area where AI can play an important role in decision-making in public administration.

Furthermore, AI can be used for predictive modelling and the assessment of the potential consequences of various policy decisions and strategies (Danish and Senjyu 2023; Madan and Ashok 2023). Researchers emphasize the importance of considering the principles of transparency, fairness, accountability, and privacy protection during the development and implementation of AI systems in the public sector (Ulnicane and Erkkilä 2023, 163). Furthermore, the need to create an appropriate legal framework and enact regulations that would moderate the use of AI in public administration is emphasized.

In general, the academic literature testifies to the significant potential of AI for the transformation of decision-making processes and the provision of services in public administration. However, the implementation of available opportunities requires careful planning, the consideration of legal aspects, as well as privacy protection (Neumann, Guirguis and Steiner 2024, 128).

AI-enabled data analysis can be a valuable tool for decision-making in different areas of public administration. Machine learning technologies can be used to identify hidden relationships and patterns in large data sets, which will allow more informed decisions to be made and facilitate the prediction of future trends (including the analysis of financial and economic data to predict risks, as well as the development of appropriate policies and strategies) (Kruhlov et al. 2024, 917).

Large language models (such as GPT-3 and LaMDA) are beginning to be used for various public administration tasks (text generation, summarization, and analysis of citizen queries and feedback). These models can improve the development of regulatory acts, report creation, and responses to citizen inquiries (Chang et al. 2024, 14). Natural Language Processing (NLP) methods are appropriate for extracting information from large volumes of unstructured text data (such as public comments or social media discussions) and ensuring digital language equality (De-Dios-Flores et al. 2023, 80). Computer vision technologies (object detection, facial recognition, image analysis) are used in various public administration sectors (infrastructure monitoring, identifying potential security threats, transportation management) (Talha et al. 2022, 546; Dilek and Dener 2023).

Researchers emphasize the importance of considering transparency, fairness, accountability, and privacy protection principles during the development and implementation of AI systems in the public sector (Ferrara 2024). Adhering to ethical principles is crucial for ensuring the responsible and reliable implementation of AI in the public administration decision-making process. Privacy and data protection are also top ethical concerns. The application of AI in areas such as facial recognition and citizen evaluation poses significant privacy threats (Gilani et al. 2023, 5). Reliable data governance systems, privacy preservation methods, and public oversight mechanisms are needed.

Currently, most countries do not have specific national legislation governing the use of AI in public administration, which can create legal uncertainty and facilitate abuse. This problem can be solved by developing an appropriate legal framework that would regulate the use of AI in the public sector. Such a regulatory legal act should include rules and requirements related to ethical and legal aspects, as well as control and accountability mechanisms. In March 2024, the European Union took a step in this direction when the first legislative act in the world to regulate AI was adopted (European Parliament 2024). The Artificial Intelligence Act defined approaches to the operation of AI, restrictions and prohibitions on its use, and a number of other directions.

Methods

This study employs a combination of different methods and approaches to comprehensively analyze the opportunities and challenges of using AI for decision-making in public administration.

The research design includes the following stages in accordance with the research objectives (Figure 1).

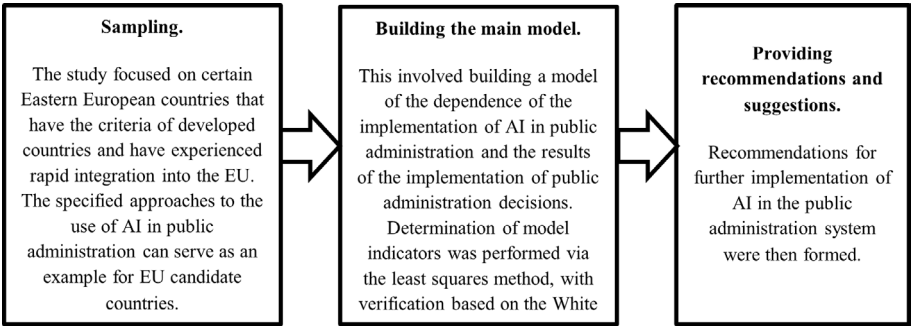

Figure 1. *Research design*

The following stages can be distinguished in the research process:

1. The level of possibilities regarding the use of AI by public authorities in selected Central and Eastern European countries was determined.
2. The degree of AI use in certain areas of public administration in selected Central and Eastern European countries was identified.
3. A correlation analysis of the dependence between AI implementation in public administration and the results of public administration was conducted.
4. The potential benefits and opportunities of AI for improving decision-making processes and providing services to citizens in the public administration system were determined.
5. Recommendations for the successful integration of AI into the public administration system were formulated.

The use of Eastern European countries in the study is related to the active implementation of AI technologies, in particular in the public administration system. Central and Eastern European countries are an interesting example of countries with transition economies undergoing the active reform of public administration systems, which makes them an important object for studying the impact of new technologies on the modernization of the public sector.

The research involved data from academic literature, the reports of public authorities, organizations, and institutions, and industry materials (Misuraca and van Noordt 2020;

Maslej et al. 2023; Rogerson et al. 2022; Hankins et al. 2023). The model of dependence between the implementation of AI in public administration and the results of public administration was built on the basis of the Government AI Readiness Index and governance indicators (Hankins et al. 2023; Legatum Institute 2023).

A combination of the methods of correlation analysis, least squares, the White test, and the Chow test was applied to explore the opportunities and challenges of using AI in public administration. Consideration of both theoretical developments and practical results provided an empirical background for the conclusions and recommendations presented in the study.

Results

The analysis of the Government AI Readiness Index in Central and Eastern European countries shows fairly acceptable results and mostly insignificant positive changes in the majority of the countries studied (Figure 1). At the same time, it should be noted that some countries show a certain decrease in the Government AI Readiness Index in 2023 (Czech Republic, Bulgaria, Romania, Hungary, Macedonia).

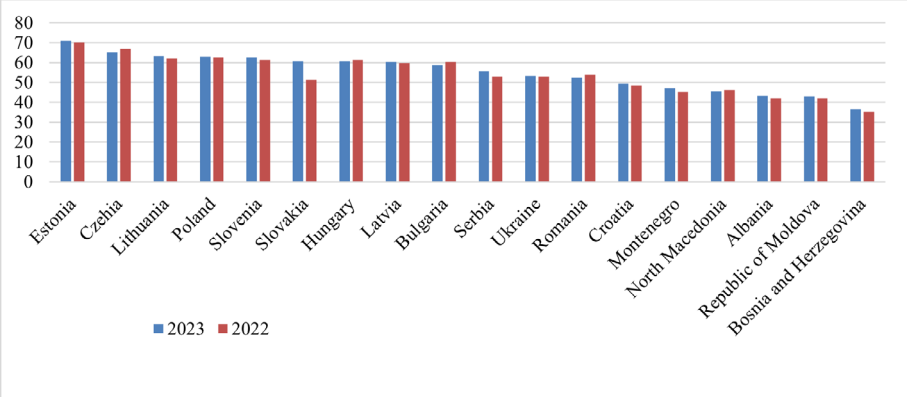

Figure 1. *Government AI Readiness Index in Central and Eastern European countries in 2022–2023 (Rogerson et al. 2022; Hankins et al. 2023)*

Directions for the use of AI in public administration based on function in selected European countries are presented in Figure 2. In most countries, the largest share of AI use is observed in such areas as general public services, social protection, economic issues, health care, and education. The level of AI adoption is lower in the fields of defense, public order and security, housing and utilities, and recreation.

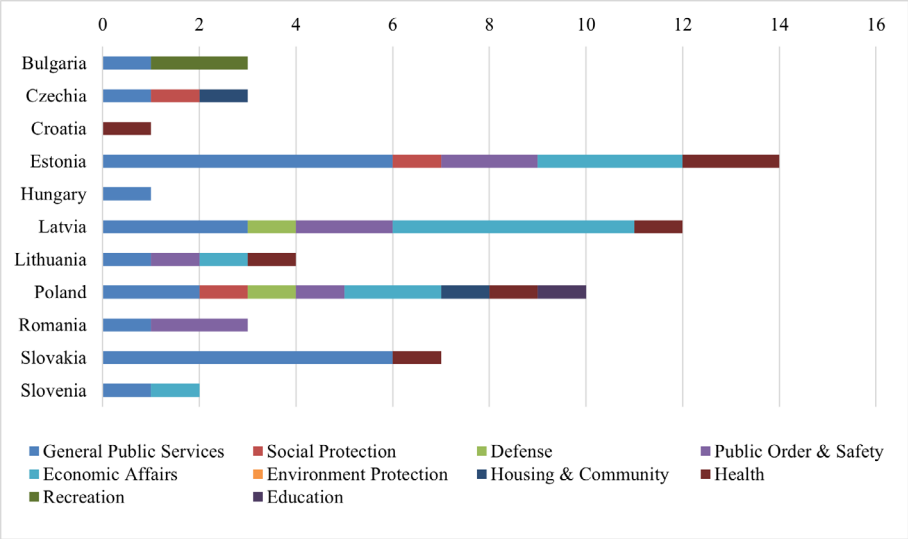

Figure 2. *Directions of AI use in public administration based on function (Misuraca and van Noordt 2020)*

There are noticeable differences between countries in the use of AI in certain fields. For example, Latvia (economic sphere), Slovakia and Estonia (general public services), and Bulgaria (recreation) have high indicators in specific areas, while the development of spheres is more balanced in other countries.

In general, the data highlight the spread of AI in the public sectors of different European countries, especially in traditional areas of public administration (provision of public services, social security, and economic development).

The analysis of dependence between public administration AI implementation and the results of the implementation of public administration decisions demonstrates a significant correlation at the level of almost 60% (Figure 3).

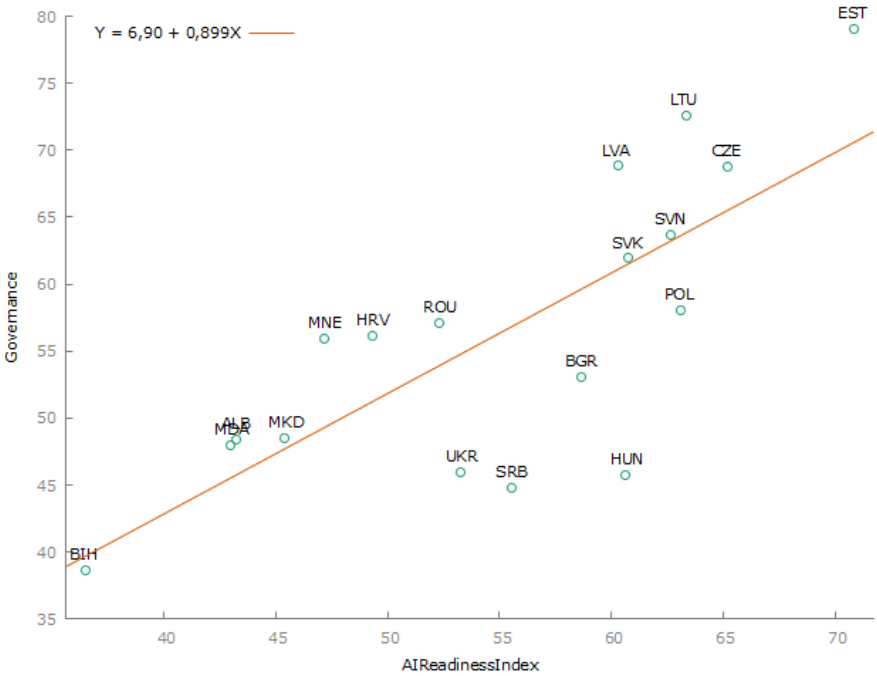

Figure 3. *The relationship between AI use in public administration and the Governance Indicator (Hankins et al. 2023; Legatum Institute, 2023)*

The scatterplot in Figure 3 demonstrates a positive correlation between public administration AI readiness and public administration outcomes. Significant results achieved by the Baltic States and the Czech Republic should be noted, indicating significant progress in AI use and subsequent results in the public administration system.

Gretl software was used to determine the indicators of the specified model using the least squares method (LSM) (Table 1).

Based on the regression model, $Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$, where:
Y_i – the observed value of the dependent variable for the i^{th} observation,
X_i – the value of the independent variable for the i^{th} observation,
β_0 and β_1 – the model parameters (free term and regression coefficient, respectively), and
ε_i – the model error for the i^{th} observation.

Thus we find the values of parameters β_0 and β_1 that minimize the sum of squared errors.

This results in the equation 6.9 + 0.899X, which characterizes the dependence of the two indicators.

Table 1. *Model 1: LSM, based on observations 1–18 (dependent variable: Governance)*

	Coefficient	**St. error**	***t*-test**	***p*-value**
Const	6.89750	10.6099	0.6501	0.5249
AIReadinessIndex	0.898836	0.190119	4.728	0.0002

According to Table 1, the *p*-value for the coefficient before AIReadinessIndex is 0.0002, which is less than the usual significance level of 0.05. This means that the coefficient is statistically significant: there is statistical confidence that the indicator of the use of AI in public administration significantly affects the results of management activities.

The quality of the obtained model is tested below (Table 2).

Table 2. *Obtained model quality indicators*

Average residual variable	56.39389
Residual sum of squares	853.4459
R squared	0.582809
F(1, 16)	22.35174
Logarithmic likelihood	–60.27109
Schwarz criterion	126.3229
Residual standard deviation	10.96973
Standard error of the regression	7.303449
Adjusted *R* squared	0.556735
p-value (*F*)	0.000228
Akaike information criterion	124.5422
Hannan–Quinn information criterion	124.7877

Table 2 shows that approximately 58% of the variation in management can be explained by the model: the model has a moderate ability to explain the dependence of the variable. A fairly high *F*-test value (22.35174) and a low *p*-value (0.000228) indicate the statistical significance of the regression as a whole; that is, the model as a whole is statistically significant.

Based on the use of Gretl software, the White test demonstrated no heteroskedasticity. The test statistics were as follows: $LM = 2.56149$, with a *p*-value of $p(\text{Chi-square}(2) > 2.56149) = 0.27783$. When checking the normality of the distribution of the residuals, the null hypothesis was confirmed: errors are normally distributed. The test statistics were as follows: Chi-square (2) = 3.37704, with a *p*-value of 0.184793. The Chow test of structural displacements at point 9 confirmed the absence of structural displacements. The test statistics were as follows: $F(2, 14) = 2.26284$, with a *p*-value of $p(F(2, 14) > 2.26284) = 0.140759$.

The results of the analysis demonstrate a satisfactory level of readiness for the use of AI in public administration in most countries. The Baltic countries and the Czech Republic have high levels of readiness and effectiveness in AI-based public administration, while Bulgaria, Romania, and Hungary lag behind in these indicators.

The analysis revealed a number of key advantages of using AI in public administration. Table 3 lists the main benefits and provides brief explanations.

Table 3. *Advantages of using AI in public administration decision-making*

Advantage	Description
Increasing efficiency	AI automates routine tasks, speeds up processes, and optimizes the use of resources, which increases the overall efficiency of public authorities.
Improving decision-making	AI technologies such as machine learning and analytics help to make more informed and accurate decisions based on data analysis.
Personalization of services	AI provides personalized services to citizens taking into account their individual needs and preferences.
Optimization of resources	AI systems optimize the allocation and use of resources such as energy, transportation, and personnel, resulting in significant cost savings.
Prediction and forecasting	Machine learning models are used to predict future trends and events, enabling authorities to be more proactive in solving problems.

Source: Based on Danish and Senjyu (2023), Madan and Ashok (2023), and Ulnicane and Erkkilä (2023, 615)

These benefits demonstrate the significant potential of AI to improve efficiency, decision-making, and service delivery in the public sector. At the same time, the successful implementation of these technologies requires careful planning, the consideration of ethical and legal aspects, as well as raising stakeholders' awareness and involvement.

Discussion

This article covers a wide range of aspects related to the application of AI in public administration, including advantages, challenges, empirical research results, and recommendations. At the same time, since the large-scale implementation of AI in public administration is a relatively new phenomenon, there is only a limited amount of data available for analysis. The geographical scope of the study, limited to Central and Eastern European countries, may not fully reflect the situation in other regions of the world.

The results of the study highlight the current state and prospects for the use of AI tools in public administration, demonstrating a wide range of AI applications, such as

e-government, data analysis, predictive modelling, and resource optimization. The automation of routine decision-making tasks, the personalization of services, the optimization of resources, and forecasting capabilities are powerful incentives for the use of AI technologies in public administration.

The fact that the use of AI in public administration decision-making is mostly a trend in developed countries limits the wider opportunities for this research to an extent. Moreover, AI technology is fairly new, and the results of its active use are limited to the period of the previous 5–7 years, which also prohibits monitoring its effects over a significant period of time.

The results obtained in this study correlate with the conclusions drawn in other studies in the field of the application of AI in public administration.

A study by Alhosani and Alhashmi (2024) confirms the key benefits of using AI, such as increasing efficiency, improving decision-making, and personalizing services, as well as reducing liabilities by analyzing the advantages and disadvantages of using AI in the public sector.

De Sousa et al. (2019) demonstrated that reforms aim to reduce public spending and the number of civil servants, and have promoted AI use to automate tasks and reorient agents towards serving users. These reforms, initially focused on managerial discourse, are shifting towards expanding AI functions, relying on the technical discourse.

A study conducted by Lampropoulos et al. (2024) highlights the potential of AI for resource optimization and forecasting. AIoT as an industry is currently in its infancy, but has shown great potential to impact and transform multiple sectors (Kankanhalli, Charalabidis and Mellouli 2019, 306–307) and has become a leading component of achieving a sustainable future, given the importance of creating ideal conditions that enable sustainable development and the achievement of the SDGs.

An analysis of the perception and readiness of civil servants to use AI (Millan-Vargas and Sandoval-Almazán 2024, 1862) confirms other survey results. This evidence suggests a lack of skills and limited understanding of AI among government officials, potentially hindering its future adoption.

The results of this study indicate that the implementation of AI in public administration is associated with significant benefits (increased efficiency, improved decision-making processes, personalization of services, and enhanced forecasting capabilities). These findings align with previous studies that have identified similar advantages of public sector AI implementation (Yfantis and Ntalianis 2020, 211).

The quantitative analysis in this study further confirms that countries with higher levels of AI integration in their public administration systems generally achieve better management outcomes, potentially leading to more efficient and effective service delivery to citizens. While these results are consistent with other studies highlighting the benefits of AI in public administration, there are some differences. For example, a study by Si (2022, 320) emphasizes the potential of AI for resource optimization and forecasting in the context of

achieving the SDGs. This aspect was not addressed in the current research, suggesting an area for future studies to explore.

For the successful implementation of AI in public administration, it is necessary to develop a comprehensive strategy that takes into account potential advantages, challenges, and risks with due regard to some key recommendations (Table 4).

Table 4. *Recommendations for Further AI Implementation in Public Administration*

Direction of implementation	Necessary actions
Creation of a favorable environment	Public authorities should create a favorable environment for the development and implementation of AI technologies (investment in research, infrastructure creation, PPP tools).
Ensuring transparency and accountability	Development of mechanisms to ensure transparency and accountability of AI-based systems used for decision-making in public administration.
Privacy and data protection	Development of rules and regulations governing the collection, storage, and use of personal data by AI-based systems; ensuring security measures to protect data.
Development of the regulatory framework	Creation of an appropriate regulatory framework that would moderate the use of AI in the public sector, which should include rules and requirements related to ethical and legal aspects, as well as control and accountability mechanisms.

The protection of citizens' privacy and data security presents significant ethical challenges in the implementation of AI in public administration. Decision-making algorithms must be thoroughly tested for bias, discrimination, and privacy violations. An appropriate regulatory framework should be developed to govern the ethical aspects of AI use, ensure accountability, and establish mechanisms for auditing and verification.

With the increase in the automation of routine tasks through AI, public servants can focus on more creative, analytical, and strategic duties. In the long term, AI can contribute to more personalized, efficient, and client-oriented public services. The widespread use of AI in public administration may lead to a shift in the governance paradigm itself, moving the emphasis from hierarchical structures to more horizontal, flexible, and adaptive models.

A comprehensive strategy for the successful introduction of AI in public administration should ensure the possibility of reliable AI use for management decision-making, guarantee the safety of work and reliability of information storage, and allow the application of complex algorithms in order to process large amounts of data. At the same time, the control of users (public officials) regarding the adequate interpretation of management information and relevant management decisions remains important.

Conclusions

This article assessed the possibilities and challenges of using AI for decision-making in the public administration system. Comprehensive analysis made it possible to draw reasonable conclusions regarding the prospects for the introduction of AI in the public sector. The results of the study demonstrate the significant potential of AI tools for increasing the transparency, accountability, and efficiency of public authorities, as well as increasing the quality of public services provided to citizens.

1. AI can facilitate the automation of routine tasks, assist in the processing of large amounts of data to make more informed decisions, ensure the personalization of services according to individual needs, optimize the use of resources, and predict future trends.
2. Despite numerous advantages, the implementation of AI in public administration is also associated with a number of serious challenges. This study found that the key issues are ethical considerations, the need to ensure the protection of the privacy of citizens' personal data, the lack of a clear legal framework to regulate the use of AI in the public sector, and the limited understanding of AI technologies among civil servants.
3. In order to successfully overcome the challenges and realize the potential of AI in public administration, it is necessary to develop a comprehensive strategy that will cover a number of key directions for creating a favorable environment for the development and implementation of AI technologies, ensuring the transparency of AI-based systems (audit and verification mechanisms) and preventing bias and discrimination in their operation.
4. An important aspect is the creation of a regulatory and legal framework that would moderate the use of AI in the public sector, taking into account ethical and legal requirements, as well as establishing control and responsibility mechanisms.

In further research, it is planned to consider the results of using AI in public administration decision-making in countries with different levels of economic development.

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DIRBTINIU INTELEKTU GRĮSTAS VIEŠOJO ADMINISTRAVIMO SPRENDIMŲ PRIĖMIMAS

Anotacija. Straipsnyje nagrinėjamos dirbtinio intelekto (DI) panaudojimo galimybės ir iššūkiai, susiję su sprendimų priėmimu viešojo administravimo sistemoje. Tyrimo tikslas – išanalizuoti AI panaudojimo galimybes priimant sprendimus viešajame administravime. Tyrime buvo taikomi šie metodai: koreliacinė analizė, mažiausių kvadratų metodas, baltojo heteroskedastiškumo testas ir Chow testas. Tyrimo rezultatai rodo reikšmingą DI technologijų naudojimo naudą didinant valdžios institucijų veiklos efektyvumą, skaidrumą ir gerinant viešųjų paslaugų kokybę. Atliktas empirinis tyrimas įrodė teigiamą koreliaciją tarp DI naudojimo lygio viešajame administravime ir viešojo administravimo kokybės. Sukurtas modelis atskleidžia beveik 60 proc. reikšmingą koreliaciją. Mažiausių kvadratų metodas leido nustatyti pagrindinius modelio parametrus. Baltojo heteroskedastiškumo testas patvirtino nulinę hipotezę. Chow testas patvirtino, kad nėra struktūrinių poslinkių. Atskleista auganti DI naudojimo viešųjų paslaugų, socialinės apsaugos, ekonomikos ir sveikatos apsaugos srityse Vidurio ir Rytų Europoje tendencija. Norint sėkmingai realizuoti DI potencialą, rekomenduojama parengti kompleksinę strategiją: sukurti palankią aplinką, užtikrinti dirbtinio intelekto sistemų skaidrumą, parengti atitinkamą reguliavimo ir teisinę bazę. Planuojama ištirti DI panaudojimo sprendimų priėmimo viešajame administravime rezultatus skirtingo ekonominio išsivystymo lygio šalyse. Radiniai prisidės prie universalesnių rekomendacijų teikimo.

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