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OPPORTUNITIES FOR IMPLEMENTING AI IN PUBLIC ADMINISTRATION AND LOCAL SELF-GOVERNMENT TO ACHIEVE THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT

OPORTUNIDADES PARA IMPLEMENTAR A IA NA ADMINISTRAÇÃO PÚBLICA E NO AUTOGOVERNO LOCAL PARA ALCANÇAR OS PRINCÍPIOS DO DESENVOLVIMENTO SUSTENTÁVEL

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Abstract
Today, the public sector is facing dynamic technological changes, with AI being among the most innovative areas. The popularization of relevant IT solutions and their widespread use in business have led to growing interest in this technology within public administration and local self-government. This trend is evident in many countries, and the introduction of AI-based solutions in local self-government bodies may have a stronger effect on achieving development principles. The study was conducted using a mixed design: a systematic literature review (2018-2025) and an expert assessment with

Resumo
Atualmente, o setor público enfrenta mudanças tecnológicas dinâmicas, sendo a IA uma das áreas mais inovadoras. A popularização de soluções de TI relevantes e sua ampla utilização nas empresas levaram a um interesse crescente por essa tecnologia na administração pública e no governo local. Essa tendência é evidente em muitos países, e a introdução de soluções baseadas em IA nos órgãos do governo local pode ter um efeito mais forte na concretização dos princípios de desenvolvimento. O estudo foi realizado utilizando um desenho misto: uma revisão sistemática da literatura (2018-2025) e

ranking (n=43, inclusion ≥3 peer-reviewed publications). Experts were asked to rank the proposed directions. The ranks were converted into normalized weights using the rank sum method, and the consistency of assessments was verified with Kendall's coefficient of concordance (W=0.64-0.67; p<0.01). The most prioritized areas of AI application are the management of large data sets and resource allocation; the main barriers are high costs, a shortage of competences, and insufficient IT tools; the key threats are risks to personal data protection, violations of intellectual property rights, and cybersecurity issues. Practical recommendations are provided on the stages of implementation and risk minimization.

Keywords: Data Privacy. Cyber Threats. Digital Technologies. Legal Regulation. Economic Efficiency.

uma avaliação de especialistas com classificação (n=43, inclusão ≥3 publicações revisadas por pares). Os especialistas foram solicitados a classificar as direções propostas. As classificações foram convertidas em pesos normalizados utilizando o método da soma de classificações, e a consistência das avaliações foi verificada com o coeficiente de concordância de Kendall (W=0,64-0,67; p<0,01). As áreas mais priorizadas de aplicação da IA são o gerenciamento de grandes conjuntos de dados e a alocação de recursos; as principais barreiras são os altos custos, a escassez de competências e a insuficiência de ferramentas de TI; as principais ameaças são os riscos à proteção de dados pessoais, as violações dos direitos de propriedade intelectual e as questões de segurança cibernética. São fornecidas recomendações práticas sobre as etapas de implementação e minimização de riscos.

Palavras-chave: *Privacidade de Dados. Ameaças Cibernéticas. Tecnologias Digitais. Regulamentação Jurídica. Eficiência Econômica.*

1 INTRODUCTION

Recent studies have identified the transformative potential of AI technologies in public administration across various service areas. At the same time, the emergence of new and innovative technologies, including AI, has broadened the scope of debates on intelligent governance in public administration (Akhmetshin *et al*., 2024a; Al-Mushayt, 2019). Some authors view AI systems as a unique set of technological innovations that will make public services more efficient and effective, while also bringing significant changes to public administration and management (Chumakova *et al*., 2024; Harrison & Luna-Reyes, 2022).

The use of AI-based solutions allows to accelerate and improve the quality of administrative tasks, especially under the pressure of intensive technological transformations in the public sector. There is a need to process vast amounts of data (Belozorova, 2025b; Janssen *et al*., 2020). Local authorities, as the level of government closest to citizens, play a key role in delivering public services, managing local resources (Imanbayeva *et al*., 2024), and implementing social policy (Vafin *et al*., 2024). Therefore,

the introduction of this technology into local self-government structures becomes not only possible but also necessary for addressing the tasks of effective human resource management and improving the quality of service delivery (Koltyapin & Chesnokova, 2024; van Noordt & Misuraca, 2020).

On the one hand, local self-government bodies will be able to solve labor-intensive problems more effectively through modern technologies such as AI. On the other hand, they will be able to spend fewer resources on managing the vast amounts of diverse data that require constant analysis and processing, which makes the use of AI systems well-suited to this task.

2 THEORETICAL FRAMEWORK

Scholars argue that with the development of applications related to Big Data and the Internet of Things, AI has become a key factor in studies on e-government and public administration (Akhmetshin *et al*., 2024b; Gurinovich & Shakhmametiev, 2024).

At the same time, advances in AI have attracted significant attention from both researchers and practitioners and have opened up a wide range of opportunities for applying this technology in the public sector, including decision-making (Krasnikov *et al*., 2023), fraud and violation detection (Kutsev, 2024; Volosova, 2023), improved service quality (especially in the healthcare (Klochko, 2024; Temirkanova *et al*., 2025), transport (Krasnikova & Mudrakova, 2024), education (Mukhasheva etal., 2023), and security (Logachev & Smirnova, 2024) sectors), enhanced monitoring of urban areas (Glebova *et al*., 2023), improved error detection (particularly in smart cities) (Akhmetshin *et al*., 2024c; Logachev & Korotun, 2023), greater efficiency and effectiveness of service delivery (Abdullayev *et al*., 2024, 2025), as well as natural resource management (Morgacheva *et al*., 2025), for example through the transformation of the energy sector (Milman *et al*., 2024).

However, according to researchers, as this technology develops and improves, new challenges arise for public administration, such as insufficient transparency, bias and discrimination, reduced guarantees in the implementation of administrative procedures (Criado & Gil-Garcia, 2019), as well as liability for damage caused by its use (Petrov *et*

al., 2024; Wirtz *et al*., 2020), along with several other important issues that we will examine in more detail.

First, when implementing AI in public administration, the following factors should be considered: human primacy (AI must serve people, who must retain control over it) (Fedchenko *et al*., 2025); fairness (AI applications must ensure the absence of discrimination, including the correction of hidden biases); transparency (the necessary access to system operating rules); and security (Katkov *et al*., 2025; Petrina *et al*., 2024), which serves as protection against the risk of cyberattacks (Akvit & Levkin, 2024; Wirtz *et al*., 2019). For this reason, the main problems associated with the use of AI in public administration will concern strategies for data and information collection (access, storage, and management of the data required for AI devices to operate) (Iskajyan *et al*., 2022; Siau & Wang, 2020).

Second, problems are related to data quality. As noted in the literature, poor data quality and unclear relationships between data and algorithms can lead to biased or distorted AI outcomes. This also applies to unlawful use or misuse of confidential data (Agarwal, 2018).

Third, problems are associated with threats arising from the lack of understanding of how AI functions in the context of decisions it makes without human involvement. Difficulties in understanding how algorithmic systems work and the decisions they produce can undermine the fundamental values of administrative justice. Thus, due to the opacity of the internal algorithmic logic of automated decision-making, individuals will find it difficult to prove that their rights and interests were violated as a result of an algorithmic decision (Kuziemski & Misuraca, 2020).

Fourth, the challenge of the pace of AI implementation in the public sector is an objective one, as the introduction of state-funded technologies often progresses more slowly (Nagumanova *et al*., 2025). AI methods and digital transformation strategies used in the private sector (Pakshin, 2023) cannot be directly copied into the public sector solely for the purpose of increasing efficiency and effectiveness (Arynova *et al*., 2025; Bullock *et al*., 2020). The public sector (public administration) has goals different from profit maximization. Serving society is the fundamental mission of public administration, which means that it can only be realized in the context of protecting public interests (Makasi *et al*., 2021; Volosova, 2024). Thus, the conditions for implementing and using AI

technologies in the public sector cannot be modeled exclusively based on elements specific to private sector organizations in terms of goals, needs, operations, tools, and processes (Belikova, 2024; Criado *et al*., 2020).

The objective of this article is to identify the problems, risks, and opportunities of implementing AI-based solutions in the work of public administration and local self-government bodies to achieve the principles of sustainable development.

3 METHODS

The study was conducted using a mixed design: a systematic literature review and an expert assessment with the subsequent ranking and aggregation of priorities. The expert part aimed to determine (a) the types of tasks for AI implementation in local self-government bodies, (b) the key problems, (c) the threats associated with the use of AI, with verification of opinion consistency. The selection of methods was determined by the need to integrate diverse expert judgments under the limited observability of AI implementation practices in local self-government.

The purpose of the study was to summarize the results related to specific research questions:

1. What are the main types of tasks solved through the implementation of AI systems in the activities of local self-government bodies?
2. What problems and threats are associated with the use of AI systems in the activities of local self-government bodies?

Literature sources were searched using databases. The collected material was subject to qualitative analysis to identify the possibilities of applying AI in local self-government bodies, as well as the problems and threats arising in this process.

At the next stage of the study, in line with the stated research objective, an attempt was made to determine the significance of the main tasks solved through the implementation of AI systems in the activities of local self-government bodies, as well as the problems and threats associated with the use of AI systems in local government activities.

For the expert assessment, a pool of 46 specialists was formed according to the criterion of having at least three peer-reviewed publications on the research topic (AI in

the public sector/e-government/digital transformation/municipal management) in journals indexed by Scopus, Web of Science, Google Scholar or eLIBRARY during the period 2018-2025.

The questionnaire contained three blocks for mandatory ranking of positions within each block. The instructions required assigning ranks from 1 (most important) to m (least important) within a block. Ties were allowed if two positions were considered equally important; in such cases, average ranks were assigned (for example, if two items tied for 4^{th} or 5^{th} position, both received a rank of 4.5). Data were collected in May 2025 using Google Forms.

Invitations were sent by email; 43 experts agreed and fully completed the survey (participation rate 93.5%). In the course of electronic correspondence, the experts described AI activities depending on the tasks performed, as well as clarified them regarding the problems and threats associated with the use of AI systems in the activities of local self-government bodies.

1) Transformation of ranks into weights. For each block, the ranks were aggregated across all the experts. To ensure interpretability, normalized weights w_i were derived using the rank-sum/Borda-type normalization method:

$$w_i = (S_{max} - \bar{r}_i) / \Sigma_j (S_{max} - \bar{r}_j), S_{max} = m + 1. \quad (1)$$

Where r_i is the mean rank of the i item, and m is the number of items. In cases of ties, averaged ranks were applied. The resulting weights are presented in the Results section.

2) Consistency of expert opinions. For each block, the Kendall's coefficient of concordance W was calculated as follows:

$$W = [12 \Sigma_i (R_i - \bar{R})^2] / [n^2 (m^3 - m) - n \Sigma T], \quad (2)$$

Where R_i is the sum of ranks for the i item across all experts, $\bar{R}$ is the mean sum of ranks, n is the number of experts, m is the number of items, and $\sum T$ is the correction for ties. The statistical significance of W was tested using the $\chi 2$ criterion: $\chi^2 = n(m - 1)W$, $df = m - 1$. In this study (see Results section), the following values were obtained:

W=0.66 (Block A), W=0.64 (Block B), W=0.67 (Block C), all with $p<0.01$.

3) Additional checks. A sensitivity analysis of the weights was conducted (leave-one-out by experts), along with a comparison against equal weights and a robustness test of the ranking order under alternative normalization methods (e.g., linear scoring scale m, …, 1).

Experts provided informed consent to participate; responses were anonymous and aggregated; no personal data were collected beyond the contact e-mail used to distribute invitations. The study does not fall under mandatory ethical review.

4 RESULTS

The detailed scope of tasks assigned to local self-government bodies is set out in the legal acts regulating their activities. These tasks cover all socially significant issues of governance, among which the following play a special role: education; healthcare; local public transport; road maintenance; water supply and sewage systems; spatial structure and planning, real estate management; environmental and nature protection; water resource management; culture; sports and tourism; public order and safety.

Of course, not all problems faced by local authorities can be solved with the help of AI, and it is impossible to point to a universal AI system capable of handling every task.

Nevertheless, the literature review and the expert survey helped identify the main types of tasks that AI can address (Table 1).

Table 1

Main types of tasks solved through the implementation of AI systems in the activities of local self-government bodies

No.	Types of tasks	Characteristics of AI activities	Ranking	Impact
1	Management of large data sets	In some cases, the effective management of certain data pools and drawing conclusions from them may be impossible for staff due to the excessive volume of records. AI can process such datasets and generate insights without the need for human resources (e.g., traffic data analysis or demographic data)	1	0.23
2	Resource allocation	AI enables automated and rapid management of available resources by identifying needs and distributing resources based on the information obtained from the system (e.g., mapping changes related to crime)	2	0.20

3	Lack of staff competences	Public administration bodies often face difficulties in recruiting personnel with the necessary knowledge and skills relevant to their diverse tasks. AI, with access to the vast amount of information available online, can ease the workload of office staff and provide citizens with quick and simple access to knowledge and information (e.g., chatbots answering questions from residents or applicants)	3	0.16
4	Management of predictable scenarios	In situations characterized by high predictability or reliance on previously occurring patterns, AI can use available data to build models that generate responses related to recurring scenarios. This is particularly valuable in contexts where rapid reaction is critical (e.g., designing response mechanisms for natural disasters)	4-5	0.15
5	Tasks based on simple procedures	In some cases (particularly when dealing with simple "yes/no" answers or decisions based on verified data), AI can efficiently process documents submitted by applicants, thereby accelerating the handling of official matters (e.g., recognition of applications for building permits)	4-5	0.15
6	**Data processing**	**One of AI's advantages is the ability to easily examine and catalogue diverse datasets, enabling the creation of effective summaries and the development of correlation networks that help visualize and analyze complex and seemingly unrelated information (e.g., mapping the influence of various factors on crime rates in different areas)**	6	0.11

Source: our own research and results of the expert survey; the concordance coefficient is $W = 0.66$ ($p < 0.01$), which indicates a strong consistency of expert opinions.

As the literature analysis has shown, AI systems are used in all cases of information analysis, especially in relation to large data sets (Table 1). Through process automation, significant cost reductions are achieved, staff workload is eased, and, above all, there is a fundamental improvement in terms of both efficiency and time of public services provided by local self-government bodies and their internal operations.

At the same time, the literature review and the results of the expert survey allowed us to identify the most important problems (Table 2), as well as potential threats (Table 3) associated with the use of AI in local self-government bodies.

Table 2

Problems associated with the use of AI systems in the activities of local self-government bodies

No.	Challenges	Ranking	Impact
1	High costs	1	0.35
2	Lack of proper knowledge/education	2	0.27
3	Lack of appropriate IT tools	3	0.22
4	Negative attitude of local government employees	4	0.16

Source: our own research and results of the expert survey; Kendall's coefficient of concordance $W = 0.64$ ($p < 0.01$), indicating strong consistency among expert opinions.

Table 3

Threats associated with the use of AI systems in the activities of local self-government bodies

No.	Threats	Ranking	Impact
1	Risks related to the protection of personal data	1	0.27
2	Infringement of intellectual property rights	2	0.22
3	Cybersecurity threats	3	0.18
4	Lack of ethical use of AI	4	0.13
5	Digital exclusion of certain citizens	5	0.11
6	Difficulties in implementing AI solutions	6	0.09

Source: our own research and results of the expert survey; Kendall's coefficient of concordance $W = 0.67$ ($p < 0.01$), indicating strong agreement among expert opinions.

To facilitate the understanding of the role and objectives of AI, the following functional classification of AI-based programs that may be used in the public sector can be applied (Table 4).

Table 4

Applications of AI in local self-government according to functionality

No.	AI functionality	Examples of application in local self-government bodies
1	Decision-making AI – autonomously solving specific problems (or suggesting solutions) based on analyzed information	– Intelligent waste management systems that optimize collection schedules based on demand analysis; – Autonomous procedures and measures for healthcare management, including staff management, service optimization, and delivery of medical care in hospitals; – AI-based public transport management systems that adjust schedules to the real needs of residents; – Smart energy management models for public buildings that reduce consumption and costs
2	Conversational AI – used to conduct ongoing dialogues (i.e., simulating human conversation) and provide feedback based on received data	– Chatbots used to provide information to residents and handle simple requests; – Autonomous knowledge bases and document analysis systems equipped with mechanisms for answering staff inquiries; – Digital dispatchers that analyze calls to emergency service numbers
3	Monitoring AI – dynamic processing of large volumes of information for continuous analysis and synthesis	– Air and water pollution monitoring systems based on data collected from sensors. This type of AI often integrates with another popular technological solution, i.e., the Internet of Things; – Mechanisms for tracking parking times and automatically charging fees for exceeding permitted durations in paid zones; – Traffic monitoring tools for both signaling and response to incidents (e.g., congestion, accidents). AI can continuously analyze traffic data to optimize not only simple functions, such as adjusting traffic light signals, but also entire traffic routes, including in response to accidents. This helps improve residents' quality of life and significantly reduces costs associated with transportation; – Algorithms for analyzing demographic data to support the planning of educational and cultural programs; – Tools for preventing data leaks or cyberattacks, as well as reporting

		on security incidents; – Automated mechanisms for supporting public order and safety based on intelligent analysis of urban monitoring data, including predictive functions. These enable ongoing management of incidents such as accidents or protests, monitoring of events captured by city cameras, protection against cyber threats to infrastructure, and sentiment analysis related to antisocial behavior or social unrest
4	Predictive AI – generating conclusions about potential future events based on past data	– Measures for monitoring natural disasters such as floods or fires; – Forecasting infrastructure needs, for example, road repairs or sewage system upgrades, based on analysis of historical data and current information
5	Generative AI – creating entirely new content (e.g., images or text) based on given instructions	Use of existing commercial tools of this type for generating graphics related to events or initiatives organized by local self-government bodies (e.g., educational, sports, or cultural activities)
6	Assistive AI – supporting human work with documentation or data through continuous learning from the information provided	– Tools that support decision-making in spatial planning considering, among other factors, urban and environmental aspects; – Programs that assist officials in analyzing documentation, enabling faster and more efficient completion of administrative procedures; – Programs that support education both in terms of selecting appropriate content for students and monitoring performance, for example, during written exams

Source: our own research

Thus, the potential applications of AI in the activities of local self-government bodies can be regarded as virtually limitless. These systems represent self-developing innovative technologies of our time, which makes it impossible at this stage to fully assess their role for municipal and public administration.

5 DISCUSSION

The introduction of new technological solutions in the public sector can be associated with numerous difficulties. The most common barriers to innovation in local self-government include a lack of financial resources (Belozorova, 2025a), shortages of knowledge and skills, a low level of social capital and trust, as well as limited tolerance for the uncertainty of potential outcomes (with conservative attitudes prevailing) (Gil-Garcia *et al*., 2018). In addition to these factors, issues related to the prevailing organizational culture within offices and existing technological barriers are of critical importance (Atasheva,*et al*., 2024; Wirtz *et al*., 2019).

A similar situation is observed in the implementation of projects that use or are based on AI systems.

As the results of this study indicate, the most significant problems associated with the use of AI in local self-government include high costs of developing and maintaining technologies, insufficient preparation of administrative staff for technological innovation (which may entail additional expenses for external expertise), reluctance to adapt to change, difficulties in coordination across different administrative units, insufficient availability or incompatibility of technologies, as well as regulatory challenges (Table 2).

First, the use of AI systems may entail high investment costs directed both toward the procurement of equipment and services necessary for implementing new solutions, and toward hiring new staff or enhancing the professional qualifications of existing personnel. Expenditures on new technologies are often not a priority for local self-government bodies.

A potential solution lies in recognizing that, in the long term, investments in AI can yield, among other tangible benefits, significant cost savings. Moreover, since AI is an innovative tool for addressing local governance challenges, there is an opportunity to leverage federal and regional programs that fund the modernization and digital transformation of local self-government bodies. Another approach to reducing costs could involve collaboration among different local self-government entities through joint procurement and implementation of AI technologies, which are then shared among these units within a framework of mutual partnership.

Second, a key challenge for local self-government bodies is the lack of sufficient personnel dedicated to the implementation and maintenance of new digital technologies, as well as a shortage of the necessary skills among staff. According to experts, this may hinder the full utilization of AI systems. Although AI systems are theoretically intended to reduce workload through automation, their initial implementation may actually lead to a significant increase in work associated with deploying new technological solutions. There are also concerns about errors during the implementation and use of AI, for which officials may subsequently be held accountable. This issue is particularly relevant in situations where there is no delegated staff with the appropriate competences not only to detect and correct errors but also to train other employees in the principles of technology operation.

Third, the problem of integrating outdated or inadequate technology stacks (i.e., existing IT tools and software) used by local self-government bodies can also make it

difficult to adapt new technical solutions to current practices (Gurinovich *et al*., 2024). While the scale of this challenge depends on the technology and the needs of individual departments, it can be partially mitigated by developing new solutions, which does not necessarily require higher costs.

Fourth, regarding the quality of expertise, local government officials and other decision-makers often lack a clear understanding of the need to invest in the technological solutions mentioned above for AI implementation. This is particularly relevant for rural local governments (Krasnikova & Kulibaba, 2024) and those with limited budgets that cannot afford to develop advanced digital competences. A way to address these challenges is through education (Amirgalina *et al*., 2025; Medeshova *et al*., 2025) and training in AI applications (both online resources and workshops funded by government programs) (Ninsiana *et al*., 2022).

A significant factor constraining AI adoption by local self-government bodies is the concerns expressed by their representatives regarding potential risks associated with the use of AI.

These threats include risks related to the protection of personal data (Okishev, 2024), infringement of intellectual property rights, user discrimination, uncertainties regarding administrative procedures and their processing, and potential harm caused by AI use, along with accountability for such harm (Table 3).

Like other digital technologies, AI systems are vulnerable to hacking and other cybersecurity threats (Wirtz *et al*., 2020; Yakovleva & Konyukhovskiy, 2024). The use of AI for important decisions and procedures may carry the risk of failure due to breaches of security protocols, which can have serious consequences for the functioning of government bodies (Mokhov *et al*., 2025). Equally serious consequences may arise, for example, from the leakage of residents' personal data (Turgaev & Turgaeva, 2024).

Local self-government bodies must also ensure that the technologies they use are employed in accordance with ethical standards. In this context, beyond the already mentioned data protection and respect for privacy, it is important to ensure transparency and avoid biased algorithmic behavior. Residents should also be informed when AI is used in services directed at them or when their data are processed, and each individual should have the right to opt out.

Another threat associated with the use of AI systems by local self-government bodies is the risk of making public services difficult to access for certain citizens, potentially leading to their digital exclusion. This issue is particularly relevant for senior individuals, as well as for those who lack modern devices with up-to-date software. Therefore, when implementing such technologies, priority should be given to providing appropriate training for residents and maximizing the accessibility of practical technological solutions. An example is chatbots, which should use clear and understandable language and, whenever possible, adapt their messages to the user. The use of AI should not replace human interaction entirely; chatbots should support communication between the office and citizens, rather than substitute it.

6 CONCLUSIONS

Although the implementation of AI solutions, or those largely based on AI, offers numerous advantages and opens many opportunities, local self-government bodies will find it challenging to avoid the problems and risks faced by all organizations seeking to introduce new technologies. It seems reasonable to put forward the thesis that, in the context of the widespread adoption of AI systems by local self-government bodies, the correct question is not “if” but “when” this will occur, and that the adoption of these solutions is only a matter of time. This makes it all the more important to prepare for such developments.

Therefore, it is essential to implement effective control measures and ensure citizen participation in the decision-making process regarding the introduction of AI-based technologies in local self-government. This entails the need to educate both officials and the public. However, as our research results showed, the advantages outweigh the risks, and the effective implementation of technological solutions can significantly improve the functioning of local self-government bodies, leading to greater convenience for public service recipients.

At the same time, the interest of local self-government bodies in AI-based solutions is likely to develop unevenly. Urban municipalities, especially large ones, will certainly pay more attention to AI. They will have the appropriate budgets available to invest in technological development.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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