

**ECONOMICS***Sociology*

Zhidebekkyzy, A., Sansyzbayeva, K., Ashirbekova, L., & Imreh-Tóth, M. (2026). AI-driven public administration: Expert insights on adoption and implementation. *Economics and Sociology*, 19(1), 172-194. doi:10.14254/2071-789X.2026/19-1/9

**AI-DRIVEN PUBLIC  
ADMINISTRATION: EXPERT  
INSIGHTS ON ADOPTION AND  
IMPLEMENTATION****Aknur Zhidebekkyzy**

*Almaty Management University,  
Almaty, Kazakhstan*

*E-mail:*

*a.zhidebekkyzy@almanu.edu.kz  
ORCID 0000-0003-3543-547X*

**Khalima Sansyzbayeva**

*Al-Farabi Kazakh National  
University, Almaty, Kazakhstan*

*E-mail:*

*halima.sansyzbaeva@kaznu.edu.kz  
ORCID 0000-0002-9992-4005*

**Laura Ashirbekova \***

*Al-Farabi Kazakh National  
University, Almaty, Kazakhstan*

*E-mail:*

*laura.ashirbekova@kaznu.edu.kz  
ORCID 0000-0003-0377-7854*

*\* Corresponding author*

**Mónika Imreh-Tóth**

*Széchenyi István University, Győr,  
Hungary*

*E-Mail: imreh-*

*totb.monika@sze.hu*

*ORCID 0000-0002-0094-5827*

**ABSTRACT.** Artificial intelligence (AI) is increasingly transforming public administration, yet empirical evidence from developing countries remains limited. This study explores the current use, key challenges, and enabling conditions of AI adoption in Kazakhstan's public administration system. The study employs an exploratory qualitative design based on semi-structured interviews with 20 experts from government, academia, and related professional domains. The data were analyzed using thematic analysis in ATLAS.ti to identify key themes. The findings show that AI adoption is in a transitional stage, supported by strong government initiatives and shifting from digitalization to its use in decision support and predictive analytics for more proactive public services. While a number of pilot projects and practical applications are already in place, broader adoption remains constrained by interrelated barriers, including data limitations, skills gaps, infrastructural constraints, and regulatory uncertainty. The results also identify a corresponding set of enabling conditions, such as institutional support, human capital development, data governance improvements, and cross-sector collaboration, which can facilitate further progress. By linking systemic barriers with corresponding enabling conditions, the study clarifies how AI adoption unfolds in practice and identifies actionable directions for policy and implementation.

*Received:* May, 2025

*1st Revision:* August, 2025

*Accepted:* March, 2026

DOI: 10.14254/2071-  
789X.2026/19-1/9

**JEL Classification:** O38;  
H83; O33

**Keywords:** artificial intelligence, public administration, AI adoption, data governance, developing countries, Kazakhstan

## Introduction

Artificial intelligence (AI) is increasingly recognized as a transformative force in public administration, reshaping how governments design policies, deliver services, and interact with citizens. By enabling data-driven decision-making, predictive analytics, and automation of administrative processes, AI holds the potential to improve efficiency, enhance service quality, and generate public value (Mergel et al., 2023; David, 2024). Recent studies highlight its application across a wide range of governmental functions, including service personalization, fraud detection, policy analysis, and citizen engagement (Madan & Ashok, 2022; Dunleavy & Margetts, 2023; Vatamanu & Tofan, 2025; Kim, 2026). At the same time, AI is not merely an extension of digitalization but represents a deeper socio-technical transformation of public sector organizations, affecting institutional structures, governance mechanisms, and administrative practices (Tangi et al., 2025; Koteczki et al., 2025). However, the actual implementation of AI in government remains uneven and often limited to pilot projects, with significant challenges related to data availability, organizational capacity, and governance frameworks that constrain its broader adoption (Busuioc, 2020; Neumann et al., 2022; Van Noordt et al., 2023; Attard-Frost et al., 2024; Roy and Vasa, 2024; Singh et al., 2025).

Despite the growing body of literature on AI in public administration, a significant research gap persists regarding developing countries and emerging economies. Existing scholarship remains heavily concentrated in North America and Europe, resulting in a geographical and empirical imbalance that limits the generalizability of current findings (Twizeyimana & Andersson, 2019; Wang et al., 2026). Kampira and Mukonza (2025) explicitly argue that, although the integration of AI and e-government is increasingly discussed, in-depth empirical knowledge remains limited in developing countries, where such processes are still relatively new. Similarly, Nguyen Duy et al. (2026) emphasize that the use of generative AI in local governments in developing contexts remains underexplored, with most studies focusing on more advanced institutional environments. This gap is further reinforced by the observation that algorithmic governance and accountability require dedicated analysis specifically within under-researched Global South contexts (Weerheijm et al., 2026). In line with this, Omonov and Ahn (2025) position their study of Uzbekistan as one of the first large-scale empirical investigations of AI adoption in a transitional developing government setting, highlighting the scarcity of comparable research. Taken together, this indicates a clear lack of systematic, context-sensitive, and empirically grounded research that would allow for a comprehensive understanding of how AI is actually implemented, governed, and experienced within public administrations in developing countries.

In this context, the aim of this study is to explore the current use, key challenges, and future development of artificial intelligence (AI) in Kazakhstan's public administration system, based on expert perspectives. By drawing on insights from practitioners, policymakers, and researchers involved in digital transformation and AI-related initiatives, the study seeks to better understand how AI technologies are being applied and governed in the public sector.

To address this objective, the study focuses on the following research questions:

RQ1: How is artificial intelligence currently used in public administration in Kazakhstan?

RQ2: What are the main challenges and risks associated with the implementation of AI in the public sector?

RQ3: What policy measures and enabling conditions support the development of AI in public administration?

## 1. Literature review

Recent research positions artificial intelligence (AI) in public administration as an interdisciplinary field spanning governance, digital government, and data-driven systems. Literature shows a clear shift in focus from general public sector digitalization to the more specific analysis of AI integration into government processes. Early review studies identified the growing use of AI in the public sector and emphasized that its adoption requires not only technological solutions but also public policy responses and societal debate on ethical implications (de Sousa et al., 2019). Later research moved beyond service modernization toward the transformation of administrative work itself, highlighting how smart technologies and algorithmic tools reshape organizational routines and give rise to forms of “algorithmic bureaucracy” (Vogl et al., 2020). In parallel, the development of smart logistics centers and digital transport infrastructure illustrates how algorithmic coordination and data-driven management extend across both public administration and logistics sectors, creating cross-sectoral models for AI-enabled governance (Vovk et al., 2025). The literature converges on viewing AI as an enabling infrastructure for improving administrative performance, particularly through enhanced efficiency, service quality, and evidence-based decision-making (Pini et al., 2025; Matias-Pereira, 2025). Empirical studies further demonstrate its expanding applications across a wide range of public-sector domains, including fraud detection, public safety, healthcare, urban governance, and social services, reflecting its integration into core governmental activities (Benkirane & Benazzi, 2024; Al-Ansi et al., 2024).

A key contribution to structuring the field is provided by the OECD (2025), which conceptualizes AI not at the level of isolated applications, but across core government functions. It highlights a critical implementation gap: while AI is associated with improvements in productivity, responsiveness, and accountability, most governmental initiatives remain at the pilot stage, with scaling constrained by skill shortages, data limitations, insufficient monitoring, and weak regulatory safeguards. Importantly, the OECD reframes AI not merely as a tool for process optimization, but as a catalyst for rethinking the architecture of government and the logic of public value creation.

At the same time, the literature increasingly emphasizes that the impact of AI in the public sector is not automatic. Rather, its effectiveness depends on a set of organizational and institutional conditions. Studies show that the mere availability of technological solutions does not translate into public value; instead, outcomes are shaped by internal capabilities, regulatory frameworks, and the ability of organizations to adapt processes and sustain AI systems over time (van Noordt & Tangi, 2023). Complementary research highlights the importance of human resources, domain expertise, data-sharing practices, and strategic coordination across the public sector value chain (Valle-Cruz & García-Contreras, 2025; Kozhakmetova et al., 2025; Temerbulatova et al., 2025). Empirical evidence further suggests that the relationship between AI adoption and performance is mediated by managerial alignment, organizational culture, and institutional support, while a gap often persists between formal AI strategies and their practical use in decision-making (Phan et al., 2026).

AI also reshapes internal power structures and professional roles within public organizations. For example, Mahroof et al. (2025) argue that algorithmic decision-making redistributes influence across administrative actors, increasing tensions between managerial, analytical, and hybrid roles. At a broader level, AI is associated with a shift in discretion and interpretive authority from civil servants toward algorithmic systems and data experts, indicating deeper transformations in administrative hierarchies and accountability structures (Wang et al., 2026).

Beyond organizational factors, a growing body of research highlights that AI in public administration must be evaluated not only in terms of efficiency, but through a broader framework of trust, ethics, and public values. Scholars increasingly argue that issues such as fairness, accountability, and transparency are central, yet often remain difficult to operationalize in practice, particularly given unresolved legal questions and the expanding role of private actors in AI governance (Carlsson & Ronnblom, 2022; Alqodsi & Gura, 2023). At the same time, public acceptance of AI is shown to depend strongly on context, institutional trust, and perceptions of fairness rather than on technological performance alone, with higher awareness sometimes leading to more critical attitudes toward risks such as bias and surveillance (Ngo Thaiduong, 2026; Sagana et al., 2025).

AI in the public sector is increasingly moving beyond traditional administrative processes toward broader GovTech and data-driven governance applications. Mortati et al. (2025), based on the WiseTown case, examine digital twins as GovTech solutions and emphasize that their effectiveness depends on governance structures, institutional arrangements, stakeholder collaboration, and user context. Casas and Palomes (2026), within the concept of Society 5.0, describe open models and digital twins as transparent and publicly verifiable decision-making tools, requiring citizens to understand underlying assumptions, data sources, and algorithms. Castellon (2023) and Pourmirza et al. (2026) consider sectoral studies in urban transport and energy systems, highlighting the importance of data sharing, interoperability, governance, cybersecurity, and institutional coordination.

Some research focuses on developing countries, where AI adoption unfolds under conditions of resource constraints, uneven digital maturity, and strong institutional sensitivity. Evidence shows that emerging economies lag behind in the depth of AI-enabled government service integration, while adoption is shaped by a combination of knowledge, optimism, distrust, discomfort, and usability factors (Lartey et al., 2026). These studies distinguish between “AI enthusiasts” and “AI sceptics,” emphasizing that effective implementation requires not only deploying digital services but also building trust and reducing behavioral barriers. Further research demonstrates that, although e-government readiness and institutional pressure influence AI readiness, critical factors include internal digital infrastructure, human capital, and adaptive institutional capacity (Anomah, 2025). Structural constraints remain significant, including shortages of skilled professionals, limited computing infrastructure, restricted access to data and connectivity, and even unstable energy supply in some contexts (Barsekh-Onji et al., 2025). These institutional and infrastructural constraints mirror challenges documented in transport system modernization contexts, where the integration of autonomous vehicles and AI-based planning tools also requires regulatory alignment and institutional capacity building (Razavi & Sierpinski, 2024). Moreover, successful integration depends on institutional support, professional capacity, coherent management strategies, data governance, and citizen trust (Bonțaș & Neamțu, 2025), as well as clear ethical frameworks, auditability, data protection, inclusiveness, and continuous evaluation of AI use (Alyileili & Opoku, 2025). Taken together, these studies suggest that in developing countries, the key issue is not the adoption of AI itself, but the institutional readiness required for its effective, accountable, and socially acceptable use.

In this regard, Kazakhstan represents a particularly important yet insufficiently empirically examined case. According to a recent analytical overview by the United Nations Department of Economic and Social Affairs (UN DESA, 2025), by the end of 2023, Kazakhstan had established the core foundations of a digital state, while recent years have been marked by intensified efforts to advance AI-related initiatives. For example, recent developments involve the scaling of national data integration systems, the introduction of AI-based public service

tools, the piloting of AI solutions across sectors, and the training of public sector employees, indicating an institutional support.

Despite this progress, existing research on Kazakhstan remains largely descriptive and provides limited insight into how AI is applied in practice. Current studies tend to focus either on the broader trajectory of digital governance and state-led digital transformation (Kosherbayeva & Kylbayev, 2025) or on specific functional domains, such as AI use in civil service human capital management (Shakhshina et al., 2025). While international scholarship increasingly conceptualizes AI adoption as a multi-level organizational and governance process, the Kazakhstan case remains insufficiently explored from an empirical perspective. This gap underscores the need for research that examines how AI is currently used, what constrains its adoption, and which conditions can support its further development in public administration.

## 2. Methodological approach

This study adopts an exploratory qualitative research design to investigate the current practices, challenges, and future prospects of artificial intelligence (AI) adoption in the public administration system of Kazakhstan. An exploratory approach is appropriate given the emerging nature of AI governance in many countries and the limited empirical evidence on its implementation in post-Soviet administrative contexts. Qualitative inquiry enables an in-depth examination of expert perceptions, institutional dynamics, and implementation barriers that cannot be captured through purely quantitative methods (Creswell, 2013).

The empirical basis of the study comprises semi-structured expert interviews, which are widely used in policy and governance research to obtain detailed insights from professionals directly involved in policy design, technological development, and implementation (Patton, 2002; Kallio et al., 2016). The interview guide was structured around three main analytical dimensions: (1) current experience and effects of AI adoption in public administration; (2) barriers, risks, and institutional challenges associated with AI implementation; and (3) policy measures, institutional reforms, and future development prospects. This structure allowed the research to capture both practical experiences and forward-looking policy perspectives regarding AI adoption in the public sector.

The study relies on data collected in 2025 via semi-structured interviews with experts involved in digital transformation, public administration, artificial intelligence development, and policy analysis. The interviews lasted between 60 and 75 minutes and were conducted either in person or online using video-conferencing platforms. With participants' consent, interviews were audio-recorded and subsequently transcribed for qualitative analysis. The interview format ensured a consistent structure across interviews while allowing flexibility for respondents to elaborate on issues based on their professional expertise.

Participants were selected through purposive sampling, targeting experts with professional experience in digitalization, artificial intelligence technologies, public administration, and policy development. The final sample included 20 experts representing key stakeholder groups involved in the AI ecosystem of public administration, including representatives of government and quasi-government organizations, analytical and policy institutions, professional associations, and academia. A detailed overview of expert profiles is provided in *Appendix A*. The distribution of respondents across sectors is presented in *Table 1*.

Participants possessed substantial professional experience ranging from 5 to 35 years, with an average professional experience of 14.2 years in areas related to digital transformation, data governance, public administration, and AI-related projects. The collected interview data were analyzed using thematic analysis, a widely applied method in qualitative policy research.

The analysis was conducted using the qualitative data analysis software ATLAS.ti, which enabled systematic coding and categorization of interview transcripts.

Table 1. Sectoral distribution of experts participating in the study

Sector	Number of experts	Share
Government / quasi-government	9	45%
Policy / analytical organizations	4	20%
Professional associations	1	5%
Academia	6	30%
<b>Total</b>	<b>20</b>	<b>100%</b>

Source: *own compilation*

The analytical process included transcription of interviews, coding of text segments to identify key ideas, and grouping of related codes into broader analytical categories, which were subsequently synthesized into overarching themes on AI applications, implementation challenges, and future development. The coding framework combined deductive and inductive approaches. Initial codes were derived from the research questions, while additional codes emerged from the data during analysis. As a result, the initial codebook of approximately 25 codes expanded to 76 codes, which were later refined and consolidated into a smaller set of analytically meaningful categories forming the final thematic structure.

Data collection and analysis continued iteratively until thematic saturation was reached, with no substantially new insights emerging from additional interviews. A visual representation of the research workflow is presented in *Figure 1*.

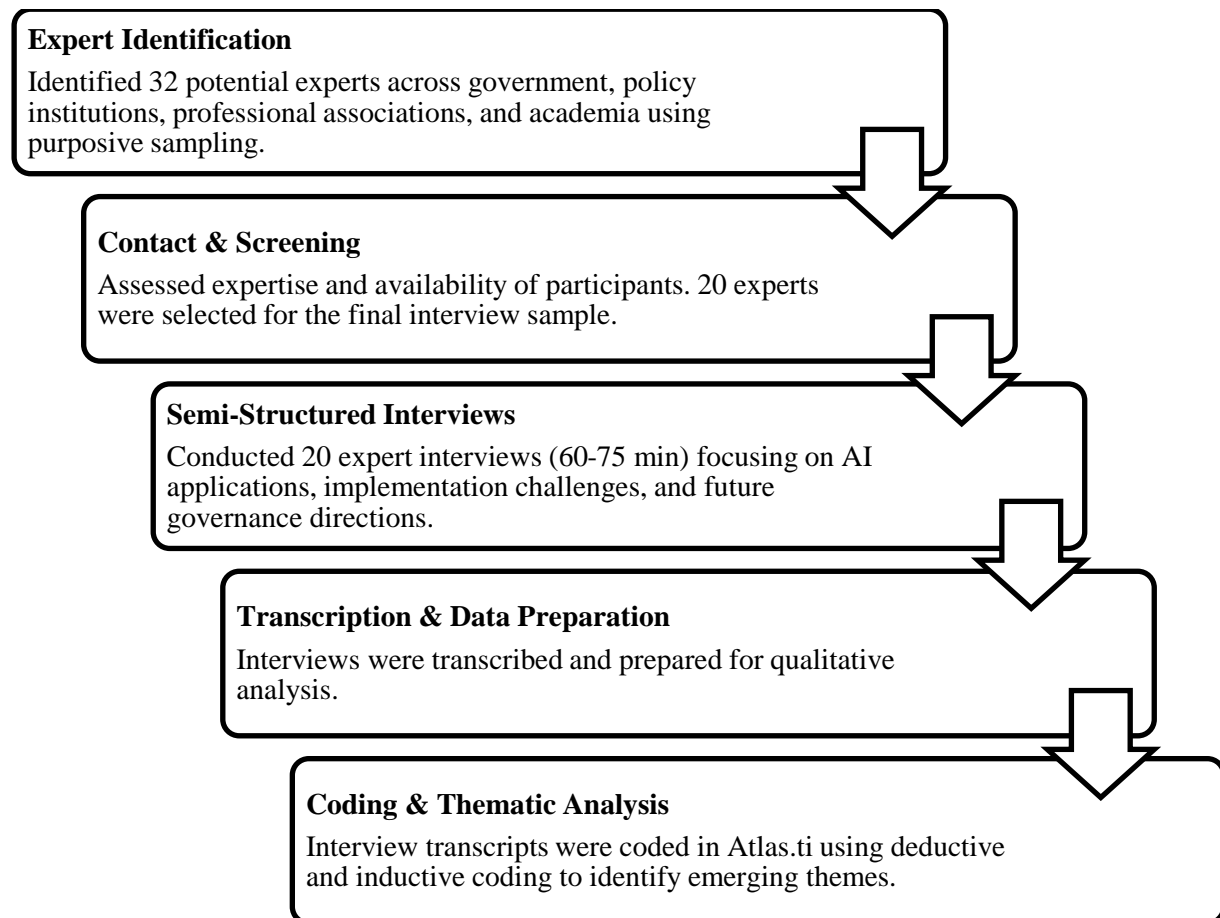


Figure 1. Research workflow of the study

Source: *own compilation*

### 3. Conducting research and results

#### 3.1. Overview of expert perspectives

The qualitative analysis yielded a set of thematic categories that reflect experts' perceptions of the current state, challenges, and future development of AI in Kazakhstan's public administration system. The coding process conducted in Atlas.ti identified several recurring themes across the interviews related to practical AI applications, institutional barriers, and policy development.

Figure 2 shows the distribution of positive, neutral, and negative sentiments in expert responses for the three research questions. For RQ1, responses are mainly neutral (298) and positive (286), with fewer negative views (79). For RQ2, the number of negative responses increases (89), reflecting concerns related to implementation challenges. For RQ3, responses again become mostly neutral (179) and positive (177), indicating a generally constructive outlook on the future development of AI in public administration.

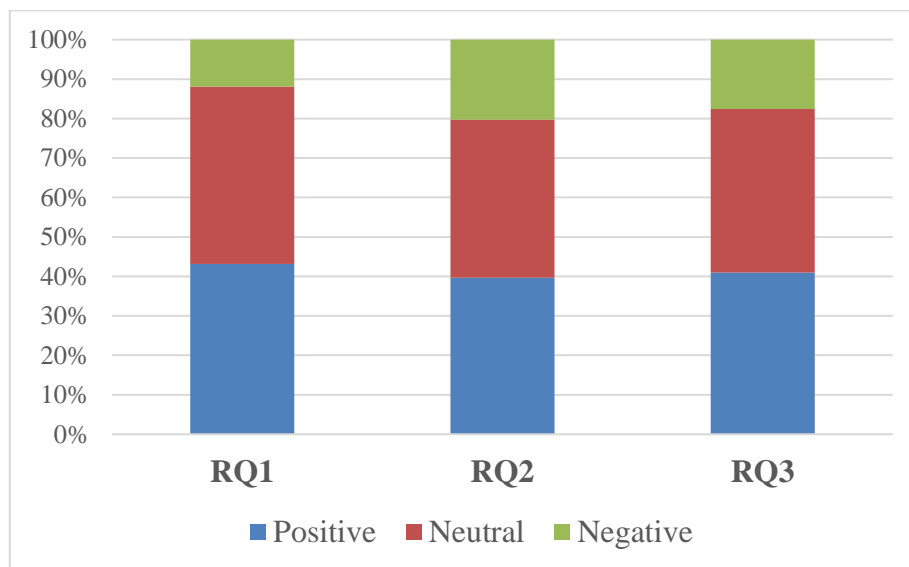


Figure 2. Sentiment distribution of expert responses across the three research questions

Source: *own compilation*

A word cloud (Figure 3) was generated based on all interview transcripts to identify the most frequently mentioned concepts in expert discussions. The visualization highlights the central role of artificial intelligence, data, decision-making, and implementation, reflecting experts' emphasis on the practical application of AI technologies. Terms such as government, digitalization, organizations, and the public sector further indicate the institutional context in which AI adoption is discussed.



Figure 3. Word cloud of the most frequently mentioned concepts in expert interviews  
Source: *own compilation*

**3.2. Current use of AI in public administration (RQ1)**

The analysis of expert interviews reveals that artificial intelligence (AI) in Kazakhstan’s public sector is applied across several interconnected domains, reflecting not only technological adoption but also an ongoing transformation of administrative practices and governance logic. The identified patterns of AI application were systematically organized into thematic categories and sub-themes, as presented in *Table 2*.

Table 2. Thematic structure of AI applications

Main theme	Sub-theme	Elements (frequency)
Current applications of AI in public administration	Strategic identification of AI use cases	Identification of priority areas for AI implementation (6)
	Citizen-oriented digital services	AI-enabled public services (99) Proactive public services (24)
	Internal administrative processes and decision-making	Administrative automation (164) Data analysis (37) AI-based decision support (113)
	Urban governance and public safety	Video analytics and surveillance systems (24) Smart city solutions (36)
	Sectoral applications of AI	Healthcare / agriculture / finance / public procurement / law (157)
	Localization and contextual adaptation	AI model training in the Kazakh language (12) Adaptation of existing AI solutions to local context (18) International collaboration and knowledge transfer (9)
	AI research and knowledge production	Applied AI research (49)

Source: *own compilation*

A key starting point for AI implementation, repeatedly emphasized by experts, is identifying priority areas where AI can deliver tangible value. This process precedes technological deployment and shapes the direction of digital transformation within public

governance. As one expert noted, *“before implementing AI, it is necessary to conduct a thorough analysis to determine where it is needed and for which tasks it can deliver value”* (Expert 20). Similarly, another respondent stressed that *“AI should not be introduced for its own sake, but only where it addresses concrete sectoral problems”* (Expert 16). This approach is particularly important for avoiding the symbolic or trend-driven adoption of AI, in which technologies are introduced primarily to signal innovation rather than to address substantive governance challenges. Instead, the findings suggest a shift toward more deliberate, problem-oriented implementation, in which AI is applied selectively to areas with clear functional relevance.

One of the most visible areas is citizen-oriented digital services, particularly within e-government platforms, where AI is used to improve accessibility, navigation, and efficiency in accessing public services. As Expert 1 noted, *“within the National AI platform, various AI-based solutions are already being piloted in government agencies, including EgovAI, an assistant that helps citizens navigate and access over 1,200 online public services”*. In addition, AI is integrated into citizen feedback systems, such as *“e-Otinish, a platform for receiving and processing citizen appeals”* (Expert 1). A further development within this domain is the emergence of proactive service delivery, where AI enables the state to anticipate citizen needs. For example, *“more than six million digital family maps covering around twenty million citizens allow social support to be provided without formal applications”* (Expert 5), while, as another expert emphasized, *“the state should move toward proactive services, where it already knows when assistance or documents are needed”* (Expert 1).

Within internal administrative processes, AI is used more intensively for administrative automation, data analysis, and decision support. In particular, AI supports evidence-based decision-making by analyzing complex datasets, including demographic, spatial, and infrastructure data. As one expert explained, *“AI was used to develop urban digital twins by combining population density, demographic data, and infrastructure layers to identify needs for social facilities across different districts”* (Expert 12). At the same time, experts consistently emphasized that AI systems function as assistive tools rather than autonomous decision-makers; as noted, *“AI should remain a decision-support tool rather than a substitute for managerial responsibility”* (Expert 15). Overall, these findings indicate that AI adoption simultaneously enhances service delivery and strengthens analytical capacity within government systems, contributing to a more data-driven and increasingly proactive model of governance.

In the areas of urban governance and public safety, AI is primarily used for video analytics and smart city solutions, enabling real-time monitoring and automated event detection. As one expert noted, *“AI technologies significantly enhance the ability to detect traffic violations and prevent incidents in public spaces, as systems automatically identify events and notify law enforcement authorities”* (Expert 5). The scale of these implementations is reflected in large-scale video monitoring systems, where *“tens of thousands of cameras are integrated with AI-based analytics for face recognition and detection of different events”* (Expert 9). Importantly, these systems are increasingly applied beyond security functions, for example, to monitor urban infrastructure and service quality, including the predictive detection of issues such as overflowing waste containers.

In sectoral applications, AI is used to support data-driven analysis and planning across multiple domains. Interview evidence indicates a wide range of use cases across sectors, including healthcare, agriculture, finance, public procurement, and law enforcement, where AI is used to improve efficiency, monitoring, and decision-making. For example, in the financial and regulatory domain, AI is employed to strengthen oversight capacities, as *“machine learning models help detect unreliable taxpayers and suspicious patterns”* (Expert 8). Similarly, in public procurement, AI is used to enhance transparency and control, where *“AI allows*

*monitoring procurement processes to identify price inflation or affiliation between participants*” (Expert 8). Another example is in the agricultural and water resource sectors, where AI is increasingly used to support public governance of natural resources. As one expert noted, AI is applied in *“inventory processes and defect detection using image-based analysis in the agricultural sector”* (Expert 3). In addition, AI-driven solutions are used to improve irrigation management and water efficiency through sensors and data systems that monitor soil conditions and optimize resource use.

The findings also indicate that AI solutions are increasingly tailored to local institutional and linguistic contexts, including training models in Kazakh with the explicit aim of integrating them into public administration systems. As one expert emphasized, *“the main goal is to expand the number of Kazakh-language products and their use, as this is ultimately a matter of national importance; ... the greater the access to Kazakh-language models, the more such products will emerge”* (Expert 2), highlighting the strategic and socio-political significance of linguistic localization. At the same time, rather than relying solely on domestic development, institutions actively adapt existing AI technologies to local needs, ensuring faster deployment and practical relevance. As noted by another expert, *“developing new technological directions from scratch is always difficult, whereas adapting existing AI solutions is more efficient and practical”* (Expert 17). This process is closely linked to the role of universities and research institutes, which contribute through applied AI research and pilot projects oriented toward public sector use.

Overall, the findings provide a consolidated empirical overview of how AI is currently implemented in Kazakhstan’s public administration, based on observed practices across different domains and levels of governance. The results capture the existing scope and forms of application, reflecting the current stage of AI integration in the public sector.

### **3.3. Key challenges and risks of AI implementation (RQ2)**

The analysis highlights a set of barriers and risks associated with implementing artificial intelligence in public administration. These challenges emerge at different stages of AI adoption and span multiple dimensions, including data, organizational, technological, and regulatory aspects. To provide a structured overview, the identified factors were grouped into thematic categories and sub-themes, as presented in *Table 3*.

Data-related constraints represent one of the most prominent challenges in the implementation of AI in public administration. Across interviews, experts consistently emphasized issues related to data quality, preparation, and governance. In particular, large volumes of administrative data remain unstructured, fragmented, or unsuitable for machine processing, requiring significant effort for cleaning and preprocessing. As one expert noted, *“data preparation alone can account for up to 80–85% of developers’ workload, as significant effort is required to organize and prepare data before implementation”* (Expert 1).

The lack of unified data standards and interoperability across government agencies restricts the effective integration of datasets. This constrains the development of AI systems. These challenges are reinforced by barriers to inter-agency data sharing. Institutional practices and concerns over responsibility also restrict access to relevant information. As one expert noted, *“inter-agency cooperation remains a major challenge, as organizations are often reluctant to share data due to concerns about responsibility, data leakage, and potential errors, making it easier not to share data than to be accountable for its use”* (Expert 8). Importantly, data-related issues are closely linked to the performance of AI systems, as the reliability of analytical outputs depends heavily on the quality and structure of input data. For example,

Expert 4 states that: “AI systems require high-quality and standardized data, as the performance of models directly depends on the underlying data”.

Table 3. Thematic structure of barriers and challenges of AI adoption in public administration

Main theme	Sub-theme	Elements (frequency)
Barriers and challenges of AI adoption in public administration	Data-related constraints	Data preparation for AI (51)
		Low data quality and unstructured data (71)
		Data governance gaps (60)
		Barriers to inter-agency data sharing (22)
		Data security risks (55)
	Technological sovereignty concerns (28)	
	Human capital and cognitive barriers	Human capital and cognitive barriers
Lack of AI skills (55)		
Lack of AI specialists (51)		
Misunderstanding of AI vs automation (25)		
Resistance to change (30)		
Fear of job displacement due to AI (10)		
Technological and resource constraints	Technological and resource constraints	Changes in the job market and staff turnover (37)
		Limited computing infrastructure and hardware (47)
		Resource and funding limitations (62)
		Regional digital divide (30)
Institutional and organizational barriers	Institutional and organizational barriers	Energy constraints for AI infrastructure (7)
		Systemic institutional constraints (58)
		Challenges in adapting AI to public sector systems (100)
Regulatory and governance challenges	Regulatory and governance challenges	Symbolic implementation of AI (16)
		Regulatory barriers (29)
Risks of AI implementation	Risks of AI implementation	Difficulties in evaluating AI impact (25)
		Lack of AI explainability (“black box” problem) (13)
		AI errors and hallucinations (32)
		Dependence on data quality and model training (40)
		Overreliance on AI systems (39)
		Decline in critical thinking (46)
Unethical use and misuse of AI (32)	Unethical use and misuse of AI (32)	Algorithmic influence on decision-making (“boomerang effect”) (15)

Source: own compilation

Human capital and cognitive barriers pose significant challenges to the adoption of AI in state government systems. A recurring theme across interviews is the low level of awareness of AI's potential applications, both among the general population and within the public sector workforce. This issue is particularly pronounced in remote regions, where limited exposure to digital technologies further constrains understanding and use.

Low levels of AI literacy and a limited understanding of what AI actually is, sometimes confused with simple automation, make it difficult to apply these technologies effectively. In some cases, this contributes to symbolic implementation, in which technologies are labeled as AI even though they do not fully match their functional characteristics. At the same time, experts noted a shortage of qualified specialists with advanced AI competencies, particularly in data science and machine learning. As one expert emphasized, “a lack of competent specialists remains a key barrier, as both users and developers may not fully understand how to apply AI, especially given how rapidly the field is evolving, with new models and techniques emerging

*continuously*” (Expert 3). While the labor market is gradually adapting, challenges related to attracting, training, and retaining such professionals persist across sectors.

In addition, workforce-related concerns further complicate AI adoption. Changes in job roles and skill requirements are already observable, yet adaptation remains uneven. Resistance to change, often driven by concerns about job displacement, was frequently mentioned by experts. At the same time, skepticism of some public sector employees toward AI-generated outputs indicates a lack of trust in these systems, which can limit their active use in decision-making and administrative processes.

Technological and resource constraints represent another important barrier to AI adoption in public administration. Experts highlighted limitations in computing infrastructure and hardware, as well as broader financial and resource constraints that restrict the development and scaling of AI solutions. As noted in the interviews, *“as the volume of data increases, infrastructure requirements also grow, including the need for more servers and memory. ...while the cost of hardware and data storage continues to rise”* (Expert 4). These challenges are further compounded by a pronounced regional digital divide, where uneven access to infrastructure limits implementation outside major urban centers. In addition, energy constraints associated with operating high-performance computing systems were identified as an emerging issue affecting the sustainability of AI deployment.

Institutional and regulatory conditions reflect both strong governmental support and ongoing adaptation challenges. Experts noted that AI development is actively promoted at the national level, including the establishment of dedicated institutions and the adoption of a framework law on artificial intelligence. However, the transition toward AI-enabled governance remains gradual and complex, similar to earlier stages of digital government development. Adapting existing administrative structures, processes, and systems to new technological realities requires time and sustained institutional transformation.

Regulatory development lags behind the rapid evolution of AI technologies. Experts emphasized that many aspects of AI governance remain unsettled globally, and similar uncertainties are observed in Kazakhstan. As one expert noted, *“regulation is still at an early stage of formation”* (Expert 15). While the adoption of a framework law is seen as an important step, concerns have been raised that excessive regulation may hinder innovation and slow the development and implementation of AI solutions. At the same time, experts pointed to the limited scope of existing legislation. As another respondent explained, *“although the first law has already been adopted, it does not yet cover the full range of social relations, as new forms of interaction are emerging. ... Since the capabilities and boundaries of AI are still not fully understood, more comprehensive regulation will require a deeper understanding of these developments”* (Expert 17).

An additional challenge concerns the difficulty of evaluating the actual impact of AI systems. The absence of clear metrics and assessment methods complicates outcome measurement and may lead to trust issues and inefficient resource allocation. This is closely related to the limited explainability of AI systems, where the logic behind algorithmic outputs is not always transparent. In such cases, insufficient understanding of how AI generates results may result in overreliance on automated decisions, with potential consequences for the quality and accountability. As one expert noted, *“many government processes are complex and nonlinear, requiring human judgment, while AI systems need extensive training on data and still have limited capacity to handle such situations, making their implementation in public administration particularly challenging”* (Expert 18).

Risks associated with AI implementation were widely discussed by experts and span technical, cognitive, and behavioral dimensions. A key concern is AI errors and hallucinations, which are closely linked to data quality and model training, as the reliability of output depends

heavily on the underlying datasets. At the same time, experts noted that increasing reliance on AI systems may lead to reduced critical engagement by users, creating risks of uncritical acceptance of algorithmic outputs. As one expert noted, “*if civil servants rely entirely on AI, they may lose the ability to independently analyze situations and search for solutions*” (Expert 5). This dynamic is further associated with the potential misuse of AI, including its application without sufficient validation or in inappropriate contexts. As highlighted in the interviews, “*the greatest risk is excessive trust in AI and the loss of critical thinking when evaluating its outputs*” (Expert 13). In addition, some experts noted the possibility of algorithmic influence on decision-making, with continuous interaction with AI systems subtly shaping user judgments and preferences. Building on technical barriers, concerns about data security and technological sovereignty impose additional constraints, particularly when using external platforms and infrastructure. Together, these risks indicate that AI adoption in state governance systems requires careful oversight to ensure that technological support does not undermine the quality and accountability of decision-making processes.

Overall, the findings demonstrate that barriers and risks associated with AI adoption in public administration are multidimensional and interrelated. Importantly, these factors do not operate in isolation but are closely connected, collectively shaping the conditions under which AI can be effectively integrated into public sector practices

### **3.4. Enablers and policy measures for AI development in public administration (RQ3)**

The analysis also identified key enabling factors and policy measures supporting the development of AI in public administration. These measures span human, technological, institutional, and regulatory dimensions and reflect expert recommendations for improving current practices. The identified factors were grouped into thematic categories and sub-themes, as presented in *Table 4*.

Institutional support and strategic direction emerge as a central enabling factor for AI development in public administration. Experts consistently emphasized the leading role of the state in setting priorities, shaping strategies, and providing the necessary infrastructure and funding. Government initiatives, including the development of AI governance structures and dedicated strategies, create the foundation for more systematic implementation of AI across sectors. As noted in the interviews, “*2026 has been declared the Year of Artificial Intelligence [in Kazakhstan], which is expected to lead to institutional changes and the consolidation of key parameters within the regulatory framework*” (Expert 7).

Human capital development represents another critical area highlighted by all respondents. On the one hand, increasing AI awareness and digital skills among the general population is essential, as citizens directly interact with AI-enabled public services. On the other hand, experts stressed the importance of training qualified specialists, including data scientists, machine learning engineers, and technical personnel responsible for maintaining AI infrastructure. At the policy level, this requires adjustments in educational priorities, particularly strengthening analytical and technical disciplines. As emphasized by one expert, reflecting the views of others, “*What measures are needed? Total training and total upskilling [for all]. The introduction of high-quality educational programs in universities, the selection and appointment of people who know how to work with AI... Personnel determines everything*” (Expert 14).

Table 4. Thematic structure of enabling factors and recommendations

## RECENT ISSUES IN ECONOMIC DEVELOPMENT

Main theme	Sub-theme	Elements (frequency)	
Enablers and recommendations for AI adoption in public administration	Institutional and strategic support	Institutional support for AI development (118)	
		Development of AI governance infrastructure (71)	
		AI implementation strategies (81)	
		Increased funding for AI infrastructure and projects (33)	
	Human capital and education	AI education and skills development (99)	
		Human capital development (88)	
		Digital skills development (20)	
		Development of data science and advanced AI competencies (10)	
	Data and infrastructure development	Data and infrastructure development	Development of data infrastructure (90)
			Data governance reforms (46)
Expansion of hardware and computing capacity (34)			
Implementation and regulatory approaches	Implementation and regulatory approaches	Adaptive AI regulation (44)	
		Reduction of bureaucratic procedures (8)	
		Adaptation to local context (27)	
Collaboration and ecosystem development	Collaboration and ecosystem development	AI model training and improvement (43)	
		Development of the AI ecosystem (80)	
		Engagement of expert communities, think tanks, and civil society (8)	
Governance and responsible use	Governance and responsible use	International cooperation (10)	
		Interdisciplinary working groups (5)	
		Ethical and transparent governance (59)	
		Ethical and responsible use of AI (31)	
		Human oversight and AI-human collaboration (68)	
		Explainable AI (7)	
		Perception of AI as an opportunity (54)	
		Positive expectations regarding AI development in public administration (47)	

Source: *own compilation*

In response to data-related challenges identified in the previous section, experts proposed a range of measures aimed at improving data management practices. These include enhancing data collection, cleaning, storage, and interoperability, as well as developing more structured data governance frameworks. In some cases, collaboration with the private sector was suggested as a way to accelerate data preparation and processing.

Regulatory and implementation approaches also play an important enabling role. Experts highlighted the need for adaptive legal frameworks that can keep pace with rapid technological change, alongside efforts to reduce bureaucratic barriers and simplify administrative procedures. As one expert noted, “*clear standards of algorithmic transparency, audit mechanisms for AI systems, and ethical protocols are needed. The current legal framework remains more reactive than strategic*” (Expert 15). At the same time, there is a need to balance the development of domestic AI solutions with the adaptation of existing technologies available on the market. This dual approach allows for both technological sovereignty and practical efficiency in implementation.

Another key direction concerns the development of a broader AI ecosystem through collaboration between government, academia, and the private sector. Experts emphasized the importance of interdisciplinary cooperation and the involvement of expert communities, think tanks, and civil society to ensure that AI solutions address real sectoral needs. As one expert noted, “*an effective approach may be the Triple Helix model, where the state defines demand, business implements technological solutions, and academia provides research and expert support*” (Expert 15). Such collaboration is seen as essential for aligning technological development with practical policy objectives.

Finally, particular attention was given to governance and the responsible use of AI. Experts stressed the importance of transparency, ethical standards, and human oversight across

all stages of AI deployment. As one expert noted, “*it is important to develop a culture and ethics of AI use*” (Expert 5). Ensuring the explainability of AI systems is especially critical in state governance, where decisions have direct implications for citizens. As emphasized in the interviews, “*particular attention should be paid to explainable AI, where it is possible to trace the chain of data and reasoning behind a given output*” (Expert 19). In addition, experts highlighted the importance of information security, given the sensitivity of data and processes involved in public services.

Overall, the findings indicate that experts express largely positive expectations regarding the development of AI in Kazakhstan. AI is widely perceived as an opportunity to improve public administration, provided that appropriate institutional, technological, and governance conditions are in place.

## Discussion

This study set out to explore the current use, key challenges, and enabling conditions for the development of artificial intelligence (AI) in Kazakhstan’s public administration. The findings provide a comprehensive empirical response to the three research questions, highlighting both the scope of AI applications and the systemic factors shaping its adoption.

With regard to RQ1, the results show that AI in Kazakhstan’s public administration is currently at a transitional stage, moving from basic automation toward the use of large language models (LLMs) and predictive analytics. While many processes remain linear and automation-driven, experts highlight a growing number of pilot projects and practical applications across different domains. These findings are consistent with existing research highlighting the increasing number of integration of AI into public service delivery and decision-making processes (Seniutis et al., 2024; European Commission, 2024), which typically evolves gradually from initial, incremental applications (Neumann et al., 2022; Larsen & Folstad, 2024; Benkirane & Benazzi, 2024). Research results provide empirical evidence from a developing-country context, illustrating how AI adoption is evolving within public administration under varying levels of technological readiness.

Regarding RQ2, the findings reveal that AI adoption is constrained by a complex set of interrelated barriers. Importantly, these challenges extend beyond public sector organizations themselves and reflect broader systemic conditions. The results highlight factors such as the level of digital maturity and population awareness, the education system’s capacity to prepare qualified specialists, persistent data-related issues, and financial and technological constraints, all of which shape the pace and effectiveness of AI adoption in public administration. In addition, regulatory frameworks often lag behind rapid technological developments, while existing administrative processes are not always easily adaptable to AI-based solutions. These findings are consistent with previous studies that identify data quality, skills gaps, and governance challenges as key obstacles to AI implementation in the public sector (Wirtz et al., 2019; Van Noordt et al., 2023; Criado et al., 2024). At the same time, this study adds value by demonstrating the systemic and interconnected nature of these barriers, providing a basis for deriving practical implications for more effective and coordinated policy interventions.

Addressing RQ3, the findings point to a set of enabling conditions that support the development of AI in public administration across institutional, human, technological, and regulatory dimensions, reflecting how existing constraints can be addressed in practice. In addition, the importance of ethical and responsible AI use emerges as a key enabling factor, consistent with prior research (Kaczorowska-Spychalska et al., 2024; Wojciechowski & Korjonen-Kuusipuro, 2025). Importantly, these enablers directly correspond to the barriers identified in RQ2, indicating that effective AI adoption requires coordinated and systemic

responses rather than isolated interventions. This systemic perspective is consistent with evidence from telematics and logistics systems, where cost reduction and efficiency gains from digital solutions are realized only when organizational, regulatory, and technical dimensions are addressed simultaneously (Szcześniak & Gorzelańczyk, 2024).

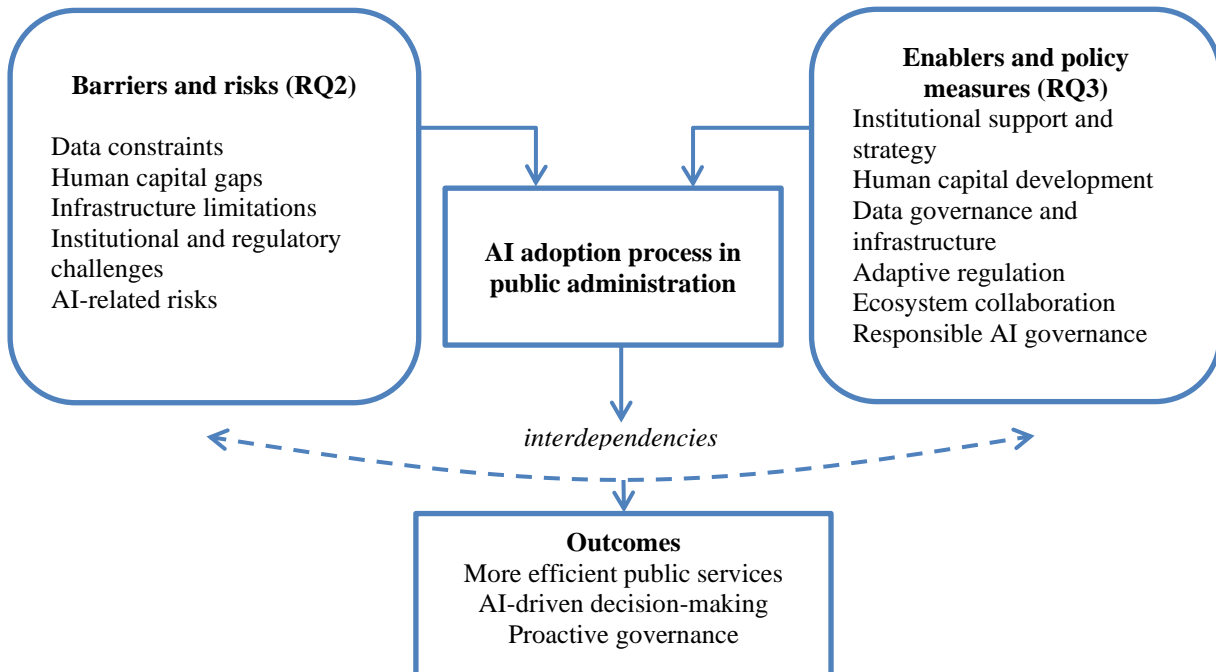


Figure 4. Conceptual framework of AI adoption in public administration

Source: *own compilation*

These relationships are summarized in the conceptual framework presented in Figure 4, which illustrates how barriers and enabling conditions jointly shape AI adoption in public administration. In particular, the framework highlights the correspondence between the identified challenges and the policy measures proposed to address them, showing that effective AI implementation depends on the interaction between constraints and targeted enabling actions.

*Practical implications.* These findings have important practical implications for policymakers and public sector organizations. First, progress depends on strengthening human capital through both broad AI literacy and specialized skills development, improving data governance practices, and ensuring the institutional capacity to support AI integration. At the same time, regulatory frameworks need to remain flexible and adaptive to keep pace with rapid technological change while maintaining transparency and accountability. Finally, the findings highlight the importance of collaboration between government, academia, and the private sector, as such cooperation can support the development and implementation of context-relevant AI solutions.

## Conclusion

This study provides an empirical examination of artificial intelligence (AI) adoption in Kazakhstan's public administration, contributing to the literature by offering evidence from a developing-country context that remains underrepresented in existing research. The findings

suggest that AI development in Kazakhstan is strongly driven by active governmental support, including the establishment of dedicated institutions, adoption of regulatory frameworks, and strategic efforts to create enabling conditions for AI integration. A growing number of practical applications and pilot projects are already being implemented, indicating gradual but tangible progress in AI deployment.

However, the findings also show that broader adoption remains constrained by several persistent barriers, particularly related to human capital, data availability and quality, technological infrastructure, and resource limitations. Addressing these challenges requires coordinated policy efforts and sustained institutional adaptation. In addition, the study draws attention to the issue of technological sovereignty, as countries with limited domestic capabilities remain dependent on external AI solutions. This highlights the importance of strengthening local innovation ecosystems and supporting the development of context-appropriate technologies. Overall, the results indicate that the pace and effectiveness of AI adoption depend on how well institutional capacity, data practices, skills, and regulatory approaches are aligned.

Future research could build on these findings in several directions. First, quantitative studies could assess the impact of AI adoption on administrative performance and public value outcomes. Second, comparative research across countries would help to identify context-specific and universal patterns of AI governance. Third, longitudinal studies are needed to examine how AI adoption evolves over time and how institutional and regulatory frameworks adapt to emerging technological developments.

### **Acknowledgement**

The authors gratefully acknowledge the experts who participated in this study for their time, valuable insights, and willingness to share their professional experience.

### **Funding**

This research was funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP23487228)

### **References**

- Al-Ansi, A. M., Garad, A., Jaboob, M., & Al-Ansi, A. (2024). Elevating e-government: Unleashing the power of AI and IoT for enhanced public services. *Heliyon*, 10(23), e40591. <https://doi.org/10.1016/j.heliyon.2024.e40591>
- Alqodsi, E. M., & Gura, D. (2023). High tech and legal challenges: Artificial intelligence-caused damage regulation. *Cogent Social Sciences*, 9(2). <https://doi.org/10.1080/23311886.2023.2270751>
- Alyileili, M., & Opoku, A. (2025). Ethical AI integration in municipal self-service technologies: A case study from UAE public sector transformation. *Journal of Open Innovation Technology Market and Complexity*, 11(4), 100648. <https://doi.org/10.1016/j.joitmc.2025.100648>
- Anomah, S. (2025). Assessing the institutional readiness and capacity for AI adoption in public audit institutions in developing countries: evidence from Ghana. *Telematics and Informatics Reports*, 20, 100260. <https://doi.org/10.1016/j.teler.2025.100260>
- Attard-Frost, B., Brandusescu, A., & Lyons, K. (2024). The governance of artificial intelligence in Canada: Findings and opportunities from a review of 84 AI governance initiatives.

- Government Information Quarterly*, 41(2), 101929.  
<https://doi.org/10.1016/j.giq.2024.101929>
- Barsekh-Onji, A., Hernandez, Z. T., & Espinosa, E. O. C. (2025). Advancing smart public administration: Challenges and benefits of artificial intelligence. *Urban Governance*, 5(3), 279–292. <https://doi.org/10.1016/j.ugj.2025.06.003>
- Benkirane, K., & Benazzi, K. (2024). Harnessing AI for public administration: A literature review on opportunities, challenges, and strategic implementation. *International Journal of Economic Studies and Management (IJESM)*, 4(4), 794–817. <https://doi.org/10.5281/zenodo.13226873>
- Bonțaș, O., & Neamțu, F. (2025). Challenges related to informational dynamics and artificial intelligence in the context of public administration. *Economy Transdisciplinary Cognition*, 28(2), 27–36.
- Busuioc, M. (2020). Accountable Artificial intelligence: holding algorithms to account. *Public Administration Review*, 81(5), 825–836. <https://doi.org/10.1111/puar.13293>
- Carlsson, V., & Ronnblom, M. (2022). From politics to ethics: Transformations in EU policies on digital technology. *Technology in Society*, 71, 102145. <https://doi.org/10.1016/j.techsoc.2022.102145>
- Casas, P. F. I., & Palomes, X. P. I. (2026). Building Society 5.0: a foundation for decision-making based on open models and digital twins. *Advanced Engineering Informatics*, 69, 103970. <https://doi.org/10.1016/j.aei.2025.103970>
- Castrellon, J. P. (2023). Using digitalisation for data-driven freight curbside management: A perspective from urban transport planning [Licentiate thesis, Chalmers University of Technology]. <https://research.chalmers.se/en/publication/534266>
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). SAGE Publications.
- Criado, J. I., Sandoval-Almazán, R., & Gil-Garcia, J. R. (2024). Artificial intelligence and public administration: Understanding actors, governance, and policy from micro, meso, and macro perspectives. *Public Policy and Administration*, 40(2), 173–184. <https://doi.org/10.1177/09520767241272921>
- David, G. (2024). Artificial intelligence: Opportunities and challenges for public administration. *Canadian Public Administration-Administration Publique du Canada*, 67(3), 388–406. <https://doi.org/10.1111/capa.12580>
- de Sousa, W. G., de Melo, E. R. P., De Souza Bermejo, P. H., Sousa Farias, R. A., & Oliveira Gomes, A. (2019). How and where is artificial intelligence in the public sector going? A literature review and research agenda. *Government Information Quarterly*, 36(4), 101392. <https://doi.org/10.1016/j.giq.2019.07.004>
- Dunleavy, P., & Margetts, H. (2023). Data science, artificial intelligence and the third wave of digital era governance. *Public Policy and Administration*, 40(2), 185–214. <https://doi.org/10.1177/09520767231198737>
- European Commission (2024). *Public Sector Tech Watch: Adoption of AI, Blockchain and Other Emerging Technologies within the European Public Sector*. Luxembourg: Publications Office of the European Union, doi: 10.2799/4393
- Kaczorowska-Spychalska, D., Kotula, N., Mazurek, G., & Sułkowski, Łukasz. (2024). Generative AI as source of change of knowledge management paradigm. *Human Technology*, 20(1), 131–154. <https://doi.org/10.14254/1795-6889.2024.20-1.7>
- Kallio, H., Pietilä, A.-M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954–2965. <https://doi.org/10.1111/jan.13031>

- Kampira, A., & Mukonza, R. M. (2025). E-Government/AI integration state and capacity in developing countries: A systematic review. *Administrative Sciences*, 15(12), 482. <https://doi.org/10.3390/admsci15120482>
- Kim, E. (2026). Generative AI in public administration: A quasi-experimental analysis of bureaucratic productivity. *Government Information Quarterly*, 43(1), 102108. <https://doi.org/10.1016/j.giq.2026.102108>
- Kosherbayeva, A., & Kylbayev, Y. (2025). Kazakhstan's digital governance evolution: Strategies, challenges, and future prospects. In Y. Kim & M. J. Ahn (Eds.), *The art of digital governance* (pp. 235–262). Springer. [https://doi.org/10.1007/978-3-032-00514-4\\_13](https://doi.org/10.1007/978-3-032-00514-4_13)
- Koteczki, R., Csikor, D. & Balassa, B.E. (2025). The role of generative AI in improving the sustainability and efficiency of HR recruitment process. *Discover Sustainability* 6, 60. <https://doi.org/10.1007/s43621-025-01484-3>
- Kozhakhmetova, A., Mamyrbayev, A., Zhidebekkyzy, A., & Bilan, S. (2024). Assessing the impact of artificial intelligence on project efficiency enhancement. *Knowledge and Performance Management*, 8(2), 109–126. [https://doi.org/10.21511/kpm.08\(2\).2024.09](https://doi.org/10.21511/kpm.08(2).2024.09)
- Larsen, A. G., & Følstad, A. (2024). The impact of chatbots on public service provision: A qualitative interview study with citizens and public service providers. *Government Information Quarterly*, 41(2), 101927. <https://doi.org/10.1016/j.giq.2024.101927>
- Lartey, S. O., Afful-Dadzie, E., & Afful-Dadzie, A. (2026). Knowledge, attitudes, and readiness towards artificial intelligence in government services: a developing country perspective. *Data & Policy*, 8, e2. doi:10.1017/dap.2025.10049
- Madan, R., & Ashok, M. (2022). AI adoption and diffusion in public administration: A systematic literature review and future research agenda. *Government Information Quarterly*, 40(1), 101774. <https://doi.org/10.1016/j.giq.2022.101774>
- Mahroof, K., Weerakkody, V., Hussain, Z., & Sivarajah, U. (2025). Navigating power dynamics in the public sector through AI-driven algorithmic decision-making. *Government Information Quarterly*, 42, 102053. <https://doi.org/10.1016/j.giq.2025.102053>
- Matias-Pereira, J. (2025). Use of artificial intelligence in global public administrations: Advances and perspectives. In *Science and Connections: The Interdependence of Disciplines*.
- Mergel, I., Dickinson, H., Stenvall, J., & Gasco, M. (2023). Implementing AI in the public sector. *Public Management Review*, 1–14. <https://doi.org/10.1080/14719037.2023.2231950>
- Mortati, M., Mariani, I., & Rizzo, F. (2025). A socio-technical perspective on digital twins as GovTech solutions: the case of WiseTown. *Data & Policy*, 7, e82. doi:10.1017/dap.2025.10045
- Neumann, O., Guirguis, K., & Steiner, R. (2022). Exploring artificial intelligence adoption in public organizations: a comparative case study. *Public Management Review*, 26(1), 114–141. <https://doi.org/10.1080/14719037.2022.2048685>
- Ngo, T. (2026). Public trust in AI: A dynamic social media view. *Social Sciences & Humanities Open*, 13, 102457. <https://doi.org/10.1016/j.ssaho.2026.102457>
- Nguyen Duy, P., Ruangthamsing, C., Kamnuansilpa, P., Lowatcharin, G., & Setthasuravich, P. (2026). Generative AI in developing countries: Adoption dynamics in Vietnamese local government. *Informatics*, 13(2), 22. <https://doi.org/10.3390/informatics13020022>
- OECD. (2025). *Governing with artificial intelligence: The state of play and way forward in core government functions*. OECD Publishing. <https://doi.org/10.1787/795de142-en>

- Omonov, M. S., & Ahn, Y. (2025). Towards smart public administration: A TOE-based empirical study of AI chatbot adoption in a transitioning government context. *Administrative Sciences*, 15(8), 324. <https://doi.org/10.3390/admsci15080324>
- Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.). SAGE Publications.
- Phan, T. T., Nguyen, P. V., Corvello, V., & Pham, T. T. P. (2026). AI capacity in the public sector: Pathways from the environmental context to an organizational impact. *Journal of Innovation & Knowledge*, 13, 100931. <https://doi.org/10.1016/j.jik.2025.100931>
- Pini, B., Dolci, V., Gianatti, E., Petroni, A., Bigliardi, B., & Barani, A. (2025). Artificial intelligence as a facilitator for public administration procedures: A literature review. *Procedia Computer Science*, 253, 2537–2546. <https://doi.org/10.1016/j.procs.2025.01.313>
- Pourmirza, Z., Bozdal, M., Khalil, M., Judson, E., & Walker, S. (2026). Digital transformation of energy systems: Technologies, data, governance and cyber security. *IET Smart Grid*. <https://doi.org/10.1049/stg2.70068>
- Razavi, N., & Sierpinski, G. (2024). An attempt to determine the impact of the implementation of autonomous vehicles on a larger scale on the planning of city transport systems. *Journal of Sustainable Development of Transport and Logistics*, 9(1), 96–120. <https://doi.org/10.14254/jsdtl.2024.9-1.8>
- Roy, J. K. & Vasa, L. (2024). Machine learning and artificial intelligence method for fintech credit scoring and risk management: A systematic literature review. *International Journal of Business Analytics*, 11(1), 1-23. <https://doi.org/10.4018/IJBAN.347504>
- Sagana, A., Zhang, M., & Sauerland, M. (2025). Public attitudes towards police use of AI-driven face recognition technology. *Computers in Human Behavior*, 174, 108821. <https://doi.org/10.1016/j.chb.2025.108821>
- Seniutis, M., Gružauskas, V., Lileikiene, A., & Navickas, V. (2024). Conceptual framework for ethical artificial intelligence development in social services sector. *Human Technology*, 20(1), 6–24. <https://doi.org/10.14254/1795-6889.2024.20-1.1>
- Shakhshina, A., Bugubayeva, R., & Stavbunik, Y. (2025). Application of artificial intelligence in human capital management of the civil service: Predicting career trajectories and personalized personnel development. *Periodicals of Engineering and Natural Sciences*, 13(4), 859–872. <https://doi.org/10.21533/pen.v13.i4.1156>
- Singh, A., R.Alghafes, J. P.Koltai, & S. K.Vishnoi (2025). Harnessing Generative AI for Sustainable Supply Chains: Lean, Circular and Green Perspectives. *Business Strategy and the Environment* 1–17. <https://doi.org/10.1002/bse.70515>.
- Szcześniak, J., & Gorzelańczyk, P. (2024). Analysis of the use of logistics-telematics systems for cost reduction in a transport company. *Journal of Sustainable Development of Transport and Logistics*, 9(1), 6–18. <https://doi.org/10.14254/jsdtl.2024.9-1.1>
- Tangi, L., Müller, A. P. R., & Janssen, M. (2025). AI-augmented government transformation: Organisational transformation and the sociotechnical implications of artificial intelligence in public administrations. *Government Information Quarterly*, 42(3), 102055. <https://doi.org/10.1016/j.giq.2025.102055>
- Temerbulatova, Z., Zhidebekkyzy, A., Sagiyeva, R., & Ludwiczak, A. (2025). Artificial intelligence as a driver of innovation and patent activity: An empirical analysis of cross-country data. *Economics & Sociology*, 18(3), 184–201. <https://doi.org/10.14254/2071-789x.2025/18-3/11>
- Twizeyimana, J. D., & Andersson, A. (2019). The public value of E-Government – A literature review. *Government Information Quarterly*, 36(2), 167–178. <https://doi.org/10.1016/j.giq.2019.01.001>

- United Nations Department of Economic and Social Affairs (UN DESA). (2025). Kazakhstan's digital evolution: From e-government to AI governance. <https://publicadministration.desa.un.org/blog/kazakhstans-digital-evolution-egov-ai-governance>
- Valle-Cruz, D., & García-Contreras, R. (2025). Towards AI-driven transformation and smart data management: Emerging technological change in the public sector value chain. *Public Policy and Administration*, 40(2), 254–275. <https://doi.org/10.1177/09520767231188401>
- van Noordt, C., & Tangi, L. (2023). The dynamics of AI capability and its influence on public value creation of AI within public administration. *Government Information Quarterly*, 40, 101860. <https://doi.org/10.1016/j.giq.2023.101860>
- Van Noordt, C., Medaglia, R., & Tangi, L. (2023). Policy initiatives for Artificial Intelligence-enabled government: An analysis of national strategies in Europe. *Public Policy and Administration*, 40(2), 215–253. <https://doi.org/10.1177/09520767231198411>
- Vatamanu, A. F., & Tofan, M. (2025). Integrating Artificial Intelligence into Public Administration: *Challenges and Vulnerabilities*. *Administrative Sciences*, 15(4), 149. <https://doi.org/10.3390/admsci15040149>
- Vogl, T. M., Seidelin, C., Ganesh, B., & Bright, J. (2020). Smart technology and the emergence of algorithmic bureaucracy: Artificial intelligence in UK local authorities. *Public Administration Review*, 80(6), 946–961. <https://doi.org/10.1111/puar.13286>
- Vovk, Y., Vovk, I., Plekan, U., Tson, O., & Oleksyuk, V. (2025). Sustainable and smart logistics centers: Challenges and opportunities for Ukraine's transport system. *Journal of Sustainable Development of Transport and Logistics*, 10(1), 116–124. <https://doi.org/10.14254/jsdtl.2025.10-1.8>
- Wang, C., Yin, Y., & Hu, H. (2026). The rise of algorithmic governance and the dual revolution: Applications, challenges, and governance of artificial intelligence in public administration. *Technology in Society*, 86, 103264. <https://doi.org/10.1016/j.techsoc.2026.103264>
- Weerheijm, B., Galdames, M., & Giest, S. (2026). Bureaucratic accountability: Enabler or barrier for algorithm use? *Policy Design and Practice*, 9(1), 16–52. <https://doi.org/10.1080/25741292.2025.2578064>
- Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2019). Artificial intelligence and the public sector—Applications and challenges. *International Journal of Public Administration*, 42 (00), 596–615. <https://doi.org/10.1080/01900692.2018.1498103>
- Wojciechowski, A., & Korjonen-Kuusipuro, K. (2025). Social impact of data bias in artificial intelligence models. *Human Technology*, 21(2), 246–250. <https://doi.org/10.14254/1795-6889.2025.21-2.0>

## Appendix A – Expert Profiles

Expert №	Sector	Organization type	Professional experience (in years)	Experience in AI-related projects
Expert 1	Government	Quasi-governmental organization	10	Participation in projects to develop GovTech and data platforms, implement AI tools in government information systems, and provide expert support for AI initiatives in the public sector.
Expert 2	Government	State/subordinate organization	8	Coordination of digital transformation projects related to AI and NLP solutions for natural language processing, development of digital language products and intelligent services.
Expert 3	Government	Quasi-governmental organization	5	Participation in IT projects for the maintenance of government digital platforms, ensuring data integration, and providing technical support for artificial intelligence-based solutions within the e-government infrastructure.
Expert 4	Government	State/subordinate organization	5	Participation in projects involving data engineering for large language models, the development of AI and NLP solutions, and the preparation of language data for intelligent digital services.
Expert 5	Government	Local executive body	20	Participation in regional projects to digitalize public administration, implement digital services, and support AI and smart city initiatives.
Expert 6	Government	Government organization	13	Participation in analytical and expert-methodological projects related to the development of data-driven governance, digital transformation, and the assessment of the application of artificial intelligence in the public administration system.
Expert 7	Government	Quasi-governmental organization	25	Participation in projects to digitalize financial processes, automate assessments, and implement data-driven management tools in financial and credit activities.
Expert 8	Government	Quasi-government organization	7	Participation in projects related to the digitalization of urban governance, including the development of analytical tools, support of city data platforms and the use of intelligent data analysis methods to support managerial decision-making.
Expert 9	Government	Quasi-government organization	13	Participation in projects related to the digitalization of urban governance, including the development of IT infrastructure, implementation of smart city solutions, and support of digital platforms and information systems to improve the efficiency of urban services.
Expert 10	Policy organizations	Analytical/policy center	10	Participation in projects on urban data analytics, the implementation of artificial intelligence-based solutions to support managerial decision-making, and the development of predictive analytics tools.
Expert 11	Policy organizations	Analytical/policy center	7	Participation in projects on urban data analysis, creation of analytical dashboards, and the use of

## RECENT ISSUES IN ECONOMIC DEVELOPMENT

				intelligent analysis methods for managing urban processes.
Expert 12	Policy organizations	Government research institute	17	Development of digitalization initiatives and introduction of AI elements in the city governance; creation of digital services, data-driven analytics and digital tools to support decision-making in public administration.
Expert 13	Policy organizations	Independent analytical center	19	Participation in analytical and applied projects involving the use of artificial intelligence and digital technologies in research and expert activities, including the application of AI tools for data analysis and support of analytical studies.
Expert 14	Professional associations	Association	15	Participation in projects related to the digitalization of public administration, development of data infrastructure and implementation of AI solutions, including initiatives aimed at advancing digital services, standards and the artificial intelligence ecosystem.
Expert 15	Academia	Private university	8	Participation in scientific, educational, and applied projects related to the development of digital technologies, data analysis, and the application of artificial intelligence methods.
Expert 16	Academia	Public university	35	Participation in research and expert-analytical projects on the digital transformation of public administration.
Expert 17	Academia	Public university	20	Participation in research projects related to the implementation of artificial intelligence tools in public administration and legislative processes, including studies on the application of AI in lawmaking activities.
Expert 18	Academia	Research university	12	Participation in research projects in robotics and artificial intelligence, including the development and integration of AI algorithms into robotic systems, as well as educational and advisory activities related to AI applications.
Expert 19	Academia	Public university	20	Participation and leadership in research and educational projects in artificial intelligence, data analytics and intelligent information systems, including the development of AI solutions, machine learning applications and the use of intelligent data analysis methods.
Expert 20	Academia	Public university	15	Participation in research and applied projects involving the development and implementation of AI solutions, including data analysis, intelligent information systems development and the use of artificial intelligence methods to support analytical and decision-making tasks.