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AI Integration in the Public Sector: A Systematic Review of Risks and Opportunities

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Abstract**:** *The development of Artificial Intelligence* (*AI*) *and e-Government is a paradigm shift in the administration of the people. Although it supports optimization of service delivery, various challenges are also brought to the fore. This scoping review examines the challenges, threats, and regulations surrounding the implementation of AI in the government sector. Following PRISMA guidelines, fifty peer-reviewed articles published between 2021 and 2025 were reviewed. The analysis found four major groups of challenges: technical* (*32%*)*, organizational* (*28%*)*, ethical and social (25%), and regulatory and policy-related* (*15%*)*. The most common identified obstacles included the lack of skills and talent* (*92%*)*, integrating with legacy systems (85%), and algorithmic bias* (*75%*)*. The authors suggest a multi-layered AI governance framework, which includes international and national regulation, organizational processes, and managerial practices. It provides strategic suggestions, which are aimed at promoting the effective and responsible use of AI in e-Government.*

Keywords**:** *Artificial Intelligence, e-Government, Digital Government, Public Administration, AI Governance.*

1. Introduction

The introduction of Artificial Intelligence (AI) into government is a critical step in the history of "e-Government", which is a revolution in governance systems, in

terms of the responsiveness of ever-advancing and efficient mechanisms [1, 2]. Governments, at all levels, are now faced with complicated social issues, and citizens expect a better quality of digital communication between them and government agencies. AI-controlled technologies, such as machine learning, natural language processing, and high-level automation, not only have the potential to streamline administration processes and support more evidence-based decision making, but they can also enable increasingly interactive and personalized models of government-citizen interaction [3, 4]. The available literature on smart governance in public institutions has received a fair share of attention. However, AI is not just viewed as a technological improvement but as the key driving force governing the concept of transforming the future models of public service [5, 6].

However, the transformative power of AI in the governmental field is not its only impact. It is also associated with numerous problems that require extensive and thorough research [7, 8]. The introduction of AI in e-Government goes beyond technological deployment because it entails fundamental socio-technological changes that cause disruption to established administrative structures, laws, and values [9]. This means that, in order to attain a responsible, ethical, and fair application of artificial intelligence, one needs to own the subtle perception of the trade-offs between the potential positive use of the technology and the democracy involved in its application, i.e., fairness, accountability, and transparency [10, 11].

The motivation behind this methodological literature review was the pressing need to have a holistic evidence-based evaluation of the issues related to the application of AI in e-Government. Although results have come to light in numerous fields, supported by empirical evidence, a comprehensive and methodological overview of all these subjects is overdue in order to provide a platform for policymakers, further research activities, and the orientation of practitioners in the complex field of AI applications. This knowledge gap is what this paper aims to address by undertaking a methodical process of identifying, analyzing, and integrating current scholarly and governmental sources on the problems with AI and the challenges it poses to the public sector.

The main aim of the literature review is to create an analytical framework that is multidimensional and encompasses the barriers, threats, and challenges associated with AI applications in e-Government. With the scope of the proposed research in mind, the review focuses on the following key questions:

1. What are the main technical, organizational, ethical, and regulatory issues in the implementation of AI in e-Government?

2. How are the current models of governance approaching these issues, and what strengths and weaknesses can be observed in the current evolution of models and theoretical frameworks?

3. What are the key success factors, best practices, and mitigation measures that can be successfully utilized to cope with these issues and help responsibly implement AI in the public domain?

This research paper aims to provide an in-depth and detailed insight into the implementation of AI in e-Government. The paper has a substantive value to a variety of stakeholders, including policymakers, administrators of the public sector,

developers of AI, and academic researchers, by providing evidence-based suggestions on how a system of effective and powerful AI governance can be built. As a practitioner in the public sector, the relevant information in the manuscript can be translated into practical policy actions, in order to face the challenges outlined and to maximize the benefits of AI in improving the provision of public services. In the case of academic researchers, the changing nature of the field is not neglected, and the article outlines various directions that can be taken in future investigations.

The paper is organized in the following way. Section 2 presents a literature review and theoretical framework, including the history of e-Government, the introduction of AI in the realm of public administration, and the theoretical assumptions involved in AI governance. Section 3 summarizes a systematic review of the literature, describing search plans, inclusion and exclusion procedures, and data-analysis plans. Section 4 provides a comprehensive study of the identified challenges of implementing AI, classifying them in terms of technology, organization, ethics, and regulation. Section 5 provides a comparative study of the good governance practices identified, and Section 6 suggests future research directions and policy recommendations. Finally, the research conclusions and contributions of the study are discussed in Section 7.

2. Literature review and theoretical framework

The establishment of e-Government based on AI, as a result of replacing traditional public administration with the new method, remains one of the most important indicators of the maturity of digital interactions in the public sector. The path of this digital transition can be divided into separate steps, starting with the initial digitization of governmental services and moving on to the modern age of intelligent automation that forms the basis of decision-making based on the data [12, 13].

The idea of e-Government appeared at the end of the 1990s, and its main aim was to use Information and Communication Technology (ICT) to improve the effectiveness and availability of government services [14]. The initial stage of development, known as “e-Government 1.0”, mainly represented online information services and a few transaction possibilities [15]. As Web 2.0 technology became widespread and opened up the government’s ideas of citizen involvement, cooperation, and transparency, Stage 2.0 of e-Government was developed [16]. This step also helped promote more citizen participation and the co-creation of value through social media and open data programs and platforms [17]. Over the last few years, however, with the emergence of new technologies like AI, Big Data, and the Internet of Things (IoT), the strategic emphasis has moved towards so-called “smart government” or “i-government” whose primary objectives consist of using data to build proactive, personalized, and predictive government services [18, 19].

The major driver of this change is AI, which has been implemented in many areas of the state. AI-based chatbots and virtual assistants deliver services on behalf of the state, continuously supporting its citizens while machine-learning algorithms are used to provide individualization and predict the needs of citizens [20]. In the

context of public management, AI has been applied to automate and streamline repetitive processes, allocate resources, and supply high-quality information in support of evidence-based decision making [21]. For example, Natural Language Processing (NLP) methods can examine large volumes of text on a corpus basis to identify insights into policies, and predictive analytics can predict upcoming trend changes, thus providing a more accurate evidence-driven basis for strategic planning [22]. The theoretical foundations of AI governance in the state sector are based on various disciplines, both well-established and recent. Public administration theorists question the principles and practices of government, efficiency problems, and the effective use (and core values) of fairness and accountability [23]. Science and Technology Studies (STS) consider technology in both socio-political and cultural contexts, focusing on the co-evolution of society and technology [24]. Ethical and legal scholarship expresses normative principles for evaluating the ethics and legal outcomes of AI, such as fairness, prejudice, privacy, and due process [25].

Over the last few years, AI governance has become sufficiently established as a research field, comprising research aimed at the creation of frameworks, principles, and feasible actions that are required to achieve responsible and value-based AI applications [26]. Science and technology are interdisciplinary, involving computer science, law, ethics, and public policy. One of the main issues of AI governance research is the development of effective mechanisms that guarantee transparency, interpretability, and accountability in AI systems [27]. To respond to this issue, it is necessary to develop technical norms for explainable AI and introduce institutional solutions that would oversee the creation and use of AI in the state sector [28].

Although a large body of literature has been compiled on the use of AI by government bodies, there are still many research questions to be answered. Similar to other social issues that feature AI, there is increased public attention on the possibly positive outcomes and situations that could be associated with it. However, there is a lack of systematic empirical evidence that deals with recognizing the challenges and risks related to its use [29]. In addition, many AI governance frameworks have been suggested, but additional comparative research is needed to evaluate their comparative prospects and weaknesses and to determine how they could be applied in different countries and institutional settings [30]. In a bid to solve these shortcomings, the main objective of this review is to explicitly map out the issues of AI in e-Government, including barriers to implementation, governing structures, and future developmental paths.

A landmark contribution to this field is the OECD report “Governing with Artificial Intelligence”: The State of Play and Way Forward in Core Government Functions (2025), which is the most comprehensive analysis of the implementation of AI in government institutions to date. The report objectively tested 200 real-world AI applications across eleven fundamental government functions and across many policy initiatives, thus providing an empirical basis like never before to understand how AI is utilized and diffused among government agencies. The authors also define seven critical enablers of successful AI adoption in the public

sector, which are governance, data, digital infrastructure, skills, investment, procurement, and collaboration with non-governmental actors. Notably, the analysis shows that nearly half of the reviewed use cases are concentrated in the area of public service delivery, justice administration, and civic participation, but adoption is low in such areas as civil service management and policy evaluation. What these findings point to is the need to shift the focus on theoretical constructs to examine practical implementation practices and results [31].

3. Methodology

We conducted a review in accordance with the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) guidelines, in order to provide transparency and rigor to the identification of the literature, selection, and synthesis of the results [32]. This methodology aimed to undertake a detailed and unbiased review of the available literature on the issues of artificial intelligence in e-Government. The research protocol (i.e., research questions, search strategy, and inclusion/exclusion criteria) was set out beforehand, in order to minimize bias and maintain methodological consistency.

3.1. Search strategy and data sources

Most prominent scholarly databases and online archives, such as Scopus, IEEE Xplore, Web of Science, ScienceDirect, and SpringerLink, were searched. In order to balance the academic and policy-oriented sources, official documents and reports by international agencies (including the Organization for Economic Cooperation and Development (OECD)) were also consulted. The search carried out for terms relating to artificial intelligence, e-Government, and implementation issues, e.g., “AI”, “e-Government”, “digital government”, “public administration”, “obstacles to implementation”, “government framework”, and “barriers to adoption”. The search was limited to English-language entries published in the same period, to ensure the topicality and relevance of the evidence used, i.e., between January 2021 and September 2025.

3.2. Study selection and screening process

The screening and selection process took the form of a two-stage process. During the first phase, the titles and abstracts of all the records retrieved were reviewed. The exclusion criteria included studies that did not address AI in the public sector or had no implementation issues. The entire text of the retained articles was then examined in the second stage to determine whether the articles met the predetermined inclusion and exclusion criteria.

Inclusion criteria:

- Studies concerning AI issues, in the context of e-Governance or public administration, that explicitly define the field of study in the e-Government sphere.
- Research results published in peer-reviewed journal articles, conference proceedings, and monograph chapters or official reports published by major governmental or international institutions.

• Empirical publications that were published during 2021-2025.

Exclusion criteria.

• Publications not published in English.

• Articles published outside the publication date range.

• Technical papers that do not address implementation and governance issues.

3.3. Quality assessment and data extraction

The quality of the methodology used in the included studies was assessed using the PRISMA checklist and the Critical Appraisal Framework, which, in turn, evaluates the rigor of the research methods, the transparency of the research questions, and the validity and reliability of the findings. The same data extraction forms were used to complete the capture of all the relevant information in each study, in terms of authorship, date of publication, methodology applied, main findings of the research, reported issues, recommended strategies of governance, and recommended future research direction.

3.4. Data synthesis and analysis

Thematic analysis was used to extract the data because the method involves recognizing, interpreting, and describing recurring patterns (themes).

Table 1. Systematic review protocol and search strategy

Component	Description	Details
Research Questions (RQ)	Primary research questions guiding the systematic review	RQ1: What are the main challenges in AI implementation for e-Government? RQ2: How do governance frameworks address these challenges? RQ3: What are the success factors and best practices?
Search databases	Academic databases and sources consulted	Scopus, IEEE Xplore, Web of Science, ScienceDirect, Springer Link, Google Scholar, OECD Publications
Search keywords	Primary and secondary search terms used	Primary: “artificial intelligence”, “e-Government”, “digital government”, “public administration” Secondary: “implementation barriers”, “governance frameworks”, “challenges”, “adoption obstacles”
Publication period	Temporal scope of literature search	January 2021 – September 2025
Language criteria	Language restrictions applied	English language publications only
Document types	Types of publications included	Journal articles, conference papers, book chapters, government reports
Inclusion criteria	Criteria for including studies in the review	Studies focusing on AI challenges in e-Government, peer-reviewed publications, empirical and theoretical research, government and policy documents
Exclusion criteria	Criteria for excluding studies from the review	Non-English publications, publications before 2021, non-academic sources (except government reports), studies not related to public sector AI
Quality assessment	Framework for evaluating study quality	PRISMA guidelines for systematic reviews, relevance scoring (1-5 Scale), methodological rigor assessment
Data extraction	Information extracted from each study	Author(s), publication year, research methodology, key findings, challenges identified, governance approaches, recommendations
Synthesis method	Approach for analyzing and synthesizing findings	Thematic analysis, narrative synthesis, and comparative analysis across different contexts and countries

Subthemes were categorized into larger and higher-level challenge themes (e.g., technical, organizational, and ethical), which form a hierarchical structure. In this hierarchy, the broadest categories of challenge were placed at the top, and many interrelated subthemes then branched out from the broader ones. This analytical tool is useful in tackling the complexity and inter-relations of the issues that face AI in e-Government and can be used to build a conceptual model of how the issues are linked, which can be the drivers of e-Government and the outcomes that may be achieved. The protocols and searching strategies that were used in this review are outlined in Table 1.

The PRISMA flow diagram summarizing the literature selection process is presented in Fig. 1, while Tables 2a, 2b, and 2c present the statistical information in these articles.

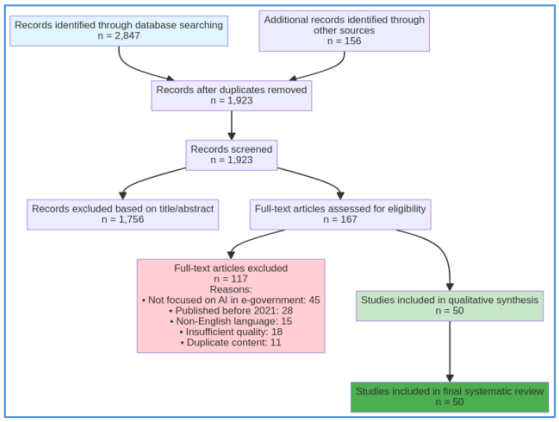

Fig. 1. PRISMA flow diagram for literature selection

Table 2a. Statistical summary

Metric	Count	Percentage
Total publications	50	100%
Journal articles	32	64%
Conference papers	8	16%
Books/Book chapters	2	4%
Reports	8	16%
Publications by year		
2021	4	8%
2022	2	4%
2023	6	12%
2024	12	24%
2025	26	52%
Database sources		
Scopus	12	24%
IEEE Xplore	8	16%
Google scholar	14	28%
ScienceDirect	6	12%
Springer	4	8%
Web of science	4	8%
Other (OECD, UNESCO, etc.)	2	4%

Table 2b. Key research areas covered

Research area	Number of publications	Percentage
AI Governance and ethics	15	30%
Implementation challenges	12	24%
Digital transformation	8	16%
Smart cities and e-Government	7	14%
Technical applications	5	10%
Policy and regulation	3	6%

Table 2c. Methodological approaches

Methodology	Number of publications	Percentage
Systematic review/Literature review	12	24%
Case study analysis	10	20%
Conceptual framework development	8	16%
Empirical study	7	14%
Theoretical analysis	6	12%
Policy analysis	4	8%
Technical implementation	3	6%

4. AI implementation challenges in e-Government

The application of AI in e-Government is a complex process, facing multiple challenges: technical, organizational, ethical, and regulatory perspectives. This review explores these challenges in detail, based on the literature, and divides them into four categories:

1. Technical challenges – involving the infrastructure, data, and security requirements of AI systems.

2. Organizational challenges – involving human and institutional factors that influence the adoption of AI.

3. Ethical and social challenges – the social impact of AI and its impact on democratic values, such as democratic decision-making mechanisms, citizen-state relations, transparency guarantees, and ethical value support mechanisms or legal impacts (including the adjustment of social goals, values, and lifestyles over time).

4. Regulatory and policy challenges – covering the legal protection mechanisms required for public sector applications.

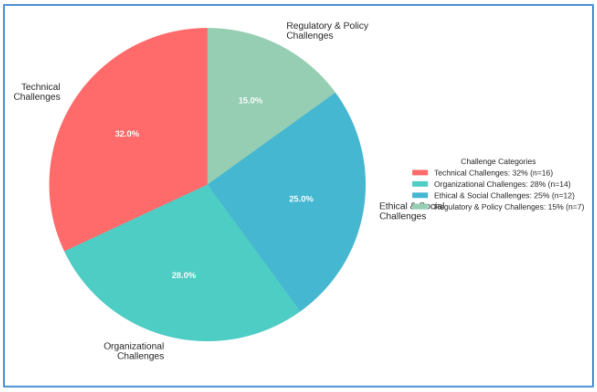

Fig. 2. Distribution of AI implementation challenges in e-Government

The analysis of the clusters of these challenges, in terms of distribution, is shown in Fig. 2 and reveals that the most common problems are technical challenges (32%), organizational problems (28%), ethical and social problems (25%), and regulatory and policy-related problems (15%).

4.1. Technical challenges

Due to the innovative nature of AI solutions, in the context of e-Government, myriad technical challenges have become the most prevalent impediments to success in implementation. These barriers are mostly related to the technical infrastructure itself, data quality and its availability, and the cybersecurity attitude of AI systems.

- The barriers in infrastructure are a ubiquitous problem, especially in low and middle-income states [33]. Effective implementation of AI requires a significant amount of computing power, high-speed data networks, and effective data storage and management software. However, many publicly-organized entities continue to be burdened by old IT systems that cannot address the requirements of AI [34]. The ensuing digital divide could prevent the integration and adoption of AI applications with respect to dimensions such as breadth, scope, impact, and scale, while at the same time, it could impair their scalability and effectiveness [35].
- Adapting AI to the legacy systems is an entrenched technical challenge. A huge number of government programs and organizations have an intricate system of old-fashioned IT that is typically fragmented, old-fashioned, and incapable of connecting to modern AI systems [36]. The lack of interoperability has a significant impact on cross-government information sharing and, at the same time, it destroys the underpinning infrastructure which is necessary to enable citizen-focused AI services [37]. The process of modernization or replacement of these systems is a complex, long-term, and expensive trajectory that requires massive organizational change and investment [38].
- Data quality and interoperability are also considered to be important obstacles. The efficacy of AI algorithms depends on the quality of the training data; however, a significant part of the publicly available data is lacking, has errors, or is not of the same quality [39]. This bias or lack of reliability may violate the rights of the citizens and create vulnerabilities to security. In addition, data is often confined to proprietary systems by government departments, and there are no commonly standardized practices or standards for sharing information [40]. The ensuing lack of data interoperability impairs the generation of large datasets of good quality, which is a necessary basis for modeling training and validation [41].
- Security and privacy are issues that are central to the e-Government environment. With the implementation of artificial intelligence, new security risks and privacy issues have become part of the new reality and should be scrutinized carefully [42]. Experimental research has shown that AI systems are vulnerable to adversarial attacks, where malicious forces use input data to influence improper decision-making [43]. In addition, such systems compound privacy concerns because of the aggregation and analysis of large volumes of citizen data, especially in jurisdictions where data protection and regulatory standards are poor [44].

Besides the issue of the quality of data, the inherent lack of data available is an independent and severe barrier to the adoption of artificial intelligence in the government sector. Even data-governance schemes are capable of alleviating data-quality and data-standardisation concerns; however, in many areas of government, the only data it has is not enough digital data to successfully train and validate AI frameworks. This issue is particularly acute in developing states and in the specialised activities of the government, when there might be only a paucity of digital records in historical archives or none at all. In the OECD (2025), the challenge of access and sharing of high-quality data is one of the major impediments to the fast implementation of AI in government. The datasets of public-sector organisations are typically small, broken, or non-existent, compared with the large-scale data collection that is usually integrated into business models of the private sector. The only way to address this gap is through specific policy interventions, including open-data projects, synthetic-data creation methods, cross-agency data-sharing treaties, and public-private data-partnerships [31].

4.2. Organizational challenges

Organizational challenges also increase the likelihood of numerous barriers to the successful implementation of AI applications in e-Government. These barriers are founded on socio-institutional characteristics that limit the ability of public sector organizations to incorporate and embrace technological innovations.

- One of the most significant organizational challenges to AI implementation is the widespread problem of skill gaps and talent shortages [45]. The necessary specialized skills are limited, and the upbringing of AI professionals requires a favorable working environment, which often goes against the operational constraints of governmental bureaucracy. This lack of knowledge applies to data science, machine learning, and AI ethics. As a result, government organizations face difficulties in competing with the commercial sector, with respect to AI talent, on the basis of salaries and the working environment [46].
- Another common dilemma is associated with the resistance to change management. The implementation of AI may increase disruptive practices, which may lead to deep skepticism in the public sector at an organizational level, particularly among employees who fear losing their jobs or their attitude towards the practicability and functionality of new technologies [47]. Addressing this resistance would require skilled managerial and dialogic skills, as well as the competent advocacy and adoption of change management, including the involvement of employees to co-design and implement their systems [48].
- The issue of resource limitations has been a constant ‘thorn in the side’ of public sector organizations, and AI is no exception. The process of building and implementing AI systems is costly because it requires significant investment in technology, infrastructure, and other auxiliary facilities [49]. In many state bodies, especially municipal ones, the investment they would need to launch AI programs is too high, thus limiting their ability to launch and implement AI solutions [50].
- Leadership and governance barriers also affect the use of AI. Visionary leadership originating at the pinnacle of decision structures cannot be ignored, as

well as the other initiatives [51]. However, public sector officials often lack the required technical skills or incentives to plan AI projects. In addition, the lack of clear governance and responsibility models may create piecemeal and non-systematic AI applications, with departments pursuing projects independently and with no strategic leadership [52].

4.3. Ethical and social challenges

The use of AI in e-Government brings new critical ethical and socio-technical logistics, which should be carefully studied, in order to introduce responsible and fair implementation of the technology. The main questions are:

1. In what ways can AI systems unintentionally apply and reinstate bias?
2. What internal controls can assure their accountability, transparency, and credibility?

• Among the most urgent ethical issues affecting the area of AI are algorithmic bias and fairness [53]. Machine learning algorithms can reproduce and increase existing biases in the training data, thus promoting the unfair discrimination of certain groups. As an example, the training data can be discriminatory in nature, meaning that an AI welfare-screening system will be inherently discriminatory against certain groups of people [54]. Reducing the effects of algorithmic bias would demand an integrated approach, which incorporates the elements of fairness-conscious machine-learning algorithms, anti-bias audits of AI systems, and the encouragement of diversity and inclusion among the developers and deployers of new technologies like AI [55].

• Transparency and interpretability are also critical to maintaining the responsibility of AI systems [56]. Most AI algorithms, especially deep learning, are often termed “black box” because they cannot be understood by the operators. Such obscurity has the potential to hinder accountability processes, as well as undermine the assessment of the fairness and justice of AI systems [57]. Explainable Artificial Intelligence (XAI) technologies aim at improving human understandability of decision-making processes and have become one of the core research directions in the field [58].

• Public trust and acceptance are the key success factors in the implementation of AI in e-Government. In the case of responsible and ethical operations, AI services are more likely to receive recognition from citizens [59]. In order to build trust and promote civic participation, citizens need to be involved in the deliberation; they should take part in designing and ruling AI systems that represent the collective bodies and concerns of individual stakeholders. Such interaction demands openness, responsibility, and the development of clear remedial procedures to resolve AI system failures [60].

• Other social issues include accessibility and the digital divide. The e-Government services based on AI have the potential to be a detriment to the citizens who are not technologically advanced or those with limited digital skills. These inequalities can intensify the developmental inequalities and prevent the ability to enjoy the benefits of AI [61]. To overcome this issue, the adoption of an inclusive design in the key development model and the assurance of everyone

enjoying the benefits of the digital society, aided by the multi-channel service delivery model and the extensive process of teaching digital literacy, are both worth consideration [62].

4.4. Regulatory and policy challenges

Finally, regulatory and policy measures ought to be formulated to help create a setting in which AI can be used responsibly in e-Government situations.

Table 3. AI implementation challenges classification framework

Challenge category	Specific challenges	Impact level	Frequency in literature	Mitigation strategies
Technical challenges	Legacy system integration	High	85%	Gradual modernization, API development, and hybrid architectures
	Data quality and interoperability	High	78%	Data governance frameworks, standardization protocols
	Lack of data availability	High	70%	Open data initiatives, synthetic data generation, and cross-agency data sharing agreements
	Infrastructure limitations	Medium	72%	Cloud adoption, infrastructure investment, partnerships
	Cybersecurity vulnerabilities	High	68%	Security-by-design, continuous monitoring, risk assessment
Organizational challenges	Skills gaps and talent shortage	High	92%	Training programs, recruitment strategies, and partnerships with academia
	Change management resistance	Medium	65%	Change management frameworks, stakeholder engagement
	Resource constraints	High	70%	Phased implementation, public-private partnerships
	Leadership and governance gaps	Medium	58%	Executive sponsorship, governance committees, and clear accountability
Ethical and social challenges	Algorithmic bias and fairness	High	75%	Bias testing, diverse datasets, fairness metrics
	Transparency and interpretability	High	82%	Explainable AI techniques, documentation standards
	Public trust and acceptance	Medium	60%	Public engagement, transparency initiatives, and pilot programs
	Digital divide and accessibility	Medium	55%	Inclusive design, multi-channel services, and digital literacy programs
Regulatory and policy challenges	Legal frameworks inadequacy	High	70%	Policy development, regulatory sandboxes, legal reform
	Accountability mechanisms	High	65%	Clear responsibility chains, audit frameworks, and oversight bodies
	Cross-jurisdictional coordination	Medium	45%	Intergovernmental agreements, standardization efforts
	Compliance and standards	Medium	52%	Standards development, compliance frameworks, certification programs

This requires the development of clear legal frameworks, strong accountability mechanisms, and integration and coordination across (and within) the various jurisdictions.

- The current legal framework is inadequate and forms the greatest obstacle towards the wider implementation of AI in the public sector. The existing laws often do not cover the concerns that are particular to AI, including the use of automated decision-support systems or the handling of massive volumes of personal data [63]. It is this legal ambiguity that creates an obstacle, preventing the adoption of AI technologies by the public sector. The reform must also focus on making sure that there is adherence to the principles of fundamental rights, democratic norms, and core values, which would enable the responsible use of AI in e-Government [64].
- Another important concern is related to the lack of accountability methods. Whenever AI malfunctions, it begs the question: "Who did what, right or wrong?" Were those who developed the algorithm to blame, or the government that adopted the system, or ordinary individuals who were running the system on the ground? By developing effective accountability routes, citizens would be able to demand redress in the case of a failure of the system [65].
- Another challenge is the cross-jurisdictional coordination that is characteristic of federal countries. The different government departments and levels are prone to different policies and regulations governing the use of AI, resulting in inconsistent governance attitudes [66]. Cross-regional coordination and cooperation should be strengthened to advance the integrated framework that regulates AI applications in the public sector [67].
- There are no clear standards or guidelines, which would also contribute to the growth of AI. The lack of defined data quality, algorithmic transparency, and ethical design benchmarks results in issues with the evaluation of the suitability of AI systems when they are implemented by public sector organizations [68]. As such, the standardization of AI in industry and the sharing of best practices are necessary to promote the creation of safe, reliable, and trusted AI [69].
- Table 3 gives a detailed account of the challenges that were identified during the review process, how they affected the review, and how frequently they occurred, as well as the recommended mitigation strategies.

4.5. Successful AI applications in the public sector

Even though earlier parts of the paper focused on the challenges that are linked to the use of AI in the context of e-Government, it is essential to admit that AI implementation in the government sector is not only in the stage of prospect but is, in reality, actively implemented and tested in many jurisdictions these days. The OECD (2025) report titled Governing with Artificial Intelligence provides records of 200 empirical examples of governmental application of AI in eleven core functional areas, which demonstrate substantive developments despite the challenges also mentioned above. The following list outlines key areas of application where AI has been found effective in the activities of the public sector [31].

One of the most used applications that a government can use is chatbots and virtual assistants based on AI. These chatbots have generated a half-cut in workloads of the call-centers and an 80% decrease in response time in Singapore, though Buenos Aires chatbot Boti handles around two million interactions of its citizens each month. The state governments in the United States have adopted AI chatbots that help citizens in filing taxes, enrolling for benefits, and answering other general inquiries about the government. Such applications suggest that AI has the potential to significantly boost the availability and usability of government services and simultaneously cut down on the costs of operation.

Another direction of high development is the automation of regular administrative procedures; governments are automating document processing, filling out forms, data entry, and handling case-management procedures with the help of AI. HM Revenue and Customs (HMRC) of the United Kingdom applies AI to automate the aspects of tax processing, and the well-developed e-governance of Estonia employs AI to process documents and provide services to citizens. Intelligent fraud-detection systems have also been implemented in some countries successfully to detect the patterns of anomalies in social benefit claims, tax forms, and procurement procedures, which resulted in significant savings to the treasuries of society [31].

AI-based traffic-optimization systems have been deployed in urban management in the cities of Singapore and Barcelona, where real-time data analysis allows running traffic flow dynamically, reducing congestion and improving the efficiency of transportation systems. Additionally, AI-based solutions to natural-disaster prediction and emergency management have proven to be quite useful; prediction systems can help governments anticipate natural catastrophes and speed up the recovery process. They are used in the sphere of policy design, analyzing large amounts of data and grouping the mass opinion during the consultation process, and thus helping to facilitate more evidence-based and participatory policymaking procedures [31]. Despite these developments, it is important to state that there is a significant difference between the pace of AI adoption in different countries. Some nations achieve so fast in terms of operational implementations, and other nations mostly generate policy papers that have no implementations.

According to the OECD (2025) report, there is a high level of early-stage initiative-experiment-pilot programs, but the initiative scaling is very rare and is at times complicated. Such disparity in preparedness and status implies the need to employ individual strategies that consider the institutional, technical, and financial environments of individual countries [31]. By adopting a multi-layered governance approach, the public-sector organizations will be able to manage the problem of AI implementation and access the power of AI transformation and, thus, enhance the delivery of more efficient, effective, and equitable public services.

5. Governance frameworks and best practices

Considering the various threats posed by AI implementation, there is a gradual emergence of various governance frameworks and best practices at the

international, national, and regulatory levels. These frameworks are meant to provide a systematic approach for governments to address the risks and benefits of AI. This section evaluates the strengths and weaknesses of the implementation policies and various techniques by comparing the main principles.

There is an increasing acknowledgment that the multi-level governance method is a crucial factor in the responsible management of AI by a public authority [70]. This model is based on the global, regional, institutional, grouped, and individual systems of governance. On the international front, organizations like the OECD have been significant in the process of producing fundamental concepts to inform authorities of the responsible use of AI (e.g., the OECD Principles on Artificial Intelligence, which have been approved by numerous nations) [71]. Such principles might be used as a universal standard for how AI should be designed and implemented, in such a way that it does not go against human rights and democratic principles.

The most recent example of a report on how governments use AI is the OECD (2025) report titled Governing with Artificial Intelligence, which provides a more current and in-depth analysis of the uses of AI in governments examining 200 real-world applications to governance, data, digital infrastructure, skills, investment, procurement, and partnerships as the seven important enablers of effective AI application. The report highlights that there is a need to have a user-centered, intentionally engaging, and clearly but reasonably set guardrails when dealing with AI transformation to manage risks without making it less agile and adaptable [31]

At a national scale, national AI strategies and regulatory frameworks are being formulated in many countries, in order to encourage the creation of AI technologies in the state sector. The differences between these frameworks are substantial, as the regulatory approach of the AI Act in the EU is a risk-based paradigm, whereas the paradigm of the AI White Paper in the UK is more market-centric and adheres to the principle of the maximization of data security and innovation [72]. Another significant move made by the United States has been its Executive Order on Artificial Intelligence, which centers on integrating coordination mechanisms across the different federal agencies to ensure safe and reliable AI standards [73]. The National Artificial Intelligence Strategy of Singapore focuses on collaboration across the entire government and effective partnership between government and the private sector to promote economic transformation and the overall interests of the people [74].

At an organizational level, the public service providers are promptly establishing internal AI governance approaches that would regulate the creation and functioning of AI systems. These systems are usually characterized by the creation of AI governance institutions, the development of internal policies and guidelines, and the creation of risk management practices [75]. One of the main pillars of such organizational structures is the creation of an internal culture of ethical AI-consciousness, such as increasing staff awareness of the ethical issues surrounding AI and giving them the knowledge and tools to make responsible decisions [76].

Good AI governance involves stakeholder engagement (such as that with the citizens, civil society, and the general population) in the design, development, and monitoring of the AI systems and cooperation between various parties, such as social institutions, industry, and academia [77]. The use of public consultations and citizen parliaments has become a more frequent way of seeking the opinion of the people, regarding the use of AI in the state sector, and there has been the deployment of public-private partnerships as a way of gaining access to resources and knowledge, but with a business approach [78].

Table 4. Comparative analysis of AI governance frameworks

Framework / Country	Governance level	Key principles	Implementation approach	Strengths	Limitations
EU AI Act (2024)	International /Regional	Risk-based regulation, fundamental rights protection	Mandatory compliance, CE marking, conformity assessments	Comprehensive coverage, rights-based approach	Complex implementation, potential innovation barriers
US AI Executive Order (2023)	National	Safety, security, trustworthiness	Federal agency coordination, standards development	Strong federal coordination, innovation focus	Limited enforcement mechanisms, fragmented approach
UK AI White Paper (2023)	National	Innovation-friendly, principles-based	Sector-specific regulation, regulatory flexibility	Flexible approach, innovation support	Potential regulatory gaps, coordination challenges
Singapore NAIS (2021-2025)	National	Human-centric AI, economic transformation	Whole-of-government approach, public-private partnerships	Strong implementation focus, clear roadmap	Limited international coordination
OECD AI Principles (2019, updated 2024)	International	Human-centered values, fairness, and transparency	Soft law approach, peer review mechanisms	Global consensus building, flexibility	Non-binding nature, implementation variations
Team-level governance	Organizational	Technical excellence, ethical development	Agile methodologies, ethics by design	Direct implementation control, technical focus	Limited scope, scalability challenges
Organization-level governance	Institutional	Strategic alignment, risk management	Governance committees, policy frameworks	Institutional integration, accountability	Organizational silos, resource constraints
Industry-level governance	Sectoral	Best practices, standards development	Industry associations, certification schemes	Sector expertise, practical focus	Limited enforcement, competitive tensions
Multi-level governance model	Integrated	Coordination across levels, coherence	Vertical and horizontal integration mechanisms	Comprehensive coverage, coordination benefits	Complexity, coordination costs

Risk management in AI governance is undoubtedly one of the key principles to be considered in AI governance. This includes proactively identifying, analyzing,

and mitigating risks in the government's use of AI. A variety of AI risk management approaches have been proposed, such as the AI Risk Management Framework of the National Institute of Standards and Technology (NIST), which provides a full lifecycle risk management process from system conception to decommissioning [79]. Such frameworks typically include technical controls (such as bias testing and security audits) and organizational controls (such as clear and documented accountability mechanisms and supervisory bodies) [80].

Table 4 provides a comparison of several mainstream AI governance frameworks.

In addition to the structured governance approach mentioned above, public sector agencies that have successfully deployed AI have also summarized several best practices, including:

- The construction of an authoritative business argument is the basis of a successful AI program. Effective agencies are generally characterized by specific goals, strict success metrics, and a thorough comprehension of the possibilities of AI applications to address certain issues in public services [81]. This remodels the use of AI as less of a technological innovation and more of a valuable creation for the people in general.
- Another factor for improving the human aspects of AI is contained in the design of its systems: improving the user experience with intuitive and easy interfaces [82]. This would be a people-based paradigm, as opposed to foisting technology on the users.
- There is a need to deploy an elaborate data governance system and to develop operational mechanisms that govern the quality, security, and privacy of data throughout the entire lifecycle of the data [83]. This includes the design of strict data collection rules that emphasize the data quality, accuracy, and completeness, and the establishment of data sharing and access policies.
- One practicable approach to data sprint organizers is to create cross-disciplinary teams that incorporate a variety of skills, such as data science, ethics in AI, general administration, legal compliance, and other areas [84]. The model of its implementation guarantees that the political ecology of AI design, including technical feasibility, ethical issues, and practical governance, meets the needs of governance as a dynamic interaction.
- Cultivation of a culture of experimentation and learning encourages the continuous trial of the AI applications, based on the findings made and the failures, and adjusting to the changes with time [85]. This requires the development of pilot projects, dynamic testing, and active optimization of methodologies due to the strongest evidence and advancements.

6. Future directions and recommendations

e-Government will also change in line with the further development of AI. The concluding part of this article speculates on the future, the development patterns, sheds some light on the applicable technologies that could affect AI in the public sector, and gives policy advice to policymakers, leaders in the public sector, and

researchers who will be striving to fit into this emerging reality. One of a number of emerging trends is the use of generative AI/Large Language Models (LLMs). Such disruptive technologies will transform government-citizen interactions and drive them towards citizen-centric, more personalized, and conversational public services [86]. As a case in point, advanced chatbots may use unrestricted LLM technology as the backend to handle advanced natural-language queries by citizens and pre-read messages and reports customized to each user [87]. However, the use of generative AI also comes with certain new issues: the technology can produce incorrect or biased information, and the necessary regulation mechanisms are in dire need [88].

The other trend is the shift towards proactive predictive governance. As the practice of AI and machine learning algorithms advances, governments are using them to pre-empt the needs of residents and to take the initiative to offer services before they are demanded explicitly [89]. As an example, AI will be able to determine citizens who are at risk of job loss and actively provide services that support training. Nonetheless, the public use of predictive analytics is fraught with many ethical issues as well, since its application in a social scoring context or in the decision-making process (which is about the life events of a citizen that cannot be redone or renegotiated) raises many ethical issues [90].

The temporal distribution of the research articles shown in Fig. 3 indicates that the discussion of the issue of AI in e-Government has become a subject of much interest among scholars and policymakers: there is a higher output of related publications between 2021 and 2024.

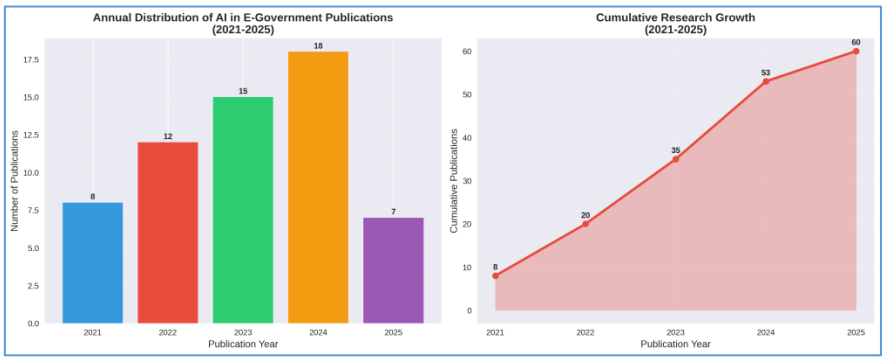

Fig. 3. Temporal analysis of research publications (2021-2025)

To overcome these new trends and to facilitate the correct and beneficial application of e-Government AI, a series of strategic steps should be preconditioned. The following recommendations are based on the results of our systematic review.

6.1. Recommendations for policymakers

- The agile and adaptable nature of the rapid development of AI means that a regulatory framework is required. The old, rigid regulatory tools are no longer sufficient; rather, policymakers should devise a framework that is flexible and can quickly adjust to new technologies and new application scenarios. This framework

must include regulatory sandboxes and experimental regulatory models, which prioritize principle-based regulation over strict statutory requirements [91]. A flexible regulatory framework should be able to compromise the two imperatives of encouraging innovation and risk reduction, so that the intensity of regulation is tied to the risk profile of individual AI applications.

• Change uncertainty into opportunity by accelerating the commitment to AI capacity building in the context of the public sector, by specifically examining how the necessary competences and institutional capacities can be developed. It is an approach that requires significant investment in resources to establish internal public-sector expertise that will facilitate the design, deployment, and governance of AI systems throughout their lifecycle as a whole. Some of these measures should include specific professional training of the current staff working in the public sector, creating clear career opportunities in the field of government AI specialists, and building government AI centers of excellence [92]. Besides this, the government needs to make partnerships with academics and the private sector to tap outside expertise and speed up knowledge transfer.

• The scheme should be to devise open systems, have actual participation, and to build a strong and stable system of engagement with the citizens to foster trust in people. To maintain and strengthen the trust of the population in the implementation of AI, governments should establish a clear operational scope for each system, as well as accessibility to the design and governance model. Specific interventions should include: the publication of guidelines for public consultation, regarding the creation and application of AI; open reporting of the capabilities and the expected impacts of AI systems; and the avenues of remediation that should be accessible to resolve the potential harm caused by the use of AI systems [93]. At the same time, there should be public education and outreach efforts aimed at providing citizens with knowledge of the opportunities and threats involved in the use of AI by the government.

6.2. Recommendations for public sector managers

• Establish a plan on an organization-wide basis to align AI efforts with the mission and vision. The current piecemeal, ad-hoc approach to AI must be avoided; rather, customized strategic objectives must be crafted to explain the way in which the adoption of AI is going to happen. This ought to be the essential message to leaders in the public sector.

• AI has the potential to realize its purpose and profit society. Careful evaluation of the dangers and advantages of AI will be required, as well as a definite approach to the implementation of technology and control systems to regulate responsible usage. The strategic planning framework should also include the long-term role of AI in the larger digital transformation projects.

• Implement a powerful data governance and management system as the foundation of AI implementation. Effective AI systems rely on data, and therefore, leaders in the public sector should endorse sound data governance policies to guarantee the quality, security, and privacy standards in their data. Such standards must encompass the development of data quality assurance principles to facilitate

uniformity in interventions and funding judgments. The development of efficient knowledge and information flow within the government agencies, while adhering to the relevant laws on privacy and data protection. They will also have to invest in data infrastructure and the capacity to sustain AI applications. At the very least, they will need to guarantee suitable security and privacy conditions.

- Transforming the case study into an experimental exploration is crucial to the adequate and responsible innovation that will promote the exploration of new opportunities by following ethical considerations and the principles of accountability. Public sector managers can achieve this by establishing an organizational culture that promotes creative experimentation and a responsible and trustworthy adherence to AI use. This would entail training their employees to be able to use and monitor AI correctly, setting up accountability mechanisms to monitor how AI systems work, and developing an environment that functions as a sandbox where experimental trial and error can be conducted. The approach to change management should also take into account the resistance of employees to AI applications and transform the enterprise into a constantly learning, constantly adapting system.

6.3. Recommendations for researchers

- The priority should be to study the overlap of AI technology development and its applications within the public sector through an interdisciplinary approach. This wider interdisciplinary method should involve computer science and expertise in the areas of public administration, law, ethics, and other subjects. Such research ought to target real-life issues at social institutions, and it must intimately cooperate with decision-makers and practitioners to make the outcomes of the research feasible [94]. The actual outcomes of AI implementation should also be evaluated in future studies, and the evidence and results should be gathered to facilitate optimal outcomes.
- Viable techniques are required to determine the presence and efficacy of AI applications within government. New methodologies and innovative research methodologies are required to measure the social, economic, and ethical effects of AI in the public sector by developing new evaluation metrics beyond that of technical accuracy, such as fairness, transparency, and creating social value. Moreover, when auditing AI systems, preference should be placed on studying novel technologies due to their bias and other ethical concerns [95]. There is a particular concern regarding the need to undertake longitudinal studies on the long-term effects of AI implementation.
- Discuss the social implications of AI in governance in the long term and how it will affect the process and democratic institutions. There is an urgent necessity to research the overall social implications of AI implementation in government. Its implications on the way future operations of the public sector would be affected, how democratic processes and accountability structures would work, and how to redistribute social resources of power. This type of research must consider the opportunities and the threats of AI governance as well as provide a

foundation upon which policy arguments and ideas about the role that AI should have in a democratic society can be discussed [96, 97].

These recommendations will allow all parties to collaborate in order to steer the creation and implementation of AI in e-Government and ensure social value, democratic value, and universal inclusion. To implement these recommendations, it is necessary to establish sustained cross-disciplinary cooperation and constantly study and adjust to advances in AI technology.

7. Conclusion

This systematic review provides an overall summary of the issues related to the implementation of Artificial Intelligence (AI) in e-Government. Through the examination of fifty peer-reviewed articles published in mainstream academic databases in the period 2021-2025, the study shows that these issues are complex and multidimensional in the spheres of technology, organization, ethics, and regulation. The results highlight that, despite the immense opportunities for AI to revolutionize e-Government, a collection of associated challenges and threats has to be overcome to achieve the dream.

The literature shows that skills gaps and talent shortages represent the largest obstacles to the adoption of AI in the public sector; they are cited in 92% of the articles analyzed. This observation outlines the extreme significance of talent development in AI policymaking. Eighty-five percent of the papers name difficulties with integration into legacy systems as the second-most important bottleneck, which highlights the necessity of overhauling digital infrastructure on a large scale. The problem of bias and fairness in AI is tackled, at least partially, in 75% of the research articles, which further highlights the importance of ethical issues surrounding AI use in the context of providing public services.

As highlighted in this review, this is highly important since governance mechanisms and best-practice guidelines are essential to reducing these challenges and facilitating responsible and sustainable AI use in the public sector. As the comparison of governance models suggests, the approaches of multi-level coordination involving international, national, organizational, and team levels are the most effective in regulating AI. Nevertheless, these mechanisms need to be instituted with a delicate balance of promoting innovation and risk management while maintaining a promise of stakeholder engagement and citizen involvement. The research adds several significant characteristics to the body of literature on AI in e-Government: first, it provides a fairly broad general overview of the issues about the implementation of AI in the public sector, which relies on the recent findings of a multitude of disciplinary approaches and geographical areas; second, it demonstrates the complexity and multidimensionality of the problem under consideration through an elaborate conceptual framework that goes beyond mere categorization to emphasize the interconnectivity of different barriers; and third, it provides evidence-based recommendations and specific guidance to a variety of stakeholders to make the multidimensional process of AI adoption is consistent with democratic norms and maintains public trust.

The results of this review are further supported by the OECD (2025) report on the topic of Governing with Artificial Intelligence, which reports that despite the growing adoption of AI in public administrations, most of the initiatives are in their pilot phase since they face the issue of scaling up. The 200 practical use cases that the report analyzes prove that AI has brought concrete benefits in the most common fields (chatbot-based citizen services, automating routine tasks, detecting fraud, and designing policies based on evidence), at the same time, revealing ongoing obstacles, such as a lack of skills, challenges of data access, financial limitations, and outdated regulations.

The implications of this analysis are considerable to policymakers, such as the need to change governance systems towards technological change, massive investments in AI systems in the public sector, and the need to invest in transparent processes to gain and maintain the trust of the population. In terms of the judiciary, the results indicate that the policy makers need to put in place regulatory mechanisms that are flexible enough to facilitate innovation and, at the same time, strong enough to protect the basic rights and democracy. The research also reveals gaps and a lack of knowledge in the scientific comprehension of the consequences of AI, with the necessity of interdisciplinary applied research.

These results highlight the need to introduce leaders in the field of the public sector to carry out strategic planning, effective data governance, and organizational culture changes that enable the transformation and integration of evidence-based proof-of-concept to the full realization of artificial intelligence. The review also mentions several limitations: the literature search is limited to English publications, which might restrict the ability to generalize the findings to other linguistic and cultural backgrounds; the timeframe is also restricted to literature published since 2021, although the study itself is timely; and the rapid development of AI requires constant attention to new challenges and opportunities, and future longitudinal research should address this issue. The environment of AI applications in e-Government is also complex due to the high rate of technological change, the continuous changes in regulations and policies, and the changing needs of the population. To overcome these shortcomings and better represent the experiences of the world with AI implementation, more inclusive and longitudinal studies are desperately needed, the studies that would take into consideration lessons of other jurisdictions and would address how the governance frameworks influence long-term outcomes. Also, more empirical data is required on the efficacy of different mitigation measures and governance systems, and a more subtle discussion of the social aspect of AI governance.

Overall, the realization of AI-based capabilities in the public sector can promise enormous opportunities and present a myriad of challenges. AI has the potential to greatly improve the delivery of services to the population, improve the work of the government, and aid decision-making. However, the issues of technology and politics are interwoven and form a very complex environment. To achieve these advantages and protect democratic principles, the rights of citizens and equitable access, cooperation between the government agencies and the stakeholders under the new forms of governance, and complex interactions within

the policy, ethical, and legal spheres are needed. When governments utilize AI strategically and responsibly, they can use this potent technology to enhance the quality, effectiveness, and availability of government services. This article is a systematic review of the opportunities that AI offers in e-Government and offers evidence-based advice to overcome the barriers to its implementation. The way forward requires technical ability, a strong sense of ethical principles, democratic responsiveness, and a commitment to the common good.

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