

ARTICLE

Designing artificial intelligence-driven knowledge governance frameworks for public sector digital transformation

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Abstract

The rapid adoption of artificial intelligence (AI) in the public sector is reshaping how governments design policies, deliver services, and manage institutional knowledge. However, AI integration in digital governance often remains fragmented, with limited design-oriented frameworks that connect technological capabilities, knowledge management, and governance processes. This study addresses this gap by proposing an AI-driven knowledge governance framework for public sector digital transformation, explicitly aligned with system design principles and socio-technical architecture. Drawing on interdisciplinary perspectives from digital governance, knowledge management, information systems, and design research, the paper develops a structured framework incorporating data ecosystems, organizational memory, intelligent decision-support systems, and governance feedback loops. The study further presents design methods for integrating AI into public administration, including system architecture, workflow alignment, and visualized governance outputs that enhance transparency, accountability, and decision intelligence. Special attention is given to emerging economies, where institutional constraints, limited data infrastructure, and governance capacity gaps create unique implementation challenges. Ethical AI use, explainability, trust, and responsible automation are also examined as essential design requirements. By bridging AI innovation with governance design, the paper contributes a practical and scalable model for building inclusive, knowledge-driven, and resilient digital public sector systems.

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1. Introduction

Digital transformation has fundamentally reshaped public administration, moving governments beyond traditional e-government models toward more integrated, data-driven, and citizen-centric systems of governance. This evolution, often described as digital governance, emphasizes not only the digitization of public services but also the strategic use of information technologies to improve transparency, responsiveness, and policy effectiveness.^{1,2} Among these technologies, artificial intelligence (AI) has emerged as a critical enabler of public sector innovation, supporting automated service

delivery, predictive analytics, intelligent decision support, and evidence-based policymaking.^{3,4} As governments increasingly rely on data-intensive systems, the ability to transform information into actionable knowledge has become central to effective governance.

At the same time, the expansion of AI in governance has exposed significant limitations in how public institutions manage knowledge. Many governments adopt AI solutions in isolated operational domains—such as fraud detection, chatbot services, and urban monitoring—without integrating these systems into broader knowledge management (KM) structures.⁵ As a result, insights generated by AI are often fragmented, difficult to reuse, and disconnected from institutional memory. KM plays a vital role in capturing, storing, sharing, and applying organizational knowledge for policy continuity and strategic decision-making.^{6,7} Without systematic integration between AI and KM, digital governance risks becoming technologically advanced but institutionally weak.

This challenge is particularly significant in emerging economies, where digital transformation is frequently constrained by limited infrastructure, fragmented data ecosystems, institutional silos, and shortages of technical expertise.^{2,8} In such contexts, the adoption of AI without appropriate governance frameworks may increase risks related to algorithmic bias, lack of transparency, weak accountability, and reduced public trust.^{9,10} The absence of policy mechanisms that align AI deployment with ethical standards and organizational learning further undermines the sustainability of digital governance initiatives. Consequently, there is a pressing need for a design-oriented framework that integrates AI capabilities with knowledge systems and governance structures.

This study addresses that need by proposing an AI-driven knowledge governance framework for public sector transformation. Drawing on design science principles and interdisciplinary perspectives from digital governance, KM, and information systems, the paper develops a structured architecture linking data ecosystems, AI analytics, knowledge repositories, and policy decision interfaces within an overarching governance and ethics layer. The framework positions AI not merely as an operational tool, but as a strategic mechanism for institutional learning, policy intelligence, and resilient governance.

The primary contribution of this study is the development of a design artifact that supports knowledge-based digital governance in the public sector. By explicitly integrating system architecture, governance mechanisms,

and feedback loops, the proposed framework offers both theoretical advancement and practical guidance for policymakers and public administrators. It contributes to the growing discourse on responsible AI by demonstrating how digital transformation can be aligned with transparency, accountability, and inclusive governance, particularly in resource-constrained and institutionally complex environments.

2. Related work

The rapid evolution of digital governance has shifted public administration from traditional e-government models toward more integrated, data-driven, and citizen-centric governance systems. Early e-government initiatives primarily focused on digitizing administrative services and improving operational efficiency through online service delivery platforms. However, contemporary digital governance extends beyond service automation to include transparency, collaborative policymaking, citizen participation, and adaptive institutional decision-making.^{1,2,11} This transition reflects a broader movement toward smart governance, where governments use advanced technologies such as AI, big data analytics, and Internet of Things (IoT) infrastructures to support real-time policy decisions and responsive public administration.^{12,13} Despite these advancements, digital governance remains challenged by institutional fragmentation, interoperability limitations, and the need for stronger policy coordination across agencies.⁸

Within this transformation, AI has emerged as one of the most influential technologies shaping the future of the public sector. Governments increasingly use AI for predictive analytics, fraud detection, automated decision support, intelligent citizen services, and administrative process optimization.¹⁴ AI enhances governance efficiency by enabling large-scale data processing, pattern recognition, and proactive policy intervention. For example, machine learning supports taxation compliance monitoring, public health forecasting, and urban management systems, while natural language processing improves citizen engagement through chatbots and virtual assistants.⁵ However, the adoption of AI also introduces critical governance concerns, particularly regarding algorithmic bias, lack of explainability, privacy risks, and unclear accountability for automated decisions.^{9,15} These concerns highlight that AI adoption in governance is not only a technical challenge but also a regulatory and institutional issue.

Knowledge management provides an important foundation for addressing these governance challenges by enabling the systematic creation, storage, sharing, and application of organizational knowledge. In the

public sector, KM supports institutional memory, policy continuity, and evidence-based decision-making by ensuring that both explicit and tacit knowledge remain accessible across administrative processes.^{6,7} Effective governance depends not only on data availability but also on the capacity to transform information into reusable knowledge that improves long-term policy outcomes. Traditional KM systems, however, often remain document-centered and fail to capture dynamic learning processes or real-time insights generated through digital systems. This limitation reduces their effectiveness in increasingly complex governance environments where adaptive decision-making is essential.

The integration of AI and KM has therefore become a significant research focus in digital governance studies. AI-driven knowledge systems enhance traditional repositories by automating knowledge extraction, improving information retrieval, and supporting predictive decision intelligence through machine learning and natural language processing.¹⁶ These intelligent systems enable governments to move from static information management toward continuous organizational learning and adaptive governance. Nevertheless, most existing studies examine AI, KM, and digital governance separately, with limited attention to how these domains can be systematically integrated within a unified design framework. In particular, policy-oriented design models that connect AI architecture, knowledge systems, and governance mechanisms remain underdeveloped, especially in emerging economies where institutional constraints and digital inequalities are more pronounced.⁹

This gap underscores the need for a design-focused framework that positions AI-enabled knowledge systems as a strategic foundation for responsible and resilient public sector transformation.

3. Design science research method

This study adopted a design science research (DSR) approach to develop a structured framework for AI-driven knowledge governance in the public sector. DSR is particularly appropriate for addressing complex socio-technical problems where the objective is not only to explain phenomena but also to design and evaluate purposeful artifacts that solve real-world challenges.^{17,18} In the context of digital governance, where institutional transformation depends on the alignment of technology, policy, and organizational processes, DSR provides a rigorous methodology for constructing practical and theoretically grounded solutions.

The first stage of the research involved problem identification and motivation. Despite the increasing

adoption of AI in public administration, many governments implement AI applications in fragmented and isolated domains, such as citizen service automation, fraud detection, and predictive analytics, without integrating these systems into broader KM and governance structures.^{3,5} This fragmentation limits institutional learning, weakens policy continuity, and creates risks related to transparency, accountability, and ethical oversight. Particularly in emerging economies, infrastructure limitations, data fragmentation, and institutional silos further constrain effective implementation.^{8,9} These challenges establish the need for a design-oriented governance framework that integrates AI capabilities with knowledge systems and policy mechanisms.

The second stage focused on defining the objectives of the solution. The primary objective is to develop an integrated design framework that supports knowledge-based digital governance through AI-enabled decision intelligence. The framework is intended to connect four critical dimensions: data ecosystems, AI analytics, knowledge repositories, and policy decision interfaces, while embedding governance safeguards such as transparency, accountability, and ethical compliance. In line with DSR principles, the artifact must be both practically relevant and theoretically grounded, addressing organizational needs while contributing to KM and digital governance scholarship.¹⁷ The design also aims to ensure applicability in resource-constrained public sector environments, particularly in emerging economies.

The third stage involved artifact design and development. The main artifact of this study is the proposed AI-driven knowledge governance framework, conceptualized as a multi-layered system architecture for public sector transformation. The framework integrates a data layer, AI analytics layer, knowledge repository, and decision-making interface, supported by an overarching governance and policy layer. A continuous feedback and learning loop connects policy outcomes back into the system, enabling adaptive governance and institutional learning. The design is informed by the knowledge-based view of organizations,¹⁹ socio-technical systems theory,²⁰ and contemporary digital governance models.¹ This ensures that the artifact reflects both technological functionality and organizational feasibility.

The fourth stage concerned demonstration, where the framework was applied conceptually to public sector governance contexts such as smart city management, citizen services, and evidence-based policymaking. Demonstration in DSR does not necessarily require immediate technical implementation; rather, it shows how the artifact can address identified problems in realistic environments.¹⁸ The framework illustrated how

governments can transform fragmented AI adoption into integrated knowledge-driven governance systems that improve decision quality, service responsiveness, and policy continuity. Special attention was given to emerging economies, where institutional readiness and governance resilience are critical for sustainable digital transformation.

The final stage addressed evaluation logic. Since this study is conceptual in nature, evaluation was conducted through analytical validation based on logical consistency, theoretical grounding, and practical relevance rather than empirical testing. The framework was assessed against key governance criteria including transparency, accountability, explainability, adaptability, and institutional sustainability. Its relevance is further examined through alignment with existing AI governance challenges identified in the literature.^{9,14}

Future empirical studies may extend this evaluation through case studies, comparative institutional analysis, and policy implementation assessment. By following the DSR process, this study contributes not only a conceptual explanation but also a design artifact capable of supporting responsible AI-enabled governance in the public sector.

In DSR, demonstration does not necessarily require a fully deployed system or empirical field implementation. Demonstration may also be achieved through representative application scenarios that illustrate how a design artifact addresses real-world organizational problems within realistic operational contexts.^{17,18} Consistent with this principle, the proposed framework is further demonstrated through illustrative public-sector application scenarios presented in Section 5, providing practical examples of how the architecture may support AI-enabled knowledge governance across multiple domains.

4. Proposed design framework

This study proposes an AI-driven knowledge governance framework as a design artifact for supporting knowledge-based public sector transformation. The framework was designed to address the fragmentation between AI adoption, KM practices, and governance mechanisms in digital public administration. Rather than treating AI as an isolated operational technology, the framework positions it as a strategic enabler of institutional learning, policy intelligence, and responsible governance. The architecture integrates technological, organizational, and policy dimensions into a unified system that supports adaptive and transparent decision-making.

In addition to the knowledge-based view of organizations and socio-technical systems theory, the

proposed framework is informed by the concept of *socio-technical imaginaries*, which describes collectively held visions of desirable futures that are materially realized through technological systems and institutional practices.²¹ Public sector AI is not merely a collection of computational tools; rather, it embodies normative assumptions about how governments should govern, how citizens should interact with public institutions, and how knowledge should support collective decision-making. From this perspective, AI-enabled governance architectures simultaneously perform technical functions and shape institutional expectations regarding transparency, accountability, participation, and public value. The proposed framework therefore recognizes that AI design choices influence not only organizational efficiency but also the broader societal imagination of trustworthy and democratic digital governance. Embedding socio-technical imaginaries within the framework strengthens its normative foundation by emphasizing that responsible AI governance requires alignment between technological innovation, institutional values, and citizen expectations.

The design is grounded in the knowledge-based view of organizations,¹⁹ socio-technical systems theory,²⁰ and socio-technical imaginaries.²¹ Together, these perspectives emphasize that effective AI-enabled governance emerges from the interaction of technological infrastructures, organizational knowledge, institutional practices, and societal values. The framework is further aligned with contemporary digital governance models that prioritize data-driven policymaking, citizen-centric services, and accountable public administration.¹

4.1. System architecture

The system architecture is organized as a multi-layered structure that transforms raw data into actionable policy intelligence through AI-enabled knowledge processes. The architecture includes four operational layers: the data layer, AI analytics layer, knowledge repository, and decision-making interface. These layers are supported by an overarching governance and policy layer that ensures ethical compliance, accountability, and institutional legitimacy.

The data layer serves as the foundation of the architecture and includes both structured and unstructured data collected from administrative records, citizen interactions, sensor networks, public databases, and social media platforms. High-quality, interoperable, and secure data infrastructures are essential for enabling reliable AI operations and trustworthy governance outcomes.²² In many public institutions, fragmented data systems remain a major obstacle to effective digital transformation.

The AI analytics layer processes the data using machine learning, natural language processing, predictive analytics, and decision-support algorithms. This layer transforms raw information into interpretable insights by identifying patterns, forecasting trends, and detecting anomalies. AI enables governments to move from reactive administration toward predictive and proactive governance models.^{14,16}

The knowledge repository functions as the institutional memory of the system. It stores, organizes, and continuously updates explicit and tacit knowledge derived from AI outputs, historical decisions, policy outcomes, and expert experience. Unlike traditional document-based repositories, AI-enabled knowledge systems are dynamic and adaptive, supporting continuous learning and knowledge reuse across government agencies.⁶

The decision-making interface connects the repository to policy formulation and administrative action. It provides dashboards, visualization tools, and decision intelligence mechanisms that allow policymakers to interpret analytical outputs and integrate them with human judgment and contextual knowledge. This layer ensures that AI supports rather than replaces human-centered governance.

4.2. Design artifact description

The primary contribution of this study is the proposed AI-driven knowledge governance framework as a design artifact for public sector transformation. Unlike purely conceptual discussions of digital governance, this study developed a structured system architecture that provides a practical and policy-oriented model for integrating AI, KM, and governance mechanisms within public administration. In DSR, an artifact represents a purposeful solution to an identified organizational problem and serves as the central output of scholarly contribution.^{17,18} The proposed architecture fulfills this role by addressing the fragmentation of AI adoption and the absence of integrated knowledge governance structures in the public sector.

The design artifact responds to a critical governance challenge: governments increasingly deploy AI applications for service automation, predictive analytics, and administrative decision support, yet these systems often remain disconnected from institutional learning processes and policy accountability structures.^{3,5} As a result, valuable knowledge generated through AI is frequently underutilized, while governance risks related to opacity, bias, and weak accountability continue to grow. The proposed framework addresses this gap by creating a layered architecture that links data ecosystems, AI analytics, knowledge repositories, and policy decision interfaces within a unified governance structure.

From a design perspective, the artifact combines

technological functionality with institutional control. It includes operational layers for data processing and decision intelligence, while simultaneously embedding governance safeguards, such as transparency, explainability, ethical oversight, and human supervision. This reflects the socio-technical principle that effective digital transformation depends on aligning technological systems with organizational structures and policy environments.^{1,20} The architecture is therefore not only a technical model but also a governance blueprint for responsible AI adoption.

The design artifact is particularly relevant for emerging economies where public institutions often face fragmented infrastructures, weak interoperability, and limited policy coordination.^{2,9} By supporting institutional memory, adaptive policymaking, and evidence-based governance, the framework provides a scalable model for sustainable public sector transformation. Its contribution lies in shifting digital governance from isolated AI implementation toward a continuous knowledge ecosystem where learning, accountability, and policy refinement are embedded into the architecture itself.

Through this artifact, the study advances both theory and practice. Theoretically, it extends the literature on digital governance by integrating AI and KM within a unified DSR-based architecture. Practically, it offers policymakers and public administrators a replicable model for designing AI-enabled governance systems that are transparent, resilient, and aligned with public values. This design-oriented contribution distinguishes the study from traditional conceptual reviews and strengthens its relevance for implementation-focused digital policy research.

4.3. Design components

The effectiveness of the proposed framework depends on the interaction among its core design components. These components are designed to ensure not only technological efficiency but also institutional sustainability and policy relevance.

The first component is data interoperability, which ensures seamless integration across government departments and platforms. Interoperable systems reduce duplication, improve coordination, and support whole-of-government policymaking.⁸ Without interoperability, AI systems remain isolated and unable to generate cross-sector knowledge value.

The second component is explainable AI (XAI), which addresses one of the most significant challenges associated with contemporary AI systems—the limited transparency of complex machine learning models. XAI refers to methods and techniques that enable human users to understand,

interpret, and appropriately trust AI-generated predictions and recommendations.^{23,24} Unlike traditional rule-based systems, many modern AI algorithms operate as “black boxes,” making it difficult for policymakers, public officials, and citizens to understand how specific decisions are produced. This lack of transparency presents substantial governance risks, particularly when AI supports decisions involving taxation, welfare eligibility, healthcare, law enforcement, or judicial administration.

Within public administration, explainability is essential for maintaining procedural fairness, public accountability, and democratic legitimacy. Governments must be able to explain not only the outcomes produced by AI systems but also the reasoning processes that lead to those outcomes. XAI therefore supports human oversight by allowing decision-makers to validate algorithmic recommendations, detect potential biases, and justify administrative actions to affected stakeholders. Recent studies have identified explainability as a fundamental requirement for trustworthy and responsible AI, complementing principles such as fairness, accountability, robustness, and transparency.^{24,25}

In the proposed framework, XAI functions as a cross-cutting design principle rather than an isolated technical capability. Explainability is embedded within the AI analytics layer, the decision-making interface, and the governance and policy layer to ensure that algorithmic outputs remain interpretable throughout the governance process. Visualization dashboards, confidence indicators, feature attribution methods, audit trails, and human validation mechanisms enable policymakers to understand AI-supported recommendations while retaining ultimate responsibility for public decisions. By integrating explainability throughout the architecture, the framework enhances institutional trust, facilitates regulatory compliance, and promotes responsible AI adoption across public sector organizations.

The third component is organizational knowledge integration, where AI outputs are embedded into formal KM processes. This ensures that insights generated by intelligent systems are preserved, shared, and reused rather than lost through administrative turnover or fragmented implementation. Knowledge continuity is essential for long-term governance resilience.⁷

The fourth component is human-AI collaboration. Effective digital governance requires AI systems to augment rather than replace public officials. Human oversight remains necessary for ethical reasoning, contextual interpretation, and democratic legitimacy. AI should therefore function as a decision support mechanism rather than an autonomous authority.

4.4. Governance layer

The governance and policy layer surrounds all operational components and functions as the institutional control mechanism of the framework. This layer ensures that technological adoption aligns with legal requirements, ethical standards, and democratic values.

Transparency mechanisms include explainable models, audit trails, and open communication of decision processes. Citizens and stakeholders must be able to understand how AI systems influence policy decisions, particularly where outcomes affect rights, access to services, or public trust.⁹

Accountability structures define responsibility across system design, implementation, and operational use. Governments must establish clear ownership of AI-supported decisions and create institutional oversight mechanisms to prevent misuse or untraceable automated actions.³ Dedicated AI governance units or digital policy councils can strengthen coordination across agencies.

Ethical safeguards address bias mitigation, privacy protection, fairness, and responsible data use. Public institutions must ensure that AI systems do not reproduce historical inequalities or create discriminatory outcomes. Ethical governance is particularly important in emerging economies, where regulatory maturity may still be developing, and institutional trust is highly sensitive.

Institutional readiness is also part of this governance layer. Capacity building, leadership commitment, and regulatory alignment are necessary to ensure sustainable adoption. AI governance is therefore not simply a technical issue but a long-term policy and institutional reform process.

4.5. Feedback and organizational learning loop

A continuous feedback and organizational learning loop is a defining feature of the proposed AI-driven knowledge governance framework. Rather than treating policy implementation as the final stage of administrative decision-making, the framework conceptualizes governance as an iterative learning process in which policy outcomes continuously generate new knowledge that informs future decisions. This perspective reflects cybernetic principles of feedback systems, where information generated by system outputs is recursively used to regulate and improve subsequent system behavior.²⁶ Within AI-enabled governance, feedback transforms digital administration from a static operational process into an adaptive knowledge ecosystem capable of continuous institutional improvement.

The framework further draws upon theories of organizational learning, which argue that institutions

improve their effectiveness by systematically reflecting upon experience and incorporating lessons into future actions.²⁷ Public sector organizations accumulate knowledge not only through formal documentation but also through policy implementation, citizen interactions, administrative performance, and institutional experience. The proposed feedback loop captures these diverse knowledge sources by continuously integrating governance outcomes into the knowledge repository, allowing AI models and decision-support systems to learn from previous policy successes and failures.

From an adaptive governance perspective, continuous learning is essential because governments operate within dynamic social, economic, technological, and environmental conditions that constantly reshape policy requirements.²⁸ AI-supported governance systems must therefore remain capable of responding to changing citizen expectations, evolving regulatory environments, emerging risks, and newly available data. The proposed feedback mechanism enables adaptive governance by continuously monitoring policy performance, evaluating implementation outcomes, identifying unintended consequences, and recommending evidence-based adjustments. Rather than assuming that policy decisions remain permanently optimal, the framework recognizes governance as an ongoing process of experimentation, evaluation, and refinement.

Operationally, the feedback loop begins when policy decisions generate administrative records, citizen feedback, service performance indicators, and other governance outcomes. These outputs become new data inputs that are processed through the AI analytics layer, incorporated into the institutional knowledge repository, and translated into updated decision intelligence. As organizational knowledge expands, policymakers gain increasingly accurate insights regarding policy effectiveness, implementation challenges, resource allocation, and citizen needs. This recursive learning process supports both incremental policy improvement and broader institutional innovation.

The feedback mechanism also strengthens governance resilience by enabling governments to detect emerging problems before they become systemic failures. For example, if an AI-supported welfare allocation system produces unequal service outcomes across demographic groups, subsequent administrative data and citizen feedback can reveal these disparities. The framework allows these findings to trigger algorithmic recalibration, policy revision, ethical review, and knowledge updating before future decisions are made. Consequently, the feedback loop functions not merely as a technical data pipeline but as an institutional mechanism for continuous

accountability, organizational learning, and evidence-based policy evolution.

By embedding continuous learning throughout the governance architecture, the proposed framework extends traditional KM approaches beyond static information storage toward dynamic institutional intelligence. The feedback loop therefore serves as the principal mechanism through which AI, organizational knowledge, and governance interact to create adaptive, transparent, and resilient public administration.

4.6. Framework visualization

The proposed framework can be visualized as a layered architecture in which operational intelligence flows upward from data collection to policy action, while governance controls operate across all layers (**Figure 1**).

Figure 1 presents the proposed AI-driven knowledge governance architecture as the primary design artifact of this study. The architecture illustrates how public sector organizations can transform fragmented AI adoption into an integrated governance system where data-driven intelligence supports policy decisions, institutional learning, and responsible public administration. The governance and ethics layer ensures transparency, accountability, and explainability across all operational components, while the feedback loop enables adaptive governance through continuous policy refinement.

5. Design implications and application

5.1. Design implications

The proposed AI-driven knowledge governance framework has significant design implications for public administration, particularly in emerging economies where digital transformation is often constrained by institutional fragmentation, infrastructure limitations, and governance challenges. Rather than treating AI as a standalone technological intervention, the framework demonstrates that sustainable digital governance requires integrating AI with KM, organizational learning, and policy accountability. This design perspective shifts the focus from isolated automation projects toward system-wide governance transformation.

In emerging economies, governments frequently face structural barriers, such as limited digital infrastructure, fragmented administrative databases, weak interoperability across agencies, and shortages of technical expertise.^{2,8} These limitations often result in fragmented AI adoption, where individual departments deploy isolated systems for service automation or monitoring without broader institutional coordination. The proposed framework

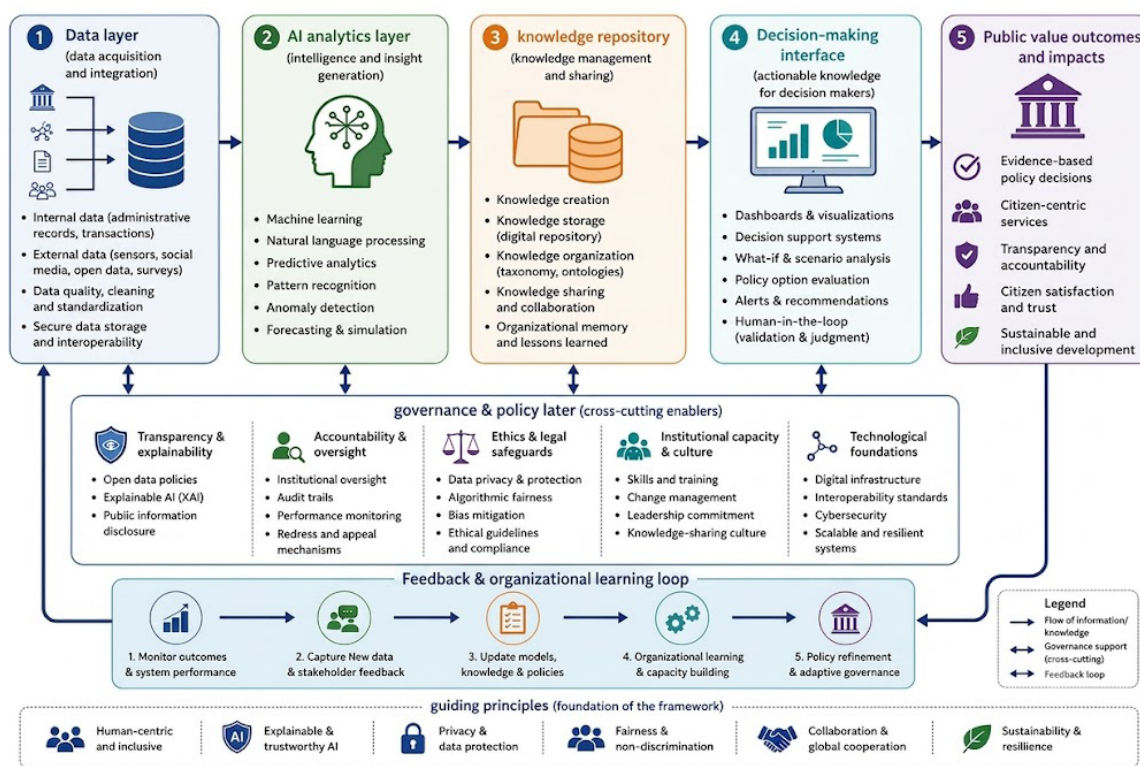


Figure 1. Artificial intelligence (AI)-driven knowledge governance architecture for public sector transformation

addresses these challenges by offering a scalable architecture that prioritizes data interoperability, knowledge continuity, and governance oversight. By embedding AI within formal knowledge systems, governments can reduce institutional dependency on individuals, improve policy continuity, and strengthen evidence-based decision-making.

A major application area of the framework is smart governance, where public institutions use digital technologies to improve responsiveness, citizen engagement, and real-time administrative performance. Smart cities, for example, rely on continuous data flows from sensors, public infrastructure, citizen feedback platforms, and service delivery systems to optimize urban management.¹² Within this environment, the AI analytics layer of the proposed framework supports predictive governance by enabling traffic optimization, environmental monitoring, public safety management, and emergency response planning. The knowledge repository ensures that insights from these operations are preserved and reused across policy cycles, supporting adaptive governance rather than isolated technological responses.

In citizen service delivery, the framework improves the

design of intelligent public administration systems such as AI-powered chatbots, automated grievance systems, digital welfare platforms, and predictive healthcare services. These applications enhance service accessibility and reduce administrative delays, particularly in high-demand sectors such as taxation, healthcare, education, and social protection.⁵ However, the framework emphasizes that service automation must remain human-centered. Human-AI collaboration ensures that public officials retain oversight in high-impact decisions involving welfare eligibility, legal rights, or public safety, thereby preserving fairness and democratic accountability.

The framework is also highly relevant for strategic public administration and evidence-based policymaking. Governments increasingly require decision intelligence systems capable of processing large-scale administrative and social data to support planning, budgeting, and policy evaluation. Predictive analytics can assist in forecasting health crises, resource shortages, educational needs, and economic vulnerabilities.³ Through the decision-making interface, policymakers gain access to actionable insights supported by XAI models and institutional memory, improving both policy speed and policy quality. This is

particularly valuable in resource-constrained governance environments where efficient allocation decisions are critical.

From a policy design perspective, the framework highlights the necessity of governance mechanisms that support transparency, accountability, and ethical AI use. Emerging economies often experience weak regulatory environments and low public trust in automated systems, making governance safeguards essential for sustainable adoption.⁹ Dedicated AI governance units, explainability standards, ethical review mechanisms, and public audit systems are necessary institutional complements to technical implementation. Without these mechanisms, AI-driven governance risks reinforcing inequality, opacity, and institutional distrust.

Ultimately, the framework demonstrates that digital transformation in public administration should be understood as a socio-technical reform process rather than a technology procurement exercise. Smart governance requires aligning infrastructure, institutional capacity, regulatory maturity, and citizen trust. By integrating AI, knowledge systems, and governance structures within a unified design architecture, the proposed model provides a practical roadmap for responsible digital transformation in both developed and developing governance environments. Its strongest contribution lies in showing how AI can support resilient, inclusive, and knowledge-driven public administration while preserving public values and democratic legitimacy.

5.2. Illustrative application scenarios

To demonstrate the practical applicability of the proposed AI-driven knowledge governance framework, this section presents four illustrative public-sector scenarios. These examples are not intended as empirical validations but rather as conceptual demonstrations consistent with the DSR methodology, showing how the proposed artifact can be operationalized in realistic governance environments.^{17,18}

5.2.1. Healthcare service delivery

In a public healthcare system, hospitals, clinics, and community health centers continuously generate electronic health records, epidemiological reports, diagnostic data, and patient feedback. Within the proposed framework, these heterogeneous data sources populate the data layer, where AI analytics identify disease trends, predict healthcare demand, and detect emerging public health risks. The knowledge repository stores previous intervention outcomes, treatment protocols, and policy experiences, enabling health authorities to formulate

evidence-based responses. Through the feedback and learning loop, patient outcomes and citizen feedback continuously improve predictive models and healthcare policies while maintaining transparency through XAI.

5.2.2. Intelligent traffic governance

Urban transportation authorities increasingly rely on sensors, surveillance cameras, GPS data, and citizen mobility applications to monitor traffic conditions. The proposed framework integrates these data streams into AI-driven predictive models that can forecast congestion, optimize signal timing, and improve emergency response. Decision-support dashboards enable transportation managers to coordinate interventions in real time, while governance mechanisms ensure accountability and transparency regarding automated traffic management decisions. Feedback generated through traffic performance indicators continuously refines AI models, allowing transportation policies to adapt to evolving mobility patterns.

5.2.3. Tax administration

Tax authorities manage extensive administrative records, financial transactions, and compliance histories. AI-based anomaly detection can help identify fraudulent activities and improve revenue collection efficiency. Within the proposed governance architecture, XAI ensures that automated risk assessments remain interpretable by tax officials and auditable by oversight agencies. Historical audit outcomes and taxpayer interactions are preserved within the knowledge repository, allowing continuous refinement of compliance strategies while maintaining fairness, transparency, and public trust.

5.2.4. Crowd management and public safety

Large public events and emergency situations require governments to process information from surveillance systems, social media, IoT devices, and emergency communication platforms. AI analytics can support real-time crowd monitoring, risk prediction, and emergency resource allocation. The proposed framework combines these capabilities with institutional knowledge and governance oversight, ensuring that automated recommendations remain subject to human supervision and ethical review. Citizen feedback and post-event assessments are incorporated into the feedback and learning loop, strengthening organizational preparedness for future events.

These illustrative scenarios demonstrate that the proposed framework is sufficiently flexible to support diverse public-sector domains while maintaining common governance principles, including transparency,

explainability, accountability, organizational learning, and adaptive policymaking (Table 1).

6. Discussion

The findings of this study highlight that AI should be understood not merely as a technological tool for administrative efficiency, but as a strategic governance mechanism capable of transforming how public institutions generate, manage, and apply knowledge. The proposed AI-driven knowledge governance framework demonstrates that sustainable digital governance depends on integrating AI capabilities with KM, institutional accountability, and policy design. This perspective extends existing digital governance literature by positioning AI as part of a broader socio-technical governance architecture rather than as an isolated innovation initiative.^{1,3}

Beyond its practical implications, this study makes several theoretical contributions to the emerging literature on AI-enabled digital governance. First, it integrates KM, AI, and public sector governance within a unified DSR artifact, addressing a gap in existing research where these domains have often been examined independently. The proposed framework demonstrates that effective AI adoption depends not only on computational capability but also on institutional mechanisms that transform data into organizational knowledge and governance intelligence.

Second, the study advances socio-technical perspectives on digital governance by incorporating the concept of socio-technical imaginaries.⁸ This perspective recognizes that AI governance architectures simultaneously embody technological functionality and normative visions of desirable public futures. Consequently, system design decisions influence transparency, accountability, citizen trust, and democratic legitimacy alongside operational efficiency.

Third, the framework extends conventional KM models by introducing a continuous organizational learning mechanism through the feedback and learning loop. Unlike static repositories that primarily preserve institutional memory, the proposed architecture supports adaptive governance by continuously integrating policy outcomes, citizen experiences, and administrative performance into future decision-making processes.

Finally, the study contributes to DSR by presenting a policy-oriented governance artifact that combines technological architecture with organizational and ethical design principles. Rather than proposing isolated AI applications, the framework offers a holistic governance architecture capable of guiding responsible digital transformation across diverse public sector contexts, particularly within emerging economies where institutional capacity and governance resilience remain critical challenges.

From a design perspective, the framework contributes to the growing field of design-oriented digital governance research by presenting a structured artifact that connects data ecosystems, AI analytics, knowledge repositories, and decision interfaces within a unified governance model. Many previous studies examined AI adoption in public administration primarily through operational case studies or policy analysis, but relatively few provided system-level design architectures that explain how these elements should be institutionally integrated.⁹ The proposed model addresses this gap by emphasizing that effective governance requires both technical interoperability and organizational learning. In particular, the inclusion of a continuous feedback loop transforms governance from a static administrative process into an adaptive learning system capable of responding to changing policy conditions.

Table 1. Different scenarios of the proposed framework

Public sector domain	AI function	Knowledge repository	Decision support	Feedback mechanism
Healthcare	Disease prediction	Clinical knowledge	Resource allocation	Patient outcomes
Traffic	Congestion prediction	Traffic history	Signal optimization	Mobility data
Taxation	Fraud detection	Compliance history	Audit prioritization	Audit results
Crowd management	Risk prediction	Emergency protocols	Resource deployment	Incident reports

Knowledge management plays a pivotal role in bridging data and policy action at the institutional level. Public organizations often accumulate large volumes of information without converting it into reusable organizational knowledge. This weakens policy continuity, especially in environments characterized by administrative turnover, fragmented records, and weak cross-agency collaboration.^{6,7} By integrating AI outputs into formal KM structures, governments can strengthen institutional memory and improve long-term decision quality. This is particularly relevant for emerging economies, where governance resilience often depends more on knowledge continuity than on technological sophistication alone.

Policy implications are equally significant. The expansion of AI in public administration raises urgent questions regarding transparency, accountability, explainability, privacy, and fairness. Governments that adopt predictive analytics or automated decision systems without adequate governance safeguards risk reinforcing social inequalities and reducing public trust in institutions.^{5,9} The governance and policy layer proposed in this study emphasizes that responsible AI adoption requires formal institutional mechanisms such as audit systems, explainable models, ethical review boards, and dedicated AI governance units. These structures are essential not only for regulatory compliance but also for democratic legitimacy and citizen confidence in digital public services.

The framework has important implications for smart governance and public sector reform. As governments increasingly adopt smart city initiatives, digital welfare systems, and predictive public services, the need for coordinated governance becomes more urgent. Fragmented implementation often leads to duplicated systems, isolated innovation, and inefficient resource allocation.¹² The proposed framework supports a whole-of-government approach by encouraging interoperability, shared knowledge repositories, and policy alignment across administrative units. This can improve both service responsiveness and strategic planning, especially in high-demand sectors such as healthcare, taxation, education, and urban management.

Despite these contributions, the study has limitations. The framework is conceptual and analytically validated rather than empirically tested through case studies or implementation assessment. While DSR supports artifact development through theoretical rigor and practical relevance,¹⁷ future studies should conduct empirical validation across different institutional contexts to examine operational feasibility and governance outcomes. Comparative studies between developed and emerging economies may further reveal how institutional readiness,

regulatory maturity, and political context influence framework adoption.

Future research should also explore sector-specific adaptations of the model, particularly in healthcare governance, education management, climate policy, and local government administration. In addition, the role of generative AI and large language models in knowledge-intensive public administration presents a new area for investigation, particularly regarding explainability, public accountability, and policy co-creation. As governments continue to evolve toward intelligent governance systems, the challenge will not be whether AI should be adopted, but how it should be designed to preserve public value, institutional trust, and long-term governance sustainability.

7. Conclusion

The rapid expansion of AI in public administration is transforming how governments design policies, deliver services, and engage with citizens. However, the effectiveness of digital governance depends not only on technological adoption but also on the ability of public institutions to integrate AI with KM, organizational learning, and accountable governance structures.^{1,14} Without such integration, AI initiatives risk remaining fragmented, reducing transparency, weakening institutional memory, and limiting long-term policy effectiveness.

This study addressed this challenge by proposing an AI-driven knowledge governance framework as a design artifact for knowledge-based public sector transformation. Using a DSR approach,^{17,18} the framework integrates five key elements: system architecture, design components, governance mechanisms, feedback loops, and policy-oriented decision interfaces. By linking data ecosystems, AI analytics, knowledge repositories, and governance safeguards, the model positions AI not merely as an operational tool but as a strategic enabler of institutional intelligence and adaptive governance.

The framework is particularly relevant for emerging economies, where digital transformation is often constrained by fragmented data systems, limited institutional capacity, and weak policy coordination.^{2,9} Its emphasis on explainability, transparency, ethical oversight, and human-AI collaboration supports responsible innovation while preserving democratic legitimacy and public trust. Integrating continuous feedback mechanisms further strengthens governance resilience by enabling adaptive policymaking and evidence-based institutional learning.

The primary contribution of this study lies in shifting the discourse from isolated AI adoption toward a unified

governance architecture that supports sustainable public sector transformation. Rather than focusing solely on automation, the framework demonstrates how AI can be embedded within knowledge systems to improve policy continuity, decision quality, and strategic public administration. This design-oriented contribution aligns with the growing need for responsible and inclusive digital governance in increasingly complex institutional environments.

Future research should focus on empirically validating the framework through comparative case studies, sector-specific implementation, and institutional performance assessment. As governments move toward more intelligent and data-driven systems, the long-term success of AI-driven governance will depend on how effectively technology is aligned with knowledge, ethics, and public value.

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Availability of data

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