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PUBLIC SECTOR INNOVATION IN SMART CITIES: A FRAMEWORK OF AMBIDEXTROUS AI GOVERNANCE

Agustinus Fritz Wijaya[1*], Merryana Lestari[2], Mega Kartika Sari[3], Rio Ferdiandinata[1]

Informatics Study Program[1]
Information Systems Study Program[2]
Artificial Intelligence Study Program[3]
Bunda Mulia University, Jakarta, Indonesia[1,2,3]
www.ubm.ac.id[1,2,3]
agustinus.wijaya@bundamulia.ac.id*, mlestari@bundamulia.ac.id, msari@bundamulia.ac.id, s32220035@student.ubm.ac.id

(*) Corresponding Author
(Responsible for the Quality of Paper Content)

Abstract— *The increasing adoption of artificial intelligence (AI) in smart city public services has intensified governance challenges related to accountability, data security, transparency, and risk management. Existing AI governance studies tend to emphasize either innovation enablement or control mechanisms, offering limited guidance on how public institutions can balance both simultaneously. This study addresses this gap by proposing an Ambidextrous AI Governance Framework grounded in COBIT 2019, which systematically integrates exploration-oriented innovation and exploitation-oriented control within public-sector governance. Using a Design Science Research (DSR) approach, the framework was developed and evaluated through a 2025 case study at the Jakarta Provincial Communication and Information Agency. Validation was conducted via expert interviews, document analysis, and simulation-based governance maturity assessments. The findings indicate that baseline AI governance maturity remains at Levels 2–3, while simulation results suggest potential advancement toward Levels 4–5, particularly in risk management (APO12) and security services (DSS05). The study contributes theoretically by operationalizing organizational ambidexterity within public-sector AI governance and practically by offering structured guidance to support secure, transparent, and sustainable AI adoption in smart city environments.*

Keywords: *AI Governance, Ambidextrous Governance, COBIT 2019, Public Sector Innovation, Smart City*.

Intisari— *Meningkatnya adopsi kecerdasan buatan (AI) dalam layanan publik kota cerdas telah memperintensifkan tantangan tata kelola terkait akuntabilitas, keamanan data, transparansi, dan manajemen risiko. Studi tata kelola AI yang ada cenderung menekankan pada pemberdayaan inovasi atau mekanisme kontrol, menawarkan panduan terbatas tentang bagaimana lembaga publik dapat menyeimbangkan keduanya secara bersamaan. Studi ini mengatasi kesenjangan tersebut dengan mengusulkan Kerangka Kerja Tata Kelola AI Ambidextrous yang berlandaskan COBIT 2019, yang secara sistematis mengintegrasikan inovasi berorientasi eksplorasi dan kontrol berorientasi eksploitasi dalam tata kelola sektor publik. Dengan menggunakan pendekatan Riset Desain Sains (DSR), kerangka kerja ini dikembangkan dan dievaluasi melalui studi kasus tahun 2025 di Dinas Komunikasi dan Informatika Provinsi Jakarta. Validasi dilakukan melalui wawancara ahli, analisis dokumen, dan penilaian kematangan tata kelola berbasis simulasi. Temuan menunjukkan bahwa kematangan tata kelola AI dasar tetap berada pada Level 2–3, sementara hasil simulasi menunjukkan potensi kemajuan menuju Level 4–5, khususnya dalam manajemen risiko (APO12) dan layanan keamanan (DSS05). Studi ini memberikan kontribusi secara teoritis dengan mengoperasionalkan ambidexteritas organisasi dalam tata kelola AI sektor publik dan secara praktis dengan menawarkan panduan terstruktur untuk mendukung adopsi AI yang aman, transparan, dan berkelanjutan di lingkungan kota cerdas.*

Kata Kunci: *Tata Kelola AI, Tata Kelola Ambidekster, COBIT 2019, Inovasi Sektor Publik, Kota Cerdas.*

INTRODUCTION

The transition to smart cities has become a strategic imperative for a number of nations to confront the challenges posed by urbanization, climate change, and the increasing public demand for efficient, transparent, and expeditious public services. In order to improve the quality of urban governance and sustainability, the concept of smart cities utilizes artificial intelligence (AI), the Internet of Things (IoT), and information technology [1]. Over 100 localities and districts in Indonesia have implemented smart city programs; however, these initiatives continue to face persistent obstacles, including limited digital capacity, fragmented policy coordination, and difficulties in sustaining long-term innovation [2]. These challenges highlight the need for a clearer governance approach that supports both operational stability and continuous innovation within smart city ecosystems.

A substantial body of global research confirms that artificial intelligence (AI) plays a pivotal role in public sector innovation, particularly in smart city service design, transportation management, and environmental planning [3][4][5][6][7]. However, the implementation of AI in government also encounters significant challenges, including algorithmic bias, privacy risks, limited institutional capacity, and the absence of adaptive governance standards [8]. These issues demonstrate that existing governance practices remain fragmented and often reactive, leaving governments without a clear mechanism to ensure responsible and innovative AI deployment. In this context, the development of an AI governance model that balances stability with innovation becomes essential. This dual capacity is reflected in the concept of ambidextrous governance, which in smart cities is increasingly viewed as a promising approach to address the competing demands of operational reliability and continuous technological innovation [9][10]. The concept aligns with the major domains of COBIT 2019, including strategic oversight (EDM), planning and policy formulation (APO), service delivery and operations (DSS), and performance monitoring (MEA), thereby offering a structured pathway for implementing balanced AI governance in the public sector.

This study introduces the Ambidextrous AI Governance Framework, developed specifically for public-sector environments within smart cities. The framework integrates three essential orientations: exploitation to maintain operational stability, exploration to foster AI-driven innovation, and sustainability to ensure inclusive and environmentally responsible technology adoption. Although prior studies have examined aspects of AI governance, such as cybersecurity, enterprise architecture, data analytics, and risk management, these contributions generally remain isolated. Existing research rarely integrates these dimensions into a coherent governance model that combines innovation and stability in a systematic manner.

Research on IT governance, including Enterprise Architecture frameworks for smart government [11], cybersecurity governance strategies [12], and capability assessments using COBIT 5 and COBIT 2019 [13], demonstrates the importance of structured and standardized governance mechanisms. Parallel studies on IoT vulnerabilities [14], ISO-based risk management [15], and data-driven decision support systems [16] further reinforce the need for robust and adaptive governance structures across digital public services. However, these contributions do not explicitly address how governance processes can be aligned with artificial intelligence risks such as algorithmic discrimination, privacy breaches, or model drift. This gap becomes evident in documented cases of AI failure, such as biased facial recognition used in criminal justice systems and unfair credit-scoring algorithms, which highlight the absence of integrated governance models capable of mitigating both innovation-related risks and operational challenges.

Organizational ambidexterity provides a theoretical foundation for balancing innovation-oriented activities with operational stability. In the public sector, AI adoption offers opportunities to improve service quality and efficiency [17], but also requires governance structures capable of managing heightened risks. Integrating ambidextrous principles with established public management approaches [18] enables a governance model in which governments can sustain innovation while maintaining accountability, institutional control, and public trust. Despite its relevance, ambidexterity has not been sufficiently integrated into AI governance literature, particularly in connection with structured governance domains such as COBIT 2019 (EDM, APO, BAI, DSS, and MEA). This gap indicates a need for a conceptual model that explicitly links ambidextrous orientations to comprehensive governance processes.

Existing AI governance literature offers several conceptual frameworks designed to ensure ethical, transparent, and accountable AI implementation. Prominent international references include the OECD AI Principles, which emphasize human-centered values and accountability at the policy level, ISO/IEC 42001,

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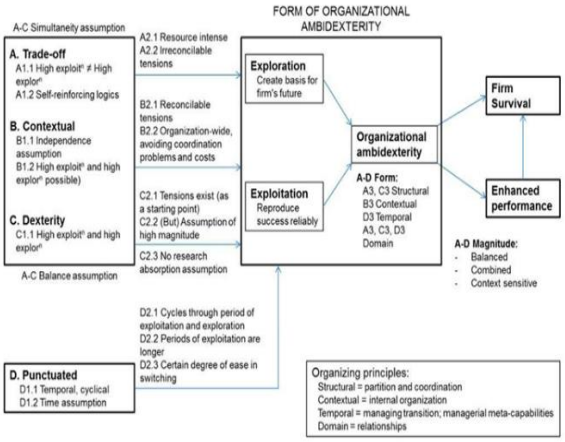
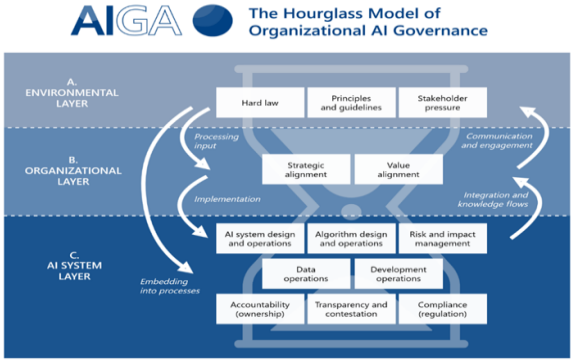
which formalizes AI management systems within organizational processes, and the NIST AI Risk Management Framework, which focuses on identifying and mitigating technical and operational AI risks. While these frameworks provide important guidance, they tend to operate at isolated levels of governance, either policy-oriented, organizational, or technical, and offer limited direction on how public institutions can simultaneously foster AI-driven innovation while maintaining institutional control and compliance. Prior studies on smart city governance stress the importance of adaptive governance structures, where policy instruments, organizational arrangements, and technical controls are coherently aligned to support responsible AI adoption [9]. Scholars further observe that the emergence of generative AI heightens governance complexity by introducing new risks such as discrimination, privacy vulnerabilities, and model manipulation [19]. However, much of the existing literature remains descriptive, cataloguing governance principles and risks without analytically explaining how different governance layers interact or how trade-offs between innovation and control are managed in practice within public-sector environments.

To address this limitation, Figure 2 presents an integrated governance model that conceptualizes AI governance across macro-policy, organizational, and technical layers [20]. Although ambidexterity has been widely applied in organizational and innovation studies, its operationalization within public-sector AI governance remains underdeveloped, particularly in relation to established IT governance frameworks. Existing AI governance research frequently references ambidextrous principles in abstract terms but stops short of mapping them to concrete governance domains, decision rights, and control mechanisms.



Source: (Research Results, 2025)
Figure 1. Source: Adapted from [18]

The transition from Figure 1 to Figure 2 highlights how external pressures are translated into internal governance structures and processes.



Source: (Research Results, 2025)
Figure 2. Source: Adapted from [20]

Despite the growing body of literature on AI governance, a critical gap remains in the integration of innovation-oriented governance and institutional control within public-sector contexts. Existing frameworks, such as the OECD AI Principles, ISO/IEC 42001, and the NIST AI Risk Management Framework, primarily operate at isolated governance layers, focusing either on policy guidance, organizational compliance, or technical risk mitigation. Moreover, prior studies rarely map ambidextrous governance principles to established IT governance structures that are already widely adopted by public institutions. Consequently, governments lack a coherent and operational framework that simultaneously enables AI-driven innovation while ensuring accountability, security, and regulatory compliance. This study addresses this gap by developing an ambidextrous AI governance framework that explicitly aligns exploration and exploitation orientations with the structured governance and management domains of COBIT 2019.

The primary objective of this study is to develop a conceptual framework for ambidextrous AI governance that supports the management of AI implementation in smart cities. The proposed framework maps exploration and exploitation orientations to the structured governance domains of COBIT 2019, including strategic oversight, policy formulation, service delivery, and monitoring activities. Through this mapping, the study identifies governance mechanisms that enable

governments to balance innovative AI initiatives with institutional stability and compliance requirements, while ensuring alignment with sustainability objectives.

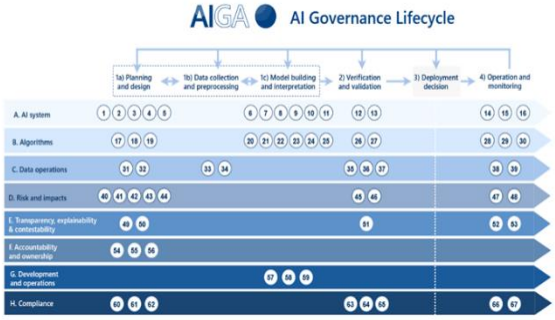
From an academic perspective, this study enriches interdisciplinary discussions on technology governance, sustainable urban development, and public-sector innovation by introducing an ambidextrous approach that remains underrepresented in existing AI governance scholarship. From a practical standpoint, the proposed framework offers municipal governments a comprehensive reference for formulating balanced AI policies, managing risks, and implementing operational procedures that reinforce transparency, security, and long-term sustainability.

This study focuses exclusively on public-sector governance and does not examine algorithmic design, ensuring conceptual clarity and broad applicability across urban governance contexts. The research lays the groundwork for future empirical validation by employing a systematic literature review and conceptual simulation.

In response to increasing AI-related governance challenges, existing literature has developed frameworks aimed at ensuring ethical, transparent, and accountable AI processes. Studies on smart city governance highlight the importance of adaptive governance structures that align policy objectives, organizational mechanisms, and technical practices [9][18]. Scholars also caution that generative AI introduces additional risks, such as adversarial manipulation, privacy vulnerabilities, and biased decision-making [21]. Building on these insights, Wijaya et al. [9] develop a preliminary ambidextrous AI governance model for Indonesian smart cities, integrating innovation and control with attention to data security and institutional readiness.

As introduced earlier, Figure 2 conceptualizes AI governance as a multilayered system spanning macro policy, organizational controls, and technical implementation [22]. This model emphasizes that strategic direction, institutional mechanisms, and operational processes must be aligned to ensure responsible AI use.

The AI Governance Lifecycle illustrated in Figure 3 further explains governance responsibilities at each stage of AI development, including design, data acquisition, model development, evaluation, deployment, and ongoing monitoring [23]. Singh and Shah [22] argue that AI-driven data governance must prioritize security, fairness, and participatory engagement to maintain public legitimacy. This lifecycle view clarifies how governance mechanisms must evolve dynamically over time rather than remain static.



Source: (Research Results, 2025)
Figure 3. Source: Adapted from [19]

Digital ambidexterity in the public sector requires governance practices that are capable of maintaining operational stability while concurrently enabling innovation. Prior studies demonstrate that ambidextrous strategies are essential for accelerating digital transformation within government institutions [24]. However, systematic reviews also reveal persistent barriers, including regulatory constraints, limited human resource readiness, and institutional rigidity, all of which continue to impede the effective adoption of artificial intelligence in public services [25]. These challenges underscore the urgency of developing an integrated governance model, such as the ambidextrous AI governance framework proposed in this study, which aims to harmonize innovation-oriented initiatives with accountability, transparency, and structured oversight.

In the broader context of smart city development, the multidomain characteristics of urban systems further reinforce the need for such a governance approach. As illustrated in Figure 4, smart cities comprise interconnected domains that include digital infrastructure, mobility systems, public services, environmental management, economic development, and civic participation. The interdependence among these components indicates that AI governance must operate across sectors rather than within siloed administrative units. Complementing this perspective, Figure 5 presents the management innovation framework developed by [9], which emphasizes that smart city governance must evolve through adaptive, integrative, and forward-looking mechanisms. Together, Figures 4 and 5 provide the conceptual underpinnings for the ambidextrous AI governance model by illustrating why modern urban systems require governance structures that simultaneously

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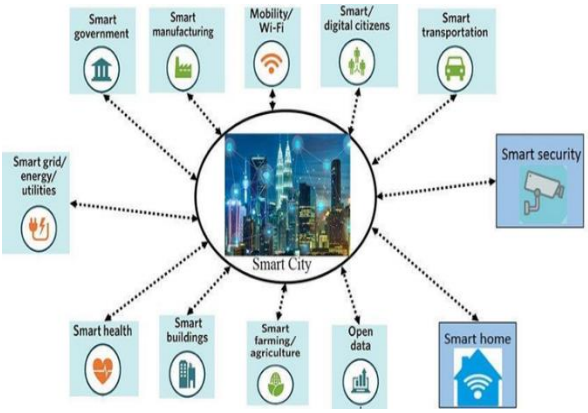
support innovation and maintain regulatory coherence.



Source: (Research Results, 2025)
Figure 4. Source: Adapted from [26]

Figure 5 integrates these perspectives by aligning ambidextrous governance orientations with COBIT 2019 domains, demonstrating how exploration and exploitation can be operationalized through strategic oversight, policy formulation, service delivery, and monitoring activities. By systematically mapping exploration and exploitation orientations to COBIT 2019 governance and management objectives, this study provides a concrete mechanism for translating ambidexterity theory into actionable public-sector AI governance practices. This mapping enables governments to pursue innovative AI initiatives while preserving institutional stability, regulatory compliance, and sustainability goals. COBIT 2019 aligns strategic objectives with governance and management processes through five domains: Evaluate, Direct, Monitor; Align, Plan, Organize; Build, Acquire, Implement; Deliver, Service, Support; and Monitor, Evaluate, Assess [27].

From an academic perspective, this study advances AI governance scholarship by moving beyond principle-based frameworks toward an integrated, theory-driven model that connects governance layers, lifecycle stages, and control mechanisms. From a practical standpoint, the proposed framework offers municipal governments a structured reference for designing balanced AI policies, managing risks, and implementing operational procedures that enhance transparency, security, and long-term public trust [28].

This study focuses exclusively on public-sector governance and does not address algorithmic design or model optimization, ensuring conceptual clarity and applicability across diverse urban governance contexts. By employing a systematic literature review and conceptual simulation, the research establishes a foundation for future empirical validation and comparative assessment across jurisdictions.

Source: (Research Results, 2025)
Figure 5. Source: Adapted from [12]

MATERIALS AND METHODS

This study adopts a Design Science Research (DSR) methodology to develop and evaluate an Ambidextrous AI Governance Framework for smart city public services. DSR is appropriate for this research because it supports the creation of governance artifacts while enabling systematic evaluation through empirical and expert-based methods.

The research was conducted through five iterative stages:

1. Problem Identification and Literature Review
   This stage identified governance challenges related to AI adoption in smart cities, including limited accountability, fragmented risk management, and insufficient integration between innovation and control. A structured literature review (2020–2025) informed the design requirements of the framework.
2. Framework Design
   The framework integrates exploration (innovation enablement) and exploitation (control and compliance) orientations within selected COBIT 2019 governance objectives: EDM01, APO12, DSS05, and MEA01. Iterative refinements were conducted based on expert feedback.
3. Instrument Development
   A questionnaire was developed based on COBIT 2019 process practices and ambidextrous governance dimensions. Reliability testing produced a Cronbach's alpha of 0.81, indicating strong internal consistency.
4. Data Collection and Analysis
   Data were collected in 2025 from the Jakarta Provincial Communication and Information Agency using surveys, interviews, and

document analysis. Quantitative analysis included descriptive statistics, gap analysis, and maturity mapping, while qualitative data were analyzed thematically.

5. Framework Validation
   Validation was conducted through expert workshops and simulation-based maturity projections rather than post-implementation measurement. The evaluation focused on projected governance improvements across the selected COBIT domains.

Source: (Research Results, 2025)
Figure 6. Research Stages

Figure 6 illustrates the customized DSR process model adopted in this study. The figure emphasizes the iterative feedback loops between framework design, evaluation, and refinement, clarifying that the research process is cyclical rather than strictly linear. The methodological stages described above correspond directly to the phases depicted in Figure 6.

RESULTS AND DISCUSSION

Results

The initial survey results (baseline) suggest that the level of AI governance maturity at DISKOMINFO DKI Jakarta Province is at Level 2–3 (Managed–Established). The maturity of the Ambidextrous AI Governance Framework, which is based on COBIT 2019, is expected to increase to Level 4–5 (Quantitatively Managed–Optimizing) through its implementation. Table 1 illustrates a comparison of maturity levels based on COBIT 2019, both before and after the framework design.

It is important to emphasize that the post-framework maturity levels reported in this study are derived from a simulation-based evaluation rather than empirical post-implementation measurements. The simulation was conducted using structured gap analysis and expert validation workshops, consistent with the Design Science Research approach. Therefore, the results reflect projected governance improvements under the proposed framework, not realized organizational performance outcomes.

To provide stronger statistical grounding, this study includes descriptive statistics for each COBIT domain, including the mean score and standard deviation (SD) of questionnaire responses. The average baseline maturity score across all domains was 2.82 (SD = 0.41), while the post-framework score increased to 4.50 (SD = 0.37).

To further strengthen quantitative interpretation, a paired comparative analysis was conducted between baseline and simulated post-framework maturity scores. The mean difference was 1.68 points, with a 95% confidence interval ranging from 1.52 to 1.84, indicating a consistent projected improvement across governance domains. The calculated effect size (Cohen's d = 4.23) suggests a very strong practical effect of the proposed framework on AI governance maturity.

Although inferential significance testing was not applied due to the simulation-based nature of the evaluation, the magnitude and consistency of the effect indicate substantial governance enhancement potential.

The enhancement percentages were computed using the following formula:

$$\Delta(\%) = \frac{L_{post} - L_{base}}{L_{base}} x\ 100\% \quad (1)$$

This formula ensures consistent comparisons across domains with different initial maturity levels. Table 1 summarizes maturity level projections and key governance findings. To support these results, descriptive statistics derived from the raw survey responses are provided in Table X, presenting the mean and standard deviation of each COBIT 2019 domain at baseline.

Table 1. A comparative analysis of the COBIT 2019 Maturity Models before and after the Framework Implementation.

COBIT 2019 Objective	Baseline Level	Post-Framework Level	Enhancement (%)	Key Findings
EDM01 – Governance Framework	3.0	4.6	+53.3%	Citizen participation is enhanced, and formal governance structures are implemented.
APO12 – Managed Risk	2.8	4.5	+60.7%	Identified specific AI hazards and established a new risk register.
DSS05 – Security Services	2.6	4.4	+69.2%	Security measures have been implemented for AI data pipelines.

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COBIT 2019 Objective	Baseline Level	Post-Framework Level	Enhancement (%)	Key Findings
MEA01 – Performance Monitoring	2.9	4.5	+55.2%	AI monitoring encompasses bias, impartiality, and model drift.

Source: (Research Results, 2025)

EDM01 – Governance Framework

A formal IT governance structure, which included a governor's regulation on smart cities, had already been established by DISKOMINFO DKI Jakarta prior to the implementation of the framework. Nevertheless, the management of AI projects in the absence of a structured mechanism for public participation in the evaluation of emerging technologies remained largely ad hoc, influenced by urgent requirements. EDM01 demonstrated an anticipated increase from Level 3.0 to 4.6 subsequent to the implementation of the ambidextrous framework.

An individual entity was initially tasked with overseeing the implementation of artificial intelligence (AI) for public service chatbots within the Jakarta Smart City program. This was executed independently of the data security unit. The newly implemented governance structure has expanded the scope of oversight. The specific definition of decision rights now enables clear identification of individuals accountable for each phase of implementation. Additionally, community forums are employed to evaluate the effectiveness of chatbots and to identify potential biases. An annual report on artificial intelligence usage is being introduced to enhance transparency and promote accountability in the application of AI technologies.

This improvement highlights the critical role of EDM01 in establishing institutional trust. Comparable findings have been reported in Singapore's Smart Nation initiative, where participatory mechanisms significantly improved citizen trust in AI-enabled public services.

APO12 – Risk Management

The risks that DISKOMINFO managed were previously restricted to general IT risks, such as server downtime or data breaches, prior to the implementation of the framework. The hazards associated with artificial intelligence had not been specifically identified. The implementation of an AI-specific risk register resulted in an increase in APO12 from 2.8 to 4.5 following the framework's implementation.

In an effort to reduce congestion in Jakarta, an artificial intelligence-based traffic prediction system is currently undergoing testing. Several key risks have been identified during its development and implementation. One concern involves potential data bias, particularly when the system relies heavily on information from specific areas equipped with more active sensors, which may lead to unequal service distribution. Another important consideration is the possibility of adversarial attacks on traffic camera data, which is addressed through the application of enhanced security protocols. The system also accounts for the risk of model drift, a condition in which the accuracy of the AI traffic model gradually declines as transportation patterns change over time.

These findings demonstrate the significance of AI risk management, which is distinct from conventional IT risk management. The most critical domain is APO12, as it is directly associated with the mitigation of new threats. This is consistent with ISACA's recommendations, which underscore the necessity of algorithmic bias, privacy, and intelligent security concerns in AI risk management.

DSS05 – Manage Security Services

Prior to the implementation of the framework, DSS05 DISKOMINFO concentrated solely on conventional data protection measures, specifically pertaining to databases and networks. Following the implementation of the framework, DSS05 rose from 2.6 to 4.4. The most significant alteration involved the incorporation of security throughout the entire AI pipeline, encompassing data acquisition, training, deployment, and monitoring.

Before the framework was implemented, data security in smart CCTV systems for public safety was limited primarily to the protection of recording storage. After the introduction of the new governance framework, security practices were significantly strengthened. The AI data pipeline is now safeguarded from the earliest stage of data input, including sensor-level collection, through model training, and up to the decision-making output. In addition, a deepfake detection mechanism has been introduced to identify potential visual manipulation within video feeds. Real-time security monitoring has also been enhanced through the integration of AI-based anomaly detection, allowing the system to identify unusual or suspicious activities more effectively.

DSS05 exhibited the highest increase, quantified at 69.2%. This study indicates that security represents the primary vulnerability prior to the implementation of the framework. This study

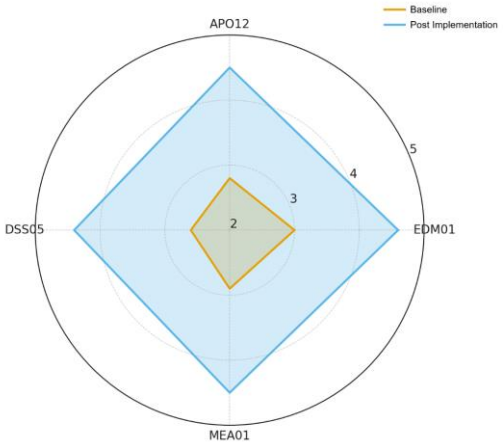
highlights the necessity of integrating AI security as a fundamental aspect of smart city governance.

MEA01 – Monitor, Evaluate, and Assess Performance

The efficacy of standard IT applications was the primary focus of monitoring prior to the implementation of the framework. The framework's implementation led to an increase in MEA01 from 2.9 to 4.5, which included new evaluation indicators specifically designed for artificial intelligence.

The framework for AI-based e-government services introduces several key indicators to ensure responsible and effective system performance. The first indicator, bias detection, evaluates whether the algorithm exhibits discriminatory tendencies toward specific groups. A second indicator focuses on monitoring model drift, which assesses whether the system's performance declines as new data diverges from the original training data. Additionally, a citizen trust index is employed to measure the degree of public satisfaction and confidence in the government's implementation of artificial intelligence.

The incorporation of AI-driven indicators enhances the monitoring function, shifting from simple compliance to an evaluation based on model quality. This study indicates that AI evaluation in the public sector must encompass fairness, interpretability, and citizen satisfaction.



Source: (Research Results, 2025)
Figure 7. Spider Chart Comparison of AI Governance Maturity Levels based on COBIT 2019

Figure 7 presents a spider chart illustrating a notable transition from Level 2–3 (baseline) to Level 4–5 (post-framework). The most significant growth is observed in DSS05 (Manage Security Services) and APO12 (Managed Risk), indicating the enhancement of AI security controls and risk management at DISKOMINFO DKI Jakarta in 2025.

Disscussion

The findings demonstrate that the proposed Ambidextrous AI Governance Framework substantially enhances AI governance maturity across key COBIT 2019 domains. The results confirm that ambidextrous governance enables public institutions to balance innovation-driven AI initiatives with structured oversight, thereby strengthening accountability, security, and institutional trust.

From a theoretical perspective, this study extends organizational ambidexterity theory into the domain of public-sector AI governance by operationalizing exploration and exploitation within established governance structures. Unlike prior AI governance frameworks that remain principle-based, this study provides a concrete mapping of ambidextrous orientations to governance processes, linking governance mechanisms to projected performance outcomes.

Practically, the framework equips local governments with actionable guidance to manage AI risks while sustaining innovation. The strongest improvements were observed in risk management (APO12) and security services (DSS05), highlighting the importance of embedding AI-specific controls within existing IT governance systems.

Despite these contributions, the study is limited by its single-case design and reliance on simulation-based evaluation. Future research should validate the framework empirically across multiple smart city contexts and extend coverage to additional COBIT domains.

CONCLUSION

This study proposes an Ambidextrous AI Governance Framework grounded in COBIT 2019 to address the persistent tension between innovation enablement and institutional control in smart city public services. Unlike existing AI governance models that emphasize either ethical principles or technical risk mitigation in isolation, this framework systematically operationalizes ambidexterity by embedding exploration and exploitation orientations within established governance and management objectives. Using a Design Science Research approach and a 2025 case study at the Jakarta Provincial Communication and Information Agency, the study demonstrates that baseline AI governance maturity remains at Levels 2–3, indicating fragmented integration of risk management, security, and performance monitoring. Simulation-based evaluation shows that the proposed framework has the potential to elevate governance maturity toward Levels 4–5,

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particularly in the domains of risk management (APO12) and security services (DSS05), which are critical for responsible AI deployment in public-sector contexts. The key theoretical contribution lies in reframing COBIT 2019 as an ambidextrous governance architecture, rather than a control-centric mechanism. By explicitly linking innovation-oriented exploration with control-oriented exploitation, this study extends organizational ambidexterity theory into the domain of public-sector AI governance. Practically, the framework offers actionable guidance for local governments to design AI governance structures that support innovation while maintaining accountability, transparency, and public trust. This study is limited to a single institutional context and relies on simulation-based evaluation rather than post-implementation performance data. Future research should empirically validate the framework across multiple smart city environments and examine its applicability to additional COBIT 2019 domains to further strengthen its generalizability and long-term governance impact.

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