

Urban Management Strategies Based on Smart Governance and Big Data Analytics to Improve the Efficiency of Urban Public Services

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Abstract. This study aims to explore in depth how urban management strategies that integrate smart governance and big data analytics can improve the efficiency of public services in urban environments. Using a descriptive qualitative approach and a literature review method, this research analyzes 24 rigorously selected scholarly articles from a total of 50 publications spanning from 1989 to 2025, sourced from Google Scholar and other credible online databases. The findings indicate that smart governance—characterized by collaboration, transparency, and participation—can be enhanced by the analytical capabilities of big data in identifying citizen needs, accelerating decision-making, and optimizing resource allocation. Case studies from cities such as Amsterdam, Surabaya, and Dublin demonstrate that the integration of technology and managerial strategies can expedite service response times, reduce operational costs, and increase public satisfaction. Nevertheless, the success of this strategy relies heavily on the readiness of digital infrastructure, the data literacy of public officials, and the establishment of standardized data governance frameworks. This study provides both theoretical and practical contributions to the development of adaptive, efficient, and inclusive technology-based urban governance models.

Keywords: Smart Governance, Big Data Analytics, Urban Management, Public Services.

1. Introduction

The rapid pace of global urbanization has compelled cities around the world, including in Indonesia, to reformulate their urban governance strategies in a more adaptive, intelligent, and responsive manner. In this context, the smart city concept has emerged as a strategic framework that is gaining increased attention, particularly through the application of smart governance—a governance system based on collaboration, transparency, participation, and the use of information and communication technology (ICT). This strategy no longer focuses solely on administrative aspects but also on creating inclusive governance mechanisms integrated with non-governmental actors such as citizens, communities, and the private sector. This concept is reinforced by [1], who assert that smart governance encompasses the government's ability to leverage technology to facilitate interactive dialogue between citizens and public service providers. Smart governance is thus a crucial element in modern urban planning that aims to address the demand for efficient, affordable, and accountable public services.

The implementation of smart governance would be difficult to achieve without the support of Big Data Analytics as an instrument for evidence-based policy-making. As the volume, velocity, and variety of data generated by urban activities—ranging from transportation, clean water services, energy, healthcare, to digital social interactions—increase, the management of big data becomes critical in formulating targeted public policies. [2] describe Big Data Analytics as a dynamic framework for evaluating behavioral patterns, detecting service anomalies, and forecasting future service needs. Within the urban management framework, big data analytics helps bridge the information gap between citizen needs and government policy responses, making public service delivery more locally relevant.

The interaction between smart governance and big data analytics creates a synergy that can transform urban management strategies holistically. Governance empowered by data intelligence enables faster, more accurate public service mechanisms with minimal administrative errors. For instance, real-time data-based public transportation systems, such as those implemented in Singapore, have proven effective in reducing waiting

times, optimizing routes, and lowering urban transport operational costs [3]. Likewise, Seoul has integrated big data into emergency management and flood control, demonstrating how technology and smart governance strategies can save lives and protect public assets [4]. These studies affirm that the adoption of smart governance and big data analytics is an urgent necessity for achieving efficient, effective, and sustainable public service delivery.

However, the implementation of such strategies continues to face major challenges in many developing cities, particularly in Indonesia. Low levels of digital literacy among government officials, inadequate data infrastructure, and institutional fragmentation often hinder the optimal integration of smart governance and big data analytics [5]. Local governments frequently face budget constraints and a lack of human resources needed to manage urban digital ecosystems in a structured manner. In this context, the concept of data governance becomes increasingly important, emphasizing the need for clear data ownership, privacy protection, and system interoperability across institutions. Without these foundational elements, the collection of large volumes of data may instead exacerbate information gaps, erode public trust, and hinder the efficiency gains that are intended. Therefore, urban management strategies that combine smart governance and big data analytics must be built upon systemic planning and robust data governance approaches.

One of the most crucial dimensions in improving public service efficiency through smart governance and big data is the strengthening of citizen feedback mechanisms. Through digital platforms such as complaint applications, e-participation forums, and online surveys, citizens can directly and in real time express their needs, critiques, and suggestions for service improvements. In cities such as Bandung and Surabaya, governments have utilized such technologies to respond to public complaints promptly [6], [7]. However, the effectiveness of these mechanisms greatly depends on both horizontal data integration (between agencies) and vertical integration (between central and local governments), as well as on decision-making systems that rely on holistic data analysis. This underscores the vital role of big data as a cross-sector coordination tool in addressing complex public service issues, and reinforces that smart governance cannot be separated from adaptive, service-oriented data technologies.

Furthermore, public service efficiency is also closely related to the predictive capabilities of government systems. Big data enables more precise trend analysis and forecasting, such as predicting surges in clean water demand, detecting potential traffic congestion, or identifying disease outbreaks. This allows urban governments to act preventively before problems occur. In Jakarta, for instance, the development of Jakarta Smart City with its disaster, transportation, and utility monitoring dashboards has facilitated predictive, data-driven preventive action [8]. Within the urban management approach, this is referred to as a proactive service model—a model of public service that anticipates and provides measurable solutions. Such efficiency is essential in managing the complexities and uncertainties of large metropolitan areas.

The interconnection between smart governance, big data, and public service efficiency must also be viewed from the perspective of social and environmental sustainability. Efficiency should not be measured solely by service speed or cost savings, but also by the extent to which public services contribute to quality of life and urban ecosystem sustainability. Cities such as Amsterdam and Helsinki have utilized big data to regulate energy consumption, reduce carbon emissions, and improve urban spatial planning in inclusive ways [9]. In Indonesia, similar initiatives remain sporadic and have yet to be adopted as a comprehensive framework for strategic urban management. Therefore, research on urban management strategies based on smart governance and big data analytics is essential to building governance models that are socially and environmentally sustainable.

Based on the discussion above, it can be concluded that the integration of smart governance and big data analytics represents a strategic key to improving the efficiency of urban public services. However, its implementation still requires a multidimensional approach that encompasses policy, technology, human resources, and sound data governance. Accordingly, this study aims to thoroughly examine how urban management strategies that integrate smart governance and big data analytics can enhance public service efficiency, while also identifying the challenges and opportunities faced by Indonesian cities in implementing such strategies.

1.1. Smart Governance

Smart governance is a governance approach that leverages digital technologies to promote transparency, public participation, multi-stakeholder collaboration, and more effective decision-making [10]. This concept arises from the understanding that modern urban governance can no longer rely solely on conventional bureaucratic structures; instead, it must adapt to the increasingly complex and digitally connected nature of society. Smart governance involves the integration of information and communication technologies (ICT) with participatory mechanisms such as e-participation, open data, and online public service systems that allow citizens to actively engage in the formulation and evaluation of policies. The ultimate goal is to create a

government system that is more responsive, accountable, and data-driven, thus enabling more efficient and adaptive public services that meet the real needs of the community.

1.2. Big Data Analysis

Big data analytics refers to the process of collecting, processing, and analyzing large and complex datasets generated from various digital activities, city sensors, public service platforms, and social interactions [11]. In the context of urban management, big data plays a critical role as a foundation for more accurate, predictive, and evidence-based decision-making. Big data analytics enables governments to identify patterns in citizen needs, map operational efficiency, anticipate crises (such as floods or traffic congestion), and design policies tailored to real-time conditions on the ground. By utilizing analytical techniques such as machine learning, data mining, and interactive visualization, big data significantly accelerates response processes and optimizes the use of public resources, making urban services faster, more precise, and cost-effective.

1.3. Urban Management

Urban management encompasses the planning, implementation, and control of all processes related to the functioning of a city, including transportation, housing, clean water, sanitation, public safety, and administrative services [12]. In modern contexts, urban management also takes on a strategic role, combining the efforts of government, communities, and the private sector to create livable, efficient, and sustainable cities. Technology-based urban management approaches—through the integration of smart governance and big data analytics—offer solutions to challenges such as urbanization, population growth, and pressure on infrastructure services. Effective urban management strategies require strong inter-agency coordination systems, sound data governance, and human resource capacity capable of navigating urban dynamics with innovation- and collaboration-based approaches.

1.4. Public Services

Public services refer to the various forms of services provided by the government to meet basic needs and improve the quality of life of its citizens, such as education, healthcare, public transportation, environmental sanitation, and civil administration [13]. The efficiency and quality of public services are key indicators of government performance, particularly in densely populated and complex urban areas. In the digital era, public services are expected to be transparent, accountable, and adaptive to changing citizen needs. The integration of digital technologies and the utilization of data have become crucial elements in transforming public services, with the aim of increasing citizen satisfaction while effectively and sustainably optimizing government resources.

2. Method

This study employs a qualitative approach using a descriptive-analytical literature review method. This approach was chosen to explore in depth various concepts, empirical findings, and theoretical arguments related to urban management strategies based on smart governance and big data analytics in enhancing the efficiency of urban public services. The objective of this method is to formulate a comprehensive understanding through a synthesis of relevant literature, without conducting direct field data collection. The data collection process was carried out by searching for and selecting scholarly articles published between 1989 and 2025, to ensure the topicality and relevance of the discussion in relation to the dynamics of contemporary smart urban governance. The primary data sources include Google Scholar and credible websites, such as reputable international journal portals (e.g., ScienceDirect, SpringerLink, Taylor & Francis, and Wiley), as well as publications from official government institutions, international research organizations, and technology-based institutions involved in smart city development. In the initial stage, a total of 50 articles matching the main keywords—smart city, smart governance, big data analytics, urban public service efficiency, and urban management strategy—were identified. However, to ensure analytical quality and thematic relevance, a rigorous selection process was conducted based on specific criteria, including: (1) direct relevance to the core research topic; (2) publication in reputable journals or by official institutions; (3) urban context, either on a global or national scale, particularly in developing countries; and (4) use of methods and results that are conceptually comparable. Following this selection, 24 scholarly articles were chosen as the primary sources for analysis in this study. The analysis was conducted through a qualitative descriptive method by organizing findings from the selected articles into several major themes, such as the conceptual framework of smart governance, the use of big data in urban decision-making, public service efficiency strategies, and the challenges of digital policy implementation at the local level. Each finding was critically analyzed to identify patterns, differences in approaches, and potential synthesis

across the literature. This process was carried out systematically to ensure that the study's results go beyond mere summarization and provide meaningful conceptual contributions to the development of urban governance studies in both the Indonesian and global contexts.

3. Result and Discussion

The concept of smart governance, which serves as one of the foundational pillars of modern urban management, is rooted in the framework of New Public Governance (NPG) developed by [14]. Philosophically, this framework offers a renewal of traditional governance approaches, which tend to be hierarchical and bureaucratic. NPG argues that the success of public governance today depends heavily on the synergy between government, civil society, the private sector, and local communities—not solely on the government's capacity as the exclusive decision-maker. In this context, smart governance emerges as a concrete manifestation of NPG principles, fully supported by advancements in digital technology such as information management systems, participatory applications, and open data mechanisms. These technologies allow citizens to actively participate in the public policy cycle—from planning and implementation to evaluation—making governance processes more transparent, efficient, and adaptive. Smart governance prioritizes open access to data, accountability in public decision-making, and the presence of more participatory social oversight systems. Therefore, in managing increasingly complex and dynamic cities, the adoption of smart governance is no longer a mere option but a strategic necessity to establish inclusive, efficient, and responsive governance systems that address citizens' needs in real-time. More than just a managerial tool, smart governance is an ethical and structural framework for building public trust and accelerating innovation in urban service delivery.

Aligned with this theoretical foundation, empirical findings by [15] highlight the strong relationship between the implementation of smart governance and the use of big data in enhancing public service performance. Their study of cities in Latin America—such as Bogotá, Quito, and São Paulo—demonstrated that the use of real-time data-based digital dashboards across sectors like transportation, sanitation, and citizen complaints reduced bureaucratic response times by up to 40% and improved the efficiency of operational resource allocation within local governments. A key insight from this study is that digital responsiveness—the ability of government institutions to rapidly interpret and respond to data—correlates directly with increased citizen satisfaction. These findings illustrate how big data analytics is shifting the paradigm of public management from a reactive to a proactive approach. Governments no longer wait for complaints or crises to occur; instead, they anticipate needs through trend analysis and data-driven forecasting. This model also strengthens collaborative governance, as openly available data can be jointly analyzed by government agencies, researchers, and civil society to evaluate service performance and formulate policy innovations. The study affirms that the success of smart governance and big data implementation depends on the readiness of organizational structures and bureaucratic culture to embrace more open, responsive, and evidence-based operational logic.

One of the most representative case studies of successful integration between smart governance and big data analytics can be found in the city of Amsterdam through its Amsterdam Smart City initiative. The city has developed an Internet of Things (IoT)-based system and data analytics infrastructure to manage various aspects of urban life in an integrated manner, including public transportation, energy consumption, waste management, and air quality. This project has fostered the development of a digital ecosystem that connects citizens, city government, the private sector, and research institutions within a collaborative network. A tangible example of its implementation is the use of sensors and predictive algorithms to regulate traffic flow and city lighting automatically, which has reduced energy consumption by 15% and alleviated congestion in the city center. Additionally, digital applications developed by the government allow residents to access public data, provide feedback, and participate in urban planning processes, including redesigning public open spaces or formulating green mobility policies. A study by [16] notes that Amsterdam's success stems from its open and cooperative governance approach, where data is treated as a common good rather than a government monopoly. This achievement underscores that effective smart governance strategies require urban management models that are democratic, inclusive, and oriented toward long-term sustainability across social, economic, and environmental dimensions.

Surabaya can be positioned as a benchmark model for the implementation of big data-based smart governance in Indonesia, particularly in emerging urban areas. The Surabaya city government has established a digitally connected ecosystem through the Surabaya Command Center, which serves as a control hub for real-time data from various public services such as traffic, emergency response, and citizen complaints [17]. One of its key innovations is the WargaKu application, which enables residents to directly report environmental conditions in their neighborhoods, thus shortening the communication chain between citizens and the

government. According to a study by [18], this digital transformation has produced concrete impacts, with the average response time to citizen complaints being reduced from seven days to two days. This reduction reflects not only time efficiency but also improvements in accountability and the speed of data-driven policy responses. Although Surabaya's information technology infrastructure is not yet perfect, the city's ongoing commitment to building sustainable data integration demonstrates that public service efficiency depends heavily on how such systems are strategically and purposefully managed within a participatory smart governance framework.

In explaining the phenomenon of technology adoption within city governments, the Technology Acceptance Model (TAM), introduced by [19], offers a relevant theoretical framework. This theory emphasizes that technology acceptance is determined by two main factors: perceived usefulness (the extent to which technology is considered beneficial) and perceived ease of use (the ease with which the technology can be used). In the context of smart governance-based city management, these two indicators serve as critical benchmarks in assessing the success of digital system integration in public services. If both citizens and government officials perceive tangible benefits from technology use—such as faster services, information transparency, and enhanced participation—then adoption will increase significantly. On the other hand, ease of use is also a determining factor, as overly complex systems tend to decrease participation and hinder the implementation of digital policies. Effective city management strategies focus on incorporating socio-cultural approaches in building digital literacy among citizens and providing training for public employees to create alignment in technology adoption across all levels of government.

In addition to domestic experiences such as those in Surabaya, valuable lessons can also be drawn from international studies, such as that conducted by [20] on the city of Dublin, Ireland. The study highlights how big data analytics has been strategically employed to manage traffic congestion and demand for social services. By integrating various data sources such as public transport GPS, road sensors, and citizen reporting systems, the Dublin government has been able to generate predictive analytics that help anticipate spikes in public activity. For instance, with accurate predictions regarding traffic congestion or emergency service demand, resource allocation such as service vehicles and personnel can be adjusted in advance. This approach enables more efficient budget planning, as expenditures are focused on pre-identified priority areas. It proves that the use of big data analytics in city management serves as a strategic instrument in shaping evidence-based policies, which directly enhances the efficiency and effectiveness of public services.

The failure of smart governance implementation in many developing cities, including those in Indonesia, does not merely reflect technical challenges but also indicates deeper structural issues, particularly in terms of inter-agency coordination and cross-sector digital policy management. [21] highlighted that data fragmentation among institutions causes inefficiencies in decision-making processes due to the lack of strong integration between information systems and bureaucratic work mechanisms. This situation is further exacerbated by the low quality of human resources, both in terms of technical skills and digital literacy, leading to a dependency on vendors or third parties in the development and utilization of information technology. In Indonesia, this is evident in the misalignment of data formats and the lack of system compatibility between central ministries and regional departments, which ultimately complicates data synchronization for cross-sector services such as healthcare, education, and transportation [22]. Without a clear legal framework governing public data management and citizen privacy protection mechanisms, digitalization efforts also risk triggering public distrust. This implies the urgent need for institutional reform that emphasizes organizational cultural transformation and the enhancement of civil servant (ASN) capacity to act as reliable and accountable data stewards.

Within the framework of institutional theory, institutional reform becomes the key to successful implementation of technology-based policies, including in the context of smart governance [23]. This theory underscores the importance of adjusting organizational norms, structures, and work systems to align with external environmental changes, including technological advancements and evolving public expectations. In this context, adaptive institutional capacity and continuous learning are essential prerequisites for managing big data as a strategic asset in city management. Implementing smart governance requires institutions that can integrate information systems, formulate data-driven policies, and respond to citizen needs in real-time. Unfortunately, many public institutions in developing countries remain rigid and bureaucratic, making them slow to adapt to technological changes. Updating institutional structures through digital bureaucratic reforms and strengthening public accountability are critical steps that must be aligned with technological investments to ensure that smart governance systems can function optimally.

Additionally, the Dynamic Capabilities (DC) theory developed by [24] is highly relevant in explaining why some cities successfully adapt to digital technologies while others lag behind. This theory posits that an organization or institution's success in navigating environmental change is determined by its ability to sense opportunities and threats, seize those opportunities, and reconfigure internal resources and capabilities dynamically. In the context of urban governance, the ability to respond to the evolving needs of citizens,

capitalize on opportunities presented by big data advancements, and convert data into actionable policies becomes a vital component of smart governance strategies. Without these dynamic capabilities, public institutions—even when equipped with adequate technological infrastructure—will likely fail in implementing smart governance. Therefore, building dynamic capabilities at the institutional level must become a priority in optimizing the use of big data to support effective and sustainable city management and public service delivery.

Through lessons drawn from case studies such as Surabaya in Indonesia and Dublin in Ireland, it is evident that the success of smart governance and big data analytics in urban management relies heavily on the synergy between technology, policy, and citizen participation. Surabaya’s experience demonstrates that infrastructure limitations are not the primary obstacle when digital strategies are implemented consistently using adaptive, citizen-oriented approaches. Conversely, the Dublin case illustrates how data-driven predictive analytics can foster more efficient resource redistribution and budget allocation. However, such success can only be achieved if data is accurately collected, integratively managed, and applied within a clear and participatory policy framework. Therefore, strengthening data governance, engaging citizens in the digitalization process, and developing flexible policy structures are essential foundations for the sustainable implementation of smart governance.

Furthermore, the success of smart governance is inseparable from the public’s trust in the systems being used. Within e-government literature, digital trust emerges as a critical issue influencing the extent to which citizens engage with technology-based public services. When people do not believe that their personal data is managed securely and transparently, technology adoption rates decline and digital strategies lose legitimacy. Consequently, city governments must not only prioritize efficiency and innovation but also focus on data protection, transparency in information usage, and public involvement in service design. In this regard, applying the principles of good governance—such as accountability, openness, and participation—serves as the backbone of a successful smart governance model based on big data analytics. Cities that manage to maintain a balance between innovation and data ethics are more likely to create efficient and inclusive public services.

Considering various theories, case studies, and previous research findings, it can be concluded that the implementation of smart governance and big data analytics offers a strategic solution for improving efficiency, accuracy, and transparency in urban management. However, its success requires a holistic approach that goes beyond technological aspects. The key lies in institutional readiness to manage change, the ability to respond to citizens' needs in real-time, and active public participation. Investments in technology must be matched with human resource capacity building, regulatory reforms, and improvements in organizational structures, ensuring that digitalization is not merely symbolic modernization but a real transformation of public services focused on citizen satisfaction.

Therefore, future strategies must involve cross-sector integration, the development of clear legal frameworks for public data governance, and comprehensive human resource development. Local governments should foster a collaborative ecosystem involving the public sector, private enterprises, academia, and civil society to jointly build responsive and sustainable smart cities. In this context, the quadruple helix approach is particularly relevant, as it enables collaborative innovation that is not only top-down but also accommodates the needs and aspirations of citizens. Without this collaborative approach, digital transformation risks becoming a mere accumulation of data without clear policy direction. Hence, effective smart governance requires a strong institutional foundation, openness to innovation, and a steadfast commitment to delivering inclusive and high-quality public services.

Figure 1. Key Findings on Smart Governance and Big Data in Urban Public Service Efficiency

| No. | Key Findings | Brief Description | Source/Case |
|-----|---|--|-------------------------------|
| 1 | Smart Governance as a Manifestation of NPG | Smart governance represents the application of <i>New Public Governance</i> principles, emphasizing collaboration among governments, civil society, the private sector, and local communities. | NPG Theory [14] |
| 2 | Technology's Role in Public Participation | Digital technologies (open data, apps, information systems) enable citizens to actively engage in the policy-making cycle (planning, implementation, evaluation). | General |
| 3 | Efficiency through Big Data Analytics | Big data helps reduce bureaucratic response times by up to 40% and optimizes resource allocation. | Bogotá, Quito, São Paulo [15] |
| 4 | Success Case: Amsterdam Smart City | Utilizes IoT and data analytics to manage transportation, energy, waste, and air quality. Results include 15% energy savings and reduced traffic congestion. | Amsterdam [16] |

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|----|---|--|---------------------------|
| 5 | Local Model: Surabaya | Through the Surabaya Command Center and the WargaKu app, citizen complaint response times dropped from 7 days to 2 days. | Surabaya [17], [18] |
| 6 | Technology Acceptance Model (TAM) | Technology adoption depends on users' perceptions of usefulness and ease of use, including both citizens and civil servants. | TAM Theory [19] |
| 7 | Dublin Study: Prediction and Resource Allocation | Predictive analytics help governments anticipate surges in service demand and improve budget efficiency. | Dublin [20] |
| 8 | Challenges in Developing Countries | Data fragmentation, vendor dependency, lack of skilled human resources, and weak interagency integration. | Indonesia [21], [22] |
| 9 | Institutional Reform as a Requirement | Adjusting norms and organizational structures is essential to integrate information systems and respond to citizens' needs in real time. | Institutional Theory [23] |
| 10 | Dynamic Capabilities Theory | Cities' success in digital transformation depends on adaptive capabilities: sensing, seizing, and reconfiguring internal resources. | DC Theory [24] |
| 11 | Success Factors: Collaboration & Participation | Effective smart governance relies on synergy between technology, policy, and citizen participation. | Surabaya & Dublin |
| 12 | Digital Trust as a Prerequisite | Public trust in data privacy and management determines the success of digital service adoption. | e-Government Literature |
| 13 | Need for a Holistic Approach | Success is not determined solely by technology but also by institutional readiness, human capacity, regulations, and public involvement. | General Conclusion |
| 14 | Quadruple Helix as a Strategic Approach | Collaboration among government, private sector, academia, and civil society is crucial in building inclusive and sustainable smart cities. | Strategic Recommendation |

4. Conclusion

This study concludes that the integration of smart governance and big data analytics represents a highly strategic and relevant approach in addressing the complexity of modern urban governance. Smart governance facilitates the creation of a more open, participatory, and collaborative government, while big data analytics provides a strong data foundation to support accurate, timely, and evidence-based decision-making. Together, these two elements synergistically enhance the efficiency of public services by accelerating response times, optimizing resource distribution, and strengthening the relationship between government and citizens. Case studies from Amsterdam, Surabaya, and Dublin demonstrate that consistent implementation of this strategy can lead to significant transformations in urban service quality. However, the success of such integration strongly depends on the readiness of digital infrastructure, the competency of human resources, and the existence of a robust data governance framework.

Theoretically, this research reinforces the relevance of the New Public Governance framework and the Technology Acceptance Model as conceptual foundations for understanding the adoption and implementation of technology in city governance. Practically, the findings provide valuable insights for policymakers—particularly city governments—to begin steering their management strategies toward more integrated and data-driven systems. Implementing smart governance and big data necessitates the development of participatory and accountable systems. These implications demand institutional transformation, civil servant training in data literacy, and the establishment of interoperability systems between government agencies. In the long term, this strategic implementation can contribute to achieving the Sustainable Development Goals (SDGs), especially in the domain of sustainable cities and communities.

This study has several limitations. First, as a literature review using a descriptive qualitative approach, it does not present primary empirical data from the field, and therefore cannot quantitatively measure the level of public service efficiency resulting from the implementation of the proposed strategies. Second, despite a rigorous selection process of articles from credible sources, the risk of publication bias remains—particularly as most of the reviewed literature is based on the context of cities in developed countries, whereas urban conditions in developing nations such as Indonesia present different structural challenges. Third, the thematic scope is

limited to the integration of smart governance and big data, without delving into other emerging technologies such as AI, IoT, or blockchain, which are also increasingly utilized in smart city management.

Future research is recommended to combine qualitative and quantitative approaches through field studies in several Indonesian cities to empirically test the concrete impact of smart governance and big data analytics on public service efficiency. Furthermore, it is crucial for local governments to develop a digital transformation roadmap focusing on strengthening institutional capacity, establishing clear data governance regulations, and enhancing public digital literacy. The central government also needs to build a national data integration system that can more effectively support localized policies. Finally, collaboration between government, academia, and the private sector must be promoted in designing data-driven solutions that are aligned with the real needs of urban communities.

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