

GOVERNMENT BIG DATA GOVERNANCE MODEL TO IMPROVE THE EFFECTIVENESS OF INTEGRATED PUBLIC SERVICES

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Abstract

This study aims to analyze a government big data governance model for improving the effectiveness of integrated public services. The research focuses on inter-agency data integration, system interoperability, data security, and the use of public data in integrated service delivery. This study employs a qualitative method with an exploratory-descriptive approach and conceptual governance model development. Data were collected from secondary and documentary sources, including recent peer-reviewed journal articles, policy documents, institutional reports, digital government guidelines, regulatory materials, and scholarly works related to big data governance, data-driven government, interoperability, data security, and public-service innovation. The data were analyzed using thematic analysis by classifying findings into inter-agency data integration, system interoperability, data quality, data security, institutional coordination, collaborative governance, public-service effectiveness, and accountability. The findings show that integrated public services require more than digital applications or one-stop service portals. Effective integration depends on shared data standards, interoperable systems, secure data exchange, reliable data quality, and coordinated institutional responsibility. The study contributes by proposing a cross-sector government big data governance model consisting of institutional coordination, data integration, system interoperability, data quality assurance, data security, and collaborative service use. This model emphasizes that big data must be governed as a strategic public asset to improve service speed, accuracy, accessibility, transparency, and accountability.

Keywords: big data governance; data integration; integrated public services; interoperability; local government.

1. INTRODUCTION

Integrated public service delivery has become a central agenda in digital government transformation, particularly for local governments that must provide faster, more accurate, and citizen-oriented services. Public services are no longer expected to operate through fragmented administrative procedures in which citizens repeatedly submit the same documents to different agencies. In many local government contexts, service quality is still affected by sectoral databases, weak coordination among regional government agencies, limited interoperability, inconsistent data standards, and the absence of a unified data governance mechanism. These problems often create duplicated records, slow verification, inaccurate targeting, and unequal access to services. A government big data governance model is needed to transform public data from scattered administrative assets into an integrated foundation for public-service effectiveness [1], [2].

Big data governance in government refers to the institutional, technical, ethical, and managerial arrangements through which public data are collected, standardized, shared, protected, analyzed, and used for service delivery. In integrated public services, big data governance is not limited to data storage or digital platforms. It includes data lifecycle management, interoperability standards, data quality assurance, metadata management, access control, institutional coordination, privacy protection, and accountability mechanisms. Shah et al. [1] argue that data-driven governments require a data lifecycle framework that manages data from creation to reuse. Sangkachan and Powintara [5] also emphasize that data-driven government depends on mechanisms that allow public organizations to use data strategically. These perspectives indicate that the effectiveness of integrated services depends not only on digital applications, but also on the governance structure that connects data, institutions, technology, and public value.

The urgency of this study is also shaped by the increasing complexity of public-service needs. Integrated public services require governments to connect population administration data, licensing data, social assistance data, health and education records, tax data, complaint data, spatial data, and sectoral service databases. Without interoperability, each government agency may operate with its own data format, indicators, verification procedure, and service logic. This situation weakens service integration and reduces the ability of government to provide one-stop, proactive, and personalized services. Data quality is also a major concern because inaccurate, outdated, or

inconsistent data may lead to administrative errors and unfair service outcomes [10]. The use of big data for integrated public services must be supported by clear institutional rules, secure data exchange, inter-agency coordination, and reliable analytical capacity [3], [4].

Recent studies have provided important foundations for understanding government big data, open data, and data-driven governance. Hossin et al. [2] show that big data-driven public policy can support planning, policy design, service delivery, supervision, and feedback. Sayogo et al. [3] identify challenges of data-driven decision-making in Indonesian local governments, including data quality, institutional culture, regulatory support, and human capability. Ariansyah et al. [4] develop a big data readiness assessment model for Indonesian local governments and emphasize organizational, technological, and environmental readiness. Shah et al. [1] propose the DaLiF framework as a data lifecycle model for data-driven governments. Sangkachan and Powintara [5] explain that data-driven government requires essential mechanisms to transform data into administrative value. Wirtz et al. [6] systematically review open government data research and highlight its role in public-sector innovation and transparency. Begany and Gil-Garcia [7] further show that open government data initiatives can become agents of digital transformation when their use is institutionally embedded.

Other studies have examined digital public services, open government, data quality, public-sector digital transformation, and citizen-oriented data use. Tai [8] demonstrates that open government research has expanded from transparency toward participation, collaboration, and digital governance. Francey and Mettler [9] explain that open government data can generate public effects, although its value depends on use, governance, and institutional context. Wook et al. [10] highlight data quality dimensions as important conditions for big data analytics. Criado et al. [11] show that digital public services are a form of administrative innovation that requires organizational capability and service redesign. Verma [12] explains that sentiment analysis can help governments understand citizen experience and improve public services. Studies on AI and digital transformation also show that public-sector data use must be connected to organizational readiness, governance capacity, privacy protection, and public value [13]–[17]. Local government digital technology adoption requires alignment among people, processes, and technology [18], while public-sector digital change requires new competencies, institutional learning, and work-process adaptation [19], [20].

The literature also shows that big data governance must address ethical, security, and accountability dimensions. Chao et al. [21] demonstrate that big data can support policy-making in public health, a field where data accuracy, protection, and institutional responsibility are critical. Mills et al. [22] emphasize that evidence-based public policy requires careful use of data to support sustainability and public objectives. Attard-Frost et al. [23] show that AI and data governance initiatives require coordination, policy clarity, and implementation mechanisms. De Almeida and dos Santos Jr. [24] explain that public organizations need structured governance to operationalize technological and ethical principles. Saura et al. [25] warn that government use of behavioral data may create privacy risks if data governance is weak. Although previous studies have discussed big data, open data, data-driven government, public-sector digital transformation, and AI governance, there remains a gap in explaining how a cross-sector government big data governance model can be designed specifically to improve integrated public services at the local government level. This study addresses that gap by proposing a governance model based on coordination, data integration, interoperability, data security, institutional collaboration, and accountable public-service use. The study aims to analyze how inter-agency data integration and system interoperability can improve the effectiveness of integrated public services while ensuring that public data remain secure, reliable, and governed in the public interest.

2. RESEARCH METHODS

This study employs a qualitative research design using an exploratory-descriptive approach **and** conceptual governance model development. The qualitative approach is appropriate because the study does not aim to test statistical causality or measure the technical performance of a specific big data platform. Instead, it seeks to understand how government big data governance can improve the effectiveness of integrated public services through inter-agency data integration, system interoperability, data security, and institutional collaboration. The exploratory-descriptive approach allows the study to examine the managerial, institutional, technical, and ethical dimensions of big data governance in local government. Conceptual model development is used because the main novelty of this study lies in formulating a cross-sector government big data governance model that connects coordination, integration, interoperability, data protection, and public-service effectiveness.

The case study of this research focuses on big data governance for integrated public services in local government. Local government is selected as the unit of analysis because integrated public services require coordination across multiple regional government agencies, including population administration, licensing, health, education, social affairs, taxation, public works, civil registry, and complaint-handling units. The study examines several key aspects of data governance: data standardization, data sharing among agencies, interoperability between service platforms, data validation, metadata management, access control, data security, institutional responsibility, and the use of data in public-service decision-making. These aspects are analyzed in relation to how local governments can reduce duplicated records, accelerate verification, improve service accuracy, support one-stop services, and provide more responsive citizen-oriented public services.

The data used in this study are collected from secondary and documentary sources. The main sources consist of peer-reviewed journal articles published within the last five years, policy documents, institutional reports, regulatory materials, digital government guidelines, and scholarly works related to big data governance, integrated public services, interoperability, open government data, data-driven government, public-sector digital transformation, data security, and public-service innovation. Data collection is conducted through document identification, relevance screening, thematic classification, and content analysis. The data are analyzed using qualitative thematic analysis by classifying findings into several themes: inter-agency data integration, system interoperability, data quality, data security, institutional coordination, collaborative governance, public-service effectiveness, and accountability. The results of this analysis are then used to construct a cross-sector government big data governance model that positions big data as a strategic foundation for integrated, secure, accountable, and citizen-oriented public services.

3. RESULTS AND DISCUSSION

a. Inter-Agency Data Integration as the Foundation of Integrated Public Services

The findings show that inter-agency data integration is the main foundation for improving the effectiveness of integrated public services. Local governments often manage public services through different regional government agencies, each with its own database, service procedure, data format, and verification mechanism. This fragmentation creates several administrative problems, including duplicated citizen records, repeated document submission, slow service verification, inconsistent beneficiary data, and weak coordination among agencies. Integrated public services require a governance system that enables population data, licensing records, health data, education data, social assistance data, tax data, complaint data, and spatial information to be connected through a unified data architecture.

The analysis indicates that big data governance allows local governments to transform scattered sectoral data into a shared public-service resource. Data integration can reduce administrative inefficiency because citizens do not need to repeatedly submit the same information to different agencies. It also improves service accuracy because government agencies can verify citizen identity, eligibility, service history, and administrative status through interconnected data systems. This finding is consistent with Shah et al. [1], who argue that data-driven government requires a data lifecycle framework that regulates data creation, storage, processing, sharing, and reuse. Hossin et al. [2] also show that big data-driven public policy can strengthen service delivery, supervision, and public feedback when data are managed as strategic governance assets.

The findings also show that data integration must be supported by clear institutional coordination. Big data governance cannot operate effectively if each agency maintains sectoral ownership over data without shared standards and collaborative mechanisms. Local governments need formal rules regarding data sharing, data stewardship, metadata management, data validation, and institutional responsibility. Sayogo et al. [3] emphasize that data-driven decision-making in Indonesian local governments faces challenges related to data quality, institutional culture, regulatory support, and human capability. Ariansyah et al. [4] further explain that big data readiness in the Indonesian public sector depends on organizational, technological, and environmental readiness. These studies support the finding that integrated public services require not only technical platforms, but also institutional arrangements that enable agencies to work through a shared data governance framework.

b. System Interoperability, Data Quality, and Data Security in Public-Service Governance

The second finding shows that system interoperability is a decisive factor in determining whether big data governance can improve integrated public services. Interoperability refers to the ability of different government information systems to exchange, interpret, and use data consistently. In local government, interoperability is needed because public services are delivered through various platforms, such as population administration systems, licensing applications, health-service systems, education databases, social assistance platforms, tax systems, complaint channels, and one-stop service portals. Without interoperability, public-service integration will remain superficial because digital platforms may exist, but they cannot communicate with one another effectively.

The analysis shows that interoperability must be supported by common data standards, application programming interfaces, metadata rules, data classification, and technical protocols for secure data exchange. These elements are important because integrated services depend on the ability of agencies to access relevant data without creating duplication, inconsistency, or unauthorized use. Wook et al. [10] highlight that data quality is a key dimension in big data analytics because inaccurate, incomplete, or inconsistent data can weaken the validity of analytical outputs. Sangkachan and Powintara [5] also explain that data-driven government requires essential mechanisms that allow public organizations to transform data into administrative value. In this study, interoperability is understood not only as a technical requirement, but also as a managerial condition for service integration.

Data security is another central finding in big data governance for integrated public services. Integrated public services involve sensitive data, including identity records, family information, health status, social assistance eligibility, tax information, licensing documents, and citizen complaints. If these data are integrated without strong protection, the risk of privacy violation, unauthorized access, data leakage, and misuse of personal information increases. Saura et al. [25] warn that government use of behavioral and citizen data may create privacy risks when

data governance is weak. This finding confirms that integrated public-service governance must include privacy protection, access control, encryption, audit trails, data minimization, and clear accountability for data use.

The discussion also shows that data quality and data security must be balanced with service usability. Excessive restrictions may slow down service integration, while weak security may endanger citizen rights. Local governments therefore need a risk-based data governance approach. Low-risk data may be shared more openly for planning and service improvement, while sensitive personal data must be managed through strict access rules and legal safeguards. Open government data studies show that data openness can support transparency, innovation, and public value, but its benefits depend on institutional use and governance context [6], [7], [8], [9]. This means that public data governance should not simply promote openness, but must distinguish between open data, shared administrative data, restricted data, and confidential personal data.

c. Cross-Sector Big Data Governance Model for Effective Integrated Public Services

The main result of this study is the formulation of a cross-sector government big data governance model for improving integrated public services. The model consists of six interconnected components: institutional coordination, data integration, system interoperability, data quality assurance, data security, and collaborative service use. Institutional coordination refers to the arrangement of roles, responsibilities, and authority among regional government agencies. Data integration refers to the consolidation and connection of sectoral datasets into a shared service ecosystem. System interoperability refers to the technical ability of digital platforms to exchange and interpret data. Data quality assurance ensures that data are accurate, complete, updated, and consistent. Data security protects citizen information from misuse and unauthorized access. Collaborative service use ensures that integrated data are used to improve public-service effectiveness rather than merely stored in digital systems.

This model contributes to previous studies by connecting big data governance with the practical needs of integrated public services at the local government level. Previous studies have discussed data-driven government, open government data, digital public services, and public-sector digital transformation [1], [2], [6], [11], [18]. This study extends those discussions by emphasizing that integrated public services require a cross-sector governance model that links technical interoperability with institutional collaboration and data protection. Criado et al. [11] show that digital public services represent innovation in public administration when they involve service redesign and organizational capability. Scupola and Mergel [20] further argue that digital transformation in public administration should be connected to co-production and public value creation. These arguments support the finding that big data governance must be oriented toward better citizen experience, not only administrative modernization.

The proposed model also highlights that big data governance can strengthen service effectiveness in several ways. First, it accelerates service verification by allowing agencies to access validated data from other institutions. Second, it improves service accuracy by reducing duplication and inconsistency across databases. Third, it supports proactive services because governments can identify citizen needs without waiting for repeated manual submissions. Fourth, it improves monitoring and evaluation by providing integrated service-performance data. Fifth, it strengthens accountability because data use can be tracked, audited, and evaluated. These functions are consistent with Mills et al. [22], who emphasize the importance of evidence-based public policy, and Chao et al. [21], who show that big data can support more responsive policy-making in public-service sectors.

The findings also indicate that institutional collaboration is the most difficult but most important element of big data governance. Technology can connect databases, but only institutions can define authority, responsibility, and accountability. Local governments need data governance bodies, inter-agency agreements, standard operating procedures, shared indicators, and leadership commitment to ensure that integrated data are used properly. Haug et al. [19] explain that digitally induced change in the public sector requires organizational learning, new competencies, and changes in work routines. Ahn and Chen [17] also show that digital transformation in AI-augmented public administration depends on employee perception and willingness to use digital systems. These findings imply that cross-sector big data governance requires both technological readiness and bureaucratic adaptation.

The overall analysis confirms that big data governance can improve integrated public services when it is designed as a comprehensive governance system rather than a collection of digital applications. The effectiveness of integrated services depends on the ability of local governments to coordinate agencies, integrate data, ensure interoperability, maintain data quality, protect data security, and use data collaboratively for citizen-oriented services. The novelty of this study lies in offering a cross-sector model that connects coordination, integration, security, and institutional collaboration within one governance framework. This model positions big data as a strategic public asset that must be governed responsibly to improve service speed, accuracy, accessibility, transparency, and accountability.

4. CONCLUSION

This study finds that government big data governance is a strategic requirement for improving the effectiveness of integrated public services. The main finding shows that public-service integration cannot be achieved only by developing digital applications or one-stop service portals. Integrated public services require a governance system that connects inter-agency data integration, system interoperability, data quality assurance, data security,

institutional coordination, and collaborative use of public data. Without these elements, digital services may remain fragmented, repetitive, and unable to provide accurate, fast, and citizen-oriented administrative processes.

The findings also show that data integration among regional government agencies is the foundation of effective public-service delivery. Local governments need to connect population data, licensing data, health records, education data, social assistance databases, tax information, complaint data, and spatial information into a shared service ecosystem. This integration can reduce duplicated records, accelerate administrative verification, improve service accuracy, and support proactive public services. Yet, data integration must be supported by clear institutional rules, shared standards, data stewardship, metadata management, and accountability mechanisms.

The novelty of this study lies in the formulation of a cross-sector government big data governance model for integrated public services. The model consists of six main components: institutional coordination, data integration, system interoperability, data quality assurance, data security, and collaborative service use. This model extends previous studies on data-driven government, open government data, and digital public services by emphasizing that integrated public-service effectiveness depends on both technical interoperability and institutional collaboration. Big data is positioned not merely as a technological resource, but as a strategic public asset that must be governed responsibly across sectors.

The study also implies that local governments must balance service efficiency with data protection. Integrated public services involve sensitive citizen data, including identity records, health information, social assistance eligibility, licensing documents, tax records, and public complaints. For this reason, big data governance must include access control, privacy protection, audit trails, data minimization, and clear responsibility for data use. Public data integration should improve service quality without weakening citizens' rights to privacy, security, and accountable administration.

This study has limitations because it uses a qualitative and documentary-based approach. The proposed model has not yet been empirically tested in a specific local government or integrated public-service system. Future research should examine the implementation of this model through field studies, interviews with public officials, system analysis, and citizen satisfaction surveys. Further studies may also compare different local governments to identify how institutional capacity, digital infrastructure, leadership, regulation, and organizational culture influence the success of big data governance in integrated public services.

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