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Multilevel Governance for Metropolitan Innovation in Indonesia

Linking Institutional Coordination and Digital Transformation

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Abstract: Metropolitan innovation increasingly depends on coordination across administrative boundaries, yet Indonesian metropolitan areas remain governed through institutions whose authority, resources, and digital capacities are distributed across levels of government. This study examines how multilevel governance shapes metropolitan innovation through institutional coordination and how digital transformation can strengthen that relationship. A structured qualitative literature review was conducted using peer-reviewed articles, scholarly works, policy reports on multilevel governance, metropolitan governance, public-sector innovation, knowledge transfer, and digital transformation. Sources were identified through predefined keywords, screened for relevance and credibility, coded thematically, compared across sources, and synthesized across governance, coordination, knowledge, digital, and innovation dimensions. The synthesis indicates that metropolitan innovation is not primarily constrained by the availability of technology, but by fragmented authority, inconsistent policy, uneven institutional capacity, limited knowledge transfer, and weak interoperability. Institutional coordination emerges as the central linking mechanism: multilevel governance establishes the distribution of authority; coordination aligns roles, policies, resources, and knowledge; and digital transformation provides infrastructure for information sharing and service integration. The study develops an integrated framework in which innovation replication is treated as an adaptive learning process involving knowledge transfer, institutional alignment, governance capacity, implementation, evaluation, and feedback. The framework implies that Indonesian metropolitan policy should prioritize functional coordination, shared data infrastructure, adaptive capacity building, and mechanisms for scaling innovations across jurisdictions.

Keywords: multilevel governance; metropolitan innovation; institutional coordination; digital transformation.

1. Introduction

Metropolitan areas have become increasingly important spaces for economic activity, public service delivery, infrastructure provision, and innovation as urbanization and interdependence intensify. Unlike conventional administrative areas, metropolitan areas are functional spaces in which population mobility, economic activities, infrastructure systems, and public services extend across multiple jurisdictions. This creates a fundamental governance challenge: metropolitan problems and innovation opportunities increasingly operate at a functional scale, while institutional authority, resources, and policy responsibilities remain distributed across governments and jurisdictions. Research on metropolitan governance has long demonstrated that jurisdictional institutions and the roles of governmental actors influence the capacity for interjurisdictional cooperation (Matkin & Frederickson, 2009). More recent research further shows that multilevel governance can shape the capacity of local governments to pursue innovation when collaboration across governmental and institutional boundaries is effectively organized (Galvin, 2019). Contemporary metropolitan governance research likewise emphasizes that fragmented jurisdictions, overlapping organizations, competing interests, and loosely coupled policy processes can coexist with collective action, making coordination a central but complex governance task (Artioli & Le Galès, 2025). Thus, metropolitan innovation should not be understood merely as the introduction of new technologies or services, but as an institutional and governance process through which different levels of government and metropolitan actors coordinate resources, knowledge, policies, and implementation.

The Indonesian context illustrates this governance challenge particularly clearly. Indonesia's metropolitan areas increasingly function as interconnected urban systems whose economic activities, population movements, infrastructure, and public services extend beyond individual administrative jurisdictions. Recent evidence from Badan Pusat Statistik [BPS-Statistics Indonesia] confirms this functional character through Indonesia Metropolitan Statistical Areas 2024, which delineates metropolitan areas using an integrated labor-market approach and commuting interactions rather than administrative boundaries alone. The analysis identifies 127 core clusters across Indonesia and provides detailed attention to 10 National Priority Metropolitan Areas, including Jabodetabekpunjur (Jakarta–Bogor–Depok–Tangerang–Bekasi–Puncak–Cianjur), Mebidangro (Medan–Binjai–Deli Serdang–Karo), and Mamminasata (Makassar–Maros–Sungguminasa–Takalar) (BPS-Statistics Indonesia, 2026). This functional configuration creates a governance problem because responsibilities for transportation, spatial planning, environmental management, infrastructure, and public services remain distributed among national, provincial, and local institutions. In the case of Jabodetabekpunjur, the institutional relationship between national and regional governments is particularly complex because metropolitan regulation and institutional arrangements involve multiple levels of government and overlapping legal instruments (Wardhana & Huda, 2022). Earlier comparative research on Indonesian metropolitan areas also shows that inter-local-government cooperation has faced difficulties under decentralization, with metropolitan partnerships requiring institutional mechanisms capable of coordinating interests and infrastructure across administrative boundaries (Firman, 2014). These conditions suggest that Indonesian metropolitan innovation requires governance arrangements capable of coordinating policy, resources, knowledge, and implementation across jurisdictions rather than relying solely on the administrative authority of individual governments.

Three strands of scholarship are particularly relevant to understanding metropolitan innovation. First, multilevel and collaborative governance research explains how authority, resources, and responsibilities are distributed vertically and horizontally, and why coordination becomes necessary when policy problems extend beyond the jurisdiction of a single government (Ansell & Gash, 2008; Torfing et al., 2019). This perspective is particularly important for metropolitan areas because innovation often depends on interactions among national, provincial, local, and nongovernmental actors rather than on the capacity of a single institution. Second, public-sector innovation research emphasizes that innovation is shaped by organizational, institutional, leadership, and collaborative conditions rather than by technological adoption alone (Cinar et al., 2023; de Vries et al., 2016). Cinar et al. (2023), for example, draw on 99 public-sector innovations in Italy, Japan, and Turkey to show that collaboration, shared goals, and mutual understanding are important conditions for successful innovation. Recent systematic evidence further confirms that public-sector innovation encompasses technological, organizational, governance, and social dimensions, while leadership, interorganizational collaboration, human capabilities, and institutional conditions influence both innovation and its constraints (Waheduzzaman, 2026). Third, digital-government scholarship demonstrates that digital transformation changes organizational processes, capabilities, routines, and relationships rather than simply replacing paper-based procedures with electronic systems (Mergel et al., 2019; Moser-Plautz & Schmidthuber, 2023; Pittaway & Montazemi, 2020). Digital transformation can therefore strengthen information exchange and service integration, but its effects depend on organizational readiness and institutional conditions. Smart-city and smart-governance research similarly suggests that digital capability should be understood as part of a broader institutional and collaborative governance process rather than as a technological intervention in isolation (Meijer & Bolívar, 2015). Taken together, these three strands indicate that metropolitan innovation is best understood as a governance process in which institutional coordination connects multilevel authority, collaborative action, organizational capacity, and digital transformation.

Despite these advances, the literature leaves a specific conceptual and policy gap. Metropolitan governance research has extensively examined jurisdictional fragmentation, intergovernmental relations, and institutional arrangements, while public-sector innovation research has focused more strongly on organizational antecedents, collaborative processes, and innovation outcomes. Research on digital transformation has likewise emphasized organizational change, digital capabilities, and technology-enabled public services. However, these strands provide less explicit explanation of the institutional mechanism through which multilevel governance is translated into coordinated metropolitan innovation, particularly in contexts where metropolitan functions cross administrative boundaries. Evidence from local and regional innovation policy suggests that multilevel interactions can shape the capacity of local governments to develop and implement innovation, but the coordination processes connecting different governmental levels and metropolitan actors remain insufficiently specified (Galvin, 2019). Similarly, knowledge-transfer research indicates that public-sector innovation depends not simply on the availability of successful practices, but on organizational processes that enable knowledge to be translated and incorporated into new contexts (Savory, 2009).

This study addresses that gap by positioning institutional coordination as the linking mechanism between multilevel governance and metropolitan innovation, with digital transformation as an enabling infrastructure. The novelty is therefore not

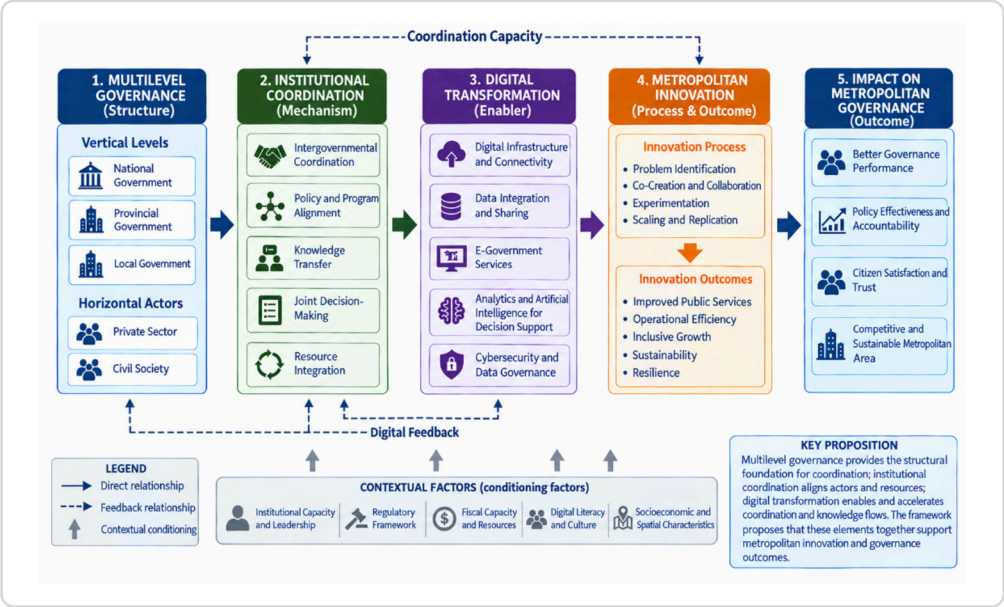


Figure 1. Theoretical Framework Linking Multilevel Governance, Institutional Coordination, Metropolitan Innovation, and Digital Transformation

Source: *Developed by the authors (2026).*

the simple combination of established concepts, but the specification of a process: governance structures distribute authority; coordination aligns institutional action; knowledge transfer enables learning; digital infrastructure accelerates exchange and integration; and metropolitan innovation emerges through adaptation and scaling. The research question is: how does multilevel governance influence metropolitan innovation in Indonesia through institutional coordination, and how can digital transformation strengthen this relationship? The objective is to develop an integrated conceptual and policy framework for understanding and strengthening metropolitan innovation governance. The framework is intended not as a predictive causal model but as a basis for analyzing how metropolitan innovation can be coordinated and sustained across Indonesian jurisdictions. The conceptual relationships proposed in this study are summarized in Figure 1.

2. Methods

2.1. Research Design and Literature Review Strategy

This study uses a structured qualitative literature review with thematic synthesis. The design is appropriate because the research question concerns institutional relationships, coordination mechanisms, knowledge processes, and innovation practices that are context dependent. Following established qualitative review principles (Bowen, 2009; Kallio et al., 2016), the review was organized as identification, screening, coding, comparison, and synthesis rather than as an unsystematic narrative review.

2.2. Search, Selection, and Coding

The search covered Scopus-indexed literature and Google Scholar, supplemented by authoritative policy and metropolitan-governance publications. Search terms combined multilevel governance, metropolitan governance, public-sector innovation, institutional coordination, digital transformation, smart governance, knowledge transfer, innovation diffusion, and collaborative governance. Priority was given to peer-reviewed journal articles, especially publications from 2015–2026,

while seminal works were retained when necessary to establish theoretical foundations. Sources were included when they addressed at least one of five dimensions: multilevel or collaborative governance; metropolitan, urban, regional, or public-sector innovation; institutional coordination and capacity; digital transformation or smart governance; or knowledge transfer and innovation diffusion. Sources were excluded when they lacked substantive relevance, duplicated another source, or dealt only with technical aspects of digital systems without a governance or innovation dimension. The review retained 35 sources, 30 of them peer-reviewed journal articles, which form the corpus synthesized below.

2.3. Thematic Synthesis and Trustworthiness

The analytical matrix recorded author, year, context, theoretical perspective, governance level, innovation dimension, institutional mechanism, digital dimension, findings, and relevance to the framework. Descriptive codes such as intergovernmental coordination, policy alignment, knowledge transfer, digital infrastructure, collaborative governance, innovation adoption, and adaptive capacity were then grouped into analytical categories. Thematic synthesis focused on four relationships: multilevel governance as structure, institutional coordination as mechanism, digital transformation as enabler, and metropolitan innovation as process and outcome. Trustworthiness was strengthened through source triangulation, iterative recoding, comparison of convergent and contradictory findings, and an explicit distinction between evidence reported in the literature and our analytical synthesis. The resulting framework is therefore a theoretically informed proposition, not a statistically validated causal model. This limitation is important because the study does not use primary metropolitan-level observations.

3. Results and Discussion

3.1. Typology of Metropolitan Innovation

The synthesis indicates that metropolitan innovation varies with institutional capacity, governance arrangements, fiscal resources, digital readiness, and the ability to collaborate across boundaries. Four analytical contexts can be distinguished: advanced, emerging, developing, and peripheral. These categories are not rankings of Indonesian metropolitan areas; they are diagnostic patterns derived from the literature.

Advanced contexts combine relatively strong coordination, fiscal capacity, digital infrastructure, and leadership. Innovation is more likely to become systemic, integrated, and scalable. Emerging contexts show growing innovation capacity but incomplete coordination, making adaptive and collaborative innovation more common. Developing contexts face resource and infrastructure constraints and tend to rely on incremental solutions. Peripheral contexts face stronger accessibility, human-resource, and infrastructure limitations, so innovation may focus on basic service improvement and external support.

The typology is consistent with innovation-systems and diffusion perspectives. Innovation depends on interactions among government, the private sector, academia, and civil society, while adoption depends on compatibility with institutional and social conditions. Consequently, an innovation successful in one metropolitan setting cannot be assumed to produce the same result elsewhere without adaptation. Table 1 summarizes the four contexts and their governance priorities.

Table 1. Analytical Typology of Metropolitan Innovation Contexts Based on Thematic Synthesis

Metropolitan Context	Institutional Characteristics	Typical Innovation	Governance Priority
Advanced	Strong coordination and capacity	Systemic innovation	Scaling and integration
Emerging	Growing but incomplete coordination	Collaborative/adaptive innovation	Capacity and coordination
Developing	Resource/infrastructure constraints	Incremental innovation	Foundational capacity
Peripheral	Accessibility and capacity limitations	Basic service innovation	Connectivity and external support

Source: Authors' synthesis (2026) of Ansell and Gash (2008), Farhan (2023), Hilmawan et al. (2023), Mahpudin (2022), OECD (2019), *and* Wijaya et al. (2026).

3.2. Innovation Replication and Multilevel Governance

Innovation replication is a central policy opportunity because governments can learn from solutions developed elsewhere. Replication, however, should not be treated as duplication. Differences in regulation, organizational structure, fiscal resources, digital infrastructure, and stakeholder relationships require the receiving jurisdiction to interpret and adapt the innovation.

The proposed replication model consists of knowledge transfer, institutional alignment, governance capacity, implementation, evaluation, and feedback. Knowledge transfer makes the innovation and its implementation experience accessible. Institutional alignment assesses compatibility with local rules, responsibilities, policy priorities, and socioeconomic conditions. Governance capacity provides leadership, skills, coordination, resources, and technology needed for implementation. Evaluation generates feedback that can modify the adapted solution and improve subsequent transfers.

This model extends Rogers' (2003) diffusion perspective by emphasizing institutional conditions after adoption. Multilevel governance provides the environment within which replication occurs: national institutions can establish standards and incentives, while provincial and local governments adapt and implement solutions. Intergovernmental networks provide horizontal learning, and private-sector and civil-society actors contribute resources and knowledge. Evidence from collaborative governance research suggests that trust, interaction, and shared problem solving are essential when no single actor controls the whole process (Ansell & Gash, 2008; Cinar et al., 2023).

The model therefore treats replication as an iterative learning cycle rather than a one-way transfer. The key policy distinction is between adoption and effective implementation. A metropolitan government may formally adopt an innovation yet fail to reproduce its benefits if institutional alignment and capacity are weak.

3.3. Knowledge Transfer Mechanisms

Knowledge transfer is the operational bridge between innovation diffusion and local adaptation. In metropolitan governance it involves not only technical information but also implementation experience, organizational routines, lessons learned, and tacit knowledge. The literature identifies six complementary channels: regulatory instruments, technical documentation, capacity building, intergovernmental networks, communities of practice, and digital platforms, summarized in Table 2.

Regulations and guidelines establish common standards and clarify responsibilities, while manuals and standard operating procedures convert experience into explicit knowledge. Training, mentoring, and technical assistance strengthen absorptive capacity. Intergovernmental forums and communities of

Table 2. Main Mechanisms of Knowledge Transfer in Metropolitan Innovation Replication

Mechanism	Main Function	Key Limitation
Regulation and guidelines	Standards and role clarity	May constrain adaptation
Documentation	Explicit implementation knowledge	Limited tacit/contextual knowledge
Training and mentoring	Capability and absorptive capacity	Resource intensive
Intergovernmental networks	Peer learning and coordination	Requires sustained participation
Communities of practice	Tacit knowledge exchange	Difficult to institutionalize
Digital platforms	Scalable information and data exchange	Interoperability and digital divide

Source: Authors' synthesis (2026) of Mora et al. (2023), Nonaka and Takeuchi (1995), OECD (2019), O'Sullivan et al. (2016), *and* Rogers (2003).

practice enable reciprocal learning and the transfer of tacit knowledge. Digital platforms expand the reach, speed, and searchability of knowledge exchange.

These channels are most effective as a connected system. A regulation can create the policy basis, documentation can explain implementation, training can develop capability, peer networks can support contextual interpretation, and digital platforms can preserve and circulate lessons. Digitalization therefore increases the scalability of knowledge transfer, but unequal infrastructure and interoperability can also reproduce regional disparities (Mergel et al., 2019; Mora et al., 2023).

The central implication is that knowledge transfer should be designed around absorptive capacity. Receiving institutions need the authority, skills, resources, and organizational support to interpret and modify what they receive. Without these conditions, transfer can produce formal compliance rather than substantive innovation.

3.4. Institutional Capacity, Readiness, and Barriers

Institutional capacity is multidimensional. The synthesis identifies leadership, regulatory support, human resources, organizational structure, digital infrastructure, financial capacity, and collaborative networks as recurring conditions for metropolitan innovation. Table 3 sets out these dimensions and the risks that arise when each is weak. Capacity should be viewed dynamically because learning and interaction can strengthen it over time.

Leadership provides direction and mobilizes resources; regulation determines the space for experimentation; human resources provide technical and managerial capability; organizational design clarifies responsibilities; digital infrastructure supports integration; finance enables continuity; and collaborative networks connect dispersed knowledge and resources. Recent evidence on Indonesian public-sector digital transformation also highlights leadership, information technology governance, and digital transformation as mutually reinforcing conditions for innovation capability (Kurniyanta et al., 2026).

Table 3. Institutional Capacity Dimensions Supporting Metropolitan Innovation

Capacity Dimension	Innovation Role	Typical Risk When Weak
Leadership	Direction and resource mobilization	Low commitment
Regulation	Space for experimentation and adaptation	Rigid or inconsistent policy
Human resources	Implementation and learning	Skill gaps
Organizational design	Role clarity and coordination	Silos and duplication
Digital infrastructure	Data integration and scalability	Fragmentation and incompatibility
Finance	Continuity and maintenance	Program discontinuity
Networks	Knowledge and resource exchange	Weak collaboration

Source: Authors' synthesis (2026) of Ansell and Gash (2008), Farhan (2023), Hilmawan et al. (2023), Mora et al. (2023), OECD (2019), *and* Wijaya et al. (2026).

Table 4. Principal Barriers to Metropolitan Innovation Replication and Corresponding Policy Responses

Barrier	Mechanism	Policy Response
Institutional fragmentation	Overlapping authority and inconsistent priorities	Functional coordination
Organizational silos	Weak sharing and resistance to change	Cross-unit collaboration
Digital disparity	Low interoperability and uneven access	Shared standards and infrastructure
Financial constraints	Weak continuity and maintenance	Sustainable financing
Human-resource gaps	Limited adaptation capability	Training and mentoring
Political and stakeholder risks	Policy reversal or weak legitimacy	Institutionalization and participation

Source: Authors' synthesis (2026) of Ansell and Gash (2008), Hilmawan et al. (2023), Mora et al. (2023), OECD (2019), *and* Torfing et al. (2019).

Readiness therefore depends on the interaction of these dimensions rather than on a single index. A technologically advanced metropolitan government may still fail to scale innovation if authority is fragmented or collaboration is weak. Conversely, a resource-constrained government may achieve useful incremental innovation when leadership, learning, and intergovernmental support are strong.

The principal barriers are institutional fragmentation, organizational resistance, technological disparity, financial constraints, human-resource gaps, and sociopolitical uncertainty. Institutional fragmentation is especially consequential because metropolitan innovation frequently requires shared data, integrated infrastructure, and joint services. Overlapping mandates or inconsistent priorities can prevent an innovation from moving beyond the originating organization. Table 4 sets out these barriers and the corresponding policy responses.

Organizational silos can reduce willingness to share information and resources. Technological disparities create interoperability problems, while limited budgets threaten continuity and maintenance. Skill gaps reduce the ability to adapt transferred solutions. Political turnover and weak stakeholder support can reverse or weaken long-term initiatives. Recent work also shows that digital innovation can be interrupted when evaluation systems focus narrowly on short-term measurable outputs rather than broader public value (Isik, 2025).

A further risk is contextual mismatch. Innovation characteristics that are compatible with one metropolitan setting may conflict with another's regulation, culture, fiscal capacity, or infrastructure. Replication strategies should therefore distinguish core elements that must be preserved from adaptable elements that should be redesigned locally.

3.5. Innovation Performance, Policy Strategies, and Ecosystem

The synthesis supports a three-level analytical classification of metropolitan innovation performance. High-capacity settings are characterized by coordinated institutions, stronger resources, digital readiness, and greater potential for systemic innovation. Medium-capacity settings can implement innovation but face coordination or resource constraints, so collaborative and adaptive innovation is more typical. Low-capacity settings face fragmented institutions, weak infrastructure, and limited skills, making incremental service innovation more feasible.

The classification is not a performance ranking. Its policy value lies in matching intervention to institutional conditions. High-capacity regions may need mechanisms for scaling and cross-jurisdictional integration; medium-capacity regions may benefit from knowledge networks and capacity building; low-capacity regions require foundational digital, human-resource, and institutional support before complex metropolitan integration can be sustained.

Six policy strategies follow from the synthesis. First, institutional integration should clarify mandates and create coordination mechanisms organized around functional metropolitan problems rather than administrative boundaries. Second, capacity building should combine leadership development, technical skills, mentoring, and peer learning. Third, digital transformation should prioritize interoperable systems, shared data standards, and platforms that support coordination rather than isolated applications.

Fourth, financing mechanisms should support both initial implementation and maintenance. Fifth, collaborative governance should involve governments, academia, the private sector, and civil society where problems require distributed knowledge and resources. Sixth, knowledge management should institutionalize lessons through repositories, documentation, communities of practice, and evaluation.

The strategies are interdependent. Digital platforms without institutional agreement can create fragmented information systems; training without resources may not translate into implementation; and regulations without feedback can constrain contextual adaptation. Monitoring should therefore assess not only adoption but also coordination, knowledge use, implementation quality, service integration, and sustainability.

An innovation ecosystem perspective integrates these strategies by treating metropolitan innovation as a network of interdependent actors. Government provides regulation, coordination, and public-value objectives; academia contributes knowledge; the private sector contributes technology and investment; and civil society contributes local knowledge, participation, and feedback. The ecosystem is enabled by digital infrastructure and trust-based relationships.

The ecosystem is not linear. Policy affects organizational incentives; organizational learning affects innovation; digital platforms change how actors exchange information; and implementation generates new knowledge. Effective governance therefore requires mechanisms that allow feedback across levels and actors. Smart-governance research supports this socio-technical interpretation, in which technology facilitates new forms of collaboration rather than replacing institutional governance (Meijer & Bolívar, 2015).

The final pathway is sustainable innovation. Sustainability requires institutionalization, collaboration, capacity building, digital integration, adaptive policy, and financial continuity. The strongest configuration is one in which authority, resources, knowledge, and data are aligned with the functional geography of metropolitan problems. The framework should nevertheless be treated as conceptual. Comparative case studies and quantitative indicators are needed to test whether the proposed mechanisms explain differences among Indonesian metropolitan areas.

3.6. Policy Integration for Indonesian Metropolitan Governance

The Indonesian setting adds an institutional dimension to the general metropolitan governance problem. Decentralization gives local governments important implementation responsibilities, while many metropolitan functions remain dependent on provincial and national policy, standards, financing, and infrastructure. Accordingly, coordination should not be designed as a purely hierarchical command mechanism. It should combine vertical alignment with horizontal cooperation among jurisdictions that face shared functional problems. This is consistent with multilevel innovation research, which emphasizes that innovation arenas evolve through

interactions among national and local institutions rather than through a single level of government (Koschatzky & Kroll, 2007; Sotarauta & Kautonen, 2007).

A practical institutional arrangement would therefore operate as a coordination platform rather than as another layer of administration. Its functions could include defining shared metropolitan priorities, coordinating an innovation portfolio, establishing interoperability and data standards, facilitating peer learning, mobilizing cross-jurisdictional resources, and evaluating whether transferred innovations produce public value. Such a platform could connect ministries, provincial governments, metropolitan coordinating bodies, local governments, academia, the private sector, and civil society. The emphasis should be on functions and problems rather than on creating a uniform organizational form for every metropolitan area. Recent work on innovation districts likewise shows that jurisdictional power and institutional arrangements continue to shape innovation trajectories even where local coalitions appear highly collaborative (Miao & Vasconcelos, 2026).

Digital infrastructure should support this institutional arrangement as shared coordination infrastructure. A common platform can make standards, data, innovation documentation, implementation lessons, and evaluation results accessible across jurisdictions. However, platform development should follow governance requirements rather than precede them. Without agreement on data ownership, standards, responsibilities, access rights, and decision processes, digital systems may simply reproduce existing institutional fragmentation. Research on digital public administration shows that transformation changes organizational routines and stakeholder relationships, while recent platform research highlights the potential of data-sharing arrangements to create public value when heterogeneous information can be connected across institutional boundaries (Mergel et al., 2019; Scupola & Mergel, 2022; Wang et al., 2026).

The same principle applies to innovation replication. A national or provincial program can provide a common policy framework, but the receiving metropolitan area needs discretion to modify implementation according to local capacity and functional conditions. Evaluation should therefore distinguish fidelity to core policy objectives from flexibility in implementation. This balance reduces the risk of two opposite failures: excessive standardization that prevents local adaptation and excessive discretion that produces incompatible systems. Recent evidence on decentralized public-sector data platforms reinforces the value of hybrid arrangements in which central and local practices coexist rather than being treated as mutually exclusive (Thabit et al., 2026).

Taken together, these findings suggest that metropolitan innovation policy should be organized as a continuous cycle of coordination, learning, adaptation, and evaluation. The cycle begins with a shared problem definition, identifies transferable knowledge, assesses institutional readiness, implements an adapted solution, evaluates outcomes, and feeds lessons back into the wider metropolitan network. This cycle operationalizes the central proposition of the study: multilevel governance creates the institutional setting, coordination converts interdependence into collective action, digital transformation accelerates exchange and integration, and learning sustains innovation over time. The framework consequently offers a policy-oriented basis for empirical comparison among Indonesian metropolitan areas without assuming that one governance model will fit all contexts.

4. Conclusion

This study indicates that metropolitan innovation in Indonesia is a governance problem as well as a technological one. Functional metropolitan problems cross administrative boundaries, while authority, resources, and capabilities remain distributed across government levels and other actors. The resulting coordination gap can limit innovation even when technology and promising solutions are available.

The main conceptual contribution is to position institutional coordination as the mechanism linking multilevel governance to metropolitan innovation. Multilevel governance establishes the distribution of authority; coordination aligns policies, roles, resources, and knowledge; digital transformation enables faster information exchange and integration; and innovation emerges through adaptive implementation and learning. The innovation-replication model further explains why adoption does not automatically produce equivalent outcomes across regions.

For Indonesian policy, the implication is a shift from isolated innovation toward coordinated metropolitan innovation. Priority should be given to functional intergovernmental mechanisms, interoperable data infrastructure, adaptive capacity building, knowledge-sharing networks, and financing that supports continuity. Policy evaluation should measure the quality of coordination and the sustainability of outcomes, not merely the number of innovations adopted.

The study is limited by its reliance on secondary literature and conceptual synthesis. The proposed relationships have not been tested through comparative metropolitan cases or statistical analysis. Future research should therefore construct metropolitan-level indicators, compare regions with different institutional capacities, and test whether coordination and digital integration mediate the relationship between governance arrangements and innovation outcomes.

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DECLARATIONS

AI Use Statement

Artificial intelligence (AI) tools were used as supplementary writing aids during the preparation of this manuscript. Their use was limited to assisting with paragraph coherence and flow, improving sentence construction, and textual and language accuracy checking. AI tools were not used to independently conduct the research, determine the research design, analyze or interpret the data, formulate the findings, or draw the conclusions. The authors remained responsible for the development and content of the manuscript, and all AI-assisted text was reviewed, revised, and verified by the authors to ensure its accuracy, relevance, and consistency with the research.

Author Contributions

Rachman Kosasih contributed to the conceptualization of the manuscript, review and synthesis of the findings from the 2025 metropolitan innovation activity, development of the analytical framework, manuscript preparation, and revision. Mohammad Rizky Luthfiah Aziz contributed to the refinement of the research framework, academic and methodological review, interpretation of the findings, and critical revision of the manuscript. Tomy Veryanto Bawulang contributed to the refinement of the conceptual and theoretical framework, critical review of the analysis and interpretation, and substantive revision of the manuscript. All authors reviewed and approved the final version of the manuscript and accept responsibility for the integrity and accuracy of the work.

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Competing Interests

The authors declare that there are no conflicts of interest or competing interests associated with this research, its preparation, or publication. No financial, personal, or institutional interests are considered to have influenced the research process, analysis, interpretation, or preparation of the manuscript.

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