

## The Quadruple Helix Model in Strengthening the Governance of Ambon City Government

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### ABSTRACT

This study examines the role of the Quadruple Helix model in strengthening the governance of Ambon City Government amid the challenges of digital transformation, institutional coordination, and unequal public access to smart city services. The research aims to analyse the interaction patterns among government, academia, business, and civil society in supporting smart governance in Ambon City, as well as to identify the main constraints and strategic efforts required to optimize collaboration. This study uses a qualitative descriptive approach with a case study design. Data were collected through in-depth interviews, focus group discussions, observation, and document analysis, and were analysed using thematic analysis. The results show that governance strengthening in Ambon City is increasingly supported by collaboration among Quadruple Helix actors through policy formulation, digital public service integration, public communication, and community participation. However, the collaboration still faces several challenges, including uneven digital infrastructure, limited digital literacy, incomplete regulatory consolidation, and partial system integration. The study concludes that the Quadruple Helix model contributes significantly to strengthening local governance, but its effectiveness depends on stronger institutionalization, wider digital inclusion, and more integrated governance systems. It is recommended that Ambon City Government strengthen smart city regulations, expand digital infrastructure, improve digital literacy, and deepen inter-agency system interoperability.

**Keywords:** collaborative governance; digital governance; local government; quadruple helix; smart city

### ABSTRAK

Penelitian ini mengkaji peran model Quadruple Helix dalam memperkuat tata kelola Pemerintah Kota Ambon di tengah tantangan transformasi digital, koordinasi kelembagaan, dan ketimpangan akses masyarakat terhadap layanan smart city. Penelitian ini bertujuan untuk menganalisis pola interaksi antara pemerintah, akademisi, sektor bisnis, dan masyarakat dalam mendukung smart governance di Kota Ambon, serta mengidentifikasi kendala utama dan upaya strategis yang diperlukan untuk mengoptimalkan kolaborasi tersebut. Penelitian ini menggunakan pendekatan deskriptif kualitatif dengan desain studi kasus. Data dikumpulkan melalui wawancara mendalam, focus group discussion, observasi, dan studi dokumen, kemudian dianalisis dengan analisis tematik. Hasil penelitian menunjukkan bahwa penguatan tata kelola di Kota Ambon semakin ditopang oleh kolaborasi antaraktor Quadruple Helix melalui perumusan kebijakan, integrasi layanan publik digital, komunikasi publik, dan partisipasi masyarakat. Namun, kolaborasi tersebut masih menghadapi sejumlah tantangan, seperti ketimpangan infrastruktur digital, keterbatasan literasi digital, belum kuatnya konsolidasi regulasi, dan integrasi sistem yang masih parsial. Penelitian ini menyimpulkan bahwa model Quadruple Helix berkontribusi signifikan terhadap penguatan tata kelola pemerintahan daerah, tetapi efektivitasnya sangat bergantung pada penguatan institusionalisasi, perluasan inklusi digital, dan integrasi sistem pemerintahan yang lebih baik. Oleh karena itu, Pemerintah Kota Ambon direkomendasikan untuk memperkuat regulasi smart city, memperluas infrastruktur digital, meningkatkan literasi digital, dan memperdalam interoperabilitas sistem antarperangkat daerah.

**Kata kunci:** collaborative governance; local government; quadruple helix; smart city; tata kelola digital

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## INTRODUCTION

Urban governance is increasingly shaped by digital transformation, data-intensive public administration, and rising demands for transparency, participation, and service responsiveness. In this setting, city governments are no longer expected to operate only through hierarchical bureaucracy; they are also required to coordinate knowledge, technology, investment, and citizen engagement across institutional boundaries. Recent scholarship shows that smart-city governance is most effective when it is understood not merely as technological modernization, but as a collaborative governance process involving public institutions, academia, business actors, and civil society (Mora et al., 2023; Tian & Wang, 2024; Marchesani et al., 2025). This makes the Quadruple Helix model particularly relevant, because it positions governance as a joint process in which innovation and public value are co-produced by four major actors rather than delivered solely by government.

The importance of this study lies in the fact that many local governments are under pressure to improve public services while also responding to complex urban problems such as uneven digital capacity, fragmented data systems, limited inter-agency coordination, and unequal citizen participation. The OECD notes that smart cities increasingly rely on real-time data to improve decision-making and public-service delivery, yet the expansion of data production often exceeds the capacity of governments to manage, integrate, and govern it effectively (OECD, 2025). Recent studies also emphasize that collaborative governance in smart-city development requires more than infrastructure; it depends on actor alignment, accountability, institutional learning, and the ability to sustain cross-sector cooperation over time (Ulibarri et al., 2023; Tian & Wang, 2024). In parallel, the growth of digital tools for citizen participation has widened opportunities for engagement, but their practical contribution to policymaking still varies across local contexts (Shin et al., 2024).

This study chooses Ambon City as its locus because it offers an important and timely case for examining the Quadruple Helix model in local governance. Ambon has been part of Indonesia's "100 Smart City" movement since 2019, and the city government has continued to consolidate its smart-city agenda through the preparation of the 2025–2029 smart-city masterplan and a draft regional regulation on smart-city governance (Ambon

City Government, 2019; ANTARA, 2024; Ambon City Government, 2025). Official reports in 2026 also show concrete implementation steps, including the launch of Call Center 112, maintenance of CCTV in 57 locations, the expansion of electronic signatures for local government agencies, SSL-based website security, and the formation of a CSIRT, alongside a 2025 Public Service Index score of 4.06 (Ambon City Government, 2026). These developments indicate that Ambon is not only adopting digital tools, but is also attempting to institutionalize governance reform through regulation, coordination, and service integration.

Ambon is also a strategic case because smart-city governance in this city is closely connected to local identity and urban development priorities. The 2025–2029 smart-city planning process identifies six major dimensions of development, including smart governance, economy, society, living, environment, and city character or branding (ANTARA, 2024). This is important because recent research has argued that smart-city development becomes more inclusive and sustainable when digital governance is integrated with local culture and community aspirations rather than being framed only in technical terms (Setiawan et al., 2024). For Ambon, this means that governance strengthening cannot be separated from the roles of universities, the private sector, communities, and cultural actors in shaping public policy, service innovation, and urban legitimacy. In that context, the Quadruple Helix model provides a useful analytical framework for explaining how governance capacity is strengthened through collaboration among government, academia, business, and society.

The relevance of this research is further supported by a gap in the literature. Although recent studies have widely discussed smart-city governance, collaborative governance, digital participation, and innovation ecosystems, many of them still focus on broad smart-city frameworks, technological adoption, or general service outcomes (Mora et al., 2023; Tian & Wang, 2024). Fewer studies specifically explain how the Quadruple Helix model strengthens the governance capacity of a medium-sized local government in an archipelagic context such as Ambon. Likewise, the interaction between formal governance reform and local socio-cultural resources remains underexplored, even though these factors are crucial for Indonesian cities outside major metropolitan regions (Setiawan et al., 2024; Marchesani et al., 2025). Therefore, this study is important both theoretically, because it extends the discussion on collaborative urban governance, and practically, because it may provide evidence for strengthening local governance arrangements in Ambon and similar cities.

To prevent the discussion from becoming too broad, this research is limited to the governance dimension of smart-city development in Ambon City. The study does not examine all six smart-city dimensions in equal depth, nor does it measure the technical performance of each digital application quantitatively. Instead, it focuses on how the Quadruple Helix model contributes to strengthening city governance through institutional coordination, policy support, participation, and collaboration among the four principal actors: government, academia, business, and civil society. Thus, the analysis is concentrated on governance strengthening rather than on the entire technical architecture of smart-city implementation.

Based on this background, the problem formulation of this study is stated as follows: this research analyses the role of the Quadruple Helix model in strengthening the governance of Ambon City Government; identifies the interaction patterns among government, academia, business, and civil society in the city's governance process; examines the main collaborative constraints affecting governance strengthening in Ambon; and explains strategic efforts to optimize the Quadruple Helix model in order to create more effective, participatory, and sustainable urban governance

## **THEORETICAL**

This section presents the main theories, concepts, and previous studies relevant to the research entitled “The Quadruple Helix Model in Strengthening the Governance of Ambon City Government.” It uses APA-style in-text citations by showing the author's last name and year of publication, for example, (Singh, 2016). The discussion is organized into four parts: smart governance, collaborative governance, the Quadruple Helix model, and previous empirical studies. These concepts are relevant because the governance of contemporary cities is increasingly shaped by digital transformation, cross-sector coordination, citizen participation, and data-based decision-making. Recent literature also confirms that smart-city development is not only a technological agenda, but a governance agenda that depends on institutions, collaboration, and social legitimacy (Mora et al., 2023; OECD, 2025).

### **Smart Governance**

Smart governance refers to the use of digital technology, data, and networked institutional arrangements to improve public decision-making, public service delivery,

transparency, accountability, and citizen participation. In the smart-city literature, governance is considered a central dimension because digital tools only become meaningful when they are embedded in public institutions that can coordinate actors, integrate information, and respond to citizens' needs. Mora et al. (2023) explain that smart-city governance should be understood from an innovation-management perspective, where public value is created through institutional capacity, policy learning, and cross-sector cooperation. Likewise, the OECD (2025) emphasizes that digital government and smart-city governance depend heavily on the effective governance of data as a strategic public asset.

In this study, smart governance is not treated merely as the digitalization of public services. It is understood as a governance arrangement in which the local government is able to coordinate public agencies, knowledge institutions, private actors, and citizens in order to produce more effective, inclusive, and responsive urban governance. This understanding is suitable for Ambon City because governance strengthening in the city is closely related to data integration, digital public services, public complaint systems, institutional coordination, and public participation within the smart-city agenda. Official guidance from the OECD also shows that cities need governance systems that can connect technology with policy, capacity, ethics, and inter-organizational coordination, rather than relying only on isolated digital applications (OECD, 2025).

### **Collaborative Governance**

Collaborative governance is one of the most relevant approaches for understanding multi-actor governance in local government. The classic definition by Ansell and Gash (2008) describes collaborative governance as a governing arrangement in which public agencies directly engage non-state stakeholders in collective decision-making processes that are formal, consensus-oriented, and deliberative. Although this concept was first formulated earlier, it remains widely used in recent studies because it provides a strong analytical basis for examining participation, trust-building, shared understanding, facilitative leadership, and institutional design in governance processes. Recent scholarship continues to rely on this framework while also showing that collaboration is shaped by power asymmetry, institutional capacity, and the quality of interaction between actors (Lynch, 2025; Vihma, 2021).

For smart-city governance, collaborative governance is especially important because urban innovation cannot be produced by the government alone. Recent reviews find that

smart-city development increasingly requires cooperation across government, academia, industry, and society to address policy fragmentation, weak coordination, and the gap between technology and real social needs. Tian and Wang (2024) show that collaborative governance has become a key research lens in smart-city development because it helps explain how cities coordinate multiple actors and balance technical efficiency with participation and legitimacy. Yahia et al. (2021) also argue that smart cities require sustainable collaborative networks to make governance more adaptive and resilient. Thus, collaborative governance provides the procedural logic of this research, while the Quadruple Helix model provides the actor configuration.

### **Quadruple Helix Model**

The Quadruple Helix model expands the Triple Helix approach by adding civil society to the interaction among government, academia, and industry. Carayannis and Campbell introduced this development to emphasize that innovation and governance in contemporary society are increasingly shaped not only by formal institutions and markets, but also by media, culture, users, communities, and the broader public sphere. In later work, Carayannis and Campbell further clarified that the Quadruple Helix reflects a more democratic and socially embedded understanding of knowledge production and innovation, where public participation and societal values are integral to development processes (Carayannis & Campbell, 2021).

In the context of local governance, the Quadruple Helix model is highly useful because it explains how governance capacity can be strengthened through interaction among four major actor groups. Government provides authority, regulation, and coordination; academia contributes research, expert knowledge, and policy advice; business offers investment, managerial innovation, and technological support; and civil society brings lived experience, participation, legitimacy, and local knowledge. Recent studies confirm that this model is increasingly used to explain smart-city transformation and digital public service innovation. Marchesani et al. (2025) show that the Quadruple Helix framework helps explain how internal and external open innovation affect the digitalization of public services in smart cities. Tutak et al. (2025) likewise argue that smart-city solutions become more responsive and socially grounded when co-created through cooperation among public administration, academia, business, and civil society.

This study uses the Quadruple Helix model because Ambon City's governance context cannot be fully explained by a state-centered or technology-centered approach. The

strengthening of governance in Ambon requires interaction among local government agencies, universities, banking and business sectors, media and digital actors, and local communities. In this sense, the Quadruple Helix model is not only an innovation model but also a governance model, because it helps explain how roles, resources, and legitimacy are distributed across actors in the urban governance process. A more recent conceptual discussion also suggests that Quadruple Helix arrangements are especially valuable in smart-city contexts where co-creation, openness, and social transformation are as important as technological modernization (Stephens et al., 2025; Rua et al., 2026).

### **Governance Strengthening**

Governance strengthening in this research refers to the improvement of institutional capacity, policy coherence, coordination mechanisms, accountability, and public responsiveness in city government. This means that governance is considered stronger when public institutions are able to coordinate actors effectively, use data and technology responsibly, support public participation, and deliver public services in a more integrated and sustainable manner. This understanding is aligned with recent digital-government literature, which stresses that stronger governance depends on strategic leadership, data governance, institutional interoperability, and public-sector capability, not only on the presence of digital infrastructure (OECD, 2025).

For this reason, governance strengthening in Ambon City is analysed through the interaction of Quadruple Helix actors in areas such as policy formulation, digital service support, coordination across agencies, and the inclusion of citizen and community input. The concept is also relevant for medium-sized cities and archipelagic regions, where governance effectiveness often depends on partnership arrangements and social trust as much as on technical infrastructure. In such contexts, collaborative governance and the Quadruple Helix framework complement each other: collaborative governance explains the process, while the Quadruple Helix identifies the main actors and their contributions.

### **Previous Studies**

Previous studies show that the relationship between smart-city governance and the Quadruple Helix model has become increasingly important. Marchesani et al. (2025) found that digital public service innovation in smart cities is influenced by both internal and external open innovation within the Quadruple Helix ecosystem. Their study underlines that governance, academia, business, and civil society each contribute to the digitalization

of services, but the success of this process depends on the quality of interaction between them. This study is relevant because it supports the argument that urban digital transformation is not only technical, but also collaborative and institutional.

Another relevant study is Tutak et al. (2025), who developed a stakeholder collaboration model within the Quattro Helix framework based on smart-city cases such as Amsterdam, Helsinki, and Songdo. They conclude that co-creation among public administration, academia, business, and civil society is crucial for implementing solutions that respond to urban needs. This study is useful for the present research because it reinforces the importance of a multi-actor governance perspective in smart-city implementation.

Mathew et al. (2024) also show that smart-city governance should move toward a more people-centric governance model. Their work emphasizes participatory governance, innovation, quality of life, and inclusive outcomes. This finding is relevant to the Ambon context because governance strengthening should not only improve administrative performance but also increase inclusion and social responsiveness. In a similar vein, Shin et al. (2024) show that digital tools can widen citizen participation, but their policy impact depends on institutional design and the way governments incorporate public input into actual governance processes.

From the Indonesian context, Setiawan et al. (2024) argue that smart-city development should integrate local cultural values so that urban innovation remains inclusive, sustainable, and rooted in local wisdom. Their study on Makassar is important because it shows that local culture can become a governance resource rather than a barrier. This is relevant for Ambon City, where local identity and social relations are important elements of governance. However, unlike Setiawan et al. (2024), the present research focuses more specifically on how the Quadruple Helix model strengthens governance institutions and collaborative arrangements in local government.

Overall, previous studies confirm the importance of collaboration, public participation, open innovation, and local context in smart-city governance. However, there is still limited research that specifically examines how the Quadruple Helix model strengthens the governance of a medium-sized Indonesian city government in an archipelagic setting. Therefore, this research fills an empirical and contextual gap by focusing on Ambon City Government.

## **Position of This Research**

Based on the theories and previous studies above, this research positions the Quadruple Helix model as the main analytical framework for understanding governance strengthening in Ambon City. Smart governance provides the substantive context, collaborative governance explains the interaction process, and the Quadruple Helix model identifies the four key actors involved in that process. Through this combination, the study analyses how governance capacity is strengthened through coordination, participation, policy support, and shared responsibility among government, academia, business, and civil society. This theoretical position is appropriate because current smart-city scholarship increasingly recognizes that effective urban governance depends on institutional collaboration and social co-creation rather than on technology alone (Mora et al., 2023; OECD, 2025; Marchesani et al., 2025).

## **RESEARCH METHODS**

This study uses a qualitative descriptive approach with a case study design. The qualitative approach was selected because the research seeks to understand in depth how the Quadruple Helix model operates in strengthening the governance of Ambon City Government through the interaction of government, academia, business, and civil society. The case study design is appropriate because it allows the researcher to examine governance processes, collaboration patterns, institutional dynamics, and local context in a specific setting, namely Ambon City. This approach is also relevant because the focus of the study is not to test statistical relationships, but to interpret social and institutional phenomena related to governance strengthening in the smart city context.

The research was conducted in **Ambon City**, with the city government and its governance ecosystem as the main unit of analysis. The study focuses on actors involved in governance strengthening, particularly local government agencies, universities, private sector institutions, and community groups that participate in smart governance practices. In this research, the Quadruple Helix framework is used to identify the roles and interactions of these four actors in supporting policy formulation, digital public services, coordination, participation, and governance innovation. The study is limited to the governance dimension and does not attempt to measure all dimensions of smart city implementation in Ambon.

This study uses **primary data** and **secondary data**. Primary data were obtained directly from field informants through interviews, focus group discussions, and

observations. The informants consisted of government officials, representatives of related local agencies, academics, private sector actors, and community representatives involved in governance and smart city activities in Ambon City. Secondary data were obtained from official documents and supporting materials, such as the Smart City Masterplan, local policy documents, government reports, and other administrative documents relevant to governance strengthening in Ambon City. The use of these two types of data is intended to provide a more comprehensive understanding of the research problem and to strengthen data triangulation.

Data were collected through several techniques. First, in-depth interviews were conducted with key informants to obtain detailed information on governance practices, institutional coordination, and the roles of each Quadruple Helix actor. These interviews allowed the researcher to explore perceptions, experiences, and constraints in the process of strengthening city governance. Second, focus group discussions (FGDs) were used to gather collective views and to verify information obtained from individual interviews. FGDs also helped identify patterns of interaction among actors and the extent of collaboration in governance processes. Third, observation was conducted in several governance-related settings, including digital public service points and smart city support facilities, in order to understand how governance and collaboration are implemented in practice. Fourth, document analysis was carried out to examine formal regulations, planning documents, reports, and other written materials related to smart governance and city administration. These techniques were used complementarily so that the data obtained were rich, contextual, and valid.

The data were analyzed using qualitative thematic analysis. The analysis began with data organization, including transcription of interview and FGD results, field note arrangement, and document classification. After that, the researcher conducted data reduction by selecting relevant information related to the governance strengthening process and the interaction of Quadruple Helix actors. The next step was coding, in which data were grouped into key themes such as actor roles, forms of collaboration, governance support, institutional constraints, and strategic efforts to strengthen governance. These themes were then interpreted to explain how the Quadruple Helix model works in the governance of Ambon City Government. The final stage was drawing conclusions based on patterns, meanings, and relationships found in the data. To increase the credibility of the findings, the study used source triangulation and method triangulation, comparing interview results, observation findings, and document evidence.

In summary, this study applies a qualitative case study approach to analyze the role of the Quadruple Helix model in strengthening the governance of Ambon City Government. The data consist of primary and secondary sources, collected through interviews, FGDs, observation, and document analysis. The data are analyzed thematically to identify collaboration patterns, governance constraints, and strategic efforts undertaken by government, academia, business, and civil society in the governance process. This method is considered appropriate because it enables an in-depth and contextual understanding of governance strengthening in Ambon City

## **RESULTS AND DISCUSSION**

The findings show that the strengthening of Ambon City Government's governance is not driven by technology alone, but by collaboration among government institutions, academia, the private sector, and society. In this research, the Quadruple Helix model appears in a practical form: the local government acts as the coordinator and regulator, universities function as knowledge partners, the private sector provides infrastructure and financial support, and the community becomes both the user and co-creator of governance innovation. This pattern confirms that city governance in Ambon has moved beyond a purely administrative model toward a collaborative governance model, in line with the view that smart governance depends on institutional coordination, public participation, and cross-sector innovation rather than on digital infrastructure alone (Ansell & Gash, 2008; Mora et al., 2023). The core empirical finding is that governance strengthening in Ambon is most visible in digital public services, transparency mechanisms, and collaborative policy support, but it remains constrained by uneven digital access, incomplete regulatory integration, and unequal actor capacity.

### **The Quadruple Helix Pattern in Strengthening Ambon City Governance**

The first result concerns the pattern of collaboration formed in Ambon City. The study finds that the Quadruple Helix model is present through a multi-actor governance arrangement in which the city government, DPRD, Universitas Pattimura, Bank Indonesia and local banks, community groups, UMKM actors, and digital service users are all involved in the implementation of smart city governance. The city government and its agencies function as the main implementers of digital services and coordination mechanisms, while DPRD plays a normative role through the drafting of the Smart City Regional Regulation. Academia contributes through policy formulation, legal studies, and

evidence-based recommendations, while the business and banking sectors enable digital finance and technological support. Society participates as users of public services, providers of feedback, and contributors to social innovation. This shows that the governance process in Ambon is not linear, but relational and co-productive.

This finding supports the theoretical argument of the Quadruple Helix model, which explains that governance innovation emerges when government, academia, industry, and civil society interact in a mutually reinforcing way. In Ambon, such interaction is visible in the formulation of the Smart City Masterplan 2025–2029, the discussion of the Smart City regulation, the operation of digital public services, the development of QRIS-based transactions, and community-facing platforms such as OMI Channel and BETA AMBON. These findings also reflect collaborative governance as conceptualized by Ansell and Gash (2008), because the governance process is built through direct engagement between state and non-state actors. However, Ambon's case also shows that collaboration is not yet fully symmetrical, since government remains the dominant coordinator while other actors mainly strengthen implementation, legitimacy, and adaptation.

### **Governance Strengthening Through Smart Governance Practices**

The second result shows that governance strengthening is most visible in the smart governance dimension. The study found several important indicators: the implementation of Electronic Signatures across agencies, the integration of more than eighty service applications, the use of Ambon Satu Data, the operation of Command Center, the use of CCTV for monitoring and disaster response, and the role of OMI Channel and BETA AMBON in public communication. These innovations improve transparency, service efficiency, and responsiveness. The presence of a system integrator role in Diskominfo also indicates that the city has begun to institutionalize digital governance rather than merely digitizing separate services. In this sense, governance strengthening occurs through improved interoperability, stronger information flows, and faster decision-making.

This finding is consistent with the concept of smart governance, which stresses the importance of data integration, accountability, responsiveness, and public communication in urban administration. OECD (2025) argues that digital government becomes meaningful when data, institutions, and public services are governed in a coordinated and strategic way. Ambon's governance reform reflects this logic. The use of electronic signatures increases legal certainty and efficiency, while the integration of service applications and public information channels shows the city's movement toward data-based governance. At the

same time, the study also reveals that the success of these digital practices depends heavily on human coordination and institutional readiness. Therefore, Ambon's experience confirms that smart governance is not simply a technical achievement, but a collaborative institutional process.

### **The Role of Each Quadruple Helix Actor**

The research also identifies the specific role of each actor in strengthening city governance. The city government acts as the central organizer of policy, service delivery, and inter-agency coordination. This is especially visible in Diskominfo, which functions as a system integrator, and in the mayor's policy direction toward regulatory strengthening, service integration, and digital inclusion. DPRD strengthens the legal basis for governance through the Smart City regional regulation. Universitas Pattimura plays an important role as a knowledge institution by contributing legal reviews, research-based recommendations, and participation in policy formulation. The private sector, especially banking institutions and digital service partners, supports transaction digitalization, financial inclusion, and service infrastructure. Civil society, including citizens, UMKM actors, and community groups, contributes through service use, complaint submission, cultural participation, and feedback on digital governance.

This actor configuration strongly reflects the Quadruple Helix framework. Government provides authority and administrative structure; academia contributes evidence and policy knowledge; business supports innovation and infrastructure; and society legitimizes and shapes governance outcomes through participation. The Ambon case therefore supports the argument of Carayannis and Campbell that innovation and governance become more sustainable when social actors are integrated into the institutional process. However, the findings also suggest that Ambon's Quadruple Helix is still evolving from consultation toward deeper co-creation. Some actors are already involved in policy and implementation, but the intensity and equality of participation still vary across sectors and dimensions.

**Table 1. Main Findings on the Quadruple Helix in Ambon City Governance**

<b>Actor</b>	<b>Main Role in Governance Strengthening</b>	<b>Empirical Evidence</b>
Government	Coordination, regulation, public service integration, digital governance leadership	Smart City Masterplan, Command Center, Ambon Satu Data, TTE, OMI Channel
Academia	Knowledge support, policy advice, research-based recommendations	Universitas Pattimura involved in masterplan and legal drafting
Business/Private Sector	Financial and technological support, transaction digitalization	QRIS expansion, collaboration with Bank Indonesia and local banks
Civil Society	Public participation, feedback, service use, cultural and community engagement	Online service users, community complaints, UMKM and music community participation

*Source: adapted from the research findings.*

The table shows that governance strengthening in Ambon is multi-actor in character. The city government remains central, but the system becomes more effective because other actors contribute distinct resources and functions. This confirms that the Quadruple Helix model is useful not only as an innovation framework, but also as an analytical lens for local governance.

### **Main Constraints in the Collaboration Process**

The second formulation of the problem concerns the main constraints faced in collaborative governance. The findings show four dominant constraints. First, there is uneven digital infrastructure, especially in coastal and peripheral areas, which limits equal access to online services and weakens the inclusiveness of governance. Second, digital literacy is still uneven, particularly among older citizens and small business actors, which reduces the effectiveness of digital programs such as QRIS and online administrative services. Third, there is limited regulatory integration, because the smart city agenda still depends on strengthening legal frameworks such as the Smart City Regional Regulation and supporting local regulations. Fourth, some governance systems remain only partially integrated, including data interoperability across agencies and limited monitoring systems such as the absence of a Destination Management System and environmental sensor-based monitoring.

These findings are highly relevant to collaborative governance theory. Ansell and Gash (2008) explain that collaboration depends on institutional design, trust, facilitative leadership, and balanced participation. In Ambon, those elements exist, but not yet evenly. Weak infrastructure affects participation, uneven literacy affects actor capacity, and

incomplete regulations limit the sustainability of collaboration. In the smart governance literature, this also confirms that the success of urban digital transformation is shaped by governance maturity, not only by the presence of digital tools. Thus, the Ambon case shows that collaboration can produce important governance gains, but its long-term consolidation requires stronger institutional support and more equal capacity among actors.

### **Governance Strengthening Beyond Smart Governance: Supporting Dimensions**

Although this article focuses on governance, the research findings show that governance strengthening in Ambon is also reinforced by other smart city dimensions. In the smart economy dimension, collaboration with Bank Indonesia, local banks, and UMKM actors supports transaction digitalization through QRIS and expands financial inclusion. In the smart branding dimension, Ambon City of Music is strengthened through digital promotion, festival coordination, and cultural programs such as Sound of Green. In the smart society dimension, digital literacy programs, public complaint channels, and online learning platforms support citizen participation and social capacity. In the smart living dimension, the Command Center and emergency-response integration improve public responsiveness and urban resilience. These dimensions show that governance strengthening is cross-sectoral, and that the Quadruple Helix works not only in government administration but also in economic, cultural, and social governance.

This result supports recent smart-city scholarship, which argues that governance is a cross-cutting dimension that connects economy, social participation, city branding, and public services. In Ambon, governance is strengthened because actors do not collaborate only in isolated programs. Rather, they contribute to a broader ecosystem in which regulation, digital services, culture, and community participation reinforce one another. This is one of the strongest findings of the research, because it shows that the Quadruple Helix model in Ambon is not confined to formal policy spaces, but also embedded in the city's digital-cultural development process.

### **Strategic Efforts to Optimize the Quadruple Helix Model**

The third problem formulation concerns strategic efforts to optimize collaboration. The findings suggest that governance strengthening in Ambon requires at least four strategic directions. First, the city needs to accelerate the legalization of the Smart City Regional Regulation so that collaboration has a clear institutional basis. Second, it needs to expand internet access through public-private partnerships, especially in coastal and

underserved areas. Third, it needs to improve digital literacy across generations, targeting not only students and civil servants but also elderly citizens, UMKM actors, and peripheral communities. Fourth, it needs to deepen system integration, including Destination Management System development, environmental sensor monitoring, and stronger interoperability across agencies. These strategies are already implied in the study's recommendations and reflect the need to move from program-based collaboration to system-based governance.

From a theoretical perspective, these strategies indicate that the Quadruple Helix model should not be treated as a static structure of actors, but as a dynamic governance mechanism that must be continuously institutionalized. The Ambon case shows that collaboration becomes more effective when it is supported by legal frameworks, inclusive infrastructure, capacity-building, and shared policy direction. In other words, the optimization of the Quadruple Helix depends on converting informal cooperation into durable governance arrangements. This is also where the discussion contributes to the literature: the Ambon experience suggests that in medium-sized and archipelagic cities, governance strengthening is most sustainable when digital transformation is linked with local culture, social trust, and multi-actor cooperation.

### **Discussion in Relation to the Research Problem**

The results answer the formulation of the problem in three ways. First, the pattern of collaboration in Ambon City is clearly multi-actor and reflects the Quadruple Helix model, with government, academia, business, and civil society contributing to governance strengthening. Second, the main constraints include digital inequality, limited literacy, incomplete regulation, and partial system integration. Third, the main strategies needed are regulatory strengthening, infrastructure expansion, literacy improvement, and deeper digital integration. These three findings confirm that Ambon's governance strengthening is collaborative in character but still transitional in maturity.

Overall, the discussion shows that the governance of Ambon City Government is being strengthened through a developing Quadruple Helix ecosystem. The city has already moved from fragmented digital innovation toward more coordinated governance practices, especially in service delivery, transparency, and public communication. However, the sustainability of this progress depends on how far collaboration can be institutionalized, expanded, and equalized across sectors and social groups. Therefore, the main contribution of this study is to show that the Quadruple Helix model is not merely a theoretical

framework for innovation, but a practical model for strengthening local governance in smart city development.

## **CONCLUSION**

This study concludes that the strengthening of Ambon City Government's governance is increasingly shaped by the practical operation of the Quadruple Helix model, in which government, academia, business, and civil society interact in supporting smart governance. The pattern of collaboration found in this research shows that the city government remains the central coordinating actor, while universities contribute policy knowledge and academic support, the private sector provides technological and financial facilitation, and society participates through service use, feedback, and community-based involvement. These interactions indicate that governance strengthening in Ambon is not solely the result of digital technology adoption, but of the growing collaboration among multiple actors in the governance process.

The study also concludes that the main constraints in strengthening governance through the Quadruple Helix model are uneven digital infrastructure, unequal digital literacy, incomplete regulatory consolidation, and still-limited integration among governance systems. These constraints affect the inclusiveness, effectiveness, and sustainability of smart governance in Ambon City. As a result, although important progress has been made in digital public services, public communication, and inter-agency coordination, the governance system still faces structural and institutional challenges that need to be addressed so that collaboration can function more equally and consistently across all sectors and communities.

Furthermore, this research finds that the optimization of the Quadruple Helix model requires stronger institutionalization of collaboration. Governance strengthening in Ambon City will be more effective if it is supported by a clear legal framework, wider digital infrastructure coverage, improved digital literacy among citizens and small business actors, and deeper interoperability among public service systems. In this regard, the smart city agenda in Ambon should continue to move from fragmented innovation toward an integrated governance ecosystem in which collaboration is not incidental, but becomes a permanent feature of local governance.

Based on these conclusions, it is recommended that Ambon City Government accelerate the formalization of smart city regulations in order to provide a stronger legal

basis for multi-actor collaboration and governance integration. It is also recommended that public-private cooperation be expanded to improve internet access in underserved areas and to ensure that digital services can be enjoyed more equally by all citizens. In addition, digital literacy programs should be strengthened not only for students and civil servants, but also for UMKM actors, elderly citizens, and communities in peripheral areas, so that participation in digital governance becomes more inclusive. Finally, stronger system integration and data interoperability need to be prioritized so that the governance reforms already initiated by Ambon City can develop into a more effective, participatory, and sustainable model of urban governance.

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