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Smart City Development and Governance in Lipa City, Batangas – A Literature Review

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Abstract

Smart city initiatives have emerged globally as strategic responses to complex urban challenges, leveraging technology and data to improve the quality of life, economic competitiveness and sustainability. A critical component is smart governance, which modernizes urban management through technology, innovation and citizen engagement. This literature review examines how smart city governance is defined and implemented, highlights challenges and best practices from global and local contexts and focuses on Lipa City, Batangas (Philippines) as a case study of a mid-sized city aspiring to become "smart." The researchers surveyed scholarly research and policy reports to distill key themes: governance models, digital infrastructure, citizen participation and policy frameworks. Globally, leading smart cities such as Singapore and Barcelona demonstrate that robust governance frameworks (ranging from integrated data systems to participatory platforms) are as important as advanced technology. In the Philippines, enthusiasm for smart cities is high and national programs support local efforts, but cities face funding, capacity and policy gaps. Lipa City has taken initial steps by partnering with national agencies to develop a smart city roadmap, upgrading digital services and prioritizing governance reforms. The findings suggest that Lipa's success will hinge on strengthening institutional capacities, engaging citizens and enacting supportive policies. The review concludes with recommendations for Lipa City and similar cities to effectively adopt and scale smart governance initiatives for sustainable urban development.

Keywords: Citizen Participation, Smart City, Smart Governance, Sustainable Cities, Urban Development.

Introduction

Smart city initiatives have emerged worldwide as strategic responses to complex urban challenges, leveraging technology and data to improve quality of life, economic competitiveness and sustainability (1). Early frameworks conceptualized smart cities across multiple dimensions – for example, a study identified six key pillars: smart governance, smart economy, smart mobility, smart environment, smart people and smart living (2, 3). Among these, smart governance – the modernization of urban management through technology, innovation and citizen engagement – is increasingly recognized as a foundational element for successful smart cities (4). Smart governance entails not just digitizing public services, but fundamentally "crafting new forms of human collaboration through the use of ICT to obtain better outcomes and more open governance processes" as Meijer and Bolívar describe. In essence, it integrates e-government tools with participatory, data-driven decision-making to create more responsive, transparent and inclusive city administration (5).

It is important to analytically distinguish smart governance from related concepts. E-government typically refers to the use of ICT to deliver government services and information online – a component of digital transformation focused on service efficiency (6). Digital governance (often used interchangeably with e-governance or connected governance) refers to the broader adoption of digital strategies to integrate government processes with information technology, enhancing public service delivery in a simple, accountable and transparent manner. Open governance, by contrast, emphasizes

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principles of transparency, collaboration and participatory decision-making, often through open data and citizen oversight initiatives. Open governance requires making governance dataand processes accessible and participatory, whereas smart governance builds on these principles while leveraging technology and innovation to achieve accountable, evidence-based public administration (7). In short, smart governance goes beyond e-government's focus on online services by holistically integrating digital tools, data and collaborative networks into governance processes. This approach seeks not only to improve efficiency but also to foster co-creation with citizens and stakeholders, aligning with open governance ideals of transparency and inclusivity. Smart governance can thus be seen as an encompassing paradigm that integrates the service-delivery improvements of e-government, the transformative process changes of digital governance and the transparency and citizen-empowerment goals of open governance.

This literature review examines how smart city governance is defined and implemented in scholarly and policy literature, the challenges encountered and the documented best practices. It places particular focus on the Philippines and uses Lipa City, Batangas, as a case study to explore how a mid-sized city can adopt and scale smart governance initiatives. Lipa City has recently signaled its smart city ambitions through a partnership with the Department of Science and Technology Region IV-A (DOST-IV-A) to integrate science, technology and innovation into local development planning. This partnership, under DOST's Smart and Sustainable Communities Program, positions Lipa as an early adopter among secondary cities in the country. We situate Lipa's efforts in the broader context of Philippine local governance and draw comparative insights from other cities in the Philippines and internationally. Key themes analyzed include governance models, digital infrastructure, citizen participation and policy frameworks, with the goal of identifying critical success factors and recommendations for Lipa City's smart governance journey. Throughout, we ground the analysis in academic research and documented experiences, ensuring that Lipa's case is coherently connected to the global discourse on smart city governance.

Methodology

Researchers conducted a narrative literature review of academic and grey literature on smart city governance, with an emphasis on sources from 2000 to 2025 to capture the field's evolution. Keyword searches were performed in scholarly databases (e.g., Scopus, Google Scholar) and institutional repositories using terms such as "smart city governance," "smart city Philippines," "smart governance challenges," and "smart city case study." Researchers included peer-reviewed journal articles, conference proceedings, government and NGO reports and reputable news reports and policy briefs that provided insights into smart governance concepts, implementation and outcomes. Given the focus on Lipa City, local government documents and press releases (e.g., from the Philippine News Agency and the city government) were also reviewed, as were related case studies of other Philippine cities.

In total, approximately 80 sources were included, prioritizing those offering empirical findings or clear frameworks for smart governance. Information was extracted and synthesized on how smart governance is defined, the technological and organizational initiatives it entails, the reported benefits and challenges and lessons learned from real-world implementations. For the Lipa City case study, specific data were gathered from news releases and official statements regarding its smart city programs (e.g., the DOST partnership and local initiatives) to assess progress and contextualize the case. The findings are organized into thematic sections (global practices, national context and the Lipa City case), followed by a comparative analysis and discussion.

To ensure transparency in the review process, Figure 1 presents the literature selection in a PRISMA-style flow diagram. The initial search yielded 230 records (180 from databases and 50 from other sources). After removing duplicates, 200 unique records remained for screening. Based on titles/abstracts, 100 records were excluded as irrelevant or not meeting the inclusion criteria. The full texts of the remaining 100 records were assessed for eligibility, resulting in the exclusion of 20 additional sources (e.g., those that lacked a focus on governance or fell outside the scope).

Ultimately, 80 sources were included in the review for analysis. Additionally, we assessed the rigor of the review using the Critical Appraisal Skills Programme (CASP) systematic review checklist. Table 1 (CASP Checklist) summarizes the key methodological appraisal questions and how this review addressed them, to ensure clarity and avoid misinterpretation in our narrative.

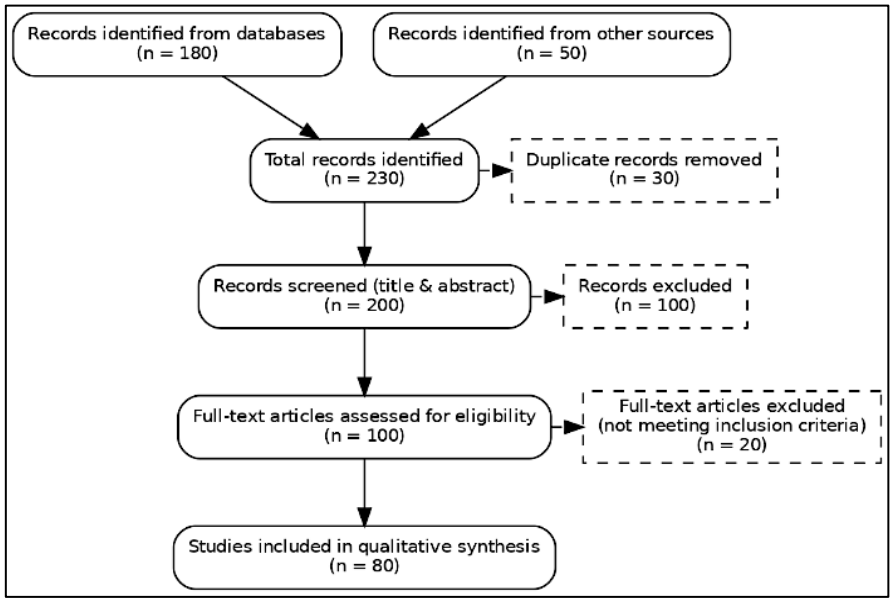

Figure 1: PRISMA Flow Diagram of the Literature Search and Selection Process for the Review

The diagram outlines the number of records identified, screened, assessed for eligibility and included in the narrative literature review. Table 1 presents the Critical Appraisal Skills Programme (CASP) checklist used to appraise the methodological quality of this narrative literature review. It summarizes how each appraisal question was addressed (search strategy, inclusion decisions, synthesis approach and applicability), strengthening transparency and rigor.

Table 1: CASP Checklist for Quality Appraisal of the Literature Review

	Assessment in This Review
Did the review address a clearly focused question/problem?	Yes. The review is centered on a clearly defined question: how smart governance is conceptualized and implemented, with a specific focus on Lipa City's context. The objectives and scope (smart city governance globally and in Lipa City) are explicitly stated in the Introduction.
Did the authors use appropriate sources and inclusion criteria?	Yes. A wide range of relevant studies (academic papers, reports, policy documents) from 2000–2025 were included to capture the evolution of smart governance. Inclusion criteria prioritized sources with empirical insights or frameworks on smart governance and Philippine-specific sources for local context.
Do you think all the important, relevant studies were included?	The search was extensive and included multiple databases and grey literature. Efforts were made to include seminal works and recent studies (including non-local cases like Singapore, Barcelona) to cover global best practices. The use of multiple keywords and sources suggests key relevant studies were captured. (Figure 1 shows the selection process, including screening steps.)
Did the review authors assess the quality of the included studies?	Partly. As a narrative review, no formal scoring (e.g., Cochrane risk of bias) was applied, but the authors critically examined sources (favoring peer-reviewed and official publications). By using CASP guidelines in designing the review, we ensured sources were credible and findings robust, although an explicit quality rating of each study was not performed.
If results of the studies have been combined, was it reasonable to do so?	Not applicable. This review did not statistically combine study results (no meta-analysis); instead, it qualitatively synthesizes findings. The narrative synthesis approach is appropriate given the diverse types of sources and information (conceptual frameworks, case studies, policy analyses).
How are the results presented and what is the main result?	The results are organized thematically (global concepts and practices, national context, Lipa City case). The main findings highlight definitions of smart governance, key success factors (e.g., citizen engagement, infrastructure, policy support), challenges and recommendations for Lipa. These are presented in a structured manner with comparative insights.
How precise are the results (e.g., confidence intervals or p-values)?	Not applicable in the conventional sense, since this is not a quantitative meta-analysis. However, where quantitative results from studies are cited (e.g., survey ratings, correlations in the Lipa case study), they are reported with appropriate detail. The emphasis is on the consistency of themes across sources rather than statistical precision.
Can the results be applied to the local population/context?	Yes. The review specifically connects global insights to Lipa City's context. While global best practices are generalized, the analysis discusses how those lessons apply to a mid-sized Philippine city. The recommendations are tailored to Lipa and similar cities, indicating practical applicability.
Were all important outcomes considered?	Yes. The review considers multiple facets of smart governance outcomes: efficiency of services, transparency/accountability, citizen satisfaction and participation and sustainable development impacts. Potential negative outcomes or challenges (funding, digital divide, privacy) are also considered to provide a balanced view.
Are the benefits of implementing smart governance worth the costs?	The review qualitatively weighs benefits (improved services, trust, economic dynamism) against challenges (cost, capacity) as reported in the literature. While a formal cost-benefit analysis is beyond scope, the discussion acknowledges resource constraints and emphasizes phased, strategic investments – suggesting that benefits can be realized if governance foundations are strong.

Results and Discussion

Global Concepts and Best Practices in Smart Governance

Conceptualizing Smart Governance

In the literature, smart city governance (often termed "smart governance") is a multidimensional concept generally referring to the use of technology to enhance the efficiency, transparency and inclusiveness of governance processes (8). A consistent thread in scholarly definitions is the emphasis on ICT-enabled collaboration among government, citizens and other stakeholders. For example, a study defined smart governance as "the ability of governments to make better decisions through the combination of ICT-based tools and collaborative governance" (9). In other words, smart governance leverages digital tools (such as open data platforms, e-government services and data analytics) to support evidence-based policymaking and to facilitate greater stakeholder participation in decision-making (10). This aligns with the idea that governance in smart cities shifts from a traditional top-down model to a more networked, participatory approach. Citizens are not viewed as passive service recipients but as active partners or co-creators in governance (11). For instance, a recent systematic review emphasizes that multi-stakeholder collaboration is "instrumental" for addressing complex urban problems, highlighting the need for practical tools (e.g., collaboration platforms, participatory budgeting frameworks) to overcome collaboration challenges (12). Similarly, case studies demonstrate the potential of broad partnerships in governance: Bandung employed a multi-stakeholder co-creation model involving government, the private sector, academia and citizens in its smart city programs (13).

Smart Governance and Good Governance Principles

Smart governance is closely linked to principles of good governance – accountability, transparency, inclusiveness and responsiveness – enhanced by digital technology (14). The literature suggests that smart initiatives should ultimately lead to more open and accountable governance processes and greater public value, rather than merely showcasing technological prowess (15). For example, open data initiatives improve transparency, real-time monitoring systems strengthen accountability and citizen feedback platforms increase responsiveness (e.g., by enabling quicker reporting of local issues and government response). In leading smart cities, these principles are codified: Singapore's approach includes stringent data privacy and cybersecurity laws to ensure trust, while Barcelona has established a "citizen data bill of rights" to embed transparency and ethics in data governance. The infusion of technology into governance should serve these normative goals of good governance. Many authors caution that without aligning to good governance values, "smart" projects may have limited social impact (16). Thus, best practices call for embedding accountability and citizen-centric metrics into smart city initiatives (e.g., tracking improvements in service delivery, conducting citizen satisfaction surveys and instituting feedback loops).

Global Exemplars – Singapore and Barcelona

Two often-cited examples illustrate distinct but apparently successful models of smart governance. Singapore, through its nationwide Smart Nation program (17), has implemented a highly integrated, top-down model. For instance, Singapore introduced a digital national ID and the "MySingapore" one-stop portal, which residents use to access a wide range of government services (18). Governance is centrally coordinated via the Smart Nation and Digital Government Office under the Prime Minister, ensuring clear leadership and cross-agency alignment. This technocratic approach prioritizes robust digital infrastructure and comprehensive policy frameworks (e.g., data governance standards, cybersecurity laws), enabling rapid deployment of smart services (19). In contrast, Barcelona pivoted toward a bottom-up, citizen-centric approach in the late 2010s (20). The city developed platforms such as Decidim, an open-source e-participation tool that enables residents to propose and vote on policies and adopted a "data commons" policy to give citizens greater control over urban data (21). Barcelona's model emphasizes co-creation and digital rights: governance is decentralized and participatory, with initiatives like the City Data Office and the citizens' data rights charter to ensure ethical data use (22). While less centrally controlled than Singapore, Barcelona demonstrates that empowering citizens and prioritizing data ethics

can yield high levels of public trust and engagement in smart city initiatives (23).

It is worth noting, however, that even these leading cities face governance limitations and challenges, which temper a purely normative (idealized) view of their success. Singapore's highly centralized, top-down approach, for example, has been critiqued for potentially limiting the depth of inclusive public participation. Some scholars argue that the city-state's technocratic smart city model, while efficient, may reinforce existing power structures and leave less room for bottom-up citizen influence (24). This highlights a tension between efficiency and inclusivity: Singapore must continually seek to solicit genuine citizen input to complement its top-down initiatives (25). Meanwhile, Barcelona's lauded citizen-centric approach must contend with practical challenges in sustaining engagement and scaling pilot projects (26). City officials in Barcelona have cautioned against "pilot project syndrome" – the proliferation of small-scale smart initiatives that garner attention but do not mature into long-term solutions. Barcelona found that a strong vision and long-term commitment (spanning 15+ years and surviving political changes) are necessary to transform experimental projects into integrated citywide programs (27). These examples illustrate that robust governance frameworks are as important as technology: both cities needed to adapt their governance processes to address challenges (ensuring citizen buy-in, securing funding, updating regulations) that arose during implementation. A more balanced analysis of these exemplars thus recognizes that smart governance is an evolving process, even for pioneers. A city can have cutting-edge infrastructure, but governance outcomes (such as trust, equity and sustained innovation) depend on how well institutional practices and stakeholders align with the technology.

Common Success Factors

Despite contextual differences, successful smart cities share several key governance factors. Integrated leadership and coordination are one: many cities establish dedicated bodies or cross-departmental teams to coordinate smart initiatives. For example, several cities appoint a Chief Data Officer or form "smart city task forces" including representatives from government agencies, the private sector and civil society (28). This ensures a holistic, citywide approach rather than isolated tech projects. A comparative study of six cities (Barcelona, Singapore, Seoul, Taipei, Toronto, Calgary) observed that cities frequently learn and borrow policy innovations from each other; having institutionalized mechanisms to absorb and implement such ideas (through inter-city networks or formal knowledge-sharing programs) makes governance more adaptive. In essence, referencing global best practices becomes a mode of governance itself – city leaders actively use inter-city comparisons to justify and shape their own smart city programs (29).

Robust digital infrastructure and interoperability are also recurrent themes. Technological underpinnings (broadband connectivity, citywide fiber, IoT sensor networks, data integration platforms) underpin smart governance. However, beyond deploying technology, ensuring interoperability is critical: systems and datasets must communicate across agencies to support integrated governance. A recent study of Indonesian smart cities found that enhancing interoperability through common data standards, unified platforms and inter-agency coordination significantly strengthened governance capacity, especially in improving human security and emergency response (30). Cities such as Yogyakarta and Makassar improved service delivery by aligning local systems with national digital frameworks and adopting "One Data" policies to break down data silos. Best practices include implementing citywide data architectures and open APIs and adhering to international smart city standards (e.g., ISO 37120/37122 indicators) to ensure consistent data collection and sharing (31). Interoperability ensures that as new technologies are added, they integrate into a cohesive system rather than creating fragmented "islands of innovation."

Citizen Engagement and Co-Creation

Engaging citizens through technology can range from basic interactions (e.g., social media communication, service feedback apps) to advanced forms (e.g., co-designing solutions via hackathons, civic innovation labs, participatory budgeting platforms). Research shows that higher levels of citizen participation correlate with more sustainable smart city outcomes (32). For instance, crowdsourcing ideas for city apps and enabling real-time citizen feedback (as done in Bandung's

smart city program) contributed to more responsive public services (33). Similarly, cities like New York and Seoul have been lauded for participatory budgeting initiatives that give residents a direct say in local spending decisions. However, the literature also notes challenges: digital participation can be constrained by the digital divide and by uncertainty about the extent of citizen input's impact on policy (34). Leading cities, therefore, invest not only in technological tools to encourage engagement (emphasizing user-friendliness, mobile access and even gamification of civic tasks) but also in institutional processes to act on citizen input. For example, Singapore uses gamified apps and public challenges to encourage feedback on urban issues (35) and ensures that feedback units are located within every agency to process citizen suggestions. Seoul's governance includes formal mechanisms for incorporating citizen proposals into budgetary decisions. These efforts cultivate a culture of co-creation. The underlying principle is that a smart city is not just about smart infrastructure, but also about "smart people" – informed, empowered citizens who collaborate in governance.

Policy and Regulatory Frameworks

Smart governance does not happen in a policy vacuum. A recurring theme is the importance of supportive policies at both local and national levels (36). The World Economic Forum's Global Smart Cities Alliance, for example, identified five foundational policy domains for ethical smart city governance: ICT accessibility, cybersecurity accountability, privacy impact assessment, coordinated infrastructure ("dig once") policies and open data (37). These ensure that technology deployment is inclusive, secure and transparent. In practice, many cities still lack such comprehensive policies. A 2021 WEF survey of 36 pioneering smart cities revealed significant gaps: only 17% of these cities conducted privacy impact assessments before deploying new technologies and approximately half had formal procedures to ensure that digital services were accessible to older adults and people with disabilities (38). On a positive note, nearly all had some form of open data portal, though only 15% had fully integrated those portals into internal data systems (39). Such findings underscore that while technology adoption in cities is accelerating, governance mechanisms often lag. Leading cities have started to address this gap by enacting local data protection ordinances, establishing dedicated cybersecurity teams and mandating stakeholder consultations for major smart city projects (as documented in WEF's 2021 report) (40). International standards also provide benchmarks; for instance, the ITU's Key Performance Indicators for Smart Sustainable Cities and ISO smart city standards offer guidelines that cities can adopt to develop local policies (41). In summary, effective smart governance requires aligning technological initiatives with updated laws and regulations covering data sharing, privacy, procurement (to allow innovative solutions) and inclusion.

Financial and Human Capacity Considerations

Many sources cite funding constraints and limited human capacity as major barriers to smart governance. Implementing citywide sensor networks, data systems, or command centers can be expensive and require skilled personnel to operate and maintain them. Best practices to address these challenges include pursuing public–private partnerships (PPPs) to finance projects, tapping into national or international grants and investing in capacity-building for city staff (42). For example, Dubai's smart city strategy extensively used PPPs (partnering with tech firms) to develop its Smart Dubai Platform, sharing costs and expertise. Numerous European cities, through EU programs such as Horizon 2020, have allocated budgets specifically for training civil servants in data analytics and project management (43). Building a "smart city team" with the appropriate expertise is crucial; some cities have created new positions (e.g., Chief Innovation Officer, data scientist) within local government. Additionally, partnering with universities and the private sector can help cities access expertise and upskill their workforce. Without adequate human capital, even well-funded smart projects may falter in execution. This is particularly relevant for developing cities, where retaining IT talent in the public sector can be challenging.

In summary, the global literature portrays smart governance as an intersection of technology, people and institutions. Cities that excel tend to have strong leadership and cross-sector collaboration, citizen-centric philosophies, Intelligently designed infrastructure and adaptive policies that guide innovation responsibly. They also openly acknowledge and navigate challenges

– whether they be social (like digital inclusion), organizational (breaking bureaucratic silos), or ethical (data privacy). These global insights set the stage for examining how the Philippines and Lipa City in particular, are progressing on their smart governance journey.

National Context: The Philippines and Smart City Governance

The Philippines, like many countries in Southeast Asia, is experiencing rapid urbanization and has begun to explore smart city development as a strategy to address urban issues. Over the past decade, national government agencies (NGAs) and local government units (LGUs) have launched various initiatives to promote smart, sustainable cities. However, studies suggest that although interest is high, Philippine cities remain in the early stages of adopting comprehensive smart governance systems (44). A recent policy published by the Philippine Institute for Development Studies (PIDS) – assessed the prospects and challenges for smart city development among selected Philippine cities (45). It found that several enablers for smart city initiatives are present in the Philippines. Many LGUs have "smart city champions" – individual leaders (often mayors or department heads) who advocate for innovation. There is a growing pool of ICT personnel in local governments and an increasing availability of digitized data at the local level (46). Digital infrastructure is gradually improving, with expanding internet connectivity extending beyond metropolitan areas. NGAs and private firms have also been supporting projects, motivated by their mandates or corporate social responsibility goals (47). For example, the Department of Information and Communications Technology (DICT) rolled out programs like Digital Cities 2025 (48), aimed at developing digital infrastructure and talent in secondary cities, while DOST launched the Smart and Sustainable Communities Program (SSCP) in 2023 to provide technical assistance and grants to LGUs for smart city projects. According to DOST, as of 2025, 91 LGUs have enrolled in the SSCP, exceeding the initial target of 80 (49). Additionally, numerous cities have been recognized or nominated for national smart city awards, indicating broad enthusiasm. A joint Department of the Interior and Local Government (DILG)–World Bank survey in 2023 reported that 70% of 115 urban Philippine LGUs were preparing smart city plans, 61% already had some smart city initiatives underway and 56% had established supportive policies such as local ICT ordinances or e-government master plans (50). These statistics point to strong nationwide momentum toward smart city development.

However, the same PIDS study and other sources highlight significant challenges and gaps in the governance of Philippine cities. Funding constraints are a top concern; many LGUs struggle to finance the procurement, implementation and maintenance of smart technologies (e.g., citywide sensor networks, CCTV surveillance systems, high-speed connectivity) (51). Some pilot projects have stalled due to insufficient budgets or the absence of private partners to co-fund scaling up. There is also a policy and standards gap: stakeholders noted a lack of clear national guidelines for implementing smart city solutions, leading to ad hoc approaches among cities. For instance, awareness of and use of standards such as PNS ISO 37122:2020 (the Philippines' smart city indicators standard) or frameworks from DOST-PCIEERD were limited among local officials (52). This has contributed to data silos and interoperability issues: cities often collect data department by department without integration, hampering real-time data sharing and analysis. Public adoption and trust are another challenge: some local leaders may have observed that citizens can be wary or slow to adopt new technology-driven services due to low digital literacy or concerns about privacy and security (53). For example, proposals for city ID systems or data platforms have raised questions about data protection. Furthermore, sustaining initiatives across political administrations is difficult – changes in city leadership sometimes lead to shifts in priorities or discontinuation of nascent smart projects if they are not institutionalized via local legislation. Private partners in the PIDS study expressed concern that elections could derail long-term collaborations if new officials do not share the vision for smart city development (54).

Despite these hurdles, there are notable examples of Philippine cities making strides in smart governance, often with support from national programs. Cauayan City in Isabela, for instance, is frequently cited as a pioneer. Declared the Philippines' first "Smart City" in 2015, Cauayan

implemented early smart governance initiatives such as citywide free Wi-Fi across all 65 barangays (villages), a unified citizen ID system, a city mobile app for services and even a "Digital Farmers" program to integrate technology into agriculture (55). These efforts improved service delivery and citizen engagement and Cauayan's example has been showcased in ASEAN Smart Cities Network (ASCN) forums (ASEAN, 2019). Baguio City is another leading example, particularly in public safety and urban management (56). In 2021, Baguio inaugurated a state-of-the-art Smart City Command Center that integrates live CCTV feeds, GIS mapping, 911 emergency response coordination and big data analytics into a single facility (57). The project, funded by a ₱200 million national grant, allows Baguio to monitor traffic, disaster risks and security in real time and coordinate across agencies The DILG praised Baguio's Command Center as "a leading innovation that will inspire… upscaling digital governance among LGUs," highlighting that strong mayoral leadership and multi-stakeholder support were key to its success (58). Notably, a DILG official at the launch emphasized that this technological innovation was aligned with good governance principles – the goal was to institutionalize data-driven, efficient and transparent processes in local government, not just to showcase gadgets (59). Other Philippine cities such as Makati, Manila and Cebu have introduced their own smart governance initiatives: Makati developed the Makatizen Card and app (a unified ID and service access card for residents), Manila established an online citizen portal and an open data website and Cebu City implemented intelligent transport systems for traffic management (especially as part of the ASCN pilot program) (60).

At the national level, the Philippines is actively participating in regional smart city collaborations (61). For example, Manila, Cebu and Davao were selected as the country's pilot cities in the ASEAN Smart Cities Network launched in 2018. Their involvement has been driven by local needs and a desire to exchange knowledge with other ASEAN cities in areas such as e-governance, urban resilience and public service innovation (62). This form of "city diplomacy" reflects how Philippine cities are seeking external models and partnerships to accelerate learning and the adoption of smart governance practices. For instance, Cebu City's improvements in traffic management benefited from sharing experiences with cities like Singapore and Da Nang through ASCN workshops (63). There is also growing support from international development institutions: the World Bank's technical assistance in 2023 assessed the smart readiness of Philippine cities and recommended developing a national smart city roadmap to harmonize efforts. The World Bank report echoed local findings that without national policies on data sharing, cybersecurity and interoperability, city-level projects would struggle to scale or interconnect (64). This recognition spurred movements toward an e-Governance Act at the national legislature and prompted DOST-PCIEERD to release an expanded smart city development framework in 2022. Encouragingly, by 2024, the national government was moving in this direction – the DICT was drafting an E-Governance Act and DOST's PCIEERD had issued updated smart city guidelines covering governance, infrastructure, environment, mobility, resilience and inclusion indicators (65).

In summary, the Philippine context for smart city governance is characterized by high enthusiasm and pockets of innovation, tempered by practical constraints. Many cities are eager and have initiated projects that benefit from supportive structures (such as national grants, intercity networks and local champions). The core challenges – financing, capacity, policy gaps and political continuity – are gradually being addressed through national-local collaborations and by learning from peers. Lipa City's venture into smart city development should be viewed against this backdrop: it enters the smart city arena as a secondary city, with the advantage of learning from early adopters such as Baguio and Cauayan and with support from programs such as DOST's SSCP and DICT's Digital Cities initiative.

Case Study: Lipa City, Batangas – Toward Smart Governance

Lipa City's pursuit of smart city development became concrete in 2024, when the local government, under Mayor Eric Africa, partnered with DOST-IV-A to implement two flagship programs: Innovation, Science and Technology for Accelerating Regional Development (iSTART) and the Smart and Sustainable Communities Program (SSCP) (66). This partnership was formalized in July 2024, marking Lipa as "the pioneer among

Batangas province cities" to undertake such comprehensive smart city initiatives. According to DOST officials, the iSTART program in Lipa comprises a series of workshops to "revisit and update Lipa City's local development plans to integrate S&T solutions," ensuring that future projects in sectors such as transportation, health and the environment incorporate technological components. Meanwhile, the SSCP is providing technical assistance for Lipa to develop a Smart City roadmap or master plan aligned with the city's needs and global best practices. In essence, Lipa City is first laying the governance groundwork – creating plans, building institutional capacity and aligning stakeholders – before deploying large-scale smart infrastructure. This deliberate, planning-first approach reflects lessons learned from other cities: namely, that a clear plan and governance framework should precede costly tech investments to avoid waste and ensure coherence.

Even before 2024, Lipa had begun adopting elements of smart governance on a smaller scale. A recent study by Sebulino and Perez (2025) assessed Lipa's smart city characteristics through the lens of local business owners. It found that the city already exhibited notable strengths in the dimensions of smart governance and smart environment. In their survey, Lipa's smart governance initiatives – including online government services, a digital business permitting system and some IoT-based innovations for efficiency – were rated as "highly manifested" by local business respondents (average ≈5.23 out of 7). Specific aspects noted were the city's policies on innovative waste management, efforts to leverage IoT for improving business operations and support for tech incubators – all of which loaded strongly on the smart governance factor in their analysis. Moreover, Sebulino and Perez's structural equation modeling showed that improvements in Lipa's smart governance are statistically associated with increases in local business competitiveness. In particular, stronger smart governance (e.g. streamlined digital services, transparent processes, proactive support for innovation) correlated with perceptions of a more enterprise-friendly, resource-efficient business environment and better government support for businesses. For example, each unit increase in their smart governance index was associated with a significant increase in perceived resource efficiency in the business environment ($\beta \approx 1.05$, $p < 0.001$). These findings reinforce the rationale for Lipa to invest in smart governance: it can not only improve public services but also stimulate economic dynamism, thereby creating a virtuous cycle of innovation and growth (67). Interviews in that study indicated that local business owners strongly support expanding digital government services, streamlining regulations and enhancing public–private coordination – all facets of smart governance – as ways to improve Lipa's business climate.

As of 2025, some tangible steps in Lipa's smart governance journey are already observable. The city has been upgrading its digital infrastructure; for instance, it implemented an Electronic Business Permit and Licensing System (eBPLS) that allows businesses to apply for permits and licenses online (68). This significantly reduces processing times and in-person visits, improving ease of doing business. Lipa has also increased the deployment of CCTV cameras and traffic sensors in key areas to enhance security and traffic management (the Batangas Provincial Information Office reported new CCTV installations and a centralized traffic monitoring initiative in 2025). The city's Public Information Office (PIO) has leveraged social media and a city mobile app to disseminate information and receive citizen feedback, which proved especially useful during the COVID-19 pandemic and for disaster response coordination (69). These measures represent the "quick wins" that many LGUs pursue as they begin their smart city journey – visible improvements that build momentum and public support.

However, Lipa's partnership with DOST suggests a broader ambition: to create an integrated "smart and sustainable city" framework for the long term (70). As John Maico Hernandez of DOST-Batangas noted, Lipa is setting a precedent for other cities in the region by holistically incorporating technology into its development agenda (71). Expected deliverables from the DOST–Lipa collaboration include a Lipa City Smart City Roadmap and pilot projects in multiple domains – for example, exploring a smart mobility initiative (intelligent traffic lights or a smart public transport system for major roads), a smart environment project (such as sensor-based flood monitoring, given Lipa's vulnerability to heavy rains) and expanded e-

governance offerings (like bringing more city services online across all departments) (72).

Comparative Analysis: Lipa City Vs Other Smart Cities

To better understand Lipa City's progress and prospects, we compare key aspects of its smart governance initiatives with those of selected cities in the Philippines and globally. Table 2 summarizes this comparative analysis, focusing on themes such as vision and leadership, digital infrastructure, citizen engagement, policy frameworks and partnerships in Lipa and in more established smart cities.

Vision and Leadership

Lipa City's vision is in an early formative stage, catalyzed by external programs (DOST's initiatives) (73). It benefits from proactive local leadership that has openly embraced the smart city concept, yet it is still developing a comprehensive master plan. In contrast, a city like Singapore has a long-term, institutionalized smart nation vision with strong central leadership and clear milestones (74), while a city like Barcelona pivoted its vision mid-course to prioritize citizen empowerment and has embedded that vision in its municipal strategies (75). Lipa's advantage is political will and an external support framework, whereas its challenge is to internalize and sustain the vision across administrations (76).

Digital Infrastructure

Lipa is in the process of upgrading basic digital infrastructure (expanding fiber connectivity, deploying sensors in pilot areas) (77). Compared to Singapore, which boasts nationwide high-speed connectivity, IoT networks and integrated data platforms (78), Lipa's infrastructure is nascent. Even relative to Philippine peers such as Baguio (with its Command Center) or Makati (citywide fiber network through a PPP), Lipa has ground to cover. The roadmap under development is expected to prioritize foundational investments, including a city data center, GIS systems and broader broadband coverage (79). A realistic approach for Lipa is incremental upgrades – for instance, building a city fiber backbone in phases and piggybacking on national government fiberization projects for municipalities.

Citizen Engagement

Currently, Lipa's citizen engagement in governance primarily occurs through traditional means (public consultations, community assemblies) and through social media feedback. The city maintains an active Facebook page and recently launched a mobile app for city services through which citizens can report issues or request services (80). However, there is currently no structured e-participation platform (such as Decidim in Barcelona or Seoul's online petition system) for collaborative decision-making. Under the iSTART program, plans include developing improved feedback mechanisms, such as an e-consultation portal or a participatory budgeting tool (81). By comparison, Barcelona has institutionalized digital participation through multiple platforms (82) and even cities such as Seoul and New York routinely use online tools to involve citizens in budgeting and planning (83). Lipa can learn from these by starting small (e.g., an online suggestion portal or periodic online town halls) and ensuring that citizen input is formally channelled into deliberations of the city council or executive.

Policy Frameworks and Governance Structures

Lipa is beginning to develop local policies to support smart governance. It will likely need to adopt ordinances on open data, data privacy and IT governance standards. For now, it leans on national laws (such as the Data Privacy Act) and the guidance of DOST and DICT. A Smart City Task Force or steering committee has been formed in Lipa, but it is in its early stages. In Singapore, governance is supported by comprehensive policies (e.g., the Public Sector (Governance) Act for data sharing and the Cybersecurity Act) (84) and a permanent agency structure. Baguio City established technical working groups for its smart city projects to ensure interdepartmental coordination (85). Lipa has made a start by forming an internal working group and partnering with national agencies; formalizing this into a permanent office or council (perhaps a Smart City Board including public, private and academic stakeholders) would strengthen continuity and oversight. Over time, Lipa will also need to localize supportive policies (for example, passing an ordinance to establish a Chief Technology Officer position in the city government, or local e-government service standards).

Partnerships and Collaboration

From the outset, Lipa's approach is heavily partnership-driven – notably its collaboration with DOST-IV-A and the union of local and national

efforts. It is also networking with other cities through events and the Philippine Smart Cities community of practice. This mirrors a key global success factor: cities learning from one another. For instance, Lipa has benefited from sharing experiences with cities such as Singapore and Da Nang through ASEAN Smart Cities Network workshops (as noted earlier, Cebu City gained insights into traffic management from Singapore) (86). International development institutions are also in the mix: the World Bank's technical assistance in 2023 assessed Philippine cities' smart readiness and recommended steps that Lipa can also follow (like developing a clear data governance policy). In comparison, Barcelona's journey involved strong partnerships with local tech companies and civic organizations (including citizens as data partners), whereas Singapore leverages industry partnerships to support innovation sandboxes (87). Lipa seems poised to combine vertical collaboration (with national agencies) and horizontal collaboration (with peer cities and local stakeholders). This is a prudent path, as it provides Lipa access to expertise and resources it may lack internally.

Overall, the comparative analysis indicates that Lipa City, as an emerging smart city, is in an early formative stage compared with more mature smart cities. Lipa is wisely focusing first on planning and capacity-building – essentially getting its governance structures and strategies in place. This contrasts with some larger cities that initially poured investments into flashy tech projects only to realize governance readiness was lacking. Lipa's step-by-step approach (roadmap -> pilot projects -> institutionalization) reflects a conscious effort to apply lessons from others. Of course, the scale differs: Lipa cannot match the resource endowment of a global city such as Singapore, but it can adopt technologies and practices appropriate to its context. For example, instead of a multimillion-dollar centralized command center, Lipa might start with a smaller operations center focused on specific needs, such as disaster response, then expand over time.

In comparison with Philippine peers. Lipa trails pioneers like Cauayan or Baguio in implementation, but it benefits from coming later – many of the concepts have been proven and national agencies are more prepared to support now. Lipa can avoid mistakes (such as neglecting interoperability or failing to secure stakeholder buy-in) by heeding the experiences of earlier cities.

The comparative summary in Table 2 reinforces several points for Lipa's smart governance journey:

Table 2: Comparative Summary of Smart Governance Themes: Lipa City Vs Selected Cities

Theme	Lipa City, Ph (Emerging Smart City)	Baguio City, Ph (Pilot Smart City)	Singapore (Global Smart City Leader)	Barcelona (Global Smart City Leader)
Governance Model	Beginning to establish a formal smart city governance framework through DOST-assisted road mapping. Still reliant on traditional LGU structures, with the mayor's office spearheading initiatives. Multi-stakeholder collaboration in planning stage (with national agency support).	Strong mayoral leadership driving innovation (e.g., Mayor Magalong). Institutionalized a dedicated Command Center under city government for integrated governance (88). Set up technical working groups for each smart project (public safety, traffic, etc.). Collaboration with national agencies (DILG, Office of the President) for funding and expertise.	Centralized, "whole-of-nation" approach led by a Smart Nation and Digital Government Office under the Prime Minister's Office. Clear governance hierarchy and inter-agency coordination through national committees (e.g., Smart Nation Steering Committee). The private sector is heavily involved but within frameworks set by government (strong public sector leadership) (89).	Decentralized and participatory governance model. The city established a Smart City department but also opened governance to citizens via bodies like the City Data Office and participatory councils. Emphasis on co-governance: for example, the Decidim platform allows citizens to propose and vote on policies. Public-private-people partnerships (involving local startups and community organizations) are common, reflecting a co-creation ethos (90).
Digital Infrastructure	Building up foundational infrastructure. Incremental deployment of fiber broadband in public offices; expanded public Wi-Fi hotspots in plazas and some barangays. CCTV cameras and traffic sensors being added on major roads. Plans (via the forthcoming smart city roadmap) to integrate these into a unified city data platform or modest command center, but not fully in place yet.	Integrated Command Center with extensive digital infrastructure: city-wide CCTV network (300+ cameras), GIS mapping, traffic control systems, emergency hotline integration (911). High-speed fiber connects city facilities. Starting to add environmental sensors (air quality, flood monitors) feeding into the command center. Some public Wi-Fi exists but is limited; focus is on robust government operational networks.	Ultra-modern infrastructure nation-wide: universal high-speed broadband and 5G coverage; IoT sensors ubiquitously deployed in transportation (intelligent traffic lights, smart parking), environment (weather and flood monitoring), utilities, etc. A National Digital Identity system (SingPass) and data platform (MyInfo) underpin city services. Multiple city operations centers use real-time data streams (e.g., OneMap geospatial platform). Interoperability is high – agencies share data via	Robust digital infrastructure with a civic tech orientation: city-wide fiber network, extensive IoT deployments (smart street lighting, smart waste bins, air quality sensors). An Open Data portal (Open Data BCN) provides hundreds of datasets in machine-readable formats. Notably, Barcelona moved away from the vendor-driven "command center" model; instead, it focuses on distributed data infrastructure (e.g., the DECODE project for encrypted citizen data sharing). Public

			integrated platforms (e.g., Integrated Municipal Operations System).	adoption of digital services is high (e.g., ~70% of transactions with city government are done online), aided by user-centric design and digital literacy programs.
Citizen Engagement	Early-stage and mostly conventional methods so far. The city conducts public consultations and uses social media for feedback. There are a Lipa City mobile app and an active Facebook page where citizens can report issues or receive information, but no structured e-participation platform yet. Under iSTART, there are plans to develop better feedback mechanisms (e.g., an e-consultation portal or participatory budgeting platform) soon.	Moderate engagement with focus on public safety. Baguio involves citizen volunteers in programs like community policing aided by Command Center data (e.g., neighborhood watch groups getting CCTV feed updates). Hosted hackathons with local universities to create apps using city data (traffic, tourism). However, formal online participation in policymaking (e.g., budget consultations or petitions) is still limited. Citizen satisfaction has improved in areas like emergency response, thanks to quicker services via the command center, which indirectly boosts trust.	Very high engagement within a "guided" framework. Singapore employs multiple channels: each agency has feedback units; a one-stop portal (Reach) for citizen complaints and suggestions; periodic Smart Nation public dialogues to solicit ideas. It also uses gamification to encourage participation (e.g., mobile games that involve citizens in solving city issues). That said, while citizen input is valued, decision-making remains largely top-down – input is filtered through expert planning processes and the government maintains strong control over policy direction.	Very high engagement with empowered participation. Barcelona pioneered the Decidim online platform, through which over 400,000 residents have participated in decisions (from budg*et al*locations to urban planning proposals). The city also runs regular innovation challenges where neighborhood associations and civic tech groups co-create solutions (e.g., apps for elderly care or community energy savings). Importantly, Barcelona treats citizens as data owners: through its digital policy, individuals can determine how data collected about them (via city sensors or platforms) is used. This "data sovereignty" approach – operationalized via pilot projects like DECODE – has built public trust and enthusiasm for smart city programs.
Policy Frameworks	Relies heavily on national frameworks while developing local policies. Lipa complies with the Philippines' Data Privacy Act for any data initiatives and references DOST's Expanded Smart City Framework (2022) for guidance. As of 2025, Lipa is drafting a city ordinance to create a Smart City Council and formal data-sharing protocols. It does not yet have a dedicated open data policy (one is planned) and its cybersecurity policies are basic, mostly relying on national e-government security standards.	Mix of local and national policies. Baguio's City Council passed resolutions to support the Smart City Command Center and related data protection measures (consulting with the National Privacy Commission to issue guidelines for safe CCTV use). The city follows national procurement laws but utilized allowable exceptions to expedite tech procurements (ensuring faster project rollouts). Baguio does not have a public open data portal, but it shares certain datasets (e.g., on traffic or tourism) with researchers or upon request. For cybersecurity, Baguio partnered with DICT to audit and secure its command center systems, acknowledging its own limited expertise.	Comprehensive and stringent frameworks. Singapore has national laws tailored to smart governance needs: for example, the Public Sector (Governance) Act facilitates data sharing among government agencies; the Personal Data Protection Act ensures privacy; and sectoral regulations cover areas like autonomous vehicles and digital payments. Policymaking is proactive – Singapore mandates, for instance, that all government digital services meet accessibility standards to include the elderly and persons with disabilities and it pioneered a Cybersecurity Act (2018) to protect critical information infrastructure in smart city systems. An open data policy has been in place for years – the data.gov.sg portal hosts thousands of datasets and agencies are required to contribute data and update it regularly.	Progressive and adaptive policies. Barcelona introduced an overarching Digital City Plan (2017–2020) that included an Ethical Digital Standards policy – requiring all tech projects to uphold transparency, privacy and co-creation principles. The city implemented a "New Data Deal" aiming to reclaim city data from private vendors and give control back to citizens, ensuring the city's data serves the public interest. Open data by default is encoded in city law and procurement rules were adjusted to favor open-source technology and local small/medium enterprises. Barcelona aligns with and often exceeds European Union policies (like GDPR for privacy); it aspires to be a model for ethical smart city governance in practice.

Structured Planning is essential. A strategic governance plan (such as Singapore's comprehensive strategy or Baguio's city plan integration) is foundational. Lipa's current effort to develop a smart city master plan and institutionalize it is on the right track and should continue to be pursued vigorously.

Digital Infrastructure must be phased and interoperable. Lipa should prioritize connectivity and data systems that can talk to each other. Rather than implement siloed solutions department by department, it should adopt a citywide approach (e.g., a common data platform). This echoes the "One Data" approach seen in Indonesian cities and the open standards push in global cities (91).

Citizen-Centric Programs. Lipa should ensure that citizen engagement isn't an afterthought. The city can begin implementing participatory tools early (even in pilot form) so that, as services go digital, citizens are involved in the design and evaluation. This will help drive adoption and trust, as seen in the cases of Barcelona and Seoul (92).

Policy and Governance Reforms. Lipa may need to update local policies (for example, to mandate data privacy compliance in city projects, to enact open

data policies, to create a local ICT unit, etc.). It can examine models such as Singapore's government mandates for accessibility standards or cities like Taipei's open data executive orders (93). Aligning with national policies (like the forthcoming E-Governance Act) and global norms will make its initiatives more robust.

Collaboration and Capacity-Building. Continuing to leverage external support (national agencies, international partners) while building local expertise is crucial. Lipa's engagement with programs and training (e.g., DICT's digital governance training series, USAID, or JICA capacity-building programs) will strengthen human capital to sustain projects. The possibility of designating a "Chief Technology Officer" or a Smart City point person within the LGU could also be considered, as some cities have done, to champion and coordinate these efforts internally (93).

Through this comparative lens, we see that Lipa's strengths lie in commitment, learning orientation and alignment with best practices, whereas its weaknesses are primarily resource and capacity limitations inherent to a mid-sized city. The next section provides concrete recommendations for Lipa City, drawing on both the analysis of its current state and best practices identified at the global and national levels.

Recommendations for Adopting and Scaling Smart Governance in Lipa City

Based on the findings above, a set of recommendations was formulated for Lipa City. These are summarized as follows:

Formalize a Smart City Governance Structure

Establish a permanent Smart City Council or Task Force in Lipa to oversee implementation. This body should include key city departments (planning, IT, budget), the local ICT office and external stakeholders (e.g., academic and business community representatives). It will ensure continuity and collective decision-making. For example, Baguio established technical working groups for its projects and Singapore has inter-agency councils; these structures guided collaboration and accountability. Lipa can adapt this by establishing working groups on major themes (e.g., e-government services, data analytics, citizen engagement) that report to the council.

Develop and Institutionalize the Smart City Master Plan

Once the DOST-assisted roadmap is completed, Lipa should convert it into an official Master Plan adopted by the City Council. This could be integrated into Lipa's Comprehensive Development Plan or stand as a separate document, but backed by a resolution/ordinance. Institutionalizing the plan gives it legal and budgetary standing, making it harder to abandon in the face of political change. The plan should include clear short-term, medium-term and long-term initiatives aligned with budget cycles. It may also be useful to include performance indicators (e.g., increases in online transaction volume, reductions in processing time and the number of open datasets published) to track progress.

Secure Funding through Diverse Sources

Proactively seek funding beyond the city's internal budget. Lipa should craft proposals for national grants (e.g., the DICT's ICT Modernization grants, DILG's assistance funds) and explore PPPs for infrastructure (as Makati did for its fiber network). For instance, partnering with telecommunications companies to expand broadband access or with banks/fintech firms to develop city payment systems could reduce costs. Lipa could also tap into international programs: organizations such as the World Bank, ADB and JICA sometimes fund smart city components (such as intelligent transport and climate-resilience technologies). Having a prioritized project list and feasibility studies will put Lipa in a strong position to attract such funding.

Invest in Capacity-Building and Talent Development. Allocate resources to train city employees in new systems (e.g., GIS, data analytics, cybersecurity best practices). Encourage department heads to participate in digital leadership training (some programs are available through USAID or city networks) (94). Lipa might consider establishing a small "Innovation Unit" within the Mayor's Office or City Planning that pilots' new ideas and serves as an internal consultant to other departments undergoing digital transformation. To address talent gaps, Lipa can offer internships or fellowships to graduates with IT backgrounds to work on city projects – a model like "Data Science Fellows" that some cities have used. Partnerships with Batangas State University or other local colleges can formalize this

pipeline. Building local capacity will reduce reliance on outside contractors over time and embed smart governance know-how within the LGU.

Enhance Citizen Engagement in Smart City Initiatives

To avoid a technology-centric approach, ensure that each major project includes a component of citizen engagement. For example, when developing an open data portal, conduct community workshops to identify which data people would find useful; or, when launching a city app, incorporate user feedback into its design (e.g., through a beta-testing group of residents). Lipa can start participatory budgeting on a small scale – e.g., allow citizens to vote on a portion of the city's investment budget for smart city projects (even if symbolic, it generates interest). Regularly publicize the progress of smart city projects through town hall meetings or social media and invite feedback. This will build public support and trust, both of which are challenges in the Philippines. People-centric communication will help mitigate fears (for instance, explaining how a city ID will protect data or how CCTV is used for public safety with privacy safeguards) (95).

Prioritize "Quick Win" Projects with Visible Impact

While working on foundational systems, also implement a few citizen-facing improvements that demonstrate the value of smart governance. Lipa has undertaken initiatives, including eBPLS and social media responsiveness. Additional quick wins could include deploying an online system to track the status of service requests or permits (improving transparency), establishing free Wi-Fi in public plazas or at city hall for citizens, or creating a 24/7 chatbot for common inquiries on the city website. These relatively low-cost initiatives can improve public perception and create momentum (96). They also help resolve operational issues on a small scale before larger systems come online.

Ensure Interoperability and Scalability in Technology Choices

As Lipa procures new technology (software platforms, sensors, databases), it should favor open standards and interoperability. For example, ensure that any new system (say, a health database or a traffic management software) can share data via APIs with other systems, or at least export data in standard formats. This will prevent the silo problem seen elsewhere. It also future-proofs investments – new modules can be added without starting from scratch. Lipa might also consider using cloud services for some applications to reduce upfront costs and gain flexibility (DICT offers GovCloud services to LGUs). With respect to scalability, pilot projects should be selected to enable expansion if successful. For instance, if testing smart trash bins in one neighbourhood, use technologies that can be replicated in all barangays later, rather than a one-off proprietary solution (97).

Adopt and Localize Data Privacy and Security Policies

Trust is fundamental to smart governance (98). Lipa should develop its own data privacy policy for city data, aligned with the National Privacy Commission's guidelines and ensure all new systems undergo privacy impact assessments. Given the rising incidence of cyber threats, the city should also implement basic cybersecurity measures (e.g., secure hosting, regular backups, staff cybersecurity training) (99). It could coordinate with DICT for security audits or use the free services DICT offers to LGUs (like web security scans). Demonstrating care for data protection will help earn citizen confidence in digital services. Likewise, transparency builds trust: publishing an open data portal (with appropriate safeguards) and sharing non-sensitive datasets (e.g., budget information, project status) can enhance accountability and foster community innovation (e.g., universities might use city data for research) (100).

By following these recommendations, Lipa City can incrementally build a robust smart governance ecosystem. The overarching principle is to keep governance improvements and citizen outcomes at the center, using technology as an enabling tool. Lipa is at a stage where careful planning and steady capacity enhancement can yield significant dividends over time, as it avoids false starts and learns from others. Table 2 and the discussions above highlight that Lipa's measured approach – focusing on "software" (institutional processes and human capital) as much as "hardware" – is prudent and aligns with expert advice on smart city implementation.

Conclusion

Smart city initiatives are often portrayed as technology-led transformations, yet the literature synthesized in this review shows that governance capacity - the institutions, rules, coordination mechanisms and citizen relationships that guide technology use - is the decisive factor in whether "smart" programs deliver public value. Drawing on around 80 academic and policy sources (2000-2025) and a focused discussion of Lipa City, the review identified recurring levers of smart governance: coordinated leadership, interoperable digital infrastructure, meaningful participation and supportive policy frameworks.

This paper contributes by (a) clarifying the conceptual distinctions among e-government (service digitization), digital governance (process transformation), open governance (transparency and participation) and smart governance (an integrative, ICT-enabled, data-driven, collaborative approach); (b) synthesizing global and Philippine evidence to surface best practices and common pitfalls; and (c) situating these insights in the context of a mid-sized Philippine city, offering a practice-oriented set of recommendations for Lipa City and similar local governments.

The practical implications are clear. For Lipa City, smart governance should be advanced as a whole-of-city reform rather than a set of isolated technology projects. Priority consequences include the need to institutionalize coordination (e.g., a permanent smart city governance body with clear mandates and accountability), invest in interoperable foundations (shared data standards and integrated platforms to avoid data silos), embed citizen feedback and co-creation mechanisms so input measurably shapes decisions and strengthen safeguards for privacy, cybersecurity, accessibility and digital inclusion to sustain public trust.

Limitations should temper interpretation. As a narrative review, the study does not perform a meta-analysis or apply a formal, study-by-study risk-of-bias scoring and some relevant work may have been missed. The discussion of Lipa City relies primarily on publicly available documents and reports; implementation details and outcomes may evolve as projects mature and policies or budgets change. Moreover, smart governance outcomes are context-dependent, so practices drawn from global exemplars require careful local adaptation.

Future research should move from planning to evaluation. Priority directions include: (a) establishing baseline and longitudinal indicators for Lipa (e.g., processing time reductions, online transaction uptake, citizen satisfaction, participation rates, open dataset publication and reuse and incident-response performance); (b) mixed-method studies of citizens, businesses and frontline staff - especially digitally excluded groups - to understand adoption barriers and equity impacts; (c) comparative studies across Philippine secondary cities to identify transferable governance designs, financing models and interoperability approaches; and (d) focused analyses of data governance (privacy impact assessment, cybersecurity readiness and ethical use of analytics or AI) in local government settings. Taken together, these lines of inquiry can strengthen the evidence base for scaling smart governance in ways that are measurable, inclusive and resilient over time.

Abbreviations

ASCN: ASEAN Smart Cities Network, DICT: Department of Information and Communications Technology (Philippines), DILG: Department of the Interior and Local Government (Philippines), DOST: Department of Science and Technology (Philippines), eBPLS: electronic Business Permit and Licensing System, iSTART: Innovation, Science and Technology for Accelerating Regional Development (program by DOST), LGU: Local Government Unit (local municipality or city government in the Philippines), PCIEERD: Philippine Council for Industry, Energy and Emerging Technology Research and Development, PIDS: Philippine Institute for Development Studies, SSCP: Smart and Sustainable Communities Program (by DOST Philippines).

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Author Contributions

Francis G Balazon: study design, literature review, writing, revising the manuscript, Jonnah R Melo: sources on global smart governance practices accumulation, analysis, writing, revising the manuscript, Evangeline G Balazon: data analysis from the Philippine context, Lipa City case study, writing, revising the manuscript, Dioneces O Alimoren: data interpretation, comparative analysis, drafting of recommendations. All authors have read and approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest. The views expressed in this article are those of the authors and do not represent any official position of the institutions affiliated with the authors.

Data Availability

No new datasets were generated or analyzed during the current study. This article is based on a review and analysis of published literature and publicly available sources, all of which are cited in the reference list. Any information supporting the conclusions is contained within the article and its references.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors confirm that no generative AI or AI-assisted technologies were used in the creation of this manuscript. All content was conceived, analyzed and written by the authors and all sources have been properly cited. The authors take full responsibility for the integrity and accuracy of the content.

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