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Digital Public Service Ecosystems in Local Governance: Insights from Northeastern Thailand's Local Administrative Organizations

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This study examines the digital public service ecosystems within Local Administrative Organizations (LAOs) in Northeastern Thailand, focusing on the factors that facilitate or hinder the adoption of key digital technologies. The research employs a qualitative design, involving in-depth interviews and focus group discussions with 56 informants across 20 LAOs, to explore eight core elements of digital public services: regulatory frameworks, organizational structure, digital literacy, infrastructure, service activities, stakeholder collaborations, citizen engagement, and budget allocations. The findings indicate that while national policies and certain regulatory instruments provide an enabling environment, fragmented governance, constrained budgets, and insufficient human resource capacity persist as significant barriers to the adoption of sustainable digital practices. Larger municipalities demonstrate higher levels of digital integration and often have dedicated IT units, whereas smaller or resource-constrained LAOs struggle to deliver even basic e-services. Drawing on Digital Ecosystem Theory, this study proposes a dual strategy that combines top-down support—encompassing funding, policy directives, and legislative reforms—with bottom-up initiatives focused on local innovation, multi-stakeholder partnerships, and citizen-oriented approaches. This integrated model underscores that robust infrastructure and regulatory clarity alone are insufficient without parallel investments in institutional capacity-building and community outreach. The policy recommendations include establishing specialized IT units within LAOs, refining budgetary allocations for digital initiatives, and enhancing national-level coordination to optimize resource allocation .

Keywords: digital ecosystems, digital public services, digital transformation, developing countries, local governance

The global shift toward digital transformation was significantly accelerated by the COVID-19 pandemic, which reshaped various sectors, including public administration, education, and commerce (United Nations, 2020). Digital transformation in the public sector, often referred to as digital government, involves integrating digital technologies into governmental operations to enhance public service delivery, improve operational efficiency, and increase transparency and accountability. This transformation is essential for enabling governments to meet the needs of

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modern societies, respond to rapidly changing environments, and ensure that services are accessible to all citizens. The importance of digital government is recognized globally, especially in developing countries, where digital tools help to reduce the gap in service access, making services more convenient, efficient, and equitable, particularly in underserved or remote areas (Omweri, 2024).

In Thailand, the government has acknowledged the need for digital transformation through its Thailand 4.0 initiative, which aims to enhance the efficiency, accessibility, and transparency of public services by utilizing advanced technologies. This initiative led to the establishment of the Ministry of Digital Economy and Society, which is responsible for overseeing the implementation of digital transformation policies at the national level. Despite substantial progress having been made at the central government level, local administrative organizations (LAOs)—the primary units of service delivery at the grassroots level—have faced challenges in fully adopting and implementing digital public services. This is particularly evident in the northeastern region of Thailand, where infrastructural and capacity-related issues have hindered the widespread deployment of digital technologies for public service provision (Thonmanee & Lowatcharin, 2024; Setthasuravich & Kato, 2022; Setthasuravich et al., 2024).

The digital transformation of public services involves leveraging key technologies, such as cloud computing, artificial intelligence, and data analytics, which facilitate improved decision-making, streamlined service delivery processes, and more efficient data storage and processing (David et al., 2019; Zia-ud-Din & Elhajraoui, 2023). These technologies are essential for automating routine tasks, enhancing citizen engagement, and increasing the overall effectiveness of government operations. For example, cloud-based platforms and artificial intelligence can enable local governments to offer more responsive services by providing real-time access to data and enhancing public decision-making processes. However, despite these technologies' potential to revolutionize public administration, significant challenges remain. Issues such as digital divides, resistance to change, and cybersecurity risks must be addressed to ensure that digital transformation initiatives can be implemented effectively and reach all citizens equally (Setyawan, 2024; Djatmiko et al., 2025; Balaji, 2025; Bjerke-Busch & Aspelund, 2021).

In the context of public services, particularly in healthcare and other essential sectors, digital transformation has been shown to enhance accessibility and improve service quality. For instance, research has shown that digital government initiatives can improve the utilization of public health services among marginalized populations, such as migrants in China, by improving access to health information and services (Jia, 2024). Similarly, studies across the European Union have demonstrated that e-government initiatives serve as catalysts for improving healthcare efficiency, making public health systems more responsive, and reducing healthcare costs (Kwilinski et al., 2024). These examples demonstrate the potential benefits of digital government transformation in enhancing public service delivery and promoting a more inclusive society.

Despite the positive global trends, Thailand's local governments face a unique set of challenges in implementing digital services. While there has been a significant push for digital adoption in the private sector, the digital transformation of local administrative organizations remains slow. The Digital Government Development Agency has been at the forefront of driving digital government policies nationwide. However, local administrative organizations often struggle with issues such as inadequate budgets, limited access to technology, and a shortage of personnel with the digital skills necessary to manage these transformations (Digital Economy Promotion

Agency, 2020). These barriers to digitalization impede the ability of LAOs to offer timely and efficient services, particularly in rural or remote areas, where the need for accessible and responsive public services is greatest (Prachumrasee et al., 2024; Van Deursen & Van Dijk, 2019).

Understanding the digital ecosystem within local administrative organizations is crucial for identifying areas where targeted interventions can be implemented to facilitate digital transformation. A digital ecosystem is a dynamic and interconnected system of technologies, people, processes, and organizations working together to deliver digital services. Boley and Chang (2007) define a digital ecosystem as an "open network, loosely coupled, domain-clustered, demand-driven, and self-organizing system," in which each agent operates autonomously yet remains accountable to the broader system. This perspective, which aligns with that presented by Tuamsuk et al., (2023), is crucial for understanding how local governments can effectively implement digital public services that meet citizens' needs while addressing regional challenges and limitations. By assessing the current state of this ecosystem, it becomes possible to identify which factors enable or hinder the successful development of digital services in local administrations (Jakob & Krcmar, 2018; Omweri, 2024; Giest & Raaphorst, 2018).

In recent years, several studies have examined digital ecosystems in public services, particularly in countries such as Singapore, Japan, and South Korea. These studies demonstrate that robust digital ecosystems substantially enhance the modernization, convenience, and transparency of public services. For instance, the integration of digital infrastructure and data connectivity has been found to enhance the delivery of public services at the local government level (Das, 2024). Furthermore, research by Nica et al., (2023) highlights that to enhance the efficiency of digital services, public servants need to possess digital skills. However, there remains a lack of research into the digital ecosystem within local Thai governments, particularly regarding how these ecosystems can be developed to meet the needs of local populations effectively.

Northeastern Thailand, often referred to as the Isan region, is uniquely significant for examining digital public service ecosystems due to its large geographic area, substantial population, and pivotal role in Thailand's decentralization efforts. Empirical data indicate that this region hosts a particularly high concentration of LAOs, many of which struggle with budgetary constraints, inadequate technical resources, and shortages of digitally skilled personnel (Department of Local Administration, 2023). These limitations tend to exacerbate existing socio-economic disparities, emphasizing the urgent need for targeted digital interventions to enhance public service provision (Robru et al., 2024; Chantasoon et al., 2025).

Moreover, the region's predominantly agricultural economy and dispersed rural settlements underscore the crucial role that LAOs play in delivering core services to underserved communities (National Economic and Social Development Council, 2022). Past studies have repeatedly underscored that limited broadband coverage and insufficient digital infrastructure are barriers to consistent and effective service delivery, especially in remote localities (Shaengchart & Bhumpenpein, 2025; Setthasuravich & Kato, 2025). Consequently, an in-depth exploration of Northeastern Thailand's LAOs not only sheds light on the distinct challenges they face—such as lower digital literacy and constrained fiscal capacity—but also provides a foundational framework for digital governance strategies that can bridge gaps in service quality (Milakovich, 2012, 2022; Pukdeewut & Setthasuravich, 2024). By focusing on this region, the present study ensures that its findings are both grounded in local realities and potentially adaptable to comparable contexts in other developing regions.

In light of these issues, this research aims to investigate the current state of the digital ecosystem as perceived by local administrative organizations in northeastern Thailand. By focusing on the readiness of these organizations to adopt and deploy digital technologies, the study will examine the components of the ecosystem and identify key gaps and opportunities for improvement. The primary research question guiding this study is: What is the current state of the digital ecosystem for public services provided by local administrative organizations in the northeastern region? Through this exploration, the research aims to provide a comprehensive understanding of the challenges faced by local governments in their digital transformation efforts and to offer insights into the factors that can facilitate the successful integration of digital technologies. Ultimately, this study's findings will inform the development of context-sensitive strategies to enhance digital public service delivery, improve accessibility, and ensure that all citizens benefit from more efficient and transparent governance.

Literature review

Digital Public Services Concept

The digital transformation of public services has become a critical pillar of modern governance, enhancing efficiency, transparency, and citizen engagement. Local governments, as frontline service providers, have increasingly integrated e-government platforms, digital identity systems, open data initiatives, and smart service applications into their daily operations in order to improve service delivery and administrative efficiency (Janssen & Estevez, 2013; Jan, 2025). This shift aligns with broader global initiatives, such as the European Union's digital government strategy, which aims for full digital accessibility by 2030 (Varisco & Pattinson, 2024). However, digital transformation is not solely a technological process: it requires institutional reforms that prioritize citizen participation, data-driven decision-making, and interoperability (Mergel et al., 2019). While automation reduces transaction costs and enhances service efficiency, its success depends on policy coherence, administrative capacity, and public trust (Roehl & Hansen, 2024; Tveita & Hustad, 2025). Persistent challenges—including policy fragmentation, bureaucratic inertia, and digital inclusion disparities—hinder progress, particularly in marginalized communities where digital literacy and internet access remain limited (Van Deursen & Van Dijk, 2019).

A critical aspect of digital governance is digital maturity, which assesses a government's ability to implement and sustain digital initiatives. Wodecka-Hyjek et al., (2024) identify six key dimensions of digital maturity—management focus, stakeholder openness, employee competencies, process digitalization, technology integration, and e-innovativeness—that reveal disparities between municipal and regional levels, influencing the adoption of digital services.

Emerging technologies, including artificial intelligence (AI), blockchain, the Internet of Things (IoT), and big data analytics, have transformed public administration. AI facilitates predictive analytics and automated decision-making, enhancing policy responsiveness and operational efficiency (Roehl & Hansen, 2024). Blockchain strengthens data security and transparency, particularly in public finance management and digital identity verification (Kshetri, 2017). IoT technologies play a crucial role in the development of smart cities, enhancing infrastructure, improving energy efficiency, and promoting urban mobility (Koonmee et al., 2021; Prachumrasee et al., 2019; Meijer & Bolívar, 2016). Big data has empowered governments to assess social and economic trends, optimizing resource allocation and crisis management (Lee, 2020; Vasilopoulou et al., 2023). Several countries, including the UK, have incorporated these innovations into national strategies, as highlighted in the State of Digital Government Review, which underscores the role of AI-driven governance and blockchain-based public services (Ubaldi et al.,

2019; Berryhill et al., 2018). However, these technologies also present governance challenges, including data privacy concerns, regulatory complexities, and financial constraints, which affect their widespread adoption (Local Government Association, 2025a).

Governance plays a central role in the sustainability and effectiveness of digital public services. Scholars emphasize the need for collaborative governance models that strike a balance between technological innovation and ethical oversight to maximize public value (Gasco Hernandez, 2024). Policy frameworks such as the Local Government Centre for Digital Technology have been proposed to coordinate digital initiatives, standardize best practices, and align local efforts with national digital strategies (Local Government Association, 2025b). However, systemic barriers, including funding disparities, digital literacy gaps, and interoperability challenges, continue to impede progress (Varisco & Pattinson, 2024). Furthermore, ethical concerns surrounding AI-driven decision-making and data governance necessitate regulatory safeguards to protect citizens' privacy and prevent algorithmic bias (Latupeirissa et al., 2024). A holistic approach that integrates technology with governance reforms, capacity-building initiatives, and equity-driven policies is essential. Future research should investigate the long-term impact of digital public services on citizen participation and explore hybrid models that strike a balance between automation and human-centered service delivery.

Digital Ecosystem Concept

The concept of a digital ecosystem, as defined by Boley and Chang (2007), revolves around dynamic networks involving various actors, technologies, and processes that collectively drive digital governance. In public administration, digital ecosystems comprise interconnected components, including governance frameworks, technological infrastructure, service providers, citizen engagement mechanisms, data governance policies, and financial models (Janssen & Estevez, 2013). In contrast to traditional bureaucratic systems, digital ecosystems prioritize flexibility, collaboration, and the co-creation of public services (Weißmüller et al., 2023; Edelmann & Virkar, 2023).

Governance frameworks are essential for coordinating the activities of multiple stakeholders within the ecosystem. Policies, regulations, and institutional arrangements must align with technological advancements to ensure transparency, accountability, and inclusivity (Sha et al., 2024). Digital ecosystems rely on the integration of scalable technological infrastructure, including cloud computing and interoperability frameworks, to facilitate seamless communication across government agencies and ensure the sustainability of digital services (OECD, 2024a, 2024b). Chang (2012) further highlights the role of technology in enhancing public service and participation.

Service providers and innovation partners, such as private sector organizations, civic tech firms, and academia, play a crucial role in driving technological innovation and enhancing service delivery (Verma & Jayasimha, 2014; Alonso & Andrews, 2022). Madan and Ashok (2023) examine the potential and challenges of AI in government, highlighting the importance of integrating advanced technologies to enhance public sector operations.

Citizen engagement and digital inclusion remain central to the ecosystem. Increasingly, citizens are seen as active participants in the design and implementation of public services, rather than passive recipients (Meijer, 2015). The digital divide continues to pose significant challenges, particularly for marginalized groups lacking access to technology or digital literacy (Curtis et al.,

2022). To promote inclusivity, governments must implement policies such as digital literacy programs, for example, mobile-first strategies, to ensure equitable access to digital services (Wang & Si, 2024; Correa et al., 2020). Additionally, data governance plays a crucial role in managing public sector data ethically and ensuring compliance with privacy regulations, such as the General Data Protection Regulation (GDPR), while fostering innovation and transparency through open data initiatives (Moriniere et al., 2024). Financial sustainability mechanisms, such as government budgets, are also vital for the continued development and success of digital ecosystems (Senyo et al., 2024; Chen et al., 2021).

Elements of Digital Public Services Ecosystem

The conceptual framework for evaluating the digital public services ecosystem in this study, as illustrated in Figure 1, is organized around eight elements that define the success and sustainability of digital public services within LAOs. These elements are interconnected and essential for creating a robust digital ecosystem that can deliver efficient public services.

The first element, "regulations and laws", often becomes a source of uncertainty in practice when new practices or digital technologies are introduced into public service delivery. Public sector personnel frequently encounter hesitation in implementation due to concerns about whether such actions are legally permissible, stemming from the absence of clear legal support and regulatory frameworks that encompass the emerging practices or technologies (Putra & Sara, 2024; Ruka, 2024; Sha et al., 2024). "Organizational structure and human resources," which comprise the second element, form the internal governance framework of public agencies, emphasizing leadership, institutional capacity, and the ability of public servants to manage and adapt to digital tools (Shaddiq et al., 2023; Xia & Md Johar, 2024). The third element, "digital literacy and skills," underscores the importance of digital literacy and capacity-building for both government staff and citizens, ensuring equitable access to services and fostering a culture of continuous learning (Oladimeji et al., 2024; Djatmiko et al., 2025). "Digital infrastructure," the fourth element, ensures the reliable functioning of digital services through robust hardware, software, and technical systems (GPAI, 2024; Baptista & Nunes, 2025). The fifth element, "activities," addresses the processes involved in digitalizing public services, ensuring that they meet the evolving needs of citizens (Janssen & Estevez, 2013). The sixth element, "collaboration" is also essential, as digital government initiatives are most successful when they involve partnerships among government agencies, the private sector, and civil society, thereby fostering innovation and enhancing service delivery (Alonso & Andrews, 2022). "Service recipients," or citizens, are the seventh element and are central to the ecosystem, driving the focus on designing accessible, inclusive, and user-friendly services that cater to all segments of the population (Meijer, 2015; Sahamies & Anttiroiko, 2024). Lastly, "budget allocations" ensure that sufficient financial resources are available to build, maintain, and scale digital infrastructure while supporting capacity-building efforts and ensuring the sustainability of digital services (Senyo et al., 2024; Chen et al., 2021).

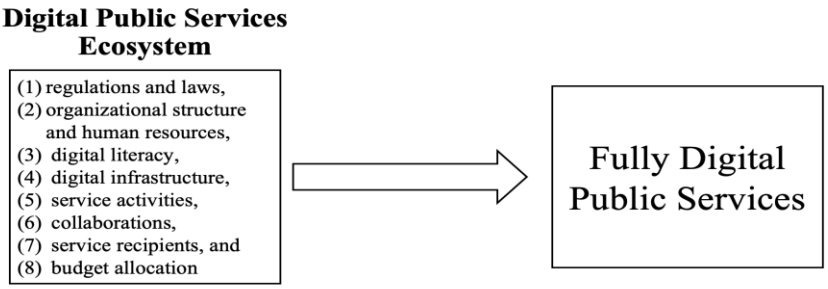

Figure 1. A conceptual framework

Although existing literature offers valuable insights into governance frameworks, technological infrastructures, and citizen engagement (GPAI. 2024; Das, 2024), previous studies have primarily examined digital public services in high-income countries or at the national level, often neglecting the distinct conditions of local governance in developing regions (Van Deursen & Van Dijk, 2019). Research on digital ecosystems rarely examines how limited resources, infrastructural challenges, and grassroots realities impact service delivery at the municipal or district level. This oversight is particularly significant in regions such as Northeastern Thailand, where socio-economic disparities, budgetary constraints, and cultural nuances complicate digital transformation efforts (Prachumrasee et al., 2022; Thonmanee & Lowatcharin, 2024).

Consequently, a gap remains in understanding how LAOs adapt and implement digital strategies in the face of these constraints. By examining critical ecosystem elements—such as regulatory frameworks, organizational capacities, and collaborative arrangements—this study offers a context-sensitive analysis that addresses the underexplored intersection of digital transformation and local governance in developing regions.

Method

This study employs a qualitative research design to investigate the digital public service ecosystem within Local Administrative Organizations (LAOs) in Northeastern Thailand. We chose to take a qualitative approach to gain in-depth insights into the structural, technological, and administrative challenges facing LAOs during their digital transformation journey. By focusing on participant perspectives and institutional contexts, this study provides a rich, descriptive analysis of the factors that enable or inhibit digital service adoption.

Site Selection Area

We employed a purposive sampling technique to select LAOs with varying levels of digital service adoption, ensuring the inclusion of informants who could provide rich, context-specific information relevant to the research objectives (Patton, 2015). In this study, we examined 20 LAOs across the four largest provinces in Northeastern Thailand, namely, Khon Kaen, Nakhon Ratchasima, Ubon Ratchathani, and Udon Thani. Within each province, all five types of local government entities were represented: Provincial Administrative Organizations (PAOs), City Municipalities, Town Municipalities, Sub-district Municipalities, and Sub-district Administrative Organizations (SAOs). We selected these provinces due to their combination of urbanized municipalities and rural sub-district organizations, which reflect varying levels of digital readiness and allow for a representation of the broader challenges encountered by Thai Local Administrative Organizations (LAOs) in their digital transformation processes. Khon Kaen and Nakhon Ratchasima exemplify more advanced digital initiatives (Digital Economy Promotion Agency, 2020), whereas Ubon Ratchathani and Udon Thani highlight ongoing challenges in less-developed contexts. This selection encompasses a broad spectrum of digital governance capacities, influenced by variations in fiscal resources and administrative contexts (Budget Bureau, 2022; Prachumrasee et al., 2024). By incorporating both advanced and underdeveloped models, the study offers a holistic perspective on the factors influencing digital transformation at the local level.

We selected these provinces because they are among the five in the region that have City Municipalities, which typically function as economic and administrative hubs and therefore play a key role in advancing digital public services (Digital Economy Promotion Agency, 2020; Nimmanphatcharin et al., 2021). To maintain balanced coverage across the five types of local government structures, we selected one Local Administrative Organization (LAO) of each type

within each province, enabling a comparative analysis of digital public service ecosystems across municipal governance structures in Northeastern Thailand. Using this approach, we captured variations in digital service adoption across different governance models, facilitating an in-depth exploration of the dynamics influencing digital public services.

Although we obtained valuable insights into the digital public service ecosystem in LAOs, our findings should be interpreted with consideration for the contextual limitations that affect them. As we conducted the study within a specific region of Thailand, caution should be exercised in generalizing the results to all Thai LAOs. However, the regulatory ambiguities, disparities in digital infrastructure, constraints in human resources, and financial limitations identified in this study are widely observed across Thailand's local governance landscape. These challenges are not confined to Northeastern Thailand but instead reflect broader structural characteristics of Thailand's decentralized administrative system. Therefore, although we do not claim statistical generalizability, the findings provide transferable insights that can contribute to digital transformation strategies in other Thai provinces with similar governance and socio-economic conditions.

Interviewees

The study involves 56 key informants from both executive and operational levels within the LAOs, as shown in Table 1. We purposively selected the participants based on their expertise and responsibilities in implementing digital public services, ensuring a comprehensive understanding of both strategic decision-making and practical execution. This group includes executives and senior officials involved in governance, policy formulation, and strategic planning, as well as operational staff and service providers directly responsible for the implementation, management, and daily delivery of these services.

Table 1

Number of interviewees.

	Khon Kaen		Nakorn Ratchasima		Ubon Ratchatani		Udon Thani		Total
	Exe-cutive	Staff	Exe-cutive	Staff	Exe-cutive	Staff	Exe-cutive	Staff	
PAO	2	4	1	1	2	4	1	3	18
City	1	2	1	1	1	2	1	1	10
Town	2	4	2	1	1	1	1	1	13
Sub-district	1	1	1	1	1	1	1	0	7
SAO	1	1	1	1	1	1	1	1	8
Total	**7**	**12**	**6**	**5**	**6**	**9**	**5**	**6**	**56**

Data Collection

Data collection took place in two main formats: in-depth interviews and focus group discussions, determined by the number of participants available at each session. When only one or two individuals were present, the session proceeded as a semi-structured interview. These interviews followed an interview protocol aligned with key ecosystem elements, including regulations, organizational capacity, and digital literacy. They featured open-ended questions that allowed participants to discuss relevant challenges, successes, and potential improvements freely and openly. In situations where three or more individuals participated simultaneously, we employed a focus group format (Morgan, 1997). Group sizes typically ranged from three to six participants,

facilitating robust interaction while ensuring each person had an opportunity to contribute (Guest et al., 2017).

We conducted all interviews and focus group discussions between May 2022 and December 2023, with each session lasting between 1 and 2 hours. Regardless of the format, all sessions were audio-recorded with the participants' informed consent, allowing for the capture of nuanced opinions and dynamics. Both the semi-structured interview guides and focus group protocols maintained a similar thematic focus, addressing organizational readiness, technological resources, service design, stakeholder collaboration, and budgetary constraints (Wodecka-Hyjek et al., 2024).

Sample Guiding Questions for In-Depth Interviews

- Can you describe your organization's current state of readiness for digital transformation?
- How do existing laws and regulations affect your organization's ability to deliver digital services?
- How would you evaluate the level of digital literacy among your staff?
- Can you provide a specific example of a digital initiative your organization has undertaken? What were the key factors contributing to its success or failure?
- What are the primary organizational challenges you encounter when adopting or scaling digital technologies?

Sample Guiding Questions for Focus Group Discussions

- What common challenges do agencies or departments face in delivering digital public services?
- In what ways do budget planning and allocation influence your organization's ability to deliver digital public services?
- From your perspective, what are the most critical success factors for effective digital transformation in the public sector?
- Is there additional support you would like to receive? If so, what is it?

Data Analysis

We audio-recorded, transcribed (verbatim), and analyzed all interviews and focus group discussions using the approach proposed by Braun and Clarke (2006). We chose this method for its flexibility and suitability in identifying, analyzing, and reporting patterns (themes) within qualitative data, particularly in complex public sector environments. Our analysis began with reading all transcripts repeatedly to ensure immersion in the data and to develop a comprehensive understanding of the content. During this process, we made notes and documented our initial observations.

The first phase involved generating initial codes. We employed both inductive and deductive coding approaches. We developed a preliminary coding scheme based on the study's conceptual framework. It included categories such as regulations, organizational structure, digital literacy, infrastructure, activities, service recipients, collaborations, and budget allocations. We derived additional codes inductively from the data to capture unanticipated insights and emerging themes. In the second phase, we identified themes by grouping codes into potential themes based on the identification of shared patterns, relationships, and meanings. This involved reviewing coded segments and aggregating similar codes into broader thematic categories. The third phase focused on reviewing themes. We refined identified themes by evaluating their internal consistency and

distinctiveness. We conducted a two-level review process—first within individual coded extracts and then across the entire data set—to ensure that the themes were representative and relevant.

In the fourth phase, we defined and named the themes. Each theme was clearly articulated and labeled to reflect its core meaning. We developed a codebook to document theme definitions, along with illustrative quotes, to enhance transparency and interpretability. Finally, we produced our report by synthesizing a coherent narrative based on the finalized themes, structured around the research questions that guided our investigation. We incorporated direct quotations from participants to preserve authenticity and to provide depth and context to the findings.

To ensure the credibility and trustworthiness of the analysis, we applied several qualitative validation strategies. We conducted triangulation by comparing insights obtained from interviews, focus group discussions, and relevant policy or administrative documents (Lincoln & Guba, 1985; Korstjens & Moser, 2018). We undertook member checking by sharing summarized findings with selected participants, who were invited to confirm the accuracy and relevance of the interpretations (Merriam & Tisdell, 2015). Additionally, we maintained an audit trail throughout the analytical process by documenting key decisions, code definitions, and the development of themes (Nowell et al., 2017). Through this rigorous and systematic approach, we promoted transparency, minimized researcher bias, and strengthened the overall validity and reliability of the qualitative findings.

Ethical Considerations

We conducted this study following the principles outlined in the Declaration of Helsinki. It was reviewed by the Institutional Ethics Committee of Khon Kaen University, Khon Kaen, Thailand (Reference Number HE653052, Approval date: April 12, 2022).

Results and Discussion

This study examined 20 Local Administrative Organizations (LAOs) across four provinces in Northeastern Thailand—Khon Kaen, Nakhon Ratchasima, Ubon Ratchathani, and Udon Thani—encompassing five types of LAOs: Provincial Administrative Organizations (PAOs), City Municipalities, Town Municipalities, Sub-district Municipalities, and Sub-district Administrative Organizations (SAOs). These LAOs differ in administrative responsibilities, population size, and budgetary capacities. Larger municipalities, such as cities and towns, tend to have more substantial budgets and often maintain dedicated information technology (IT) units. In contrast, smaller, rural-based SAOs frequently lack specialized personnel and rely on external service providers. Such diversity highlights the heterogeneity of digital readiness among these LAOs, providing the context for the findings that follow.

Current State of the Digital Ecosystem

We structured the qualitative analysis of the digital public services ecosystem around eight key elements: regulations and laws, organizational structure and human resources, digital literacy, digital infrastructure, service activities, collaborations, service recipients, and budget allocation, as illustrated in Figure 2.

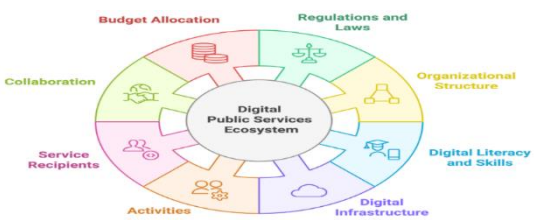

Figure 2: Eight elements of the digital public services ecosystem.

Regulations and Laws

Regulations and laws play a crucial role in shaping the adoption of digital systems. Although several legislative frameworks support digital transformation, ambiguities and inconsistencies in regulatory provisions often hinder the effective implementation of this transformation. For instance, while the Personal Data Protection Act (PDPA) mandates stricter compliance measures, many Local Administrative Organizations (LAOs) perceive a lack of clear operational guidelines, leading to cautious adoption and fragmented digital service implementation (Putra & Sara, 2024; Ruka, 2024; Sha et al., 2024; Kandasamy et al., 2023). This challenge is reflected in the perspectives of LAO representatives, as illustrated in the following excerpts from interviews. Some interviewees highlight the restrictive nature of existing administrative regulations, which impede the complete transition to digital public services, particularly in processes that still require physical documentation:

> *...Certain bureaucratic regulations are not yet conducive to a complete shift towards fully digital public service delivery, especially in cases where approval processes still necessitate physical documentation… (A1).*

Conversely, personnel from other LAOs contend that the current legal framework does not present a substantial barrier, as existing legislation, including the Licensing Facilitation Act and the Electronic Transaction Act, provides sufficient legal support for digital service delivery:

> *...Regulations do not hinder the adoption of digital systems in public service provision, as the Facilitation of Official Services Act and the Electronic Transactions Act already provide a legal foundation for digital transactions… (A2).*

Organizational Structure, Digital Literacy, and Skills

In terms of organizational structure and human resources, the findings indicate that most Local Administrative Organisations (LAOs) in Thailand lack dedicated digital units, resulting in the fragmented implementation of digital initiatives. Even in municipalities with designated digital departments, a significant shortage of specialized personnel persists, resulting in the assignment of digital governance responsibilities to general administrative staff who often lack the necessary digital competencies. This study aligns with the work of Lohr (2025), who underscores the critical role of human resources in driving digital government transformation. It further extends this perspective by illustrating how decentralization, while empowering local administrations, can inadvertently widen the digital skills gap. In a context where local governments have varying levels of resources, leadership capacity, and access to training, decentralization leads to unequal development of digital competencies. As one interviewee noted:

> *...There is a lack of personnel with direct digital expertise. Existing staff are often tasked or assigned responsibilities that do not align with their positions. The organizational structure does not facilitate digital transformation, and there is a lack of systematic management in place. Recruiting skilled personnel is challenging due to regulatory constraints imposed by the central government, which limit the autonomy of local governments… (D1).*

This issue highlights concerns regarding the digital literacy and skills of LAO personnel, as well as digital literacy among officials and citizens. The varying levels of digital competence among different stakeholders exacerbate the challenges of digital transformation. While some LAOs periodically offer training sessions, there is no standardized digital capacity-building program in place. As illustrated by the following interview excerpts, digital proficiency remains limited:

> *...Overall, digital knowledge and skills among personnel are at approximately 40%. There is a small group with high digital competency, while the majority possess only moderate proficiency... (B1)*

...Executives should have sufficient digital literacy to integrate technology into management and policymaking. Department heads, in particular, need adequate skills to manage data effectively. However, the agency does not provide a structured training program to enhance digital competencies… (B2)

This reflects a broader trend of digital inequality, stemming from disparities in digital skills and knowledge. These disparities serve as barriers to the development of digital government initiatives (Van Deursen & Van Dijk, 2019; Setthasuravich et al., 2024; Pukdeewut & Setthasuravich, 2024).

Digital Infrastructure

Digital infrastructure is the most essential and salient determinant of the preparedness and quality of digital public services, particularly in larger municipalities that benefit from greater budgetary support. Certain city municipalities have invested in cloud systems and automation tools. However, smaller LAOs continue to face challenges, including outdated software, unreliable internet connectivity, and inefficient data management systems. As one respondent noted:

...Hardware is insufficient and outdated. The software in use may be obsolete and poses licensing issues… System connectivity remains incomplete… (C2).

The adoption of digital platforms for public service delivery varies significantly among LAOs. While some organizations effectively utilize e-portals and mobile applications, others primarily rely on social media for citizen engagement. This fragmentation in service provision presents a significant challenge, aligning with the findings of ICLEI (2023) and Latupeirissa et al., (2024), which emphasize the risks associated with uncoordinated digital initiatives. Previous research has demonstrated that sustained investment in digital infrastructure significantly enhances the effectiveness of local governance (Xu & Dai, 2024; Mofokeng et al., 2025). These findings underscore the importance of adopting a strategic and integrated approach to digital service delivery—one that improves usability, ensures accessibility, and strengthens overall service effectiveness.

Activities and Service Recipients

In terms of service activities, most LAOs have yet to incorporate digital service initiatives into their annual operational plans. Rather than implementing comprehensive digital strategies, LAOs primarily establish working groups and utilize online communication channels such as Line, Facebook, and official websites to engage with citizens. However, digital services remain largely fragmented, with limited cross-agency data integration, reflecting broader challenges in digital coordination among government entities. As one respondent noted:

...There are no structured initiatives to advance digital public services. Traditional service delivery methods remain functional due to the manageable size of the jurisdiction and population… (B5)

Another interviewee highlighted:

...Line and Facebook are used for communication and handling citizen complaints, but identity verification for official requests must still be conducted in person at the municipal office… (D4)

This issue aligns with key challenges previously identified in e-government transition research (Janssen & Estevez, 2013). Digital infrastructure alone is insufficient for meaningful transformation without concurrent advancements in policy and human resource capabilities (Zhang & Chen, 2024; Ruiz et al., 2024). Despite these gaps, many LAOs have started integrating digital platforms for specific functions, such as revenue collection and citizen engagement. However, the

extent of digital adoption varies significantly, with some municipalities implementing comprehensive digital solutions while others restrict their digital presence to fundamental social media interactions.

Collaboration

Collaborations with external stakeholders, including private technology firms and academic institutions, remain underutilized by many local authorities. Most partnerships align with provincial-level mandates rather than being directly related to digital public service provision. While some municipalities have engaged in collaborative efforts for digital training and software implementation, these partnerships tend to be ad hoc rather than systematically embedded within governance frameworks. Strengthening institutional partnerships could facilitate digital adoption by leveraging external expertise and shared resources. This finding is consistent with several studies, which likewise affirm that collaborations between government and the private sector enhance digital service delivery (Verma & Jayasimha, 2014; Alonso & Andrews, 2022; Ma et al., 2023; Liu et al., 2024). As one respondent noted:

...LAOs have partnerships with Krung Thai Bank for electronic salary and welfare payments, but there are no collaborations with other agencies in digital initiatives... (A5).

The study also reveals an increasing level of citizen engagement with digital public services, particularly in urban areas where digital literacy is higher. However, significant difficulties persist in rural communities, where access to digital platforms remains limited due to both infrastructural deficiencies and a lack of digital skills. Addressing these challenges necessitates targeted digital inclusion policies to ensure equitable access to government services (Friederici et al., 2017). As one interviewee observed:

...Most citizens are not yet prepared to use digital services, particularly older people and those in remote areas... (A1).

Budget Allocation

Budget allocation constraints persist as a significant challenge across all LAOs, restricting long-term investment in digital transformation. As long as municipalities allocate limited funding to basic IT infrastructure, there is a minimal financial commitment to comprehensive digital strategies, advanced cybersecurity measures, or personnel training programs. As interviewees noted:

...There is budget allocation for digital investment, but it remains a tiny proportion of the overall budget... (A3).

Another respondent highlighted:

... A tiny budget of approximately 5,000 baht is allocated annually for website maintenance out of a total central government allocation of 80 million baht, while no budget has been designated for other digital systems... (B5).

Similarly,

...There is funding for website domains and annual fees for Line Official accounts, but no budget allocated for developing specialized digital systems... (B3).

This reactive budgeting approach hinders sustainable digital governance and reinforces reliance on external support for service development. Our findings suggest that structured and predictable budgetary allocations for digital public services are essential to achieving long-term transformation. Previous research has emphasized that financial sustainability is a crucial factor in the success of e-government initiatives (Senyo et al., 2024; Chen et al., 2021; Sigurjonsson et al., 2024). However, this study indicates that financial planning in Thai LAOs remains reactive rather than strategic, thereby limiting the effectiveness and sustainability of digital transformation efforts.

Comparisons by LAO Type

Table 2 summarizes the comparative readiness of different types of LAO. City Municipalities demonstrate the highest level of digital development, supported by relatively modern infrastructure, specialized IT units, and active public engagement. Town Municipalities follow closely, yet continue to face bureaucratic and connectivity challenges. PAOs show mixed readiness, with some leading in digital adoption while others struggle with limited IT governance and uneven staff capabilities. Sub-district Municipalities exhibit lower levels of integration and rely primarily on basic social media communication. SAOs rank lowest, constrained by unclear regulations, minimal IT staffing, and rudimentary digital platforms. These combine to leave them less equipped to offer citizen-centered e-services.

Table 2

The comparative readiness of different types of LAO

Category	City Municipalities	Town Municipalities	PAOs	Sub-district Municipalities	SAOs
Legal Readiness	Moderate (some outdated regulations)	Moderate (bureaucratic obstacles)	Mixed (some facilitative, some restrictive)	Weak (unclear regulations)	Weak (unclear and inconsistent policies)
Organizational Structure	Well-defined IT units	IT under strategic departments	Varies (some have digital units, others lack structure)	Limited digital governance	Minimal digital staffing
Human Resources	Digital expertise available but constrained	General awareness but skill gaps	Highly variable (some trained, others lacking)	Staff often lack specialized training	Digital tasks assigned to non-experts
Digital Literacy & Training	Ongoing digital upskilling programs	Efforts to enhance competencies	Inconsistent training programs	Sporadic training	Rare or informal training
Infrastructure Readiness	Advanced (modern hardware, stable internet)	Mostly modern but occasional connectivity issues	Mixed (some well-equipped, others lacking)	Outdated systems in many areas	Limited investment, infrastructure gaps
Digital Service Integration	High (diverse digital services, citizen engagement)	Moderate (good but uneven service implementation)	Basic integration with inconsistencies	Basic social media/web-based communication	Minimal digital services
Public Readiness & Access	High engagement with digital platforms	Moderate but some barriers remain	Mixed (some digital adoption, others reluctant)	Low, with accessibility challenges	Very low, particularly in rural areas
External Collaboration	Active partnerships with agencies/private sector	Some collaborations, but lacking strategy	Mixed (some initiatives, but not sustained)	Limited cooperation	Minimal partnerships
Overall Readiness Ranking	1st	2nd	3rd	4th	5th

Comparisons by Province

To derive the "Overall Readiness Ranking" by province, as shown in Table 3, we employed the same qualitative criteria as were used in Table 2. Specifically, we examined each province's performance across the eight ecosystem elements and aggregated the insights from interviews and focus groups. We then ranked the provinces from 1 (highest) to 4 (lowest) based on the extent of digital service integration, alignment with existing regulations, staff digital competencies, and evidence of sustainable investment in IT infrastructure. We found that Khon Kaen stands out for its relatively modern infrastructure and range of digital services, although there is room for improvement in governance and public adoption. Ubon Ratchathani benefits from active

collaborations and moderate infrastructure but struggles with staff skill gaps and a persistent digital divide. Nakhon Ratchasima has adequate infrastructure yet lacks specialized digital personnel and fails to prioritize holistic digital transformation. Udon Thani faces the most severe constraints, including a shortage of skilled staff, minimal budget allocations, and low public readiness. Common to all provinces are the burdens of outdated policies, limited training, and underinvestment, which collectively impede robust e-government delivery.

Table 3

The comparative readiness by province.

Factor	Khon Kaen	Ubon Ratchathani	Nakhon Ratchasima	Udon Thani
Digital Infrastructure	Well-developed, stable internet	Moderate, stable in urban areas	Adequate but uneven	Limited, connectivity issues
Organizational Structure	Dedicated digital service units	Moderate specialization	Lacks specialized units	Relies on outsourcing
Human Resources	Skilled but limited expertise	Skills gaps among personnel	Limited specialized staff	Severe shortage of skilled staff
Digital Public Service Offerings	Diverse and innovative	Moderate, sector-specific	Basic but expanding	Limited, mostly social media-based
Collaboration with External Organizations	Strong partnerships	Active collaborations	Moderate engagement	Minimal collaboration
Budget Allocation for Digitalization	Moderate but strategically invested	Moderate but inconsistent	Prioritized for hardware, not services	Minimal allocation
Regulatory Readiness	Supportive but needs updates	Some alignment, minor gaps	Moderate alignment	Outdated regulations hinder progress
Public Readiness	Increasing but not universal	Growing but urban-centered	Improving, uneven adoption	Low, requires digital literacy programs
Overall Readiness Ranking	1st	2nd	3rd	4th

The variations we observe in digital adoption among LAOs can be explained via multiple theoretical frameworks. Larger municipalities demonstrate higher levels of digital integration, which aligns with Digital Ecosystem Theory (Boley & Chang, 2007), emphasizing the interdependence of governance structures, technological capabilities, and institutional collaboration. Well-developed digital ecosystems foster innovation, efficiency, and responsiveness, which is why municipalities with strong governance and robust funding mechanisms tend to perform better. In contrast, smaller LAOs remain constrained by limited financial capacity, fragmented IT governance, and a lack of strategic vision, inhibiting their ability to develop robust digital services.

However, this study partially challenges Diffusion of Innovation Theory (Rogers, 2003), which suggests that innovations naturally spread when they offer clear advantages and observable success cases. Despite some municipalities successfully implementing digital governance, these practices do not readily diffuse to other LAOs, primarily due to regulatory constraints, financial disparities, and institutional inertia. This suggests that, beyond technological readiness, regulatory and financial barriers must also be considered significant inhibitors to digital transformation.

The Supportive and Inhibitive Factors Affecting the Development and Effectiveness of the Digital Ecosystem in Public Services within LAOs.

A mix of both supportive and inhibiting factors shapes the digital transformation of LAOs in Northeastern Thailand. While advances in digital infrastructure, regulatory frameworks, and citizen engagement have created an environment conducive to digital adoption, persistent challenges in human resource capacity, financial sustainability, and fragmented governance structures continue to hinder progress.

One of the most significant enablers is digital infrastructure readiness, particularly in city municipalities, where investments in cloud-based systems and broadband connectivity have facilitated the expansion of digital public services. This finding is consistent with Digital Ecosystem Theory (Boley & Chang, 2007), which posits that a well-integrated technological infrastructure is fundamental for sustainable digital ecosystems. In line with the Technology-Organization-Environment (TOE) framework (Tornatzky et al., 1990; Xiao et al., 2022; Adade & de Vries, 2025), digital transformation in LAOs appears to be driven by the availability of technological resources and organizational capacity.

The presence of regulatory frameworks also supports digital transformation. National legislation, such as the Electronic Transactions Act and the Licensing Facilitation Act, provides a legal basis for online transactions and digital service delivery. This finding aligns with Fountain (2001) and Irbe (2024), who argue that regulatory support is essential for shaping digital governance structures. However, while some municipalities effectively leverage these laws, others are uncertain regarding their interpretation and enforcement, leading to inconsistent implementation. This challenges the assumption that regulatory presence alone guarantees adoption, as observed in earlier studies on e-government failures due to regulatory misalignment (Heeks, 2003).

Beyond legal and infrastructure factors, public engagement with digital services emerges as a key enabler, particularly in urban areas where younger populations are more inclined to interact with government agencies through online platforms. This pattern aligns with the Diffusion of Innovation Theory (Rogers, 2003), which posits that younger, tech-savvy populations tend to act as early adopters, influencing the wider social acceptance of digital public services.

Despite these enabling factors, several barriers continue to hinder digital transformation efforts across LAOs. Significant challenges are the limited human resource capacity and digital literacy gaps within government agencies. Many LAOs lack specialized IT personnel, and digital service responsibilities are frequently assigned to general administrative staff with minimal technical training. While some municipalities conduct periodic training workshops, these programs often lack standardization and continuity, resulting in inconsistencies in digital service management and innovation. This finding partially contradicts the assumption that training alone is sufficient to enhance digital service management. Research suggests that long-term institutional reforms, structured governance frameworks, and policy standardization play a far greater role in sustaining digital transformation (Veenstra et al., 2011; OECD, 2022). Without such systemic changes, short-term training initiatives are unlikely to produce lasting improvements in e-government performance.

Other critical barriers are fragmented digital governance and weak inter-agency coordination. Unlike national-level agencies that operate under centralized digital strategies, many LAOs implement digital services independently, resulting in duplication of effort, lack of interoperability, and inefficient service delivery. This aligns with Meijer's (2015) assumption that interconnected digital platforms naturally lead to more efficient governance. Moreover, our findings support the research of Lam (2005) and Scott and Gong (2021), who argue that organizational silos and decentralized decision-making structures often pose significant barriers to the integration of e-government.

Budgetary constraints and short-term financial planning further complicate the adoption of digital solutions. Many LAOs operate under tight financial conditions, with funding primarily allocated for IT maintenance rather than for strategic digital development. Officials frequently express concerns that while government grants are available for basic infrastructure support, long-term investments in digital platforms, cybersecurity, and human resource development remain inadequate. Dunleavy et al., (2006) emphasize that digital transformation necessitates ongoing investment beyond IT infrastructure, encompassing cybersecurity, workforce training, and system maintenance. However, these critical areas are often overlooked in short-term public sector funding models, leading to fragmented digitalization efforts. Our findings align further with the E-Government Readiness Models (United Nations, 2020), which indicate that in low-resource environments, short-term investments rarely lead to sustained digital adoption without comprehensive financial strategies.

Finally, regulatory ambiguities and bureaucratic barriers add further complications. Despite national efforts to encourage digital transformation, several outdated legal provisions still require physical documentation for official approvals, creating a disconnect between policy intentions and actual administrative practices. Additionally, conflicting regulations regarding data protection and digital transactions have generated uncertainty among local officials, leading to hesitancy in adopting fully automated government processes. This echoes findings from Heeks' (2003) model of e-government failure, which suggests that in developing countries, regulatory frameworks often fail to align with digital governance needs, resulting in bureaucratic resistance and system inefficiencies.

This study's findings confirm several established models of e-government adoption, including the Technology-Organization-Environment (TOE) framework, Institutional Theory, and the Diffusion of Innovation Theory. However, they also challenge existing assumptions, particularly those related to Smart Governance Theory and Capability Maturity Models, which often overlook the context-specific challenges of decentralized governance structures and fragmented financial planning in developing countries. Our results suggest that successful digital transformation in LAOs requires a multi-faceted approach, integrating infrastructure investment, regulatory reforms, human capital development, and governance restructuring. Table 4 presents a summary of the key supportive and inhibitive factors this study identifies.

Table 4

Summary of Key Enablers and Barriers Affecting Digital Public Services in LAOs

Factor	Enablers (Supportive Factors)	Barriers (Inhibitive Factors)
Digital Infrastructure	Well-developed IT infrastructure in urban municipalities supports cloud-based systems and broadband connectivity.	Rural LAOs face slow internet, outdated hardware, and limited technical support, restricting service expansion.
Regulatory Frameworks	National legislation such as the Electronic Transactions Act provide legal support for e-services.	Lack of clear local enforcement and regulatory ambiguities create uncertainty, slowing adoption.
Public Digital Engagement	Younger and urban citizens are increasingly willing to use online services.	Elderly and rural populations exhibit low adoption rates due to digital literacy gaps and distrust of online services.
Human Resource Capacity	Some municipalities have IT teams managing digital services, facilitating smoother implementation.	Many LAOs lack dedicated IT personnel, and training programs for digital governance are inconsistent.
Digital Governance and Coordination	Some cities engage in cross-agency digital initiatives, improving interoperability.	The lack of a centralized digital governance framework leads to fragmented implementation and inefficiencies.
Financial Sustainability	Central government provides some funding for IT infrastructure.	Budget allocations are short-term and insufficient, limiting investment in long-term digital transformation projects.

Bureaucratic Processes	Certain processes have moved online, reducing the administrative burden.	Some legal requirements still mandate physical documentation, preventing a full transition to digital services.
Stakeholder Collaboration	Partnerships with banks facilitate e-payment integration in some LAOs.	Most LAOs lack structured collaborations with private tech firms or academic institutions, limiting innovation.

The Digital Public Services Ecosystem Model for LAOs

Based on our findings, we propose a dual-strategy model, as illustrated in Figure 3. It integrates digital ecosystem theory (Boley & Chang, 2007; Baptista & Nunes, 2025; Prachumrasee et al., 2022; GPAI, 2024) with public administration frameworks (Meijer, 2015; Alonso & Andrews, 2022; Ma et al., 2023; Mofokeng et al., 2025). In this model, regulatory environments, human capital, and infrastructure are identified as foundational elements that influence the adoption of digital services. Additionally, we identify adaptive governance mechanisms, including strategic collaborations and budget prioritization, as key enablers of sustainable digital transformation.

We advance the theoretical discourse, emphasizing the interdependence among digital ecosystem components, rather than treating them as isolated factors. We also emphasize that financial sustainability and regulatory clarity are equally crucial as technological infrastructure in shaping digital governance outcomes. To further explore digital transformation trajectories, this model should be applied in longitudinal studies over time.

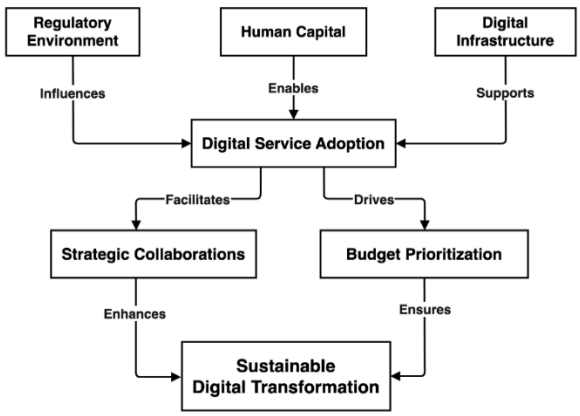

Figure 3: Digital Public Services Ecosystem of Local Administration Organizations Model.

Policy Recommendations for Improving Digital Public Service in Local Administrative Organizations

Based on the study's findings, a structured set of policy recommendations is essential for improving digital public service delivery in LAOs. Policymakers at all levels—including LAOs, the Ministry of Digital Economy and Society, and international development agencies—must implement targeted interventions to address the institutional, financial, and infrastructural barriers identified in this study.

At the local level, LAOs should institutionalize digital public service delivery by establishing dedicated digital governance units responsible for planning, maintaining, and expanding digital platforms. Without such teams, digital efforts remain fragmented and unsustainable. Equally important is the integration of digital services into annual planning and budgeting processes. A strategic and long-term perspective is needed to ensure that digital transformation becomes a core function of governance, rather than an option or ad hoc initiative. Additionally, enhancing citizen digital literacy and engagement is crucial. LAOs should conduct public education campaigns and offer training workshops, particularly in rural areas with lower

levels of digital competency. Collaboration with universities and private technology firms can significantly enhance the reach and effectiveness of these initiatives.

At the national level, the Ministry of Digital Economy and Society should develop a comprehensive framework for digital public services tailored to local administrative organizations (LAOs). This framework should outline the best practices, interoperability standards, and cybersecurity protocols to promote consistency and reliability across municipalities. The ministry should also provide targeted financial and technical support to under-resourced LAOs. A tiered funding model could prioritize smaller municipalities by offering direct subsidies, access to cloud-based service platforms, and customized training programs tailored to their specific needs. Furthermore, regulatory frameworks must be modernized to support digital innovation. Streamlining procedures, such as the approval process for digital procurement, can help Local Area Offices implement digital services more efficiently.

International development agencies should have a critical role in supporting the improvement of digital public services. These agencies should also invest in capacity-building initiatives that strengthen the digital competencies of LAOs personnel, enabling them to manage and expand the e-government platform effectively. They can also facilitate multi-stakeholder projects that combine private sector innovation, public sector leadership, and academic insight to test scalable models of digital service delivery.

Finally, international partners should invest in digital infrastructure, particularly in rural and underserved regions, by supporting the expansion of broadband and cloud-based solutions to reduce the digital divide and enhance service accessibility.

Conclusion

This study examined the ecosystem of digital public services within LAOs in Northeastern Thailand, illuminating both the potential and the persistent obstacles associated with digital transformation at the local government level. Our findings reveal that although national policies and certain regulatory frameworks create an enabling environment, fragmented governance structures, limited budget allocations, and insufficient human resource capacity frequently hinder sustained digital adoption. In particular, LAOs benefiting from larger budgets and dedicated IT departments demonstrate comparatively high levels of digital integration. In contrast, those operating under strict resource constraints face challenges in delivering even basic e-government services.

A key contribution made by this research is its dual-strategy approach, which integrates top-down mechanisms—such as national-level directives, funding support, and legislative reforms—with bottom-up initiatives that prioritize local innovation, stakeholder collaboration, and citizen participation. This approach underscores that meaningful and sustainable digital transformation relies on both robust infrastructure and clear regulatory guidance as well as localized capacity-building and community engagement. The successes observed in selected municipalities exemplify how comprehensive training, strategic partnerships, and focused investments can address organizational and financial barriers, ultimately fostering an inclusive digital ecosystem.

Despite these contributions, we acknowledge that this study is affected by several limitations. The qualitative design, while offering in-depth perspectives, does not capture the whole variety of digital readiness across all Thai LAOs. Likewise, the regional focus in Northeastern Thailand limits the generalizability of findings to other provinces or international contexts.

Furthermore, the cross-sectional nature of the data collection restricts insights into how LAO digital maturity evolves.

To address these gaps, future research should explore mixed-methods or longitudinal designs, extending across multiple regions or countries. Comparative analyses, whether interprovincial or cross-national, would shed light on how diverse institutional and socio-economic contexts shape digital transformation. In addition, assessing the long-term impacts of policy and organizational reforms would strengthen the understanding of how strategies evolve to sustain digital public services.

In conclusion, effective digital governance frameworks require concerted efforts from national policymakers, local authorities, and external stakeholders. By aligning financial resources, regulatory modernization, and grassroots participation, LAOs can enhance service delivery, bridge the digital divide, and advance transparent and efficient public administration. The insights generated by this study offer a pathway for both Thai policymakers and international practitioners seeking to optimize digital government initiatives in diverse governance settings.

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