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Digital innovation pathways: Transforming local governance in Thailand

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ABSTRACT

This study evaluates how ten award-winning digital innovation projects were developed and successfully implemented in local government in Thailand. Using qualitative methods, data were collected from government reports, media sources, and interviews with administrators, officials, and experts. The analysis shows that these projects followed clear steps, such as identifying problems, setting goals, and carrying out plans in an organized way. The innovations were grouped into three types: management, service, and technical, each created to solve problems in public services and government operations. Key factors for success included strong leadership, active involvement of stakeholders, focus on users' needs, and good support systems. The results highlight the value of careful planning and teamwork in creating effective innovations. This study offers practical guidance for improving local government practices and supports Thailand's 20-year strategic plan under the Thailand 4.0 policy, which promotes digital transformation to achieve sustainable development goals.

1. Introduction

Innovation has emerged as a cornerstone of contemporary organizational development, permeating various disciplines such as education, organizational management, and public administration. The term "innovation" is now frequently associated with strategies aimed at improving organizational performance, streamlining processes, and fostering the creation of novel products. Embracing innovation as a core value is key to a forward-looking brand identity. Leadership fosters a culture of creativity and empowerment, while sustainability-driven innovation enhances reputation and market opportunities. This commitment drives sustainable growth and competitive advantage (Setyawan et al., 2024). In the public sector, innovation is increasingly harnessed to modernize management systems, deliver high-quality services, and align governance practices with citizen needs through digital technologies.

The rapid pace of digital transformation globally has highlighted significant disparities in the capacity of local governments to adopt and implement innovative solutions tailored to their specific needs. While innovation is frequently celebrated as a driver of efficiency and quality in public administration, the mechanisms and strategies for fostering successful digital innovations remain inadequately understood, particularly in the context of developing economies like Thailand (Asmawa et al., 2024). Many local administrative organizations struggle with issues such as limited resources, inadequate infrastructure, and a lack of expertise in digital technologies, which hinder their ability to design and implement effective innovation projects. While government initiatives under the Thailand 4.0 framework aim to modernize governance through smart city policies, the research highlights a critical gap in addressing social justice and equity. The study by Choi and Kenney (2024) emphasized that the alignment of these policies with local contexts and their practical impact on service delivery remain insufficiently examined at the national level. Furthermore, it identifies variations in implementation at the local level, influenced by whether smart city initiatives follow a top-down or bottom-up approach.

Thailand's embrace of innovation is deeply embedded within its 20-year national strategic plan (2017–2036), which aims to achieve stability, prosperity, and sustainability through the Thailand 4.0 model. This framework prioritizes innovation-driven economic growth, focusing on leveraging digital technologies to reform bureaucratic systems and enhance public services. The government's Bureaucracy 4.0 policy identifies three critical

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components for reform: Transparency and connectivity in governance, citizen-centered service delivery, and the development of intelligent, high-performance organizations staffed by proactive and innovative personnel. These efforts are supported by the Digital Government Development Agency (DGA), tasked with transforming government operations to align with Bureaucracy 4.0 objectives.

Although the Bureaucracy 4.0 policy and the Digital Government Development Agency (DGA) have been introduced, there is still little empirical evidence on how local administrative organizations are applying these frameworks in practice. Most existing studies focus on national-level digital transformation strategies but do not examine local processes or the specific contextual factors that influence the success or failure of innovation projects. Furthermore, while the "Digital Local Innovation Award" recognizes outstanding projects, there has been no systematic analysis of how these initiatives were designed, implemented, and sustained over time. Gaining a deeper understanding of the development approaches, success factors, and challenges of such projects is essential for replicating and scaling successful practices. These gaps highlight the need for a detailed investigation into how digital innovation projects are developed and implemented within local governance in Thailand.

This study addresses these gaps by examining ten award-winning projects recognized by the Digital Local Innovation Awards. These projects cover diverse areas, including healthcare innovations such as Saensuk Town Municipality's elderly care system and waste management initiatives like Khrueng Subdistrict Municipality's digital platform. Using the Design Thinking framework, the research explores how these projects evolved from initial ideas to full implementation, emphasizing stakeholder participation and the use of monitoring and evaluation systems. The study aims to analyze the development strategies of these projects and identify key factors contributing to their success. The findings are expected to offer practical insights for improving digital innovation in Thailand's local governance, supporting the broader goals of the Thailand 4.0 policy and the nation's sustainable development objectives.

2. Literature review

2.1. Overview of digital innovations in public administration

Digital innovations have emerged as a transformative force in public administration, fundamentally reshaping how governments operate and interact with citizens. These innovations encompass a wide array of technologies, including artificial intelligence (AI), big data analytics, blockchain, and social media, which are increasingly integrated into governmental processes to enhance efficiency, transparency, and service delivery (Pakhnenko and Kuan, 2023). The adoption of these technologies is not merely a technical upgrade; it represents a paradigm shift in governance that emphasizes responsiveness and citizen engagement.

The integration of digital technologies in public administration facilitates the streamlining of processes and the reduction of bureaucratic inefficiencies. For instance, AI can automate routine tasks, allowing public servants to focus on more complex issues that require human judgment and creativity (Bondarenko et al., 2020). Big data analytics enables governments to analyze vast amounts of information to make informed decisions, predict trends, and tailor services to meet the specific needs of citizens (Siddiqui, 2024). Blockchain technology offers a secure and transparent method for recording transactions, which can enhance trust in government operations by providing verifiable records of public transactions (Pakhnenko and Kuan, 2023).

Moreover, the transformation of public administration through digital means is characterized by a fundamental change in how governments interact with citizens. Digital platforms facilitate two-way communication, allowing citizens to engage with their governments in real-time. This shift is particularly evident in the use of social media, which has become a vital tool for local governments to connect with their communities (Larionova and Vecherov, 2024). Social media platforms such as Facebook and Twitter enable governments to disseminate information quickly, gather feedback, and foster a sense of community engagement. However, the effective use of social media requires a commitment to openness and engagement from government officials, as highlighted by Novara et al. (2024), who argued that a culture of communicative reciprocity is essential for deeper dialogue between governments and citizens.

The potential of social media in local governance is further underscored by its role in enhancing civic engagement. Research indicates that social media can improve public trust in government by providing a platform for transparency and accountability. For example, during crises such as natural disasters, social media serves as a critical communication tool for local governments to disseminate information and coordinate responses (Belli and Aydın, 2024). This capability not only enhances the responsiveness of local governments but also empowers citizens to participate actively in governance processes.

Despite the advantages of digital innovations, challenges remain in their implementation within public administration. One significant barrier is the digital divide, which refers to the disparities in access to technology among different demographic groups. Ensuring equitable access to digital services is crucial for fostering inclusive governance. Additionally, the ethical implications of using digital technologies in public administration must be carefully considered. As noted by Pakhnenko and Kuan (2023), the ethical deployment of AI and data analytics is essential to prevent biases and protect citizens' privacy.

Furthermore, the successful integration of digital innovations into public administration requires a cultural shift within governmental organizations. Public servants must be equipped with the necessary skills and training to leverage these technologies effectively (Nchaga, 2025). This includes not only technical skills but also an understanding of the ethical and social implications of digital governance. As governments increasingly rely on technology to engage with citizens, fostering a culture of innovation and adaptability becomes paramount.

In conclusion, digital innovations are reshaping public administration by enhancing efficiency, transparency, and citizen engagement. The integration of technologies such as AI, big data, and social media offers significant opportunities for improving governance and service delivery. However, addressing the challenges associated with the digital divide and ensuring ethical practices in technology deployment are critical for realizing the full potential of these innovations. As public administration continues to evolve in the digital age, a commitment to fostering a culture of innovation and inclusivity will be essential for building trust and enhancing the quality of governance.

2.2. Theoretical frameworks on governance and technology

The intersection of governance and technology is increasingly analyzed through various theoretical frameworks that emphasize the role of digital governance in enhancing administrative efficiency and accountability. The New Public Management (NPM) paradigm has significantly influenced public administration by advocating for the adoption of private sector management techniques to improve service delivery and operational efficiency. This framework highlights the importance of innovation while also addressing the challenges posed by traditional bureaucratic structures that may resist change. Additionally, the concept of digital government represents a governance model where digital technologies are leveraged to modernize administrative processes and improve service delivery. This model necessitates a comprehensive understanding of the organizational, technological, and environmental factors that influence the adoption of digital innovations in public administration. Furthermore, the notion of digital ambidexterity emphasizes the need for public organizations to balance exploration and exploitation of digital technologies, allowing them to innovate while effectively managing existing operations (Magnusson et al., 2020). This dual approach fosters a culture of innovation and adaptability, which is crucial for responding to the rapidly changing technological landscape (Khin and Ho, 2019).

Moreover, sociocultural factors play a critical role in shaping the effectiveness of digital governance initiatives, as understanding the values and expectations of the communities served can enhance citizen engagement and acceptance of digital services (Fitriani et al., 2023). However, challenges such as the digital divide and ethical considerations surrounding data privacy and security must be addressed to ensure that digital governance initiatives are inclusive and equitable (Pakhnenko and Kuan, 2023). By integrating these theoretical frameworks, public administrators can navigate the complexities of digital governance, ultimately enhancing the quality of governance and public service delivery.

2.3. Previous studies on local governance innovations in Thailand

Research on local governance innovations in Thailand has revealed significant advancements in the adoption of digital technologies aimed at improving public service delivery. A pivotal study by Prachumrasee et al. (2024) emphasized the critical role of local government bodies, such as Tambon Administrative Organizations (TAOs), in rural development, where digital innovations can enhance their operational capabilities despite existing budgetary constraints. The authors argue that the integration of digital tools enables TAOs to streamline processes, improve communication, and enhance service delivery, ultimately leading to better outcomes for rural communities. This is particularly important in the context of Thailand's rural areas, where traditional governance structures often face challenges related to resource limitations and bureaucratic inefficiencies. Furthermore, fostering innovative behavior within organizations is crucial for the successful implementation of digital initiatives in the Thai context. Their findings suggest that cultivating a culture of innovation among public servants can lead to more effective use of technology, thereby improving public services and enhancing citizen engagement. This aligns with the broader national strategies aimed at promoting sustainable development and enhancing citizen participation in governance. The report underscores the importance of integrating digital innovations into local governance frameworks to address operational challenges and align with national goals, such as those outlined in Thailand 4.0, which seeks to transform the economy through innovation and technology.

Moreover, the Thai government has recognized the importance of digital governance in achieving its developmental objectives. Thoppae and Praneetpolgrang (2021) discussed the establishment of a blockchain-enabled e-government document interchange architecture, which aims to enhance transparency and efficiency in public administration. This initiative reflects the government's commitment to leveraging advanced technologies to improve service delivery and foster trust among citizens. The authors argue that government policy support is essential for the successful implementation of such innovations, highlighting the establishment of Thailand's Ministry of Digital Economy and Society

and the National Digital Economy Master Plan as critical steps in this direction. These initiatives are designed to create a conducive environment for digital transformation, enabling local governments to adopt innovative solutions that enhance their operational capabilities.

In addition to technological advancements, the social implications of digital governance are also critical to consider. Choi and Kenney (2024) explored the social implications of Internet of Things (IoT) and smart city governance in Thailand, emphasizing the need for inclusive policies that address social equity and citizen engagement. The study reveals that while the Thai government has made strides in promoting digital technologies, social inclusion remains a marginal consideration in national economic and social development plans. This gap underscores the importance of ensuring that digital governance initiatives are not only technologically sound but also socially equitable, allowing all citizens to benefit from the advancements in public service delivery.

Furthermore, the behavioral acceptance of e-government initiatives is a crucial factor influencing the success of digital governance in Thailand. Al-Haddad et al. (2023) examined the perceptions of e-security and its impact on the usage of e-government systems, revealing that citizens' trust in digital platforms is essential for their widespread adoption. Their findings suggest that enhancing the security and transparency of e-government services can significantly increase public confidence and participation in digital governance initiatives. This is particularly relevant in the context of Thailand, where concerns about data privacy and security can hinder the effective implementation of digital solutions.

The integration of digital technologies in local governance also aligns with the broader objectives of Thailand 4.0, which aims to create a sustainable and innovation-driven economy. Maksimchuk et al. (2021) discussed how digital technologies in the tax sphere can optimize economic activities, thereby contributing to the overall sustainability of public finances. The authors argue that by adopting digital solutions, local governments can enhance their revenue collection processes, reduce administrative burdens, and improve service delivery to citizens. This not only supports the financial sustainability of local governments but also enhances their capacity to invest in community development initiatives.

Moreover, the urgency for digital literacy among citizens is highlighted in the work of Jantavongso (2022), who emphasized the need for Thailand to cultivate a digitally literate population capable of navigating the complexities of the digital economy. The study suggests that enhancing digital literacy is essential for empowering citizens to engage with digital governance initiatives effectively. This aligns with the government's efforts to promote digital education and training programs aimed at equipping citizens with the necessary skills to thrive in a digital society.

In conclusion, the landscape of local governance innovations in Thailand is characterized by significant advancements in the adoption of digital technologies aimed at improving public service delivery. The integration of digital tools within local governance frameworks, as evidenced by the studies reviewed, highlights the potential for enhancing operational capabilities, fostering innovation, and promoting citizen engagement. However, challenges such as the digital divide, social inclusion, and trust in digital platforms must be addressed to ensure that these innovations are inclusive and equitable. By leveraging digital technologies and fostering a culture of innovation, local governments in Thailand can navigate the complexities of digital governance, ultimately enhancing the quality of public services and contributing to the country's sustainable development goals.

2.4. The role of digital transformation in sustainable development goals

Digital transformation plays a crucial role in achieving Sustainable Development Goals (SDGs) by enhancing the efficiency and effectiveness of public services. The integration of digital technologies facilitates better resource management, improved service delivery, and increased transparency, which are essential for sustainable governance (Wongwuttiwat et al., 2024). For instance, the implementation of digital platforms allows governments to streamline processes, reduce operational costs, and enhance the accessibility of services to citizens, thereby promoting inclusivity and equity in service delivery. This is particularly significant in the context of developing countries like Thailand, where traditional bureaucratic systems often struggle with inefficiencies and resource constraints. As articulated by Wongwuttiwat et al. (2024), the Thai government has recognized the importance of digital technology in driving economic growth and social development, aligning its policies with the ASEAN Digital Masterplan 2025 to foster regional cooperation and innovation. This alignment not only facilitates the sharing of best practices among member states but also encourages the adoption of innovative solutions that can address common challenges related to sustainable development.

Moreover, the ethical considerations surrounding digital innovations in public administration are increasingly recognized, as they are essential for maintaining public trust and ensuring equitable access to services. The successful implementation of digital transformation initiatives requires a commitment to ethical standards that prioritize data privacy, security, and inclusivity. For example, the use of cloud computing in local governments has been shown to enhance service delivery by providing scalable and flexible solutions that can adapt to the changing needs of citizens. However, without proper governance frameworks that address ethical concerns, the benefits of digital transformation may

not be fully realized, potentially exacerbating existing inequalities.

The role of digital transformation in achieving the SDGs is further underscored by its potential to create new opportunities for economic growth and environmental sustainability. For instance, the use of big data analytics can help governments make informed decisions regarding resource allocation and environmental management, thereby promoting sustainable practices. Additionally, digital technologies can facilitate the development of smart cities, which leverage IoT and data-driven solutions to optimize urban planning and resource management, ultimately contributing to the achievement of SDG 11: Sustainable Cities and Communities. Such initiatives not only enhance the quality of life for citizens but also promote environmental sustainability by reducing waste and improving energy efficiency.

Furthermore, the COVID-19 pandemic has acted as a catalyst for digital transformation in public service delivery, highlighting the urgent need for governments to adapt to new realities (Agostino et al., 2020). The rapid shift to online services during the pandemic has demonstrated the potential of digital technologies to enhance resilience and continuity in governance. This experience has prompted governments to reevaluate their digital strategies and invest in the necessary infrastructure to support sustainable digital governance. For example, the implementation of e-government platforms has enabled local governments to maintain service delivery during lockdowns while also improving citizen engagement through digital channels (Moskalenko et al., 2022).

In addition to enhancing service delivery, digital transformation can also contribute to the overall sustainability of public finance. By adopting digital solutions, governments can improve their revenue collection processes, reduce administrative costs, and enhance financial transparency (Kotina et al., 2022). This is particularly important in the context of sustainable development, where effective resource management is essential for achieving long-term goals. The integration of digital technologies in public finance management can lead to more efficient allocation of resources, ultimately supporting the achievement of the SDGs.

Moreover, the digital economy presents new opportunities for innovation and entrepreneurship, which are critical for driving economic growth and job creation (Hao et al., 2023). By fostering a conducive environment for digital innovation, governments can empower local businesses and entrepreneurs to leverage technology for sustainable development. This aligns with the objectives of SDG 8: Decent Work and Economic Growth, which emphasizes the importance of promoting sustained economic growth through innovation and technological advancement. However, the successful realization of these benefits requires addressing the challenges associated with digital transformation. The digital divide remains a significant barrier to equitable access to digital services, particularly for marginalized communities (Vărzaru, 2022). Ensuring that all citizens have access to digital technologies and the necessary skills to utilize them is essential for promoting inclusivity in governance. Additionally, governments must prioritize cybersecurity as an integral component of their digital transformation strategies to protect sensitive data and maintain public trust.

In conclusion, digital transformation is crucial for achieving the Sustainable Development Goals. It improves the efficiency and effectiveness of public services, supports economic growth, and promotes environmental sustainability. Integrating digital technologies into governance systems enables better resource management and enhances service delivery, while also fostering more inclusive and equitable societies. As governments work through the challenges of digital transformation, it is important to consider ethical issues, address the digital divide, and invest in infrastructure to ensure that all citizens can benefit. Aligning digital transformation efforts with the SDGs can drive significant improvements in governance and public services, contributing to a more sustainable and fair future.

3. Methods

This study uses a qualitative research design to investigate the innovative pathways of digital transformation in local governance in Thailand. A qualitative approach is well suited to this research because it enables a deep understanding of the complex social dynamics involved in digital governance initiatives. It also captures the subtle details of stakeholders' experiences and perceptions. The methodology includes key elements such as data collection methods, data analysis techniques, and a discussion of the study's limitations.

3.1. Research design

The research adopts a qualitative design, which is particularly suited for exploring complex social phenomena and understanding the perspectives of key stakeholders involved in local governance innovations. This approach allows for an in-depth examination of the experiences, motivations, and challenges faced by local government executives and other relevant actors in the implementation of digital initiatives. The qualitative design is grounded in a constructivist paradigm, which emphasizes the co-construction of knowledge through interactions between the researcher and participants (Boestam et al., 2023).

3.2. Key informants

The key informants for this research were selected using a purposive sampling strategy to ensure the inclusion of individuals with direct

experience and strategic oversight in local government innovation projects. A qualitative approach was deemed appropriate for this study as it allows for an in-depth exploration of the complexities surrounding digital governance transformation, emphasizing contextual understanding over statistical generalizability. The sample comprised 15 key informants, an appropriate size based on the principle of data saturation, where additional interviews are unlikely to yield new insights (Guest et al., 2013). Among the selected informants, 11 were representatives from local government entities, including mayors, deputy mayors, permanent secretaries, and directors, who played instrumental roles in the management and execution of innovative projects across ten municipalities recognized by the Digital Government Innovation Award (DG Award) from the Digital Government Development Agency (DGA). Their leadership positions and hands-on experience made them well-positioned to provide valuable insights into the opportunities and challenges of implementing digital innovations in local governance.

Additionally, 4 informants were selected from related national agencies, including high-ranking officials and experts from the Office of the Public Sector Development Commission (OPDC) and the Digital Government Development Agency (DGA). These individuals were chosen for their specialized knowledge and strategic contributions to public sector digital innovation, offering a broader perspective on policy implementation and governance frameworks. The selection criteria emphasized the informants' positions of authority, direct involvement in innovation projects, and their ability to provide insights into both operational and strategic aspects of local government innovations. By incorporating perspectives from both municipal leadership and national governance bodies, the study ensures a comprehensive understanding of the factors influencing digital transformation in local governance and its implications for public service delivery.

3.3. Data collection methods

Data collection for this study involves a triangulation of methods to ensure a comprehensive understanding of the research topic. The primary data collection methods employed include:

1. Government documents: A thorough review of relevant government documents, policies, and reports related to digital governance initiatives in Thailand is conducted. This includes national strategies, local government plans, and evaluation reports that provide insights into the objectives, implementation processes, and outcomes of digital transformation efforts. Analyzing these documents allows for a contextual understanding of the policy landscape and the alignment of digital initiatives with national development goals. This method is essential for establishing a foundational understanding of the frameworks guiding local governance innovations.
2. Media analysis: Media analysis is utilized to capture public discourse and perceptions surrounding digital governance initiatives. This involves examining news articles, opinion pieces, and social media discussions related to digital innovations in local governance. By analyzing media content, the study can identify prevailing narratives, public attitudes, and potential concerns regarding the implementation of digital technologies. This method provides insights into how digital initiatives are perceived by the public and can highlight areas of support or resistance.
3. Interviews with administrators, officials, and experts: Semi-structured interviews are conducted with key informants, including local government executives, representatives involved in the ten local government innovation projects, 11 representatives from local government agencies, and 4 experts in digital governance. The semi-structured format allows for flexibility in the interview process, enabling participants to share their insights and experiences while also addressing specific research questions. The interviews are designed to explore participants' perceptions of the challenges and opportunities associated with digital transformation in local governance, as well as their views on the effectiveness of current initiatives (Montel, 2023). This qualitative method is crucial for gathering in-depth information and understanding the complexities of the implementation process.

The combination of these data collection methods ensures a holistic approach to understanding the dynamics of digital governance innovations in Thailand. By triangulating data from government documents, media analysis, and interviews, the study aims to provide a comprehensive perspective on the factors influencing the success of local governance initiatives and their alignment with broader national goals.

3.4. Data analysis

The data analysis process in this study follows a thematic analysis approach, which involves identifying, analyzing, and reporting patterns (themes) within the qualitative data. This approach is particularly effective for exploring complex social phenomena and understanding the perspectives of key stakeholders involved in local governance innovations. The analysis is conducted in several stages to ensure a comprehensive understanding of the data. Initially, the researcher engages in familiarization with the data, immersing themselves in the material by reading and re-reading interview transcripts, government documents, and media content. This stage is crucial for gaining a comprehensive understanding of the context and nuances of the data, allowing the researcher to

identify significant features relevant to the research questions. Following this, coding is performed to identify significant features of the data. This involves generating first-order descriptive codes that capture the essence of participants' responses and the content of the documents. The coding process is iterative, allowing for the refinement of codes as the researcher gains deeper insights into the data (Morgan and Nica, 2020).

Once initial coding is complete, the researcher moves to the theme development stage, where first-order codes are grouped into broader second-order themes that reflect underlying patterns and relationships within the data. This thematic framework helps to organize the findings and provides a structured way to present the results, ensuring that the themes are representative of the data as a whole (Wood and Alsawy, 2018). To enhance the credibility of the findings, validation is employed through member checking, where participants are invited to review the interpretations and themes derived from their interviews. This process allows for feedback and validation of the research findings, ensuring that the themes accurately reflect the participants' perspectives. Overall, the thematic analysis approach provides a robust framework for analyzing qualitative data, enabling the researcher to derive meaningful insights from the experiences and perspectives of key informants involved in local governance innovations. By systematically following these stages, the study aims to contribute to a deeper understanding of the factors driving digital transformation in local governance and its implications for public service delivery.

4. Results

The results of this study provide a comprehensive analysis of 10 local innovation projects in Thailand, highlighting their development across five stages: Define, Ideate, Prototype, Test, and Implement. These projects addressed critical community challenges through collaborative problem-solving, visionary leadership, and the integration of accessible technologies. Key factors influencing success included the ability to analyze root causes, strong stakeholder engagement, expert support, effective communication strategies, and alignment with public needs. Together, these findings illustrate a structured approach to fostering sustainable and impactful innovations within local governance systems.

4.1. Innovation development process

4.1.1. Define: Establishing objectives and goals

The foundation of these innovative projects lies in the identification of critical community challenges and the pursuit of effective, sustainable solutions. While traditional governance approaches often rely on incremental policy adjustments, these digital innovations represent a shift toward proactive, technology-driven problem-solving. However, the process of setting objectives is not merely about responding to visible problems; it involves complex decision-making, prioritization, and the balance between community needs and administrative feasibility. Public input plays a significant role in shaping these initiatives, but it is not without limitations. While community feedback helps identify pressing issues, it can also reflect short-term concerns rather than long-term systemic challenges, leading to solutions that prioritize immediate relief over structural reform. For instance, in Koh Samui Municipality, the Geographic Information System (GIS) initiative was introduced to streamline patient management in response to hospital overcrowding. While effective in improving logistical efficiency, such technological interventions may also risk reinforcing reliance on digital infrastructure without addressing underlying healthcare system capacity issues. Similarly, in Yala Municipality, the COVID-19 management system was developed to mitigate confusion in policy implementation. However, reliance on digital solutions in crisis response raises concerns about accessibility and inclusivity, particularly for marginalized populations with limited technological literacy. Beyond reactive measures, local government leaders also play a crucial role in driving innovation through strategic vision.

The Smart Health initiative in Saen Suk Municipality, aimed at supporting bedridden elderly patients, exemplifies leadership-driven innovation. Yet, while such projects showcase forward-thinking governance, they also highlight potential governance challenges, such as resource allocation, digital divide concerns, and long-term sustainability beyond a mayor's tenure. Likewise, the YALA E-Commerce platform, created to support small businesses during the COVID-19 crisis, reflects an economic adaptation strategy, yet it raises questions about the scalability and competitiveness of local platforms against global e-commerce giants. Ultimately, while these initiatives demonstrate commendable efforts in addressing local governance challenges, their long-term effectiveness depends on balancing technological adoption with broader structural improvements, ensuring equitable access, and maintaining adaptability to evolving socio-economic conditions.

4.1.2. Ideate: Generating innovative concepts

The ideation stage was a dynamic process that combined internal creativity with external collaboration, ensuring that digital innovations were not only technically feasible but also contextually relevant. While stakeholder involvement was central to idea generation, it is important to critically assess the balance between top-down expert-driven solutions and bottom-up community-driven innovation. Although collaboration with external

experts brought technical advancements, it also introduced dependencies on private sector partnerships and academic institutions, which may pose sustainability and ownership challenges in the long run. For instance, the GIS project in Koh Samui Municipality was developed through multi-stakeholder engagement, integrating insights from hospital staff, public health officials, and community health volunteers.

While this approach ensured that diverse perspectives were considered, it also highlights potential coordination challenges, such as reconciling competing priorities among stakeholders and ensuring equitable participation in decision-making. Similarly, the Smart Health initiative in Saen Suk Municipality benefited from partnerships with Burapha University and private companies like Dell and Intel, which facilitated the integration of Internet of Things (IoT) technology for remote patient care. However, such reliance on corporate partnerships raises questions about data security, long-term affordability, and whether proprietary technologies create barriers to future scalability. Beyond external collaborations, ideation was also shaped by operational needs within local government. The Mobile Application system in Udon Thani Municipality was conceived as a response to inefficiencies in market resource management, demonstrating how internal problem-solving can lead to innovation. Yet, while such initiatives address immediate administrative pain points, they also reveal the potential for local governments to develop solutions in silos, which may hinder cross-municipality knowledge-sharing and standardization. Likewise, the YALA E-Commerce platform was initiated to support local entrepreneurs, reflecting an attempt to leverage technology for economic recovery. However, its effectiveness must be critically examined in the context of competition with established national and global e-commerce platforms, which may limit its long-term viability.

Overall, while the ideation process in these projects successfully combined expertise, collaboration, and operational insights, it is crucial to assess the risks associated with external dependencies, stakeholder coordination, and the scalability of solutions. Digital innovation in governance must balance the excitement of technological possibilities with careful consideration of structural and institutional constraints to ensure sustainable and impactful outcomes.

4.1.3. Prototype: Developing and testing initial models

The prototyping phase was essential in transforming conceptual ideas into functional models, yet this process was not without its challenges and trade-offs. While the establishment of innovation management divisions and the restructuring of work processes improved efficiency, it also required significant resource investment and organizational adaptation. For instance, the Smart Health initiative in Saen Suk Municipality created a proactive healthcare system for bedridden elderly patients. However, such structural changes raise questions about long-term sustainability, particularly in municipalities with limited funding or fluctuating political support. Similarly, the GIS project in Koh Samui Municipality integrated geographic data into medical workflows, demonstrating the value of spatial analysis in public health.

Yet, the success of such technological interventions depends on continuous training and system maintenance, which could pose operational difficulties in under-resourced municipalities. Technological adoption was another defining feature of this phase, with IoT devices, GPS systems, and online platforms playing a central role in enhancing service delivery. While these tools improved accessibility and responsiveness, they also introduced concerns regarding digital inclusion, data security, and system adaptability. The YALA E-Commerce platform, for example, provided an online marketplace for local businesses, yet its long-term competitiveness against national and global platforms remains uncertain. Additionally, the Pang Moo E-Smart Service, which utilized GPS and online platforms for remote service provision, raises questions about the digital divide—how effectively can rural and elderly populations engage with such innovations without additional support? These considerations highlight the need for balancing technological ambition with inclusivity and long-term feasibility.

4.1.4. Test: Piloting the innovations

The testing phase was crucial in assessing the practicality and adaptability of the innovations. While piloting with local officials, volunteers, and community leaders ensured that the solutions were aligned with user needs, it also revealed underlying challenges. For instance, the Smart Bannoi initiative in Ban Noi Subdistrict underwent extensive trials to determine whether digital services were accessible for elderly populations. While initial feedback was positive, the reliance on digital literacy training suggests that the success of such innovations hinges on continuous capacity-building efforts. Similarly, in Koh Samui Municipality, the Geographic Information System (GIS) was tested with medical personnel to refine workflows. While this process improved efficiency, it also highlighted gaps in technological readiness among some staff, underscoring the need for ongoing professional development. Another key concern in the testing phase was scalability. While pilot projects demonstrated promising results, their effectiveness at a larger scale remains uncertain. For example, the COVID-19 surveillance system in Yala Municipality was successfully trialed within select administrative units. However, replicating such a system in larger jurisdictions may introduce new complexities related to interoperability, data privacy,

and regulatory compliance. This underscores the need for a critical assessment of how innovations transition from controlled test environments to full-scale deployment.

4.1.5. Implement: Scaling and sustaining the innovations

The implementation phase was marked by efforts to integrate innovations into routine governance structures, yet this transition was not without challenges. While forming dedicated working groups facilitated the operationalization of these initiatives, it also highlighted concerns regarding bureaucratic inertia and institutional resistance to change. For instance, the Smart Bannoi initiative incorporated outreach programs to train elderly citizens in using digital services. While these efforts improved adoption rates, they also revealed the persistence of generational and socio-economic barriers to digital engagement, suggesting that infrastructure alone cannot guarantee inclusivity. Furthermore, financial sustainability was a critical consideration in this phase. While local governments allocated resources to support implementation, the long-term viability of these initiatives depends on continuous investment and political commitment. The Smart Health initiative in Saen Suk Municipality, which distributed IoT devices for elderly care, demonstrated immediate benefits, yet the cost of maintaining and upgrading such technology remains a key issue. Similarly, the Nikhom Phatthana digital waste fee payment system streamlined revenue collection, but its scalability depends on sustained public participation and institutional backing. These cases highlight the broader challenge of ensuring that innovative solutions are not just effective in the short term but also financially and structurally sustainable.

4.2. Factors influencing the success of local innovation development

The development of local innovations is influenced by multiple interdependent factors that determine their effectiveness, adoption, and sustainability. While the identified factors contributed to the success of the innovation projects examined, a deeper analysis reveals underlying tensions, potential trade-offs, and broader structural implications that must be considered. This section critically examines the enabling conditions and the challenges they introduce, emphasizing the complexity of innovation development in local governance.

4.2.1. Ability to analyze problems and identify root causes

A fundamental determinant of success in innovation projects was the ability to conduct thorough problem analysis and accurately identify root causes. However, while comprehensive assessments enabled targeted interventions, there is a risk that problem analysis processes may be constrained by bureaucratic perspectives or short-term political objectives. For instance, the GIS project in Koh Samui Municipality effectively addressed hospital overcrowding by improving patient flow management. However, this technological intervention did not necessarily tackle the deeper issue of healthcare infrastructure shortages, a challenge that requires broader policy reforms.

Similarly, Yala Municipality's COVID-19 surveillance system was designed to mitigate inefficiencies in pandemic response coordination. While the system improved real-time monitoring and decision-making, it did not necessarily enhance the overall preparedness of the healthcare system for future public health crises. These cases illustrate that while digital solutions provide immediate relief, they may also risk reinforcing a pattern of reactive governance, where innovations are introduced to manage crises rather than to address underlying systemic weaknesses. The question remains: Are these innovations truly transformative, or do they serve as short-term fixes that leave fundamental issues unaddressed? Local governments must critically evaluate whether technological solutions complement or overshadow necessary policy and structural reforms.

4.2.2. Leadership and technological competence

Strong leadership was an indispensable factor in the successful implementation of innovations. Leaders with a clear vision, technological awareness, and political influence played key roles in driving projects forward. However, this reliance on individual leaders also presents a sustainability challenge. The Smart Health initiative in Saen Suk Municipality exemplifies how mayoral leadership facilitated the adoption of IoT technology to improve elderly care services. However, the project's long-term viability remains uncertain if future leadership does not prioritize or understand digital transformation.

This raises the broader issue of institutional dependency—should innovation be reliant on political will, or should it be embedded into governance frameworks to ensure continuity beyond leadership changes? Moreover, while technological competence among leaders was beneficial, an overemphasis on digital solutions may lead to an unintended bias toward technology-centric governance. There is a risk that decision-makers might prioritize innovations that align with prevailing technology trends rather than those that address foundational community needs. Thus, while leadership and technological competence are crucial, they must be complemented by institutional mechanisms that ensure innovation sustainability beyond individual-driven initiatives.

4.2.3. Strong networks and expert support

Collaboration with academic institutions, private companies, and external experts was a significant enabler of innovation success, as these networks provided specialized technical expertise and additional resources. However, such collaborations also introduce concerns about long-term self-sufficiency and ownership of innovation processes. For instance, Saen Suk Municipality's Smart Health initiative benefited from partnerships with Burapha University and tech firms like Dell and Intel, which provided expertise in integrating IoT-based healthcare solutions. While these partnerships accelerated technological advancements, they also created potential dependencies—if these external entities withdraw support, can local governments maintain and scale these innovations independently? Additionally, the role of private-sector involvement raises ethical considerations regarding data privacy, commercialization of public services, and vendor lock-in. Are municipalities ensuring that their partnerships empower them with sustainable digital sovereignty, or are they becoming overly reliant on external players? While expert support is valuable, local governments must balance external assistance with internal capacity-building to prevent technological dependence.

4.2.4. Acceptance of change and innovation

Innovation adoption relies not only on technological feasibility but also on public and institutional willingness to embrace change. While public outreach and training programs helped mitigate resistance, deeper socio-cultural factors influenced adoption rates. For example, the YALA E-Commerce platform was introduced to support local entrepreneurs, yet digital literacy gaps and resistance to online transactions posed challenges to its widespread adoption. Despite training efforts, generational differences, cultural attitudes toward technology, and trust in digital platforms influenced how the system was received. Similarly, the Nikhom Phatthana digital waste fee payment system aimed to streamline public service payments, but varying levels of digital familiarity led to uneven adoption. These examples illustrate that innovation success cannot be measured merely by implementation rates but must also consider socio-economic and behavioral factors that shape adoption. Governments must ask: Are we designing innovations for optimal functionality, or for optimal accessibility? Ensuring that innovations are culturally and socially inclusive is critical to their long-term impact.

4.2.5. Stakeholder engagement

While stakeholder involvement was a key success factor, it is essential to critically assess the extent and quality of engagement. Were all voices equally represented in decision-making, or did certain actors hold disproportionate influence? The GIS project in Koh Samui Municipality, for example, involved medical professionals, public health officials, and administrators. While these groups provided critical insights, was there sufficient consultation with patients, particularly marginalized groups who might face barriers to healthcare access? Similarly, while private-sector collaborations enriched innovation design, did they align with public interest, or were commercial interests prioritized in certain instances? Effective stakeholder engagement requires transparency, accountability, and mechanisms to ensure that the voices of affected communities—rather than just institutional actors—are central to decision-making.

4.2.6. Effective communication and awareness

Public communication played a crucial role in innovation adoption, but a critical examination reveals potential gaps in accessibility. While Yala Municipality used social media and digital tools to promote its COVID-19 management system, reliance on digital platforms may have excluded individuals without internet access or digital proficiency. Moreover, how do governments ensure that innovation narratives are not just persuasive but also critically examined? Public engagement strategies must move beyond promotional efforts and foster spaces for meaningful dialogue, where concerns, limitations, and potential risks of digital transformation are openly discussed.

4.2.7. Political stability and institutional endurance

Political stability was a key enabler of innovation, but over-reliance on political continuity raises risks. Many successful initiatives were driven by stable leadership, but how resilient are these projects to political transitions? For example, municipalities with consistent leadership structures were able to maintain momentum in digital transformation efforts. However, projects that are closely tied to political figures may face discontinuity if new administrations shift policy priorities. Institutionalizing innovation policies at a structural level—rather than anchoring them to individual leaders—is essential to ensure their longevity.

5. Discussion

The findings from the ten local innovation projects in Thailand reveal a structured yet complex approach to digital governance, where success is shaped by multiple interdependent factors rather than a linear process. Central to innovation development is the ability to define clear objectives and goals that address urgent community needs. Rather than merely identifying issues, successful projects strategically leveraged public input to refine problem definitions and ensure solutions were both

relevant and impactful. For instance, the Geographic Information System (GIS) initiative in Koh Samui was developed to alleviate long wait times at the local hospital, demonstrating the importance of translating public concerns into actionable digital solutions. Similarly, the COVID-19 management system in Yala Municipality underscored the role of digital governance in crisis management, emphasizing the need for rapid adaptability in policymaking. The ideation stage highlights how multi-stakeholder collaboration enhances the depth and sustainability of innovations. The involvement of local government officials, community leaders, and external experts ensures that projects are not only technically sound but also contextually appropriate (Noor et al., 2023). A key insight from this phase is that partnerships with academic institutions and the private sector, as seen in the Smart Health initiative in Saen Suk Municipality, are instrumental in bridging local capacity gaps. This aligns with the notion that strong networks and expert support are critical for successful innovation development. The prototyping phase revealed the importance of institutional adaptation in facilitating innovation integration. Rather than focusing solely on technology adoption, local governments needed to restructure workflows and create dedicated innovation management divisions to ensure that digital solutions became embedded in governance practices. The implementation of IoT devices in the Smart Health initiative illustrates how technological efficiency must be matched with structural readiness to optimize public service delivery. The testing phase reinforced the significance of stakeholder engagement. Pilot testing not only ensured technical feasibility but also provided a mechanism for iterative refinement, where community feedback shaped the final implementation. This was evident in the Smart Bannoi initiative, where testing with local stakeholders allowed adjustments to improve accessibility. Such an approach demonstrates that, beyond initial adoption, the long-term success of digital governance relies on continuous public participation and iterative improvements. The implementation of these innovations was characterized by institutionalized collaboration rather than isolated project execution. The formation of working groups that included multiple stakeholders ensured that digital initiatives were not only technically deployable but also administratively and socially sustainable. Outreach and training programs targeted at vulnerable populations further illustrate the role of digital inclusivity in strengthening public trust and long-term adoption.

The synthesis of findings reveals several key strategic factors influencing local innovation success. A problem-solving mindset was more critical than simply identifying challenges. Local governments that conducted thorough assessments were able to frame issues in ways that led to systemic, rather than superficial, solutions. This aligns with research indicating that a deep understanding of community issues enhances innovation impact. Leadership was pivotal not just in initiating projects but in sustaining their momentum. Leaders with technological competence fostered trust and credibility, ensuring alignment between digital tools and governance objectives. Strong networks enabled municipalities to access expertise beyond their internal capacities. Collaborations with academic institutions and private partners provided essential resources, reinforcing local governments' ability to sustain innovations over time. The public's willingness to embrace change played a decisive role in adoption rates. Digital literacy programs and awareness campaigns were not mere supporting elements but central to overcoming resistance and fostering a culture of innovation. Stakeholder engagement went beyond consultation to co-creation. Successful projects actively involved diverse groups in the design and execution phases, creating shared ownership and enhancing long-term viability (Ganotakis and Love, 2012). Communication strategies determined the extent of public participation. Beyond conveying technical information, effective communication built confidence in new systems, ensuring that innovations were used as intended.

Despite the valuable insights gained from this research, certain limitations highlight areas for further inquiry. The qualitative nature of the study means that findings offer contextual depth but may not be generalizable to all governance settings. The reliance on self-reported data presents potential biases, as participants may emphasize successes while underreporting challenges. Moreover, the rapid pace of technological change necessitates ongoing evaluation, as what is considered innovative today may become obsolete in the near future. To address these gaps, future research should focus on the long-term impacts of digital governance initiatives. Longitudinal studies tracking the effectiveness of these innovations would provide insights into their sustainability and scalability. Comparative studies across different regions or governance structures could also help identify best practices, ensuring that successful models are adaptable beyond their original contexts. Additionally, examining the role of citizen engagement in shaping digital transformation could provide further understanding of how participatory governance influences innovation outcomes. Finally, the ethical implications of digital governance, particularly concerning data privacy and security, require further exploration to ensure that technological advancements do not compromise public trust or individual rights.

6. Conclusion

This study has explored the innovative pathways of digital transformation in local governance in Thailand, focusing on ten local government projects that received the Digital Government Innovation Award (DG Award). The findings reveal a structured innovation development process characterized by

five key stages: Define, Ideate, Prototype, Test, and Implement. By systematically analyzing these stages, this research contributes to the growing body of knowledge on digital governance by offering an empirical framework that illustrates how local governments can effectively develop, test, and sustain digital innovations. Each stage highlights the importance of addressing urgent community needs through a collaborative and inclusive approach that engages various stakeholders, including local government officials, community leaders, and external experts. The ability to analyze problems and identify root causes emerged as a critical factor in defining clear objectives that directly address community challenges, ensuring the relevance and impact of the innovations. This study advances existing knowledge by demonstrating how problem identification and structured implementation can lead to more sustainable and impactful digital transformation efforts, particularly in resource-constrained local governments. Leadership and technological competence were also pivotal in driving these initiatives, with successful leaders demonstrating vision and the ability to inspire their teams. The establishment of strong networks and expert support further enhanced the capacity of local governments to implement and sustain innovations, while stakeholder engagement fostered a sense of shared ownership and commitment to the projects. Effective communication strategies played a crucial role in promoting acceptance and utilization of the innovations, ensuring that they were user-friendly and aligned with public needs. Unlike previous studies that focus primarily on national or large-scale digital transformation, this research highlights how local governments—often constrained by limited resources—can leverage strategic collaboration and adaptive governance to implement impactful digital initiatives. Despite the valuable insights gained, the study acknowledges several limitations, including the qualitative nature of the research and the potential for bias in self-reported data. Future research directions include longitudinal studies to assess the long-term impacts of these digital innovations, comparative studies across different regions, and investigations into the role of citizen engagement in the innovation process. Additionally, this study contributes to the debate on ethical digital governance by underscoring the need to balance technological advancements with privacy, inclusivity, and accountability. Exploring the ethical implications of digital governance will be essential for ensuring that innovations serve the public good while safeguarding individual rights.

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Compliance with ethical standards

Ethical considerations

In conducting this research, several ethical considerations were prioritized to ensure the integrity of the study and the protection of participants involved. Informed consent was obtained from all key informants, ensuring they were fully aware of the study's purpose, procedures, potential risks, and benefits before participation. Confidentiality and anonymity were maintained by removing personal identifiers from all data collected and securely storing information to protect participants' privacy. The research design aimed to minimize harm by allowing participants to skip any uncomfortable questions. Ethical approval was sought from the BUU ethics committee to ensure adherence to established guidelines.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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