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The Role of Adaptive Leadership in Improving the Performance of Smart City-Based Public Services

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A B S T R A C T

This study examines the role of adaptive leadership in enhancing smart city–based public service performance in Pekanbaru. Using a qualitative case study design with 12 informants, data were collected through semi-structured interviews, field observations, and policy document analysis. Thematic analysis reveals that adaptive leadership is crucial in driving innovation, resolving technical challenges, strengthening cross-unit collaboration, and improving the responsiveness and efficiency of digital public services—particularly in online licensing, citizen complaint systems, and command center operations. The study concludes that adaptive leadership is a key determinant of the sustainability of smart city transformation and contributes both theoretically to public administration studies on innovative and collaborative leadership, and practically to strengthening regional digital governance.

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INTRODUCTION

Digital transformation has become the main foundation of public service development in various countries, especially through the concept of smart cities that emphasize the use of technology to improve the effectiveness of governance. Global studies show that cities that are able to integrate technology with good governance are able to significantly increase citizen satisfaction and efficiency of public services (Meijer & Bolívar, 2021). In various developing countries, the implementation of smart cities has also been proven to increase transparency, service quality, and the government's ability to respond to the needs of dynamic communities (Ahvenniemi et al., 2022). The city of Pekanbaru is one of the regions that seeks to accelerate digital transformation through various innovations such as command centers, public service applications, and electronic-based licensing systems. This condition shows that the success of smart cities depends not only on technology, but also on how regional leadership manages change and facilitates organizational adaptation.

Although many regions have adopted digital technology, various studies confirm that the main obstacle to smart city implementation lies not in technical tools, but in the readiness of human resources and leadership in the bureaucracy (Anthopoulos, 2020). Bureaucracies often face resistance to change, conflicts of interest, and digital capacity gaps that can hinder the effectiveness of public services. Studies in various Asian cities show that the implementation of technology without adaptive leadership support tends to result in uneven digitalization and suboptimal public services (Lin & Wu, 2021). In Pekanbaru, bureaucratic complexity, variations in apparatus capabilities, and citizens' demands for fast service are factors that demand leadership that is able to respond flexibly. This shows the need for an in-depth analysis of how adaptive leadership affects the success of smart city implementation.

Adaptive leadership, as argued by Heifetz, Grashow, and Linsky through their various theoretical developments, emphasizes the ability of leaders to solve complex problems, respond to change, and manage uncertainty in organizations. Recent research confirms that adaptive leadership is particularly relevant in dynamic work environments, especially when organizations are facing structural change and digital transformation (Northouse, 2021). Other studies show that adaptive leaders play an important role in reducing change resistance, driving innovation, and improving cross-unit collaboration in public organizations (DuBrin, 2022). In the context of local governments that are implementing smart cities, leaders are required to be able to be facilitators, directors, and drivers of change so that digital innovation can run effectively. Thus, adaptive leadership is an important variable in the digital transformation of government.

Although research on smart cities and public services is growing rapidly, studies that explicitly link the concept of adaptive leadership to the performance of smart city-based public services are still very limited. Previous studies have emphasized more aspects of technology, infrastructure, or organizational readiness without in-depth reviewing the role of leaders in addressing the uncertainty and dynamics of digital change (Bibri & Allam, 2021). Research examining smart city governance has also not highlighted how bureaucratic

leaders manage policy conflicts, internal resistance, and technological adaptation simultaneously (Panori et al., 2022). This research gap is even more significant when applied to the context of cities in Indonesia, including Pekanbaru, which have bureaucratic characteristics, public pressure, and diverse digital capacities. Therefore, empirical research is needed to fill the void in the literature.

Research on smart cities in Indonesia generally focuses more on big cities such as Jakarta, Bandung, and Surabaya, so that the context of other regions such as Pekanbaru is relatively underexplored academically (Santoso & Darmawan, 2023). In fact, Pekanbaru is one of the cities in Sumatra that is quite progressive in implementing smart governance through online licensing systems, command centers, and other public service applications. However, such implementation does not automatically result in improved public service performance if it is not balanced with a leadership style that is able to navigate organizational change. The lack of research examining the relationship between adaptive leadership and digital service performance in Pekanbaru shows that there is a need for locally relevant but scientifically significant research. This condition makes this research have a strong empirical contribution.

Based on the research gap, this study specifically aims to analyze the role of adaptive leadership in improving the performance of smart city-based public services in the city of Pekanbaru. This research focuses on how bureaucratic leaders manage digitalization dynamics, respond to implementation challenges, and encourage organizational behavior change in public services. In addition, this study aims to identify the extent to which adaptive leadership is able to strengthen cross-unit collaboration, increase service responsiveness, and maximize the effectiveness of digital systems. By examining these relationships, this study is expected to provide a comprehensive overview of the key factors for the success of smart city implementation at the regional public service level. The research also aims to produce empirical findings that are relevant to other cities in Indonesia.

This research makes a theoretical contribution by expanding the study of smart city governance through the integration of adaptive leadership concepts into the framework of improving public service performance. The study also offers a new analytical model that can be used by future researchers in evaluating the success of digital transformation in the public sector. Practically, this study provides recommendations for local governments, especially the City of Pekanbaru, in strengthening leadership capacity and managing changes towards a technology-based public service system. The findings of the research are expected to be a reference for the development of smart city policies that are more responsive, inclusive, and citizen-oriented. Thus, this research makes a real contribution to the development of public administration science and its application in the field.

THEORETICAL REVIEW

Smart City Concept and Public Service Performance Orientation

The concept of smart city today is positioned not only as technological integration, but as a planning and governance paradigm that combines data-

driven decision making, digital infrastructure, and orientation towards more responsive public services. This demands a multidimensional understanding including technological, social, and institutional to improve public service outcomes. Bibri (2021) emphasized that an effective smart sustainable city model relies on data-driven capabilities and linkages between public and private actors so that technology can truly translate into improvements in service performance indicators such as service time, the rate of complaints handled, and user satisfaction. In the context of public administration, the idea of smart cities should be seen as an institutional transformation process that places service performance indicators as the main measure of successful implementation. Focusing solely on hardware or IoT without strengthening governance aspects and organizational capabilities tends to result in superficial and unsustainable technology adoption. The literature therefore suggests that studies on improving public service performance through smart cities always incorporate policy, organizational, and impact analysis on the public.

Smart Governance: Structure, Collaboration Mechanisms, and Performance Measurement

Smart governance places governance and cross-stakeholder collaboration mechanisms as the core of smart city implementation. Weak governance or fragmentation between OPDs can hinder the effectiveness of digital services even though technology is available. Paes et al. (2023) identified various operational and institutional challenges such as data interoperability, managerial capacity, and accountability that must be addressed to ensure smart cities deliver real improvements to the quality of public services. They emphasized the importance of accurate measurement indicators to assess the impact of smart city programs on service performance. This literature is relevant for research in Pekanbaru because it shows that service performance improvement is the result of a combination of technical architecture, administrative processes, and leadership that is able to coordinate these elements. Therefore, empirical studies need to include the analysis of governance architecture, collaboration mechanisms between OPDs, and performance metrics as the main variables.

Smart City Progress Measurement and Performance Index Relevance

Measuring smart city progress requires an indicator framework that is able to capture the integrity of implementation and tangible results in public services. A systematically designed index or dashboard will help with evidence-based decision-making. Lai et al. (2023) developed a smart city index evaluation method that emphasizes aspects of the indicator's credibility, reliability, and relevance. This approach is important in assessing the relationship between smart city interventions and public service performance outcomes. The methodological literature is relevant in case studies because it provides principles for the preparation of performance metrics such as online service speed, complaint resolution rate, and user satisfaction so that the analysis of adaptive leadership can be directly linked to measurable indicators. Empirical studies therefore need to justify the way of measuring service performance used according to the best practices of the smart city index.

Adaptive Leadership Theory: Relevance and Application to the Public Sector

Adaptive leadership theory emphasizes the leader's ability to manage complex problems or adaptive challenges, mobilize organizational learning, and regulate the level of pressure within the organization during the change process. This concept is particularly relevant for public organizations facing digital transformation. Chughtai et al. (2023) show that adaptive leadership increases the capacity of organizations to innovate through strengthening learning mechanisms and change efficacy which ultimately encourages the adoption of innovation in public service organizations. In the context of local government, the application of this theory means that leaders not only encourage the use of technology but also build a culture of learning, cross-unit communication, and feedback mechanisms with citizens. This is an important factor for the successful implementation of smart cities. The integration of this adaptive framework allows for a more comprehensive analysis of how leadership actions contribute to changes in service performance indicators.

Digital and Transformational Leadership in Government

The literature on digital leadership emphasizes that successful public sector digital transformation requires strategic vision, resource commitment, and the ability to build organizational capabilities. Digital leadership is a combination of transformational style and digital competence. Adie et al. (2024) show that digital leadership in public institutions can increase transparency, community participation, and service innovation if leaders are able to synergize technology with organizational policies and processes. In the context of smart cities, effective leadership must combine technical, managerial, and relational skills to create synergy between technology and governance. Case research in Pekanbaru can use these findings to identify the most relevant adaptive leader competencies in improving the performance of smart city-based public services.

Implementation Barriers: Bureaucratic Resistance, HR Capacity, and Data Security

International studies show that there are various obstacles to the implementation of smart cities that directly affect the quality of public services. These obstacles include bureaucratic resistance, low digital capacity of civil servants, data fragmentation, and issues of security and data protection of citizens. Paes et al. (2023) emphasized that non-technical obstacles often determine implementation failures more than the limitations of technological devices. Without leadership interventions in the form of capacity building, process redesign, or interoperability policies, the adoption of digital services will not result in significant changes to service performance. Therefore, empirical research needs to analyze these institutional barriers while looking at how adaptive leadership functions as a mitigation mechanism that bridges the technical aspects of smart cities with organizational dynamics and public services.

METHODOLOGY

Types, Approaches, and Research Design

This study uses a qualitative approach with a case study design to examine in depth the role of adaptive leadership in improving the performance of smart city-based public services in Pekanbaru City. The case study was chosen because it provides space to understand the dynamics of digital policy, organizational change processes, and leadership capacity in a real context, as Creswell & Poth (2021) explain that qualitative research needs to capture the complexity of phenomena that are not quantitatively measurable. This approach is also relevant to look at adaptive leadership practices that are contextual, flexible, and responsive to changes in the digital environment, in line with the thinking of Watkins (2023) who affirms that adaptive leadership requires an in-depth analysis of the organizational situation, not just quantitative measurements. Thus, this study places the transformation of Pekanbaru's smart city as a single case that is analyzed based on the experience of key actors and the dynamics of digital service systems.

Population and Informant Determination Techniques

The research population includes all actors involved in the smart city ecosystem in Pekanbaru, which includes policy makers, technical implementers, and digital service users. Informants were selected using purposive sampling techniques based on considerations of direct involvement, in-depth knowledge of digital policy implementation, and relevance of roles to the focus of the research. This technique follows the recommendations of Palinkas et al. (2020) who explain that the selection of informants in qualitative studies must consider their competence and proximity to the phenomenon being studied. A total of twelve informants were considered adequate to achieve the depth of analysis, as well as in line with the findings of Guest et al. (2020) that data saturation in policy studies was generally achieved in about twelve participants. The composition of informants is divided into three main groups so as to allow for a holistic perspective analysis.

Description and Rationalization of Informant Selection

The policy-making group consists of four main officials, namely the Head of the Communication and Information Service, the Head of the DPMPTSP, the bureaucratic reform official at the Regional Secretariat, and the Head of the UPT Command Center. The four have strategic authority in setting the direction of smart city transformation, strengthening digital systems, and data-based decision-making. This selection is in line with the analysis of Paes et al. (2023) who affirm that the effectiveness of smart city implementation rests on the quality of leadership and policy consistency at the strategic level. The second group includes technical implementers responsible for the operation of digital systems, such as Command Center 112 operators, online licensing application admins, community complaint application admins, and e-government staff. The information from this group is important to illustrate how policies are translated in field practice, in line with Bibri's (2021) opinion that the success of smart cities is determined by the operational reliability and interoperability of digital

systems. The third group consists of four service users who provide perspectives on the quality, responsiveness, and ease of digital services, as per Tan & Taeihagh's (2020) emphasis that smart city evaluations should place citizen experience as the main indicator.

Data Collection Techniques and Research Instruments

Data collection was carried out through semi-structured interviews, field observations, and document analysis. Semi-structured interviews were chosen because they allow for an in-depth exploration of the informant's experiences and the flexibility to explore the issues that arise during the conversation, as Tracy (2020) explains about the importance of a dialogical approach in public administration research. The interview guidelines were prepared based on the concept of adaptive leadership and digital service performance indicators, which are in line with the international smart city evaluation framework discussed by Lai (2023). Observations were made on the Command Center and other digital services to understand the workflow and effectiveness of coordination in system operations. The document analysis includes smart city policies, operational standards, performance reports, and public service dashboards. The validity of the data is improved through triangulation of techniques and sources as well as the process of confirming findings to informants, in accordance with the principles outlined by Carter et al. (2021) regarding efforts to maintain the credibility of qualitative data.

Research Implementation Procedure

The implementation of the research began with an in-depth literature review on smart cities and the concept of adaptive leadership as a conceptual foundation to formulate the research focus. Furthermore, the researcher prepares instruments and manages permits to local governments before assigning informants through an institutional approach to related regional apparatus organizations. The data collection process was carried out through in-depth interviews with an average duration of one hour, observation of digital service operations, and collection of regulatory documents and performance reports. All data is recorded, transcribed, and then analyzed by maintaining the confidentiality of the informant's identity as part of the ethical commitment of the research. In the final stage, the researcher carried out the process of coding, thematic grouping, and interpretation of the results to compile a comprehensive empirical narrative, following the guidelines for the implementation of qualitative research outlined by Nowell et al. (2022).

Data Analysis Techniques

The data was analyzed using a thematic analysis method by following six main stages developed by Braun & Clarke (2021), namely thorough reading of the data, initial coding, theme identification, theme review, theme definition, and writing results. This method was chosen because it is able to capture patterns of meaning that emerge from the experiences of informants, especially in understanding the dynamics of adaptive leadership and the implementation of

digital services. The analysis process is assisted by NVivo 12 Plus software to facilitate code organization and ensure transparency of analytical steps, as recommended by Chughtai et al. (2023) in a study on technology-based organizational behavior. The entire process is done iteratively to ensure that the themes formed have a solid foundation in empirical data and not on the researchers' assumptions.

RESEARCH RESULTS

Innovation Facilitation and Technical Problem Solving

The findings show that adaptive leadership plays a major role in driving innovation and accelerating the resolution of technical constraints in smart city services. Leaders in local government circles seem to be able to read the situation quickly, direct technical teams, and open up room for improvisation when formal procedures cannot accommodate the needs of the field. In the context of system disruptions, one policymaker explained that changes in approach often have to be made immediately to ensure that public services continue to run. He stated, "*We have to quickly change our approach when the system is disrupted, because public services cannot stop. Sometimes we can't wait for the SOP revision, so we take adaptive steps.*" (P1, interview September 12, 2025).

Field technicians reinforce these findings by describing operational dynamics that demand high flexibility. One of the Command Center technicians explained that data disruptions can appear at any time and leaders always provide space to explore technical solutions, "*Data disruptions can appear at any time. Leaders always give space to find the most possible solution, even if they have to change the flow temporarily.*" (T1, interview September 18, 2025). This support is also felt in the process of debugging the online licensing system, as expressed by other informants, "*When the application errors, the leadership does not blame. They are more focused on finding the cause and asking us to offer repair options. It makes us more courageous to try new solutions*" (T2, interview September 19, 2025).

Digital service users also feel the positive impact of this adaptive leadership pattern. A resident explained that the app glitch is now fixed much faster than before, "*In the past, if the application was stuck for a long time, now it is quickly fixed. It seems like the coordination is better.*" (L1, interview September 22, 2025). These findings confirm that adaptive leadership not only facilitates internal innovation, but also contributes directly to the quality of digital services that society receives.

Strengthening Cross-Unit Collaboration

The results of the study show that collaboration between organizational units increases significantly as adaptive leadership is strengthened. Leaders at the strategic level establish patterns of active communication and cross-organizational dialogue to avoid duplication of digital services and ensure uniform data integration. One of the officials emphasized the importance of alignment between agencies by stating, "*Collaboration is the core of a smart city. We need to unify the way we work so that digital services do not overlap*" (P3, interview September 10, 2025).

The strengthening of this collaboration is also felt by technical implementers who are directly involved in the management of dashboards and reporting systems. One of the technicians explained that the leader always emphasizes quick coordination when community reports are related to several agencies at once, "*When there is a report concerning several agencies, the leadership always asks us to immediately contact the relevant agency admin. No more throwing at each other*" (T3, interview September 17, 2025). This effort is accompanied by the creation of a shared data format and periodic technical meetings to harmonize the flow of system integration.

From the perspective of the community, cross-unit collaboration is reflected in the shortening of the follow-up chain of digital services. A user shared his experience, "*Now if you make a report, it will be followed up faster because the agencies are already connected*" (L3, interview September 23, 2025). This shows that adaptive leadership practices significantly improve internal bureaucratic coordination while strengthening the satisfaction of digital service users.

Increased Responsiveness and Effectiveness of Digital Services

Adaptive leadership seems to play a role in increasing the responsiveness and effectiveness of digital services such as the online licensing system, public complaints, and Command Center operations. Leaders ensure that teams are able to adjust capacity when there is a surge in reports or service requests. One of the officials said, "*We have to keep the rhythm of the service fast. When there is a surge in requests or reports, leaders must ensure the team is ready to adjust capacity*" (P1, interview September 12, 2025).

The impact of adaptive decisions is also seen in the improvement of the verification flow of report 112. A technician explained how the previously complicated mechanism was then simplified by the leadership so as to speed up the process of distributing reports to the relevant agencies. He stated, "*In the past, the response of 112 was long because the verification of the route was complicated. After the leadership simplifies the mechanism, the report quickly goes to the relevant agencies*" (T1, interview September 18, 2025).

Service users feel quite significant changes. One resident said that reports through the app are now getting follow-up in hours, not days, "*If you report through the application, it is very fast. In just a few hours, there has been a follow-up.*" (L1, interview September 22, 2025). These findings confirm that adaptive leadership succeeds in creating work patterns that are more responsive to people's needs.

Strengthening Digital Bureaucratic Readiness

Adaptive leadership also seems to play a role in preparing the bureaucracy's readiness towards a stable and sustainable digitalization process. Leaders don't just focus on technology, but also on the readiness of human resources. One of the policy makers explained the importance of investing in employee competencies in dealing with technological changes, "*Technological changes are not only about applications, but the readiness of people. Leaders must*

continue to encourage employee capacity building." (P3, interview September 10, 2025).

Technical implementers feel that leaders consistently provide assistance through short training when new features are launched. A technician stated, "*We are often given short training when there are new features. That's because the leadership wants us to be able to operate the system immediately.*" (T4, interview September 20, 2025). Direct policy explanations by leaders help employees understand the reasons for the change so that the adaptation process runs more smoothly.

Service users also feel an increase in employee professionalism and application stability. One user said, "*Employees seem to understand the system better. Their explanations are clearer and less confusing.*" (L3, interview September 23, 2025). This shows that strengthening internal capacity contributes to a better and consistent public service experience.

DISCUSSION

The findings of the study show that adaptive leadership plays a fundamental role in facilitating innovation and rapid resolution of technical constraints in the smart city ecosystem. Using a qualitative case study design, this study can reveal how leaders' rapid response to system disruptions encourages the formation of improvisational spaces and continuous organizational learning. This is in line with the view of Roberts (2022) who emphasizes that adaptive leadership requires the ability of leaders to dynamically adjust decisions based on rapidly changing field conditions. These findings are also consistent with the study of Krishnan & Teo (2023), which states that the success of smart cities is largely determined by the flexibility of bureaucratic actors in managing the complexity of data and technology. Consequently, adaptive leadership is emerging as a crucial factor that enables the acceleration of technical innovation and improves the continuity of digital public services.

Furthermore, the research reveals that adaptive leadership skills in strengthening cross-unit collaboration are key elements in the sustainability of smart city implementation. The purposive sampling approach allows researchers to explore the strategic views of key officials as well as technical and user perspectives, so that the dynamics of collaboration can be understood more comprehensively. The leader's emphasis on the importance of data integration and communication between OPDs reflects what Munro et al. (2024) conveyed that cross-organizational coordination is a key foundation for ensuring the interoperability of digital services. These findings are reinforced by the study of Dwivedi et al. (2022), who explain that smart governance requires a collaborative pattern that is able to unify standards, quality, and data flows between institutions. Thus, this study confirms that adaptive leadership serves as a connecting point that unifies cross-organizational processes in a single digital public service architecture.

In the responsiveness aspect of digital services, the study found that adaptive leadership contributes to accelerating licensing flows, community report management, and Command Center data processing. The semi-structured interview process allows for an in-depth exploration of how leaders simplify

flows, distribute instructions quickly, and open up spaces for direct communication between the technical team and users. These findings are in line with the analysis of Khan et al. (2023), who stated that leaders with adaptive characters tend to produce work structures that are more agile and responsive to the needs of society. The results of this research also support the statement of Lindgren and Jansson (2024), that adaptive digital leadership encourages efficiency by eliminating procedural barriers and adjusting work mechanisms according to the dynamics of service demand. The implications of these findings suggest that adaptivity is not only a leadership approach, but also a managerial strategy that directly increases public satisfaction.

The research also confirms that adaptive leadership has a strategic role in strengthening the readiness of the digital bureaucracy, especially in building a data-driven work culture and increasing employee capacity. Field observation and document analysis confirm that leaders provide systematic encouragement for technical training, mentoring, and workflow simplification. This supports the findings of Guo & Chen (2023), who state that human resource readiness is a key prerequisite for the success of public sector digital transformation. This perspective is also strengthened by the analysis of Pradhan et al. (2024), which emphasizes that improving technical competence and digital literacy of employees are key elements of the sustainability of innovation in the bureaucratic environment. Thus, the findings of this study make an important contribution to the literature on how adaptive leadership strengthens bureaucratic capacity towards technology-based governance.

From a methodological perspective, the use of thematic analysis provides a solid foundation for the process of identifying patterns and relationships between findings. By following the six stages of Braun & Clarke (2022) analysis, this study was able to build a strong theme based on empirical evidence from interview, observation, and document data. The use of NVivo 12 Plus allows for transparency and systematization in data processing, in line with the recommendations of Levitt (2021) who affirm the importance of documentation and auditability in qualitative research. The reliability of the findings is also strengthened through triangulation of techniques and sources, ensuring that the resulting interpretations are free of individual bias. These methodological implications show that a qualitative approach can produce a deep understanding of digital organizational dynamics that is difficult to capture through quantitative methods.

Although this study produced important findings, there are a number of contextual factors that could potentially influence the results. For example, the level of digital maturity of each organizational unit is different, so the adaptations made by leaders do not always run uniformly. This condition is in line with the argument of Fortunak et al. (2023), who state that internal capacity inequality can slow down the organizational adaptation process. In addition, the simultaneous digitization process in various sectors makes the technical workload high so that it can affect the effectiveness of the implementation of leadership directives. External factors such as limited data infrastructure or network disruption can also pose its own challenges. Nonetheless, these findings provide an important

overview of the factors that influence the successful implementation of smart cities.

Finally, this research makes a theoretical and practical contribution to the development of public leadership studies and digital transformation. Theoretically, the research expands the understanding of how adaptive leadership works at the operational level in the context of smart cities, linking technical, organizational, and behavioral dimensions. Practically, the findings can be a reference for local governments in formulating strategies to improve the quality of digital services through strengthening the capacity of leaders and bureaucrats. For further research, it is recommended to expand the scope of cases by comparing more than one city so as to identify variations in leadership models in smart city implementation. Data enrichment through citizen analytics can also open up a broader understanding of people's expectations of digital services. Thus, this research is an important foundation for the development of digital transformation in the Indonesian public sector.

CONCLUSION

This research confirms that adaptive leadership has a strategic role in ensuring the success of smart city implementation through the ability of leaders to respond quickly to technical disruptions, manage digital complexity, and encourage continuous organizational improvisation and learning. Field findings show that decision-making flexibility, bureaucratic flexibility, and open coordination spaces allow technical innovation to develop faster and digital public services to remain stable. The responsiveness of leaders in simplifying workflows, strengthening communication between technical teams and users, and managing Command Center data shows that adaptivity is not only a personal character, but is a managerial strategy that directly increases service effectiveness and community satisfaction. Thus, this study confirms that adaptive leadership is an important foundation for responsive, efficient, and continuous improvement-oriented digital governance.

In addition, this study reveals that adaptive leadership serves as a key link in building cross-unit collaboration and strengthening digital bureaucratic readiness. Strengthening data integration, inter-organizational synergy, and increasing human resource capacity show how leaders create work architectures that are able to support the interoperability of digital public services. A rigorous methodological approach through thematic analysis and data triangulation ensures that the findings have a strong empirical basis. However, differences in the level of digital maturity between units and the limitations of digital infrastructure are contextual factors that still affect the effectiveness of the adaptation process. However, the results of this study provide a theoretical contribution to the technology-based public leadership literature as well as practical recommendations for local governments in strengthening digital capacity and smart city governance in a sustainable manner.

FURTHER STUDY

Future studies are recommended to explore more deeply the organizational, technological, and behavioral mechanisms through which

adaptive leadership influences the success of smart city implementation. Further research could examine how variations in digital maturity, infrastructure quality, and inter-unit coordination shape leaders' adaptive strategies in managing digital transformation. Comparative studies across different cities or administrative levels may also provide broader insights into contextual differences in adaptive leadership practices within digital governance. In addition, longitudinal research is needed to understand how adaptive leadership contributes to long-term improvements in interoperability, service reliability, and public satisfaction as smart city ecosystems evolve. By expanding these research directions, future studies can strengthen theoretical frameworks on technology-driven public leadership and support the development of more resilient, collaborative, and future-ready digital governance models.

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