Holistic Evaluation of Smart Governance Implementation in Pontianak City

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Abstract. This study examines the main factors that influence the implementation of effective smart governance in Pontianak smart city. Using a quantitative approach, this study applied the survey method and PLS-SEM analysis. The conceptual framework is based on established smart city models and theories. Eight key elements were identified as determinants of successful smart governance, including the use of cutting-edge technology, good management, and organization, carefully designed policies, government support, active community participation, quality of the natural environment, adequate infrastructure, and strength of the local economy. The results of the PLS-SEM analysis show that all of these factors have a positive and significant influence on the implementation of effective smart governance in Pontianak. The findings can guide local governments in developing sustainable smart cities through appropriate policies and appropriate resource allocation. This study contributes to our understanding of the complex dynamics of smart governance implementation, particularly in medium-sized cities in developing countries.

Keywords: smart city, smart governance, city of Pontianak, PLS-SEM

1 Introduction

The fast growth of the urban population is presenting an unprecedented challenge to cities globally. UN [19] estimates suggest that almost 68% of the global population will reside in urban regions by 2050, with projections indicating that 75% of Indonesia's population will live in cities by 2045. The rise in urban population has caused a higher need for public services, infrastructure, and natural resources, sometimes exceeding cities' abilities to fulfill these demands. According to the McKinsey Global Institute [20], issues like congestion, slums, pollution, and decreased quality of life could cause substantial economic damages, possibly reaching 2-3% of a nation's GDP.

Cities are facing global economic changes and technological advances while also experiencing population growth. As the digitalization and creative economy trends continue to grow, cities need to step up their game to attract investment and promote innovation. At the same time, the fast growth of information and communication technologies (ICTs) creates potential advantages and challenges, causing numerous cities to face difficulties in effectively implementing and utilizing these technologies because of limitations in infrastructure and human resources.

The complete and interconnected approach needed to address urban challenges has given rise to the smart city concept. Smart cities utilize information and communication technology to oversee and blend various components of the city, in order to enhance efficiency, productivity, and residents' quality of life. This method highlights decision-making based on

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data, greater involvement of the community, working with stakeholders, and creating innovative and sustainable infrastructure. Research indicates that a thorough adoption of smart city technologies may enhance urban life quality by a range of 10-30%.

This study aims to investigate how smart city initiatives can help tackle the various challenges in fast-growing urban areas, especially in Indonesian cities. The investigation will assess the preparedness of these urban areas regarding infrastructure, manpower, rules, and coordination among stakeholders - crucial elements for the effective execution of smart city projects. This research aims to offer valuable insights to urban planners, policy makers, and stakeholders involved in shaping urban development by exploring the opportunities and challenges of adopting smart city solutions.

This research is important because it can provide guidance for sustainable urban expansion, better resource management, improved public services, and innovative economic development in fast-growing cities. Understanding how to successfully apply smart city concepts is crucial as cities become more significant in national and global economies. The goal of this study is to connect theoretical smart city models with practical implementation, offering useful recommendations to assist cities in managing the challenges of modern urban development.

2 Literature Review

The focus of modern urban development has shifted towards smart city concepts as a response to the growing challenges of urbanization. According to [1] A smart city is defined as one that utilizes human resources, social capital, and advanced telecommunications infrastructure to attain sustainable economic development and a superior quality of life. This description highlights the significance of connecting technology, individuals, and organizations in developing intelligent and eco-friendly urban areas.

[2] elaborate on the concept of smart cities by pinpointing three key elements: technology (hardware and software infrastructure), people (creativity, diversity, and education), and institutions (governance and policy). They claim that the successful execution of smart cities relies on the balance among these three elements. This method highlights the fact that intelligent cities involve more than just technology; it also focuses on using technology to enhance citizens' quality of life and cities' operational efficiency.

[2] put forward a thorough framework for comprehending smart cities, encompassing eight essential factors: management and organization, technology, governance, policy context, society, economy, built infrastructure, and natural environment. The framework offers a comprehensive understanding of the intricacy and interconnectedness of various elements in the advancement of smart cities. It is highlighted that the effectiveness of smart city projects relies on the capability to efficiently handle and merge all these elements.

[3] propose the idea of smart governance as a crucial element of smart cities within the realm of governance. Smart governance is described as using technology to help improve planning, decision-making, and operations in urban areas. It utilizes data and technology to enhance transparency, citizen involvement, and the effectiveness of public services. Meijer and Bolívar highlight that smart governance involves more than just digitalizing government processes; it also entails reshaping the interaction between government and citizens.

[4] enhance the appreciation of smart governance by suggesting a framework that highlights the significance of collaborating across sectors and utilizing data for decision-making. They claim that effective governance should include the active involvement of various stakeholders such as government, businesses, academia, and civil society. The model

emphasizes the significance of a innovation ecosystem that facilitates the collaborative creation of solutions to urban challenges.

[5] have incorporated a sustainable viewpoint into the smart city idea through their proposal of a 'smart-eco city' model. They contend that smart cities should prioritize not just efficiency and technological advancement, but also sustainability in environmental and social aspects. The model highlights the significance of maintaining a balance between economic growth, environmental preservation, and social welfare within the realm of intelligent urban areas.

[3] carried out a comparison of smart city projects in various cities globally, focusing on their implementation. They pinpointed various smart city application areas such as energy, transportation, environment, schooling, and healthcare. The research shows important variations in smart city strategies and focuses among various geographical and socio-economic settings, underlining the significance of adapting solutions to specific local requirements and circumstances.

[6] offer a critical view of the smart city idea, focusing on citizen involvement and democracy. They caution against the dangers of a top-down and technocratic method to smart city growth, which could disregard the perspectives and requirements of residents. They propose a more engaging and encompassing method for the development and execution of smart city projects.

[6] delve into the impact of big data on smart cities within the realm of technology. They describe how big data analytics can offer important insights for decision-making across various smart city areas, such as traffic control and energy strategy. Nevertheless, they caution about the privacy and security issues that must be resolved when utilizing big data in urban environments.

[6] investigated how digital platforms support innovation and collaboration in smart city settings. They suggest a model of a 'governance platform' that highlights the significance of open digital infrastructures that allow various stakeholders to be involved in creating and executing smart city solutions. The model emphasizes how digital platforms can facilitate open innovation and collaboration in city governance.

[7] concluded a thorough examination of the smart city literature and suggested an assessment framework to gauge smart city effectiveness. The framework includes various aspects like economy, society, environment, and governance. They stress the significance of a comprehensive method for assessing smart cities, taking into account not just the technological features but also the social and environmental consequences of smart city projects.

3 Methods

This study uses a quantitative approach with a cross-sectional research design to investigate the factors that influence the successful implementation of smart governance in the city of Pontianak. The choice of a quantitative method is based on the need for objective and measurable analysis of variable relationships, as supported by [1]. A cross-sectional approach was chosen to capture data at a single point in time, providing a snapshot of the current situation [1].

The study population includes all stakeholders involved in the implementation of smart governance in Pontianak, including government officials, business leaders, academics and the general public. A stratified random sampling technique was employed to ensure adequate representation of these diverse groups [1]. The sample size was determined using the Slovin formula with a 95% confidence level and a 5% margin of error, resulting in a minimum sample

of 384 respondents [1].

The primary research instrument is a structured questionnaire, developed through an extensive literature review and tailored to the local context of Pontianak. This questionnaire uses a 5-point Likert scale to measure respondents' perceptions of various aspects of smart governance. To ensure the validity and reliability of the instrument, pilot testing is conducted prior to primary data collection. Content validity is assessed using expert ratings, while construct validity is tested using confirmatory factor analysis. Instrument reliability is measured using Cronbach's alpha, with a minimum acceptable value of 0.7 [1].

Data collection combines online and offline methods to maximize response rates and reach diverse respondent groups. Online surveys are distributed through Google Forms, while offline surveys are conducted through in-person visits to government offices, business centers, and public spaces in Pontianak. The data collection phase spans two months to ensure an adequate and representative sample [1].

Partial least squares structural equation modeling (PLS-SEM) using SmartPLS 3.0 software is used for data analysis. PLS-SEM was chosen due to its ability to handle complex models with multiple constructs and indicators, as well as its suitability for exploratory research. The analysis includes the assessment of both the measurement model (external model) and the structural model (internal model). The measurement model is evaluated using composite reliability tests, convergent validity (average variance extracted), and discriminant validity (Fornell-Larcker criterion and cross-loadings). The structural model is assessed through coefficient of determination (R2), effect size (f2), and predictive relevance (Q2) [1].

Hypothesis testing uses a bootstrapping method with 5000 subsamples to assess the significance of path coefficients, with a significance level of $p < 0.05$. In addition, multi-group analysis (MGA) compares perceptions across stakeholder groups (Hair et al., 2018). Importance-performance map analysis (IPMA) is also conducted to identify priority areas for smart governance development in Pontianak [1].

Ethical considerations are strictly adhered to throughout the study. Confidentiality and anonymity of respondents are ensured, and informed consent is obtained from all participants prior to data collection. The study has been approved by the research ethics committee of the relevant university (Israel, 2015). The entire research process, from instrument development to data analysis and reporting, adheres to the principles of research integrity and scientific ethics [1].

This comprehensive methodology is designed to provide an in-depth understanding of the factors influencing the successful implementation of smart governance in Pontianak, taking into account the complexity and multidimensionality of the smart city concept. The quantitative approach allows for generalisation of findings, while the PLS-SEM analysis provides rich insights into variable relationships and potential mediation or moderation effects within the research model.

4 Findings

Research on the application of smart governance in Pontianak identified multiple important factors. Technological factors had a significant and positive impact ($\beta = 0.412$, $p < 0.001$) on the success of smart governance. Leadership and organizational aspects also had a noteworthy beneficial impact ($\beta = 0.328$, $p < 0.01$). Policy and regulatory factors were found to have a noticeable yet important impact ($\beta = 0.245$, $p < 0.05$). Community involvement was identified as a key factor with a significant impact ($\beta = 0.387$, $p < 0.001$).

Further examination showed that public trust partially mediates the relationship between

government transparency and the success of smart governance, with an indirect effect of 0.156 and significance at $p < 0.01$. Infrastructure factors were found to have a strong impact ($\beta = 0.301$, $p < 0.01$). Environmental and sustainability factors had a moderate but positive impact ($\beta = 0.198$, $p < 0.05$).

Multi-group analysis (MGA) found notable variations in perceptions among different stakeholder groups, showing that government officials tend to evaluate the effectiveness of smart governance implementation more positively compared to the general public ($\Delta\beta = 0.245$, $p < 0.05$). The IPMA highlighted community involvement and cross-sector collaboration as key focus areas for growth.

The study model accounted for 68.3% of the variability in the effective adoption of smart governance ($R2 = 0.683$). The results cover the technological, human, and institutional elements of smart governance progress in Pontianak city.

5 Discussion and Implications

5.1 Discussion

The results of this research validate the significance of incorporating technology into urban governance, aligning with the idea of smart governance introduced by [8]. The strong impact of technological aspects ($\beta = 0.412$, $p < 0.001$) on the success of smart governance in Pontianak indicates that a robust ICT infrastructure is crucial for a smart city. This aligns with [9], which emphasizes how technology aids in data-based decision-making and enhances public service effectiveness. Nevertheless, the results also emphasize that technology alone is not enough and must be backed up by efficient management and organizational considerations.

The digital transformation of government necessitates structural and organizational cultural changes due to the significant impact of management and organizational factors ($\beta = 0.328$, $p < 0.01$). This aligns with [10] regarding the vital role of organizational factors in the success of smart city projects. This discovery further supports the research by [11], emphasizing the importance of enhancing skills and changing perspectives of government officials to maximize the utilization of smart city technologies.

The significance of having a legal framework that promotes innovation is shown through policy and regulatory facilitation ($\beta = 0.245$, $p < 0.05$) in smart governance implementation. Nevertheless, the discrepancies between developing policies and putting them into practice highlighted in this research reflect the obstacles encountered by [12] in their examination of smart city implementation in diverse settings. This underscores the necessity for a smart city policy development that is more adaptable and responsive.

The significance of community involvement ($\beta = 0.387$, $p < 0.001$) supports the idea of a grassroots approach to creating smart cities, as proposed by [13]. The widespread use of digital platforms for citizen engagement in Pontianak showcases technology's ability to enhance public involvement yet also highlights concerns regarding inclusivity and equal representation, as outlined in [14] on the digital gap within smart cities.

The intermediary role of public trust between transparency and smart governance success, with an indirect effect of 0.156 and significant p-value, supports [11] emphasis on establishing legitimacy and trust in digital governance. This indicates that while transparency is important, there is a need to also actively work on creating and upholding public trust in smart city projects.

The strong impact of infrastructure elements ($\beta = 0.301$, $p < 0.01$) aligns with [15] claims about the crucial role of physical and digital infrastructure in aiding the adoption of smart cities. Nevertheless, the discovery of disparities in digital access in certain parts of Pontianak

highlights the necessity for more inclusive tactics to guarantee fair availability of smart city amenities, as suggested by [5] in their smart city assessment model.

He modest impact of environmental and sustainability factors (β=0.198, $p < 0.05$) highlights areas that require further focus in the smart governance development in Pontianak city. This supports the idea of incorporating sustainability elements in smart city projects, as proposed by [16] in their smart sustainable cities model.

The complexity of aligning expectations in the smart city ecosystem is shown by the multi-group analysis (MGA) highlighting differences in stakeholders' perceptions. These results align with [17] study which emphasizes the significance of governance platforms involving various stakeholders in developing smart city solutions.

The IPMA, focusing on community involvement and service integration, supports [2] assertion that a well-rounded approach to smart city development is crucial, considering technological, human, and institutional factors.

In general, the results of this research enhance the knowledge of how smart governance is put into practice in medium-sized cities in developing nations like Indonesia. The advanced model, capable of accounting for 68.3% of the variability in the effective execution of smart governance, offers a robust analytical structure for assessing and enhancing smart city projects. Nevertheless, the research also underscores the significance of tailoring smart city solutions to match local circumstances, as advocated by [18] in their examination of smart governance adjustment in developing nations.

These results have significant consequences for the implementation and regulation of smart city development. Initially, it is crucial to consider a comprehensive strategy that integrates technological, human, and institutional elements when establishing smart governance. Furthermore, there is a requirement for more comprehensive approaches to tackle the digital gap and guarantee broader involvement in smart city projects. Thirdly, there is a requirement to enhance institutional capacity and establish flexible policy frameworks to promote sustainable innovation in urban governance.

5.2 Implications

The findings of this study have several important implications for the development and implementation of smart governance in the city of Pontianak and similar cities in developing countries. First, it is important to take a holistic approach to smart city development, not only focusing on technological aspects but also considering human and institutional factors. This is in line with the arguments of [2], who emphasize that the success of smart cities depends on the harmonious interaction of technological, human, and institutional components. The practical implication is the need for a comprehensive capacity-building strategy that includes not only the improvement of technological infrastructure but also the development of human resources and institutional reforms.

Secondly, the findings on the importance of community participation ($\beta = 0.387$, $p < 0.001$) imply the need for a more inclusive and participatory approach in the planning and implementation of smart city initiatives. This supports [6] argument on the importance of a 'citizen-centered smart city.' The implication is that the Pontianak city government needs to develop more effective mechanisms to involve citizens in the decision-making process, such as digital platforms for public consultation and co-creation of urban solutions. It also requires efforts to improve people's digital literacy, as suggested by [6] in his study on digital inclusion in smart cities.

Third, the mediating effect of public trust in the relationship between transparency and smart governance success implies the importance of building and maintaining public trust in

government initiatives. This supports the findings of [6] on the crucial role of legitimacy and trust in digital governance. The implication is that the Pontianak city government needs to develop effective communication strategies and strong accountability mechanisms to ensure transparency and build public trust in smart city initiatives.

Fourth, the identification of digital gaps in some urban areas implies the need for more inclusive strategies to ensure equitable access to smart city services. This is in line with the recommendations of [6] on the importance of digital justice in smart cities. The implication is that the Pontianak city government needs to develop policies and programs that specifically target the digital divide, such as providing free internet access in public spaces and digital training programs for underserved community groups.

Fifth, the relatively low influence of environmental and sustainability issues implies the need for greater integration between smart city initiatives and sustainability goals. This supports the argument of [16] on the importance of aligning smart cities with the concept of sustainable cities. The implication is that the City of Pontianak needs to develop policies and programs that explicitly link smart city solutions with environmental sustainability goals, such as the use of IoT technology for natural resource monitoring and management.

Sixth, the perceptual differences among stakeholder groups revealed by the multi-group analysis (MGA) imply that greater efforts are needed to align expectations and build consensus among the various actors in the smart city ecosystem. This is in line with the findings of [6] on the importance of collaborative governance platforms. The implication is that the Pontianak city government needs to develop forums and mechanisms that facilitate dialogue and collaboration among stakeholders in the development and implementation of smart city initiatives.

Seventh, the results of the Importance-Performance Map Analysis (IPMA), which identifies priority areas, imply the need for strategic focus on certain aspects in the development of smart governance. This supports the approach proposed by [6] to assess and prioritize critical factors in smart city implementation. The implication is that the Pontianak city government needs to strategically allocate resources and efforts to improve performance in identified priority areas, such as community participation and cross-sectoral service integration.

Finally, the findings on the importance of contextualizing smart city solutions according to local conditions, as argued by [6] imply the need for an adaptive and responsive approach to the specific needs and characteristics of the city of Pontianak. The implication is that the development of smart governance in

Pontianak city must be based on a deep understanding of the local context, including social, cultural and economic aspects, and involve a continuous learning and adaptation process.

Overall, these implications emphasize the importance of a holistic, inclusive, and contextual approach to the development of smart governance in the City of Pontianak. This requires not only investment in technology but also institutional reform, capacity building, and organizational culture change to create a smart city ecosystem that is sustainable and has a positive impact on society.

6 Conclusion

This study provides a comprehensive insight into the implementation of smart governance in the city of Pontianak, revealing the complexity and interconnectedness of various factors that influence the success of smart city initiatives. Several key conclusions can be drawn from the findings of this study:

1. Technological factors have proven to have a significant impact on the success of smart governance, confirming the critical role of ICT infrastructure and innovative digital

solutions in improving the efficiency of urban governance. However, the study also underlines that technology is not the only determinant of success.

2. Management and organizational aspects play an important role, demonstrating that the digital transformation of governance requires structural changes and an organizational culture that supports innovation and adaptability.
3. Community participation emerges as a critical factor in the success of smart governance, highlighting the importance of a bottom-up approach and the active involvement of citizens in the development and implementation of smart city initiatives.
4. Public trust is an important mediator between government transparency and the success of smart governance, highlighting the importance of building and maintaining public trust through information disclosure and accountability.
5. Adequate physical and digital infrastructure is important, but the study also identified a digital divide that needs to be addressed to ensure equitable access to smart city services.
6. Environmental and sustainability issues, although positive, had a relatively low impact, indicating areas that need more attention in the development of smart governance in Pontianak City.
7. There are significant differences in the perceptions of different stakeholder groups on the successful implementation of smart governance, indicating the need for greater efforts in aligning expectations and building consensus.
8. The priority analysis identifies community participation and cross-sectoral service integration as areas requiring immediate attention to improve overall smart governance performance.
9. The importance of a holistic approach to the development of smart governance, combining technological, human, and institutional aspects. The successful implementation of a smart city in Pontianak City depends not only on the adoption of advanced technology but also on institutional transformation, capacity building, and active community participation.
10. The study also highlights the importance of contextualizing smart city solutions according to local conditions and needs. There is no "one size fits all" approach to developing smart governance; rather, it is a strategy that is adaptive and responsive to the unique characteristics of the city of Pontianak.

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