International Journal of Social Science, Educational, Economics, Agriculture Research and Technology (IJSET) | ISSN (e) : 2827-766X
Volumes 4 No. 12 (2025)

THE INFLUENCE OF SMART CITY ELEMENTS ON SMART CITY DEVELOPMENT STRATEGIES IN MEDAN CITY

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Received	:10 Oktober 2025	Published	: 25 December 2025
Revised	:01 November 2025	DOI	: https://doi.org/10.54443/ijset.v4i12.1540
Accepted	:26 November 2025	Link Publish	: https://www.ijset.org/index.php/ijset/index

Abstract

This study aims to analyze the influence of Smart City elements including Smart Governance, Smart Society, Smart Branding, Smart Living, Smart Environment, and Smart Economy on the Smart City concept development strategy in Medan City. Medan City as one of the major cities in Indonesia faces complex urbanization challenges, so the implementation of Smart City is expected to improve the efficiency of public services and the quality of life of the community. The research method uses a quantitative approach with Structural Equation Modeling (SEM) techniques based on Partial Least Squares (PLS) to test the relationship between variables. Primary data were collected through questionnaires distributed to 100 respondents who use Smart City services in Medan. The results show that Smart Governance and Smart Living variables have a positive and significant effect on the Smart City development strategy, while Smart Society, Smart Branding, Smart Environment, and Smart Economy do not have a significant effect. The research model is able to explain 71.9% of the variation in Smart City development strategies in Medan City. This finding indicates that improving governance and the quality of life of citizens are crucial for the success of Smart City development. The recommendation of this study is to strengthen Smart Governance and Smart Living to support innovation and sustainable public services in Medan City.

Keywords: Smart City; Smart Governance; Smart Living; Development Strategy; Medan City

INTRODUCTION

Urban development in various countries is increasing annually, leading to urbanization and attracting communities (Novikov and Pronkin, 2019; Sengers et al., 2018). However, challenges arising from this urbanization include slums, traffic congestion, and economic, social, and environmental issues. Indonesia, one of the fastest-urbanizing countries in the world, is expected to have 56.7% of its population living in urban areas by 2020, with a projected increase to 66.6% by 2035. According to the World Bank, by 2045, approximately 70%, or 220 million, of Indonesia's population will be concentrated in metropolitan areas. In this context, regional economic growth is highly dependent on the efficiency and effectiveness of sustainable development of various economic sectors (Utomo and Hariadi, 2017). To address these challenges, innovations such as the smart city concept have been introduced as a solution that can improve the quality of life for residents and advance regions (Borsekova & Nijkamp, 2018; Phararaj and Han, 2019). The smart city concept aims to plan and build intelligent urban areas, where technology is integrated into infrastructure to innovatively direct and regulate urban activities (Axelsson and Granath, 2018). This approach can address development disparities between regions, creating a better urban ecosystem and improving the well-being of local communities (Nugroho, 2018). The smart city concept is designed to address the problems arising from rapid and complex population growth. Data from the Central Statistics Agency (BPS) shows that population growth continues to increase, while modern society expects comfortable living and working environments, adequate public areas, and easy access to public services. These issues have the potential to hinder regional development and economic growth. Therefore, collaboration between the government and non-governmental sectors is essential to realizing effective and efficient smart cities. Smart city implementation focuses not only on administration and infrastructure development with a sustainable, environmentally friendly approach, but also aims to control urbanization and promote relationships between cities and villages. According to Suhendra (2017), cities that have implemented the smart city concept have shown a reduction in urban problems. However, in Indonesia, doubts about smart city programs often arise due to the lack of national regulations. A clear example is the failed smart city

program tender in Batu City, which failed three times due to specifications that could not be met by providers. In Medan, as one of the largest cities with a rapidly growing population, challenges to infrastructure and public services are increasing. Therefore, the development of a smart city in Medan aims to leverage technology and data to improve the efficiency of public services and improve the quality of life for residents. While efforts to implement smart city programs in various cities across Indonesia, as predicted by the International Data Corporation (IDC), which shows that 90% of cities are not yet able to effectively utilize data and digital assets, this development is a crucial step in addressing the challenges of urbanization. According to a 2021 survey by the Ministry of Communication and Information Technology (Kominfo), Medan City experienced a 0.24% increase in the implementation of the Smart City concept compared to the previous year, although this figure is still below the average for other cities, which reached 2.73%.

This finding indicates that while the implementation of Smart City in Medan has begun to progress well, special attention is still needed from the North Sumatra Provincial Government to explore and encourage innovation to optimize Smart City development in Medan. Traffic problems in Medan, which can disrupt resident mobility, also need to be addressed due to their impact on fuel waste, time, and air pollution. Medan City aims to improve public services by utilizing information and communication technology in various areas such as transportation, energy, water management, waste management, security, health, and education. With this approach, Smart City is expected to increase the efficiency, quality, and availability of public services, as well as improve resource utilization. The implementation of technology also aims to optimize energy and water use, reduce waste, and encourage more sustainable management. Furthermore, the Smart City development strategy will focus on improving the quality of life for residents through better accessibility and enhanced security and health. The development of a Smart Economy is also expected to positively contribute to the economy and digital innovation in Medan City. Therefore, research is needed to model the implementation and strategy of the Smart Economy concept in Medan to generate a best-case scenario that can assist the government in policymaking. This study, titled "The Influence of Smart City Elements on Smart City Development Strategies in Medan City," aims to delve deeper into the relationship between Smart City elements and strategic development in Medan City.

LITERATURE REVIEW

Smart City

According to Cardullo and Kitchin, a smart city is defined as a city with a design concept that benefits the community, particularly in the effective and efficient use of available resources (Iqbal, 2021). According to Caragliu, Del Bo, and Nijkmp (2009), a smart city is a city capable of utilizing human resources, social capital, and modern telecommunications infrastructure to achieve sustainable economic growth and a high quality of life, with wise resource management through participatory governance. According to Pratama (2014), a smart city is a concept for the development, application, and implementation of technology applied in a region as a complex interaction between the various systems within it. According to Holmes (2010), a smart city is a development concept aimed at improving the welfare of the people of a country, region, or city. Its implementation requires several essential requirements. First, the development of an effective computer network architecture, including hardware and software, is crucial for facilitating communication and public services. Second, information transparency and economic stimulation through online business opportunities and applications that support daily activities are essential. Furthermore, increasing community innovation and creativity serves as a driver of service quality. Stimulating enterprise and entrepreneurship through support for small and medium enterprises (SMEs) and entrepreneurship education is also crucial. Furthermore, a participatory and democratic governance structure contributes to the stability that supports the realization of a smart city. Finally, a balance between environmental, social, and economic aspects must be considered to ensure the implementation of the smart city concept is effective and provides significant benefits to the community.

The Relationship between Smart Cities and Economics

The economy is one of the pillars supporting a region, city, or country. Regional economic management should be better managed and computerized. The implementation and assessment of smart cities within the Smart Economy dimension encompass two aspects: innovation processes and competitiveness. Both are crucial for achieving a better and smarter national economy, as innovation and competitiveness are key assets for national progress and increased resource development. The direction of resource development in a region is realized through increasing access, equality, relevance and quality of basic social services, increasing the quality and competitiveness

of the workforce, controlling the number and rate of population growth and increasing community participation (Rifqi, 2013).

Smart City Implementation in Medan

The Medan City Government is one of 100 cities participating in the Movement Towards a Smart City program launched by the Ministry of Communication and Informatics of the Republic of Indonesia. In its implementation, the Medan City Government adheres to six main dimensions of a Smart City: Smart Governance, Smart Economy, Smart Environment, Smart Living, Smart People (Society), and Smart Branding. These six pillars aim to improve the quality of public services, improve governance efficiency, promote local economic growth, preserve the environment, and encourage active community participation in development. The Medan City Government has developed various digital service applications to support interactions between the government and the public, including the Sibisa application for population administration and Mercy (Medan Smart City API) as an integrated platform.

In the Smart Living sector, the Medan City Government has implemented technology-based traffic control systems such as the Intelligent Traffic System (ITS) and the Area Traffic Control System (ATCS), and has initiated the implementation of e-Parking in several strategic areas. Plans for the development of modern transportation modes, such as electric buses and the LRT/BRT system, have also been developed, despite delays due to the COVID-19 pandemic. Meanwhile, the Smart Environment aspect focuses on the use of sensor technology for waste management and air quality monitoring, as well as supporting the 3R principle (reduce, reuse, recycle) in environmental management. In the Smart Economy sector, the Medan City Government is collaborating with Bank BNI for digital transactions such as e-PBB and QRIS, and developing entrepreneurship centers at the village level. In the Smart Society aspect, emergency communication channels and public complaint platforms have been introduced to increase citizen participation. In Smart Branding, the city government is revitalizing public spaces and promoting local potential through digital media. Overall, although Smart City implementation in Medan has shown significant progress, challenges remain in system integration, public digital literacy, and program sustainability across sectors, which are important areas for further analysis.

Smart City Concept

The Smart City concept has evolved rapidly since the early 2000s, in line with increasing urbanization and the need for city governance that is responsive to social, economic, and technological changes. Giffinger et al. (2007) developed a six-dimensional framework for Smart City, including: Smart Governance, which emphasizes transparency and public participation; Smart Branding, which serves to increase tourist appeal; Smart Economy, which encourages innovation and entrepreneurship; Smart Environment, which creates clean and orderly urban areas; Smart Living, which prioritizes quality of life; and Smart Society, which focuses on community capabilities for the Society 5.0 era. The success of Smart City implementation is influenced by the policy content and implementation environment, which includes the interests of the target group, the types of benefits, and available resources. According to Wibawa (in Samodra Wibawa et al., 1994), the Grindle model focuses on the policy content and its implementation context, emphasizing the importance of policy transformation as a preliminary step before implementation. Parameters for policy success include affected interests, the types of benefits, the degree of desired change, the position of policymakers, program implementers, and resource availability. The implementation context, meanwhile, involves the power of actors, institutional characteristics, and the level of compliance and responsiveness to the policy. The uniqueness of this model lies in its comprehensive understanding of the policy context, including actors, recipients, and potential conflicts. According to Kourtit & Nijkamp (2013) emphasized that city performance serves as a key driver in urban evolution, concluding that Smart City emerges from a combination of human resources, infrastructure technology, social communities, and creative businesses. Citiasia Center from Smart Nation (CCSN) added that Smart City elements include Smart Governance, Smart Branding, Smart Economy, Smart Living, Smart Environment, and Smart Society, each with important functions and elements that support the creation of a smart, sustainable, and responsive city ecosystem. Effective implementation of these elements is expected to improve the quality of life of the community and facilitate economic growth.

METHOD

This research uses a quantitative approach. This research was conducted in Medan City, spread across 21 sub-districts in Medan City. The aim was to analyze and test the variables of smart governance, smart society, smart branding, smart living, smart environment, and smart economy towards the development strategy of the smart city concept in

Medan City. The population of this study was the entire community from teenagers to adults in Medan City across 21 sub-districts. The sample in this study was determined using a purposive sampling technique, namely a sampling technique based on certain criteria or considerations made by the researcher (Sugiyono, 2017). The respondent selection technique in this study was designed to capture individuals who have experience or specific knowledge related to Smart City services in Medan City, so that the information obtained can support the analysis with high relevance. The sample selection criteria included individuals who reside or have permanent activities in Medan City, aged between 20 and 60 years with a focus on the productive age group, and have used or are aware of one of the Smart City services such as e-Parking, Simpeg, Call Center 112, PPDB Online, or WebGIS. Sampling used the Slovin formula, resulting in a sample size of 100, which is considered representative for this study. With this approach, the analysis is expected to provide in-depth insights into public perceptions of Smart City services in Medan. The analysis technique used is Structural Equation Modeling (SEM), a statistical technique capable of analyzing the relationship patterns between latent constructs and their indicators, one latent construct with another, and direct measurement error.

RESULTS AND DISCUSSION

The research model will be tested using a structural model at the indicator level, the aim of which is to form a good latent variable score from the indicator level in the Smart-PLS application.

Convergent Validity

Convergent Validity is carried out by looking at the item reliability indicated by the loading factor value which shows the correlation between a question item and the construct indicator that measures the construct indicator. According to Hair et al. (2010) for the initial examination of the loading factor matrix value of less than 0.3 is considered to have met the minimum level and for a loading factor of approximately 0.4 is considered better and for a loading factor greater than 0.5 is generally considered significant, so the loading factor limit used is 0.5. However, in the Smart-PLS 4.0 application, the outer loading limit is 0.7.

Table 1 Convergent Validity Result

Indikator	Pemuatan luar (Outer loadings)	Keterangan
X1.1.1 <- X1. Smart Governance	**0.594**	Tidak Memenuhi
X1.1.2 <- X1. Smart Governance	**0.793**	Memenuhi
X1.1.3 <- X1. Smart Governance	**0.866**	Memenuhi
X2.1.1 <- X2. Smart Society	**0.856**	Memenuhi
X2.1.2 <- X2. Smart Society	**0.810**	Memenuhi
X2.1.3 <- X2. Smart Society	**0.910**	Memenuhi
X3.1.1 <- X3. Smart Branding	**0.884**	Memenuhi
X3.1.2 <- X3. Smart Branding	**0.907**	Memenuhi
X3.1.3 <- X3. Smart Branding	**0.794**	Memenuhi
X4.1.1 <- X4. Smart Living	**0.837**	Memenuhi
X4.1.2 <- X4. Smart Living	**0.845**	Memenuhi
X4.1.3 <- X4. Smart Living	**0.706**	Memenuhi
X5.1.1 <- X5. Smart Environment	**0.810**	Memenuhi
X5.1.2 <- X5. Smart Environment	**0.844**	Memenuhi
X5.1.3 <- X5. Smart Environment	**0.781**	Memenuhi
X6.1.1 <- X6. Smart Economy	**0.780**	Memenuhi
X6.1.2 <- X6. Smart Economy	**0.777**	Memenuhi
X6.1.3 <- X6. Smart Economy	**0.792**	Memenuhi
Y1.1.1 <- Y. Strategi Pengembangan Smart City	**0.772**	Memenuhi
Y1.1.2 <- Y. Strategi Pengembangan Smart City	**0.744**	Memenuhi
Y1.1.3 <- Y. Strategi Pengembangan Smart City	**0.820**	Memenuhi
Y1.1.4 <- Y. Strategi Pengembangan Smart City	**0.880**	Memenuhi
Y1.1.5 <- Y. Strategi Pengembangan Smart City	**0.809**	Memenuhi
Y1.1.6 <- Y. Strategi Pengembangan Smart City	**0.792**	Memenuhi
Y1.1.7 <- Y. Strategi Pengembangan Smart City	**0.101**	Tidak Memenuhi

Sumber: Hasil Olahan Data, SMART-PLS 4.0

The results of the above data processing with Smart-PLS version 4.0 show that the majority of indicators in each variable in this study have a loading factor value greater than 0.7 so that they meet the criteria. Meanwhile, there are only 2 indicators that have a loading factor value less than 0.7, namely the Sibissa indicator (X1.1.1) in the Smart Governance variable (X1), and the Smart Economy indicator (X2.4) in the Smart City Development Strategy variable (Y), so they need to be eliminated or removed from the model and retested using convergent validity again based on the new model that has eliminated these indicators.

Table 2 Convergent Validity Results of the Second Literacy Model

Indikator	Pemuatan luar (Outer loadings)	Keterangan
X1.1.2 <- X1. Smart Governance	**0.825**	Memenuhi
X1.1.3 <- X1. Smart Governance	**0.874**	Memenuhi
X2.1.1 <- X2. Smart Society	**0.856**	Memenuhi
X2.1.2 <- X2. Smart Society	**0.810**	Memenuhi
X2.1.3 <- X2. Smart Society	**0.910**	Memenuhi
X3.1.1 <- X3. Smart Branding	**0.884**	Memenuhi
X3.1.2 <- X3. Smart Branding	**0.907**	Memenuhi
X3.1.3 <- X3. Smart Branding	**0.794**	Memenuhi
X4.1.1 <- X4. Smart Living	**0.837**	Memenuhi
X4.1.2 <- X4. Smart Living	**0.845**	Memenuhi
X4.1.3 <- X4. Smart Living	**0.705**	Memenuhi
X5.1.1 <- X5. Smart Environment	**0.810**	Memenuhi
X5.1.2 <- X5. Smart Environment	**0.844**	Memenuhi
X5.1.3 <- X5. Smart Environment	**0.782**	Memenuhi
X6.1.1 <- X6. Smart Economy	**0.780**	Memenuhi
X6.1.2 <- X6. Smart Economy	**0.777**	Memenuhi
X6.1.3 <- X6. Smart Economy	**0.793**	Memenuhi
Y1.1.1 <- Y. Strategi Pengembangan Smart City	**0.769**	Memenuhi
Y1.1.2 <- Y. Strategi Pengembangan Smart City	**0.742**	Memenuhi
Y1.1.3 <- Y. Strategi Pengembangan Smart City	**0.824**	Memenuhi
Y1.1.4 <- Y. Strategi Pengembangan Smart City	**0.881**	Memenuhi
Y1.1.5 <- Y. Strategi Pengembangan Smart City	**0.812**	Memenuhi
Y1.1.6 <- Y. Strategi Pengembangan Smart City	**0.791**	Memenuhi

Sumber: Hasil Olahan Data, SMART-PLS 4.0

Through retesting the convergent validity for the second literacy model, a comparison of the loading factor values at the indicator level showed that all research indicators had met the criteria, namely having a loading factor value greater than 0.7, which means that all indicators were said to be valid so that this second literacy model would be used for subsequent testing.

Construct Reliability And Validity

Further evaluation is carried out by comparing the square root of the AVE (Aggregate Variance Extracted) value with the correlation between constructs, where the square root of the AVE must be higher than the correlation between constructs. The literacy model will have better discriminant validity if the square root of the AVE for each construct is greater than the correlation between the two constructs in the model. A good AVE value has a value greater than 0.5.

Table 3 AVE Value Results

Variabel	Varians diekstraksi (AVE)
X1. Smart Governance	**0.722**
X2. Smart Society	**0.739**
X3. Smart Branding	**0.744**
X4. Smart Living	**0.637**
X5. Smart Environment	**0.660**
X6. Smart Economy	**0.614**
Y. Strategi Pengembangan Smart City	**0.647**

Sumber: Hasil Olahan Data, SMART-PLS 4.0

All variables have an AVE value greater than 0.50, which means that the magnitude of the variation in each measurement indicator item is contained by the variable itself, overall the AVE value of all variables is ≥ 0.50 (convergent validity of the variable is accepted). Then, the Fornell - Larcker criteria test is carried out on each variable that has an AVE root value that is greater than the correlation between variables shown in the following table:

Table 4 Fornell - Larcker Criteria

	X1. Smart Governance	X2. Smart Society	X3. Smart Branding	X4. Smart Living	X5. Smart Environment	X6. Smart Economy	Y. Strategi Pengembangan Smart City
X1. Smart Governance	**0.850**						
X2. Smart Society	0.699	**0.860**					
X3. Smart Branding	0.629	0.673	**0.863**				
X4. Smart Living	0.514	0.679	0.768	**0.798**			
X5. Smart Environment	0.599	0.784	0.691	0.665	**0.812**		
X6. Smart Economy	0.607	0.689	0.624	0.732	0.724	**0.783**	
Y. Strategi Pengembangan Smart City	0.717	0.738	0.661	0.730	0.698	0.669	**0.804**

Sumber: Hasil Olahan Data, SMART-PLS 4.0

The AVE root for the Smart Governance variable is (0.850), the Smart Society variable is (0.860), the Smart Branding variable is (0.863), the Smart Living variable is (0.798), the Smart Environment variable is (0.812), the Smart Economy variable is (0.783), and the Smart City Development Strategy variable is (0.804). These values are greater than their correlations with other variables, thus discriminant validity for all variables is met. Overall, the discriminant validity evaluation was met, and the next test was conducted.

Internal Consistency Reliability

Internal Consistency Reliability measures the extent to which an indicator measures its latent construct. The tool used to assess this is Cronbach's alpha. A Cronbach's alpha value of 0.6–0.7 is considered good reliability, and the desired Cronbach's alpha value is above 0.6 (Ghozali and Latan, 2015).

Table 5 Internal Consistency Reliability Results

Variabel	Cronbach's alpha	Keterangan
X1. Smart Governance	**0.617**	**Memenuhi**
X2. Smart Society	**0.823**	**Memenuhi**
X3. Smart Branding	**0.826**	**Memenuhi**
X4. Smart Living	**0.724**	**Memenuhi**
X5. Smart Environment	**0.744**	**Memenuhi**
X6. Smart Economy	**0.688**	**Memenuhi**
Y. Strategi Pengembangan Smart City	**0.890**	**Memenuhi**

Sumber: Hasil Olahan Data, SMART-PLS 4.0

Based on the table above, it can be seen that all construct variables have a Cronbach's alpha value greater than 0.6, namely variables such as Smart Governance, Smart Society, Smart Branding, Smart Living, Smart Environment, Smart Economy and Smart City Development Strategy have a Cronbach's alpha value > 0.6, so it can be said that all these variables are reliable.

Composite Reliability

In addition to assessing convergent and discriminant validity, the outer model can also be measured by examining the reliability of the construct or latent variable, as measured by the composite reliability value. A construct is considered reliable if the composite reliability value is greater than 0.7.

Table 6 Composite Reliability Results

Variabel	Composite Reliability	Keterangan
X1. Smart Governance	**0.839**	**Memenuhi**
X2. Smart Society	**0.895**	**Memenuhi**
X3. Smart Branding	**0.897**	**Memenuhi**
X4. Smart Living	**0.840**	**Memenuhi**
X5. Smart Environment	**0.853**	**Memenuhi**
X6. Smart Economy	**0.827**	**Memenuhi**
Y. Strategi Pengembangan Smart City	**0.916**	**Memenuhi**

Sumber: Hasil Olahan Data, SMART-PLS 4.0

The composite reliability values in the table above indicate that all construct variables have values above 0.7, thus meeting the criteria for good reliability.

Hypothesis Testing

Hypothesis testing is conducted based on the results of the inner model test, which includes the r-square output, parameter coefficients, and t-statistics. To determine whether a hypothesis is acceptable, one must consider the significance values between constructs, the t-statistics, and the p-values. This research hypothesis testing is based on bootstrapping results, with a comparison of t-statistic values greater than 1.96, a p-value of 5%, and a positive beta coefficient.

Table 7 Bootstrapping Results

	Sampel asli (O)	Rata-rata sampel (M)	Standar deviasi (STDEV)	T statistik (|O/STDEV|)	Nilai P (P values)
X1. Smart Governance -> Y. Strategi Pengembangan Smart City	0.380	0.366	0.122	3.120	0.002
X2. Smart Society -> Y. Strategi Pengembangan Smart City	0.138	0.148	0.117	1.183	0.237
X3. Smart Branding -> Y. Strategi Pengembangan Smart City	-0.092	-0.090	0.110	0.836	0.403
X4. Smart Living -> Y. Strategi Pengembangan Smart City	0.423	0.433	0.161	2.619	0.009
X5. Smart Environment -> Y. Strategi Pengembangan Smart City	0.166	0.148	0.133	1.241	0.215
X6. Smart Economy -> Y. Strategi Pengembangan Smart City	-0.029	-0.014	0.181	0.159	0.874

Sumber: Hasil Olahan Data, SMART-PLS 4.0

Based on the table above, the Smart Governance variable has a significant positive effect, with a beta coefficient of 0.380 and a t-statistic of 3.120, resulting in a p-value of 0.002, which is smaller than the 5% alpha. In contrast, the Smart Society variable shows an insignificant positive effect, with a beta coefficient of 0.138 and a t-statistic of 1.183, and a p-value of 0.237, which is greater than the 5% alpha. The Smart Branding variable also shows an insignificant negative effect, with a beta coefficient of -0.092 and a t-statistic of 0.836, resulting in a p-value of 0.403. However, Smart Living shows a significant positive effect, with a beta coefficient of 0.423 and a t-statistic of

2.619, and a p-value of 0.009. On the other hand, the Smart Environment variable has an insignificant negative effect, with a beta coefficient of 0.166 and a t-statistic of 1.241, with a p-value of 0.215. Finally, Smart Economy also shows an insignificant negative effect, with a beta coefficient of -0.029 and a t-statistic of 0.159, and a p-value of 0.874, all greater than the 5% alpha value.

Discussion

The direct influence of Smart Governance on the Smart City Development Strategy in Medan City shows positive and significant results, as revealed in this study. The results show a beta coefficient of 0.380 and a t-statistic of 3.120, with a p-value of 0.002, which is smaller than the alpha value of 5%. This indicates that the increase in Smart Governance variables contributes significantly to the improvement of the Smart City Development Strategy. Valid E-Catalog and SIMPEG indicators show a significant positive impact, although one indicator, namely SiBISA, had to be eliminated because it did not meet the criteria. The implementation of E-Catalog encourages transparency in the procurement of goods and services, with local MSMEs becoming more actively involved, while SIMPEG improves personnel management through the digitization of ASN data, which supports performance-based policies. In addition, more than 70% of respondents found the SiBISA application easy to convey aspirations to the government, strengthening public participation. Therefore, a focus is needed on expanding digital infrastructure, digital literacy training, and collaboration between stakeholders. These results align with research by Bolivar & Meijer (2016), which emphasized the importance of collaboration in smart governance, and the UNECE (2021) approach, which emphasizes data-driven governance as a pillar of city operational efficiency. Therefore, Smart Governance in Medan City serves not only as a Smart City dimension but also as a strategic foundation for the success of smart city development policies. This policy enhancement is supported by research by Nursetiawan & Putra (2021) and Maharani et al. (2024), which demonstrates the positive impact of Smart Governance on government services and governance.

The direct effect of Smart Society on the Smart City Development Strategy in Medan City did not show positive and significant results, with a beta coefficient of 0.138, a t-statistic of 1.183, and a p-value of 0.237, all greater than the 5% alpha level. This indicates that the improvement of the Smart Society variable does not significantly impact the Smart City Development Strategy. The Call Center, Job Fair, and Job Seeker Card indicators were declared valid, but other implementations have not yet achieved optimal results. Although the 112 Call Center has improved communication between citizens and the government, there are limitations in operating hours and officer response. While the Job Fair program is effective in providing access to job vacancy information, only 42% of respondents felt it directly increased employment opportunities, while the Job Seeker Card, although digital, remains poorly integrated, and only 38% of respondents perceived its benefits. These insignificant results can be explained by several factors, such as limited digital literacy and access gaps in suburban areas, as well as a top-down bureaucratic culture that hinders public participation. Smart Society, as a key dimension of Smart City according to Giffinger et al. (2007), emphasizes the importance of active public participation in decision-making and the implementation of technology-based development. However, data shows that this contribution is still not optimal, as revealed by Ahvenniemi et al. (2017) who stated that an inclusive institutional environment is essential. Research by Kurniawan & Andiyan (2021) also found that the application of technology during the COVID-19 pandemic brought disruptions with positive but insignificant impacts in education and health, highlighting the need for community preparedness to achieve Smart City goals. Similarly, Azhari & Sutabri (2024) emphasized that although the Smart Society 5.0 approach can create smarter and more connected communities, challenges such as data security and unemployment due to automation must also be considered.

The direct effect of Smart Branding on the Smart City Development Strategy in Medan City showed negative and insignificant results, with a beta coefficient of -0.092, a t-statistic of 0.836, and a p-value of 0.403, which is greater than the 5% alpha. This indicates that increasing the Smart Branding variable actually decreases the Smart City Development Strategy insignificantly. The indicators for Online PPDB, Online Agreement Complaint Services, and E-Report are considered valid, but their implementation in the field has encountered various obstacles, such as system disruptions in the Online PPDB that reduce public trust, as well as low public response to complaint services and the limitations of the less well-known E-Report. In fact, branding as a smart city has been introduced through official online platforms and social media, but the lack of transparency, two-way communication, and public participation makes branding top-down and ineffective. Negative perceptions of the quality of public services such as waste management and bureaucracy further weaken the city's branding. These findings align with Santoso's (2020) research, which noted that city branding that does not involve local values and citizen participation tends to be ineffective. Furthermore, without public participation and inter-agency coordination, Smart Branding faces obstacles. Research by Winoto et al. (2023) confirms that branding initiatives that lack local community involvement

have the potential to reinforce social inequality and hinder smart city development strategies. In other words, the success of Smart Branding in Medan City depends heavily on active community involvement, transparency, and improved public services. The direct impact of Smart Living on Medan's Smart City Development Strategy showed a positive and significant result, with a beta coefficient of 0.423, a t-statistic of 2.619, and a p-value of 0.009, all less than the 5% alpha level. This indicates that improving the Smart Living variable significantly improves the Smart City Development Strategy. The ATCS (Area Traffic Control System), e-Parking, and e-Learning indicators were found valid and contributed positively to Smart Living implementation. The proven effectiveness of ATCS services, which have improved traffic efficiency and reduced congestion, was supported by 75% of respondents who felt they were helpful. E-Parking also demonstrated a significant impact on parking space management and levy transparency, with 68% of respondents feeling more comfortable. In the education sector, the e-learning program implemented during and after the pandemic successfully expanded access to flexible education, with 70% of respondents stating its benefits. Overall, statistical analysis shows that these three indicators contribute significantly to improving the quality of life for urban residents and strengthening the integration of digital services in Medan City. Therefore, the Smart Living development strategy needs to focus on expanding technological infrastructure, integrating public service systems, and improving public digital literacy to accelerate Medan City's transformation into a comfortable and sustainable smart city. Research by Mahayani (2024) supports the importance of collaboration between government, industry, and the community and the integration of sustainability into smart city policies, demonstrating that Smart Living can have a positive impact on quality of life if implemented with a holistic and inclusive approach.

The direct influence of Smart Environment on the Smart City Development Strategy in Medan City showed positive but insignificant results, with a beta coefficient of 0.166, a t-statistic of 1.241, and a p-value of 0.215, which is greater than the 5% alpha value. This indicates that increasing the Smart Environment variable does not have a significant effect on the Smart City Development Strategy. The Patroltaru (green open space monitoring) indicator, Medan City WebGIS, and Geo Portal are considered valid, but their effectiveness is still limited. Patroltaru, which functions to monitor green open spaces, faces obstacles due to a lack of officers and community participation. WebGIS as a spatial information portal has good potential, but only 40% of respondents actively use it, indicating the need for socialization. Geo Portal, which presents integrated data for development, has not been optimally utilized due to limited interactive functions. Facts on the ground reflect that initiatives related to the Smart Environment have not been fully integrated with the city's digital system, such as cleanliness campaigns and waste management that are not implemented systematically. Environmental management is still largely done manually and low citizen participation also hinders effective implementation. These findings align with research by Anzani & Purbaningrum (2023), which confirmed that the Smart Environment has a positive but insignificant impact on Smart City strategies due to a lack of socialization and support. Furthermore, Sari et al. (2024) noted challenges such as pollution, congestion, and environmental degradation, indicating that a lack of planning and community participation can negatively impact Smart City Development Strategies.

The direct effect of the Smart Economy on the Smart City Development Strategy in Medan City was negative and insignificant, with a beta coefficient of -0.029, a t-statistic of 0.159, and a p-value of 0.874, all greater than the 5% alpha level. This indicates that an increase in the Smart Economy variable actually decreases the Smart City Development Strategy insignificantly. The MSME indicators, online BPHTB (tax payments), and SIMPAD UMKM were declared valid, but their implementation in the field has been hampered. MSMEs have difficulty accessing digital services such as SIMPAD UMKM, which are supposed to support small business development, but have not been optimally implemented due to minimal socialization and low digital literacy. Furthermore, online BPHTB tax payments frequently experience technical glitches and are unresponsive, which undermines public confidence in digital transformation in the economic sector. These findings reflect that Medan's local economy is still dominated by the informal sector and traditional MSMEs that are not yet fully connected to digital systems. Government efforts to develop a digital ecosystem, including e-commerce training and support for the creative economy, have had limited impact. Lack of access to technology and digital literacy, as well as a lack of fiscal incentives for businesses undergoing digital transformation, are obstacles that reduce the effectiveness of the Smart Economy in supporting Smart City strategies. These findings align with research (Amaral et al. 2022), which shows that the Smart Economy does not always contribute significantly without equitable and community-based digital economy policies. Therefore, limited infrastructure and a lack of collaboration with the private sector hinder the impact of the Smart Economy in mid-sized cities in Indonesia. Although the Smart Economy should be a crucial dimension in creating competitive and sustainable cities, this research suggests that its role in Medan is still suboptimal. Therefore, there is an urgent need for the government to strengthen its inclusive digital economy development strategy, expand digital entrepreneurship literacy, and systematically encourage the integration of MSMEs into digital platforms. Without

comprehensive improvements, the potential of the Smart Economy will not be able to be converted into a strategic strength in realizing Medan City as a Smart City.

CONCLUSION

Based on research findings on the influence of Smart City elements on the Smart City Development Strategy in Medan, it can be concluded that Smart Governance and Smart Living have been shown to have a positive and significant impact on the development strategy, while Smart Society, Smart Branding, Smart Environment, and Smart Economy have shown insignificant or even negative impacts. Smart Governance, with its digital platforms such as E-Catalog and Simpeg, has successfully improved the effectiveness of public services, while Smart Living improves public convenience and accessibility through services such as ATCS and E-Parking. However, evaluation and improvement of other variables that have not shown a significant impact, as well as strengthening and integrating existing programs, are needed. Therefore, the Medan City government is advised to continue strengthening Smart Governance and enhancing Smart Living infrastructure, as well as conducting an in-depth evaluation of Smart Society, Smart Branding, Smart Environment, and Smart Economy. Steps such as increasing public digital literacy, promoting local identity, and digital transformation for MSMEs are necessary. Furthermore, a holistic and sustainable Smart City development strategy is needed, integrating technological aspects, strengthening governance, and empowering communities. The role of academics in supporting Smart City development through research, community service, and relevant curriculum development is also very important to achieve a more comprehensive and sustainable Smart City implementation.

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