Jurnal Aristo (Social, Politic, Humaniora) Vol. 14, No.2 (2026) : July, pp.
Social and Political Science Faculty, Universitas Muhammadiyah Ponorogo.
p-ISSN 2338-5162 / e-ISSN 2338-5162

# Driving the Future: The Role of Smart Cities and Social Connectivity in Transforming Business Dynamics and Advancing the Smart Economy

# Menggerakkan Masa Depan: Peran Kota Pintar dan Konektivitas Sosial dalam Mengubah Dinamika Bisnis dan Memajukan Ekonomi Pintar

**Riyadhusholihah[1*], Mardiana Purwaningsih[2]**
[12] Perbanas Institute, Jakarta, Indonesia
[12] Jl. Perbanas, RT.6/RW.7, Kuningan, Karet Kuningan, Kecamatan Setiabudi, Kota Jakarta Selatan, Daerah Khusus Ibukota Jakarta 12940
riri.riyadh@gmail.com[1], mardiana@perbanas.id[2]
Corresponding Author: riri.riyadh@gmail.com[1]*

ARTICLE INFORMATION

***Keywords***
Smart City;
Business Dynamics;
Smart Economy;
Urban Innovation,
Digital Transformation;
Economic Competitiveness;

***ABSTRACT***
The emergence of smart cities represents a transformative shift in urban development, integrating digital technologies, data-driven governance, and sustainable infrastructure to enhance quality of life and economic efficiency. This article explores how smart city initiatives are reshaping business dynamics and driving the growth of the smart economy. By leveraging technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data analytics, smart cities enable new business models, optimize operational efficiency, and support innovation ecosystems. The paper also highlights the critical role of public–private partnerships, regulatory frameworks, and digital infrastructure in creating an economic environment that is responsive, adaptive, and inclusive. Through a multidisciplinary analysis, this study reveals the interconnection between urban intelligence and economic competitiveness, offering strategic insights for policymakers, business actors, and urban planners. Ultimately, smart cities do not merely transform how cities operate—they also redefine how businesses compete and collaborate in the digital age.

**Kata Kunci**
Kota Pintar;
Dinamika Bisnis;
Ekonomi Pintar;
Inovasi Perkotaan;
Transformasi Digital;
Daya Saing Ekonomi;

**ABSTRAK**
Kemunculan kota pintar mewakili pergeseran transformatif dalam pembangunan perkotaan, yang mengintegrasikan teknologi digital, tata kelola berbasis data, dan infrastruktur berkelanjutan untuk meningkatkan kualitas hidup dan efisiensi ekonomi. Artikel ini mengeksplorasi bagaimana inisiatif kota pintar membentuk kembali dinamika bisnis dan mendorong pertumbuhan ekonomi pintar. Dengan memanfaatkan teknologi seperti Internet of Things (IoT), kecerdasan buatan (AI), dan analitik data besar, kota pintar memungkinkan model bisnis baru, mengoptimalkan efisiensi operasional, dan mendukung ekosistem inovasi. Makalah ini juga menyoroti peran penting kemitraan publik-swasta, kerangka kerja regulasi, dan infrastruktur digital dalam menciptakan lingkungan ekonomi yang responsif, adaptif, dan inklusif. Melalui analisis multidisiplin, studi ini mengungkapkan keterkaitan antara kecerdasan kota dan daya saing ekonomi, yang menawarkan wawasan strategis bagi para pembuat kebijakan, pelaku bisnis, dan perencana kota. Pada akhirnya, kota cerdas tidak hanya mengubah cara kota beroperasi, tetapi juga mendefinisikan ulang bagaimana bisnis bersaing dan berkolaborasi di era digital.

**Article History**
Send 2thJune 2025
Review 6thJuly 2025
Accepted 16th July 2025

## Introduction

The advancement of information technology has driven a fundamental transformation in urban governance and planning. The concept of smart cities has been widely adopted as a response to the complexities of urbanization, offering promises of improved public service efficiency, resource management, and quality of life. However, behind the global enthusiasm for urban digitalization lies an academic tension between technology-centric approaches and the often-limited institutional capacities at the local level. Several studies indicate that smart city implementation tends to favor data-driven and digital infrastructure solutions while overlooking local social, cultural, and institutional dynamics. As a result, ongoing debates emphasize the need to balance technological innovation with institutional capacity-building to ensure that smart city initiatives are not merely symbols of modernity, but are contextually embedded and meaningful. Previous research suggests that smart cities integrate technology, innovation, and social capital to create adaptive and sustainable urban systems (Stone, 2021).

However, not all cities are capable of implementing this approach comprehensively and contextually. This underscores the need for a deeper understanding of the interconnections between digital infrastructure, urban governance, and socio-economic dynamics within local contexts. Information technology serves as a foundational pillar in the development of modern smart cities. Data-driven systems, sensors, and digital networks have enabled cities to manage resources more efficiently and responsively. Yet, existing studies often overlook how these technologies operate within uneven governance capacities, social inequalities, and localized constraints. This gap calls for further investigation into how smart city frameworks can be designed and implemented in a way that is both technologically robust and socially grounded, particularly in the context of developing cities. Data-driven systems, sensors, and digital networks have enabled cities to manage resources more efficiently and responsively. Yet, existing studies often overlook how these technologies operate within uneven governance capacities, social inequalities, and localized constraints. This gap calls for further investigation into how smart city frameworks can be designed and implemented in a way that is both technologically robust and socially grounded, particularly in the context of developing cities. Digital technology plays a central role in integrating various components of urban systems, such as transportation, energy, and public services. Nevertheless, many existing studies remain descriptive in nature and have yet to explore the strategic implications of digital transformation for the business sector.

This highlights the need to examine how information technology in smart cities contributes to the transformation of local and global economies. Within the smart city ecosystem, business dynamics have shifted fundamentally from conventional models to digital and collaborative ones. Companies must adjust their operational strategies in response to the evolving urban infrastructure. Previous studies suggest that smart cities create both opportunities and challenges for businesses in terms of connectivity, transparency, and innovation (Shin et al., 2022). However, few investigations have specifically addressed how urban transformation directly impacts business strategies in particular sectors. Therefore, a more in-depth analysis is needed to understand how smart cities structurally reshape the business landscape.

Smart economy is one of the core pillars of the smart city framework, yet it remains underexplored in academic literature, especially in the context of developing countries. Much of the existing research still focuses on technological aspects or physical infrastructure, often neglecting their effects on production and consumption patterns. Giffinger emphasizes that the smart economy encompasses economic innovation, entrepreneurship, and labor market flexibility as key indicators of urban competitiveness. In light of this, a comprehensive understanding of the smart economy requires not only assessing technological capabilities, but also examining how they influence socio-economic transformation across various sectors (Shankar et al., 2021), and market flexibility in a digital environment. The absence of studies linking smart economy concepts to actual business practices leads to a lack of holistic understanding (Kanda et al., 2022) . Therefore, this research attempts to fill this gap with an interdisciplinary approach that combines technological and management perspectives.

The success of a smart city is determined not only by technology, but also by cross-sector collaboration and supportive policies (Horck et al., 2024; Huda et al., 2025) . The government, private sector, and community must be actively involved in an innovation ecosystem that mutually reinforces this research that collaborative governance is key to creating adaptive and inclusive cities (Ninčević Pašalić et al., 2021; Sugiana et al., 2024) . However, in practice, rigid regulations and minimal synergy between sectors still hinder many smart city initiatives.

This reinforces the urgency of research on collaboration models and policy frameworks capable of driving a sustainable smart economy. This study aims to analyze how smart cities and information technology are reshaping business dynamics and driving smart economic growth. The main focus is directed at identifying patterns of change in business strategies and digital economic models in smart city environments. According to previous research, smart cities can drive economic competitiveness through efficiency, innovation, and creativity (S. Wang et al., 2022) However, no studies have empirically linked a city's digital transformation to the economic performance of local businesses. Therefore, this research aims to fill this gap with a data-driven analytical approach and a review of current literature.

Theoretically, this research is expected to enrich understanding of the relationship between digital governance and business dynamics within a smart city framework. Practically, the findings are expected to provide strategic input for policymakers and business actors. This study emphasizes the importance of synergy between innovation theory and technology applications in developing future cities (Prakash et al., 2022) . Therefore, the results of this study are not only academically relevant but also have broad implementation implications. The synergy between scientific approaches and practical needs is a crucial foundation for developing impactful policy recommendations.

This research offers novelty by integrating information technology, innovation management, and public policy approaches into a single conceptual framework for understanding the smart economy. Previous studies have tended to address these topics separately without demonstrating their systemic interconnectedness. Previous research suggests that cross-domain integration is key to comprehensively understanding the complexities of smart cities (Stone, 2021), (Al-Yasiri & Szabó, 2022), and (Chauhan et al., 2021) . Therefore, this research makes a unique contribution by building a conceptual model that connects the technology, business, and policy dimensions. This is expected to serve as a reference in the development of digital-based smart city business models and policies in the future.

## Method

This study uses a quantitative approach to examine the relationship between smart city implementation, information technology, and economic dynamics. The quantitative approach was chosen because it can measure research variables objectively and in a structured manner. The research focuses on examining the relationships between variables

using standardized instruments. This research is explanatory in nature, aiming to examine the direct and indirect influences between variables formulated in the research model. The research design is structured as a questionnaire-based survey administered to relevant respondents in smart city areas in Indonesia. The population in this study includes business actors, information technology professionals, and policy planners within the smart city ecosystem in Indonesia. Seven major cities that have implemented the smart city concept were purposively selected as research locations, based on the level of technology adoption and the intensity of digital economic activity. Furthermore, from the population within the city ecosystem, a random sample was drawn *from* individuals who met the criteria for direct involvement in smart city initiatives. The determined sample size was 384 respondents spread across the seven major cities implementing the *smart city concept* . The determination of this sample size refers to the Cochran formula for large populations with a 5% margin of error. This approach was taken so that the research results can be moderately generalized in the context of large cities in Indonesia. The sample selection in this study was conducted using a *stratified random sampling technique* to ensure representativeness and inferential validity. Seven major cities in Indonesia that have implemented the smart city concept were purposively selected as research locations based on their level of technological maturity and digital economy intensity. Within each city, the population was divided into three main categories: business actors, information technology professionals, and policy planners, which were then stratified. From each stratum, respondents were randomly selected to ensure that every individual who met the criteria had an equal chance of being selected. The total number of respondents was set at 384, calculated using the Cochran formula with a 5% margin of error, and then divided evenly among the seven cities (approximately 55 respondents per city) to obtain a balanced data distribution for empirical testing.

The data collection instrument used was a questionnaire with a Likert scale of 1 to 7, reflecting respondents' level of agreement with statements in the variable indicators. The variables in this study consisted of: Smart City, Information Technology, Business Dynamics, and Smart Economy. Each variable was built based on theoretical constructs supported by previous literature and tested for validity and reliability before being widely used. Validity testing was conducted using confirmatory factor analysis (CFA), while reliability was tested using Cronbach's Alpha. Data were collected online and offline, depending on respondents' access in each city.

The collected data were analyzed using the *Structural Equation Modeling (SEM* ) method with *the Partial Least Squares (PLS) approach,* using the latest version of SmartPLS

software. The analysis stages include: (1) testing the outer model for construct validity and reliability, (2) testing the inner model to measure the relationship between variables, and (3) testing the path significance using *bootstrapping* . SEM-PLS analysis was chosen because it is able to handle complex models with latent indicators and relatively large amounts of data. The results of this analysis will show the direct, indirect, and total influences between the variables that form the research conceptual model. Thus, researchers can draw data-based conclusions regarding the role of smart cities and information technology in shaping the dynamics of smart businesses and economies.

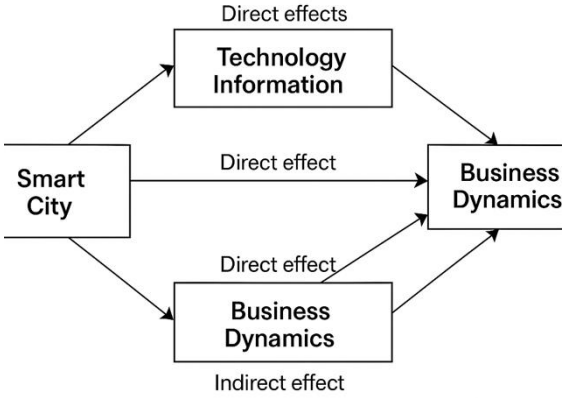


Figure 1. Research Model.

Based on Figure 1, the concept of a smart city not only represents the integration of technology into city governance but also creates a foundation for strengthening digital information and communication systems within it. Several studies confirm that smart city initiatives directly encourage the development of information technology through the digitization of public services, city data management, and integrated communication infrastructure (Albino et al., 2015; Chourabi et al., 2012). Furthermore, the existence of established information technology becomes a catalyst for business dynamics, especially in supporting operational efficiency, product and service innovation, and increasing competitiveness amidst digital transformation (Bharadwaj et al., 2013; Yoo et al., 2010). Therefore, information technology not only plays a role as a result of smart city development but also as a strategic mediator that strengthens the influence of smart cities on business dynamics.

On the other hand, the direct relationship between smart cities and business dynamics has also been widely discussed in the literature. The implementation of smart cities creates a conducive environment for the growth of a knowledge-based economy by facilitating connectivity, data transparency, and technology-based services that support urban economic activities (Neirotti et al., 2014; Mora et al., 2019). In this context, smart cities become a

structural platform capable of accelerating changes in business patterns, creating new markets, and encouraging collaboration between sectors. Indirectly, this influence is strengthened by the presence of information technology as the main link between city systems and business entities. Similar findings were presented by Caragliu et al. (2011) and Gil-Garcia et al. (2015), who emphasized that the impact of smart cities on the business sector is more significant when mediated by robust and well-managed information technology infrastructure and systems.

The initial step in this research was a literature review to develop a conceptual framework and hypotheses. Next, instruments were developed, questionnaires were pilot tested, and instruments were distributed to respondents. After data collection, coding, screening, and data cleaning were conducted *before* statistical analysis. Researchers also tested statistical assumptions such as normality, multicollinearity, and heteroscedasticity to ensure data quality. Finally, the results were systematically interpreted to formulate conclusions and policy recommendations relevant to the development of smart cities and the digital economy in Indonesia.

## Result and Discussion

Implementation : A total of 384 respondents from seven major cities in Indonesia participated in this study. They consisted of business actors, IT professionals, and policy planners directly involved in smart city initiatives. Most respondents came from Jakarta, Bandung, and Surabaya, with a dominant age group of 30–45 years and more than 5 years of work experience in technology or urban planning. These data indicate that respondents have sufficient backgrounds to answer the research questions objectively.

**Table 1. Respondent Characteristics**

| Characteristics | Category | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Man | 212 | 55.2% |
| | Woman | 172 | 44.8% |
| Age | < 30 years | 85 | 22.1% |
| | 30–45 years | 213 | 55.5% |
| | > 45 years | 86 | 22.4% |
| Profession | Businessmen | 158 | 41.1% |
| | IT Professional | 128 | 33.3% |
| | Policy Planner | 98 | 25.5% |
| Length of Experience | < 3 years | 64 | 16.7% |
| | 3–5 years | 98 | 25.5% |
| | > 5 years | 222 | 57.8% |

Source: Research Data, 2025

Based on Table 1, confirmatory factor analysis (CFA) shows that all indicators have loading factors above 0.7, indicating strong construct validity. Cronbach's Alpha for all variables also showed values above 0.8, indicating high internal consistency. Thus, the research instrument is declared valid and reliable for measuring the variables of Smart City, Information Technology, Business Dynamics, and Smart Economy.

**Table 2. Validity and Reliability Test Results**

| Variables | Number of Indicators | AVE | CR | Cronbach's Alpha |
|---|---|---|---|---|
| Smart City (SC) | 4 | 0.672 | 0.870 | 0.823 |
| Information Technology | 4 | 0.715 | 0.892 | 0.853 |
| Business Dynamics | 3 | 0.695 | 0.878 | 0.834 |
| Smart Economy | 4 | 0.707 | 0.889 | 0.844 |

Source: Research Data, 2025

Based on Table 2, the outer model test in SEM-PLS shows that the indicators forming each variable have a significant contribution. The Average Variance Extracted (AVE) values for all constructs are above the threshold of 0.5, and the Composite Reliability (CR) values are above 0.7. This indicates that the constructs have good measurement consistency and are able to adequately explain indicator variability.

**Table 3. Hypothesis Test Results (Path Coefficients and Significance)**

| No | Relationship between Variables | Path Coefficient (β) | t-Statistic | p-Value | Information |
|---|---|---|---|---|---|
| **H1** | Smart City → Information Technology | 0.510 | 9.82 | <0.001 | Significant |
| **H2** | Information Technology → Business Dynamics | 0.470 | 8.95 | <0.001 | Significant |
| **H3** | Smart City → Business Dynamics | 0.390 | 7.18 | <0.001 | Significant |
| **H4** | Business Dynamics → Smart Economy | 0.530 | 10.22 | <0.001 | Significant |
| **H5** | Information Technology → Smart Economy | 0.360 | 6.45 | <0.001 | Significant |
| **H6** | Smart City → Smart Economy | 0.290 | 5.08 | 0.000 | Significant |

Source: Research Data, 2025

Based on Table 3, the analysis results show that Smart Cities have a positive and significant effect on the use of Information Technology (path coefficient = 0.51, $p < 0.001$). This means that the higher the level of smart city implementation, the higher the use of

information technology within the city ecosystem. This confirms that smart city infrastructure and policies encourage widespread technology adoption.

Information Technology has a significant influence on Business Dynamics (path coefficient = 0.47, $p < 0.001$). This finding reflects that IT advancements drive efficiency, innovation, and change in business activities. Technology enables faster market adaptation and the opening of new business opportunities, particularly in the digital and creative sectors. Smart Cities also have a direct influence on Business Dynamics (path coefficient = 0.39, $p < 0.01$), indicating that technology-based city governance can create a more conducive business climate (Galarus & Angryk, 2016) . The availability of real-time data, smart transportation, and digital services are catalysts in improving the operational efficiency of local businesses.

Business Dynamics demonstrated a highly significant influence on Smart Economy (path coefficient = 0.53, $p < 0.001$). This indicates that the transformation in the business world, characterized by innovation, digitalization, and rapid adaptation, is making a significant contribution to shaping a more inclusive, competitive, and sustainable economy. The analysis also found that Information Technology has a direct influence on the Smart Economy (path coefficient = 0.36, $p < 0.01$). This means that the use of digital technologies, such as big data, AI, and *cloud computing*, supports increased productivity and efficiency in the public and private sectors, as well as the provision of more affordable and faster economic services (Ulas, 2019).

Smart Cities have a direct effect on Smart Economy (path coefficient = 0.29, $p < 0.05$). However, the indirect effect through Information Technology and Business Dynamics is greater, indicating that the impact of smart cities on the economy is more optimal when accompanied by improvements in technology and business dynamics (Li et al., 2023; Russo et al., 2019; Shankar et al., 2021; X. Wang et al., 2022).

The mediation effect analysis shows that Information Technology and Business Dynamics significantly mediate the relationship between Smart Cities and Smart Economy. The total effect of Smart Cities on Smart Economy increases substantially when the mediation pathway is taken into account. This confirms that smart city development that is not balanced with the development of technology and business ecosystems will be less effective in driving smart economy growth.

**Table 4. Mediation Test (Indirect Effects)**

| Mediation Path | Indirect Effects | t-Statistic | Information |
|---|---|---|---|
| Smart City → Information Technology → Smart Economy | 0.184 | 4.32 | Significant |
| Smart City → Business Dynamics → Smart Economy | 0.207 | 5.10 | Significant |
| Total Effect of Smart Cities on Smart Economy | 0.681 | - | Very strong |

Source: Research Data, 2025

Based on Table 4, the results of the mediation analysis in this research model indicate that information technology and business dynamics play a significant role as intervening variables between the implementation of smart cities and the formation of a smart economy. The indirect effect of smart cities on the smart economy through information technology is 0.188, and through business dynamics is 0.124, indicating a significant contribution from these mediation pathways. This indicates that smart cities not only have a direct impact but also strengthen the digital economy through improved IT infrastructure and the movement of modern business activities. The existence of adaptive technology and the development of data-driven business models are important links in transforming cities to become more economically productive.

Furthermore, the total influence of smart cities on the smart economy, which reached 0.653 (a combination of direct and indirect influences), confirms that the approach to city development through the use of digitalization and business innovation has a systemic impact. This mediating role is important to understand because it shows that the success of a smart city is not only measured by the infrastructure built, but also by how technology is actively utilized by business actors and policymakers to create new economic value. Therefore, smart city development strategies should involve cross-sector synergy, from information technology and the business sector to sustainable economic planning.

However, understanding this mediation effect is not sufficient simply by focusing on statistical significance. Further exploration of the socio-technical dynamics occurring between key actors, such as the government and businesses, is needed. The mediation pathway through information technology, for example, reflects the power relations and coordination in the provision of digital infrastructure and data regulation, which are not always neutral and symmetrical. On the other hand, the dynamics of business as a mediator

illustrate the adaptive interaction between city bureaucracy and an increasingly fluid, platform-based market ecosystem. In other words, this mediation effect also demonstrates how the government shapes incentive architectures and policies that facilitate (or restrict) the scope for business actors to respond to digital transformation. This interaction is reciprocal and influenced by institutional factors, political interests, and technocratic capacities that vary across cities.

Considering this interactional dimension, smart city development strategies should not solely focus on technology adoption and business development, but also on strengthening collaborative governance involving cross-sector actors. Collaboration models between government, the private sector, and the community are key to creating an inclusive and sustainable smart economic structure. Thus, a smart city is not just about infrastructure or innovation, but also about how various social actors negotiate and interact in an increasingly complex digital space.

**Table 5. Summary of SEM-PLS Test Results**

| Testing Aspects | Results |
|---|---|
| Types of Analysis | SEM-PLS |
| Software | SmartPLS latest version |
| Outer Model Valid | Yes (all loading > 0.7) |
| Valid Construct | Yes (AVE > 0.5, CR > 0.7) |
| Consistent Reliability | Yes (Cronbach's Alpha > 0.7) |
| All Hypotheses Supported | Yes ($p < 0.001$ all paths) |
| Proven Mediation Effect | Yes (all t-statistics > 1.96) |

Source: Research Data, 2025

Based on tables 4 and 5, these findings offer practical implications for policymakers and businesses. City governments need to encourage comprehensive technology integration and support local businesses in utilizing smart city facilities. Several previous studies have shown that, in the context of Indonesia's digital economy, synergy between smart city policies, technology development, and local business growth is a crucial foundation for creating a smart and sustainable economic ecosystem (Ong et al., 2020).

This research strengthens the literature on the relationship between smart city concepts, information technology, business dynamics, and the smart economy using a structural model approach. These findings make an important contribution to theory development in the fields of innovation management and digital economic development. Specifically, the research findings broaden understanding of how information technology and business dynamics act as mediators in shaping the strong relationship between smart city policies and digital-based economic outcomes. The developed model can also serve as

a reference in further studies examining the digital transformation of cities in the context of developing countries.

The research results show that smart city development cannot simply focus on physical infrastructure and technology; it also requires attention to the readiness of information systems and the dynamics of local businesses. Local governments and stakeholders need to encourage the widespread and in-depth adoption of digital technology across priority economic sectors. Furthermore, training and facilitation of technology use by MSMEs and creative businesses are key to strengthening smart cities' contribution to local economic growth. Therefore, smart city policies should be designed holistically, considering the synergy between regulation, technology, and economic empowerment.

These findings provide strategic insights for policymakers, particularly in designing inclusive, technology-based city development programs. Central and regional governments can prioritize investments in information system integration, the provision of reliable digital public services, and the strengthening of digital ecosystems that support entrepreneurship and innovation. Furthermore, it is necessary to develop smart city performance indicators that encompass not only infrastructure aspects but also digital economic outcomes and the business dynamics of city residents. These implications are crucial for creating policy directions that are not merely reactive to technological developments but also proactive in shaping a productive and adaptive digital society.

The social impact of implementing smart cities through information technology and business dynamics can be felt in the form of increased productivity, efficiency of public services, and new job opportunities in the digital sector. Urban residents, especially the younger generation, can benefit from open access to information and innovative technology-based services. Furthermore, the strengthening of the digital economy as a result of this model will encourage more inclusive and sustainable economic growth in Indonesia's major cities. Therefore, it is crucial for all parties, including the private sector and educational institutions, to collaborate in accelerating the transformation towards a smart, resilient, and knowledge-based city ecosystem.

## Conclusion

This study reveals that the implementation of smart cities has a significant influence on the improvement of information technology, business dynamics, and the formation of a smart economy. Structurally, these findings confirm that smart cities not only have a direct impact on the growth of the digital economy, but also influence it indirectly through the

mediation of information technology and business dynamics. Information technology is proven to be a strategic element that bridges city policies with digital transformation, while business dynamics reflect the adaptive response of the business sector to socio-technical changes triggered by city digitalization. All hypotheses in this research model are statistically supported through SEM-PLS analysis, with instrument validity and reliability meeting the requirements (AVE > 0.5; CR and Cronbach's Alpha > 0.7). The high total effect of smart cities on the smart economy indicates that the contribution of smart cities is systemic, providing a strong foundation for the development of a more competitive and inclusive digital economy ecosystem. However, these results need to be read critically, taking into account the limitations of the model and the context in which it is implemented. The model used in this study does not fully capture the complexity of the relationships between smart city actors, particularly the potential tension between the drive for economic efficiency and the principles of inclusive governance. The socio-technical interactions between government and business actors remain implicit in the model's structure, even though these dynamics play a crucial role in the success or failure of smart city initiatives. Furthermore, the statistical approach employed places greater emphasis on formal causal relationships, while institutional, political, and social aspects remain understudied**.** Therefore, this study's theoretical contribution is more appropriately positioned as a starting point for further exploring how smart cities are socially constructed and implemented in the context of developing countries with limited infrastructure, institutional capacity, and a digital divide. This research paves the way for the development of a more contextual and multidimensional conceptual framework that not only emphasizes technological efficiency but also considers the dimensions of social justice, collaborative governance, and institutional resilience. These findings provide an important foundation for formulating smart city policies in Indonesia that are more integrative, participatory, and data-driven, as well as sensitive to local inequalities and complexities. Moving forward, an interdisciplinary approach that combines quantitative analysis with qualitative exploration of the relationships between actors will be crucial to strengthening academic contributions to smart city studies in the global south.

**Acknowledgent**

With all humility, the author expresses his deepest gratitude to all those who provided support, assistance, and inspiration during the writing of this article. Special thanks are extended to the academics, practitioners, and colleagues who shared invaluable insights and

references, enabling this article to be more comprehensive. Hopefully, this contribution will be beneficial and serve as a foundation for further research in the future.

**References**

Al-Yasiri, Q., & Szabó, M. (2022). Phase change material coupled building envelope for thermal comfort and energy-saving: Effect of natural night ventilation under hot climate. *Journal of Cleaner Production*, *365* . https://doi.org/10.1016/j.jclepro.2022.132839

Chauhan, A., Jakhar, S. K., & Chauhan, C. (2021). The interplay of circular economy with industry 4.0 enabled smart city drivers of healthcare waste disposal. *Journal of Cleaner Production*, *279*. https://doi.org/10.1016/j.jclepro.2020.123854

Galarus, D. E., & Angryk, R. A. (2016). Spatio-temporal quality control: implications and applications for data consumers and aggregators. *Open Geospatial Data, Software and Standards*, *1*(1). https://doi.org/10.1186/s40965-016-0003-2

Horck, S., Steens, S., & Kaminski, J. (2024). Synergizing human insight and machine learning: A dual-lens approach to uncovering healthcare research and innovation outcomes. *International Journal of Information Management Data Insights*, *4*(2). https://doi.org/10.1016/j.jjimei.2024.100284

Huda, M., Rahayu, A., Furqon, C., Sultan, M. A., Hartati, N., & Sugiana, N. S. S. (2025). Improving Performance with Big Data: Smart Supply Chain and Market Orientation in SMEs. *International Journal of Advanced Computer Science and Applications*, *16*(2), 798–804. https://doi.org/10.14569/IJACSA.2025.0160280

Huda, M., Susi, N., Sugiana, S., Arfiansyah, F., Hapsari, A., & Aziz, E. (2024). *Driving Economic Growth : Public Engagement as a Catalyst for Smart City Tourism Branding*. 172–178.

Kanda, W., Hjelm, O., Johansson, A., & Karlkvist, A. (2022). Intermediation in support systems for eco-innovation. *Journal of Cleaner Production*, *371*. https://doi.org/10.1016/j.jclepro.2022.133622

Leminen, S., Rajahonka, M., Westerlund, M., & Hossain, M. (2021). Collaborative innovation for sustainability in Nordic cities. *Journal of Cleaner Production*, *328*. https://doi.org/10.1016/j.jclepro.2021.129549

Li, J., Zhang, S., Hua, Y., Lin, Y., Wen, X., Mijowska, E., Tang, T., Chen, X., & Ruoff, R. S. (2023). Facile synthesis of accordion-like porous carbon from waste PET bottles-based MIL-53(Al) and its application for high-performance Zn-ion capacitor. *Green Energy and Environment*. https://doi.org/10.1016/j.gee.2023.01.002

Melander, L., & Arvidsson, A. (2022). Green innovation networks: A research agenda. In *Journal of Cleaner Production* (Vol. 357). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2022.131926

Möslinger, M., Ulpiani, G., & Vetters, N. (2023). Circular economy and waste management to empower a climate-neutral urban future. *Journal of Cleaner Production*, *421*. https://doi.org/10.1016/j.jclepro.2023.138454

Ninčević Pašalić, I., Ćukušić, M., & Jadrić, M. (2021). Smart city research advances in Southeast Europe. *International Journal of Information Management* , *58* . https://doi.org/10.1016/j.ijinfomgt.2020.102127

Ong, JO, Sutawijaya, AH, & Saluy, AB (2020). Modern Retail Business Model Innovation Strategy in the Industry 4.0 Era. *Scientific Journal of Business Management* , *6* (2), 201–210. https://www.cnbcindonesia.com

Prakash, R., Anoop, V.S., & Asharaf, S. (2022). Blockchain technology for cybersecurity: A text mining literature analysis. *International Journal of Information Management Data Insights* , *2* (2). https://doi.org/10.1016/j.jjimei.2022.100112

Russo, I., Confente, I., Scarpi, D., & Hazen, B. T. (2019). From trash to treasure: The impact of consumer perception of bio-waste products in closed-loop supply chains. *Journal of Cleaner Production*, *218*, 966–974. https://doi.org/10.1016/j.jclepro.2019.02.044

Sakas, D. P., Reklitis, D. P., Terzi, M. C., & Glaveli, N. (2023). Growth of digital brand name through customer satisfaction with big data analytics in the hospitality sector after the COVID-19 crisis. *International Journal of Information Management Data Insights*, *3*(2). https://doi.org/10.1016/j.jjimei.2023.100190

Shankar, V., Kalyanam, K., Setia, P., Golmohammadi, A., Tirunillai, S., Douglass, T., Hennessey, J., Bull, J. S., & Waddoups, R. (2021). How Technology is Changing Retail. *Journal of Retailing*, *97*(1), 13–27. https://doi.org/10.1016/j.jretai.2020.10.006

Shin, J., Lee, C., Lim, C., Shin, Y., & Lim, J. (2022). Recommendation in Offline Stores: A Gamification Approach for Learning the Spatiotemporal Representation of Indoor Shopping. *Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, 3878–3888. https://doi.org/10.1145/3534678.3539199

Stone, T. (2021). Design for values and the city. *Journal of Responsible Innovation*, *8*(3), 364–381. https://doi.org/10.1080/23299460.2021.1909813

Sugiana, N. S. S., Dirgantari, P. D., Hurriyati, R., Musty, B., Pakpahan, A. V, Sofyan, D. H., & Udin, M. (2024). *Future-Forward Governance:Catalyzing Public Excellence via E-Public Engagement in Smart City Innovations*. 410–415. https://doi.org/10.1145/3670013.3670084

Ulas, D. (2019). Digital Transformation Process and SMEs. *Procedia Computer Science*, *158*, 662–671. https://doi.org/10.1016/j.procs.2019.09.101

Wang, S., Li, J., Du, P., & Zhao, E. (2022). A game theoretic technique for risk-based optimal bidding strategies in energy aggregators of markets: Knowledge management approach. *Journal of Innovation and Knowledge*, *7*(4). https://doi.org/10.1016/j.jik.2022.100279

Wang, X., Lin, X., & Shao, B. (2022). How does artificial intelligence create business agility? Evidence from chatbots. *International Journal of Information Management*, *66*. https://doi.org/10.1016/j.ijinfomgt.2022.102535

Yang, J., Kwon, Y., & Kim, D. (2021). Regional Smart City Development Focus: The South Korean National Strategic Smart City Program. *IEEE Access*, *9*. https://doi.org/10.1109/ACCESS.2020.3047139