

SMART CITY BASED ON COMMUNITY PARTICIPATION: A SYNERGY OF TECHNOLOGY, GOVERNMENT AND SOCIOLOGY

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Abstract

Smart cities in the past decade have become an important strategy to face urbanization and digital transformation, but their implementation is often technocratic with a focus on infrastructure so that the dimension of community participation receives less attention. This research aims to analyze the role of citizen participation in smart cities, examine the synergy of technology, government, and sociology, and formulate a participatory-based smart city conceptual framework that is inclusive and sustainable, the research was conducted using the Systematic Literature Review (SLR) method on 34 scientific articles published in 2020–2025 which were selected through the process of identification, screening, and thematic synthesis. The results of the analysis show that transparent and responsive digital public services increase citizen trust and encourage participation, although in Indonesia participation still tends to be reactive and depends on local government initiatives. The integration of technology, governance, and social values strengthens transparency, service effectiveness, and policy legitimacy, but its success is determined by the extent to which social and cultural dimensions are accommodated. The conceptual framework offered emphasizes the principles of human-centric and public value, and emphasizes that smart cities should contribute to the achievement of the Sustainable Development Goals (SDGs), this research contributes theoretically by offering an integrative model that combines technology, governance, and social values, as well as practically providing direction for local governments to expand digital literacy, social inclusion, and citizen participation. Follow-up studies are recommended to conduct cross-urban empirical tests to measure the linkage between digital participation, quality of public services, and SDGs achievement.

Keywords: *smart city, community participation, collaborative governance, human-centric, SDGs*

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1. Introduction

The development of smart cities in the last decade has become an important strategy in facing the challenges of urbanization, population growth, and the need for adaptive urban governance, but the implementation of this concept is often trapped in a technocratic approach that emphasizes digital infrastructure alone without providing enough space for the community, this condition creates a gap between the potential of technology and real social needs. so that the urgency of research on smart cities based on community participation becomes increasingly relevant (Supriyanto et al., 2022).

Modern smart cities cannot be separated from the role of digital technology that provides data-based public services, smart transportation systems, to renewable energy management models, an approach that only emphasizes technological efficiency is not enough to create inclusive city development, so the concept of smart city must be understood as a social transition that prioritizes inclusivity and justice for all citizens (Lee et al., 2022). The contemporary smart city framework is understood as a multidimensional ecosystem that places citizens as the center (human-centric), not just a technocratic project, the latest literature emphasizes the need for the integration of social-environmental sustainability, innovation, and adaptive governance so that technology truly solves citizens'

problems (Bibri, 2021; Mora et al., 2023). In addition, the reciprocal relationship between smart cities and smart government suggests that data analytics, IoT, and AI are supposed to strengthen responsive and accountable public services, not just administrative efficiency (Anthopoulos et al., 2022).

The collaborative governance model is very important in the development of smart cities, technology is indeed an enabler, but the success of smart cities is determined by the synergy between the government, the community, the business world, and the academic community, the involvement of various parties in collaborative governance is believed to ensure the legitimacy of policies and strengthen citizens' sense of ownership of the smart city development agenda (Tian & Wang, 2024). The implementation of collaborative governance in the context of smart cities requires trust-building, shared motivation, and institutional design that opens up space for sustainable public deliberation, the success of government, community, business, and academia collaboration depends on clarity of shared goals, an inclusive participation process, and transparent evaluation mechanisms (Bianchi et al., 2021; Ulibarri et al., 2023).

Post-pandemic, a societal smart city approach has emerged that emphasizes the importance of social, psychological, and cultural dimensions in urban policy formulation. Post-pandemic smart cities are required to be not only technologically efficient, but also resilient in the face of social challenges such as access gaps and digital literacy inequality (Sharifi & Alizadeh, 2023). This reinforces the view that smart cities should not be separated from the social context that surrounds them, the concept of societal smart cities emphasizes six key dimensions, namely social sustainability, citizen alignment, e-democracy, social justice, participatory governance, and cultural resilience as a counterbalance to the technocratic bias that has been dominant (Alizadeh & Sharifi, 2023). In the Indonesian context, the Movement Towards 100 Smart Cities Program has encouraged more than 90 districts/cities to prepare master plans and adopt digital services, but the latest national evidence shows challenges in terms of public engagement, internet penetration does reach 79.5% by 2024, but the use of digital channels for policy participation is still uneven, indicating the need for a more inclusive participation design and stronger digital literacy (Indonesian Internet Service Providers Association [APJII], 2024).

The use of data is also an important pillar in smart city planning, big data applications, sensors, and digital information systems have been proven to support faster and adaptive decision-making in dealing with the complexity of cities, but this data-based governance must consider ethical issues, especially related to citizen privacy and equitable access to technology (Kaluarachchi, 2022). Technological innovations such as blockchain have begun to be implemented to strengthen transparency and accountability in municipal government, studies on blockchain-based public participation consortiums show that these mechanisms are able to increase public trust and improve the quality of municipal governance (Bai et al., 2022). Other research confirms that smart city applications can encourage community participation through digital platforms, so that citizens can engage in online consultation forums, provide real-time feedback, or voice their opinions through special applications, this digital participation has been proven to increase policy effectiveness while strengthening democratization in city governance (Bastos et al., 2022).

The challenges of smart city development are also influenced by differences in social and economic conditions of the community, studies in India show that ICT-based smart city government systems are able to expand citizen participation, but obstacles such as limited digital literacy and access inequality are still significant obstacles (Das, 2024). Therefore, participatory strategies in smart cities must be designed adaptively to suit the characteristics of diverse communities, human factors also have an important role in the success of smart city development. Aspects of trust, skills, and cultural values of the community are elements that determine the extent to which technology can be accepted and utilized (Giela, 2023).

The integration of the concept of smart urbanism with participatory planning is also getting more attention, recent studies show that the use of digital technology in urban planning can increase community involvement in the long term, while strengthening the legitimacy of the government in formulating policies (Jung & Kang, 2023). This proves that

community involvement is a key component in the success of smart cities, the literature on the evolution of smart cities also emphasizes the need for a balance between technological efficiency, sustainability, and governance, so that smart cities are not only technical instruments, but also a means to create inclusive and equitable development (Adenekan et al., 2024).

Previous research has proven that smart cities can contribute to the achievement of the Sustainable Development Goals (SDGs), for example, good governance can improve people's quality of life and support environmental sustainability (Guimarães et al., 2020). In addition, the evolution of the smart city concept has also expanded the dimensions of sustainability, governance, and proper urbanization as the foundation for smart city development (Park & Yoo, 2022).

The development of civic technology shows that digital platforms, if designed with the principles of openness and two-way feedback, can deepen citizen participation from mere reporting to policy co-production (Shin et al., 2024). At the same time, the smart government framework expands the channels of real-time data-based participation and personalization of public services, so that digital collaboration between citizens and the government becomes more participatory and has an impact on improving the quality of public services and strengthening governance transparency (Anthopoulos et al., 2022; Cardullo, 2025).

Previous research tends to highlight technological or governance aspects separately, without integrating the dimension of community participation in depth with a sociological perspective, this study formulates a smart city conceptual framework based on community participation that emphasizes the synergy between technology, governance, and sociology as a more inclusive and sustainable urban development strategy, the purpose of this study is to analyze the role of community participation in the development of smart cities, identify synergies between technology, government, and sociological dimensions, and formulate a smart city conceptual framework based on community participation as an alternative to urban development strategies in the digital era.

2. Method

This study uses a Systematic Literature Review (SLR) approach with the aim of identifying, analyzing, and synthesizing research findings on smart cities based on community participation that emphasizes the integration between technology, governance, and sociological dimensions, the selection of the SLR method is based on the need to comprehensively map research developments, find conceptual gaps, and develop an analytical framework that is more integrative for the context Indonesia.

The SLR process begins with the determination of research questions that focus on three main aspects, namely: (1) how to form community participation in the development of smart cities in the digital era, (2) how synergy between technology, government, and sociological dimensions can be realized in smart city development, and (3) how to formulate a smart city conceptual framework based on inclusive and sustainable community participation. This research question serves as a guideline in the selection and screening of literature.

Furthermore, the source of literature is determined from articles that have been indexed on reputable international and national databases, including Scopus, ScienceDirect, SpringerLink, Taylor & Francis, Google Scholar, and SINTA, based on the results of the initial curation, this research corpus consists of 34 scientific articles published in the range of 2020–2025 and has gone through a peer-review process, so that the academic validity is guaranteed, articles that focus only on technical aspects, such as the development of IoT algorithms or system architecture designs that are unrelated to aspects of community participation or governance, are excluded from the list, but in this corpus there are no articles that need to be eliminated because they all meet the inclusion requirements

The literature selection process was carried out as follows, first, an examination of titles and abstracts to ensure suitability with the participatory smart city theme, second, a full reading to assess the substantive contribution to the three research focuses, from this stage no articles were excluded, so that a total of 34 articles were used in the final synthesis, data

extraction from each article included author and year information, research context, methods used, main findings, and the relationship with aspects of citizen participation, technology-governance–sociology synergy, or contribution to the SDGs.

The final stage is thematic synthesis, the 34 articles collected are analyzed in depth to find research patterns, tendencies, and gaps, the synthesis process produces four main themes, namely: (1) community participation in smart cities, (2) synergy of technology, governance, and sociology, (3) participatory smart city conceptual frameworks based on human-centric and public value, these three major themes then become the basic framework in compiling research results and discussions.

3. Results and Discussion

Community Participation in Smart City Development in the Digital Era

Empirical findings show that public participation in smart city programs is often triggered by the quality of public services offered, a study in Malaysia confirms that the provision of responsive e-government services increases citizens' interest in engaging in smart city programs (Lim, Malek, Hussain, & Tahir, 2020). The same thing also happened in Semarang, strengthening the digital service system has a positive impact on bureaucratic transparency and service effectiveness, thereby increasing citizens' confidence to participate in the city's agenda (Saputri, Mutiarin, & Isolana, 2024).

International experience shows that the factors driving community participation in smart city development vary significantly, in Hong Kong, quality of life and level of satisfaction with public governance are the main factors that encourage citizen involvement in the decision-making process (Hartley, 2023). Meanwhile, in Europe, citizen participation is more driven by the use of digital co-creation platforms that allow people to channel ideas and aspirations more openly (Leclercq & Rijshouwer, 2022). While in Indonesia, the situation is different because citizen involvement has not grown independently, but is still greatly influenced by initiatives from local governments, meaning that the public will generally participate only if there is an invitation, program, or official invitation from the government, not because of the encouragement of collective awareness to participate, the form of community participation in Indonesia is still limited, not to the stage where residents really have a wide space to voice opinions and participate in determining the direction of city policies freely and openly.

Theoretically, citizen participation can be understood through the framework of political efficacy, which is the belief that individual actions can influence public policy (Lebrument, Zumbo-Lebrument, Rochette, & Roulet, 2021). This concept is in line with the idea of the Right to the Smart City which places citizen involvement as a fundamental right in determining the direction of city development (Leclercq & Rijshouwer, 2022), so that community involvement in smart cities is not only understood as a technical mechanism in governance, but also as a manifestation of digital political rights that guarantee public access to play a role in shaping city policies.

Based on the results of the research, digital participation needs to be strengthened through forums for discussion and interaction at the community level so that community involvement is not limited to symbolism, the integration between online and offline participation is crucial to embrace groups of citizens who are still facing digital literacy limitations, with this step, the implementation of smart cities in Indonesia can move towards a more inclusive, meaningful participation model, and oriented to the real needs of the community.

Synergy of Technology, Government, and Sociological Dimensions

The results of the study show that the integration of technology with public governance expands the space for community participation and improves bureaucratic efficiency, the application of blockchain in public data management, is proven to strengthen transparency and accountability in various cities (Bai, Zhang, & Sun, 2022; Nechesov & Ruponen, 2024), in Indonesia, blockchain trials in the education sector have shown the potential to strengthen smart education-based services (Anggraito et al., 2023)

Differences in approaches are also seen among different countries, with China emphasizing public-private partnership mechanisms to improve smart city performance (Ju, Liu, & Feng, 2024), while Europe prioritizes co-creation between governments and citizens (Leclercq & Rijshouwer, 2022). Indonesia still tends to implement a top-down pattern, where the government dominates policy formulation, while the deliberative space of citizens has not been optimally managed (Supriyanto, Saputra, & Nugroho, 2022).

The collaborative governance framework emphasizes that the success of smart city governance depends on multi-stakeholder collaboration based on trust and shared goals (Ulibarri, Scott, & Lubell, 2023). Meanwhile, the innovation management approach sees smart cities as a sustainable innovation arena that requires adaptation of regulations and policies to technological developments (Mora, Gerli, Ardito, & Petruzzelli, 2023). These two theories explain why smart cities cannot be built solely on technology, but rather require inclusive governance.

The results of this study show that the development of smart cities does not only depend on technological sophistication and the effectiveness of governance, but also on the ability to integrate sociological values that include social justice, a sense of belonging to citizens, and cultural sustainability, technology serves as an enabler that accelerates urban transformation, but the true essence of smart cities lies in the creation of equitable living spaces, inclusive, and rooted in the social identity of the community, so the integration of the social dimension needs to be placed as an inherent element in the design and implementation of smart cities in Indonesia.

Smart City Conceptual Framework Based on Community Participation

The smart city conceptual framework that is oriented towards community participation emphasizes the importance of social and cultural dimensions in the development of smart cities, the study of Alizadeh and Sharifi (2023) outlines the six dimensions of societal smart cities, namely social sustainability, citizen partisanship, e-democracy, social justice, participatory governance, and cultural resilience. The role of public institutions, such as libraries, also serves as a means of increasing the capacity of citizens to become smart citizens (Palma, Miranda, Buyannemekh, Gascó-Hernández, & Gil-García, 2024).

Differences in conceptual models are also seen in different countries, China emphasizes public-private collaboration in the PPP model (Ju et al., 2024), while Europe highlights co-creation platforms as a means of participation (Leclercq & Rijshouwer, 2022). Indonesia has the potential to develop a hybrid framework by integrating technological innovation and community-based approaches, to match existing socio-cultural diversity.

Bibri (2021) emphasizes the importance of data-based smart cities and sustainability, while Adenekan, Yusuf, and Bello (2024) highlight the need for human-centric inclusive governance, public value theory is also relevant, as it underlines that digital innovation is only meaningful if it actually creates real public value (Pereira, Luna-Reyes, & Gil-García, 2020), the conceptual framework of smart cities can be formulated as a multidimensional ecosystem that placing residents as the main actors.

The results of this study show that the conceptual framework offered emphasizes that the success of smart cities is not solely measured through the efficiency of digital services, but also from the level of success of the community in feeling the existence of an inclusive deliberative space, the smart city model in Indonesia has the potential to move towards a human-centric orientation if public policies consistently emphasize the integration of technology with aspects of social inclusivity. However, this framework is still conceptual and normative at this stage, so the biggest challenge lies in the implementation process, especially in operationalizing social dimensions such as justice and cultural resilience. Therefore, cross-urban empirical tests are needed to validate the relevance and extent to which the framework can be effectively adapted into real policies.

In addition to the participatory and socio-cultural dimensions, the formulation of a community-based smart city conceptual framework also needs to consider its contribution to sustainable development (SDGs), the results of the study show that smart cities can support the achievement of sustainable development goals through good governance and the use of environmentally friendly technologies, for example smart city governance has been proven to

contribute to improving the quality of life and environmental sustainability (Guimarães, Silva, & Costa, 2020). In addition, the evolution of smart cities is increasingly geared towards integrating sustainability aspects in urban planning (Park & Yoo, 2022).

Cross-border experience shows that the contribution of smart cities to the SDGs varies, in developed countries, the integration of sustainability has become a key pillar in smart city design (Hou, Yu, & Song, 2020), while in developing countries such as Indonesia, the focus is still often stuck on technocratic approaches (Supriyanto et al., 2022). This shows that there is a gap between the ideality of the concept and the reality of implementation.

The public value framework explains that the contribution of smart cities to the SDGs can only be considered successful if it truly creates real public value, such as improving citizens' welfare and preserving the environment (Pereira et al., 2020). In addition, openness-based civic technology deepens citizen participation and encourages the democratization of public policy (Shin, McGrath, & Kim, 2024). Thus, the conceptual framework of a participatory smart city not only places citizens as the main actors, but also ensures their contribution to the global agenda of the SDGs through inclusive governance, digital literacy, and equitable technological innovation

To clarify the results of the synthesis that has been presented in the previous section, a comparative summary is needed that shows the linkage between previous research findings, global contexts, and relevant theoretical frameworks, the following table is prepared to summarize the four main dimensions that are the focus of the discussion, namely community participation, technology-government-sociology synergy, participatory smart city conceptual framework, and smart city's contribution to the SDGs. Through this table, it can be seen more systematically how smart city practices in various countries show diverse success patterns, the theories used provide an analytical basis, and how their implications can be contextualized in the development of smart cities based on community participation in Indonesia.

Table 3.1

Key Aspects	Findings of Analysis of Previous Research	Global Context Comparison	Relevant Theoretical Framework
Community participation in smart cities	Digital public services increase citizen trust and participation (Lim et al., 2020; Saputri et al., 2024).	Malaysia: e-gov focus; Hong Kong: quality of life (Hartley, 2023); Europe: digital co-creation (Leclercq & Rijshouwer, 2022).	<i>Political efficacy</i> (Lebrument et al., 2021); <i>Right to the Smart City</i> (Leclercq & Rijshouwer, 2022).
Synergy of technology, government, and sociology	Blockchain, IoT, AI strengthen accountability (Bai et al., 2022; Nechesov & Ruponen, 2024); blockchain for smart education in Indonesia (Anggraito et al., 2023).	China: PPP (Ju et al., 2024); Europe: co-creation; Indonesia: still top-down (Supriyanto et al., 2022).	<i>Collaborative governance</i> (Ulibarri et al., 2023); <i>Innovation management</i> (Mora et al., 2023).

<p>Conceptual framework of participatory smart cities</p>	<p><i>Societal smart cities</i> with six socio-cultural dimensions (Alizadeh & Sharifi, 2023); the role of libraries in shaping smart citizens (Palma et al., 2024).</p>	<p>China: PPP; Europe: co-creation; Indonesia: the potential of hybrid models.</p>	<p><i>Human-centric smart city</i> (Bibri, 2021; Adenekan et al., 2024); <i>Public value</i> (Pereira et al., 2020).</p>
<p>The contribution of smart cities to the SDGs</p>	<p>Smart city governance supports quality of life and the environment (Guimarães et al., 2020; Park & Yoo, 2022).</p>	<p>Developed countries: sustainability as a key pillar (Hou et al., 2020); developing countries: still dominant technocratic (Supriyanto et al., 2022).</p>	<p><i>Public value</i> (Pereira et al., 2020); civic tech encourages democratization (Shin et al., 2024).</p>

The table above summarizes the synthesis of the results of the discussion by highlighting the four main focuses of the research: community participation, technology–governance–sociology synergy, conceptual framework, and contribution to the SDGs, the visible pattern is that the success of smart cities cannot be separated from the combination of inclusive digital services, collaborative governance, and integration of social values, cross-country comparisons show that best practices emerge when a technocratic approach is combined with citizen deliberative spaces, the theories used emphasize the need for a human-centric orientation and the creation of public value, while the implications and limitations presented reflect the urgent need to strengthen digital literacy and expand cross-urban empirical research in Indonesia.

4. Conclusions and Suggestions

This research shows that community participation in smart cities is not only determined by the availability of digital services, but also by the quality of responsive and inclusive governance, technological synergy, governance, and sociology being an important foundation for realizing a just and sustainable smart city, the conceptual framework offered emphasizes that smart cities based on community participation must integrate human-centric principles, the creation of public value, as well as a real contribution to the achievement of the SDGs, so that the development of smart cities must not stop at technical efficiency, but must be directed at the creation of public value, social justice, and sustainability.

The main contribution of this research is to develop an integrative conceptual framework that can be used as a reference in the formulation of smart city policies in Indonesia, for further research, empirical validation is needed in various cities with different socio-cultural characteristics, in order to test the extent to which this framework can be adapted in practice, and a quantitative analysis linking digital participation, public service quality, and SDGs achievement is also recommended so that the results are more comprehensive and relevant for policy makers.

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