

Smart Sustainable Cities: Digital Communication and Information Literacy in Jakarta and Bandung

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ABSTRACT

Purpose – The development of smart cities in Indonesia has accelerated in an effort to enhance urban sustainability through the integration of information and communication technology (ICT). This study adopts the smart sustainable city framework to examine digital communication transformation and information literacy challenges in Jakarta and Bandung. It aims to explore the implementation of digital communication strategies and identify barriers to information literacy in supporting sustainable urban development.

Method – This study employed a qualitative comparative case study approach. Data were collected through semi-structured interviews, direct observations, and document analysis, and were analyzed using thematic analysis to identify patterns in digital communication practices and information literacy challenges.

Findings – The findings reveal that Jakarta optimizes digital technology for public service delivery through the JAKI application, while Bandung emphasizes a collaborative and community-based approach through the Bandung Sadayana platform. In addition to these differences in implementation strategies, both cities face similar challenges: a digital literacy gap, uneven public participation, and limitations relating to digital inclusion. The study concluded that the success of smart cities depends not only on the use of technology but also on strengthening information literacy, increasing inclusive citizen participation, and fostering collaboration between the government, the community, and other stakeholders in order to achieve sustainable urban development.

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INTRODUCTION

The development of smart cities has emerged as an innovation that is attracting increasing attention worldwide (Qin, 2022), including in Indonesia. According to data from the Ministry of Communication and Information Technology, the formulation of master plans and quick wins for smart cities in 100 districts/cities was implemented over a three-year period from 2017 to 2019 (<https://www.kominfo.go.id>). The designation of these 100 districts/cities is intended to serve as a benchmark for smart city implementation in other regions. (Inkinen et al., 2021) argue that public and private sectors, in recent years, have heavily funded and influenced smart city initiatives which are growing in importance as cities expand and technology evolves. As the internet continues to advance rapidly, the implementation of smart cities in many countries has expanded significantly and is viewed as a necessity for improving citizens' quality of life. Consequently, research on smart cities is regularly conducted by academics and practitioners.

The concept of Smart Cities has been widely adopted worldwide and is gaining increasing attention because of its potential to improve the quality of life in urban areas. A smart city, as defined by (Dadwal et al., 2023), is a city that integrates its physical, digital, social, and economic infrastructures to harness and use its collective intelligence. It can be said that the development of smart cities is closely linked to the Internet of Things (IoT) to support urban sustainability. This statement is line with (Joshi et al., 2016) who states Smart cities use Big Data and the Internet of Things to support environmental sustainability, making urban areas more efficient, liveable, and environmentally responsible. Several pillars have been developed to support smart cities, including a smart economy, a smart society, smart governance, smart transportation, a smart environment, and smart living. The implementation of smart city features varies based on the specific context, including financial resources and technological capabilities. Not every pillar needs to be fully developed; cities can adopt tailored solutions to effectively address their unique needs and constraints.

The development of smart cities has become an applied response to the challenges posed by rapid urbanization and urban population growth (Mohanty et al., 2016). As cities continue to grow, governments are required to adopt integrated digital solutions that improve service distribution, increase management efficiency, and promote sustainable urban management (Das, 2024). In this context, digital communication and information literacy strategies are important components that enable citizens to effectively engage with smart city platforms and utilize online data-based services. Strengthening these aspects can support the successful execution of smart city initiatives whilst ensuring that technological innovation contributes to inclusive and sustainable urban development.

The implementation of the Smart City concept is vital for Indonesia, a developing country with a large population, as it continues to face urban challenges that require an innovative approach (Gunawan, 2022). The concept of smart cities was introduced in Indonesia in the early 2010s with a target of 100 smart cities by 2025. Jakarta and Bandung are two major cities in Indonesia that are included in the Smart City Index. These two cities are the focus of this study. The application of digital innovation in the DKI Jakarta smart city program is

through the use of the JAKI (Jakarta Kini) application, which focuses on the development of digital-based public services, while the Bandung smart city program emphasizes a collaborative approach through the 'Bandung Sadayana' digital platform. Both cities also have unique characteristics in the execution of their smart city programmes, which provide opportunities for comparative studies on the effectiveness of digital communication strategies and the challenges relating to information literacy (Barth et al., 2017).

Digital communication strategies play a major role in conveying information to the public (Nciweni et al., 2023). The government needs to ensure that messages about smart city programs are received and understood by all levels of society (Kolotouchkina et al., 2024). In addition, information literacy is a key aspect in encouraging active community participation (Alfiyah et al., 2017). Information literacy includes the ability to access, understand, and use information effectively (Tayia, 2022), which is very important to support the success of the smart city program itself (Chávez, 2015). Furthermore, government communication is also very important in conveying ideas, programs, and concepts to the public. Various strategic methods have been used, one of which is through social media. The government is expected to communicate and convey ideas well to the public while paying attention to the needs of citizens (Tri Mahadewi & Sri Darma, 2024).

However, there are various challenges in implementing smart cities in Indonesia (Atmaheni & Adiarto, 2024). inequality of access to technology, digital literacy gaps, and a lack of public awareness about the benefits of smart city programs are obstacles that need to be overcome (Syah et al., 2024). In Jakarta, for example, despite having advanced applications such as JAKI, there are still challenges in increasing public participation and expanding the scope of technology use (Mukti & Prambudia, 2018). On the other hand, Bandung, which focuses on community collaboration, also faces challenges in ensuring that all segments of society are equally involved. The concept of sustainable smart cities has emerged as a more comprehensive approach than previous conventional smart cities (Shao & Min, 2025). This approach emphasizes not only the efficiency of the technology used but also environmental sustainability and social inclusion (Shao & Min, 2025). In this context, it is important to evaluate how digital communication strategies can support cities' sustainability goals and how information literacy can be enhanced to reduce the participation gap among smart city residents.

This study aims to examine some key issues. First, how are digital communication strategies implemented in Jakarta and Bandung to support sustainable smart city programs? Second, what are the challenges of information literacy faced by communities in these two cities? Third, how can this approach be adapted to improve the sustainability of sustainable smart city programs in Indonesia as a whole? The transformation toward a Smart Sustainable City represents both a challenge and a significant opportunity for major cities in Indonesia (Rachmawati et al., 2024). As the demand for more efficient, sustainable, and inclusive urban ecosystems continues to grow, this concept has become a central focus in contemporary urban development (Kashiripoor, 2023). In addressing the challenges and priorities posed by changing times, cities must adopt innovative governance approaches that integrate digital technology and active community participation. Accordingly, this study examines and compares the

implementation of Smart Sustainable City programs in two major Indonesian cities, Jakarta and Bandung, as practical examples of how technological innovation and citizen engagement are incorporated into urban governance practices.

This study employs a qualitative approach using a comparative study method. Data collection involved in-depth interviews with key stakeholders, field observations, and an analysis of official documents related to smart city programs. The data analysis process comprised data reduction, data presentation, and conclusion drawing to generate practical recommendations applicable to city governments and other relevant stakeholders. This approach aims to deepen understanding of how digital communication practices and information literacy are shaped by local contexts, institutional dynamics, and community engagement within smart city initiatives in Jakarta and Bandung.

In order to address the challenges of information literacy, it is important to involve all stakeholders, including the government, communities, and the private sector (Brey-Casiano, 2006). Information literacy education must be a priority to ensure that people not only receive information but are also able to use it critically and constructively (Johnson et al., 2024). Additionally, cross-sector collaboration can help expand the reach of smart sustainable city programs (Lai et al., 2025) and ensure that their benefits are felt by all segments of society (Johnson et al., 2024).

This study aims to offer practical insights into supporting the development of sustainable smart cities in Indonesia by examining the dynamics of digital communication strategies and information literacy. As major urban centers, Jakarta and Bandung offer relevant examples that can serve as benchmarks for implementing similar initiatives in other cities. While there is already a substantial body of research on smart city development, existing studies generally focus on technological infrastructure and digital governance systems, often overlooking the role of digital communication practices and information literacy in shaping public participation, a crucial factor for the effective implementation of smart city programs. This gap highlights that technological innovation alone is insufficient to achieve sustainable urban transformation without effective communication mechanisms (Tri et al., 2024; Yulia et al., 2025) and adequate public digital competence (Bouzguenda et al., 2019). Consequently, this study contributes to the growing literature on technology-driven urban development and sustainability by integrating perspectives on digital communication and information literacy into the analysis of sustainable smart city implementation. Through a comparative study of Jakarta and Bandung, this research aims to examine and analyze how communication practices and literacy initiatives foster inclusive digital transformation and sustainable urban governance.

METHOD

This study employed a qualitative methodology using a comparative approach to gain an in-depth understanding of the implementation of sustainable smart cities, particularly with regard to digital communication strategies and information literacy challenges in two major cities in Indonesia. The selection of comparative study as the main approach is intended to identify similarities and differences between the two cities, thereby enriching the understanding

of the implementation of the Sustainable Smart City program at the local level. In this context, the comparative qualitative approach is described as an analytical effort to identify similarities and differences in certain phenomena (Ragin, 1998).

The research data was obtained through in-depth interviews conducted with the municipal governments of Jakarta and Bandung as the organizers of the smart city program. In Jakarta, data collection was carried out directly at the Jakarta Smart City Management Unit (UP JSC), a Regional Public Service Agency (BLUD) under the DKI Jakarta Provincial Government, which operates under the Communication, Informatics, and Statistics Agency (Diskominfo). Meanwhile, in Bandung, the research was conducted through the Communication and Information Agency (Diskominfo), which is responsible for managing and implementing the Bandung Smart City program. In addition to interviews with government representatives and community groups targeted by the program, this study also used observation and documentation methods to collect supporting data for comparative analysis. Furthermore, a literature analysis was conducted to reinforce the research findings, particularly those related to digital communication strategies and information literacy challenges in the context of the Sustainable Smart City initiative.

Data analysis in this study followed the stages proposed by (Miles & Huberman, 2014), which consisted of four main steps. First, data collection was carried out by compiling transcripts of interviews with officials from the Jakarta Smart City Management Unit (UP JSC) and the Bandung Communication and Information Agency, supplemented by field observation notes and relevant policy documents. Second, data reduction involved repeated review of all collected material, coding of information related to digital communication practices, stakeholder roles, and information literacy issues, and organizing it into thematic categories aligned with the comparative research focus. Third, data presentation was carried out by compiling the coded findings into comparative tables and analytical narratives to clearly highlight the patterns, similarities, and differences between Jakarta and Bandung. Finally, conclusions were drawn through an iterative interpretation process, in which emerging findings were continually reviewed and cross-checked across various data sources to ensure that the results accurately represented the empirical evidence obtained during the research.

Meanwhile, the validity of the research data was established through source triangulation by gathering information from various relevant stakeholders and was further supported by a literature review that helped confirm and contextualize the findings. This triangulation process aims to assess the consistency of information obtained from various perspectives, thereby strengthening the credibility of qualitative research (Donkoh, 2023). In addition, data validation is carried out through systematic comparison of information obtained from policy documents, official digital platforms, government reports, and secondary academic sources. This verification process helps reduce interpretation bias and enhances the reliability of the analysis. Jakarta and Bandung were selected using purposive sampling because both cities are recognized as leading smart city pioneers in Indonesia, featuring distinct governance models and digital communication strategies; this enables a deeper comparative qualitative analysis regarding the implementation of Sustainable Smart Cities.

RESULTS AND DISCUSSION

Results

This results section presents research findings regarding the implementation of Smart Sustainable Cities in Jakarta and Bandung, with a specific focus on digital communication strategies and information literacy practices. The findings are organized into three key aspects: (1) the execution of digital communication and information literacy programs in each city, (2) a comparison of their implementation approaches, and (3) the enabling and inhibiting factors affecting program effectiveness. These three subsections provide a comprehensive overview of how each city integrates digital technology, governance, and citizen participation to support sustainable urban development, before further interpretation of these findings in the discussion section.

Description of the Digital Communication and Information Literacy Program

Jakarta and Bandung, as two major cities in Indonesia, have adopted different approaches in implementing the Sustainable Smart City program, particularly in the areas of digital communication and information literacy. The findings indicate that Jakarta primarily relies on an integrated and centralized digital service model, whereas Bandung combines digital service provision with community-based communication and participation. These contrasting approaches are summarized in Figure 1.

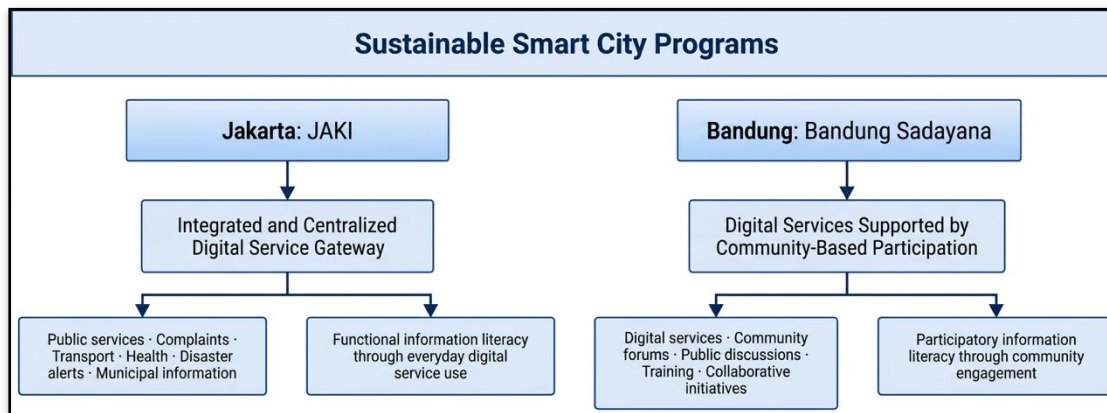


Figure 1. Comparative Models of Digital Communication and Information Literacy in Jakarta and Bandung Smart City Programs

Source: (Developed by the authors based on the research findings, 2025)

As illustrated in Figure 1, digital communication in Jakarta is primarily facilitated through the Jakarta Kini (JAKI) application, which can be characterized as an integrated and centralized digital service gateway. The application connects citizens with various municipal services through a single mobile interface. It organizes administrative services, public complaint mechanisms, transportation information, disaster alerts, health services, and other municipal information into several service categories. Rather than requiring citizens to navigate separate government channels, JAKI provides a unified point of access through which users can identify, select, and use the services they need. This integration enables residents to interact

more directly with relevant local government agencies while improving the efficiency and accessibility of public service delivery. The findings further reveal that the Jakarta Smart City program places strong emphasis on centralized digital governance, with technological integration serving as the primary mechanism for improving government responsiveness and service quality.

Beyond service provision, JAKI supports information dissemination by delivering real-time updates through its mobile interface. Its service menus and notification features direct users from general municipal information to specific public services and reporting channels. Interviews and document analysis indicate that the application contributes to increasing public awareness of municipal programs by simplifying access to official information and digital public services. Through their everyday use of the application, citizens are required to navigate the digital interface, identify relevant information, select appropriate service channels, and respond to updates. Therefore, JAKI promotes functional information literacy through citizens' routine interactions with digital public services.

The Jakarta Smart City program is built upon seven main pillars: Smart Governance, Smart Economy, Smart Environment, Smart People, Smart Mobility, Smart Living, and Smart Branding. Through JAKI and its connected services, the program also supports micro, small, and medium enterprises (MSMEs) through initiatives such as JakPreneur, as well as the integration of public transportation services through a connected digital payment system. These features reinforce JAKI's role as a centralized digital gateway that brings together information, public services, and interactions between residents and government agencies.

In contrast, Bandung adopts a more collaborative approach through the Bandung Sadayana platform, which integrates digital services with community-oriented communication practices. The website functions as a shared digital gateway through which users can access municipal information, public services, and community-related programs. Its interface brings together different categories of city services and information, enabling residents to identify relevant programs and connect with government and community initiatives. However, unlike Jakarta's predominantly application-centered model, Bandung's digital platform is supported by direct communication and collaborative activities involving the local government, communities, academic institutions, and the private sector.

As summarized in Figure 1, Bandung Sadayana should not be understood solely as a digital participation platform. Rather, it operates within a broader communication ecosystem in which digital services are complemented by community forums, public discussions, digital training, and neighborhood-based empowerment activities. These activities encourage residents to become active participants in urban development rather than merely users of digital services. Accordingly, Bandung's approach promotes participatory information literacy by strengthening citizens' collective capacity to access, understand, discuss, and use information within community and urban governance contexts.

The Bandung City Government also encourages community participation through community forums, WhatsApp discussion groups, and educational campaigns such as "Kota Pintar Bandung Masuk Kampus" (Bandung Smart City Goes to Campus). The emphasis on

local community involvement constitutes one of the program's main strengths because it provides opportunities for residents to contribute directly to policy discussions and supports the development of more collaborative governance practices. However, Bandung continues to face challenges related to uneven technological infrastructure across certain areas, resulting in disparities in access to digital services and varying levels of public participation.

The comparison presented in Figure 1 demonstrates that digital communication and information literacy are developed through different mechanisms in the two cities. Jakarta's platform-based approach encourages citizens to develop the functional ability to navigate digital interfaces, understand service-related information, select appropriate service channels, and respond to real-time updates. In contrast, Bandung combines digital service provision with community-based communication practices, emphasizing participatory learning through outreach activities, public discussions, and collaborative forums. Jakarta therefore emphasizes information literacy through individual interactions with an integrated digital service system, while Bandung strengthens information literacy through both digital access and collective community engagement.

Although the two cities employ different approaches, both are aligned with the broader objectives of smart city development: enhancing the efficiency of public services, promoting environmental sustainability, and improving residents' quality of life. The Jakarta City Government places greater emphasis on the digitalization and integration of public services, whereas the Bandung City Government gives greater attention to direct interaction and active community participation. These differences demonstrate how each city adapts its smart city initiatives to local needs, institutional capacities, and available resources.

The Jakarta Smart City program receives strong institutional support through collaboration among local government agencies and private-sector actors, including the installation of CCTV cameras in public areas and the provision of free Wi-Fi in selected public spaces to improve security and digital accessibility. In contrast, Bandung also highlights aesthetic and cultural values through the revitalization and landscaping of city parks as part of its city-branding strategy. This initiative is intended not only to attract visitors but also to strengthen public spaces as sites of community interaction. Overall, the findings suggest that Jakarta represents a technology-integrated and service-centered model, while Bandung represents a digitally supported and community-oriented model of Sustainable Smart City communication.

The findings demonstrate that, although both cities utilize digital technologies to support smart sustainable city development, Jakarta primarily adopts a technology-driven model centered on integrated digital services, whereas Bandung combines technological innovation with participatory communication mechanisms to strengthen collaboration among urban stakeholders.

Comparison of Implementation

A comparison of Smart Sustainable City implementation reveals both similarities and differences in the digital communication strategies adopted by Jakarta and Bandung. Both cities

recognize digital communication as an essential component of smart governance and utilize digital platforms to improve public service delivery, facilitate information dissemination, and strengthen interactions between government institutions and citizens. The governments of Jakarta and Bandung actively seek to strengthen community engagement through a combination of social media platforms, mobile applications, and face-to-face forums. Collaboration among government institutions, local communities, and the private sector plays an important role in maintaining program continuity and building public trust in smart city initiatives. The comparison demonstrates several similarities and differences in communication strategies, public participation, and technological utilization between the two cities.

Despite these similarities, each city demonstrates distinctive implementation characteristics. Jakarta places greater emphasis on the digitization of public services, with the JAKI application serving as the central platform supporting its operations. Through this application, citizens can report urban issues, access transportation information, and utilize health services digitally. This approach highlights technological efficiency and ease of access, positioning digital platforms as the main communication channel between the government and the public. Consequently, public interaction with government services increasingly relies on citizens' ability to navigate digital systems and effectively interpret online information.

Bandung, meanwhile, adopts a more decentralized and participatory approach by combining digital platforms with community engagement initiatives. Bandung prioritizes direct engagement with the community through forums and focus group discussions that facilitate two-way communication between the government and citizens. These initiatives support participatory dialogue and encourage community involvement in urban development processes. One example is the community forum activities within the Bandung Smart City program (as shown in Figure 3 below), which function not only as communication channels but also as spaces for collective learning and information exchange among stakeholders.



Figure 2. Community Forum Activities Involving the Community
Source: (research documentation, 2024)

In addition, campaigns such as “Smart City Bandung Enters Campus” illustrate how the city actively involves young people in the development of smart city initiatives by promoting

awareness of digital governance and strengthening information literacy among students and the academic community. These activities aim to encourage greater understanding of digital public services while encouraging youth participation in urban innovation. One example of an activity implemented in the Bandung Smart City literacy program is presented in Figure 4.



Figure 3. Bandung Smart City Road to Campus Event
Source: (research documentation, 2024)

Overall, the findings indicate that both implementation models contribute to Smart Sustainable City development through different governance approaches. Jakarta demonstrates stronger institutional integration of digital services, while Bandung illustrates broader community engagement through collaborative communication practices.

Supporting and Hindering Factors

The implementation of Smart Sustainable City programs in both cities is influenced by several supporting and inhibiting factors identified through interviews, observations, and document analysis. The findings identify government commitment as one of the primary supporting factors. The implementation of the Smart Sustainable City program in Jakarta and Bandung is the active role of the government as both initiator and regulator. Strong institutional commitment is essential in coordinating stakeholders, formulating policies, and ensuring the continuity of smart city initiatives. In Jakarta, the government has developed an effective communication strategy through community segmentation analysis and the extensive use of social media to disseminate information and encourage public participation. This approach allows communication to be more targeted, reaching different social groups according to their digital behavior and information needs. Meanwhile, Bandung emphasizes collaboration with local communities as a key mechanism for increasing citizen engagement, positioning community participation as a central component of program implementation as well as an

important channel for policy feedback.

However, the findings also reveal several persistent challenges. One major obstacle is the uneven level of digital literacy among citizens, which limits the effective utilization of digital services despite improvements in technological infrastructure. Differences in educational background, digital competencies, and access to information technologies create disparities in citizens' ability to participate in digital governance. Jakarta faces obstacles related to gaps in digital literacy within the community, which limit the optimal use of digitalization programs despite the availability of advanced technological platforms. In addition, budget constraints and complex bureaucratic processes often slow program implementation, even though smart city policies are intended to improve public services and promote sustainable development (Reza & Azmi, 2021). Bandung encounters some challenges, particularly in terms of uneven technological infrastructure and internet coverage across different parts of the city, which affects equal access to digital services and opportunities for participation. Public participation also varies considerably, as not all citizens possess sufficient motivation, awareness, or digital capabilities to engage actively in Smart Sustainable City initiatives. Table 1 summarizes the supporting and hindering factors identified by the authors based on field findings and comparative analysis. Table 1 summarizes the supporting and hindering factors identified by the authors based on field findings and comparative analysis.

Table 1. Supporting and Hindering Factors of JSC and BSC Programs

Dimension	Supporting Factors	Hindering Factors
Smart Technology	JAKI application innovation (Jakarta), Data integration (Bandung)	Access to JAKI application not yet on target (Jakarta), Limited digital infrastructure (Bandung)
Information Literacy	Use of various print and non-print media (Jakarta), Community-based education (Bandung)	Digital literacy gap among the public (Jakarta and Bandung)
Community Engagement	Collaboration with various media parties (Jakarta), Active participation through community forums (Bandung)	Lack of public understanding of the smart city concept (Jakarta and Bandung)

Source: Author's compilation, 2025

Overall, the findings demonstrate that successful Smart Sustainable City implementation depends not only on technological infrastructure but also on institutional commitment, collaborative governance, digital inclusion, and citizens' capacity to utilize digital communication effectively.

Discussion

Digital Communication as the Foundation of Smart Sustainable City Governance

The findings demonstrate that digital communication serves as the fundamental mechanism through which Smart Sustainable City initiatives are translated into practical governance. Although both Jakarta and Bandung have adopted digital technologies to improve urban services, the comparison reveals that the effectiveness of smart city implementation is determined not merely by technological availability but by the way communication processes facilitate interactions between government institutions and citizens. This finding reinforces the argument that smart cities should be understood as socio-technical systems in which technology functions as an enabler of governance rather than an end in itself (Grossi & Welinder, 2024; Jiang et al., 2020; Meijer & Bolívar, 2016).

The comparative findings reveal two distinct governance models. Jakarta represents a government-driven model characterized by centralized digital integration through the JAKI platform, where multiple public services are consolidated into a single digital ecosystem. This approach reflects the principles of smart governance that emphasize efficiency, interoperability, and integrated public service delivery. By reducing administrative fragmentation, digital platforms such as JAKI enable faster communication between government agencies and citizens while improving transparency and accessibility of public services. These findings are consistent with previous studies suggesting that integrated digital platforms enhance institutional responsiveness and improve the quality of public administration through data-driven governance (Hossin et al., 2023; Luna-Reyes & Gil-Garcia, 2014; Mergel et al., 2019).

In contrast, Bandung demonstrates a more collaborative governance model in which digital communication extends beyond service delivery to facilitate continuous interaction among government institutions, communities, universities, and private organizations. Rather than positioning technology as the sole driver of innovation, Bandung utilizes digital platforms to strengthen social collaboration and collective problem-solving. This finding supports the growing body of literature arguing that successful smart cities depend on participatory governance and collaborative communication capable of mobilizing local knowledge and community resources (Leino & Puumala, 2021; Rocha et al., 2022). Consequently, digital communication functions not only as an information channel but also as a mechanism for strengthening civic engagement and shared responsibility in urban development.

The comparison further indicates that the differences between Jakarta and Bandung should not be interpreted as competing implementation models but rather as complementary governance strategies that respond to their respective urban contexts. Jakarta, as Indonesia's largest metropolitan area, requires extensive institutional integration to manage highly complex public services across multiple governmental sectors. Conversely, Bandung benefits from a governance environment that allows stronger interaction with local communities and innovation networks. This finding aligns with recent Smart Sustainable City studies emphasizing that successful digital transformation should be adaptive to local institutional capacity, demographic characteristics, and governance culture rather than relying on standardized technological solutions (Demirel, 2023; Mills et al., 2024; Safira et al., 2024).

Another important implication emerging from the findings concerns the changing role of digital communication in contemporary public administration. The evidence suggests that communication technologies should no longer be viewed merely as instruments for disseminating government information but as strategic governance infrastructures that facilitate policy coordination, citizen participation, and collaborative decision-making. This perspective extends previous smart city literature by demonstrating that communication constitutes an institutional capability that enables governments to transform digital infrastructure into sustainable governance outcomes. Without effective communication processes, even sophisticated digital technologies may fail to generate meaningful citizen engagement or long-term policy effectiveness.

These findings therefore reinforce the Smart Sustainable City framework by illustrating that technological innovation alone cannot guarantee successful urban transformation. Instead, digital communication acts as the critical connecting mechanism through which technological resources, governance institutions, and community participation become integrated into sustainable urban management. In this sense, the experiences of Jakarta and Bandung suggest that the maturity of smart city governance depends less on the sophistication of technology itself than on the government's capacity to design communication systems that are transparent, participatory, and responsive to citizens' needs. This interpretation provides an important theoretical contribution by positioning digital communication as a foundational governance dimension that links technological innovation with sustainable urban development.

Information Literacy as a Mediating Factor between Digital Communication and Citizen Participation

One of the most significant findings of this study is that the effectiveness of digital communication strategies depends not only on the availability of digital platforms but also on citizens' capacity to access, interpret, evaluate, and utilize digital information. This finding suggests that information literacy functions as a mediating factor that determines whether digital communication can be transformed into meaningful public participation. In both Jakarta and Bandung, digital platforms have expanded opportunities for accessing public services and government information; however, the extent to which these opportunities contribute to Smart Sustainable City objectives varies according to citizens' information literacy competencies. Therefore, digital transformation should not be understood solely as technological modernization but also as the development of citizens' cognitive and social capacities to engage with digital governance.

The comparative findings illustrate this relationship clearly. Jakarta has invested substantially in integrated digital infrastructure through the JAKI platform, enabling efficient access to multiple public services. Nevertheless, the findings indicate that unequal digital competencies among citizens continue to influence the utilization of these services. Although technological integration has improved administrative efficiency, disparities in digital literacy remain a major obstacle to inclusive participation. This finding supports previous studies arguing that digital transformation may unintentionally reproduce social inequalities when improvements in technological infrastructure are not accompanied by equivalent investments

in digital capability development and inclusive public education (Caragliu & Del Bo, 2023; Chen et al., 2022; Dastyari & Jose, 2024). Consequently, digital inclusion should be interpreted as encompassing both technological access and citizens' ability to transform digital information into informed decision-making.

Bandung presents a complementary perspective. Rather than emphasizing technological integration alone, the city combines digital communication with community-based learning, collaborative forums, and public engagement activities that strengthen citizens' understanding of digital information. The findings suggest that this participatory approach contributes to the development of information literacy as a collective social process rather than merely an individual technical competence. Such an approach is consistent with contemporary perspectives that conceptualize information literacy as a civic capability enabling individuals to critically evaluate information, collaborate with others, and participate effectively in democratic governance (Kim & Yang, 2016; Lloyd, 2012). Accordingly, Bandung demonstrates that community engagement can strengthen the social dimensions of digital transformation by encouraging citizens to become active contributors rather than passive recipients of government information.

These findings extend existing Smart Sustainable City literature by demonstrating that digital communication and information literacy should be viewed as mutually reinforcing components of urban governance. Previous studies have frequently emphasized technological innovation, digital infrastructure, and e-government as the principal determinants of smart city success. However, the findings of this study indicate that technological sophistication alone is insufficient to generate sustainable governance outcomes. Instead, digital communication becomes effective only when citizens possess adequate information literacy to interpret digital content, evaluate its credibility, and utilize available information for civic participation. This interpretation complements recent discussions on human-centered smart cities, which argue that sustainable digital transformation requires equal attention to technological innovation, institutional capacity, and citizen empowerment (Bouzguenda et al., 2019; Kelleher & Kerr, 2020).

Furthermore, the findings demonstrate that information literacy contributes directly to the quality of citizen participation. Individuals with higher levels of information literacy are more capable of understanding government policies, accessing digital public services, verifying information, and participating constructively in collaborative governance processes. Conversely, limited information literacy increases vulnerability to misinformation, reduces public trust in digital services, and weakens citizens' willingness to participate in government initiatives. These conditions illustrate that information literacy is not merely an educational outcome but also a governance resource that enhances the effectiveness of digital public administration.

Another important implication concerns the relationship between information literacy and social sustainability. Smart Sustainable City initiatives ultimately seek to improve urban resilience, inclusiveness, and quality of life rather than simply expanding digital infrastructure. The findings indicate that information literacy enables citizens to engage more effectively in

environmental programs, public health initiatives, disaster management, and other digital public services that contribute to sustainable urban development. Thus, strengthening information literacy simultaneously enhances citizens' adaptive capacity and reinforces collaborative governance, both of which are essential for achieving long-term urban sustainability.

Overall, this study proposes that information literacy serves as a critical link between digital communication and sustainable citizen participation. Digital technologies create opportunities for interaction, while digital communication facilitates information exchange; however, only information literacy enables citizens to transform information into knowledge, participation, and collaborative action. This conceptual relationship represents an important contribution of the present study by demonstrating that successful Smart Sustainable City implementation requires an integrated approach in which technological innovation, digital communication, and information literacy evolve simultaneously as mutually reinforcing dimensions of sustainable urban governance.

Digital Communication and Information Literacy as Complementary Dimensions of Smart Sustainable City

The findings of this study suggest that Smart Sustainable City implementation should be understood as a multidimensional governance process in which technological innovation, digital communication, and information literacy are mutually reinforcing rather than independent components. Existing smart city literature has traditionally emphasized digital infrastructure, intelligent technologies, and data-driven governance as the primary drivers of urban transformation (Albino et al., 2015; Batty et al., 2012; Meijer & Bolívar, 2016). However, the comparative findings from Jakarta and Bandung demonstrate that the availability of digital platforms alone does not necessarily produce inclusive or sustainable governance outcomes. Instead, the effectiveness of smart city initiatives depends on how digital communication facilitates interactions between government and citizens and how information literacy enables citizens to meaningfully engage with digital public services. These findings reinforce recent arguments that the transition toward Smart Sustainable Cities requires balancing technological advancement with social and institutional capacities that support inclusive governance.

The comparison between Jakarta and Bandung further illustrates that technological sophistication does not automatically translate into higher levels of public participation. Jakarta has successfully developed an integrated digital ecosystem through the JAKI platform, enabling citizens to access a wide range of public services efficiently. Nevertheless, the findings indicate that disparities in citizens' digital competencies continue to influence the extent to which these services are utilized. Conversely, Bandung complements digital platforms with community-based communication initiatives that encourage dialogue, collective learning, and collaboration among government institutions, community organizations, universities, and the private sector. These contrasting approaches demonstrate that technological infrastructure and participatory communication should not be viewed as competing alternatives but as complementary governance strategies whose effectiveness depends on local institutional contexts and citizens' capacities.

This interpretation expands the understanding of digital communication within Smart Sustainable City implementation. Rather than functioning merely as a channel for disseminating governmental information, digital communication emerges as an institutional mechanism that shapes transparency, responsiveness, trust, and collaborative governance. Previous studies have increasingly argued that successful smart cities are characterized not only by advanced technological systems but also by communication processes that enable continuous interaction between governments and citizens (Przebylowski et al., 2022; Zhu et al., 2022). In this perspective, communication becomes a strategic governance capability that facilitates co-creation, strengthens public trust, and enhances policy responsiveness through continuous feedback and citizen engagement rather than one-way information delivery.

The findings also demonstrate that the effectiveness of digital communication is inseparable from citizens' information literacy. While digital platforms expand opportunities to access public information, information literacy determines whether citizens are able to interpret, evaluate, verify, and utilize that information in meaningful ways. Therefore, information literacy should not be interpreted simply as the technical ability to operate digital devices, but rather as a broader civic competence that enables individuals to critically assess information, make informed decisions, and participate constructively in public affairs. This interpretation aligns with contemporary perspectives that conceptualize information literacy as a prerequisite for democratic participation and sustainable digital governance, particularly in increasingly data-driven urban environments.

From this perspective, information literacy performs a complementary function within Smart Sustainable City implementation. Digital communication creates opportunities for interaction, while information literacy determines the quality of that interaction. Without adequate information literacy, citizens may gain access to digital services but remain unable to distinguish reliable information from misinformation, evaluate policy content critically, or participate effectively in collaborative governance. Consequently, improvements in technological infrastructure alone cannot eliminate inequalities in civic participation because unequal information literacy may reproduce new forms of digital exclusion despite expanded technological access. Recent studies similarly argue that reducing the digital divide requires strengthening both technological accessibility and citizens' capacity to use information critically for civic purposes.

The relationship identified in this study therefore supports a broader interpretation of Smart Sustainable City as a people-centered governance paradigm. Rather than positioning citizens as passive users of digital services, Smart Sustainable City initiatives should recognize citizens as active collaborators capable of generating knowledge, providing feedback, and contributing to policy implementation. In this regard, digital communication facilitates interaction, whereas information literacy enables citizens to transform digital information into collaborative action. Together, these dimensions strengthen institutional trust, improve government responsiveness, and encourage more inclusive forms of urban governance. This interpretation resonates with recent research emphasizing that citizen participation should be considered a core indicator of smart city maturity instead of merely a supporting component

of technological innovation.

Another important implication emerging from the findings concerns the relationship between digital inclusion and urban sustainability. Sustainable urban governance requires that digital transformation benefits all segments of society rather than only digitally advantaged groups. The findings indicate that challenges such as uneven digital literacy, infrastructure disparities, and unequal participation remain significant barriers to realizing inclusive Smart Sustainable Cities. These challenges illustrate that digital inequality is multidimensional, encompassing access to infrastructure, digital competencies, institutional trust, and opportunities for participation. Consequently, smart city policies should move beyond expanding digital infrastructure toward strengthening citizens' capabilities to access, evaluate, and utilize information effectively. Such an approach is consistent with recent scholarship highlighting that sustainable digital transformation depends on integrating technological development with social inclusion and capacity building (Bouzguenda et al., 2019; Chen et al., 2022; Djatmiko et al., 2025; Ghazal Masri & El-Fadel, 2026).

The present findings therefore contribute to the Smart Sustainable City literature by demonstrating that digital communication and information literacy should be regarded as complementary dimensions rather than separate policy domains. While digital communication provides the institutional infrastructure for interaction between governments and citizens, information literacy enables those interactions to generate informed participation, collaborative governance, and sustainable policy outcomes. This integrated perspective broadens existing Smart Sustainable City discussions, which have often prioritized technological innovation while giving comparatively less attention to communication processes and citizens' informational capacities. Accordingly, this study argues that sustainable urban transformation cannot be achieved solely through technological modernization; it equally depends on governments' ability to foster transparent communication, strengthen information literacy, and create inclusive opportunities for meaningful citizen participation. These findings provide both theoretical and practical support for advancing Smart Sustainable City governance toward a more human-centered and socially sustainable approach.

CONCLUSION

This study set out to explore the implementation of digital communication strategies and identify information literacy challenges in supporting Smart Sustainable City initiatives through a comparative analysis of Jakarta and Bandung. The findings demonstrate that both cities have made significant progress in integrating digital technologies into urban governance; however, they employ different implementation approaches that reflect their respective institutional priorities and local contexts. Jakarta emphasizes integrated digital public services through a centralized platform, whereas Bandung adopts a more collaborative approach by combining digital communication with community engagement initiatives. These findings indicate that Smart Sustainable City implementation cannot be understood solely as a process of technological innovation but rather as a governance transformation that requires the integration of digital infrastructure, effective communication, and active citizen participation.

Beyond comparing two urban cases, this study contributes to the Smart Sustainable City literature by demonstrating that digital communication and information literacy should be regarded as complementary dimensions of sustainable urban governance. Digital communication expands opportunities for interaction between governments and citizens, while information literacy enables citizens to critically access, evaluate, and utilize digital information for meaningful participation in public affairs. Accordingly, the study extends existing discussions that have predominantly emphasized technological advancement by highlighting the importance of communication processes and citizens' informational capacities in achieving inclusive, participatory, and sustainable smart city development. These findings also suggest that investments in digital infrastructure should be accompanied by policies that strengthen digital inclusion, information literacy, and collaborative governance to maximize the social benefits of smart city initiatives.

Despite these contributions, several limitations should be acknowledged. This study employed a qualitative comparative approach focusing on two metropolitan cities in Indonesia, which may limit the transferability of the findings to other urban contexts with different governance capacities, demographic characteristics, and levels of digital development. In addition, the analysis primarily relied on interviews, observations, and policy documents, providing limited insight into the long-term experiences and behavioral changes of citizens as users of digital public services. Future research could therefore broaden the comparative scope by including cities with diverse socio-economic characteristics, employing mixed-method or longitudinal research designs, and examining more explicitly how digital communication and information literacy influence citizen participation, public trust, and urban resilience across different governance contexts.

In conclusion, the study demonstrates that the sustainability of smart city initiatives depends not only on technological innovation but also on governments' ability to foster effective digital communication, strengthen information literacy, and create inclusive opportunities for citizen participation. As cities continue to accelerate digital transformation, the integration of these complementary dimensions will become increasingly essential for developing resilient, citizen-centered, and sustainable urban governance. Ultimately, the future of Smart Sustainable Cities lies not in technology alone, but in the capacity to connect technological advancement with informed citizens, collaborative institutions, and inclusive governance.

Declaration of Generative AI Use

During the preparation of this manuscript, the authors used DeepL and Grammarly to improve the clarity and readability of the text. Output generated by the tool were carefully reviewed and edited by the authors, who take full responsibility for the content of this article. All substantive intellectual contributions, including conceptualization, analysis, interpretation of data, and final decisions regarding content, arguments, and conclusions, were carried out solely by the authors. The authors take full responsibility for the integrity, originality, and academic quality of this article.

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