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Smart City Development in the New Capital City: Indonesian Government Plans

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Abstract

The idea of a smart city and a new capital city in Indonesia is complex, so planning and the government's role are crucial. The purpose of this research is based on two big questions about the government's plan for preparing for development and the potential for smart city development in the new capital city. This study was done based on the results of a direct examination of official government documents using a thematic analysis approach and an analytical tool called Nvivo 12 Plus. This research was able to show what the Indonesian government's plans are and what they could do to build smart cities in the new capital city (IKN/Nusantara). The findings of this study map out six smart city support systems, which are the government's priority plans, including urban systems, safety and security, livability and urban life, government services, the environment and sustainability, and access and mobility. They all focus on technology adaptation, digitization, renewable energy, and sustainability. Despite these priority plans, there are still significant challenges to rethinking the prospects and potential for developing smart cities in the new capital city, especially the issues of human resources, budget capacity, infrastructure, and government bureaucratic adaptation patterns. This study proposes to set up a smart governance system to adapt to the new system, primarily to accommodate those problems and challenges. It can contribute to unravelling smart cities' complexities, challenges, and future development potential.

Keywords: *New Capital City; Smart City; Smart Governance; Urban Development*

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Introduction

The Indonesian government is considering building a new capital city because of environmental problems, the number of people living in cities, the risk of natural disasters, and the idea of sustainable development (Shimamura & Mizunoya, 2020; Baharuddin, Nurmandi, Qodir, & Jubba, 2022; Ramadhan et al., 2022). In addition, the development idea is also based on the national development equity plan and the development of a smart city system (Baharuddin et al., 2022). Researchers all over the world are interested in the development of smart cities (Mora, Bolici, and Deakin, 2017; van Twist, Ruijer, and Meijer, 2023). The smart city is a model and concept of urban development based on maximising technology to improve the development and welfare of urban communities (Angelidou, 2014; Mortaheb & Jankowski, 2022). The term smart city refers to opportunities and solutions to improve the quality of life and sustainable development, where the government's role is needed to accommodate and promote these aspects (Chen & Chan, 2023; Blasi, Ganzaroli, & Noni, 2022; Ismagilova, Hughes, Rana, & Dwivedi, 2022).

The government has considered developing a smart city in Indonesia's new capital city (IKN/Nusantara). The government has made severe projections for this idea to be built in the new capital city (Rachmawati, Haryono, & Rohmah, 2021). The new capital city is currently planned to be moved from Jakarta and built in the Kalimantan region (Baharuddin et al., 2022; Teo, Lechner, Sagala, & Campos-Arceiz, 2020). Kalimantan was chosen with the consideration that the population is not significant and the land is also available (Shimamura & Mizunoya, 2020; Baharuddin et al., 2022). The characteristics of this development idea lie in the infrastructure that is different from other regions in Indonesia (Muzady & Berawi, 2022; Spencer et al., 2023). The region will implement and maximise innovative technological advances as a consequence of the desire to develop a smart city concept (Muzady & Berawi, 2022; Sensuse, Putro, Rachmawati, & Sunindyo, 2022).

So far, there has been much research on smart cities, especially in recent years. However, there are still few research results that specifically carry out analyses that link smart cities with the new capital city of Indonesia simultaneously. This argument is also novel in this research. This research accommodates all of these aspects. Even so, at least some of the trends from the results of previous studies can still be used to assist the analysis process. First, smart cities adopt technology to improve the local economy, transport, and traffic management; protect the environment; improve the quality of life of their citizens; and promote communication between citizens and government (Ismagilova et al., 2019; Mishra & Chakraborty, 2019). Second, one of the nations pushing towards the creation of sustainable smart cities is Indonesia. However, before the government can start a smart city project, it is necessary to assess the readiness of each target city (Mahesa, Yudoko, & Anggoro, 2019). Third, when the government fails to consider various factors in implementing smart city policies, it will affect the effectiveness of quality services to its citizens because smart cities involve complex elements surrounding them, such as socio-economic life and the surrounding

environment (Myeong, Jung, & Lee, 2018; Zhu, Shen, & Ren, 2022). Fourth, reliance on the idea of a smart city poses significant political, technical, and socio-economic challenges to the administration. The new entity prompted the government's response (Ismagilova et al., 2022; Noori, Hoppe, De Jong, & Stamhuis, 2023).

This study will use a thematic analysis approach to map smart city studies with the development of a new capital city (IKN/Nusantara) in Indonesia. This will fill a gap in previous research. This study is new because it looks at the importance of building new capital cities (IKN/Nusantara) and how it relates to the government's plans for building smart cities. This is something that hasn't been looked at much before. The research questions are mapped as follows: (1) What is the government's plan for preparing for smart city development in the new capital city? (2) What is the potential for smart city development in the new capital city? These two questions make it possible to observe the plans of the Indonesian government for developing smart cities in the new capital city and know the potential for future development.

Research Methods

This study uses a qualitative approach with a focus on thematic analysis. The thematic analysis was chosen to maximise the analysis of smart city development ideas in the new capital city in Indonesia (IKN/Nusantara). This approach was selected to guide researchers in finding sources of analysis directly in official government documents in the form of Presidential Regulation Number 63 of 2022.

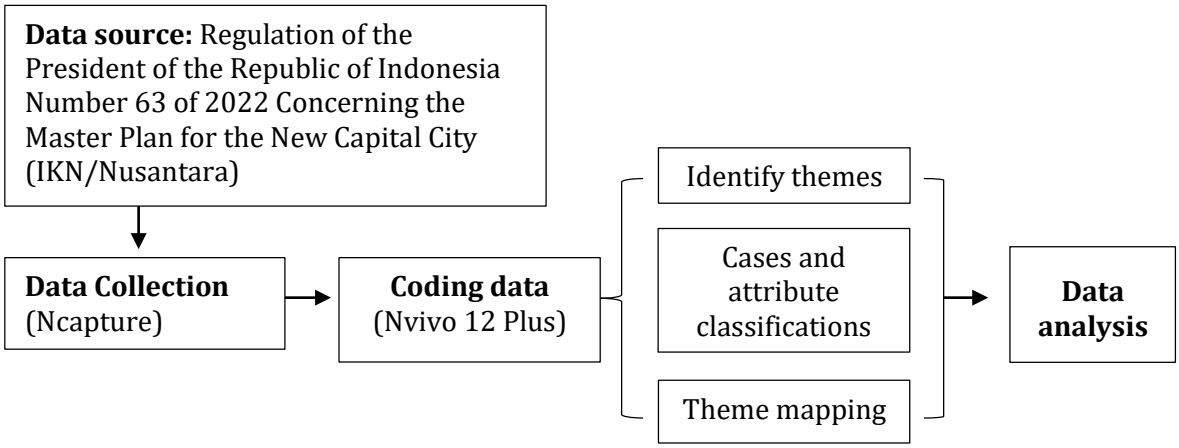

Figure 1. Data Analysis Process
Source: Processed by Authors (2023)

Figure 1 shows the analysis process, which starts with gathering data and figuring out where relevant data can be found. Sources of useful information were found, such as the Presidential Regulation of the Republic of Indonesia Number 63 of 2022 about the Master Plan for the New Capital City (IKN/Nusantara), which is an official government document. This study uses only one document because it is relevant to the research

question. Previously, the researcher filtered and examined several other related documents, but they were considered less relevant.

Data collection was performed with Ncapture in Google Chrome and transferred to the analysis tool for data coding, relying on the Nvivo 12 Plus analysis tool. This process maximises analytical features such as identifying themes, cases, attribute classifications, and theme mapping. Identify themes to identify the information on the website, thus helping select and determine relevant themes. Cases and attribute classifications serve to categorise the collected data. Theme mapping helps map the overall results of coding previously classified data. The coding results were then analysed and described to answer the research questions.

Results and Discussion

Government Plans: Smart City Development in the New Capital City

Official documents show that the government wants to build a smart city in the new capital, IKN/Nusantara (Presidential Regulation, 2022). The official document is the Presidential Regulation of the Republic of Indonesia Number 63 of 2022 about the Master Plan for the New Capital City (IKN/Nusantara). The document has a plan for how the government wants to build smart cities in the new capital and what their top priorities are. The search results on the official document are mapped in figure 2.

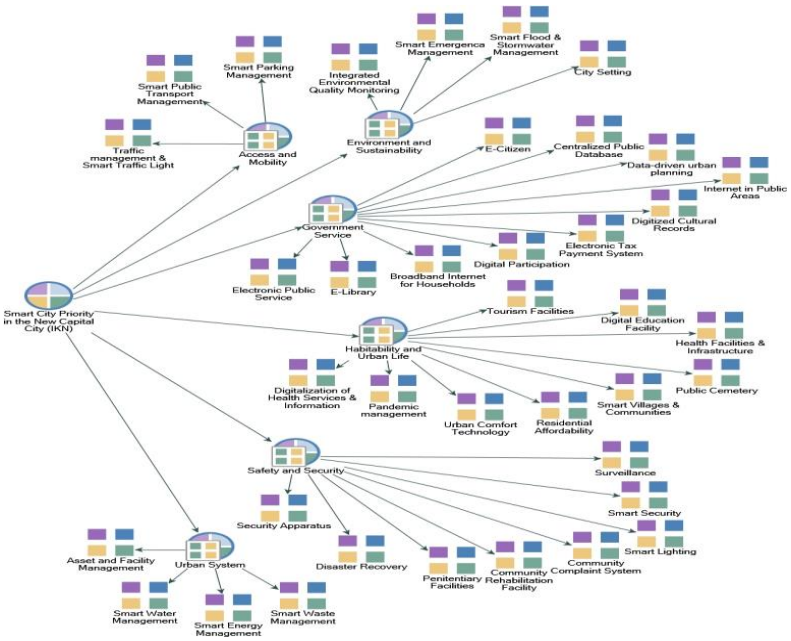

Figure 2. The Government's Plan for Smart City Development in the New Capital City
Source: Analysis Using Nvivo12 Plus (2023)

Figure 2 shows that the Indonesian government is thinking about making the new capital (IKN/Nusantara) a smart city. Smart city development has been planned using the concept of priority development. Smart city development priorities in the new capital city

are identified through six systems: urban systems, safety and security, livability and urban life, government services, environment and sustainability, and access and mobility (Presidential Regulation, 2022).

Urban Systems

The urban system focuses on several aspects. First, part of asset and facility management is managing a facility so that it always functions properly and is sustainable, economical, efficient, and effective. Facility management aims to bring out the potential for improving service processes and asset management to support sustainability.

Second, smart water management seeks to respond to the scarcity of clean water and water stress problems. This aspect of smart water management emerges due to several instances of water scarcity posing a threat to the global population. This situation encourages the need for management efforts to ensure sustainable water. These efforts are carried out with a device used throughout the water distribution network to monitor and control the water network's components (Ntuli & Abu-Mahfouz, 2016). A smart water management system is essential to the concept of a smart city since water is a valuable resource for human life (Mohammed Shahanas & Bagavathi Sivakumar, 2016; Ahad, Paiva, Tripathi, & Feroz, 2020).

Third, smart energy management is done to find out how well a city can save energy and use energy that is good for the environment. Energy distribution, energy substitution, and the use of new ideas in energy management are all examples of indicators that can be used as benchmarks. Smart energy management uses technology that utilises various alternative, sustainable, and renewable energy sources (Presidential Regulation, 2022). Smart energy management is also supported by the accumulation of large amounts of data in the energy sector using sustainable applications such as sensor systems, wireless transmission, network technologies, and cloud computing technologies (Zhou, Fu, & Yang, 2016). The Indonesian government might consider that.

Fourth, smart waste management aims to realise smart and sustainable waste and waste management. This is encouraged to reduce the number of landfills or waste (Presidential Regulation, 2022). Waste management must be founded on a normative framework for the integrative idea of sustainability using smart technical capabilities (Zhang et al., 2019). This technical approach suggests an Internet of Things-based smart waste management system that aids in estimating how much rubbish is placed in trash cans. The information is then transmitted via the Internet to the server for treatment and transmission to the farthest location (Pardini et al., 2020). The Indonesian government could consider this approach.

Safety and Security

The safety and security system consists of several aspects. First, aspects of the security apparatus are prepared to encourage the provision of community security apparatus at the neighbourhood unit and community unit levels (Presidential Regulation, 2022). The issue of security in smart cities is currently the concern of many researchers (Laufs, Borrion, & Bradford, 2020).

Second, disaster recovery aims to provide community services for disaster victims and the recovery process after a disaster (Presidential Regulation, 2022). Several researchers have considered using Drone Empowered Small Cellular Networks (DSCNs). DSCN is deployed in disaster recovery scenarios. It depends on the number of drones and their range in post-disaster situations (Hayajneh, Zaidi, McLernon, & Ghogho, 2016). Another approach proposed is the integration of shared power and communication networks dedicated to disaster situations to ensure communication is maintained at the disaster site (Alqahtani, Abhishek, Tipper, & Medhi, 2018).

Third, correctional institutions try to make sure they have the right places for prisoners to be coached (Presidential Regulation, 2022). Fourth, the goal of community rehabilitation centres is to help addicts, ex-convicts, and some other groups get better so they can live without drugs and eventually be accepted back into society (Presidential Regulation, 2022). In an ideal world, a region or city would also think about the best way for correctional and rehabilitation facilities to help people get back to normal (Cid, 2005).

Fifth, the public complaint system; this system accommodates complaints and information from the public that is integrated with the digitalization approach (Presidential Regulation, 2022). The public complaint system has been linked to the development of smart cities; there are necessary considerations, namely optimising an integrated application that can accommodate all complaints (Ziadi, Supriyono, & Wijaya, 2016).

Sixth, smart lighting is projected to optimise general lighting. It can be used for street or traffic lighting. Smart lighting allows it to be remotely controlled to turn on or off (Presidential Regulation, 2022). The goal of SCALS (Smart Cities Adaptive Lighting System), commonly referred to as smart lighting, is to provide more adaptable urban smart lighting components that will enable municipalities to monitor and control street lighting for the general public. This system can independently change the brightness of street lamps, which lowers energy use (Gagliardi et al., 2020; Pardo-Bosch, Blanco, Sesé, Ezcurra, & Pujadas, 2022).

Seventh, smart security is a prediction that focuses on the fact that security measures no longer depend on security forces in a city that are spread out over a wide area. However, their effectiveness depends on smart technology in other areas, like street lighting and traffic management (Laufs et al., 2020). Eighth, a surveillance system in a smart security system that uses CCTV, drones, body cameras, robotic cameras, automatic number plate recognition systems, patrol cameras, face recognition, and video analytics to find violations, crimes, and disturbances of public order (Presidential Regulation, 2022). So, the government is planning to build a smart city in the new capital city area, taking safety and security into account.

Livability and Urban Life

Smart cities are built with livability and city life in mind. A number of factors help make this possible. First, the digitalization of health services and health information systems encourages health services to rely on communication and information technology. This means that people can get health services and information remotely. The

system connects health facilities to support the referral process and patient treatment more quickly. The system must ensure the availability of supporting telecommunications facilities such as telemedicine services (Presidential Regulation, 2022). Health services using telemedicine have also begun to be implemented in many countries (Oueida, Aloqaily, & Ionescu, 2019; Mbunge, Muchemwa, & Batani, 2022). Health services are an important prospect in smart cities (Mouton et al., 2019; Pramanik, Lau, Demirkan, & Azad, 2017; Poongodi, Sharma, Hamdi, Maode, & Chilamkurti, 2021).

Second, pandemic management focuses on making the new capital city a "smart city" (Presidential Regulation, 2022). Pandemic management is closely related to various layers of smart cities. It requires the support of technology, the government, community organisations, and the general public (Söderström, 2021; Das & Zhang, 2021).

Third, urban comfort technology is also considered. It was built to create comfort and harmony with nature through efficient use of resources and low carbon emissions (Presidential Regulation, 2022).

Fourth, residential affordability is also projected to support smart city development in the new capital city. It is projected by the government to guarantee the community's ability to reach housing, both in the form of owning a house or apartment and renting a house or apartment (Presidential Regulation, 2022). Promoting housing affordability with smart city development also requires regulations focusing on land use and other sectors (Marantz, 2021). The Indonesian government can consider this in the future.

Fifth, smart villages and communities It is intended to revitalise existing settlements to improve quality of life and habitability (Presidential Regulation, 2022). Sixth, public cemeteries are a part of the urban housing feasibility system. The urban housing eligibility system covers all aspects of life related to urban dwellings, including public burial facilities (Presidential Regulation, 2022).

Seventh, health facilities and infrastructure are essential to the urban residential eligibility system (Presidential Regulation, 2022). Good health infrastructure can help improve the quality of life and people's welfare (Grum & Grum, 2020), and play an essential role in preventing and controlling disease outbreaks (Utami, Baharuddin, Khaerah, & Fariaty, 2022). By paying attention to these health facilities and infrastructure, the urban housing eligibility system can help improve the quality of life and people's welfare.

Eighth, making sure there are digital education, or e-education, facilities is another way to help the livability system and urban life. Through the internet and digital technology, this building gives people in cities access to education and training. It can help improve job skills and qualifications (N. Das, 2023). Ninth, tourism facilities are essential to the eligibility system for urban housing and urban life (Presidential Regulation, 2022). Tourism can be an essential source of income for cities and provide visitors with a unique and valuable tourist experience (Gretzel & Koo, 2021). As previously described, an important element of smart city development lies in the supporting facilities. This context requires a cross-sectoral approach and government leadership (Budde, 2014; Sancino & Hudson, 2020).

Government Services

The government service system in the new capital is made up of several parts that work together to help smart cities grow. First, for electronic public services, the government encourages the creation of digital-based services that allow each service to be easily accessed. These services include licencing for manufacturing industries and new businesses, information on employment data, micro, small, and medium enterprises (MSMEs), and MSMEs education. Another service is an electronic tax and retribution payment system (Presidential Regulation, 2022). Second, as part of the government service system supporting the development of smart cities, in addition to providing public library facilities, the government also provides e-libraries (Presidential Regulation, 2022).

Third, providing broadband internet access for households and internet facilities in public spaces. This facility is intended to accommodate the public's dependency on the Internet. This is important because the potential for smart city development requires adequate and broad-reaching Internet capacity support (Talari et al., 2017; Samih, 2019). It also influences models of public participation. Fourth, e-participation was initiated by the government to encourage the level of public participation. The government needs tools to support this aspect. E-participation is part of the transition towards smart governance (Kopackova, Komarkova, & Horak, 2022; Alizadeh, Sarkar, & Burgoyne, 2019). Fifth, the electronic tax payment system. The system is able to encourage taxpayer compliance. (Night & Bananuka, 2020).

Sixth, digitised cultural records refer to digital records regarding culture, history, and cultural heritage (Presidential Regulation, 2022). In today's digital era, digitised cultural records are vital because they allow us to maintain, access, and share a cultural heritage more quickly and efficiently (Salleh & Bushroa, 2022). Seventh, other services, namely the Internet in public spaces. The Internet in public spaces allows easy access to the information the public needs. This allows the public to access various sources of information, especially information related to the government (Presidential Regulation, 2022). Innovation is needed in developing a smart city, which also depends on the Internet.

Eighth, initiating government services through a data-based urban planning system. Data-based urban planning is a system that uses information technology and data to assist governments in planning urban development (Engin et al., 2020). Ninth, a centralised public database, is considered to support government services (Presidential Regulation, 2022). Tenth, initiating services based on e-citizens. E-citizenship is a concept in which citizens use information and communication technology to participate in political and governmental life. In urban development issues, the government can involve e-citizens in data collection and information dissemination (Mahou-Lago & Varela-Álvarez, 2016).

Environment and Sustainability

The environment and sustainability are the government's priorities in the idea of developing a smart city in the new capital. Some of the supporting aspects include

monitoring integrated environmental quality, smart emergency management, including an early warning system, preparedness, disaster management, smart flood and stormwater management, and city face structuring. To support a conducive environment in the new capital, the government will switch to environmentally friendly technology, use renewable energy, strengthen ecological resilience, reduce pollution risk, and mitigate (Presidential Regulation, 2022). Environmental and sustainability issues are important aspects of smart city development (Ahvenniemi et al., 2017; Silva et al., 2018).

The Indonesian government is thinking about things like the city's setting to help with these problems in urban development. A city setting is needed to support the environment and sustainability. City setting is the process of designing, developing, and managing cities so that they function correctly, are comfortable, and are safe for their residents (Clement & Crutzen, 2021). A city setting can support the environment and sustainability. However, challenges may be faced, especially regarding costs and public participation (Huang-Lachmann, 2019). Building environmentally friendly infrastructure requires a large amount of money. Therefore, the government needs to allocate sufficient funds to build the infrastructure. Public awareness about the importance of the environment and sustainability is essential to creating a sustainable city setting. The community needs to be educated about an environmentally friendly way of life and its environmental impact.

Access and Mobilty

When building smart cities in the new capital city, access and mobility, among other things, are taken into account. The system requires supporting aspects. The planned supporting aspects include traffic management and smart traffic lights, smart public transport management, and smart parking management (Presidential Regulation, 2022). This is especially important because there are many cases where there are still violations while driving, so a new smart traffic light management system is proposed to minimise the occurrence of violations or accidents. The problem of public transportation facilities is also an important sector in developing smart cities (Lee & Chiu, 2020; Saharan, Bawa, & Kumar, 2019; Yan, Liu, & Tseng, 2020). In this context, serious planning is needed because demographic changes in the new capital can hinder the adoption of the new change system. Mobility within the city, supported by a public transportation management system, is a supporting sector for smart cities (Porru, Misso, Pani, & Repetto, 2020).

The government's plan for smart city development ideas in the new capital city is identified in a priority plan. The priority plan prioritises six support systems, including urban systems, safety and security, livability and urban life, government services, the environment, sustainability, and access and mobility (Presidential Regulation, 2022). The government's plan focuses on integrating technology into many new aspects of capital development. In addition, adaptation and innovation are also key factors for the government in realising the development of smart cities. In this development, the government is also thinking about environmental aspects and the mobility of urban communities. The trend of the data obtained in figure 2 shows that the government is

serious about preparing plans for developing smart cities in the new capital city. That leaves important questions about prospects and the potential for future development.

The Potential for Smart City Development in the New Capital City

Based on the data and explanations that have been given, the new capital city has a lot of potential to become a modern, rapidly growing city through smart city development. Unlike Jakarta, the new capital city was built in an area with minimal population density, which can provide ample space to develop the necessary infrastructure. By building new cities from scratch with smart city development planning, the government can also design cities better. In addition, the new capital city can attract the attention of investors in various sectors, such as property, tourism, and technology. This supports the development of smart cities in the future. However, it all depends on the government's seriousness and management of development.

The government's plan to develop a smart city in the new capital city (IKN/Nusantara) is the big idea of the Indonesian government to become a developed country by 2045. In this effort, the Indonesian government is also planning the development of a smart city in the new capital city. The development priority plan has been contained in Presidential Regulation Number 63 of 2022 (Presidential Regulation, 2022). Despite these priority plans, there are still major challenges to rethinking the prospects and potential for developing smart cities in the new capital city, especially the issues of human resources, budget capacity, infrastructure, and government bureaucratic adaptation patterns.

Many countries generally consider human resources when considering the idea of developing smart cities (Bakıcı et al., 2013; Thite, 2011). Human resources are a potential that is calculated in the future to start the government's plans for smart cities and new capitals. The Indonesian government must optimise the sector. Generally, human resources are optimised with education, outreach, adaptation, accommodative training, and supporting facilities (Bemelmans-Videc, Eriksen, & Goldenberg, 2020; Nafukho, Graham, & Muyia, 2010).

People also think that budgets will have an effect on how smart cities develop in the future, especially when moving new capital, which costs a lot of money. The budget capacity is projected to fulfil infrastructure, technology, human resources, and others (Baharuddin et al., 2022). In general, the development of smart cities also considers costs and budget allocations from the government or investment returns from many supporting parties (Voda & Radu, 2019; Tan & Taeihagh, 2020). The government must plan and ensure the budget and financing capacity for the development of smart cities and new capital cities simultaneously.

In addition to human resource and budgetary issues, infrastructure aspects also require attention. Many researchers have focused on the development of smart cities and sustainability in the infrastructure sector. The infrastructure section is considered as important as the others. That is a challenge for the government (Khan et al., 2020). Initiatives by the government to facilitate and bridge development ideas towards the realisation of smart cities are the responsibility of the government, especially

government initiatives in measuring the ability of the public and private sectors to be involved together (Ruhlandt, 2018; Taylor Buck & While, 2017).

So, the way the government bureaucracy changes is also one of the problems we've already talked about. In order for the government to help build smart cities and new capital cities, it must use a bureaucratic model that works with these new ideas. It may take some time. The idea of developing a smart city that is synonymous with the use of digital technology encourages government bureaucratic governance to study digital platforms and ecosystems. It encourages new bureaucratic rules and government adjustments (Lekkas & Souitaris, 2022). This study assesses that even though the government's priority plan has been implemented as well as possible, the potential for future realisation is a challenge in itself.

In addition, smart cities are often considered to represent the idea of sustainable development, so human resources, budget, infrastructure, and bureaucratic governance are the determining aspects, especially in the projection of a new capital city in Indonesia, which requires a lot of preparation from the government in dealing with problems that will arise (Nilssen, 2019; Baharuddin et al., 2022). This study proposes to prepare a smart governance system to adapt to the new system, especially to accommodate these problems and challenges. It just might be able to contribute to unravelling the complexities, challenges, and development potential of smart cities in the future.

Conclusion

The development of smart cities is included in the Indonesian government's priority plan for the new capital city (IKN/Nusantara). The plan has six smart city development systems and the government's priority plans, including urban systems, safety and security, livability and urban life, government services, the environment and sustainability, and access and mobility. The plan focuses on implementing technology, digitization, the use of renewable energy, and sustainability. Despite these priority plans, there are still major challenges to rethinking the prospects and potential for developing smart cities in the new capital city, especially the issues of human resources, budget capacity, infrastructure, and government bureaucratic adaptation patterns. It will be a challenge for the government in the future to be more proactive and adaptive. This study proposes to prepare a smart governance system to adapt to the new system. The limitation of this study lies in the research method that focuses on examining official government documents, so further research is needed that can exploit other data sources such as observations and interviews. This study also recommends conducting tests related to implementation development based on a solid hypothesis. With that, better analysis can be found, especially to answer more complex problems.

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