

Analysing smart governance in public service delivery: evidence from 61 smart cities in Indonesia

Prananta Radika*, Rini Rachmawati, R. Rijanta

Universitas Gadjah Mada, Indonesia

Abstract: Digital governance transformation has become crucial in Indonesia, in line with increasing urbanisation and technological innovation that drives public demand for better government services. This article examines the evolution of digital public services in 61 Indonesian cities that will become smart cities in 2023. The scope of the research focuses on the use of The study investigates the use of Information and Communication Technology (ICT) in public service delivery. Methods employed are document analysis and review of government sites. Findings indicate that numerous cities have utilised digital technology to manage their populations, licensing, and health service delivery, streamlining service provision and making it more accessible. City types differ in their levels of digital adoption. Adoption rates are higher in metropolitan and large cities than in medium and small cities. The addition of government services to big applications, particularly in large cities, is a significant step for Indonesia's digital bureaucracy. These platforms reduce the government's burden and enhance the user experience by enabling one system to do even more. So, one needs to invest in digital technology and gain support from policymakers, while also upgrading skills to overcome it. By building more super apps, we will have smarter governance that is inclusive and effective.

Key Words: *smart governance, digital public services, smart city.*

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Introduction

Digital transformation has revolutionised government business processes across the world, including Indonesia. Digital transformation in government refers to comprehensive improvements in interactions between the government and citizens, the provision of public services, and data-driven policy making (Janowski, 2015; Mergel et al., 2019; Vial, 2019), rather than simply the adoption of information technology itself. The digital era has not

*** Corresponding author**

Address: Faculty of Geography, Universitas Gadjah Mada, Yogyakarta, 55281, Indonesia
Phone: +62 82241224472 | Email: prananta.r@mail.ugm.ac.id

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only accelerated changes in how governments work but also played a major role in improving the quality of public services. Indonesia, as a large and diverse country, faces two main problems: how to deal with increasing urbanisation and how to meet the growing demand for better public services.

The percentage of Indonesia's population living in urban areas has increased steadily and significantly over time. In 2010, 49.8% of the population lived in cities. By 2035, this figure is expected to rise to 66.6%. This rapid urbanisation has impacted the demographic environment, prompting the government to provide appropriate, effective, and targeted public services (Silver, 2024). Because in the digital age, people also want fast, helpful, and high-quality government services (Wirtz et al., 2018). The necessity to fulfil these needs is increasing with the growth of the urban population and the number of computer users (Kala et al., 2024). In cities where individuals are accustomed to receiving public services quickly and of high quality, this has become a major problem.

The public service quality index (IKM) in Indonesia shows a positive change from 2020 to 2023. IKM of public service quality reflects a change from 2020 to 2023. In 2020, the index performed fairly well, scoring 81 out of 100. This number increased to 84.75 in 2021. However, the index dropped to 79.87 in 2022, only to bounce back to 80.74 in 2023. These fluctuations demonstrate that although public service reform is underway, the change is still short-lived. The growing population and migration to urban areas require public services to be more efficient to meet developmental demands. Improving public services is positive, but it does not meet public expectations.

Using ICT in government practices describes an innovative approach called smart governance and is valued as one of the components of smart cities (Meijer & Bolívar, 2016; Gil-Garcia et al., 2018). The adoption of smart cities in Indonesia is accompanied by the adoption of smart governance as well. Consequently, the advocated practice of smart governance innovations has helped improve the government's efficiency, transparency, and accountability in the provision of public services (Jiang et al., 2020; Abbas et al., 2024). The enhancement of public participation in governance facilitates more effective service delivery and enhances trust in government. In addition, the cost-effectiveness of public administration is enhanced, public demands are optimised, and government performance is improved (Veirhejen, 2015; Ahmed & Khan, 2021; Arora et al., 2024).

The promise brought about by smart governance is undoubtedly overshadowed by unaddressed issues. These issues include the lack of the required technological foundations, the imponderables of cybersecurity, and the ineffectiveness of the primary data integration process (Hashim, 2024). Beyond implementation issues, the government framework is rigid, and there are no innovative policies (Gongora & Bernal, 2015). Furthermore, public perception of smart governance services is unfortunately unreliable (Khan, 2020). This mistrust hinders the adoption of already complex services. The absence of user-sensitive design, a uniquely technocratic approach, and inadequate infrastructure to support implementation and integration further exacerbate the problem.

Building smart cities in Indonesia means incorporating digital public services as well as smart governance initiatives. In addressing problems caused by urban sprawl, the integration of sectoral public policies is of great importance for the development of smart cities, as stated by Pratama (2018). Sjafrizal and Jacob (2017) outline the basic steps that should be considered for the provision of functional digital public services in Indonesia's megacities. Appropriate and well-directed use of technology fulfils the requirements of service digitisation towards urban smart public governance. There should be holistic planning for the deployment of smart governance to ensure that digital public services, which meet the demands of the fast-growing urban population, are delivered in an effective and sustainable manner (Faidat & Khozin, 2018).

This research analyses different types of digital public services, including demographic, licensing, and health services. Enhanced digital demographic services assist in managing and processing demographic data, thereby supporting the fair and sustainable development of a region (Admar et al., 2024). Digital services, such as the licensing of community work programs, facilitate the organisation and management of these programs (Garell et al., 2016; Fedotov et al., 2020). On the other hand, digital health services improve a person's health more effectively and affordably by enabling more efficient health care (Foley et al., 2021; Rosendlund et al., 2023; Horkonen et al., 2024). The pandemic accelerated the integration of digital health services into the system, as telemedicine proved effective for remote delivery (Gomacho-Leaon et al., 2022; Rohmah et al., 2022). This condition brings forward a primary research question: the implementation of smart governance in the provision of public services in Indonesia.

Methods

This study focuses on Indonesia, particularly cities officially recognised by the Ministry of Communication and Information Technology as smart cities. As of 2023, there are 61 cities that have received this certification. Several local governments that already have smart city projects underway were selected for analysis, as both cases offer an ideal setting for examining how smart governance factors play a role in supporting citizens. This designation recognises the efforts of these cities, but, more importantly, it shows that they have developed appropriate regulations and physical infrastructure to support smart governance. An adequate and capable government is one that officially recognises this.

This study employed a quantitative approach, using secondary data from reputable Indonesian official sources. Primary data for the 61 smart city initiatives was extracted from the Smart City Master Plan Documents and the Official Government Web Portals of all 61 cities that have implemented smart city initiatives. Additional information was obtained from the Central Statistics Agency (BPS), annual reports from several ministries and agencies, and orders from ministers. Demographics, the economy, education, infrastructure, and how people use technology are all examples of the kinds of information that are included. These figures provide a comprehensive view of the socioeconomic position and ICT infrastructure, which are important for assessing how ready and able the smart government is.

The first stage in this study was to discover and collect information from three primary service areas: healthcare, population services, and licensing services. After that, all the information was arranged into a table that illustrated how it all went together. The table illustrates the type of service, which cities offer it, why it was set up, the main uses of the technology, and what the public and the government, as the service provider, have gained from it.

Government Regulation No. 59 of 2022 concerning Urban Areas and Government Regulation No. 26 of 2008 concerning the National Spatial Plan (RTRWN) were used to classify cities by population size and to conduct comparative analyses. There are three types of cities: large, medium, and small. We grouped these cities and analysed how much smart governance technology is used in public services, particularly in population, licensing, and health, for each group. This study aims to identify weaknesses, distribution patterns, and implementation trends related to urban scale.

Results

Examining Cities Adopting the Smart City Concept in Indonesia

In Indonesia, Smart Cities have received considerable attention as a means of improving city management, public services, and sustainable development (Rachmawati et al., 2024). With swift urbanisation, guardians of urban centres tend to shift from reactively assessing city needs to proactively utilising technology to improve transport, energy, public safety, and governmental service governance provisions. However, the pace of Smart City adoption remains uneven across different parts of the country and the world. Fatima et al. (2019) list some of the factors that influence the how and where of Smart initiatives as: infrastructure, economic development, population density, and governmental interest. The following analysis seeks to examine where Smart Cities are present in Indonesia and why they are unevenly distributed across the country.

The locations of Smart Cities in Indonesia are represented in Figure 1. Cities that have started Smart City initiatives are marked with red dots. There are more of these cities located on Java than on any other island. Most are situated in the central and western parts of the island. Java is the hub of Smart City development because of the more advanced ICT infrastructure located there and more budget allocations. Additionally, the high urban population density creates a considerable demand for sophisticated technical solutions (Juariah & Ubaya, 2020). Smart City implementations are primarily in advanced urban centres such as Jakarta, Bandung, Surabaya, and Yogyakarta, which enjoy government support and economic clout (Felasari & Roychansyah, 2019; Atmojo & Fridayani, 2023; Kencono et al., 2024).

There are also a number of Smart Cities in Sumatra and Kalimantan, particularly in areas with significant commercial activity. The eastern coast of Sumatra, for instance, has more Smart Cities since it has cities and commercial activity (Jiang et al., 2025).



Figure 1. Distribution of Cities Adopting the Smart City Concept in Indonesia

Source: Analysis Results 2025

The building of the new capital city (IKN) in Kalimantan has also led to Smart City projects (Rachmawati et al., 2021). In eastern Indonesia, though, there are a lot fewer Smart Cities. This includes Sulawesi, Maluku, and Papua. This is because of insufficient infrastructure, a lower population density, and budgetary limits, all of which make it harder to use technology (Ahn, 2024).

Most Smart City projects are in medium-sized cities, and 32 cities have adopted the idea. Smart City projects have also been added to 14 metropolitan areas and 12 significant cities. This indicates that metropolitan, large, and medium-sized cities have a strong preparedness for digital transformation, possibly bolstered by sustained economic growth and a rising need for efficient digital services (Syalianda & Kusumastuti, 2021). On the other hand, just three small cities have adopted Smart City technology. This is because of major problems such as a lack of infrastructure, financial constraints, and a lack of technological knowledge among government officials and residents (Atmojo & Fridayani, 2023; Ahn, 2024).

Table 1. Number of Cities Adopting the Smart City Concept in Indonesia by City Classification

City Classification	Number of Cities Implementing
Small City	3
Medium City	32
Large City	12
Metropolitan City	14
Total	61

Source: Analysis Results 2025

The spread of Smart Cities in Indonesia is largely determined by the readiness of the economy and technology, the government's financial resources, and the private sector's willingness to invest (Mahesa et al., 2019). Many people live in cities, especially on Java, so they need better ways to manage them. This is why the Smart City initiative has been adopted more quickly. On the other hand, the development of Smart Cities in remote areas is hampered by geographical and infrastructure issues (Suprayitna et al., 2021). However, as government programmes and investment grow, Smart City technology is slowly being adopted in other parts of Indonesia to accelerate digital transformation and improve city management (Thalib et al., 2021).

Adoption of ICT in Public Service Delivery in Indonesia

In Indonesia, the importance of Indonesia's Smart Governance initiative has grown because of the digitalisation of government services. To implement Smart Governance, the government has increasingly adopted digital means of public administration to improve efficiency, transparency, and accessibility (Zhang & Kaur, 2024). Government digital services not only streamline transparency but also enable citizens to acquire essential services at any time and from any place. This makes the government more open and responsive (Xanthopoulou et al., 2023; Anggara et al., 2024; Latupeirissa et al., 2024). Digital transformation is occurring in Indonesia's most vital public services, including population management, licensing, and healthcare. Each sector has its own challenges and opportunities to improve services, engage the public more actively, and strengthen governance.

Table 2 shows how different types of cities in Indonesia have varying levels of digital adoption. Full implementation has occurred in metropolitan cities and large cities. All 14

metropolitan cities and all 12 large cities now provide digital population administration services. A total of 25 out of 32 medium-sized communities have adopted this programme, reaching 78%. Interestingly, all three small communities (3 out of 3) have implemented this service. This may be because they have smaller populations, making it easier and faster to do so.

Table 2. Number of Cities Adopting ICT in Population Administration Services

City Classification	Number of Cities Implementing
Small City	3 out of 3
Medium City	25 out of 32
Large City	12 out of 12
Metropolitan City	14 out of 14

Source: Analysis Results 2025

In Indonesia, the digitisation of population management services is a key feature of Smart Governance. This makes it easier for people in large, medium and small cities to carry out administrative tasks. Switching to a digital platform makes it easier for customers to do important things such as registering, processing documents and obtaining services anytime, anywhere. Furthermore, the application of new technologies increases the transparency of the processes and the management of the public information, which is stored securely, efficiently, and precisely. This minimises risks related to mistakes, double entry, and tampering with the data. (Lazor et al. 2024).

According to Table 3, the use of digital licensing services in Indonesia is dependent on the city type. The digital licensing gap is more pronounced when looking at the different-sized metropolitan areas. Most metropolitan regions and large cities have moved beyond basic digital licensing to offering fully integrated services. In contrast, 32 mid-sized cities are worse off, with only 19 offering any form of digital licensing, leaving more than half with digital licensing still purely manual. This is especially true in small cities, where none of the three studied cities have yet adopted digital licensing.

Table 3. Number of Cities Adopting ICT in Licensing Services

City Classification	Number of Cities Implementing
Small City	0 out of 3
Medium City	19 out of 32
Large City	11 out of 12
Metropolitan City	14 out of 14

Source: Analysis Results 2025

Digital licensing systems mitigate the issues and pressures citizens and businesses face more efficiently (Haryanto et al., 2020). Previously, obtaining a licence required a visit to the appropriate government office, completion of numerous forms, and a long wait for the application to be processed. Currently, people can apply for these licenses online at any time, which has saved considerable time and money. Also, automated processing of applications increases the level of control with which applications are handled as well as the system's reliability and functionality, and decreases the risk of errors that are a result of human processing.

Digital licenses streamline government processes and make them more transparent (Al-Kaabi, 2023). By shifting processes to digital licensing, government personnel can see each

step in the licensing process, making potential corruption, discrimination, and inefficiency less likely. Furthermore, the integration of government entity data facilitates inter-agency collaboration, providing greater efficiency in the management of multi-sector licensing processes. This integration makes it easier for the government to carry out its duties and makes public services more accountable and responsive (Hermawan, 2020).

The Integrated One-Stop Investment Service (DPMPTSP) in Indonesia currently offers online licensing services for a number of non-business permits in nine important areas: health, transportation, research, education, the environment, public works, communication and information, trade, and agriculture. Digitalisation is very important for making it easier to issue and oversee different types of permits, as managing them all is so hard.

Varying types of cities in Indonesia have adopted digital healthcare services at varying rates, as shown in Table 4. Adoption rates go lower as the size of the city goes down. For example, 12 of 14 major towns have begun using digital healthcare services. Only half of the big cities (6 out of 12) have started using these services; therefore, progress is only moderate. There is a wider gap in medium and small cities, where only 9 out of 32 and 1 out of 3 have used digital healthcare technologies.

Table 4. Number of Cities Adopting ICT in Healthcare Services

City Typology	Number of Cities Implementing
Small City	1 out of 3
Medium City	9 out of 32
Large City	6 out of 12
Metropolitan City	12 out of 14

Source: Analysis Results 2025

It is clear that smaller and medium-sized cities encounter particular challenges in coping. Even as the management of population administration and licensing services has become more digital, health services in these areas remain rudimentary and underdeveloped. For people who live far away, have mobility challenges, and for other users, these services, including telemedicine, online queue registration, and access to information about doctors and clinics, can be valuable. Moreover, unnecessary doctor visits can be avoided, resulting in greater efficiency in the overall functioning of the health system.

It is crucial to increase the availability of digital health services (Andiani et al., 2022) to overcome distance limitations and make services more reachable. Online appointment scheduling, live systems for room availability, and doctor scheduling help manage patient flow, reduce waiting times, and make the most of health care resources. Unfortunately, most government-built systems still do not have real-time consultation features. Simplifying and fast-tracking early diagnosis and preventive care is vital. Adding features to improve digital health systems would greatly enhance health and make it easier for healthcare professionals to do their jobs.

Super Apps in Indonesia's Smart Governance

The rise of super apps in Indonesia is a groundbreaking step towards making public services more digital. These apps bring together a range of services, including population management, licensing, health care, and more, into a single easy-to-use platform. By allowing citizens to perform several administrative functions simultaneously, the apps

significantly enhance accessibility and speed of services (Zang et al., 2023). From the government's perspective, the integration of services addresses process redundancies and duplication of effort, and improves the user experience. Interactions with public institutions become more efficient and user-centric (Kavitha et al., 2023).

Table 5 indicates that super applications are especially preferred in large municipalities; out of 14, 8 have set up integrated digital platforms. As integrated service delivery systems are designed to improve the spatial accessibility and efficiency of public services, a number of large municipalities have implemented digital service platforms. Some well-known examples are Tangerang Live, Depok Single Window, Surabaya Single Window, and Pekanbaru Dalam Genggaman. On the other hand, only Serang has created a similar platform called Ragem, indicating that digital integration in this group remains limited. Yogyakarta, a city of medium size, has also adopted this new idea through Jogja Smart Service.

The fact that super applications are more common in big cities is because those cities have better technology, more money to spend, and more administrative power. The emergence of analogous applications in both large and medium-sized cities indicates that smaller urban centres are also recognising the advantages of digital integration and advancing towards Smart Governance.

Table 5. Cities That Have Integrated Services into a Single Unified Platform

City Types	City Name	Service Name
Metropolitan City	Tangerang	Tangerang Live
	Bandung	Bandung Sadayana
	Depok	Depok Single Window
	Bogor	Bogor Single Window
	Surabaya	Surabaya Single Window
	Pekanbaru	Pekanbaru Dalam Genggaman
	Makassar	Anrong Apps
	Medan	Mercy
Big City	Serang	Ragem
Medium City	Yogyakarta	Jogja Smart Service

Source: Analysis Results 2025

Discussions

Digital technology has advanced rapidly, transforming the way public services are delivered and enabling smart governance. Digital services for managing the population, issuing licences, and providing health services have modernised government work, but the level of digitisation still varies across cities. Metropolitan and large cities generally have higher adoption rates than medium and small cities, indicating that there are still disparities between regions. This discussion focuses on how digital services can support smart governance by analysing their benefits and drawbacks, and on how to ensure that all citizens have access to them.

Digital services make it easier for governments to operate by enabling people to perform various tasks from home (Anshari & Hamdan, 2023). Online systems streamline resident registration and document processing, and monitor population data. This accelerates and simplifies the process. Digital licenses reduce the use of paper documents, enable the tracking of applications, and speed up the issuance of permits. Telemedicine, the ability to

register for health service appointments online, and scheduled appointments have greatly improved the accessibility and usability of health services.

Digitalisation contributes significantly to the spike in openness and accountability in Smart Governance (Hien et al., 2024). Actions of the administration are subject to real-time monitoring, online recording, and evaluative systems to counteract corruption and discrimination (Harinee & Anand, 2024). The consolidation of several administrative tasks within the framework of Digitalisation promotes the development of integrated systems, which improves inter-entity cooperation and, subsequently, collaborative governance (Gasco-Hernandez et al., 2022).

Public use of digital services is uneven. Compared to medium and small towns, larger cities and metropolitan areas are more digitised. The latter cities are still dealing with underdeveloped infrastructure, and with limited funds and technical resources (Atmojo & Fridayani, 2023). Closing such gaps is necessary to provide quality public services to all. Among the digitised services, the automated population administration services are the most utilised and have the most to give in terms of growing transparency, effectiveness, and accuracy (Zhang & Kaur, 2024). Public participation widens and integrated systems bolster data security. Governments, in turn, become more attuned and responsive to the public's needs (Hassan & Ahmad, 2019).

The importance of online licensing services as a component of smart governance is evident, given the simplification of permit processing and the boost in accountability. At this point in time, about half of medium-sized cities, and a small number of small cities, have engaged in online licensing (Ahn, 2024). This is largely because most large cities and all metropolitan areas have adopted online licensing. This difference in progression suggests a breakdown in government infrastructure and in the competencies needed to handle these situations. Technology and online licensing integration, employee training, and infrastructure all need to be addressed (Thalib et al., 2021).

While the advancement of digital services in healthcare has been slower than in most other industries, it is picking up. Large digital health services are more common in urban areas, but small and medium-sized cities are still waiting for widespread implementation. Remote communities would greatly benefit from services such as online registration, access to clinic information, and consultations (Andiani et al., 2022; Rohmah et al., 2022). With government-run telemedicine services in most provinces being scarce, access to early diagnosis and preventive care will be challenging. Building on available digital health services will ease demand on the healthcare system, enhance the overall health of the population, and reduce the time it takes to access care.

Users are hindered in accessing digital services due to weak infrastructure, resource scarcity, and limited digital skills (Rachmawati et al., 2024). For the public to keep trust in digital services, the infrastructure, cybersecurity, and data protection facets of a digital system must be continuously expanded (Ahmad et al., 2020; Tiwari et al., 2023). Policy frameworks must target the provision of funds, skills, and active supportive regulations (Windholz, 2017). Governments, private enterprises, and tech firms are best positioned to deliver swift, adaptable, and innovative digital solutions tailored to the specific needs of each urban centre (Mahesa et al., 2019; Ju et al., 2024).

Integrated digital platforms, especially super apps, constitute an intelligent way to optimise potential. These platforms integrate several public services on one interface, including health, population, and licensing services. Super apps facilitate information access, enhance productivity, and allow seamless data transfer between silos. This results in improved government transparency and responsiveness (Kavitha et al., 2023; Zang et al., 2023).

Super apps have gained popularity in Indonesia. Well-implemented infrastructure and planning have benefited eight metropolitan areas, one major city and one medium-sized city. Unfortunately, in smaller cities, adoption remains low due to insufficient financing and technology, meaning Indonesia needs a customisable model that can be modulated and scaled for each region to provide this platform nationwide.

The evolution of super apps demonstrates the beginning of a more consolidated digital governance. Future work must be oriented toward inclusive scalability and citizen participation to maximise impact vertically. The more people use the services, the more feedback they provide, and, in turn, the burden decreases, and the digital governance system of Indonesia matures.

Conclusions

Digital services improve service delivery and rationalise processes. Digital services improve the accessibility and efficiency of public services. Digital services improve the accessibility and efficiency of public services. However, cities do not adopt digital technologies at the same pace. Large cities and metropolitan areas tend to adopt these technologies faster than smaller cities and medium-sized cities, though the pace varies with population size. However, cities do not adopt digital technologies at the same pace. Large cities and metropolitan areas tend to adopt these technologies faster than smaller and medium-sized cities, though adoption rates vary by population size. In large cities and metropolitan areas, organisational skills, funding, and infrastructure tend to be superior. Marginalising people from digital services undermines the principle of digital equity.

Super applications can provide fully cohesive, functioning modules for a digital governance system. They streamline access to governance services through a one-stop shop interface. This also facilitates the collaboration of government siloed agencies through data sharing. While these applications have become ubiquitous and efficient in large metros, the need for customisable, scalable models for small municipalities remains. For digital transformation to be sustainable, the collaboration between the public and private sectors must deepen, systems need to be established to capture user feedback, and robust civic tech initiatives must be developed to empower citizens.

While Indonesia strives towards smart governance, an appropriate level of equitable and inclusive digital service access is necessary and will enable community members to access instant, efficient public services. Utilising digital technologies to address existing public governance challenges will facilitate the development of a more integrated, responsive, and service-oriented governance ecosystem. In this context, such a digitally enabled governance system is likely to foster social trust and active participation in public governance.

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References

- Abbas, Q., Alyas, T., Alghamdi, T., Alkhodre, A., Albouq, S., Niazi, M., & Tabassum, N. (2024). Redefining governance: a critical analysis of sustainability transformation in e-governance. *Frontiers in Big Data*, 7. <http://doi.org/10.3389/fdata.2024.1349116>.
- Admar, A., Sirojuzilam, Badaruddin, & Rujiman. (2024). Digital Transformation Model of Population Administration Services for Regional Development through a Population Data Utilization System in Medan City. *Journal of Ecohumanism*. 3(3). 579-591. <http://doi.org/10.62754/joe.v3i3.3366>.
- Ahmad, A., Desouza, K. C., Maynard, S. B., Naseer, H., & Baskerville, R. L. (2020). *Journal of the Association for Information Science and Technology*. 71(08). 939-953. <https://doi.org/10.1002/asi.24311>.
- Ahmed, S., & Khan, M., 2021. Analysis of factors affecting government digitization: A pilot case study of Pakistan. *Computers, Materials and Continua*, 66(1), 291-301. <http://doi.org/10.32604/cmc.2020.012066>.
- Ahn, Y. (2024). An investigation of smart city development implementation in Korea: Barriers, potential and future. In J. N. Reddy, C. M. Wang, V. H. Luong, & A. T. Le (Eds.), *Proceedings of the Third International Conference on Sustainable Civil Engineering and Architecture*. ICSCEA 2023 (vol. 442). Springer. https://doi.org/10.1007/978-981-99-7434-4_2.
- AL-Kaabi, R. (2023). The impact of e-government services on customer satisfaction in the private sector: A case study of the Kingdom of Bahrain (SIJILAT), an online commercial registration. *The Electronic Journal of Information Systems in Developing Countries*, 89(6), e12275. <https://doi.org/10.1002/isd2.12275>.
- Andiani, A. F., Putra, B. T. W., & Khoiri, A. (2022). Future of Telemedicine in Indonesia During Covid-19 Pandemic Era: "Literature Review". *Health Technology Assessment in Action*. 6(02). <https://doi.org/10.18502/htaa.v6i2.12198>.
- Anggara, S. M., Hariyanto, A., Suhardi, Arman, A. A., & Kurniawan, N. B. (2024). The development of digital service transformation framework for the public sector. *IEEE Access*, 12, 146160–146189. <https://doi.org/10.1109/ACCESS.2024.3406571>.
- Anshari, M., & Hamdan, M. (2023). Enhancing e-government with a digital twin for innovation management. *Journal of Science and Technology Policy Management*. 14(06). 1055-1065. <https://doi.org/10.1108/JSTPM-11-2021-0176>.
- Arora, A., Gupta, M., Mehmi, S., Khanna, T., Chopra, G., Kaur, R., & Vats, P. (2024). Toward intelligent governance: The role of AI in policymaking and decision support for e-governance. In S. K. Singh, V. K. Singh, & S. K. Yadav (Eds.), *Machine learning and data engineering* (pp. 307–328). Springer. https://doi.org/10.1007/978-981-99-8612-5_19.
- Atmojo, M. E. & Fridayani, H. D. (2023). Bridging the Urban-Rural Divide: Exploring the Potential of Smart Technologies for Rural Micro-Enterprises in Yogyakarta City, Indonesia. *International Conference on Environment and Smart Society*. 440. <https://doi.org/10.1051/e3sconf/202344002005>.
- Faidat, N., & Khozin, M. (2018). Analisa Strategi Pengembangan Kota Pintar (Smart City): Studi Kasus Kota Yogyakarta. *JIP (Jurnal Ilmu Pemerintahan): Kajian Ilmu Pemerintahan Dan Politik Daerah*, 3(2), 171-180. <https://doi.org/10.24905/jip.3.2.2018.171-180>.
- Fatima, A., Abbas, S., Khan, M. A., Khan, M. S. (2019). Optimization of Governance Factors for Smart City Through Hierarchical Mamdani Type-1 Fuzzy Expert System Empowered

- with Intelligent Data Ingestion Techniques. *EAI Endorsed Transactions on Scalable Information Systems*. 6(23). <https://doi.org/10.4108/eai.13-7-2018.159975>.
- Felasari, S., & Roychansyah, M S. (2019). Importance performance analysis for smart city implementation in Surabaya, Indonesia. *IOP Conference Series: Earth and Environmental Science*. 340(1). <https://doi.org/10.1088/1755-1315/340/1/012039>
- Foley, K., Freeman, T., Ward, P., Lawler, A., Osborne, R., & Fisher, M. (2021). Exploring access to, use, and benefits from population-oriented digital health services in Australia. *Health Promotion International*. 36(4). 1105-1115. <https://doi.org/10.1093/heapro/daaa145>.
- Gamacho-Leon, G., Faytong-Haro, M., Carrera, K., Molero, M., Melean, F., Reyes, Y., Mautong, H., De La Hoz, I., & Cherrez-Ojeda, I. (2022). A Narrative Review of Telemedicine in Latin America during the COVID-19 Pandemic. *Healthcare*. 10(9). <https://doi.org/10.3390/healthcare10081361>.
- Garell, C., Svedberg, P., Nygren, J.M. (2016). A legal framework to support the development and assessment of digital health services. *JMIR Medical Informatics*. 4(2). <https://doi.org/10.2196/medinform.5401>.
- Gasco-Hernandez, M., Gil-Garcia, J. R., & Luna-Reyes, L. F. (2022). Unpacking the role of technology, leadership, governance, and collaborative capacities in inter-agency collaborations. *Government Information Quarterly*. 39(03). <https://doi.org/10.1016/j.giq.2022.101710>.
- Gil-Garcia, J. R., Dawes, S. S., & Pardo, T. A. (2018). Digital government and public management research: finding the crossroads. *Public Management Review*, 20(5), 633-646. <https://doi.org/10.1080/14719037.2017.1327181>
- Gongora, G., & Bernal, W. (2015). Factores clave en la gestion de tecnologia de informacion para sistemas de gobierno inteligente. *Journal of Technology Management and Innovation*, 10(4), 109-117. <https://doi.org/10.4067/s0718-27242015000400012>.
- Harinee, S., & Anand, M. V. (2024). Digital Solutions for Crime Control: A Comprehensive Criminal Identification and Reporting Framework. *11th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions)*. <https://doi.org/10.1109/ICRITO61523.2024.10522465>.
- Harkonen, H., Lakoma, S., Verho, A., Torkki, P., Laskela, R., Pennanen, P., Laukka, E., & Jansson, M. (2024). Impact of digital services on healthcare and social welfare: An umbrella review. *International Journal of Nursing Studies*, 152. <https://doi.org/10.1016/j.ijnurstu.2024.104692>.
- Haryanto, R., Manaf, A., & Priambudi, B. N. (2020). The level of community readiness in Semarang Regency for online single submission of building permits. *IOP Conference Series: Earth and Environmental Science*. 562(01). <https://doi.org/10.1088/1755-1315/562/1/012008>.
- Hashim, H. (2024). E-government impact on developing smart cities initiative in Saudi Arabia: Opportunities and Challenges. *Alexandria Engineering Journal*, 96. 124-131. <https://doi.org/10.1016/j.aej.2024.04.008>.
- Hassan, N. H. M., & Ahmad, K. (2019). A Review on Key Factors Data Integration Implementation in Public Sector. *Proceedings of the International Conference on Electrical Engineering and Informatics*. <https://doi.org/10.1109/ICEEI47359.2019.8988826>.
- Hermawan. (2020). Online single submission (OSS) system: A licensing services breakthrough in local government?. *International Journal of Innovation, Creativity and Change*. 10(11).
- Hien, B. N., Tuyen, N. T. K., Lan, N. T., Ngan, N. T. K., & Thanh, N. N. (2024). The Impact of Digital Government Initiatives on Public Value Creation: Evidence from Ho Chi Minh

- City – Vietnam. *Resvita de Gestao Social e Ambiental*. 18(02). <https://doi.org/10.24857/RGSA.V18N2-092>.
- Janowski, T. (2015). Digital government evolution: From transformation to contextualization. *Government Information Quarterly*, 32(3), 221-236. <https://doi.org/10.1016/j.giq.2015.07.001>
- Jiang, H., Geertman, S., Witte, P. (2020). Avoiding the planning support system pitfalls? What smart governance can learn from the planning support system implementation gap. *Environment and Planning B: Urban Analytics and City Science*, 8(47), 1343-1360. <https://doi.org/10.1177/2399808320934824>.
- Jiang, L., Xuan, Y., & Zhang, K. (2025). Dynamic interaction and evolution analysis of the resource-environment-economy-society complex system in China under the advancement of smart cities. *Renewable Energy*. 244. <https://doi.org/10.1016/j.renene.2025.122704>.
- Ju, J., Liu, L., & Feng, Y. (2024). Governance mechanism of public-private partnerships for promoting smart city performance: A multi-case study in China. *Cities*. 153. <https://doi.org/10.1016/j.cities.2024.105295>.
- Juariah, R. S., & Ubaya, H. (2020). Visualization of Twitter geo-location for equalization analysis of smart cities in Indonesia. In *2020 International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS)* (pp. 278–283). IEEE. <https://doi.org/10.1109/ICIMCIS51567.2020.9354293>.
- Kala, D., Chaubey, D., Meet, R., & Al-Adwan, A. (2024). Impact of User Satisfaction With E-Government Services on Continuance Use Intention and Citizen Trust Using TAM-ISSM Framework. *Interdisciplinary Journal of Information, Knowledge, and Management*. 19. <https://doi.org/10.28945/5248>.
- Kavitha, D., Maheswari, B. U., & Sujatha, R. (2023). Super apps: The natural progression in fin-tech. In *Fintech and cryptocurrency*. Wiley. <https://doi.org/10.1002/9781119905028.ch17>.
- Kencono, D. S., Pradipta, R. N., Agustiyara, A. (2024). Managing Bandung City for a Smart Economy in Society: The Role of the Bandung City Government. *E3s Web of Conference*. 594. <https://doi.org/10.1051/e3sconf/202459407002>.
- Khan, Z., Abbasi, A., & Pervez, Z. (2020). Blockchain and edge computing-based architecture for participatory smart city applications. *Concurrency and Computation: Practice and Experience*. 32(12). <https://doi.org/10.1002/cpe.5566>.
- Latupeirissa, J. J. P., Dewi, N. L. Y., Prayana, I. K. R., Srikandi, M. B., Ramadiansyah, S. A., & Pramana, I. B. G. A. Y. (2024). Transforming Public Service Delivery: A Comprehensive Review of Digitization Initiatives. *Sustainability*, 16(7), 2818. <https://doi.org/10.3390/su16072818>.
- Lazor., Lazor, O., Zubar, I., Zabolotnyi, A., & Yunyk, I. (2024). The Impact of Digital Technologies on Ensuring Transparency and Minimising Corruption Risks among Public Authorities. *Pakistan Journal of Criminology*. 16(02). 357-374. <https://doi.org/10.62271/pjc.16.2.357.374>.
- Mahesa, R., Yudoko, G., & Anggoro, Y. (2019). Dataset on the sustainable smart city development in Indonesia. *Data in Brief*. 25. <https://doi.org/10.1016/j.dib.2019.104098>.
- Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences*, 82(2), 392-408. <https://doi.org/10.1177/0020852314564308>.
- Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, 36(4), 101385. <https://doi.org/10.1016/j.giq.2019.06.002>

- Pratama, A.B. (2018). Smart City Narrative in Indonesia: Comparing Policy Documents in Four Cities. *Public Administration Issues*, 65–83. <http://dx.doi.org/10.17323/1999-5431-2018-0-6-65-83>.
- Rachmawati, R. (2025). Concept and definition of smart city, village, and region. In R. Rachmawati (Ed.), *Smart city, village, and region: Innovation and praxis in several countries* (pp. 1–24). Gadjah Mada University Press.
- Rachmawati, R., Haryono, E., & Rohmah, A. A. (2021). Developing smart city in the new capital of Indonesia. *2021 IEEE International Smart Cities Conference (ISC2)*, Manchester, United Kingdom, 1–7. <https://doi.org/10.1109/ISC253183.2021.9562891>.
- Rachmawati, R., Reinhart, H., Rohmah, A. A., Sensuse, D. I., & Sunindyo, W. D. (2024). Smart Sustainable Urban Development for the New Capital City of Indonesia. *Journal of Urban and Regional Analysis*, 16(1), 85–113. <https://doi.org/10.37043/JURA.2024.16.1.4>
- Rohmah, A. A., Rachmawati, R., & Mei, E. T. W. (2022). Digital transformation of health service through application development in handling COVID-19 in Indonesia. In *2022 International Conference on ICT for Smart Society (ICISS)* (pp. 01–06). IEEE. <https://doi.org/10.1109/ICISS55894.2022.9915235>.
- Rosenlund, M., Kinnunen, U., & Saranto, K. (2023). The Use of Digital Health Services Among Patients and Citizens Living at Home: Scoping Review. *Journal of Medical Internet Research*. 25, e44711. <https://doi.org/10.2196/44711>.
- Silver, C. (2024). Rapid urbanization: The challenges and opportunities for planning in Indonesian cities. In B. P. Resosudarmo & Y. Mansury (Eds.), *The Indonesian economy and the surrounding regions in the 21st century* (New Frontiers in Regional Science: Asian Perspectives, Vol. 76). Springer. https://doi.org/10.1007/978-981-97-0122-3_3.
- Sjafrizal, T. & Jacob, D. (2017). The Critical Factors Affecting e-Government Adoption in Indonesia: A Conceptual Framework. *International Journal on Advanced Science, Engineering and Information Technology*. 7. <https://doi.org/10.18517/ijaseit.7.1.1614>.
- Suprayitna, F. R., Munawaroh, L. A., Azmi, M. A., Besari, A. I., & Rachmawati, R. (2021). Challenges in developing and implementing smart city in Palangka Raya. In L. T. T. Huong & G. M. Pomeroy (Eds.), *AUC 2019. Advances in 21st century human settlements* (pp. 343–355). Springer. https://doi.org/10.1007/978-981-15-5608-1_26.
- Syalianda, S. I., & Kusumastuti, R. D. (2021). Implementation of Smart City Concept: A Case of Jakarta Smart City, Indonesia. *IOP Conference Series: Earth and Environmental Science*. 716(1). <https://doi.org/10.1088/1755-1315/716/1/012128>.
- Thalib, P., Sabrie, H. Y., Kurniawan, F., & Aliansa, W. (2021). Role Model of Legal Support for Implementation Smart City in Indonesia. *Review of International Geographical Education Online*. 11(4). <https://doi.org/10.33403/rigeo.800638>.
- Tiwari, M., Tiwari, T., Ticku, A., Dadhwal, H., & Singh, T. (2023). Methodologies and Challenges of Cybersecurity Techniques in Cloud Computing Environment. *ACM International Conference Proceeding Series*. 182. <https://doi.org/10.1145/3647444.3652492>.
- Verheijen, T., Bhatti, Z., & Kusek, J. (2015). Smart government solutions in emerging economies: Making the leap ahead. *Proceedings of the European Conference on e-Government, ECEG*, 292–299.
- Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, 28(2), 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>.
- Windholz, E. L. (2017). *Governing through Regulation: Public Policy, Regulation and the Law*. Routledge.

- Wirtz, B. W., Weyerer, J. C., & Geyer, C. (2018). Artificial Intelligence and the Public Sector—Applications and Challenges. *International Journal of Public Administration*, 42(7), 596–615. <https://doi.org/10.1080/01900692.2018.1498103>.
- Xanthopoulou, P., Antoniadis, I., & Avlogiaris, G. (2023). Unveiling the drivers of digital governance adoption in public administration. *Problems and Perspectives in Management*, 21(4), 454-467. <https://doi.org/10.3390/su16072818>.
- Zang, X., Hu, B., Chu, J., Zhang, Z., Zhang, G., Zhou, J., & Zhong, W. (2023). Commonsense knowledge graph towards super APP and its applications in Alipay. In *Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining* (pp. 5509–5519). <https://doi.org/10.1145/3580305.3599791>.
- Zhang, M. & Kaur, M. (2024). Toward a theory of e-government: Challenges and opportunities, a literature review. *Journal of Infrastructure, Policy and Development*. 8(10). <https://doi.org/10.24294/jipd.v8i10.7707>.