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Research Article

Review of E-government Policy as the Foundation for Smart City Transformation in Indonesia: Opportunities and Challenges

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Abstract.

Since the issuance of Presidential Instruction No. 3 of 2003 on the National Policy and Strategy for E-Government Development, Indonesia has progressively integrated information technology into its governance structures. This study aims to identify the challenges that hinder this transformation and to propose strategies that can enhance public service delivery, promote transparency, and support economic growth, thereby strengthening national competitiveness. The adoption of e-government and the smart city concept are critical technological instruments for improving public service delivery, necessitating adequate regulation. This study reviews the current state of e-government in Indonesia, identifies challenges to its implementation, and proposes strategies for transforming traditional governance into digital governance as part of the smart city transformation. Key challenges include the slow adoption of technological changes, the digital divide, a lack of data integration, inadequate Information and Communication Technology (ICT) competence, and regulatory gaps. By addressing these challenges, through enhancing public service delivery, promoting transparency, facilitating economic growth, supporting smart city development, and strengthening national competitiveness, Indonesia can improve the effectiveness of e-government and implement a digitally empowered government. The findings provide insights for policymakers and contribute to strategies for optimizing e-government to support smart city initiatives in Indonesia.

Keywords: e-government policy, smart city, information and communication technology (ICT), digital transformation

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1. INTRODUCTION

The development of e-government in Indonesia represents an important shift in the way public administration and services are delivered, laying the groundwork for the country's transformation into a smart city ecosystem. The Indonesian government has recognized the critical role that information and communication technology (ICT) plays in modern governance, starting with the issuance of Presidential Instruction No. 3 of 2003, which

established the National Policy and Strategy for E-Government Development. This policy aimed to implement ICT to enhance the efficiency and accessibility of public services, providing transparency and supporting democratic processes [1]. The momentum continued with the issuance of Presidential Regulation No. 95 of 2018, which mandated the implementation of the Electronic-Based Government System (SPBE) across all levels of government. This regulation underscores the government's commitment to integrating e-government practices into both central and local governance structures, ensuring cohesive and effective service delivery across the nation [2]. Indonesia's journey in e-government has been marked by gradual but significant progress, particularly in the E-Government Development Index (EGDI). Initially, the country's position on the EGDI was moderate, often trailing behind regional and global counterparts. However, recent years have seen a marked improvement, with Indonesia reaching a high EGDI category by 2022. This reflects the government's ongoing efforts to strengthen digital governance and improve the quality of public services [3]. Despite these advancements, the implementation of e-government at the regional and provincial levels reveals a mixed picture. According to a study by Dwiyanto (2022), most regions are still primarily at the E-Information stage, with only a few provinces demonstrating a commitment to more advanced stages such as E-Participation. This suggests that while digital platforms are increasingly used for information dissemination and service delivery, active citizen engagement in policy-making remains limited [4].

The significance of e-government as a foundation for smart city transformation in Indonesia cannot be overstated. As cities globally strive to become smarter and more sustainable, the integration of e-government services becomes essential in managing urban resources effectively. This is particularly relevant for Indonesia, where the adoption of smart city technologies—such as IoT, big data, and artificial intelligence—depends heavily on the existing e-government infrastructure [5]. The successful implementation of these technologies will not only enhance public service delivery but also promote greater transparency, reduce corruption, and support economic growth by creating a conducive environment for business and innovation [6]. However, the path to fully realizing the potential of e-government in Indonesia is fraught with challenges. Issues such as the digital divide, slow adaptation to technological changes, and lack of data integration pose significant obstacles to the effective implementation of e-government initiatives [7]. Moreover, the competence of government employees in ICT and the need for stronger leadership and regulatory frameworks further complicate the transition [8]. Addressing these challenges will require concerted efforts from both the

central and local governments, as well as a commitment to continuous improvement in digital governance practices [9,10]. So, this study aims to identify the challenges that hinder this transformation and to propose strategies that can enhance public service delivery, promote transparency, and support economic growth, thereby strengthening national competitiveness. Through this review, the study seeks to provide insights and recommendations for policymakers to optimize e-government practices as a foundation for smart city initiatives in Indonesia.

2. METHODOLOGY

The methodology for this study centers on an extensive literature review, which serves as the foundation for analyzing the impact of e-government policies on the transformation of Indonesian cities into smart cities.

2.1. Identification of Relevant Literature

The first step involved identifying relevant literature that addresses e-government policies, smart city initiatives, and their intersection in Indonesia. This was achieved by searching academic databases through Google Scholar, JSTOR, IEEE Xplore, and Scopus. Keywords used in the search included “e-government in Indonesia,” “smart city transformation,” “digital governance,” “ICT in public administration,” and “EGDI in Southeast Asia.” The search also extended to official publications from Indonesian government agencies, including the Ministry of Communication and Information Technology, the Ministry of Administrative and Bureaucratic Reform, and the National Development Planning Agency (Bappenas). Additionally, reports from international organizations such as the United Nations (UN) and the World Bank were reviewed for insights into global benchmarks and comparisons.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria included:

1. Publications that specifically address e-government initiatives and policies in Indonesia.
2. Studies that explore the concept of smart cities within the Indonesian context.

3. Comparative studies that include Indonesia in their analysis of e-government or smart city development.
4. Reports and papers published within the last 5 years to ensure the inclusion of the most recent developments.

Exclusion criteria involved:

1. Studies that do not directly relate to Indonesia or Southeast Asia.
2. Outdated publications that do not provide relevant insights into the current e-government landscape.
3. Non-peer-reviewed articles or sources lacking academic rigor.

2.3. Data Collection and Categorization

Key categories included:

1. E-Government Policy and Implementation: Focusing on the legal frameworks, policy development, and implementation strategies of e-government in Indonesia.
2. Smart City Initiatives: Examining the integration of ICT in urban governance, the role of e-government in enabling smart cities, and specific case studies of Indonesian cities.
3. Challenges and Opportunities: Addressing the barriers to successful e-government implementation and smart city transformation, as well as the potential benefits and opportunities.
4. Comparative Analysis: Comparing Indonesia's progress with other countries in the region and globally, particularly through the lens of the E-Government Development Index (EGDI).

3. RESULT AND DISCUSSION

3.1. E-Government Policy in Indonesia

The development of e-government in Indonesia has been a significant focus of the government since the issuance of Presidential Instruction No. 3 of 2003, which laid the

foundation for the National Policy and Strategy for E-Government Development. This policy marked the government's serious commitment to utilizing information technology to enhance governance. The main goal was to improve the quality of public services by making them more efficient and accessible, thereby promoting transparency and implementing democratic processes. The legal and regulatory framework supporting e-government in Indonesia was further strengthened by the issuance of Presidential Regulation No. 95 of 2018, which mandated the implementation of the Electronic-Based Government System (SPBE) across all levels of government. This regulation underscores the importance of integrating e-government practices in both central and local governments to ensure cohesive and efficient public service delivery.

E-government in Indonesia has evolved over the years, with notable progress reflected in the E-Government Development Index (EGDI). Significant improvements were noted in subsequent years, with Indonesia reaching a high EGDI category by 2022, showcasing the government's continuous efforts to improve digital governance. Furthermore, based on the results of the 2019 SPBE evaluation, the majority of the participating provinces received a "Good" rating. The evaluated aspects included governance policies, service policies, institutional frameworks, strategy and planning, ICT, government administration services, and public services [4]. The classification of the primary dimensions of E-Government in Indonesia can be divided into three main categories: E-Information, E-Services, and E-Participation [11–13].

1. E-Information refers to an information service system that provides information to citizens. This dimension has several limitations, such as the availability of limited, slow, and inaccurate information, and the absence of direct interaction between the system and the users. Consequently, users often experience dissatisfaction with these information services, leading to negative attitudes and behaviors that do not generate productive feedback [4].

2. E-Services involve actions, efforts, or performances where the delivery is based on information technology. According to Rowley (2006), E-Services consist of three main components: service providers, service recipients, and service channels that use information technology [14]. Jeong (2007) further elaborates that E-Services are online services enabling transactions between service providers and recipients, facilitating more efficient and effective service delivery through digital platforms [4].

3. E-Participation emphasizes the active involvement of citizens in the policy-making process, transforming them from consumers to producers of policy initiatives. The goal of E-Participation is to broaden the scope of citizen participation, utilizing technology to facilitate diverse communication techniques within the community, and providing relevant information that is easier for citizens to understand and engage with on a deeper level [15]. This dimension is crucial for implementing a more inclusive and participatory governance model, where citizens' inputs significantly contribute to shaping public policies.

Figures 1, 2, and 3 show the results of the study by Dwiyanto (2022) related to the mapping of E-Government across 34 provinces in Indonesia [4].

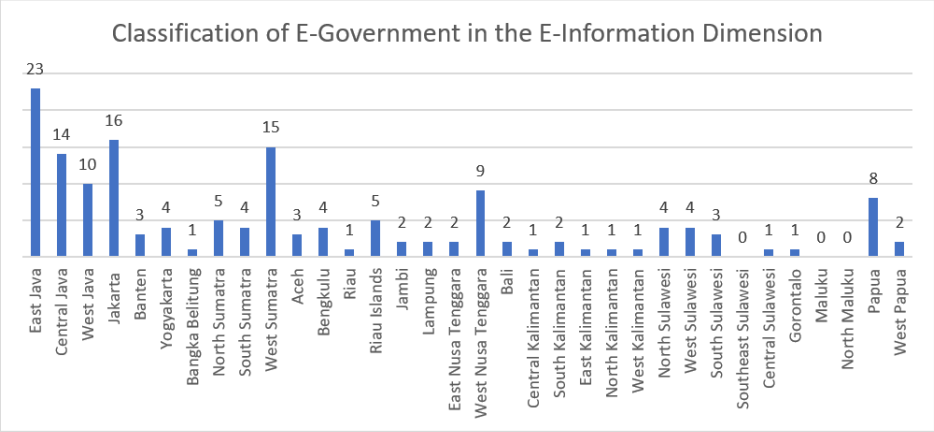


Figure 1: Classification of E-Government in the E-Information Dimension [4].

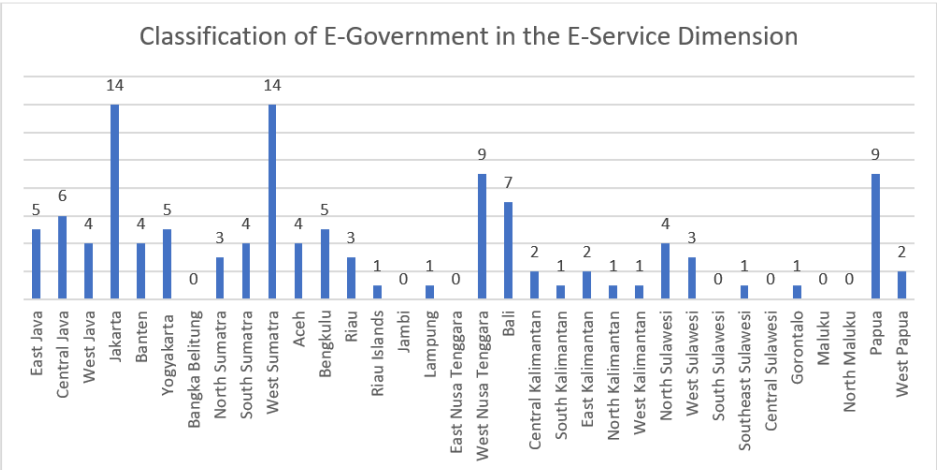


Figure 2: Classification of E-Government in the E-Service Dimension [4].

Study from Dwiyanto (2022) showed that that the implementation of E-Government at the regional and provincial levels in Indonesia is still primarily at the E-Information

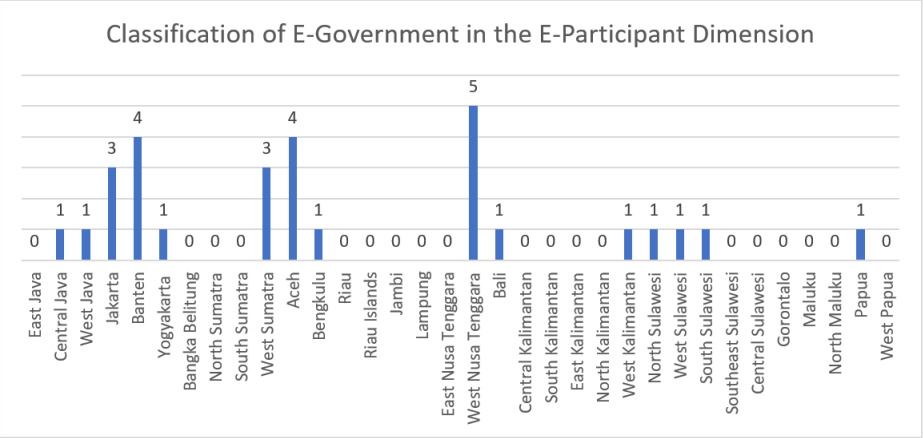


Figure 3: Classification of E-Government in the E-Participant Dimension [4].

stage, followed by E-Service. When examining each dimension of the E-Government classification, only a few provinces have shown a commitment to implementing E-Participation [4]. This suggests that while there has been progress in providing information and services through digital platforms, active citizen involvement in the policy-making process remains limited across most provinces.

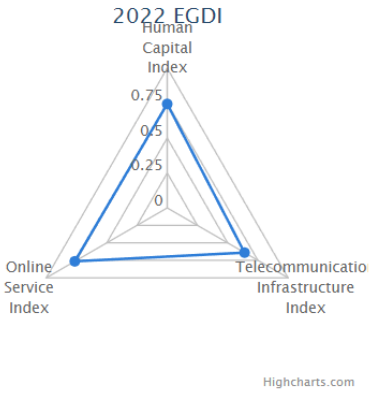
3.2. Review of Indonesia EDGI

The E-Government Development Index (EGDI) is a critical tool developed by the United Nations (UN) to evaluate the progress and implementation of e-government initiatives across countries. First introduced in the World Public Sector Report in 2001, EGDI ranks nations based on their scores across key dimensions, reflecting the effectiveness of their digital governance infrastructure [16]. The core purpose of EGDI is to encourage improvements in government efficiency, transparency, and citizen participation through the adoption of Information and Communication Technology (ICT) [5,17]. EGDI is composed of three primary components: online service provision, telecommunication infrastructure, and human capital. These components are evaluated to determine how well a country is implementing ICT to improve public services, enhance public participation, and streamline government operations [18]. The development and application of e-government are seen as important in addressing the inefficiencies in governance, particularly in Southeast Asian and South Asian regions, where digital governance frameworks are still maturing [3]. For instance, in South Asia, countries like Afghanistan, Bangladesh, and Sri Lanka have consistently ranked lower on the EGDI, reflecting challenges in technological adoption and infrastructure development [19]. These nations

struggle with issues such as limited internet access, particularly in rural areas, which hampers the broader implementation of e-government services [20].

In contrast, Southeast Asian nations like Singapore and Malaysia have performed better, demonstrating the effectiveness of robust ICT infrastructure in driving e-government initiatives [21]. An increase in a country's EGDI score can lead to significant governance improvements, including enhanced transparency and accountability. For example, Meuleman et al. (2022) argue that higher EGDI scores are associated with greater accessibility of government information, which in turn provides public trust and strengthens democratic processes [22]. Moreover, MácHová et al. (2018) emphasize that e-government reduces bureaucratic inefficiencies and corruption, contributing to more efficient public administration [23]. The automation of routine governmental tasks allows officials to focus on strategic decisions, thereby improving overall governance [24]. The impact of EGDI on public participation is also noteworthy. Higher scores often correlate with increased citizen engagement through digital platforms, including online consultations and electronic voting [25]. Enhanced e-government services improve the quality and accessibility of public services, reducing the time and costs for citizens to interact with government entities [26].

In Indonesia, for example, the 2022 EGDI score was 0.7160, positioning the country 77th globally, a notable improvement from its 88th rank in 2020. This advancement reflects progress in digital infrastructure and online services, which have strengthened Indonesia's e-government framework [2]. However, despite these gains, Indonesia still trails behind regional leaders like South Korea and Singapore, where digital governance is more advanced [1,28].



E-Government (2022 EGDI: 0.7160)	
2022 Rank	77
Group	HEGDI
Rating Class	HV
2020 Rank	88
Change	-11

E-Participation (2022 EPART: 0.7159)	
2022 Rank	37
2020 Rank	57
Change	-20

Figure 4: Indonesia EGDI Overview [2].

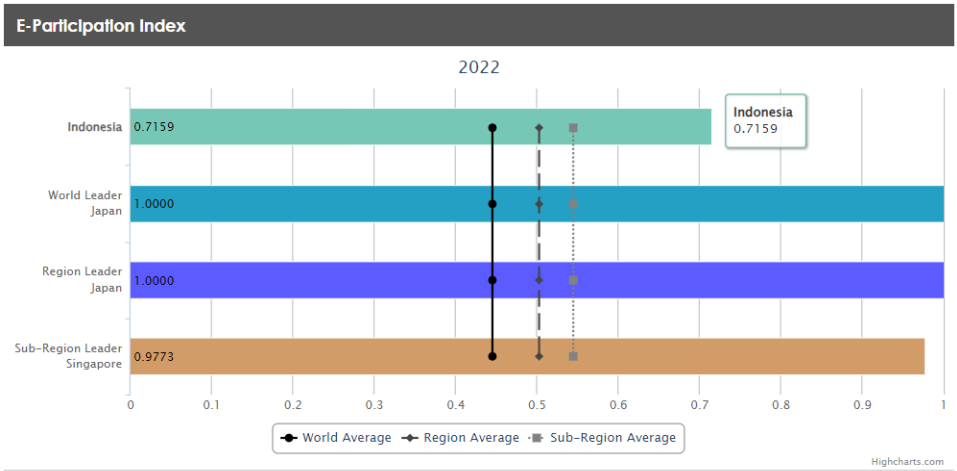
Table 1: The global distribution of EGDI scores with a focus on Southeast Asia.

Country	EGDI Rank	EGDI Group	OGDI Group	Observations
Singapore	6	Very High EGDI	Very High OGDI	Singapore ranks very high on the EGDI, reflecting its advanced digital infrastructure and governance practices.
Malaysia	29	Very High EGDI	Very High OGDI	Malaysia has made significant progress in digital governance, with a focus on improving public service delivery through e-government initiatives.
Thailand	51	Very High EGDI	Very High OGDI	Thailand's EGDI ranking is very high, with improvements in e-government services, though issues related to digital inclusion still persist.
Indonesia	53	Very High EGDI	Very High OGDI	Indonesia shows very high progress, with ongoing efforts to enhance digital governance, although challenges remain in reaching more remote areas.
Philippines	57	Very High EGDI	Very High OGDI	The Philippines is making significant progress but faces challenges related to digital infrastructure and public access to e-services.
Vietnam	70	High EGDI	Middle OGDI	Vietnam has seen steady progress in e-government development, focusing on expanding digital services and infrastructure.
Brunei Darussalam	100	High EGDI	Middle OGDI	Brunei Darussalam ranks high on the EGDI, with ongoing efforts to improve digital governance but faces challenges in open data implementation.
Cambodia	129	Middle EGDI	Low OGDI	Cambodia ranks low, with limited progress in digital governance due to economic and infrastructural constraints.
Myanmar	168	Middle EGDI	Low OGDI	Myanmar ranks low on the EGDI, facing significant challenges in political stability and ICT infrastructure, hindering e-government development.
Laos	175	Low EGDI	Low OGDI	Laos has a low EGDI and OGDI rank, with severe limitations in ICT infrastructure and digital governance capabilities.

Source: [3,27]

The E-Participation Index, a component of EGDI, shows that Indonesia has made significant strides in enhancing citizen engagement through digital platforms. In 2022, Indonesia's E-Participation Index score rose to 0.7159, placing it 37th globally, a marked improvement from 57th place in 2020 [2]. However, as Figure 5 shows, the country still faces challenges in closing the gap with global leaders like Japan and Singapore, where digital participation is more widespread and effective [29,30].

This comparative analysis underscores both the progress and ongoing challenges that countries like Indonesia face in enhancing their EGDI scores. While there have been improvements in digital governance, issues such as digital literacy, infrastructure



E-Participation Index	2022	2020	2018	2016	2014	2012	2010	2008	2005	2004	2003
Indonesia (Rank)	37	57	92	114	110	66	86	135	34	32	41
Indonesia (Value)	0.71590	0.75000	0.61800	0.37288	0.29411	0.21050	0.12857	0.04545	0.28571	0.26229	0.25860

Figure 5: Indonesia EGDI Overview Indonesia E-Participation Index [2].

development, and socio-economic disparities continue to hinder broader participation and effective e-governance [9,10].

3.3. The Adoption of Smart Sustainable City in Indonesia

The concept of a Smart Sustainable City is rooted in the effective and integrated management of resources, implementing Information and Communication Technology (ICT) to enhance the quality of urban life. It embodies a vision of urban governance where resources are managed in an interconnected and integrated manner, enabling more efficient and responsive city services. As cities worldwide vie to become smarter and more sustainable, they increasingly adopt the Internet of Things (IoT) as a core approach. This involves deploying sensors to collect, control, and analyze data using big data technologies, transforming raw data into actionable insights for critical decision-making processes. These insights drive improvements in various sectors, including transportation, crime prevention, waste management, water resource availability, and public services like education, healthcare, and energy [31].

The successful implementation of Smart Sustainable Cities depends on the seamless synchronization and integration of ICT with physical infrastructure. IoT networks enable functional connections between digital and physical elements, linking them to essential urban services and engaging with the community at large. The adoption of smart city technologies is influenced by several critical factors, including technological infrastructure, organizational readiness, governance frameworks, government policies,

economic conditions, and the overall work environment. In managing smart cities, six key dimensions must be considered: smart governance, smart economy, smart living, smart people, smart mobility, and smart environment [32]. Among the various models guiding smart city development, the Garuda Smart City Model and the Boyd Cohen Wheel are particularly noteworthy, offering comprehensive frameworks that address the multifaceted nature of smart cities. These models emphasize the integration of intelligent governance, infrastructure, economy, citizens, environment, and mobility [31].

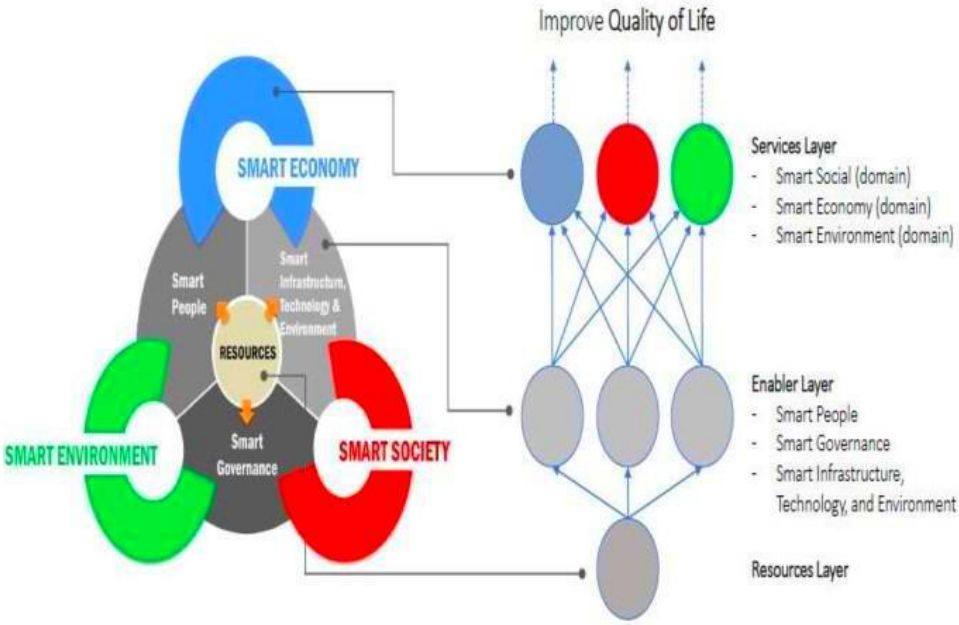


Figure 6: Garuda Smart City Model [31].

The adoption of smart city technologies is not merely a matter of technological implementation but also depends on the acceptance and approval of these technologies by users. Research in this area has explored various success factors for smart city adoption, including the acceptance of smart locks in smart homes, IoT-based smart meters, smart payment systems, and smart home insurance [31]. Additionally, the adoption of consumer IoT technologies and mobile payment systems (M-Payment) reflects the broader trend of integrating digital solutions into daily urban life, underscoring the importance of aligning technology with user needs and preferences [31].

3.4. E-Government and the Impact on Smart City Transformation

E-Government has become an important element in the transformation of cities into Smart Cities across Indonesia. The effectiveness of e-government services is crucial for

the successful adoption of Smart Sustainable City initiatives through the E-Government Services Effectiveness Evaluation Framework (E-GEEF), which evaluates factors like system quality, information quality, and service quality to drive smart city transformation on Madura Island [31]. In Jakarta, the implementation of Smart City concepts underscores the significance of ICT infrastructure and public engagement in enhancing service delivery and management [33]. Similarly, Maharani et al. (2023) highlights that strong ICT infrastructure is foundational for effective governance and public service efficiency in Padang Panjang [34]. In Makassar, e-government-based urban governance plays a vital role in ensuring the success of smart city programs through effective planning, organization, and control [35]. Additionally, the successful implementation of e-government in Bandung is critical for providing stakeholder collaboration and developing robust digital infrastructure [36], despite the challenges related to digital divide and infrastructure issues, particularly in e-parking systems [37]. In Sungai Penuh, Nadila (2021) emphasizes the role of e-government in realizing Good Governance and smart city transformation, supported by effective institutions and competent officials [38]. Lastly, Manalu (2024) argues that e-government forms the backbone of Smart City transformation in Bengkulu [39], stressing the importance of infrastructure, financial resources, and human capacity development [31,35].

Table 2: E-Government and the Impact on Smart City Transformation.

No.	References	Provinces in Indonesia	Theory	Result (E-Government and Impact on Smart City Transformation)
1	[31]	Madura Island	E-Government Services Effectiveness Evaluation Framework (E-GEEF): to assess the effectiveness of e-government services in adopting Smart Sustainable City initiatives. It evaluates various factors like system quality, information quality, and service quality to measure how well e-government services contribute to the development of smart cities.	E-Government initiatives, through the E-GEEF model, are crucial in driving Smart Sustainable City transformation by identifying key adoption factors.
2	[33]	Jakarta	Smart City Implementation: examines the concept of Smart City implementation, focusing on the integration of technology in urban governance to improve public services. It highlights the importance of ICT infrastructure and public engagement in transforming traditional cities into smart cities.	E-Government infrastructure and user engagement significantly enhance Smart City transformation in Jakarta, enabling better service delivery and management.

Table 2: Continued.

No.	References	Provinces in Indonesia	Theory	Result (E-Government and Impact on Smart City Transformation)
3	[34]	Padang Panjang	E-Government Development as a Step Toward Smart Government: discusses how the development of e-government serves as a foundational step towards achieving Smart Government. It emphasizes the need for strong ICT infrastructure to support effective governance and public service delivery in smart cities.	Improved ICT infrastructure via e-government is essential for effective Smart City transformation, enabling better governance and public service efficiency.
4	[35]	Makassar	Urban Governance in Smart City: focuses on the role of urban governance in the successful implementation of smart city programs. It explores how e-government-based governance can lead to better planning, organization, implementation, and control in urban management.	E-Government contributes to Smart City transformation in Makassar by ensuring good urban governance through effective planning, organization, and control.
5	[36]	Bandung	E-Government as Smart Governance Implementation: examines the implementation of e-government within the framework of smart governance. It stresses the importance of collaboration among stakeholders and the development of digital infrastructure to ensure the success of smart city initiatives.	E-Government facilitates Smart City success in Bandung by providing stakeholder collaboration and developing robust digital infrastructure.
6	[37]	Bandung	E-Government Implementation in E-Parking - discusses the challenges of implementing e-government initiatives, specifically in the context of e-parking systems. It highlights the barriers such as digital divide, workforce issues, and infrastructure challenges that affect the effectiveness of e-government services.	E-Government's impact on Smart City in Bandung is hindered by challenges such as digital divide and infrastructure issues, limiting the effectiveness of e-parking.
7	[38]	Sungai Penuh	Electronic Government and Smart City Implementation - focuses on how Electronic Government (e-government) supports the realization of Good Governance and the transformation into a Smart City. It emphasizes the role of governance principles, institutions, and competent officials in achieving these goals.	E-Government provides Smart City transformation in Sungai Penuh by prioritizing good governance principles, supported by effective institutions and competent officials.
8	[39]	Bengkulu	E-Government as the Basis of Smart City Program - This theory explores the role of e-government as a foundational element in implementing smart city programs. It underscores the importance of infrastructure, financial resources, and human capacity development in the success of smart city initiatives.	E-Government forms the backbone of Smart City transformation in Bengkulu, with emphasis on infrastructure, financial resources, and human capacity development.

3.5. Opportunities in E-Government Policy as the Foundation for Smart City Transformation in Indonesia

The adoption of e-government in Indonesia presents significant opportunities, especially as a foundation for the transformation into smart cities. As the country continues to integrate digital technologies into public administration and service delivery, several key opportunities emerge that can drive this transformation forward

3.5.1. Enhancing Public Service Delivery

One of the most immediate opportunities presented by e-government is the enhancement of public service delivery. By providing digital platforms, the government can provide services that are more accessible, efficient, and responsive to citizens' needs. For example, e-government initiatives can streamline administrative processes, reduce the time required for transactions, and improve the overall quality of services offered to the public. This is particularly important in a country like Indonesia, where the geographic spread and diversity of the population pose challenges for traditional service delivery methods [2]. The use of e-government can thus play a crucial role in bridging these gaps, ensuring that even remote areas have access to essential services.

3.5.2. Promoting Transparency and Reducing Corruption

E-government has the potential to significantly enhance transparency within government operations, thereby reducing opportunities for corruption. Digital platforms can make government data and processes more open and accessible to the public, allowing for greater oversight and accountability. This transparency is crucial in building trust between the government and its citizens, a key factor in effective governance [8]. Additionally, by automating processes and reducing human intervention in transactions, e-government can minimize the potential for corrupt practices, leading to a more ethical and efficient public sector.

3.5.3. Facilitating Economic Growth

The integration of e-government into the broader economy offers substantial opportunities for economic growth. Digital government services can support the development

of a more robust digital economy by providing a conducive environment for businesses, particularly small and medium-sized enterprises (SMEs), to thrive. For instance, online licensing, taxation, and regulatory compliance services can reduce the administrative burden on businesses, making it easier for them to operate and expand. This, in turn, can stimulate innovation and entrepreneurship, contributing to overall economic growth [6].

3.5.4. Supporting Smart City Development

E-government provides the necessary infrastructure and technological framework for the development of smart cities. Smart cities rely on the integration of various digital technologies—such as the Internet of Things (IoT), big data, and artificial intelligence (AI)—to improve urban living. E-government platforms can facilitate the collection and analysis of data, enabling better decision-making and resource management within cities. This can lead to more sustainable urban development, with improved public transportation, energy efficiency, and waste management systems [7]. Moreover, the interconnectivity provided by e-government can enhance citizen engagement, allowing for more participatory governance in smart cities.

3.5.5. Strengthening National Competitiveness

On a broader scale, the successful implementation of e-government can enhance Indonesia's global competitiveness. As more countries adopt digital governance, those that lead in this area are better positioned to attract foreign investment, provide international trade, and participate in the global digital economy. By improving its e-government infrastructure and services, Indonesia can position itself as a regional leader in digital governance, which is crucial for its aspirations to become a more competitive and dynamic economy within the ASEAN region [2].

3.6. Challenges in the Implementation of E-Government in Indonesia

The implementation of e-government in Indonesia faces significant challenges, which hinder the progress toward an effective smart city transformation. These challenges, as identified through discussions with key governmental bodies such as the Ministry

of Administrative and Bureaucratic Reform (MENPAN), the Ministry of Communication and Information Technology (KOMINFO), the Ministry of National Development Planning (Bappenas), and the Agency for the Assessment and Application of Technology, can be broadly categorized into several key areas: slow adaptation to technological changes, digital divide, and lack of data integration.

3.6.1. Slow Adaptation to Technological Change

One of the major hurdles in the implementation of e-government is the sluggish response to the rapid developments in information and communication technology (ICT). The existing e-government policies are often criticized for not keeping pace with the dynamic changes in technology and the growing public demand for digital services. For instance, despite the fact that 64% of Indonesians are internet users, and there are over 338.2 million mobile phone connections—124% of the total population—government regulations and policies have not adequately addressed the needs arising from these digital advancements [7]. This gap has resulted in increased demand for online services, a surge in online transactions, and significant growth in online-based industries, yet government responses remain slow and insufficient.

3.6.2. Digital Divide

The digital divide is another critical barrier, reflecting the unequal access to ICT across different regions and demographics in Indonesia. This divide not only hampers the equitable implementation of e-government but also exacerbates social inequalities. The lack of infrastructure in rural and remote areas further widens this gap, preventing a large segment of the population from accessing essential e-government services [8]. Moreover, the gap in digital literacy among the population means that even when digital services are available, they are not fully utilized due to the lack of knowledge and skills.

3.6.3. Lack of Data Integration

Data integration remains a substantial challenge in the e-government ecosystem in Indonesia. Government agencies have developed multiple budget-related applications independently, leading to duplicative efforts and inefficient use of resources. A survey

by the National ICT Council (2018) revealed that 65% of Indonesian government institutions requested duplicate budgets for similar unnecessary applications. This issue is further compounded by the low level of data integration across agencies, resulting in poor data validity and exchange. Despite having around 2,700 data centers across 630 government institutions, most do not meet international standards, making data integration a significant hurdle [7].

3.6.4. Inadequate ICT Competence among Government Employees

The competence of government employees in ICT is another critical issue. While most employees possess basic ICT skills, such as word processing and web usage, the more advanced skills required for developing and managing digital public services are lacking. This skills gap hinders the effective implementation and operation of e-government systems. Additionally, there is a pervasive fear among government officials that embracing e-government might threaten their existing positions, leading to resistance to digital transformation [7].

3.6.5. Leadership and Regulatory Gaps

The implementation of e-government is also stymied by weak leadership and inadequate regulations. The lack of alignment between central and local government policies, insufficient budget allocations, and unclear system standardization all point to a need for stronger leadership commitment to e-government initiatives. The success of e-government projects is often dependent on the commitment of local leaders, such as governors, regents, or mayors, who can drive these initiatives within their jurisdictions [40].

4. CONCLUSION

The integration of e-government policies in Indonesia represents a pivotal step toward the nation's smart city transformation. As the country seeks to modernize its urban governance through digital solutions, the progress made since the issuance of Presidential Instruction No. 3 of 2003 underscores the government's commitment to enhancing public service delivery, promoting transparency, and strengthening national competitiveness. Despite notable advancements, such as the improvement in the E-Government

Development Index (EGDI), significant challenges persist, including slow technological adaptation, digital divides, and a lack of data integration. Addressing these challenges is critical for fully realizing the potential of e-government as a foundation for smart city initiatives. The opportunities presented by e-government, particularly in enhancing public services, reducing corruption, and facilitating economic growth, offer a roadmap for Indonesia to not only improve the quality of urban life but also to position itself as a leader in digital governance within the ASEAN region. However, success will require concerted efforts from both central and local governments, as well as strong leadership and a commitment to continuous improvement in ICT infrastructure and digital literacy.

References

[1] Setiawan I, Pape U, Beschorner N. Bagaimana mengatasi ketidakmerataan akses internet di Indonesia. World Bank 2022. https://blogs.worldbank.org/in/eastasiapacific/bagaimana-mengatasi-ketidakmerataan-akses-internet-di-indonesia

[2] United Nations. UN E-Government Knowledgebase 2024. https://publicadministration.un.org/egovkb/en-us/Data/Country-Information/id/78-Indonesia

[3] Nurhidayat N, Nurmandi A, Misran M. Evaluation of the Challenges of E-Government Implementation: Analysis of the E-Government Development Index in Indonesia. J Manaj Pelayanan Publik. 2024;8(2):371–83.

[4] Dwiyanto D. Dasar Hukum bagi E-Government di Indonesia: Studi Pemetaan Hukum pada Pemerintah Daerah. Court Rev J Penelit Huk. 2022;2:1–11.

[5] Kabbar EF. A comparative analysis of the e-government development index (EGDI). 14th Int Conf ICT, Soc Hum Beings, ICT 2021, 18th Int Conf Web Based Communities Soc Media, WBC 2021 13th Int Conf e-Health, EH 2021 - Held 15th Multi-Conference Comput Sci Inf Syst MCCSIS 2021 2021:23–9. https://doi.org/10.33965/ict2021_202106L003.

[6] AL Qudah MA, Muradkhanli L; AL Qudah MA. Muradkhanli L. the Use of Generative Artificial Intelligence for Customer Services. Probl Inf Technol. 2024;15(1):10–7.

[7] Susilawati FE, Yanti R, Erni E. Transformasi Digital Pemerintah (Studi Kasus: implementasi e-Government dan Hambatannya). J Soc Soc. 2023;3(2):80–94.

[8] Alcaide Mu noz L, Rodríguez Bolívar MP. International e-government development: Policy, implementation and best practice. Int E-Government Dev Policy, Implement.

Best Pract. 2017;:1–320.

[9] Fuchs C. Social media and the public sphere. TripleC. 2014;12(1):57–101.

[10] Funilkul S, Chutimaskul W. The framework for sustainable eDemocracy development. Transform Gov People. Transforming Gov. 2009;3(1):16–31.

[11] Lee AC, Chang K, Berry FS, Lee C, Berry FS. Perspective Published by: Wiley on behalf of the American Society for Public Administration in Public Sector Testing the Development and Diffusion of E-Government and E-Democracy: A Global Perspective Information (IT) means of improving technology In 2018;71:444–54.

[12] Manoharan A. A Study of the Determinants of County E-Government in the United States. Am Rev Public Adm. 2013;43(2):159–78.

[13] Nam T. Determining the type of e-government use. Gov Inf Q. 2014;31(2):211–20.

[14] Rowley J. An analysis of the e-service literature: towards a research agenda. Internet Res. 2006;16(3):339–59.

[15] Macintosh A. Characterizing e-participation in policy-making. Proc Hawaii Int Conf Syst Sci 2004;37:1843–52.

[16] Adams SO, Paul C. E-government development indices and the attainment of United Nations sustainable development goals in Africa: A cross-sectional data analysis. Eur J Sustain Dev Res. 2023;7(4):em0234. https://doi.org/10.29333/ejosdr/13576.

[17] Bilal JT. Ensuring Transparency and Access To Information in the Management of Public Institutions Through E-Government. Proc 11Th Int Manag Conf Role Manag Econ Paradig Xxist Century (Imc 2017) 2017:88–98.

[18] Olphert W, Damodaran L. Citizan Participation and Engagement in the Design of E-Government Services: The Missing Link in Effective ICT Design and Delivery. J Assoc Inf Syst. 2007;8(9):491–508.

[19] Younus M, Pribadi U, Nurmandi A, Rahmawati IZ. Comparative analysis of E-Government Development Index: a case study of South Asian countries. Transform Gov People, Process Policy 2023;17:552–74. https://doi.org/https://doi.org/10.1108/TG-05-2023-0068

[20] Schandl H, West J. Resource use and resource efficiency in the Asia-Pacific region. Glob Environ Change. 2010;20(4):636–47.

[21] Tanesia RK, Suryani D, Yudha FM, Ramba J. KAJIAN SEGMENTASI PASAR DAN STRATEGI PEMASARAN USAHA JASA KONSTRUKSI DI NEGARA-NEGARA ASEAN (Studi Kasus: indonesia vs Filipina). J Tek Sipil. 2017;13(3):216–27.

[22] Meuleman J, Kwok WM, Aquaro V. Open Government Data for Sustainable Development: Trends, Policies and Assessment: Continuing the Pilot Assessment

of the Open Government Data Index (OGDI). ICEGOV 2022 15th Int Conf Theory Pract Electron Gov 2022. https://doi.org/10.1145/3560107.3560149.

[23] Máchová R, Volejníková J, Lněnička M; MácHová R. Volejníková J, Lněnička M. Impact of E-government Development on the Level of Corruption: Measuring the Effects of Related Indices in Time and Dimensions. Rev Econ Perspect. 2018;18(2):99–121.

[24] Chun SA, Shulman S, Sandoval R, Hovy E. Government 2.0: making connections between citizens, data and government. Inf Polity. 2010;15(1,2):1–9.

[25] Kneuer M. E-democracy: A new challenge for measuring democracy. Int Polit Sci Rev. 2016;37(5):666–78.

[26] Wahyu Sulistya AQ, Bastian Sulistiyo B, Aditya F, Aritonang ID, Amos Simangunsong S, Shihab MR, et al. A case study of indonesian government digital transformation: Improving public service quality through E-government implementation. Proc - 2019 5th Int Conf Sci Technol ICST 2019 2019. https://doi.org/10.1109/ICST47872.2019.9166234.

[27] Ministry of Communication and Information Technology of Indonesia. Hasil Survei PBB, e-Government Indonesia Naik Peringkat 2020. https://www.kominfo.go.id/content/detail/30024/hasil-survei-pbb-e-government-indonesia-naik-peringkat/0/artikel

[28] West DM. Digital Government: Technology and Public Sector Performance. Princeton University Press; 2005.

[29] Kassebaum NJ, Barber RM, Dandona L, Hay SI, Larson HJ, Lim SS, et al.; GBD 2015 Maternal Mortality Collaborators. Global, regional, and national levels of maternal mortality, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016 Oct;388(10053):1775–812.

[30] Muqoffa AN, Mawar M, Serikandi N. Manfaat Sosial Media dalam E-Government di Indonesia. J JISPENDIORA. 2022;1:34–41.

[31] Darmawan AK, Siahaan DO, Susanto TD. Hoiriyah, Umam BA, Bakir B. Exploring Factors Influencing Smart Sustainable City Adoption using E-Government Services Effectiveness Evaluation Framework (E-GEEF). 2020 3rd Int Conf Inf Commun Technol ICOIACT 2020 2020:234–9. https://doi.org/10.1109/ICOIACT50329.2020.9332140.

[32] Neirotti P, De Marco A, Cagliano AC, Mangano G, Scorrano F. Current trends in smart city initiatives: some stylised facts. Cities. 2014;38:25–36.

[33] Syalianda SI, Kusumastuti RD. Implementation of smart city concept: A case of Jakarta Smart City, Indonesia. IOP Conf Ser Earth Environ Sci. 2021;716(1):012128.

[34] Maharani FM, Putera RE, Ariany R. Pengembangan E-Government sebagai Langkah Mewujudkan Smart Government di Kota Padang Panjang. J Ranah Publik Indones Kontemporer. 2023;1:50–67.

[35] Hardi R, Gohwong S. E-Government Based Urban Governance on the Smart City Program in Makassar, Indonesia. J Contemp Gov Public Policy. 2020;1(1):12–7.

[36] Kesuma AA, Yulianto AS, Dwi S S. Dwi S S. E-Government As A Form Of Smart Governance Implementation At Bandung Smart City. J Indones Sos Teknol. 2023;4(12):2469–80.

[37] Rachmawati T, Fitriyanti KD. Analysis of the E-government initiative at local government level in Bandung City, Indonesia. J Ilmu Sos Dan Ilmu Polit. 2021;25(1):62–80.

[38] Nadila E, Septiani E. Implementasi Electronic Government Dalam Mewujudkan Good Governance Dan Smart City [JAN Maha]. J Adm Nusant Mhs. 2021;3:72–83.

[39] Manalu M, Rahayu D, Rahayu N. E-Government Sebagai Basis Program Smart City di Kota Bengkulu. J STIA Bengkulu Committe to Adm Educ Qual. 2024;10(1):85–96.

[40] Syartissaputri NP, Setiyowati E, Siwabessy L. Hubungan Antara Manajemen Waktu dengan Kemandirian Belajar Siswa Kelas X SMA Negeri 56 Jakarta. INSIGHT J Bimbing Dan Konseling. 2014;3:88–94.