

Analyzing Digital Maturity as an Implementation to Assess the Responsiveness of E-Government

Dwi Wiranto^{1*}; Achmad Nurmandi²; Herman Lawelai³;
Muhammad Younus⁴; Wahdania Suardi⁵

^{1,2,5}Department of Government Affairs and Administration, Faculty of Social and Political Sciences, Jusuf Kalla School of Government, Faculty of Social and Political Sciences, Universitas Muhammadiyah Yogyakarta
Yogyakarta City, Indonesia 55183

³Departement of Government Studies, Faculty of Social and Political Sciences, Universitas Muhammadiyah Buton
Sulawesi Tenggara, Indonesia 93724

⁴Department of Product Research and Software Development, TPL Logistics Pvt Ltd.
Karachi, Pakistan 75300

¹dwiwiranto1010@gmail.com; ²nurmandi_achmad@umy.ac.id; ³hermanlawelai92@gmail.com;
⁴mohammedyounusghazni@gmail.com; ⁵suardiwahdania@gmail.com

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Abstract - The research analyzed digital maturity in assessing the responsiveness of e-government services. The research is driven by the issue that many governments struggle to deliver responsive and efficient digital services due to uneven levels of digital maturity. Technological infrastructure gaps, limited digital competencies, and rigid bureaucratic processes hinder the creation of adaptive e-government systems. Using a scientometric analysis method, the research evaluated literature published from 2019 to 2024, sourced from the Scopus database, and employed RStudio and CiteSpace tools for data visualization and trend mapping. The findings reveal that high levels of digital maturity significantly improved public service efficiency, transparency, and citizen engagement. These improvements are achieved through effective integration of digital technology, organizational transformation, and citizen-centered service design. The research also identifies persistent challenges, such as low digital literacy, infrastructure inequality, resistance to change, and data security concerns, all of which obstruct the realization of responsive e-government. The research contributed originality through a multidimensional approach, offering a strategic framework to evaluate e-government effectiveness using digital maturity indicators such as

accessibility, service quality, and public satisfaction. It emphasizes the need for sustained investment in infrastructure, digital literacy programs, and cross-sector collaboration involving the government, private sector, and civil society. Additionally, it identifies opportunities for future research to explore how emerging technologies—such as artificial intelligence, blockchain, and big data—can enhance transparency, efficiency, and inclusivity in public services. Overall, the research positions digital maturity as a key enabler of adaptive and effective governance in the digital era.

Keywords: digital maturity, e-government, digital transformation, responsiveness

I. INTRODUCTION

The increasing reliance on digital technology has transformed how governments interact with citizens and deliver public services (Mergel et al., 2019). As a concept, e-government refers to the integration of information and communication technologies (ICTs) to improve governmental operations, transparency, and responsiveness to public needs (Lindgren et al., 2019). Over the past decade, numerous studies have explored the multifaceted nature of e-government, emphasizing its potential to enhance efficiency, facilitate citizen

*Corresponding Author

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engagement, and address administrative challenges. However, the extent to which digital maturity can be a robust framework for assessing e-government responsiveness remains underexplored (Andersen et al., 2011).

E-government, information and communication technologies (ICT) to deliver government services, has become a pivotal aspect of modern public administration (Zhang, 2011; Goloshchapova et al., 2023). It aims to enhance service delivery, increase transparency, and improve citizen engagement by providing direct services to citizens, businesses, and other government entities (Buell et al., 2021; Waddington et al., 2019). Digital maturity in e-government refers to the extent to which these digital services are developed, integrated, and utilized effectively to meet the needs of the public (Nazmetdinova & Kalmykova, 2023; Wessiani et al., 2021).

In the "network society era," digital communication processes have significantly transformed the relationship between governments and their citizens (García-Ruiz & Pérez-Escoda, 2020; Volodenkov, 2019). E-government, which refers to the use of digital tools and systems to provide public services, has become a critical area of focus for enhancing governmental efficiency, transparency, and citizen engagement (Santos et al., 2014; Hashim, 2024). Digital maturity in e-government is essential as it helps assess how well governments leverage digital technologies to meet these objectives (Al-Fadhli et al., 2023; AlMurtadha, 2024). Digital maturity models, which have been extensively used in the private sector, are now being adapted to evaluate the effectiveness and responsiveness of e-government initiatives (Al-Fadhli et al., 2023).

E-government research has highlighted the critical role of digital maturity in ensuring the success of digital initiatives. Digital maturity refers to the stage at which organizations, particularly public institutions, integrate digital tools and processes into their operational and strategic frameworks (Aras & Büyüközkan, 2023).

Previous research has highlighted the importance of digital maturity in e-government. Moreover, research has shown that higher levels of digital maturity correlate with improved public service delivery, increased transparency, and greater citizen participation (Distel & Becker, 2018). For instance, the evaluation of Brazilian state government websites reveals that while digital tools are widely used, their effectiveness in promoting democratic engagement and innovation varies significantly (Santos et al., 2014). Similarly, research in Indonesia has indicated that e-government is still in the developmental stages, with a need for more comprehensive maturity assessments to enhance accountability and reduce corruption (Sari et al., 2021).

Furthermore, the development of digital maturity models tailored to the public sector has been a focus of recent studies. These models integrate factors from established business maturity frameworks and adapt

them to the unique needs of government institutions (Al-Fadhli et al., 2023). For example, Indonesia's *Sistem Pemerintahan Berbasis Elektronik* (SPBE) maturity model in Indonesia assesses e-government maturity across various dimensions, including input, process, and output, to provide a holistic view of digital public service quality (Wessiani et al., 2021).

Despite these advancements, challenges persist. The digital divide, characterized by unequal access to technology, continues to hinder the inclusiveness of digital services (Liao et al., 2022). Furthermore, issues such as data security, trust in digital platforms, and the bureaucratic resistance to change have been identified as critical barriers to achieving higher levels of digital maturity (Ślusarczyk & Wiśniewska, 2024).

The research addresses the following question: How can digital maturity be effectively analyzed to assess the responsiveness of e-government services? By investigating this question, the study seeks to develop a robust framework for evaluating digital maturity in e-government, thereby providing insights into the effectiveness of digital services and identifying strategies for enhancing their responsiveness to citizen needs. The research contributes to the ongoing efforts to improve e-government systems and ensure they meet the evolving demands of the digital age.

In response to the empirical phenomenon of rapid global e-government adoption but variable results due to challenges such as digital infrastructure gaps, low digital literacy, and data security issues, the research aims to deeply analyze the role of digital maturity as a framework for assessing the responsiveness of e-government services. The locus of the research is not bound to a particular geographical area. Still, it focuses on global scientific discourse using the scientometric analysis method of relevant literature sourced from the Scopus database from 2019 to 2024. Through this approach, the research aims to answer how digital maturity can be effectively analyzed to assess the responsiveness of e-government services and to develop a robust framework for evaluating and improving public services in the digital era.

II. METHODS

The research applies scientometric analysis to examine research on digital maturity as a method to assess the responsiveness of e-government (Batcha, 2018). Moreover, the research uses the Scopus database because of its extensive capabilities. The goal is to identify trends, important topics, and the evolution of research topics. Scopus is widely recognized for its comprehensive coverage of peer-reviewed literature in various fields, making it an appropriate foundation for an exhaustive literature review. Using Scopus allows for a comprehensive examination of developing and disseminating research findings related to digital maturity as an implementation to assess the responsiveness of E-Government (Ravšelj et al., 2022).

The Scopus database is searched to ensure a comprehensive and systematic collection and analysis of relevant literature, and the resulting dataset is exported in CSV format (Liao et al., 2022). The data is then imported into RStudio and CiteSpace applications for visualization and analysis. These tools are an integral part of the methodological framework of scientific reviews, allowing researchers to visualize patterns, map bibliometric networks, and efficiently synthesize data. Using RStudio and CiteSpace facilitates a better understanding of the collected literature, thus enabling a more comprehensive analysis of the data retrieved from Scopus. This methodological approach is consistent with standard data collection and analysis practices in scientometric research and emphasizes the importance of visual aids in data extraction and synthesis.

Figure 1 presents the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram, which outlines the systematic process used to identify, screen, assess, and include studies in the final review. This approach ensures that only studies meeting predefined inclusion criteria relevant to the research topic are incorporated into the systematic review.

In the identification phase, 3,596 records are retrieved from a single database. Notably, no records are removed before screening due to duplication, automation tools, or other reasons. This finding indicates a clean and careful initial data extraction

process with no redundant entries.

During the screening phase, all 3,596 records are assessed and none are excluded, allowing all retrieved records to proceed to the eligibility assessment phase. A more detailed evaluation is conducted at the eligibility stage, excluding 3,131 reports based on several criteria. The reasons for exclusion included publication year ($n = 1,817$), document type ($n = 414$), publication stage ($n = 23$), publication language ($n = 66$), and subject area ($n = 903$). These exclusion categories reflect the predefined focus and scope of the review.

Ultimately, 465 studies meet the inclusion criteria and are included in the final review. This number also represents the total number of included study reports, with one per study. Overall, the PRISMA diagram demonstrates a rigorous, transparent, and methodologically sound process of literature selection, aligned with PRISMA guidelines, thereby enhancing the validity and reliability of the review findings.

The query for this research is: (TITLE-ABS-KEY ("e-government ") AND TITLE-ABS-KEY ("digital")) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SUBJAREA , "SOCI"))

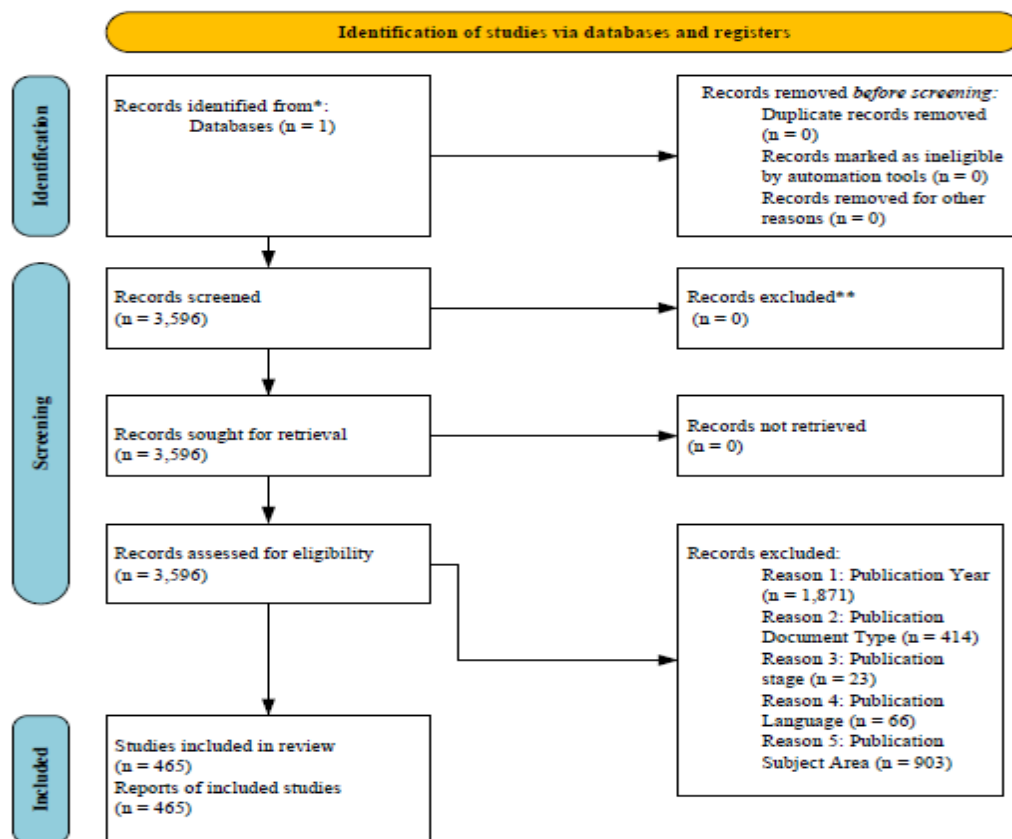


Figure 1 Prisma Diagram Research Topic
Source: Author

The query analysis shows that the search focuses on scholarly works that address the topic of 'e-government' and the 'digital' aspect of social science. The retrieved research included only finalised journal articles and conference papers published between 2019 and 2024, in English-language publications. The focus aims to ensure that the results are relevant, up-to-date, and derived from publications that have undergone a formal review process. By limiting to social science subjects, the analysis directs the search to studies highlighting social, cultural, or policy aspects in implementing and developing e-government and digital transformation. It is important to understand the social impact of digital initiatives in government.

III. RESULTS AND DISCUSSIONS

The number of publications and the collaboration map are key indicators that illustrate the growth and dynamics of collaboration in a particular research field. The number of publications reflects the level of productivity and scientific interest in a topic. Concurrently, the collaboration map demonstrates the cooperation network between researchers, institutions, and countries and the dissemination of knowledge and innovation across the scientific community. This analysis enables the identification of key trends, collaborative strengths, and potential opportunities for future advancement within a field.

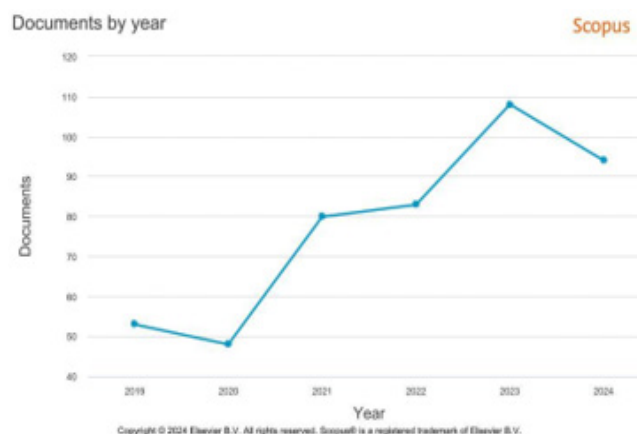


Figure 2 Publications over the year
Source: Scopus (Elsevier, 2024)

Figure 2 shows the number of documents published in Scopus from 2019 to 2024, with yearly trends. In 2019, the number of documents hovered around 50, indicating early attention to a particular topic. However, there was a slight decrease in 2020. This decline was most likely influenced by the COVID-19 pandemic, which led to a change in research priorities in various fields. Even so, from 2020 to 2021, the number of publications increased sharply. This surge could reflect a more active academic response to global challenges, such as adopting digital

technologies or new policies relevant to the pandemic.

The upward trend continued from 2021 to 2023, with the number of documents reaching more than 100 in 2023. This increase indicates that the topic is increasingly relevant and attracting greater research attention. It could be related to accelerated digitization, government transformation, or policy development that leverages technology. Publications in these years represent the peak of research activity with many new results published to address challenges or opportunities in specific sectors.

However, in 2024, the graph showed a decrease in the number of documents compared to the previous year. The decline could be due to several factors, such as less focus on this topic because of the emergence of new issues, limited funding, or a shift in research direction. However, this trend is not strong enough to be concluded as a long-term decline. Further analysis is needed to determine whether this is a normal fluctuation or the first sign of a trend change. Overall, this graph reflects a large increase in the topic's relevance over the past five years, illustrating opportunities to deepen research or explore related topics that have not been widely covered.



Figure 3 Collaboration Map
Source: RStudio

Figure 3 shows the pattern of relationships between countries in related research. Countries such as the United States, China, and Europe dominate the collaboration, as shown by the dark blue color of their regions. The connecting paths between countries show that international collaboration is very active, especially between developed countries in North America, Europe, and East Asia.

Regional collaboration is evident in regions such as Asia and Europe. Countries such as India, Japan, and South Korea have strong research links with China and the United States. However, collaboration from developing countries, such as Southeast Asia, Africa, and South America, tends to be more limited. The lighter blue color indicates low engagement in global research networks.

This map shows the imbalance in research collaboration between countries. Developed countries dominate research networks, while developing countries have lower connectivity. Efforts to encourage more inclusive collaboration, such as involving

developing countries in global research projects, can help reduce this gap and strengthen research capabilities at the international level.

Trends and issues research is an in-depth analysis of the current dynamics and challenges of government data security in smart cities, identifying key patterns and shifts in the focus of existing research. In the context of scientometric analysis, this involves monitoring the latest developments in publications, identifying new technologies and strategic approaches, and assessing the issues that arise as science and technology advance. Understanding these trends makes it possible to understand emerging areas and address critical scientific progress issues.



Figure 4 Occurrence topic
Source: RStudio

Figure 4 shows that e-government is the central theme in recent publications and research. This term dominates the visualization, indicating that academic and practical attention to digitizing public services is very high. E-government reflects the transformation of government from manual or conventional systems to digital technology, improving the effectiveness, efficiency, and transparency of public services.

Words such as digital transformation, digital maturity, and digital government also appear fairly large. The research focuses on applying technology

and the government's readiness to adopt and manage digital change comprehensively. Terms such as public administration, public services, and public sector indicate that digital transformation cannot be separated from governance and the quality of services provided to the public. Technologies such as ICT and processes such as digitization and digitalization reinforce the important role of digital infrastructure in supporting e-government systems.

Contextual issues such as COVID-19, trust, smart cities, and e-participation reflect the external and social dynamics that shape the direction of e-government policy and implementation. The COVID-19 pandemic has been the main catalyst for accelerating the digitalization of public services, while public trust and engagement are important indicators in assessing the success of digital government systems. These terms emphasize that e-government is not only about technology, but also about how technology can be used to build more open, participatory, and responsive relationships between government and society.

Table 1 shows research topics with a significant increase in citations at various periods. The topic of open government has the longest dominance, indicating that digital transformation in government has been a major focus of research for many years, with citation spike strengths of 2.98. Initially, topics such as information and communication technologies and digital transformation dominated, reflecting attention to the development of technological infrastructure and digitization processes in the public sector.

Attention shifted to more specific issues such as trust and cybersecurity, demonstrating the importance of building public trust in digital systems and maintaining data security. In the current period, the topics of trust and cybersecurity have become particularly relevant due to the increasing digital security risks and the need to protect user privacy. E-government is now focused on technological

Table 1 Top Topic with the Strongest Citation Bursts

Keywords	Year	Strength	Start	End	2019-2024
Open government	2019	0.151388889	2019	2020	<div><div></div></div>
Developing country	2019	2.49	2019	2020	<div><div></div></div>
Smart cities	2020	0.095833333	2020	2021	<div><div></div></div>
Social media	2020	0.095138889	2020	2022	<div><div></div></div>
Government data processing	2021	2.04	2021	2022	<div><div></div></div>
Public value	2021	0.090972222	2021	2022	<div><div></div></div>
Digital skills	2021	0.090972222	2021	2022	<div><div></div></div>
COVID-19	2022	0.110416667	2022	2024	<div><div></div></div>
Digital inclusion	2022	0.109027778	2022	2024	<div><div></div></div>
E-learning	2022	0.089583333	2022	2024	<div><div></div></div>

Source: CiteSpace

innovation, service sustainability, and security.

This analysis reflects the evolution of research from basic technology development to more complex strategic issues. In the future, research should strengthen efforts to build trust and enhance security in e-government, ensuring reliable public services that are responsive to people's needs.

Topic mapping is a scientific analysis method employed to identify, visualize, and comprehend relationships and structures in the research literature. Through this technique, researchers can explore how different research topics are interconnected, identify key trends and patterns, and reveal cluster topics that often appear together in scientific publications.

Figure 5 shows the relationship between concepts in three main groups. The green group includes conceptual framework, privacy, e-government adoption, and leadership. This group focuses on theoretical and strategic approaches. The red group centers on digital transformation, trust, public administration, and democracy. It reflects the impact of digitalization on government and society. Meanwhile, the blue groups address themes related to policy, green economy, and the European Union, which relate to public policy and sustainability.

The horizontal axis illustrates the shift from practical applications on the left to strategic discussions on the right. The vertical axis shows the level of abstraction, with the top more theoretical and the bottom more implementation-focused. The red clusters look the densest, indicating that digital transformation in government is a major concern in the data. This map reveals the importance of concepts such as e-government and digital transformation, which connect different themes.

The timeline and evolution view of the research topic is a visual representation that clearly illustrates how the focus and direction of public administration data security research in smart cities has evolved and changed over time. It reveals changing trends,

governance technological advances, and shifts in priorities and challenges faced in urban data security management.

Figure 6 shows the development of e-government research topics from 2019 to 2024. The topic of “electronic government” is at the center of the map, with strong connections to various subtopics such as information and communication technology, digitalization, and new technology adoption. The research highlights how governments are using technology to improve public services. Terms such as “information and communication technology” and “digital technology” show the considerable influence of technology in driving digital transformation in the government sector.

Recent research trends, shown in red, 2024, include terms such as “digital inclusion,” “public value,” and “circular economy.” It reflects attention to how technology can create social, economic, and environmental value. However, challenges such as “digital divide,” “trust,” and “digital literacy” also appear, indicating the need to address the digital divide, increase public trust, and strengthen digital literacy. The terms “local government” and “exploring local challenges” highlight the importance of addressing local issues to create solutions relevant to local communities' needs.

The COVID-19 pandemic is also an important factor driving the accelerated adoption of digital technologies, as indicated by the term “COVID-19.” In addition, “competing ecosystem” and “blockchain” underscore the importance of technological innovation and competition in the digital ecosystem. The research shows that e-government continues to evolve with a focus on responsiveness, inclusiveness, and sustainability to support more adaptive and effective public services.

Figure 7 shows the evolution of research topics related to e-government from 2019 to 2024. In 2019-2020, research focused on the foundations

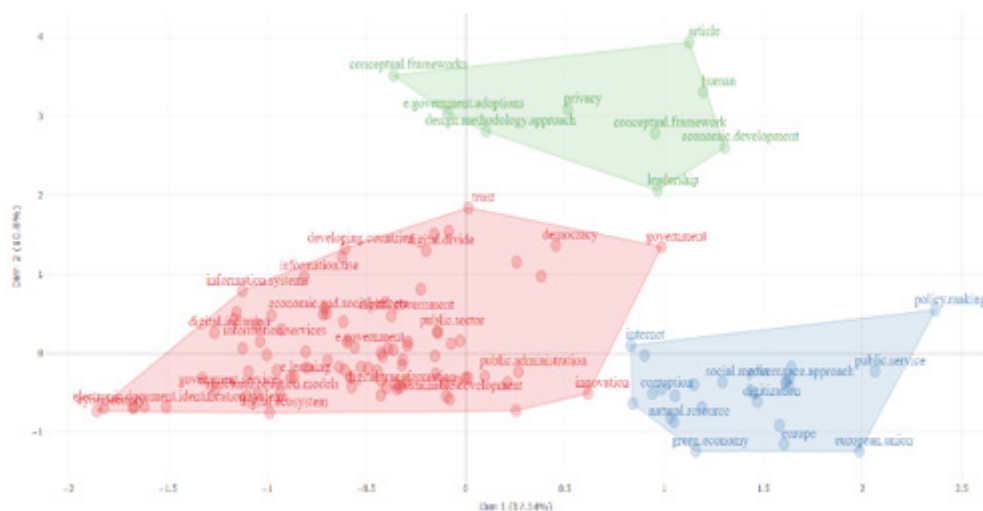


Figure 5 The Conceptual Structure Map Source: RStudio

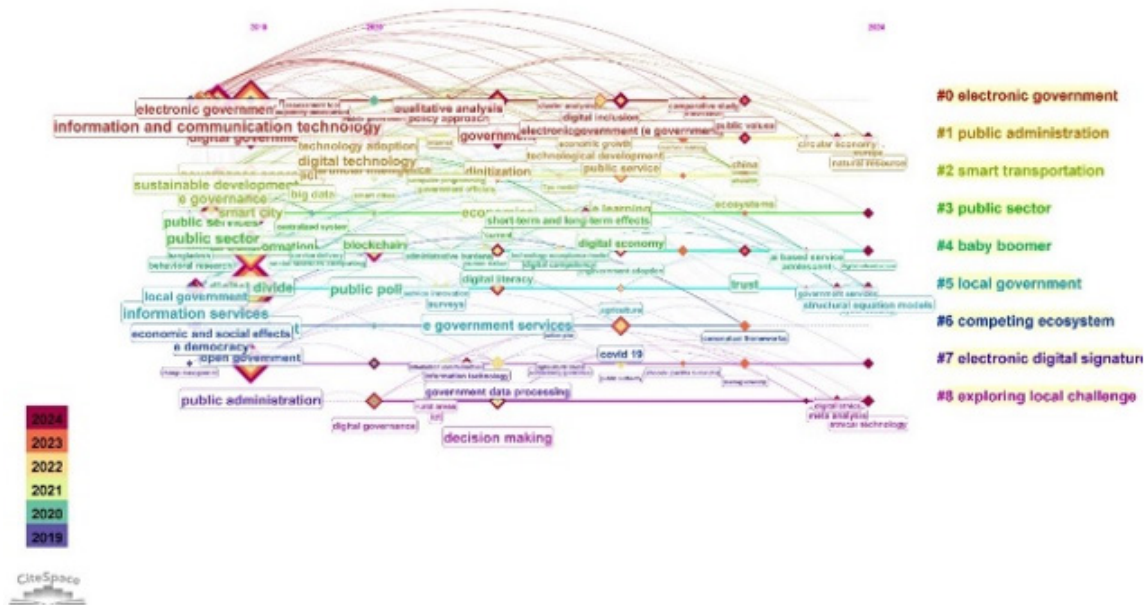


Figure 6 Timeline View Topic of digital maturity as an Implementation to Assess the Responsiveness of E-Government
 Source: CiteSpace

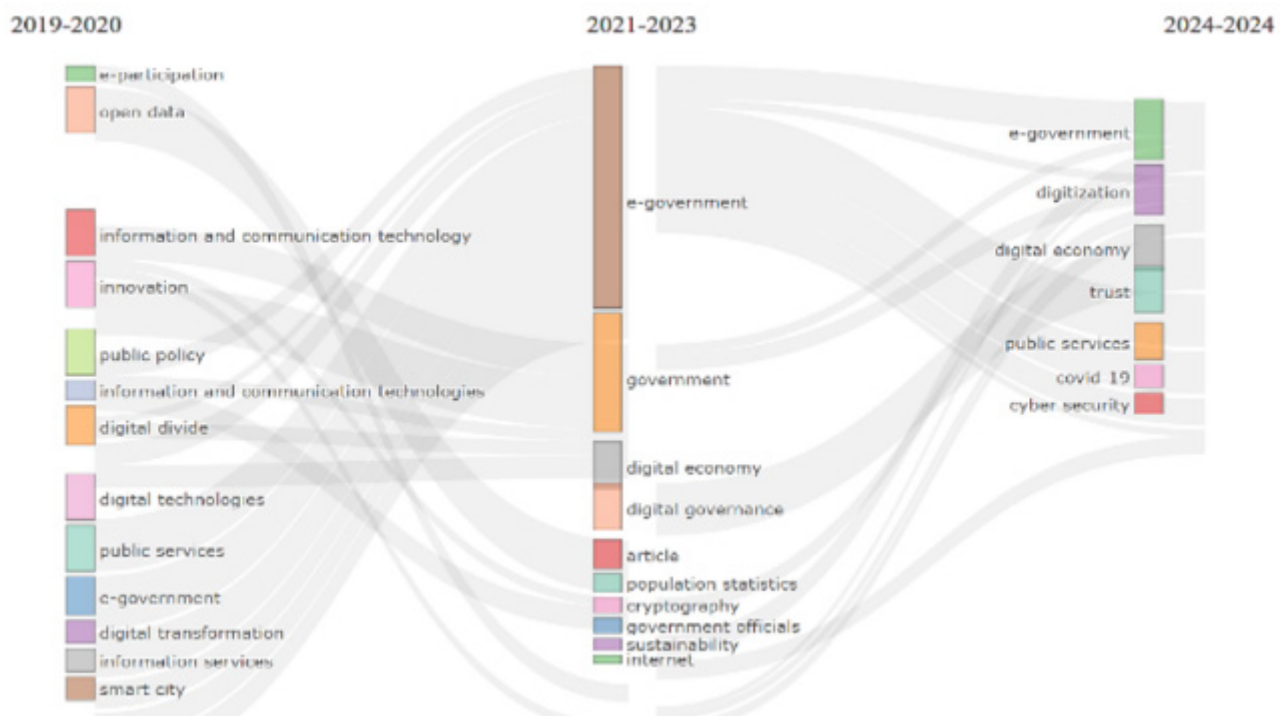


Figure 7 Topic evolution of digital maturity as an Implementation to assess the Responsiveness of E-Government
 Source: RStudio

of digital transformation, such as information and communication technology, digital technology, and public services. Terms like e-participation and open data describe government efforts to increase transparency and public participation. However, the term digital divide highlights the challenge of the

technology access gap, a major obstacle at this early stage.

In 2021-2023, the research focus shifted to integrating digital strategies, with topics such as digital economy, digital governance, and sustainability. Researchers began to discuss the

importance of demographic data and the role of government officials in supporting e-government transformation. Cryptography and sustainability highlight the importance of data security and the need for sustainable transformation. Research in this period also begins to address more complex challenges, such as how technology can support more effective and efficient governance.

In 2024, research increasingly focuses on responsiveness and trust in e-government. Terms such as trust, cybersecurity, and COVID-19 became key topics, reflecting the need to build people's trust in digital services and protect their data. Research in this period also shows how the COVID-19 pandemic is driving the accelerated adoption of technology to keep public services responsive and adaptive. Overall, this evolution reflects the journey of e-government transformation from basic infrastructure development to more complex, sustainable, and responsive digital strategies.

The analysis of digital maturity in e-government responsiveness shows the importance of a deep understanding of how technology can be integrated to improve public services (Tangi et al., 2023). During research period from 2019 to 2024, interest in this topic has fluctuated, mainly influenced by global challenges such as the COVID-19 pandemic. The change in research focus reflects the need for adaptation and innovation in an increasingly digitized public service.

One important finding is that digital maturity involves not only technology but also changes in organizational culture and internal processes. It is evident from the concept clusters that focus on the interaction between government and citizens. Research shows that to reach a higher level of maturity, governments must listen to citizen feedback and integrate it into service development. By doing so, the government's responsiveness to citizens' needs can be significantly improved.

Digital maturity indicators such as accessibility, service speed, and user satisfaction become important tools to assess how effective e-government is in meeting people's expectations. Data obtained from surveys and usage analysis becomes the basis for identifying areas that need improvement. For example, if the analysis shows low user satisfaction, the government can formulate strategies to improve service quality and accessibility. Challenges such as digital infrastructure gaps and lack of digital skills among employees remain obstacles. Regulatory rigidities and concerns over data security also hinder progress in implementing e-government.

The persistence of digital infrastructure gaps and limited digital skills among employees reflects structural and systemic issues that slow down the adoption of e-government. Furthermore, rigid regulations and data security concerns illustrate the complexity of aligning technological innovation with existing legal and institutional frameworks.

This analysis highlights that digital maturity as a tool to assess e-government responsiveness is highly

relevant in the current context. With the rapid adoption of technology and the changing needs of society, governments that can assess and improve their digital maturity will have an edge in delivering better and more responsive services. Digital maturity is not just about technology, but also includes the human aspects and processes that support the success of digital transformation in government.

IV. CONCLUSIONS

The research has deeply analyzed the concept of digital maturity as a significant framework in assessing e-government responsiveness. Digital maturity, which includes various dimensions such as technological infrastructure, digital literacy, and government commitment, was proven to greatly impact the government's ability to deliver responsive, efficient, and transparent public services. With a sufficient level of digital maturity, governments can more easily adapt their services to the increasingly dynamic needs of modern society. The research also revealed that adopting digital technologies can help reduce administrative burdens, improve operational efficiency and build public trust in government. Furthermore, the research shows the importance of cross-country collaboration to accelerate the adoption of digital technologies and share best practices in e-government implementation.

The results show that countries with high levels of digital maturity could consistently offer more responsive, transparent and effective public services than countries with low digital maturity. Key factors influencing this success include adequate technological infrastructure, high levels of digital literacy among the public, and government commitment to innovate and adopt new technologies. However, the research also identifies key challenges, including the digital divide between urban and rural areas, resistance to change within bureaucracies, and resource constraints in developing countries. Proposed mitigation strategies include greater investment in technology infrastructure, digital literacy training for the public, and promotion of cross-sector collaboration between the government, private sector, and civil society organizations. Overall, the research provides in-depth and relevant insights for policymakers, practitioners, and academics in their efforts to support the government's digital transformation towards better public services.

Future research could focus more on the influence of social, cultural and political factors on the successful implementation of digital maturity in different countries. These factors, often unique to each country, play an important role in determining the success rate of digital transformation in the government sector. In addition, further research must explore the role of cutting-edge technologies such as blockchain, artificial intelligence (AI) and big data in improving transparency, efficiency and accountability of e-government services. Longitudinal research can

also provide more comprehensive insights into how digital maturity evolves, affects public satisfaction, and the effectiveness of public services. It is also important to understand the impact of the digital divide and how efforts to bridge it can improve the inclusiveness and accessibility of digital services. Then, further research could combine theoretical approaches from the green cluster with policy applications from the blue cluster. It also shows opportunities to explore less-discussed themes, such as the relationship between conceptual frameworks and concrete policies.

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Data Availability Statement: Data openly available in a public repository that issues datasets with DOIs. The data that support the findings of this study are openly available in: 10.6084/m9.figshare.30479828.

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