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E-Government Research Analyzed Through Social Network Perspective: Patterns, Trends, and Future Directions

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ABSTRACT

This paper presents a comprehensive analysis of e-government research from a social network theory perspective. By systematically reviewing existing literature, it uncovers prevailing patterns and emerging trends that characterize the intersection of e-government initiatives and social networks. The study highlights how social network structures influence the adoption, implementation, and success of e-government services, emphasizing the role of connectivity, collaboration, and information exchange among stakeholders. Furthermore, it identifies gaps in current research and proposes future directions to advance understanding in this evolving field. This paper explores the evolving landscape of e-government research through the lens of social network analysis, uncovering key patterns, emerging trends, and prospective future directions. VOSviewer software is used to map the relationships between themes, authors, affiliations, and global research trends. The results show that e-government publications fluctuate, with the highest peak in 2022 before declining significantly in 2025. Analysis of the distribution of published themes shows that e-government is a multidisciplinary field. EGDI analysis confirms the consistency of countries such as Denmark, South Korea, Estonia, Finland, Iceland, and Singapore in achieving top rankings through inclusive policy support, digital infrastructure, and quality human resources. Therefore, this study recommends that future e-government development focus on fostering cross-disciplinary research by strengthening international collaboration. Furthermore, cross-country policy comparisons are crucial for strengthening transparent, participatory, and sustainable digital governance.

INTRODUCTION

E-government Efolution of represents a transformative shift in public administration, driven by advancements in information and communication technologies (ICT). By digitizing governmental processes and services, e-government initiatives aim to enhance transparency, efficiency, and citizen participation. However, the complexity of these initiatives extends beyond technology, encompassing the intricate social interactions and networks that influence policy adoption, implementation, and outcomes. Social network theory provides a powerful framework to analyze these relationships, shedding light on the patterns of collaboration, influence, and information flow among stakeholders in the digital governance ecosystem. Despite the increasing

recognition of social networks' role in e-government, there remains a fragmented understanding of how these networks shape research trends and practical implementations globally.

This paper addresses this gap by employing bibliometric and social network analysis techniques to systematically map the intellectual structure and evolution of e-government research. Using VOSviewer software, we analyze publication patterns, author collaborations, thematic clusters, and geographic distributions to identify emerging trends and critical knowledge gaps. The findings underscore the multidisciplinary nature of e-government studies and highlight the need for enhanced cross-country and cross-sector collaborations to drive inclusive, sustainable digital governance. By providing a comprehensive overview of the field through the lens of social networks, this study offers valuable insights for scholars, policymakers, and practitioners seeking to optimize e-government strategies in an increasingly interconnected world.

Current global developments are characterized by the rapid pace of digitalization, transforming social, economic, and political interactions (Rusch et al., 2022). This digital transformation has also had a significant impact on governance (Ravšelj et al., 2022). Government digitalization ultimately gave rise to the concept of e-government as an innovation in modern governance (Lytras & Şerban, 2020). In this context, governments are required to adapt rapidly to meet the increasingly diverse and dynamic needs of society. E-government integrates the use of information and communication technology (ICT) into the administration of government with the main goal of improving the effectiveness, efficiency, and quality of public services (Uwizeyimana, 2022). This concept emerged as one of the main strategies used by the government to utilize digital technology to improve the quality of public services, transparency, and bureaucratic efficiency (Zeebaree et al., 2022). Thus, e-government is not only a technological tool, but also a strategic instrument in realizing good governance.

Włodyka (2024) the implementation of e-government is also in line with the global agenda of sustainable development which emphasizes the importance of transparency, participation, and accountability in public administration. Countries globally are trying to optimize digital services to increase government legitimacy, access to public information, and connectivity with citizens (Chen & Li, 2024). Through e-government, the government seeks to create a more accountable, transparent, and participatory public administration system (Effiong & Okijie, 2021). As people's demands for the quality of public services increase, e-government has become an important agenda in national development in various countries (Chohan & Hu, 2022). International organizations such as the United Nations (UN) almost always use the E-Government Development Index (EGDI) to determine the level of implementation of e-government around the world (Adams & Paul, 2023).

This phenomenon has significantly increased academic research related to e-government over the past two decades (Pisár et al., 2022). Many studies have examined a wide range of topics, ranging from data security, digital literacy to the integration of cutting-edge technologies such as artificial intelligence (AI), big data, blockchain, and the Internet of Things (IoT) (Abdulkareem, 2024; Tolossa & Melese, 2024). Other studies have also focused on issues such as e-government adoption, digital governance, citizen engagement, service quality, organizational readiness, policy implementation, and the challenges of digital transformation in the public sector. (Baharuddin et al., 2022; Fisdian Adni et al., 2024; Ibrahim et al., 2023; Isabella et al., 2024, 2025).

Based on the research trends mentioned above, an approach that can identify research areas in detail is needed. Bibliometric analysis has been recognized as a useful method for assessing the level of publication, research process, as well as the level of collaboration between researchers and institutions (Isabella et al., 2024). Through this concept, researchers can identify popular topics, influential authors, major journals, as well as the most active countries in e-government publications (Elmatsani et al., 2024).

For example, bibliometric analysis can also provide information about international collaboration networks in e-government research (Dias, 2019). Cross-actor collaboration is crucial in generating new knowledge because it opens up space for technology transfer, exchange of experiences, and expansion of perspectives (Mkude, 2023). Through this collaboration, key

actors can be identified who play a significant role in driving the expansion of e-government at the global level (Weigl et al., 2024).

According to Akbar et al., (2022) the concept of bibliometric analysis provides an idea of how the concept of e-government has evolved over time. In addition, bibliometric analysis also allows researchers to examine areas of study that have not yet been fully identified (Quintana et al., 2022). For example, while the topic of data security and privacy is often discussed in developed countries, it is rarely discussed in developing countries (Singh et al., 2022). Similarly, research on the social impact of e-government on rural or vulnerable communities is still very limited. Identification of these gaps can be a crucial component for future research.

Some research questions that need to be answered arise based on the above background. First, how has e-government studies progressed over the past six years? Second, who exactly are the key actors, authors, subjects, and affiliates who control research in this field? Third, what is the direction of future development that can be determined from the results of bibliometric analysis? These questions will be discussed in this article.

Based on the problems that have been described, this study aims to analyze the trend of e- government studies by utilizing the Scopus database. In particular, this study is intended to comprehensively describe the findings, identify the research team and the methodology used, and map collaborative networks in the field of e-government (Elmatsani et al., 2024). Thus, the results of this research are expected to make a significant contribution to the development of academic knowledge as well as practice.

RESEARCH METHODS

This study uses a qualitative approach with a literature study method to analyze the development of e-government research. Data was obtained from the Scopus database with the keyword "e-government" and its derivative term in the period 2020–2025. The selected articles are focused on publications of Scopus indexed journals, while proceedings, editorials, and reviews are excluded. Data analysis is carried out through content analysis by examining thematic patterns, topic trends, and the contribution of researchers, institutions, and countries in the development of e-government literature (Elmatsani et al., 2024).

To reinforce the findings, VOSviewer was used as a tool in mapping theme connectivity as well as visualizing keyword networks (Işık et al., 2022). The validity of the data is maintained through triangulation of sources, namely by comparing findings from various articles, official reports, including *the E-Government Development Index* (EGDI). In this way, the research is expected to provide a comprehensive understanding of the dynamics and direction of the development of e-government studies at the global level.

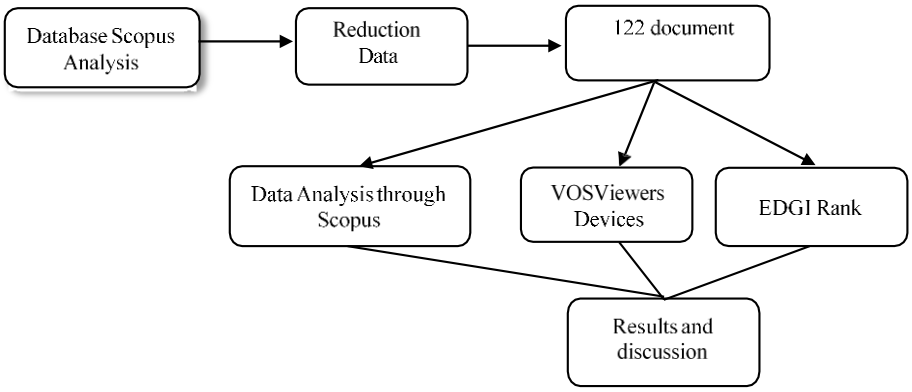

Figure 1. Re search Stages

This research was carried out in several systematic stages. First, data was collected through the Scopus database, with a total of 122 documents relevant to the research topic. In the document, there were 606 keywords identified, with 45 keywords meeting the threshold three

times. In the next stage, data reduction was carried out to filter themes that were in accordance with the focus of the study. The reduced data was then analyzed based on findings through the Scopus database, using the VOSviewer software to map the keyword network (Isabella et al., 2024; Akbar et al., 2022). In addition, EDGI ranking data is used to measure the level of development and relevance of research (Zambrano-Yépez et al., 2023). The results of the mapping are then the main findings in this study, which discusses research patterns, scientific trends, and the direction of study development in accordance with bibliometric findings.

RESULTS AND DISCUSSION

The Development of E-Government Studies in the Last Six Years Annual Publication Fluctuations

Research on e-government in recent years has become one of the important focuses in the context of modern government (Marysyuk et al., 2021). The development of digital technology in effective, efficient, and transparent public services has prompted many researchers to explore this topic. To understand the fluctuations of e-government scientific research. Analysis of annual publication trends is an important step. The year-over-year trend in publications reflects how much academic interest there is in the issue in a global context. Based on data from the Scopus database, here are the number of publications relevant to e-government topics in the last six years (2020–2025).

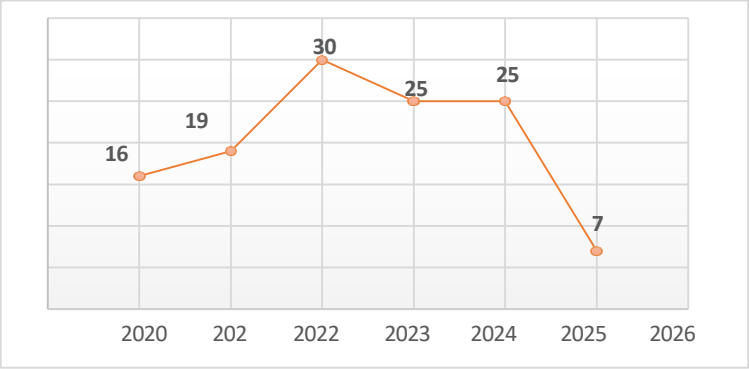

Figure 2. Annual Publication Trends Source: Scopus Database (2020-2025)

Based on the fluctuation data of the annual publication of e-government research from 2020 to 2025, it can be seen that there are significant dynamics. At the beginning of the period (2020) the number of publications was recorded as many as 16 documents, then increased in 2021 to 19 documents, and jumped quite high in 2022 with the achievement of 30 documents, which is the highest number of publications in the last six years. But after that, the number of publications tends to decrease, namely 25 documents in 2023, stagnate at the same number in 2024, and then drop drastically in 2025 with only 7 documents.

The data shows that e-government research peaked in 2022 with the highest number of publications, before showing a downward trend in the following years. The surge in 2022 occurred due to increasing attention to the digitalization of government after the pandemic. Meanwhile, the decline after that was caused by a shift in research focus to other fields such as artificial intelligence, smart cities, or big data governance (Abdulkareem, 2024; Ahmad et al., 2021). These findings indicate that although e-government has received strong global attention, the sustainability of research in this area still faces challenges in maintaining consistency in the number of publications.

Studies on e-government are growing rapidly in line with the increasing public need for public services based on digital technology (Tejedo-Romero et al., 2022). The complexity of this topic encourages the involvement of various disciplines in producing diverse studies, ranging from social, technological, economic, to environmental aspects. Analysis of the distribution of publications according to fields of science is important to understand the dominant perspective as

well as to see the contribution of cross-disciplines in strengthening the development of e-government. The mapping of this research subject provides a comprehensive picture of the direction of the study that is developing at the global level, as shown in Figure 3. Research Subject Trends.

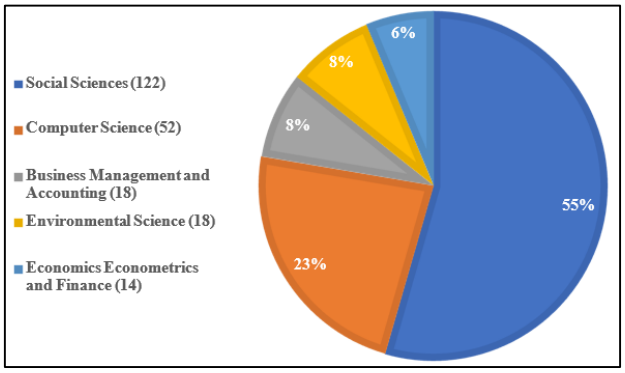

Figure 3. Research Subject Trends

Figure 3 above shows that the results of the e-government research analysis are multidisciplinary with the dominance of the Social Sciences field of 55% (122 documents), confirming that this topic is widely studied from the perspective of social sciences related to governance, public policy, and community participation. Furthermore, the Computer Science sector accounted for 23% (52 documents), indicating the importance of technology and information systems aspects in supporting the government's digital transformation.

Other contributions came from Business, Management and Accounting and Environmental Science at 8% each (18 documents), reflecting the linkage between e-government and organizational management, digital business, and environmental sustainability issues. The Economics, Econometrics and Finance sector of 6% (14 documents) shows a focus on fiscal efficiency and the impact of digital policies on the economic sector. These findings show that the development of e-government is understood not only as a technological innovation, but also as an interrelated social, economic, and managerial phenomenon.

Key Actors, Authors, and Affiliates of E-Government Research

In bibliometric analysis, the identification of the authors who contribute the most is an important step to understand the main actors that drive the development of a field of study (de Melo Santos & de Souza, 2021). The top contributors can represent researchers who have high consistency in publishing scientific papers, so that they can provide direction, influence, and important references for other researchers. So that the mapping of the main authors in e-government research provides an overview of global academic productivity centers. Figure 4 below shows five of the most prolific writers in researching the topic.

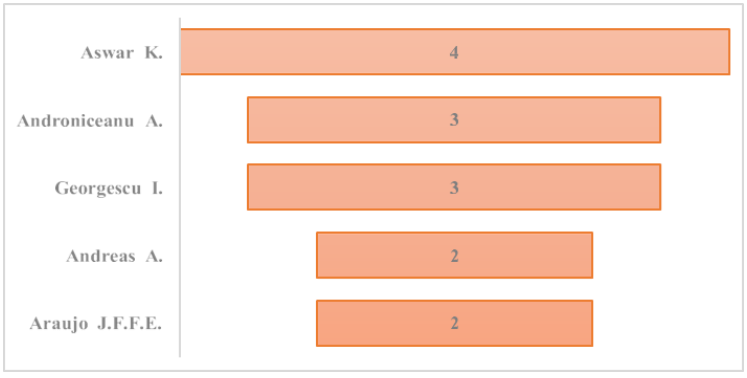

Figure 4. Author Contributor Trends

Based on the results of the analysis of publications in the Scopus database, there are 159 authors who have contributed to research related to e-government. Of these, there are five authors who occupy the position of the top contributors with the highest number of publications compared to others. The author with the highest publication contribution is Aswar K. with a total of 4 articles, followed by Androniceanu A. and Georgescu I. who each contributed 3 articles. Meanwhile, Andreas A. and Araujo J.F.F.E. were listed as the next contributors with 2 articles each. These findings show that e-government research contributions are still dominated by a small number of authors who consistently write on this topic, so they play an important role in shaping the academic direction in the field of e-government.

Institutional affiliation analysis is an important step to find out which institutions actively contribute to the development of a study. The author's affiliation can reflect academic productivity, but it also indicates research centers that are the main references in e-government studies (Elmatsani et al., 2024). By understanding this distribution of affiliation, it is possible to identify the role of universities and research institutions in various countries in strengthening the global discourse on digital governance. Figure 5 below shows the top five affiliates in the global e-government study.

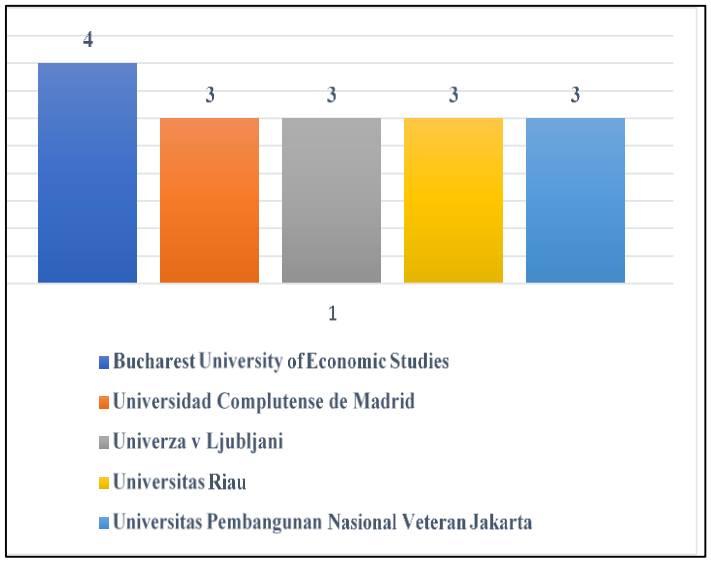

Figure 5. Institutional Affiliations

Figure 5 above shows the results of the analysis of institutional affiliation from a total of 159 authors, it can be seen that the contribution of e-government research is spread across various international and national universities. The affiliation with the highest contribution comes from the Bucharest University of Economic Studies (Romania) with 4 publications, showing the dominance of this institution in producing studies related to e-government. Furthermore, there are four institutions that each contribute 3 publications, namely Universidad Complutense de Madrid (Spain), Univerza v Ljubljani, (Slovenia), University of Riau (Indonesia), and Veteran National Development University Jakarta (Indonesia).

This distribution shows the active involvement of European countries, especially Romania, Spain, and Slovenia, which emphasizes an international perspective in the study of e- government. In addition, the significant contribution of universities in Indonesia shows that the issue of e-government is also an important focus in the context of developing countries. This pattern of institutional affiliation confirms that e-government research is highly relevant for countries with diverse digital governance needs, both in Europe and Southeast Asia (Agbozo & Asamoah, 2019; Akbar et al., 2022).

Future Development Direction of E-Government Research

Visualization mapping of networks, clusters, and items is one of the important techniques in bibliometric analysis (Akbar et al., 2022). This technique is used to understand the relationship between concepts, authors, and research themes. Through this approach, it is possible to identify the close relationship between keywords and the distribution of themes in the form of groups or clusters. The visualization not only makes it easier to read research patterns, but also provides a more comprehensive picture of the direction of the development of e-government studies globally. Thus, this mapping is the basis for interpreting the scientific dynamics reflected in Figure 6 below.

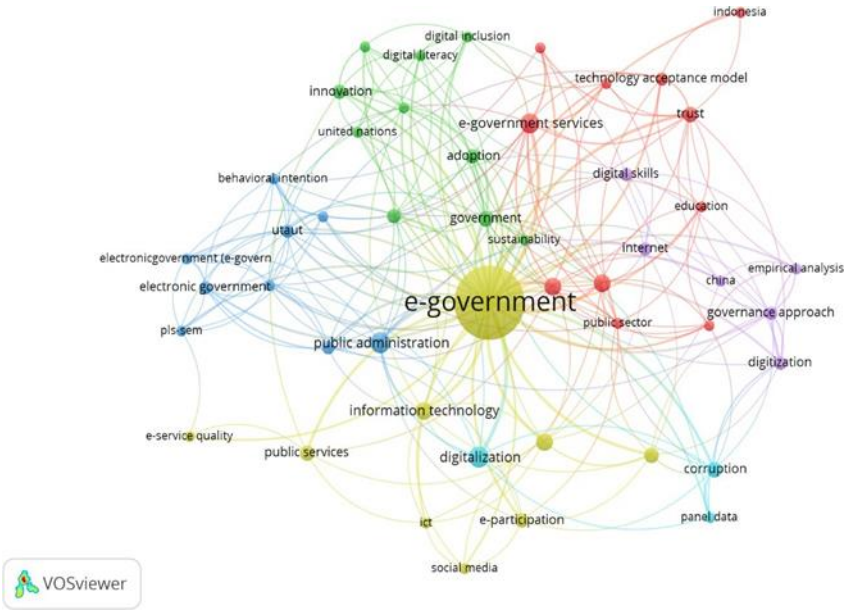

Figure 6. Network Visualization Mapping

Figure 6 above shows a visualization of the keyword network posed using VOSviewer. Based on bibliometric data, 606 keywords were identified, with 45 keywords meeting the minimum threshold of three appearances. In this map, the size of the nodes represents the frequency of occurrence of keywords, the thickness and proximity of the lines indicate the strength of co- occurrence, while the color marks the clustering of interconnected themes. This visualization helps identify the main focus of the research, the linkages between themes, and the direction of development of e-government studies. To understand more details the composition of each research group, it can be seen in Table 1. Summary of Clusters, Colors, and Related Items.

Table 1. Cluster Summary, Colors, and Related Items

Cluster	Color	Items	Keyword
Cluster 1	Yellow	11	covid-19, digital divide, e- government services, e- services, education, Indonesia, information services, public sector, state role, technology acceptance, trust
Cluster 2	Green	10	Adaptation, digital inclusion, digital literacy, digital transformation, government, innovation, policy implementation, sustainability, technology adaptation, United Nations.
Cluster 3	Blue	9	behavioral intention, digital government, e-government systems, economic and social efforts, electronic government, electronic government (e- government), pls-sem, public administration, utaut
Cluster 4	Red	9	e-government, e-participation, e-service quality, ICT, information technology, local government, public services, social

			media, transparency
cluster 5	Purple	6	China, digital skills, digitizations, empirical analysis, governance approach, internet
cluster 6	Light Blue	3	Corruption, digitalization, panel data

Based on the results of mapping with VOSviewer, six main clusters were obtained that represent the focus of e-government research studies. Cluster 1 (yellow) consists of 11 items with dominant keywords such as covid-19, digital divide, e-government services, education, and trust. The presence of this theme shows the close relationship between pandemic issues, digital divides, and technology acceptance in the context of public services, especially in developing countries such as Indonesia (Mukminto et al., 2023; Nadhira et al., 2024). Cluster 2 (green) includes 10 items, with a focus on digital inclusion, digital literacy, digital transformation, innovation, and sustainability. This illustrates the research orientation on sustainable digital transformation as well as the role of international policies and organizations such as the United Nations (Djatmiko et al., 2025).

Furthermore, Cluster 3 (blue) contains 9 items with keywords such as behavioral intention, digital government, public administration, and PLS-SEM. This theme emphasizes aspects of user behavior, technology acceptance models, and quantitative approaches in analyzing e-government systems (Noor, 2022). Cluster 4 (red), also with 9 items, highlights e-government, e-participation, social media, local government, and transparency. These findings emphasize local governance, quality of digital services, and ICT-based public participation (Sussy & Vicente, 2021). Cluster 5 (purple) with 6 items focuses on the context of a specific country (China), digital skills, and governance approach, showing the existence of an empirical approach in assessing digital policy and internet governance (Mensah, 2019). Meanwhile, Cluster 6 (light blue) consists of 3 items, namely corruption, digitalization, and data panels. This shows the direction of the study on the relationship between digitalization and efforts to eradicate corruption through quantitative data analysis (Wu et al., 2020).

The study of e-government develops in various interrelated aspects, ranging from the issue of digital divide, technological literacy, to sustainable digital transformation (Bokšová et al., 2021; Zambrano-Yépez et al., 2023). Overall, the results of this mapping show that e- government research has a wide diversity of themes, ranging from fundamental issues such as digital divide and technological literacy, to practical aspects such as governance, transparency, and corruption eradication. This shows that the study of e-government is not only seen as a technological innovation, but also a multidimensional social, political, and economic phenomenon.

In line with previous studies, the development of e-government can also be seen through the achievement of the e-government development index (EGDI) which is released periodically by the United Nations (UN) (Adams & Paul, 2023). This index is an important benchmark in assessing the extent to which a country has successfully integrated digital technology in governance, covering aspects of online services, telecommunication infrastructure, and human resource capacity (Zambrano-Yépez et al., 2023). The analysis of countries' rankings in EGDI provides a more concrete picture of the future development of e-government. Table 2 below shows the countries with the best e-government development index in the world.

Table 2. EDGI Global Rankings

Rank	Country	Score EDGI	Year
1	Denmark	0.98474	**2024**
2	Estonia	0.97274	
3	Singapore	0.96912	
4	Republic of Korea	0.96789	
5	Iceland	0.96707	
1	Denmakr	0.9717	**2022**
2	Finland	0.9533	
3	Republic of Korea	0.9529	
4	New Zealand	0.9432	

5	Iceland	0.941	
	Sweden	0.941	
1	Denmakr	0.9758	**2020**
2	Republic of Korea	0.956	
3	Estonia	0.9473	
4	Finland	0.9452	
5	Australia	0.9432	

Based on EDGI data released by the United Nations in 2020, 2022, and 2024, Denmark consistently ranks first with very high scores. The score was recorded at 0.9758 in 2020, decreased slightly to 0.9717 in 2022, and increased again to 0.98474 in 2024. This consistency demonstrates Denmark's success in integrating digital public services, telecommunications infrastructure, and human resource capacity in a sustainable manner. In the next position, there are countries with established digital ecosystems such as the Republic of Korea, Estonia, Finland, and Iceland, which are repeatedly in the top five. The presence of these countries confirms that the success of e-government is closely related to long-term digital policy strategies, infrastructure support, and community technology literacy (Abdulkareem, 2024).

Meanwhile, the change in position between years reflects global dynamics in the development of digital governance. For example, Singapore is in the top three in 2024 with a score of 0.96912, showing significant progress in public digital services and smart government integration. New Zealand, Australia, and Sweden also briefly entered the top five in certain periods, although they were inconsistent in each release. These findings confirm that EGDI's achievements reflect not only technological readiness, but also institutional capacity, inclusive policies, and community participation (Adams & Paul, 2023). Thus, these results provide an important picture of how developed countries place e-government as a strategic priority in strengthening transparent, efficient, and service-oriented governance.

The results of the analysis show that the development of e-government studies in the last six years has fluctuated quite dynamically. The increase in the number of publications that peaked in 2022 indicates a global push towards the digitalization of public services post-pandemic. Weigl et al (2024) technological innovation is considered a solution to the limitations of face- to-face interaction in the implementation of government services. However, this trend then declined in the following years, even experiencing a significant decline in 2025. This is an indication that academic attention is shifting to other more up-to-date issues such as artificial intelligence, smart cities, and big data governance (Prabawa et al., 2024). While e-government remains an important field, the sustainability of research in this area requires new strategies to maintain its relevance in an increasingly competitive academic landscape.

Substantially, the distribution of the research theme shows that e-government is a multidisciplinary study involving various fields of science. The dominance of the social sciences field of 55% shows that governance, public policy, and community participation are the main focuses of the research (Androniceanu & Georgescu, 2021, 2023). Meanwhile, the contribution of the computer science sector of 23% confirms the important role of technology in providing the digital foundation for modern public services (Smirnova, 2020). Other disciplines such as business, management, accounting, environmental science, and economics also complement the perspective of the study by highlighting aspects of sustainability, fiscal efficiency, and organizational management. This emphasizes that the understanding of e- government cannot be separated from a cross-disciplinary approach that complements each other.

Analysis of key actors also shows an interesting pattern. Of the total 159 authors, only a small fraction are consistent in producing publications, with five authors occupying the top positions. The presence of this core author shows that there is a certain group of academics who play an important role in directing the global discourse on e-government. In terms of affiliation, the largest contributions come from universities in Europe, such as Bucharest University of Economic Studies in Romania, as well as universities in Spain and Slovenia. Interestingly, several universities in Indonesia, namely the University of Riau and UPN Veteran Jakarta, are also recorded

to make significant contributions. These findings suggest that e-government studies are global as well as contextual, where developed and developing countries alike have an interest in developing digital governance models that suit their respective conditions (Isabella et al., 2024; Elmatsani et al., 2024).

In addition, network visualization mapping through bibliometric analysis identified six main clusters that represent the direction of e-government development (Mostafa & El-Masry, 2013). Each cluster contains a central theme that describes the concerns of academics, ranging from issues of digital divide and public trust, digital literacy and sustainability, digital service user behavior, to transparency of local government and the eradication of corruption. This diversity of themes shows that e-government is developing as a topic that not only emphasizes the technical aspect, but also touches the social, political, and ethical realms (Abdulkareem, 2024). Thus, future research can be directed at the exploration of new issues that arise from the interaction between technology, governance, and societal needs.

Finally, these results are reinforced by EGDI data released by the United Nations in 2020, 2022, and 2024. Countries such as Denmark, South Korea, Estonia, Finland, Iceland, and Singapore consistently rank top in the e-government development index. This shows their success in building a strong and sustainable digital governance ecosystem (Abdulkareem, 2024; Mkude, 2023). Such success is determined not only by technological readiness, but also by the quality of policies, the capacity of human resources, and the supporting infrastructure. Therefore, the future direction of e-government research development needs to pay attention to the comparison of cross-border policies, international collaboration models, and digital adaptation strategies in developing countries that are still facing the challenges of digital divide and infrastructure limitations.

CONCLUSION

This study concludes that e-government is an important field of study in modern governance that has experienced fluctuating developments in the last six years. There were 122 publications of articles indexed by Scopus in the period 2020 to 2025 related to this research topic. The publication trend showed a significant increase until it peaked in 2022 with 30 publications. The main contributors came from the top five authors, including Aswar K. with 4 publications and Androniceanu A. and Georgescu I. with 3 publications each. In terms of affiliation, the institution of Bucharest University of Economic Studies (Romania) was recorded as the most productive with 4 publications, followed by the Universidad Complutense de Madrid (Spain), Univerza v Ljubljani (Slovenia), the University of Riau, and the University of National Development Veteran Jakarta (Indonesia) with 3 publications each. Based on the results of bibliometric analysis using VOSviewer on 45 of the 606 keywords identified in the Scopus database, six main clusters that form the e-government research structure were obtained. The first cluster focused on the issues of the COVID-19 pandemic, digital divide, and technology acceptance, while the second cluster emphasized digital inclusion, digital literacy, and sustainable transformation. The third cluster is related to user behavior and quantitative analysis models (PLS-SEM), while the fourth cluster highlights public participation, transparency, and local government. The fifth cluster is more contextual on specific countries such as China and digital skills, while the sixth cluster highlights the relationship between digitalization and the eradication of corruption. In addition, the results of the E-Government Development Index (EGDI) released by the United Nations in 2020, 2022, and 2024 show that countries such as Denmark, South Korea, Estonia, Finland, Iceland, and Singapore consistently rank top. These findings demonstrate their success in building a strong digital governance ecosystem through the integration of online services, telecommunication infrastructure, and strengthening the capacity of human resources. Thus, this study confirms that e-government is not only seen as a technological innovation, but also a multidimensional phenomenon that involves social, political, economic, and governance aspects that are transparent and participatory.

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