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Public administration in the era of digital and collaborative governance: a bibliometric analysis

Mimin Sundari Nasution[1*)], Almasdi Syahza[2], Zaili Rusli[3], Mayarni[4], Dadang Mashur[5], Zulkarnaini[6] Fajriani Ananda[7]
[1,3,4,5,6,7]*Department of Public Administration, Universitas Riau, Indonesia*
[2]*Institute of Research and Community Services, Universitas Riau, Indonesia*

Abstract

This research paper examines how digital governance evolves and intersects with collaborative governance to reshape the principles and practices of public administration. The research explores how digital platforms facilitate stakeholder collaboration, co-production of public services and evidence-based decision-making. The study also discusses the challenges that public institutions face in adapting to this new paradigm, including issues of digital divide, institutional resistance and governance capacity. These findings underscore the importance of aligning technological innovation with inclusive governance practices to achieve more effective, accountable and citizen-centred governance. The implications of this research suggest that future public sector reforms should prioritise digital inclusion, invest in collaborative capacity building, and strengthen governance networks to respond more adaptively to complex societal needs. Ultimately, this research suggests that the fusion of digital and collaborative governance offers significant potential to address complex policy challenges and enhance democratic legitimacy in contemporary public administration.

Keywords: *e-government, digital governance, collaborative governance, public administration*

*)Corresponding Author
Email: mimin.sundari@lecturer.unri.ac.id

Introduction

The rise of digital governance is becoming a more popular and relevant topic in political science and government research. Digital governance has grown in relevance due to the increasing reliance on digital platforms for public service delivery, especially after the COVID-19 pandemic. According to Scopus data (2006–2024), there are over 700 publications on digital governance, showing exponential growth since 2015. Furthermore, studies such as (Mergel et al., 2019; OECD, 2020) highlight how digital tools enhance transparency, participation, and service efficiency, making this topic central to modern public administration and political science research. Understanding trends, patterns, and developments in digital governance becomes critical as the world transitions to an era where digital technology plays a critical role in governance structures (Caviggioli & Ughetto, 2019; Liao, H., Tang et al., 2018; Rasyid, 2022) Bibliometric analysis, a quantitative tool for analyzing academic literature, can help understand the history of digital governance by mapping the research environment, identifying major contributors, and highlighting new trends.

Several prior studies have examined the influence of digital governance on tourism, demonstrating that the capacity and practice of internet shutdowns affect incoming tourism. Tourists are also prevented from entering through social media surveillance with strict guidelines. In China, tourists have reported being warned or

penalized for sharing sensitive content online, and the country enforces strict digital surveillance. This affects its image as a tourist destination for some segments of international travelers (Grinberg, 2017; Guo & Zhang, 2024; Qiang, 2019).

The study discovered that practical sensors' governance capability and consequences had a negative impact on tourism activities (Sun et al., 2016). Some policy concerns for adequate digital communication control are also addressed (Gozgor et al., 2024). Digital finance is a key accelerator for today's economic system, and it plays an important role in developing a resilient city core based on innovation and transformation processes. The depth of digital finance utilization has the greatest influence, followed by the amount of digitalization (Z. Wang, 2023). Furthermore, decentralized autonomous organizations (DAOs) are a relatively new sort of online entity related to governance or business models that provides a decision-making process aimed at facilitating digital governance and collaboration (Valiente & Pavón, 2024). Electoral organizers should be cognizant of the fact that technology-based recapitulation data has the potential to serve as digital evidence for adversarial parties in electoral courts (Habibi et al., 2023). The recommendations aim to enhance public services by leveraging current digital service applications and incorporating not yet integrated public services with digital-based services (Prihatin et al., 2023).

Digital governance technologies provide new solutions by allowing for real-time data collection, conflict resolution, and community interaction. To successfully integrate digital governance into animal conservation, a holistic approach is required, which includes infrastructural improvements, education, cultural sensitivity, and economic accessibility. The study sheds light on the obstacles and potential of applying digital solutions, emphasizing the necessity of community engagement in sustainable conservation practices (Tripathi & Singh, 2024).

The term 'digitalization' in public administration, which is a synonym for 'e-government', refers to the application of rapid and secure procedures by administrative authorities. E-governance, often known as digital governance, is the use of innovation and technology in public administration. This article looks at e-government issues such as e-services, e-participation, personal data privacy, and how e-government adoption affects public administration efficiency (Tskhadadze, 2024). Today's digital governance poses challenges in the context of ports, where efficiency and transparency are critical to successful operations. Efficient public-private collaboration on digital governance enhances port competitiveness. Data security requires a regulatory framework, and digital governance is becoming increasingly important for global success (González-Cancelas et al., 2024).

Another study underlines the importance of technology pathways in digital governance for ensuring economic and legal compliance while managing digital resources, thereby promoting sustainability (Wan et al., 2024). Improving the quality of ecology and the environment is dependent on environmental governance capacities, which can be significantly improved through the use of digital technology. The digital economy has harmed regional environmental governance. Furthermore, the gap between government website creation and environmental governance competence is visible in digital governance (Saha, 2024). Other research investigates how environmental legislation and digital governance affect the resource curse. The impact of moderation demonstrates that e-governance and environmental restrictions are critical to promoting economic growth. The usual smallest feasible square yields a similar result. Granger's causality test demonstrates bidirectional causality among all model variables and provides useful policy implications (Ding, 2022).

Government digital development has become inextricably tied to modern governance frameworks in a quickly changing digital context. These findings show that government digital progress is inversely connected with carbon efficiency when it falls below a specific level. This detrimental effect, however, diminishes when the government's digital development exceeds the threshold value (Lu et al., 2024). Then (Mann et al., 2024) critically analyze the concept of a decentralized and privacy-preserving Bluetooth-based contact tracing framework suggested by global technology corporations, which could jeopardize a country's sovereignty when selecting public health responses to present or future crises.

An interpretive approach to investigating how local policymakers describe and justify their own visions of digital governance initiatives at the city level helps to understand the various interpretations that underpin the development of digital governance initiatives.Local governments can adaptably use smart technology as an instrument to address a wide range of environmental, social, and economic problems based on where smart urban technologies should be framed as a means to solve different social problems and achieve different policy goals—not the goals themselves (Esposito et al., 2024).

Digitalization presents new challenges to liability standards as traditional actors, such as newspapers, fade into the background and new players, such as platforms, take the stage. The following article investigates how liability laws respond to the transfer of power from one group of actors to another, with a focus on autonomous systems and digital platforms (Wagner, 2024). Climate governance ability is vital to long-term progress, and data aspects play a significant role in current governance. The study (Wen et al., 2024). investigates the trajectory and options for digital transformation in climate governance. At the same time, energy prices and open trade have a major negative impact on natural resource management (Si Mohammed et al., 2024).

A robust digital governance mechanism that prioritizes the well-being of customers and society demonstrates the strengthening of guidelines through the process of understanding the organization and encourages the integration of responsible CAs that adhere to ethical principles and social values (Sidaoui et al., 2024). In recent years, Bangladesh has experienced a revolutionary shift toward digitalization as a key driver of citizen security and economic growth. The implementation of digital governance has streamlined administrative processes, reduced bureaucratic bottlenecks, and increased the efficiency of public services. Bangladesh's ongoing digitalization initiatives have emerged as a powerful catalyst for citizen safety and economic prosperity. As the country continues to embrace digital transformation, a deliberate and inclusive approach is required to fully realize the potential of digitalization and provide a resilient, secure, and prosperous future for its residents (Abdullah-Al-Faruk, 2024) .

Increasing the government's digital governance capacity makes a substantial contribution to green and sustainable development. The government's digital governance primarily encourages natural resource management through two mechanisms: green technology innovation and intellectual property protection, with quality taking precedence over quantity. The impact of improved government digital governance on natural resource management varies greatly depending on city types, political levels, urban locations, and human capital levels (Chen et al., 2024). Ethical and governance issues concerning the development of digital innovations such as artificial intelligence have sparked much debate and research, with opportunities and relevance

in driving effective digital innovation governance that considers the potential risks of AI while identifying business and social opportunities (Salgado-Criado et al., 2024).

The importance of contextualizing the pandemic response's digital transformation within a democratic framework. Taiwan's history differs dramatically from that of other Asian authoritarian countries, illustrating the feasibility of taking digital measures without relying solely on the virus and society to oversee the digital pandemic and its repercussions in general (Perng et al., 2024). Digital governance covers a wide range of topics, including the use of digital technology in public administration, e-governance projects, data-driven decision-making procedures, and the digital transformation of entire government activities. In addition, to achieve meaningful progress, global collaboration and the establishment of *universal digital governance standards* are essential. By focusing on creating an inclusive digital ecosystem, encouraging policy innovation, and ensuring broad digital literacy, governments can lay the foundations for a sustainable, economically prosperous, and gender-inclusive digital society (Bhattacharya, 2024). This highlights the potential of the digital government approach, which is increasingly prioritizing public participation. With an overarching goal, this study seeks to expand our understanding of the growth of digital governance in China, providing useful insights into its likely future path. This contribution greatly informs discussions on policy formulation and the sustainable growth of digital governance, presenting nuanced viewpoints with a sharp focus on Chinese practices that illuminate the contemporary digital governance (Guo & Zhang, 2024).

The study adds vital empirical evidence to the subject of e-government and cybersecurity, providing insights that can help influence evidence-based policy decisions and resource allocation. Understanding the complicated factors at play allows Saudi Arabia to strengthen its digital governance infrastructure and provide safe and high-quality e-government services to its constituents (Al-Hawamleh, 2024).It also dives into Morocco's tax issues, which are highlighted by huge revenue shortages revealed by the IMF. In essence, this study investigates the relationship between digitization in tax administration and taxpayer behavior, with a particular emphasis on tax avoidance (Belahouaoui & Attak, 2024).

Digital governance is becoming increasingly vital in an age when information and communication technology play a critical role in many facets of modern society's life. This notion not only calls for the use of technology to promote government efficiency and openness, but it also introduces new issues in data management, privacy, and information security. Rapid advances in information technology have altered the landscape of public governance, influencing how governments communicate with their constituents, offer public services, and allocate resources. In this context, bibliometric studies can provide useful information about the evolution of the scholarly literature on digital governance. Bibliometric analysis allows you to detect research patterns, dominant themes, and changes in major concepts throughout time.

Rapid advances in information technology have altered the landscape of public governance, influencing how governments communicate with their constituents, offer public services, and allocate resources. In this context, bibliometric studies can provide useful information about the evolution of the scholarly literature on digital governance. Bibliometric analysis allows you to detect research patterns, dominant themes, and changes in major concepts throughout time.

Previous studies have revealed a growing interest in this area, particularly as new technologies such as artificial intelligence, big data analytics, and blockchain technology are increasingly used in the context of digital governance. Nonetheless, a thorough study of the current research is required to gain a better understanding of how these notions emerge and interact in the academic literature. This study attempts to fill this information gap by conducting a complete bibliometric analysis of the most recent scientific articles in the field of digital governance, focusing on the development or publication patterns connected to the issue of digital governance research. What are the current research trends and mappings on digital governance? What are the keywords and citation trends for these topics? What are the trends in digital governance research in terms of co-authors, author collaboration across borders, organizational collaborations, and publisher journals? Despite the increasing attention on digital governance, there remains a lack of systematic understanding of how this concept has evolved and interacted within the academic literature. To address this gap, this study conducts a comprehensive bibliometric analysis of recent scholarly publications on digital governance. It aims to uncover the development patterns, dominant themes, emerging keywords, and citation trends that shape the field. In particular, the study explores global collaboration patterns among authors, institutions, and countries, as well as journal-level contributions. Given the strategic role of digital governance in reshaping public administration, transparency, and citizen participation in the digital era, this research is crucial to inform future studies and guide policy innovation.

It is predicted that using a bibliometric methodology, it will significantly contribute to our understanding of evolutionary dynamics and trends in digital governance, as well as provide recommendations for future study and policy development. The study of the literature on digital governance requires a variety of methodologies and research areas. By paying attention to current research advances and trends, academics can acquire a better grasp of the difficulties, possibilities, and innovations in the field of digital governance. In recent decades, digital transformation has dramatically altered the landscape of government. Digital governance, which refers to how governments and public institutions use digital technology to handle information, interact with citizens, and offer public services, is becoming more vital in a more connected and digital society.

This article introduces a novelty by bridging the concepts of digital governance and collaborative governance within the broader context of public administration transformation. Whereas prior research has often treated these dimensions separately, this study highlights their interdependent evolution, demonstrating that digital technologies not only enhance administrative efficiency but also foster deeper, multi-actor collaboration across sectors.

However, despite extensive research on digital governance, there is no clear consensus on how the notion has evolved over time. As a result, a comprehensive bibliometric review of the scientific literature can provide a thorough picture of how this topic has progressed from the beginning of the twenty-first century to the present. By analyzing scientific publications from the Scopus database, it was discovered that research on digital governance topics existed between 2006 and 2024. Using this data, the author identified the main trends in digital governance research, significant contributions from various disciplines, and their impact on public policy. This article's methodology intends to provide significant insights for practitioners, scholars, and policymakers interested in building effective and long-term digital governance policies.

Research Methods

VOSviewer is reliable software that can analyze bibliometric data and present the results with a variety of features. A specific ranking algorithm and complex dynamic analysis are utilized to undertake prestige, cocitation, and dynamic co-citation analysis (Khanra, S. et al., 2020). The VOSviewer program employs a variety of approaches and tools for bibliometric analysis across several parameters; the review will benefit potential contributors, editors, and other journal stakeholders (Kumar et al., 2024). In an era of rapid scientific production, bibliometric analysis (BA) has emerged as an important technique for understanding the dynamics of research domains (F. Ahmed et al., 2024; Alkathiri et al., 2024; Hassan & Duarte, 2024).

Figure 1 depicts the investigation's mechanism. From start to finish, the steps are divided into three stages: The first stage is data gathering, followed by bibliometric analysis and visualization, and finally formulating or interpreting the results. This study's Phase 1 data came from the Scopus database, which contains 745 documents of various types, including articles, letters, reviews, book reviews, book chapters, and more. The keywords "digital governance" yielded 396 articles, 173 conference papers, 110 book chapters, 23 reviews, one retraction, 20 books, ten conference reviews, seven editorials, and three notes. Following data collection, a bibliometric analysis is conducted, and the results are displayed using the VOSviewer software. Scopus publications include a lot of data (full notes and citations are saved to a text file), including the publication year, author, author address, title, abstract, source journal, subject area, and reference. As a result, all of the data from Stage 1 can be successfully used for bibliometric analysis and information visualization in Stage 2, followed by a conclusion drawing in Stage 3. Figure 1 displays the procedure's Stage.

The bibliometric analysis of digital governance research began by setting clear research objectives, such as identifying trends, evaluating contributions, and exploring collaboration patterns. Data was gathered from scientific materials like journal articles and conference papers, primarily sourced from the Scopus database using the keyword "digital governance." This search yielded 745 relevant publications from 2006 to 2024.
Next, the collected data was analyzed using bibliometric techniques, including citation analysis, co-keyword analysis, and co-author analysis. Visualization tools like VOSViewer helped map research networks and trends. Finally, the results were interpreted to highlight key findings, emerging themes, and gaps in the literature. The analysis provided insights into research trends, identified areas needing further exploration, and offered recommendations for future studies in digital governance.

Figure 1. Stages of bibliometric analysis in Digital Governance research.

Results and Discussion

Evolution of Publication Trends

VOSviewer enables bibliometric analysis of digital government research, as well as an understanding of the publishing industry's history. The emergence and development of digital governance research has slowed the rapid advancement of information and communication technology (TIK) and its implications for governments, businesses, and the general public. Utama Development The field of digital governance is growing in parallel with governments' worldwide adoption of digital technologies. It focuses on the use of e-government, smart city projects, and digital transformation to improve public sector efficiency. Organizations, whether public and commercial, face the challenge of adapting to the digital age through digital transformation. However, a previous study on digital governance from the WoS Database revealed A future study on digital governance is expected to focus on the usability and dependability of systems, investigating user adoption, system performance, and service quality (Zhao Lin & Yaakop, 2024)

The most recent trends in digital governance studies are AI and machine learning. The application of artificial intelligence (AI) and machine learning in digital governance has been identified as a top priority by the publication in 2024. This study investigates how technology can increase operational efficiency, data analysis for decision-making, and service automation. Blockchain and cybersecurity: Blockchain technology is being utilized to enhance security and transparency in public administration and data management. The study also looks at novel cyber risk mitigation measures and data security.

The research focuses on the application of the Internet of Things (IoT) to smart governance and smart cities. This includes enhancing municipal infrastructure, providing public services, and analyzing sensor data for better urban planning.

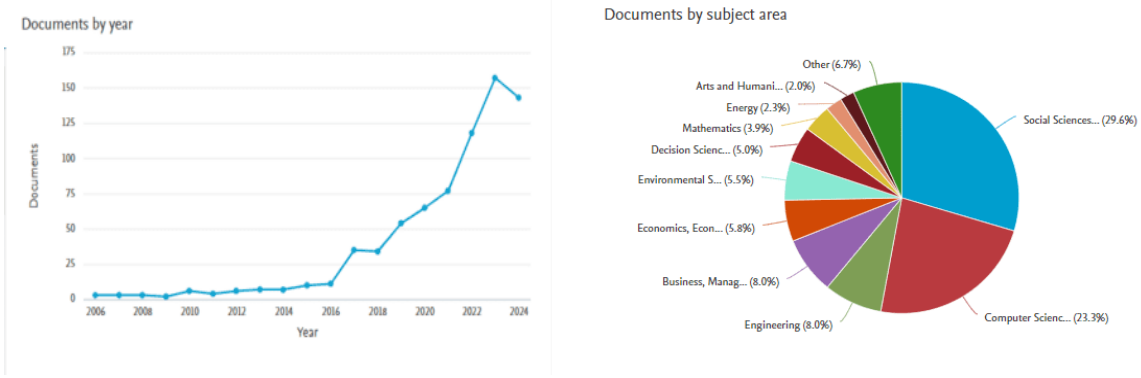

Figure 2 : Development and Trends of Digital Governance Publications
Source: processed by author

The number of publications is an essential indicator of the growth trend in scientific research. A record of how frequently articles are mentioned as sources by others indicates the quality of a publication. Figure 2a depicts the evolution of articles on productive digital governance in its publications. Until 2024, there will be 745 published documents, of which 53.2% are articles, 23.2% are conference papers, 14.8% are book chapters, 3.1% are reviews, 2.7% are books, 1.3% are conference reviews, 0.9% are editorials, 0.4% are notes, 0.3% are letters, and 0.1% are retractions. The data shows

that this kind of article is the most common form of content in digital governance publications. While the digital governance publication area covers a wide range of topics, this research on digital governance has had an impact on a number of other studies in the field. Figure 2b demonstrates that the social science area publishes the most on the topic of digital governance, accounting for 29.6%. Computer science is the second most published subject on the topic, with 23.3%. Engineering: 8.0%; Business Management: 8.0%; Economics: 5.8%; Environmental Science: 5.5%; Decision Science: 5.0%; Mathematics: 3.9%; Energy: 2.3%; Art and Humanities: 2.0%; and Others: 6.7%.

Table 1. Top 10 most productive and influential sources, authors, organizations, and countries in the development of research on digital governance topics from 745 publications (2006-2024)

RO	Source Titles		Authors		Countries/Region	
	ST	**PC**	**Name**	**PC**	**Coutries**	**PC**
Top 1	Small business economics	626	Acs, Zoltan j.	490	United States	2019
Top 2	Sustainability (Switzerland)	249	Sussan, Fiona	490	United Kingdom	1123
Top 3	Sociologis Ruralis	234	Williamson, Ben	302	China	485
Top 4	City	212	Wiig, alan	212	India	271
Top 5	ACM International conference proceeding	181	Floridi, luciano	168	Switzerland	211
Top 6	Big Data and Society	164	Song, Abraham K.	136	Germany	199
Top 7	Government information Quarterly	159	Chopra, Ritika	120	Spain	186
Top 8	Sustainable Futures	126	Sharma, Gagan deep	120	Australia	167
Top 9	Learning, media dan technology	104	Yadav, anshita	118	Netherlands	161
Top 10	Human Genetic	95	Florin, Marie-valentine	118	Italy	144

Source: processed by author *Note : ST : Source Title; PC : Publication Citation*

According to Table 1, there are some factors that are highly significant and contribute to digital governance research. Table 1 lists the top ten publications that have made significant contributions to the study of digital governance, including Small Business Economics, which has a citation count of 626. Meanwhile, the most influential author is Acs Zoltan, who has received 490 citations. Furthermore, it is affiliated with or organized by the Scharr School of Policy and Government at George Mason University. The United States is the leading publishing country, with a 2019 citation count.

According to the Scopus database, between 2006 and 2024, there were 745 published documents, 1746 authors, 3800 keywords, 460 journal sources, 1385 organizations and affiliates, and collaborations from 94 countries. Meanwhile, the keyword trend in the most recent research on the topic of digital governance, specifically in 2024, includes keywords such as digital strategy, green technology, technological innovation, human-machine-organization interaction, virtual assistance, damage, environmental governance, and others.

Analyzing co-keyword and keyword citations

Co-keyword analysis (or co-occurrence analysis) is a technique for discovering and visualizing the link between keywords that appear frequently in literature or scientific papers. The primary purpose is to investigate thematic links among issues that are frequently mentioned in a certain setting. Keyword citation analysis examines how

frequently specific terms are mentioned in the context of specific research. This assists in determining the popularity or significance of terms in academic or research literature, as well as identifying trends and study topics. The combination of these two methods of analysis can provide a deeper understanding of the structure and growth of knowledge in a particular topic, as well as aid in defining research strategies and developing new concepts, particularly in the field of digital governance (Dupre, 2019). In the study of digital governance, the visualization of keywords and clustering can be shown in Figure 3, with the top keywords and clustering numbers in Table 2.

Table 2. Top-ranking keywords with occurrence weight and excellent link strength.

Rangking	Keywords	Occurances	Link	Total Link strenght	APY	APC
Top 1	Digital Governance	267	667	1400	2021	8,43
Top 2	Digital transformation	58	184	303	2021	4,66
Top 3	E-Government	57	194	334	2019	4,4
Top 4	Sustainable Development	39	293	433	2022	5,87
Top 5	Decision making	36	275	378	2021	3,17
Top 6	Governance Approach	35	282	428	2021	11,31
Top 7	Artificial Intelegent	34	188	257	2021	10,53
Top 8	Smart City	34	169	239	2021	13,32
Top 9	Digital Economy	33	154	214	2022	3,39
Top 10	Digitization	30	246	368	2022	8,7

Source: processed by author *Note: APY : Average Publication year*

The digital governance investigation detected a total of 3800 keywords. Of the 3800 keywords available, the keyword digital governance appears the most frequently (267 times), with the highest overall network strength among others, up to 1424, as shown in Figure 3a. Between 2006 and 2023, research on digital governance evolved keywords, leading to the birth of new terms such as sustainable development and digital transformation. This is extremely useful information for digital governance studies. This is illustrated in Figure 3b. Over time, the most often used keywords have remained Digital Governance (267) and Digital Transformation (58). This suggests that the terms digital governance and digital transformation have had a significant impact on digital governance research thus far.

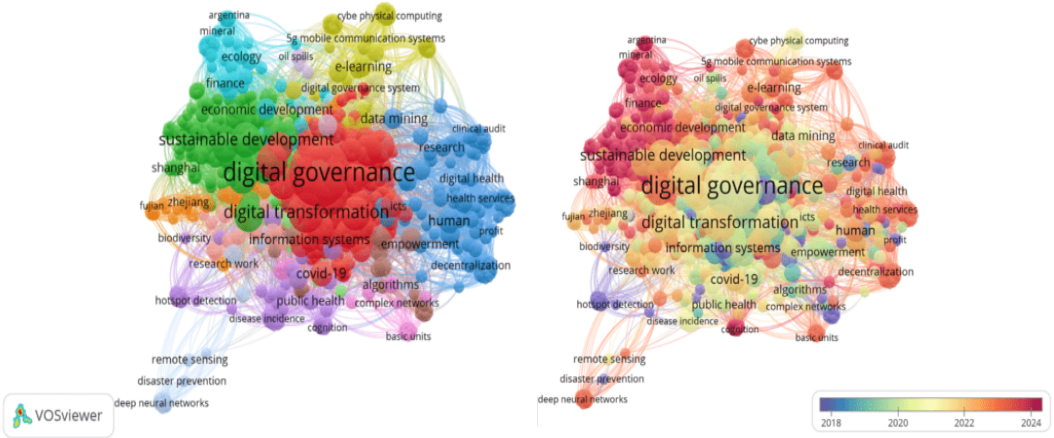

Figure 3. Co-keyword network visualization on Digital Governance research

Source: processed by author

Co-authorship visualization analysis

Co-authorship visualization analysis is a bibliometrics technique used to investigate collaboration relationships between writers in academic literature. By evaluating the co-authorship network, researchers can obtain insight into collaboration patterns, identify major contributors in a field, and comprehend the structure of the research community. One study by (Meng et al., 2020) used VOSviewer to create and show a network map of co-authorship and pertinent terms retrieved from the publication's title and abstract, allowing for a thorough examination of the author's relationships and research issues. This method enables researchers to see the relationships between authors and their contributions to scientific work, resulting in a clear picture of collaboration patterns in certain research domains (Vrydagh, 2023).

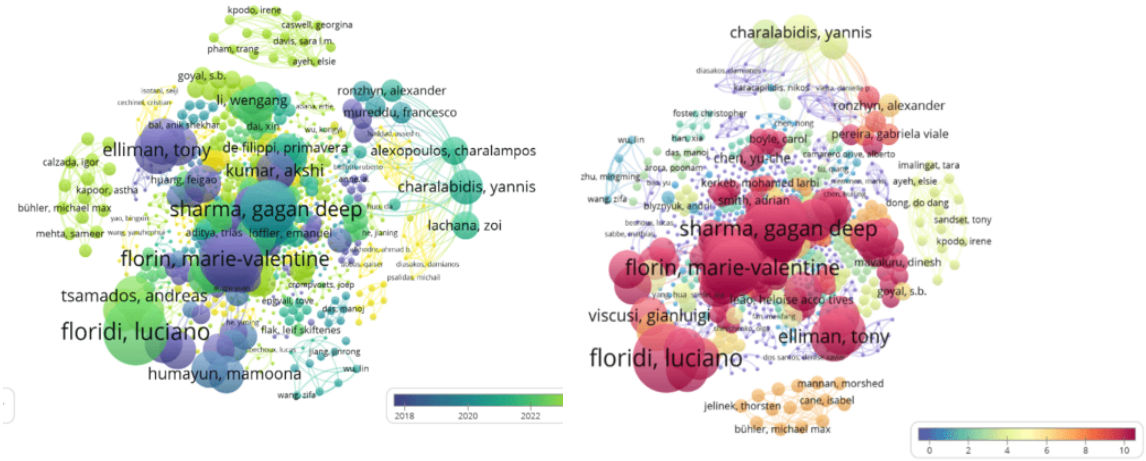

Figure 4: Co Author Network for Digital Governance. Note: **(a)** Overlay visualization was based on author citation weights and average year score; and **(b).** Overlay visualization was based on Citation weights and the average publication citation score

Figure 4 shows the collaborative network of 1746 co-authors on digital governance topics. Figure 4a reveals that Floridi and Luciano are the co-authors with the most published papers. He is the co-author who has made the most significant contribution to research on digital governance, followed by the other co-authors. Meanwhile, figure 4b demonstrates that the co-author has the most publications but not the most recent ones. Figure 4b illustrates that the co-authors who have the greatest citations as co-authors are influential, as shown in Table 3 with network limitations.According to the Scopus database as of July 2024, there are ten authors who have made significant contributions to publications on digital governance subjects

Co-authors' visualization of countries and regions.

China is the country that contributes the most to research on the topic of digital governance by producing the most publication documents among other countries. Meanwhile, the United States and the United Kingdom and other countries that are in the top 10 countries that contribute the most can be seen in table 4. Based on table 4 which is initialized in figure 7, it can be explained that the country with the highest number of joint publication colloquial documents is China, followed by the United States, the United Kingdom, India, and Italy as the top 5 rankings. The countries with the highest number of citations in joint publications are the United States, the United Kingdom, China, India, and Switzerland. This can be seen in the visualization of figure 7a. The latest publications in digital governance research are Azerbaijan (2023),

Kazakhstan (2023), Ghana (2023), Cambodia (2023), China (2022), and Australia (2022). And the number of publication documents per country is according to figure 7b.

Table 4. Top country rankings based on the number of joint publication collaboration documents

Rangking	Country	Document	Citation	Total Link Strength	APC	APY
Top 1	United States	117	2019	63	17,26	2019
Top 2	United Kingdom	59	1123	57	19,03	2019
Top 3	China	172	485	41	2,82	2022
Top 4	India	53	271	16	11,72	2020
Top 5	Switzerland	18	211	27	5,11	2021
Top 6	Germany	23	199	29	8,65	2020
Top 7	Spain	30	186	25	6,2	2021
Top 8	Australia	24	167	24	6,96	2022
Top 9	Netherlands	28	161	34	5,75	2021
Top 10	Italy	35	144	31	4,11	2021

Source: processed by author *Note: APY : Average Publication year*

Figure 7 illustrates the involvement of author partners from diverse nations and regions in digital governance research. China appears to have the most published documents, ranking first among other countries. Total publication documents China has 172 published documents, including those by other authors. The United States (117 publication documents) came next, followed by the United Kingdom (59 joint publication documents). This demonstrates that the three countries provide the most significant contributions to research on digital governance. Figure 7 shows that 94 countries collaborate on scientific publications.

Figure 7a shows the network and co-authoring collaboration. The network's strength lies in the United States (63 total networks), the United Kingdom (57 networks), and China (41 networks). These three countries have a very strong collaboration of author partners compared to 94 other countries in research on the topic of digital governance. Figure 7b shows the documents published with the co-author, as well as their average year of publication. According to this image, China has the most recent and largest number of papers in the digital governance research, which includes 94 contributing countries. China's average year of publishing is 2022, the United States' average is 2019, and the United Kingdom's median is also 2019. The two countries have identical rankings for the novelty of research on digital governance

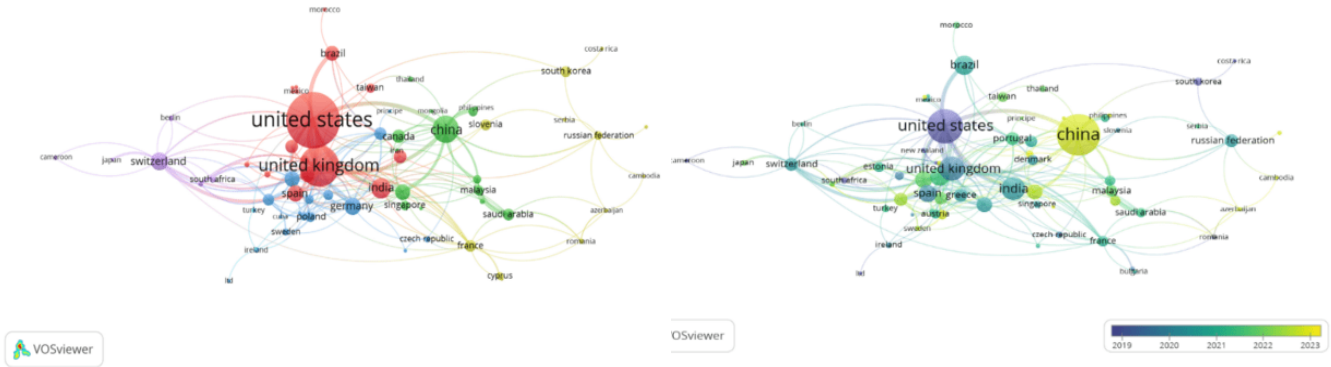

Figure 7 : Co-author visualization map of countries/ regions.
Source: processed by author

Visualization of citations by country or region

The literature review on Citation Visualization Analysis by Country or Region contains several sources that might provide in-depth insights into publishing patterns and research collaborations from various nations or regions (Schraven et al., 2021), (Wahyudin, 2023), (Chowdhry, A. et al., 2023). This analysis offers useful insights into the dynamics of global research and maps the contributions of scholars from across the world to the advancement of knowledge on the issue of digital governance research.

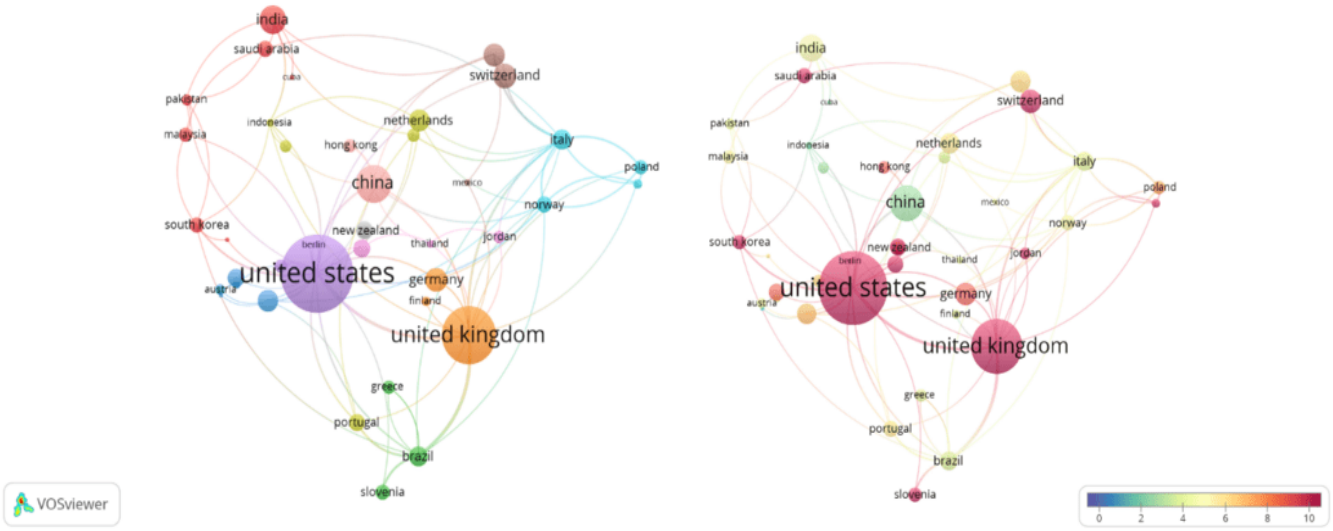

Figure 8. Citation visualization map of countries/regions.
Source: processed by author

In the study of digital governance, 94 countries or regions were identified, as detailed in the published article. The United States is the top Kutipan country in 2019, with a Kutipan score of 17.26 per year. Citations based on a single country, such as the United States, outnumber 94 other countries, implying that the United States has a significant impact on worldwide digital governance research. The visualization of the Kutipan score based on country can be seen in Figure 8.

Research Organization

In the realm of bibliometric analysis, the term "research organization" encompasses a wide range of academic and scientific entities, including universities, research institutes, and other institutions dedicated to conducting research and publishing scholarly articles. When utilizing tools like VOSviewer for bibliometric studies, a "research organization" is defined as an academic or research institution that can be identified and examined through the affiliations listed in scientific publications. This approach allows researchers to trace the contributions of these organizations to the broader academic landscape.

By analyzing these affiliations, bibliometric studies shed light on the patterns and dynamics of collaboration among research organizations, particularly in specialized fields such as global digital governance. Such investigations are invaluable for understanding how these institutions interact, share knowledge, and collectively advance research in this domain. Furthermore, a thorough review of the literature on research organizations within digital governance reveals a wealth of sources that delve into the critical role these entities play in shaping the evolution of digital governance frameworks. These sources offer nuanced perspectives on how research organizations

influence policy, innovation, and theoretical developments in the field, highlighting their significance as key drivers of progress in digital governance research.

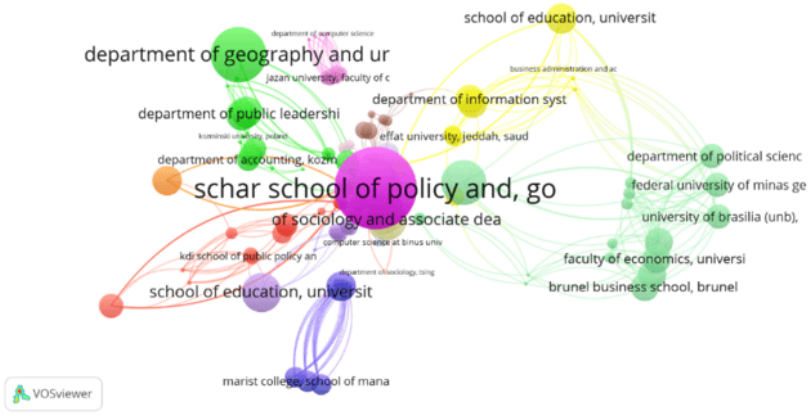

Figure 9. Citation visualization map of research organizations on Digital Governance

Source: processed by author

Figure 9 show Citation visualization map of research organizations on Digital Governance that between 2006 and 2024, digital governance research identified 1385 research organizations. The Schar School of Policy and Government at George Mason University (490 citations), the School of Advanced Studies at the University of Phoenix (490 citations), and the Ecole Polytechnique Federale de Lausanne in Switzerland (118 citations) are the most notable research institutions. This organization has a significant influence on digital governance research, despite the fact that its papers are not new.

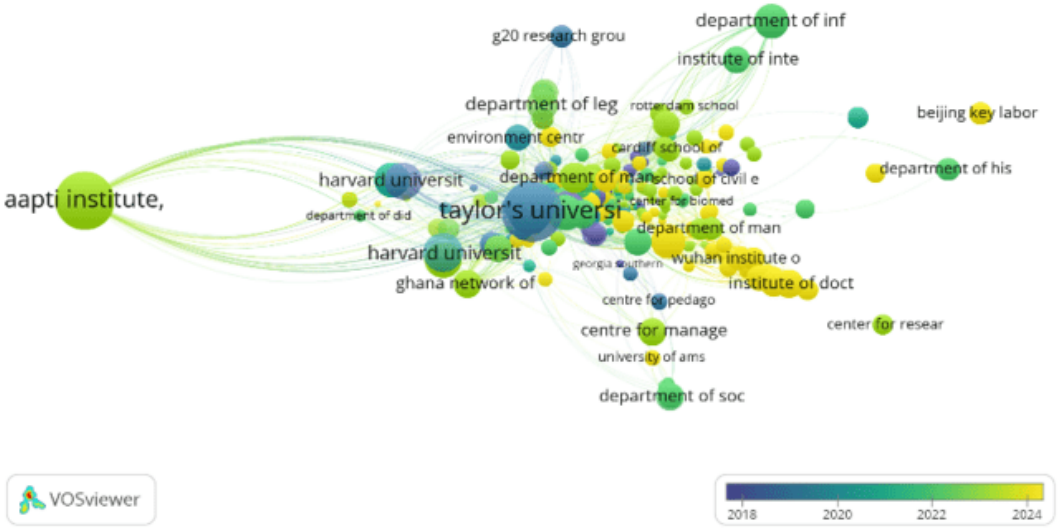

Figure 10. The Bibliographic Coupling visualization map of research organizations on Digital Governance.

Source: processed by author

Figure 10 depicts bibliographic coupling, a bibliometric analysis technique that calculates the proximity of two papers based on the identical reference mentioned by both. In the context of "The Bibliographic Coupling Visualization Map of Research Organizations on Digital Governance," this refers to a visual map that depicts the relationship between various research organizations in the field of digital governance based on common bibliographic patterns. Each dot symbolizes a research organization, and the lines connecting the dots indicate how tight their bibliographic link is. This indicates that the more frequently two organizations refer to the same or similar publications in the scientific literature, the closer they will be to each other. The goal of

this visualization map is to provide a more detailed view of the network of collaborations or interactions between research organizations working in the field of digital governance. By showing these bibliographic trends, the map can assist in identifying research clusters or organizations that interact regularly or share similar research interests on the issue.

Journal Publishing

A citation visualization map depicts how a certain source (such as a research paper, book, or article) is discussed or cited in other works. The goal of making this visualization map is to visually investigate and comprehend the relationship between citations in different academic works. In bibliometric analysis with VOSviewer, "journal publishing" refers to an analysis and visualization method that leverages scientific journals as the major source of research publications. Merigó et al. (2016). In this regard, VOSviewer is used to identify and evaluate patterns and relationships in scientific data published in various papers on digital governance.VOSviewer enables academics to assess journal performance using a variety of bibliometric indicators, such as citation count, co-citation networks, and keyword co-occurrence. Furthermore, VOSviewer is useful in reviewing journal publications since it illustrates the relationships between journals, authors, and study subjects. Visualizing the journal co-citation network enables scholars to identify the most influential journals in a certain subject and comprehend the flow of knowledge across various publications (Morçöl, 2021), (Meng et al., 2020), (Cai et al., 2024), Such analyses provide valuable insights into the distribution of knowledge in scientific publications and help scholars navigate the vast academic literature on digital governance.

Figure 11 visualizes 460 sources provide information about digital governance. Small business economics received the most citations (626), followed by the Sustainability Journal (Switzerland) (249), Sociologia Ruralis (234), Jurnal City (212), and other publications. However, ACM International Conference Proceedings has the most joint articles, with 75 publications, 181 citations, and 967 collaboration networks. Then came resources policy as a source for digital governance research, with 19 publications, including the second-most papers (18 citations) and 190 collaborative networks.

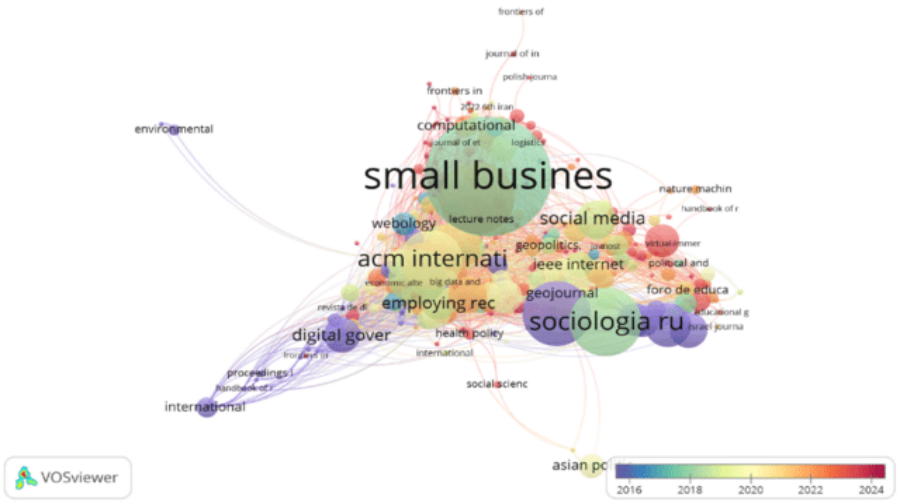

Figure 11. Bibliographic coupling map of sources
Source: processed by author

Figure 11 also describes the bibliographic coupling visualization map, which shows the relationships between scientific documents based on the references they share. Each source (document or publication) is displayed as a node on the map. Nodes often contain titles, author, and other metadata relating to digital governance subjects. The line linking the nodes symbolizes bibliographic coupling, which means that two nodes are coupled if they have the same reference. The more references the two texts have, the stronger the association (thicker or darker lines). Documents that are tightly related (with many references to one another) create clusters or groups on a map. This cluster represents study fields or themes connected to digital governance.

Synthesis of Key Findings with Related Literature

A bibliometric analysis indicates that digital governance and collaborative governance have become increasingly popular topics within public administration literature. A significant surge in publications is particularly evident following the COVID-19 pandemic, which compelled governments worldwide to accelerate the adoption of digital technologies in order to maintain continuity in public service delivery. Over the past two decades, scholarly publications have also shown a notable shift from traditional governance approaches toward more open, adaptive, and network-based models.

Nevertheless, the conceptual and practical connection between digital governance and collaborative governance remains underexplored and insufficiently mapped in academic literature. (Maulana & Dečman, 2023) identify that the concept of collaborative digital transformation (CDT)—an emerging term combining elements of digitalization and collaboration in public governance transformation—remains fragmented. In the bibliometric mapping, CDT appears as a nascent cluster that has yet to be fully consolidated into a robust theoretical framework. This highlights the need for the development of conceptual models that can effectively explain how digital technologies facilitate cross-sector collaboration in public governance.

Furthermore, the bibliometric findings also reveal that most studies on digital governance predominantly focus on its technological aspects—such as e-government, smart cities, and digitalization—without sufficiently addressing the role of non-governmental actors and the collaborative dimensions involved. In fact, the success of digital transformation in the public sector largely depends on the capacity of these actors to collaborate in policy formulation and implementation processes. Therefore, integrating collaborative approaches into digital governance research not only enriches the theoretical discourse but also provides practical insights to better address the complex challenges of public governance in the digital era.

Transformation of Public Administration Models

The advancement of digital technologies has driven a fundamental transformation in public administration, shifting from traditional bureaucratic models toward more adaptive, participatory, and citizen-centered approaches. In the digital era, rigid hierarchies and siloed decision-making processes are no longer sufficient to address the complex and fast-evolving challenges faced by public institutions. Scholars such as (Mergel et al., 2019)) introduced the concept of Digital Era Governance (DEG), highlighting the importance of reintegrating government functions, focusing on user

needs, and leveraging digital tools to improve governance outcomes. This shift reflects the growing expectation for public administration to become more agile, data-driven, and accountable to diverse stakeholders.

Collaborative governance has emerged as a complementary model to support this transformation. Defined by (Ansell & Gash, 2008) as a process in which public agencies engage with non-state stakeholders in collective decision-making, collaborative governance aligns with the digital governance agenda that seeks openness, inclusiveness, and joint problem-solving. In a digitally enabled governance context, information flows more rapidly, and interactions between governments, citizens, civil society, and the private sector can occur in real time. These dynamics enable co-production of services and policies, encouraging shared ownership of public outcomes. As observed in recent studies, platforms such as open data portals, digital consultations, and smart city applications have become tools for facilitating collaboration (Tiglao, 2023)

Nevertheless, this transformation is not without its challenges. The adoption of collaborative and digital governance approaches requires public institutions to undergo organizational restructuring, enhance digital literacy, and develop mechanisms for managing multi-actor coordination. Resistance to change, unequal access to technology, and institutional inertia remain significant barriers (Habibi et al., 2023) (Perng et al., 2024). Despite these obstacles, the convergence of digital and collaborative governance offers a unique opportunity to rethink public administration models—moving away from a top-down system toward a more distributed and networked architecture that is better equipped to meet the demands of modern governance.

Collaborative Governance in the digital era

The success of digital transformation in public administration heavily relies on effective collaboration among multiple stakeholders, including government institutions, private sector entities, academia, and civil society organizations. This multi-actor synergy is crucial in addressing the complexity of modern governance challenges, particularly in implementing innovative and citizen-centric digital services. The concept of the "penta-helix model" has gained traction as a framework for fostering inclusive governance, where knowledge and resources from diverse sectors are pooled together to co-create solutions and drive public innovation (Sumarto et al., 2020) (Avoyan, 2023)(Alblas, 2023).

A notable case from West Java, Indonesia, illustrates how multi-actor collaboration can be institutionalized to accelerate digital governance. The establishment of Jabar Digital Service (JDS), a specialized digital transformation unit, represents a strategic effort by the provincial government to integrate stakeholders under a unified platform. JDS functions as a hub for coordinating efforts across public agencies, IT developers, universities, and citizen communities to develop data-driven policies and digital services. Studies suggest that such cross-sectoral collaboration enhances trust, accelerates technological adoption, and aligns public service delivery with community needs (Ulibarri, 2019).

However, effective collaboration is not automatic; it requires structured mechanisms for dialogue, shared goals, and continuous capacity-building. Power asymmetries, conflicting interests, and lack of interoperability between systems can hinder collaborative processes. To overcome these barriers, governments need to adopt participatory leadership, ensure transparent communication, and invest in digital infrastructures that support co-creation. The penta-helix approach thus not only serves as a theoretical model but also as a practical guide for realizing collaborative governance in the digital era.

The Role of Digital Technology in Governance

Digital technologies—particularly e-government platforms—play a pivotal role in transforming public administration by enhancing transparency, accountability, and service efficiency. As governments transition from traditional bureaucratic systems to digitally enabled models, the deployment of information and communication technologies (ICT) becomes central to enabling faster decision-making and more inclusive citizen engagement. (Tskhadadze, 2024) highlight that e-government implementation significantly accelerates bureaucratic processes, expands public participation channels, and mitigates corruption risks by reducing opportunities for rent-seeking behavior.

Moreover, digital platforms serve not only as tools for service delivery but also as enablers of participatory governance. Online portals, open data initiatives, and interactive feedback systems allow citizens to voice concerns, monitor government performance, and co-produce public policies. This aligns with the principles of New Public Governance, which emphasize horizontal accountability and stakeholder collaboration. According to (Zhang et al., 2024), countries with advanced e-government infrastructures tend to report higher levels of citizen satisfaction and institutional trust, illustrating the far-reaching potential of digital transformation in governance systems.

However, the full realization of digital governance is hindered by persistent digital divides and institutional inertia. In many regions, unequal access to technology and limited digital literacy constrain the inclusiveness of digital initiatives. Additionally, cultural resistance within bureaucracies—characterized by rigid hierarchies and reluctance to adopt innovation—impedes digital adoption. Overcoming these challenges requires targeted policy interventions, such as digital capacity-building programs, adaptive leadership, and structural reforms that incentivize innovation within public institutions (Mergel et al., 2019).

Conclusion

This study highlights the growing academic interest and practical relevance of digital and collaborative governance as transformative paradigms in public administration. The bibliometric analysis reveals a significant post-pandemic surge in research output, driven by the global urgency to adopt digital technologies for sustaining public service delivery. However, despite increasing attention, the conceptual integration between digital governance and collaborative governance remains fragmented and underdeveloped. The emergence of collaborative digital transformation (CDT) as a research niche indicates the need for a more unified

theoretical framework that bridges digital tools with inclusive, participatory governance mechanisms. Furthermore, digital transformation is catalyzing a paradigm shift from traditional bureaucratic models toward more adaptive, citizen-centered approaches. Collaborative governance, facilitated by digital platforms, empowers multi-actor engagement, supports real-time policy co-creation, and fosters shared accountability. Nevertheless, the realization of this transformation faces persistent challenges such as institutional resistance, digital inequality, and coordination complexity among diverse actors. Ultimately, the synergy between digital and collaborative governance offers a compelling vision for modernizing public administration. By addressing infrastructural gaps, enhancing digital literacy, and promoting inclusive collaboration, governments can harness digital technologies not only for efficiency but also for strengthening democratic values and public trust. Future research should focus on developing integrative models, assessing impact across various governance contexts, and exploring scalable frameworks for collaborative digital innovation.

References

Abdullah-Al-Faruk, M. (2024). Safeguarding Citizen Security and Fostering Economic Prosperity in Bangladesh through Digitization. *Economic Affairs (New Delhi)*, *69*(1), 469–477. https://doi.org/10.46852/0424-2513.2.2024.9

Ahmed, F., Zapata, O., & Poelzer, G. (2024). Sustainability in the arctic: a bibliometric analysis. *Discover Sustainability*, *5(1)*, *121*. https://doi.org/10.1007/s43621-024-00312-4

Al-Hawamleh, A. M. (2024). Investigating the multifaceted dynamics of cybersecurity practices and their impact on the quality of e-government services: evidence from the KSA. *Digital Policy, Regulation and Governance*, *26*(3), 317–336. https://doi.org/10.1108/DPRG-11-2023-0168

Alblas, E. (2023). Collaborative agri-environmental governance in the Netherlands: a novel institutional arrangement to bridge social-ecological dynamics. *Ecology and Society*, *28*(1). https://doi.org/10.5751/ES-13648-280128

Alkathiri, N. A., Said, F. B., Meyer, N., & Soliman, M. (2024). Knowledge management and sustainable entrepreneurship: a bibliometric overview and research agenda. *Journal of Innovation and Entrepreneurship*, *13*(1), 38. https://doi.org/10.1186/s13731-024-00387-3

Ansell, C. H., & Gash, A. (2008). Ansell, C. H., & Gash, A. . Collaborative governance in theory and practice. *Journal of Public Administration Research and Theory*, *18*(4), 543-571. https://doi.org/https://doi.org/10.1093/jopart/mum032

Avoyan, E. (2023). Collaborative Governance for Innovative Environmental Solutions: Qualitative Comparative Analysis of Cases from Around the World. *Environmental Management*, *71*(3), 670–684. https://doi.org/10.1007/s00267-022-01642-7

Belahouaoui, R., & Attak, E. H. (2024). Digitalization of tax administration and tax avoidance: Evidence on tax reform dynamics in Morocco. In *Impact of Digitalization on Reporting, Tax Avoidance, Accounting, and Green Finance* (p. 26). https://doi.org/DOI: 10.4018/979-8-3693-1678-8.ch009

Bhattacharya, S. (2024). Government strategies for sustainability, socioeconomic progress, and genderbiased citizen participation in global digital governance. In

Emerging Developments and Technologies in Digital Government. https://doi.org/10.4018/979-8-3693-2363-2.ch008

Cai, Y., Huang, Z., & Zhang, X. (2024). FinTech adoption and rural economic development: Evidence from China. *Pacific Basin Finance Journal*, *83*. https://doi.org/https://doi.org/10.1016/j.pacfin.2024.102264

Caviggioli, F., & Ughetto, E. (2019). A bibliometric analysis of the research dealing with the impact of additive manufacturing on industry, business and society. *International Journal of Production Economics*, *208*, *254–2*, 254–268. https://doi.org/https://doi.org/10.1016/j.ijpe.2018.11.022

Chen, K., Li, Q., Shoaib, M., Ameer, W., & Jiang, T. (2024). Does improved digital governance in government promote natural resource management? Quasi-natural experiments based on smart city pilots. *Resources Policy*, *90*. https://doi.org/10.1016/j.resourpol.2024.104721

Chowdhry, A., K., Bhargava, D., & Bagga, D. (2023). Mapping of journal of oral and maxillofacial pathology from 2011 to 2022: a vosviewer-based bibliometric visualisation. *Journal of Oral and Maxillofacial Pathology*, *27(1)*, *204*. https://doi.org/https://doi.org/10.4103/jomfp.jomfp_398_22

Ding, R. (2022). Polycentric Collaborative Governance, Sustainable Development and the Ecological Resilience of Elevator Safety: Evidence from a Structural Equation Model. *Sustainability (Switzerland)*, *14*(12), 7124. https://doi.org/10.3390/su14127124

Dupre, K. (2019). Trends and gaps in place-making in the context of urban development and tourism: 25 years of literature review. *Journal of Place Management and Development*, *12*(1), 102–120. https://doi.org/10.1108/JPMD-07-2017-0072

Esposito, G., Terlizzi, A., Guarino, M., & Crutzen, N. (2024). Interpreting digital governance at the municipal level: Evidence from smart city projects in Belgium. *International Review of Administrative Sciences*, *90*(2), 301–317. https://doi.org/10.1177/00208523231167538

González-Cancelas, N., Camarero Orive, A., Vilarchao, A. R., & Vaca-Cabrero, J. (2024). Use of End-to-End Tool for the Analysis of the Digital Governance of Ports. *Logistics*, *8*(2), 58. https://doi.org/10.3390/logistics8020058

Gozgor, G., Lau, C. K., Lin, Z., & Zeng, Y. (2024). The impact of digital governance on tourism development. *Journal of Digital Economy*, *3*, 1–13. https://doi.org/10.1016/j.jdec.2024.05.003

Grinberg, D. (2017). Chilling Developments: Digital Access, Surveillance, and the Authoritarian Dilemma in Ethiopia. *Surveillance & Society*, *15*(3/4), 432–438. https://doi.org/10.24908/ss.v15i3/4.6623

Guo, Y., & Zhang, T. (2024). The present of digital government: Insights from Chinese practices. In *Emerging Developments and Technologies in Digital Government* (p. 21). https://doi.org/10.4018/979-8-3693-2363-2.ch002

Habibi, M., Mahadika, A., & Widia Astuti. (2023). Digital dilemma: technology in the vote counting process for general elections and local head elections in Indonesia. *Otoritas : Jurnal Ilmu Pemerintahan*, *13*(3). https://doi.org/https://doi.org/10.26618/ojip.v13i3.12729

Hassan, W., & Duarte, A. E. (2024). Bibliometric analysis: A few suggestions. *Current*

Problems in Cardiology, *49*(8), 102640. https://doi.org/10.1016/j.cpcardiol.2024.102640

Khanra, S., Dhir, A., Islam, A. N., & M¨ antym¨ aki, M. (2020). Khanra, S., Dhir, A., Islam, A. N., & M¨ antym¨ aki, M. (2020). Big data analytics in healthcare: A systematic literature review. Enterprise Information Systems, 14(7), 878–912. *Enterprise Information Systems, 14(7)*, *878*.

Kumar, V., Joshi, S., & Sharma, M. (2024). A retrospective overview of Transnational Corporations Review: An analysis of past, present and future contributions. *Transnational Corporations Review*, *16*(4), 200075. https://doi.org/10.1016/j.tncr.2024.200075

Liao, H., Tang, M., Luo, L., Li, C., Chiclana, F., & Zeng, X. (2018). A bibliometric analysis and visualization of medical big data research. *Sustainability (Switzerland)*, *10*(1), 166. https://doi.org/https://doi.org/10.3390/su10010166

Lu, J., Cheng, Y., Qi, X., Chen, H., & Lin, X. (2024). Rethinking urban wilderness: Status, hotspots, and prospects of ecosystem services. *Journal of Environmental Management*, *364*. https://doi.org/10.1016/j.jenvman.2024.121366

Mann, M., Mitchell, P., & Foth, M. (2024). Between surveillance and technological solutionism: A critique of privacy-preserving apps for COVID-19 contact-tracing. *New Media and Society*, *26*(7), 4099-4117. https://doi.org/10.1177/14614448221109800

Maulana, R. Y., & Dečman, M. (2023). Collaborative Governance in the Digital Transformation Age: A Systematic Literature Review with Bibliometric Mapping. *Central European Public Administration Review*, *21*(1), 31–60. https://doi.org/10.17573/cepar.2023.1.02

Meng, C., Du, X., Ren, Y., Shen, L., Cheng, G., & Wang, J. (2020). Sustainable urban development: An examination of literature evolution on urban carrying capacity in the Chinese context. *Journal of Cleaner Production*, *277*. https://doi.org/10.1016/j.jclepro.2020.122802

Mergel, I., Edelmann, N., & Haug, N. (2019). Defining digital transformation: Results from expert interviews. *Government Information Quarterly*, *36*(4), 101385. https://doi.org/10.1016/j.giq.2019.06.002

Morçöl, G. (2021). The collaborative governance networks literature: A comprehensive and systematic review. In *Handbook of Collaborative Public Management* (pp. 36–49). https://api.elsevier.com/content/abstract/scopus_id/85114015948

OECD. (2020). *The Covid-19 crisis: A catalyst for government transformation?* (OECD Policy Responses to Coronavirus (COVID-19)). https://doi.org/10.1787/1d0c0788-en

Perng, S.-Y., Chen, Y.-Y., Fan, M.-F., Pan, M.-L., & Tsai, H.-Y. S. (2024). Digital Pandemic Governance in Taiwan. In *Taiwan's COVID-19 Experience: Governance, Governmentality, and the Global Pandemic* (pp. 134–152). https://doi.org/10.4324/9781003438380-9

Prihatin, P. S., Amri, P., & Agung Wicaksono. (2023). Public service transformation trough digital-based services during Covid-19 pandemic in Riau Province, Indonesia. *Otoritas : Jurnal Ilmu Pemerintahan*, *13*(111–124). https://doi.org/https://doi.org/10.26618/ojip.v13i1.9861

Qiang, X. (2019). President XI's Surveillance State. *Journal of Democracy*, *30*(1), 53–67. https://doi.org/10.1353/jod.2019.0004

Rasyid, S. (2022). (2022). Gender equality in the global research publication: the bibliometric review and scientific visualization. *Humanus*, *21(1)*, *41*. https://doi.org/https://doi.org/10.24036/humanus.v21i1.115645

Saha, S. K. (2024). Assessing the impact of rural electrification on economic growth: a comprehensive analysis considering informal economy and income inequality in Bangladesh. *Asia-Pac J Reg Sci*, *8*, *551–583*. https://doi.org/https://doi.org/10.1007/s41685-024-00336-8

Salgado-Criado, J., Mataix-Aldeanueva, C., Nardini, S., ..., Balestrini, M., & Rosales-Torres, C. S. (2024). How should we govern digital innovation? A venture capital perspective. *Technological Forecasting and Social Change*, *200*. https://doi.org/10.1016/j.techfore.2023.123198

Schraven, D., Joss, S., & de Jong, M. (2021). Past, present, future: Engagement with sustainable urban development through 35 city labels in the scientific literature 1990–2019. *Journal of Cleaner Production*, *292*. https://doi.org/10.1016/j.jclepro.2021.125924

Si Mohammed, K., Abddel-Jalil Sallam, O. A., Abdelkader, S. B., & Radulescu, M. (2024). Dynamic effects of digital governance and government interventions on natural resources management: Fresh findings from Chinese provinces. *Resources Policy*, *92*. https://doi.org/10.1016/j.resourpol.2024.105004

Sidaoui, K., Mahr, D., & Odekerken-Schröder, G. (2024). Generative AI in Responsible Conversational Agent Integration: Guidelines for Service Managers. *Organizational Dynamics*, *53*(2), 101045. https://doi.org/10.1016/j.orgdyn.2024.101045

Sumarto, R. H., Sumartono, Muluk, K. R. K., & Nuh, M. (2020). Penta-Helix and Quintuple-Helix in the management of tourism villages in Yogyakarta City. *Australasian Accounting, Business and Finance Journal*. https://doi.org/10.14453/aabfj.v14i1.5

Sun, X., Sun, W., Wang, J., Zhang, Y., & Gao, Y. (2016). Using a Grey–Markov model optimized by Cuckoo search algorithm to forecast the annual foreign tourist arrivals to China. *Tourism Management*, *52*, 369–379. https://doi.org/10.1016/j.tourman.2015.07.005

Tiglao, N. C. C. (2023). Crowdsourcing, digital co-production and collaborative governance for modernizing local public transport services: The exemplar of General Santos City, Philippines. *Research in Transportation Economics*, *100*. https://doi.org/10.1016/j.retrec.2023.101328

Tripathi, S., & Singh, T. (2024). Empowering Local Communities through Digital Governance: A Capacity Building Approach for Inclusive Participation and Sustainable Development. *ACM International Conference Proceeding Series*, 352–360. https://doi.org/10.1145/3657054.3657097

Tskhadadze, K. (2024). E-Government Implementation on the Example of Georgia. *TalTech Journal of European Studies*, *14*(1), 253–270. https://doi.org/10.2478/bjes-2024-0012

Ulibarri, N. (2019). Collaborative governance: A tool to manage scientific, administrative, and strategic uncertainties in environmental management? *Ecology and Society*,

24(2). https://doi.org/10.5751/ES-10962-240215

Valiente, M.-C., & Pavón, J. (2024). Web3-DAO: An ontology for decentralized autonomous organizations. *Journal of Web Semantics*, *82*, 100830. https://doi.org/10.1016/j.websem.2024.100830

Vrydagh, J. (2023). The Integration of Deliberative Mini-publics in Collaborative Governance Through the Perspectives of Citizens and Stakeholders: The Case of the Education Reform in French-speaking Belgium. In *Representation* (Vol. 59, Issue 1, pp. 95–116). https://doi.org/10.1080/00344893.2020.1853599

Wagner, G. (2024). Digital Governance—Liability and Responsibility [Digitale Ordnungspolitik – Haftung und Verantwortung]. *List Forum Fur Wirtschafts- Und Finanzpolitik*, *50*. https://doi.org/10.1007/s41025-022-00237-8

Wahyudin, C. (2023). A BIBLIOMETRIC ANALYSIS COLLABORATIVE GOVERNANCE OF PLASTIC REDUCTION THROUGH THE TRANSFORMATION INDUSTRY. *Journal of Engineering Science and Technology*, *18*(4), 85–93. https://api.elsevier.com/content/abstract/scopus_id/85171570045

Wan, J., Ma, W., & Mao, C. (2024). Navigating economic and legal compliance in digital resource management: Technological Pathways to sustainability with digital government. *Resources Policy*, *95*, 105110. https://doi.org/10.1016/j.resourpol.2024.105110

Wang, T., Wang, D., & Zeng, Z. (2024). Research on the Construction and Measurement of Digital Governance Level System of County Rural Areas in China—Empirical Analysis Based on Entropy Weight TOPSIS Model. *Sustainability (Switzerland)*, *16*(11), 4374. https://doi.org/10.3390/su16114374

Wen, H., Hu, K., & Zhou, F. (2024). Progress in Digital Climate Governance in China: Statistical Measurement, Regional Differences, and Dynamic Evolution. *Systems*, *12*(5), 181. https://doi.org/10.3390/systems12050181

Zhang, W., Wang, J., & Jin, H. (2024). Digital finance, innovation transformation, and resilient city growth. *Scientific Reports*, *14*(1), 7056. https://doi.org/10.1038/s41598-024-56998-z

Zhao Lin, & Yaakop, M. R. (2024). Research on digital governance based on Web of Science—a bibliometric analysis. *Front. Polit. Sci*, *6*, 14. https://doi.org/https://doi.org/10.3389/fpos.2024.1403404