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Trends and Thematic Evolution in Digital Policy Research: A Bibliometric Analysis

[1]Helen Dian Fridayani, [2]Muhammad Younus, [2]Yuli Isnadi, [1]Achmad Nurmandi, [1]Sindy Widyasari

[1]Universitas Muhammadiyah Yogyakarta, Kabupaten Bantul, Daerah Istimewa Yogyakarta 55183, Indonesia

[2]Universitas Gadjah Mada, Kabupaten Sleman, Daerah Istimewa Yogyakarta 55281, Indonesia

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CORRESPONDENCE

Name: Helen Dian Fridayani
Email: helen.dian@umy.ac.id

ABSTRACT

This study presents a bibliometric analysis of digital policy research, evaluating its thematic evolution and theoretical underpinnings across international journals. Utilizing the Scopus search engine, the research identifies and classifies digital policy publications from 2013 to 2023, and VOSviewer software was employed to visualize trends, network linkages, and information production. The findings indicate a notable lack of theory-driven research in the digital policy domain, with a majority of studies focusing on empirical or applied aspects rather than foundational theory. This gap is particularly pronounced in areas like cybersecurity, data privacy, and digital governance. Additionally, the study reveals that interdisciplinary journals contribute more to theory-based digital policy research than specialized publications. The research calls for greater integration of theoretical frameworks in digital policy studies to address global digital challenges better. It highlights the need for scholars to explicitly link their work to theory, thus enriching policy development and offering more comprehensive solutions to emerging technological issues. Failure to incorporate theory consistently represents a missed opportunity to influence the broader discourse on digital governance and policy making.

INTRODUCTION

Much like a fingerprint reveals unique identifying characteristics of an individual, bibliometric analysis examines a journal's citation patterns, publication history, and authorship networks. This allows us to gain a deeper understanding of the journal's maturity (how long it has been around and how established it is), its quality (how influential and impactful its articles are), and its productivity (how much research it publishes) (Haghani, 2023). Imagine research orientation as a guiding light, illuminating the path for authors to share their discoveries effectively (Collins, 2018). Bibliometric analysis, like a powerful telescope, allows us to zoom out and observe the vast landscape of scientific literature, tracking its growth and patterns. In this study, we use bibliometrics to explore the fascinating world of digital policy-related research published in international journals, uncovering the diverse theoretical foundations that underpin these studies (Scutz et al., 2022). Unlike previous bibliometric studies that mainly map productivity or collaboration patterns, this study uniquely focuses on identifying and analyzing the theoretical foundations used in digital policy research. This study aims to answer the following research questions: (1) What kinds of theoretical frameworks are most commonly used in digital policy research across disciplines? (2) How has the use of theory in digital policy studies evolved over time? (3) What gaps exist in the theoretical development of digital policy literature that future research could address? By answering these questions, the study seeks to clarify how theory is integrated into scholarly conversations around digital governance, and how conceptual gaps may limit both academic and policy advancements.

Despite significant research efforts across various social science disciplines on policy, there remains a noticeable deficiency in studies that theorize the 'impact' of such policies. This gap is particularly pronounced in the domain of digital policy research, where the lack of a robust theoretical foundation affects not only the field itself but also its contribution to broader scientific discourse (Dwivedi et al., 2024). As a result, this void limit the capacity to comprehend global digital challenges and constrains policymakers in devising effective strategies to address them Recognizing this limitation, the current study aims to bridge this theoretical gap by emphasizing the importance of developing a stronger conceptual framework to understand how digital policy influences—and is influenced by—societal, institutional, and technological change.

Theory serves as the foundation of research, offering a structured lens through which complex phenomena can be interpreted and understood (Muzari, 2022). In digital policy studies, theory is not just a conceptual tool, but a necessity for decoding how technological change reshapes governance structures, societal norms, and public values. Rather than being a rigid or outdated framework, theory enables researchers to trace patterns, identify causal relationships, and make sense of the evolving digital landscape. It helps to clarify not only what is happening, but why it matters, and what should be done about it. In this context, theorizing becomes a dynamic process—one that bridges abstract concepts with real-world digital policy challenges such as data privacy, platform governance, and algorithmic accountability. Without theoretical grounding, digital policy risks being reactive, fragmented, or overly driven by technological hype (Ytre-Arne & Moe, 2020)Therefore, the development and application of theory is indispensable in ensuring that policy responses are both analytically rigorous and socially responsive. Therefore, a deeper understanding of theoretical trajectories in digital policy research is crucial to ensure that academic contributions are relevant to contemporary governance needs.

To better understand how theory informs policy, we must consider the broader knowledge-policy relationship. In relation

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to digital policy, the concept of enlightenment in policymaking highlights the importance of knowledge in shaping policy decisions (Christensen, 2021). In the context of digital policy, this concept is particularly relevant, as knowledge about technological developments influences policy through various diffuse networks that create incremental and frequent conceptual changes (Hanafizadeh et al., 2020). According to George (2024), the concept of knowledge accumulation further underscores this by illustrating how the incremental build-up of insights and expertise can shape the development of digital policy frameworks. These ideas align with the broader assumptions found in ideational theories of policy change, which propose that shifts in policy are driven by changes in knowledge and perception over time (Hannah et al., 2022). Thus, tracing the theoretical evolution of digital policy over time becomes essential to understand how ideas circulate and solidify within the policymaking process. This body of work suggests that efforts to track the development of theory-based digital policy often overlook the broader, more subtle conceptual shifts that occur over extended periods.

This study examines the impact of theories in digital policy research, responding to earlier critiques that digital policy lacked a distinct methodology and overarching scientific theory that addresses the entire policy process (Swinkels, 2020)—the research aimed to identify thematic trends in digital policy research across various journals. By reviewing digital policies and their theoretical foundations across diverse fields, the authors sought to investigate the scope and application of theories within these studies. To achieve this, bibliometric techniques were applied to identify dominant conceptual trends, allowing researchers to detect which theoretical frameworks have guided the field's intellectual development and how they interconnect. The Scopus database was utilized to classify digital policy-related publications from a range of journals, and VOSviewer software was used to visualize data, analyze network connections, and observe trends in information production within digital policy analysis.

This research assesses the growth and development of scholarly activity, characteristics of digital policy research, and patterns of knowledge transfer involving theoretical frameworks. In doing so, it provides a more nuanced picture of how theory contributes to knowledge production in this field. Given that the Government widely carries out the application of applications. Applications are considered capable of accelerating bureaucratic processes and increasing public satisfaction. However, there are still various challenges, such as limited infrastructure, low digital literacy, and sectoral ego between agencies. These practical obstacles reinforce the importance of theoretical guidance, as theory can help navigate implementation complexity and evaluate policy outcomes in light of broader societal goals. By including concrete examples like this, the research will be stronger in showing how digital policy theory is implemented, adjusted, and tested in the practice of governance. Additionally, it underscored the importance of understanding the theoretical approaches behind digital policy formulation to address evolving challenges in the digital landscape. The research also provided strategies for scholars to better comprehend how theoretical approaches shape incremental developments in digital policy.

The identification of a research gap in digital policy studies primarily emphasizes the theoretical deficiencies existing within the field. However, solely outlining this theoretical gap lacks a comprehensive perspective without addressing the empirical dimensions. While discussing the importance of theoretical frameworks is crucial for the advancement of digital policy research, it is equally imperative to highlight the absence of empirical evidence that demonstrates how these theories translate into practice. By neglecting to examine the practical implications and real-world applications of digital policies, the research may inadvertently create a disconnect between theoretical discourse and the actual challenges faced by policymakers and stakeholders in both government and the private sector. Future research should aim to incorporate empirical case studies to validate the practical relevance of theoretical insights, thereby bridging the gap between scholarly frameworks and implementation realities.

To enhance the robustness of the research, it would be beneficial to incorporate specific case studies or field analyses that showcase the implementation of digital policies. These concrete examples would provide tangible insights into the complexities involved in executing theoretical frameworks in varied contexts, illustrating how policies operate in practice and their effectiveness in addressing current challenges. Furthermore, exploring the empirical gap through case studies would enrich the theoretical contributions by offering a dual perspective that captures both the nuances of policy implementation and the real-world impacts of these digital frameworks. This approach not only solidifies the research findings but also supports a more holistic understanding of the interplay between theory and practice in the realm of digital policy.

METHOD

This study employs the Scopus search engine to gather data and conduct a literature analysis encompassing various aspects of the "Digital Policy" theory. Scopus is one of the most extensive databases providing citations and abstracts of peer-reviewed literature, including scholarly journals, conference proceedings, and books published by Elsevier (Publications, 2020). This research focuses on international journals extracted using the Scopus search engine. The search is limited to the most relevant data on the topic of "Digital Policy" based on the publication year, specifically articles published between 2013 and 2023. The purpose of this limitation is to identify research trends in the theoretical aspects of "Digital Policy" more specifically.

In the initial stage, a search was conducted to identify publications relevant to the research related to "Digital Policy". The search criteria included titles, abstracts, and keywords containing the key phrase "Digital Policy." This search was limited to a specific year range and several keywords.: TITLE-ABS-KEY (digital AND policy) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (EXACTKEYWORD, "Public Policy") OR LIMIT-TO (EXACTKEYWORD, "Decision Making") OR LIMIT-TO (EXACTKEYWORD, "Internet") OR LIMIT-TO (EXACTKEYWORD, "Digital Divide") OR LIMIT-TO (EXACTKEYWORD, "Policy") OR LIMIT-TO (EXACTKEYWORD, "Social Media") OR LIMIT-TO (EXACTKEYWORD, "Digital Technologies") OR LIMIT-TO (EXACTKEYWORD, "Digital Technology") OR LIMIT-TO (EXACTKEYWORD, "Big Data") OR LIMIT-TO (EXACTKEYWORD, "Information Technology") OR LIMIT-TO (EXACTKEYWORD, "Technology") OR LIMIT-TO (EXACTKEYWORD, "Digitalization") OR LIMIT-TO (EXACTKEYWORD, "Blockchain") OR LIMIT-TO (EXACTKEYWORD, "Internet Of Things") OR LIMIT-TO (EXACTKEYWORD, "Digitization") OR LIMIT-TO

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(EXACTKEYWORD, "Network Security") OR LIMIT-TO (EXACTKEYWORD, "Security Of Data") OR LIMIT-TO (EXACTKEYWORD, "Technological Development") OR LIMIT-TO (EXACTKEYWORD, "Cybersecurity") OR LIMIT-TO (EXACTKEYWORD, "Digital Platforms") OR LIMIT-TO (EXACTKEYWORD, "ICT") OR LIMIT-TO (EXACTKEYWORD, "Information And Communication Technologies") OR LIMIT-TO (EXACTKEYWORD, "E-government") OR LIMIT-TO (EXACTKEYWORD,"Information And Communication Technology") OR LIMIT-TO (EXACTKEYWORD, "Block-chain") OR LIMIT-TO (EXACTKEYWORD, "Policy Makers") OR LIMIT-TO (EXACTKEYWORD, "Security") OR LIMIT-TO (EXACTKEYWORD, "Government") OR LIMIT-TO (EXACTKEYWORD, "Policy Making") OR LIMIT-TO (EXACTKEYWORD, "Access Control") OR LIMIT-TO (EXACTKEYWORD, "Data Privacy") OR LIMIT-TO (EXACTKEYWORD, "Digital Transformation") OR LIMIT-TO (EXACTKEYWORD, "Quality Control") OR LIMIT-TO (EXACTKEYWORD, "Privacy") OR LIMIT-TO (EXACTKEYWORD, "Information Systems") OR LIMIT-TO (EXACTKEYWORD, "Digital")).

Inclusion and Exclusion

A systematic review approach was employed in this research, as shown in Figure 1. It utilized two criteria, namely inclusion and exclusion criteria, to filter research relevant to the scope of the bibliometric search. Publications related to "Digital Policy" were selected from various international journals published between 2013 and 2023. The types of publications included were books and their chapters, conference proceedings, and journal articles. However, types such as letters, book reviews, reprints, news articles, errata, notes and bibliographies, short surveys, and conference reviews were not included.

The literature search was conducted without geographical or language restrictions. The selection process of abstracts and full texts to determine relevant studies was carried out by the second and third authors, with the first author conducting an audit and review. Of the identified publications, only those that explicitly focused on "digital policy" research and applied theory in their investigations were included. Publications that only mentioned "digital policy" in general or did not involve the substance of "digital policy" in depth were not included. Before data extraction, duplicate records were removed, and a data extraction template was designed to extract relevant and significant data to inform the synthesis proces.

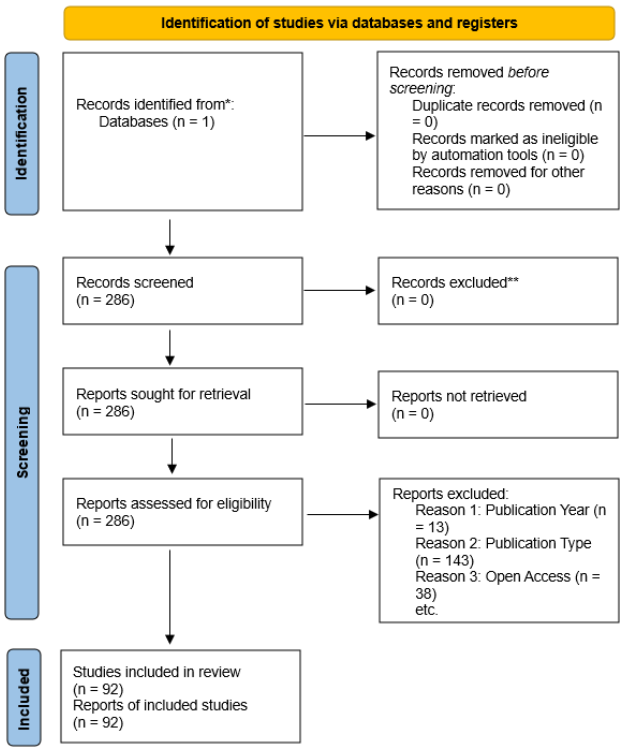

Figure 1. PRISMA Flow Diagram
Source: Created by Author

Data Extraction

The filtered search results were saved in a dedicated list using Scopus. The search results data was then used for visualization, categorization, and ranking of research findings. The extracted data was subsequently imported into the VOSviewer software, which is a program for creating and analyzing network maps based on the collected data (Pan et al., 2018).

Analysis

The acquired articles were then categorized and reviewed considering various variables, as shown in **Figure 2**. The authors evaluated them by taking into account citation metrics, leading publications, journals, publication types, countries or regions, and research areas. In conducting the bibliometric review, the authors utilized the VOSviewer software to identify published literature and key network relationships. By applying bibliometric techniques, research trends in various fields were explored. Therefore, a similar approach was also employed in examining the literature on policy implementation, evaluation, learning, evolution of science and technology, and knowledge. The VOSviewer network maps were used to reveal the relationships between publications based on shared keywords, content shared in publication titles and abstracts (co-occurrence), and the evaluation of co-citation frequency (co-citation).

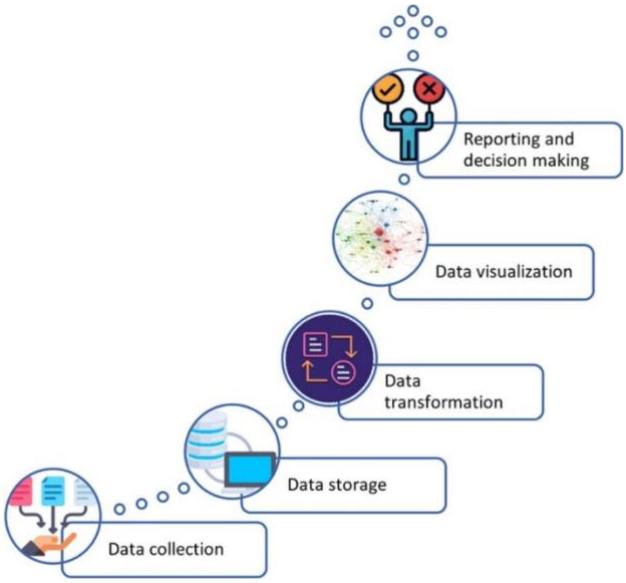

Figure 2. VOSViewer Working Flow Diagram
Source: (Umar Ali Bukar et al., 2023)

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RESULTS AND DISCUSSION

A flowchart was constructed at the outset to systematically depict the decision-making pathway for identifying theory-related content. This visual, step-by-step framework supports the categorization process by enhancing transparency and promoting consistency in distinguishing theoretical contributions across the clusters identified through bibliometric mapping.

Result

Publications related to "digital policy" were mapped and analyzed following the data search result trends. Each displayed data, or item originated from the search and filtering results on the Scopus website and utilized the VOSviewer features. The data was visualized according to calculated weights and followed the identified trends. This research also considered data relevance, thus not displaying visualizations for less relevant items. The purpose of conducting publication research was to enable proper comparisons between institutions and countries on a global scale based on the intensity of publication counts, leading research, and inter-literature synthesis.

Research related to "digital policy" in Scopus has a total of 4,784 documents over the past ten years from 2013 to 2023. Research on "digital policy" has a trend that tends to increase in the period from 2013 to 2023. The highest number of studies was conducted in 2023. This increase was influenced by developing issues that affected the responses of global researchers. The focus of "digital policy" research in the distribution of development trends each year can be seen in **Figure 3.**

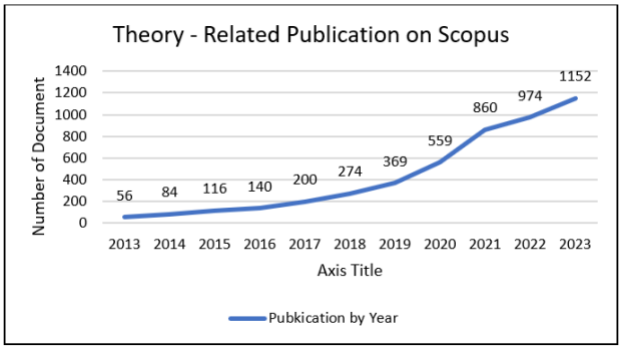

Figure 3. Publication trends in related digital policy research
Source: Personal processing data from the Scopus database, 2024

Geographical Distribution

Table 1. Data search results reveal that the production of "digital policy" research across various country affiliations is geographically uneven, with some countries generating significantly more publications than others. The United Kingdom stands out as the country with the highest number of authors and publications related to "digital policy," reaching 837 publications or about 20% of the total relevant "digital policy" research production. Meanwhile, the United States ranks second with 834 publications, also accounting for 20% of the total "digital policy" related publications, surpassing China with 648 publications, which contributes around 16% of the total relevant "digital policy" research production. These findings demonstrate that the United Kingdom, the United States, and China play dominant roles in generating literature on "digital policy." While other countries make more limited contributions to "digital policy" publications, they still play a meaningful role in the development of knowledge in this field.

Table 1. Country affiliation of authors publishing the most theory-related digital policy research.

Author Country	Number of digital-related publications	The proportion of total related digital policy research theory research output (%)
United Kingdom	837	20%
United States	834	20%
China	648	16%
Australia	318	8%
Germany	286	7%
Italy	263	6%
Spain	261	6%
Netherlands	236	6%
Canada	214	5%
Russian Federation	193	5%

Publication Venues

Table 2. Data search results indicate that Sustainability Switzerland has the highest number of publications at 275, with

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31% of them related to the theory of "digital policy." The International Journal of Environmental Research and Public Health follows with 15% of its publications related to "digital policy." Meanwhile, the number of publications from other sources, such as IEEE Access, PLOS ONE, Journal of Medical Internet Research, ACM International Conference Proceeding Series, Energies, IOP Conference Series: Earth and Environmental Science, E3S Web of Conferences, and Journal of Physics: Conference Series, reflects a diverse interest in the field of "digital policy." Nevertheless, these sources have smaller contributions, with percentages ranging from 4% to 10% of the total publications. This demonstrates the complexity and diversity in research and thought related to digital policy, represented by these various publication sources. Sustainability Switzerland has the highest proportion of publications related to the theory of "digital policy," followed by the International Journal of Environmental Research and Public Health.

Table 2. Theory-related policy research publications in different international journals

Source Title	Number of digital-related publications	Proportion of digital policy theory publication (%)
Sustainability Switzerland	275	31%
International Journal of Environmental Research and Public Health	128	15%
IEEE Acces	96	11%
Plos One	85	10%
Journal of Medical Internet Research	79	9%
ACM International Conference Proceeding Series	53	6%
Energies	44	5%
Top Conferences Series Earth and Environmental Science	40	5%
E3s Web Pf Conferences	39	4%
Journal Of Physics Conference Series	37	4%

Authorship

Figure 4. Data search results show that authors publish articles in various international journals related to theories connected to "digital policy" research. As depicted in Figure 2, Liu, X. is the most productive author with 11 publications; Deng, R.H. and Wang, S. each have 9; Livingstone, S. and van Deursen, A.J.A.M. each have 7; Flew, T., Janssen, M., Kaaniche, N., and Weerakkody, V. each have 6; and Ali, A. has five publications.

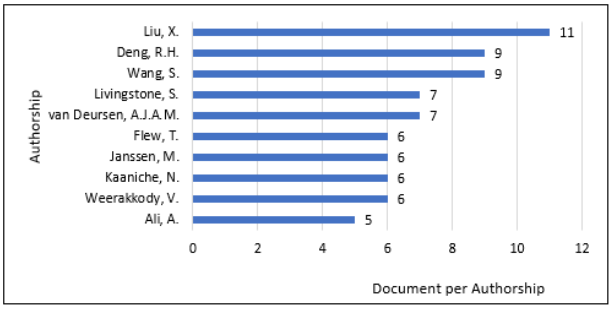

Figure 4. Authors are producing most theory-related publications
Source: Personal processing data from the Scopus database, 2024.

Affiliation

The majority of authors are affiliated with several institutions that have more than thirty (30) publications on "digital policy" research related to theory, as shown in **Figure 5**. These include the University of Oxford (78), University College London (65), Harvard Medical School (42); King's College London & University of Toronto (each with 41); The University of Sydney (39); University of Cambridge (38); Monash University & University of Melbourne (each with 37); and Imperial College London (34). The University of Oxford has the highest proportion of publications related to "digital policy," followed by University College London.

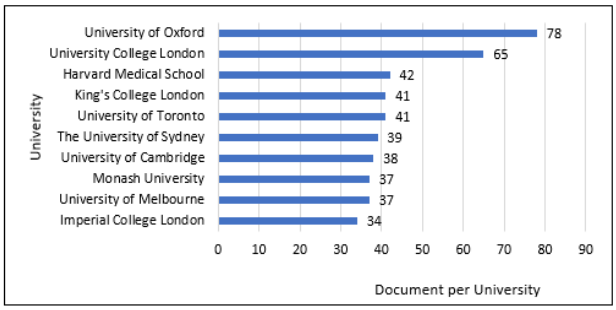

Figure 5. Institutional affiliations of authors producing most theory-related policy research publications
Source: Personal processing data from the Scopus database

Area of Public Policy Focus

The number of "digital policy" studies has significantly increased in several research topics, subsequently influencing the interest of researchers in this field. The abundance of "digital policy" research in the field of Decision Making can be observed in **Table 3.**

Table 3. Frequently Topics/Themes Based on theories related to digital policy researched on Keywords in Research Publication Documents

Topic/Themes	Result		Topic/Themes	Result
Decision Making	7%		Data Privacy	3%
Internet	6%		Block Chain	3%
Social media	6%		Internet of Things	3%
Policy	6%		Policy Making	3%
Digital Transformation	5%		Information Technology	2%

Public Policy	5%		Information And Communication Technology	2%
Digital Technology	5%		Digital Platforms	2%
Digital divide	5%		Technological Development	2%
Digitalization	5%		Security	2%
Privacy	4%		Policy Implementation	2%
Digital Technologies	4%		Network Security	2%
Technology	3%		ICT	1%
Big Data	3%		Digital	1%
Access Control	3%		Block-chain	1%
Government	3%		Policy Makers	1%

Table 3 demonstrates that documents published related to "digital policy" exhibit a correlation between the frequency of topic discussion and its popularity within the publication corpus. Higher results and percentages indicate greater topic prevalence, while lower figures suggest less frequent discussion. This mapping aids future researchers in positioning their contributions within the "digital policy" research landscape. Several identified topics may assist future researchers in analyzing similar issues or cases, including decision-making, Internet, Social Media, Policy, Digital Transformation, Public Policy, Digital Technology, Digital Divide, Digitalization, Privacy, Technology, Big Data, Access Control, Government, Data Privacy, Blockchain, Internet of Things, Policy Making, Information Technology, Information and Communication Technology, Digital Platforms, Technological Development, Security, Policy Implementation, Network Security, ICT, Digital, Blockchain, and Policy Makers.

Network Linkages is Digital Research Theories

Table 3 provides an overview of the most cited "digital policy" publications and the main issues discussed. These publications have served as foundations or inspirations for other research and have contributed to the development of significant and relevant policies, as shown in **Figure 5**. The results indicate that "digital policy" research is published in various journals, depending on the topic and approach used. **Table 2.** shows that "digital policy" research most frequently appears in the top five international journals: Sustainability Switzerland, International Journal of Environmental Research and Public Health, IEEE Access, PLOS ONE, and Journal of Medical Internet Research.

This is important because it demonstrates how research is spread across different disciplines and reveals connections that may not have been apparent before. For instance, "digital policy" is most often discussed in the context of digital transformation, smart city initiatives, the digital economy, social media marketing, and digital platforms and infrastructure, as shown in **Table 4.**

Table 4. Most cited theory-related policy research publications)

Author	Issued Discuss	Citation
Warner K. (2019).	Building dynamic capabilities for digital transformation	1181
Neirotti p. (2014).	Current trends in Smart City initiatives	1156
Teece D. (2018).	Profiting from innovation in the digital economy	835
Appel G. (2020).	The future of social media in marketing	744
Orben A. (2019).	The association between adolescent well-being and digital technology use	667
Constantinides P (2018)	Introduction—Platforms and Infrastructures in the Digital Age	549
Chen y. (2016)	The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly	515

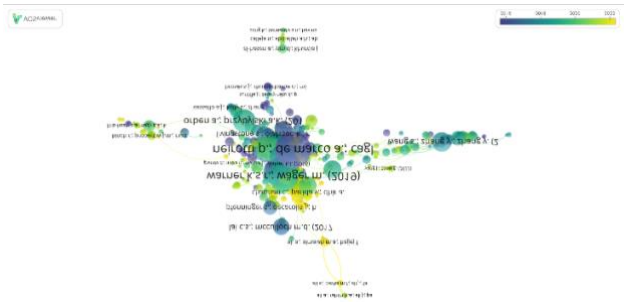

Figure 6. Citation network of theory-related digital policy publications
Source: Created by Author

Figure 6. illustrates how frequent publications (with at least ADD citations) are cited by other publications within the network. The nodes represent publications and their interconnections, indicating citation relationships. Larger nodes signify publications with a higher number of citations. Publications with close citation relationships are grouped together in clusters of the same color.

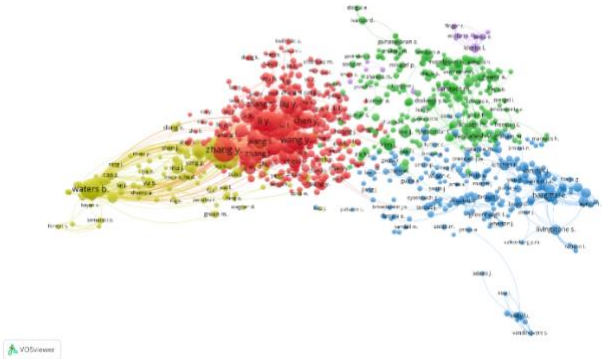

Figure 7. Co-citation network of scholars with theory-related digital policy publications
Source: Created by Author

Figure 7. illustrates how frequently researchers (with at least ADD citations) are co-cited in publications. The nodes in the image represent researchers, and their connections indicate co-citation relationships. Larger nodes represent researchers with more citations. The strength of the links indicates the frequency of co-citation. Researchers who are frequently co-cited are grouped together in clusters of the same color.

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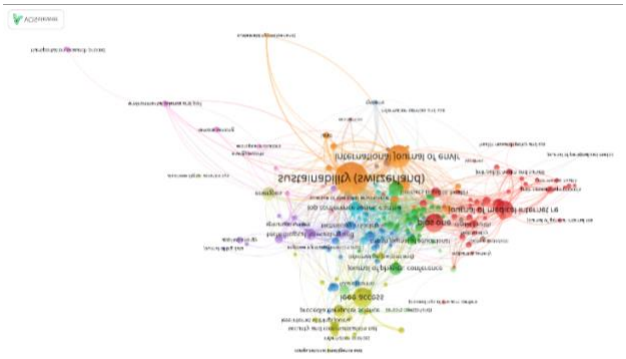

Figure 8. Co-citation network of journals publishing theory-related public policy research
Source: Created by Author

Figure 8. illustrates how frequently journals (with at least ADD citations) are co-cited in publications. The nodes in the image represent journals, and their connections indicate co-citation relationships. Larger nodes represent journals with a higher number of citations. The strength of the links indicates the frequency of co-citation. Journals that are frequently co-cited are grouped together in clusters of the same color.

Thematic Evolution of Digital Policy Research Theories

This research systematically categorized the thematic evolution of theories in digital policy research, providing a comprehensive overview of how scholarly focus has shifted from traditional approaches to more contemporary frameworks. Figure 8 presents a network analysis that illustrates the transition between established theories and emerging directions in digital policy research. Central to this evolution are key theoretical domains such as digital transformation theory, system dynamics, public policy, institutional theory, and newer areas of inquiry, including health policy, foreign and monetary policies, as well as reinforcement learning. Among these, **digital transformation theory** has become the most prominent and frequently cited keyword, marking a critical shift in how digital policy is studied and understood.

Digital transformation theory has historically played a pivotal role in analyzing the comprehensive transition to digital systems and processes, particularly within the context of multi-stakeholder networks (Ferinelli et al., 2023). In these networks, digital policies are not only crafted but also implemented through the interactions of numerous actors, such as governments, private sector entities, civil society, and international organizations. The theory serves as a foundational framework for understanding how technological advancements, especially digitalization, reshape organizational structures, processes, and strategies (Hanelt et al., 2021). As the digital landscape continues to evolve at a rapid pace, the complexity of these interactions has grown, particularly in areas like data governance, cybersecurity, privacy, and the digital economy. This increasing complexity has underscored the importance of networked governance, where policy decisions are no longer the sole domain of individual actors but are shaped by a collective, often transnational, set of stakeholders.

According to Allen et al (2023), it recognized in their earlier work on the multi-actor dimension of policy development, policy formulation has long involved a variety of stakeholders interacting within a dynamic ecosystem. However, recent research demonstrates that the visibility and relevance of these networked interactions have become more pronounced, especially within the digital policy arena (Gumusay et al., 2022). As digital transformation permeates various sectors, the traditional boundaries of policy formulation—once confined to national governments or singular institutions—have dissolved, giving rise to a more interconnected and collaborative policy environment. This thematic shift signals a broader reorientation in the field, where theories that were once confined to specialized areas, such as digital transformation or institutional theory, now play a more integrated and crucial role in addressing the complexities of digital policy. For instance, digital transformation theory is no longer solely applied to technological changes within organizations; it now informs a broader understanding of policy development processes, encompassing the societal, economic, and political impacts of digitalization. System dynamics, another important theoretical approach, complements this by helping to model and predict the behavior of these complex systems, making it a valuable tool for policymakers grappling with the unintended consequences of digital policies, such as digital divides or issues of data privacy (Rahman, 2015).

Moreover, institutional theory, traditionally focused on the rules and structures governing organizational behavior, has been adapted to explore how institutions at multiple levels—national, regional, and global—navigate the challenges posed by digitalization. Theories from newer fields such as health policy, foreign and monetary policy, and reinforcement learning also contribute to this evolving landscape, addressing the specialized challenges that arise from the integration of digital technologies in various domains (Dwivedi et al., 2023; Vermesan & Bacquet, 2017). The evolution of digital policy research theories highlights the increasing reliance on interdisciplinary approaches. The dynamic nature of the digital age requires scholars and practitioners alike to draw on multiple theoretical frameworks to grasp the intricacies of modern policy challenges fully. Multi-actor dynamics, such as the involvement of both public and private sector actors in cybersecurity or data governance, illustrate the need for collaborative policy formulation (Carr & Lesniewska, 2020). As digital transformation continues to accelerate, the integration of theories from diverse fields is essential for addressing the multifaceted nature of digital policy challenges—ranging from regulatory issues in digital economies to the governance of emerging technologies such as artificial intelligence and blockchain.

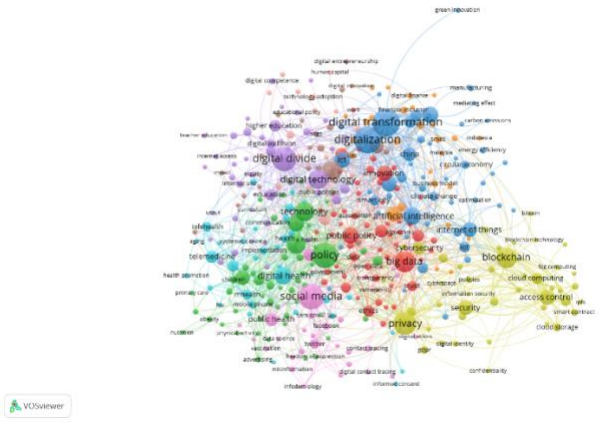

Figure 9. Co-occurrence network of keywords in theory-related publications across different international journals
Source: Created by Author

Figure 9. illustrates the relatedness of designated authors and author-indexed keywords (with at least ADD occurrences) based on how frequently they occur in the same publications. Nodes represent the connections and associated keywords, indicating co-occurrence relationships. Larger nodes signify keywords with more occurrences. The strength of the links represents the co-occurrence frequency. Keywords that frequently appear together are grouped together. Nodes are colored based on the frequency of keyword occurrence in publications across different years. Keywords that appear with greater frequency in recent publications are colored lighter than keywords that frequently appeared in the past.

Discussion

The validity of the findings is constrained by the inherent limitations of keyword-based bibliometric analysis. The authors employed clear operational definitions and a targeted focus on digital policy studies, leading to the inclusion of various policy-related works. The research primarily examined academic publications, leaving out contributions from non-profit organizations, NGOs, government agencies, and think tanks. Despite these methodological constraints, the data revealed distinct patterns and trends, offering valuable insights and suggesting promising avenues for further investigation in the field of digital policy.

In the realm of digital policy research, there is a notable gap in the engagement with theoretical frameworks within international journals. Despite the rapid evolution of digital technologies and their profound impact on governance and policymaking, relatively few studies explicitly theorize digital policy. This deficiency is not confined to digital policy alone; it extends to other technology-driven fields such as information technology, cybersecurity, and the Internet of Things (IoT) (Chowdhury, 2024). The lack of robust theoretical grounding across these disciplines can significantly impede the development of comprehensive and effective digital policy frameworks.

The absence of a theoretical foundation is particularly concerning, as it restricts researchers from challenging and refining existing theories through empirical evidence. This stagnation can lead to a narrow understanding of the complex interplay between technology and policy, which is essential for adapting to the rapidly changing digital landscape (Ciarli et al., 2021). For instance, while research on digital governance has made strides in exploring how institutions interact with technology during policy implementation, many studies fall short of addressing deeper theoretical questions. They often overlook the ways in which digital transformation theories intersect with established political structures or how emerging technologies, such as blockchain and artificial intelligence, might influence or redefine governance frameworks.

Moreover, the gap between practical applications and theoretical discourse can hinder the evolution of digital policies. While studies may provide valuable insights into the mechanisms of implementation and the challenges faced by policymakers, they frequently lack a comprehensive theoretical analysis that could enrich our understanding of these dynamics (Head, 2019; Schlager, 2007; Theobald et al., 2018). For example, without a theoretical lens, it becomes difficult to assess the broader implications of digital policy decisions on societal structures, power dynamics, and individual rights.

The continuous evolution of digital technologies brings about an ongoing stream of new challenges that demand real-time responses from policymakers. In areas such as cybersecurity, data privacy, digital ethics, and platform regulation, the existing legal and regulatory frameworks often lag behind the rapid pace of technological development (Nguyen & Tran, 2023). For instance, the rise of AI has introduced ethical concerns surrounding bias, surveillance, and job displacement, while the widespread adoption of blockchain has raised questions about financial regulation and transparency (Hongdan, 2022). Therefore, digital policy must evolve dynamically to address the complexities and risks introduced by these innovations, ensuring that governance mechanisms are not only reactive but also proactive in mitigating potential harm.

Despite the breadth of research in digital policy, which intersects fields such as public policy, law, information technology, and social sciences, there remains a notable lack of theoretical integration across these disciplines. Much of the research in digital policy is conducted by experts from diverse backgrounds—such as computer science, law, and economics—who bring their own disciplinary perspectives to the table (Spruijt et al., 2014; Stuart, 2017). While this interdisciplinary approach enriches the field, it also presents challenges in developing a cohesive theoretical framework for digital policy. As a result, the conceptual underpinnings of digital policy often remain fragmented, with limited crossover between the fields contributing to its research.

This fragmentation is particularly evident in the way scholars approach problem-solving within the realm of digital policy. Researchers from non-policy disciplines may focus on technical or legal aspects of digital technologies without fully engaging with the broader societal and governance implications (Cox et al., 2022). For example, a computer scientist may concentrate on the technical feasibility of cybersecurity measures, while a legal scholar might explore the regulatory challenges of blockchain without delving into the policy implications of these technologies for digital rights and governance. This lack of theoretical cohesion makes it difficult to develop comprehensive digital policy solutions that address the full spectrum of challenges posed by emerging technologies.

There have been notable efforts to integrate policy theory into digital policy research, though such instances remain relatively rare. According to Ali et al (2021), it explored employees' adherence to security policies through a framework based on intrinsic motivation, highlighting how personal motivation influences compliance with security rules. This approach offers valuable insights into how digital security policies can be designed to align with employees' intrinsic motivations, thereby improving compliance with digital security protocols. Hermans et al., (2023) applied digital transformation theory to examine the implementation of coastal policies in the EU, revealing the complex interactions involved in policy implementation (Assche et al., 2020). This theory could similarly be applied to digital policy, particularly in understanding how digital technologies reshape governance structures and processes, influencing the interactions between governments, private companies, and citizens in areas like cybersecurity and digital privacy.

In the realm of information system (IS) security, (Shepherd & Mejias, 2016) Employed Deterrence Theory posits that illicit behavior can be controlled through the imposition of swift, certain, and severe punishments. This theory is particularly relevant in digital policy discussions related to cybersecurity and data protection, where the threat of legal consequences may act as a deterrent to data breaches or cyberattacks. According to

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Marangunic & Granic (2015), It employed technology acceptance theory, which explores how employees' behavior regarding internet policies is influenced by their perceptions of the technology's usefulness and ease of use. This theory suggests that when employees find a digital tool or policy beneficial and simple to navigate, they are more likely to comply with it. Additionally, external factors, such as the level of organizational support and the overall technological environment, play a crucial role in shaping employees' attitudes and willingness to adhere to internet policies. This approach provides a more nuanced understanding of digital policy compliance in workplaces where new digital tools and platforms are rapidly being adopted.

According to Matraeva et al (2022), it took a digital transformation approach to assess residential energy efficiency programs, factoring in the rebound effect, consumer behavior, and government policies. This methodology can also be extended to digital policy to evaluate how individuals and organizations interact with digital technologies under different regulatory scenarios. Although examples like these are relatively scarce, they demonstrate how policy-oriented theoretical frameworks offer significant potential in the digital realm. (Valtysson, 2020). By applying such frameworks, researchers can gain deeper insight into the complexities of digital policy issues and evaluate the contextual efficacy of various policy solutions. These examples underscore the importance of a theoretical lens in assessing how digital policies are crafted, implemented, and received, emphasizing the need for further exploration of these frameworks within the digital policy landscape.

While digital policy research has seen a relatively rapid increase in publications across various fields, theory-driven research in this area remains comparatively less common in leading international journals. This disparity is particularly evident when examining the geographical distribution of digital policy research output. Certain countries, such as the United Kingdom, the United States, and China, tend to perform better than others due to higher capital investment in digital policy research, particularly through funding allocated to policy-oriented agencies and research institutions. These nations often prioritize research projects that demonstrate the social impact of technological innovation and policy development, particularly in areas like cybersecurity, digital governance, and data privacy. The presence of well-established policy faculties, prominent think tanks and a tradition of evidence-based governance further enhances their capacity for producing cutting-edge digital policy research.

The challenge of integrating theory into digital policy research can also be seen in the limited number of publications addressing fundamental theoretical concepts. Journals that engage with theory-based digital policy tend to focus on specific fields, such as cybersecurity, digital transformation, and data governance (Faro, 2020). While some areas of digital policy—like digital transformation—are emerging as dominant themes in research, theory-related publications are often concentrated within a relatively small community of scholars. This has led to the development of distinct, independent strands of policy scholarship, particularly within interdisciplinary groups that tackle the complexities of digitalization, privacy, and technology regulation.

One particularly prominent cluster identified in this study is cybersecurity, which appears frequently in digital policy literature yet often lacks engagement with broader policy theories such as institutional change, governance dynamics, or policy learning. This reveals a critical disconnection: although cybersecurity is a pressing concern for governments and international bodies, much of the research remains descriptive or technical, leaving its theoretical implications underexplored. Bridging this gap could deepen our understanding of how cybersecurity policies are formulated, evolve, and impact wider governance structures.

Certain fields, particularly information security systems and information technology, have gained substantial attention in digital policy research. The focus in theory-related studies has shifted towards contemporary themes such as the impact of information technology, internet usage, and the influence of information systems on human behavior, governance, and health education (Gopal et al., 2024). Scholars in science and technology studies have highlighted how these fields produce theoretical frameworks and knowledge that help define social issues and inform appropriate policy responses (Sovacool & Hess, 2017). Furthermore, the development of technologies, skills, and instruments plays a critical role in governance, contributing to the broader understanding of how digital tools are deployed in decision-making processes.

Additionally, in the digital policy arena, it is essential to explore theory-related approaches within the policy process to enhance research and development in areas such as digital governance, cybersecurity, and privacy. (Stufflebeam & Shinkfield, 2007) They emphasized the importance of the Theory-Based Evaluation approach, advocating for the rigorous application of theory to address complex issues arising from digital transformation effectively. This theoretical framework offers key principles for evaluating digital policies and programs, supporting the design and implementation of effective regulations in the digital sphere. By integrating theory into the policy-making process, this approach ensures that digital policies are grounded in a strong conceptual foundation, enabling policymakers to address challenges such as data privacy, security risks, and the ethical implications of emerging technologies.

In the digital policy sphere, such work provides valuable, evaluative theoretical frameworks that enable policymakers to analyze trends, factors, and challenges, as well as assess the consequences and effectiveness of current policy initiatives. These frameworks help craft more appropriate enforcement solutions to address the complexities of digital governance. However, this represents only a fraction of the broader scope of theory-related digital policy research. The field is shifting towards more action-oriented, problem-centric, and theoretically focused approaches that aim to tackle the unique challenges posed by rapid technological advancements.

This shift mirrors broader trends within policy science, where theoretical conceptualization is increasingly emphasized in the analysis of digital policy issues. As digital transformation continues to reshape sectors such as cybersecurity, data privacy, and digital infrastructure, there is a growing need for research that not only informs technical studies but also addresses the theoretical underpinnings of policy concerns.

CONCLUSION

In conclusion, this research explored the evolution of digital policy studies through bibliometric analysis, identifying key theoretical frameworks and trends in digital policy research. The study highlighted a significant gap in theory-driven approaches, emphasizing the need for a more structured theoretical foundation to understand the complexities of digital

transformations. Despite an increase in publications, the field remains fragmented, with theory-related research often limited to specific disciplines. This fragmentation restricts the development of comprehensive digital policy frameworks that could better address challenges such as data privacy, cybersecurity, and governance.

The study underscores the importance of integrating theories into digital policy research to inform policy development and enhance its effectiveness. The findings suggest that future digital policy research must focus on bridging disciplinary divides and incorporating robust theoretical approaches to tackle emerging technological challenges. This approach will enable policymakers to craft informed strategies that align with the evolving digital landscape. Thus, a systematic and theory-driven framework is crucial for advancing the field of digital policy and for addressing the societal impacts of digital technologies on governance, security, and equity.

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