

## BETWEEN DATA AND GOVERNANCE: UNVEILING THEMES AND COLLABORATION IN DIGITAL GOVERNMENT LITERATURE

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**Abstract:** *Digital transformation has become a central driver of public administration modernization, as governments increasingly rely on digital technologies to improve public service delivery, administrative efficiency, transparency, and citizen-oriented governance. However, the rapid expansion of digital government research has generated a fragmented literature, dispersed across concepts such as e-government, digital transformation, public services, governance, innovation, and emerging technologies. This fragmentation limits the understanding of how the field is thematically structured and how scientific collaboration is organized across countries and institutions. Therefore, this paper maps the intellectual structure of digital government literature and identifies the dominant themes, emerging research directions, and collaboration patterns within this field. A bibliometric science-mapping analysis was conducted on 1,877 documents indexed in the Web of Science Core Collection, retrieved using the topic search terms "digital transformation" and "public services". The analysis was performed with VOSviewer and focused on keyword co-occurrence, country co-authorship, and organizational co-authorship networks. The findings show that digital transformation serves as the conceptual hub of the field, connecting traditional e-government research with newer themes in innovation, governance, artificial intelligence, big data, trust, adoption, performance, and post-pandemic public service resilience. The country-level network reveals broad but uneven international collaboration, while the organizational network remains more fragmented. The study contributes by integrating thematic and collaboration-based perspectives, showing that digital government research is expanding, interdisciplinary, and globally visible, but still institutionally fragmented and unevenly connected. These findings indicate the need for stronger institutional partnerships, interdisciplinary integration, and more coherent research networks in future digital government studies.*

**Keywords:** *digital government; digital transformation; public services; bibliometric analysis; VOSviewer; public administration.*

**JEL:** H83; O33; O38; L86.

## Introduction

Digitalization of the government has become one of the leading forces behind change in modern public administration. Governments face growing demands to provide citizens with faster, more convenient, more transparent, and more adaptive public services. In this respect, digital government does not mean just digitizing existing government functions but rather entails a much broader transformation of governments.

The changing nature of digital government research can be seen by comparing early approaches that emphasized e-government, i.e., the application of ICTs to deliver public services. In contrast, recent research emphasizes digital transformation, which entails an even more profound process of transformation than what was seen before. For instance, Janowski (2015) notes that the process of digital government development entails digitization, transformation, engagement, and contextualization, while Mergel, Edelmann, and Haug (2019) indicate that digital transformation of governments encompasses administrative transformation across several dimensions beyond mere technology application.

Moreover, it has become more complex for the science. Modern scientific studies of digital government involve theories and approaches used in various areas, including public administration, information systems, management, innovation studies, public policy, and governance studies. Digital government transformation is considered in context with various issues such as service quality, efficiency of management and administration, transparency, trust, participation, innovative capacity, artificial intelligence, big data, and resilience after the pandemic era. Scientific knowledge keeps becoming more and more diversified; however, it has become extremely fragmented due to many concepts and scientific approaches.

Nevertheless, the emergence of studies dedicated to digital government has not been reflected in the creation of comprehensive and systematic overviews of literature on this topic that would reflect the development of thematic areas and scientific cooperation. Most studies concentrate on the process of concept formation and issues related to technology and management aspects, but little research is devoted to the interaction between thematic trends and scientific cooperation.

In this regard, bibliometric science mapping becomes quite important because it facilitates an analysis of extensive and scattered literature. Contrary to traditional methods of review, bibliometric analysis allows discovering latent intellectual structures, thematic groups, areas of research influence, and collaboration patterns between nations and institutions. In other words, this approach can be used to detect the conceptual structure and scientific connections underlying the research on digital government. According to Donthu et al. (2021), bibliometric analysis represents a robust approach to analyzing scientific literature in extensive volumes. Van Eck and Waltman (2010) demonstrate that VOSviewer is quite helpful in building bibliometric maps.

On the basis of this gap, the current study attempts to identify the structure of knowledge in the literature of digital government and its major themes, emerging trends, and collaboration patterns. It helps fill the identified gap in the literature since the current study offers a combined bibliometric approach that addresses both thematic and multi-level collaboration patterns at once.

To guide the analysis, the study addresses the following research questions:

RQ1: What are the dominant and emerging research themes in digital government literature?

RQ2: How are collaboration patterns structured at the country and organizational levels?

RQ3: What relationships can be identified between thematic development and collaboration networks?

The article is structured as follows. The next section presents the data and methodology, including the search strategy, selection criteria, and VOSviewer thresholds. The third section discusses the bibliometric results, focusing on keyword co-occurrence, country co-authorship, and organizational co-authorship. The final section summarizes the main findings, highlights the study's limitations, and outlines future research directions.

## Basic content

In this section, the aim is to operationalize the research objective by identifying the intellectual and collaborative structure of the literature on digital government. Based on the research questions posed at the introduction stage, the analysis is conducted along three different but complementary dimensions, including keywords co-occurrence, which represents the thematic structure; country co-authorship, reflecting collaboration at the international level; and organization co-authorship, depicting the structure of the scientific production process.

The bibliometric study was carried out by processing the information obtained from the Web of Science Core Collection database. The topic search "digital transformation" AND "public services" was used, yielding 1,877 publications. The analyzed collection spans the period from 1997 to 2026 and was extracted on 03.05.2026. There were no filters applied to document type, as the objective of the study is to analyze the intellectual and collaboration networks based on Web of Science. In fact, topic search allowed us to find papers in which these topics appeared in the title, abstract, author keywords, or Keywords Plus. Topic search was selected for the research because it encompasses a broad scientific area at the intersection of digital transformation, public administration, and the provision of public services.

Before conducting any bibliometric analysis, it was necessary to check and clean the exported metadata to improve the reliability and consistency of the study's findings. In particular, such data-cleaning activities included searching for spelling differences, identifying equivalent terms, and filtering generic/weakly informative terms that do not aid understanding of the field's structure. This activity was especially important for keyword analysis, as there might be variations in similar concepts, and for co-authorship analysis due to variations in institutional/country names in Web of Science records.

VOSviewer was used to analyze bibliographic data and construct bibliometric maps across various dimensions. In particular, three dimensions-keyword co-occurrences, co-authors' country, and organization, were explored in the study. These dimensions of bibliometric analysis were chosen for their relevance to the study's purpose.

For keyword co-occurrence analysis, the minimum number of occurrences of a keyword was set at 50. Out of 6,624 keywords identified in the dataset, 28 met the threshold and were included in the final map. For country co-authorship analysis, the minimum number of documents per country was set to 25, and the minimum number of citations was set to 1. Out of 114 countries, 31 met these thresholds. For organizational co-authorship analysis, the minimum number of documents per organization was set to 10, and the minimum number of citations was set to 1. Out of 2,491 organizations, 17 met the thresholds.

The selected thresholds represent an optimal compromise between analytical clarity and representation. A more conservative choice of threshold would result in maps that are too detailed and therefore hard to understand. Conversely, choosing a more liberal threshold would be tantamount to omitting actors and issues that need to be considered in the analysis. Hence, the chosen thresholds ensure the visibility of the most prominent actors and keywords.

**Table 1. Bibliometric search protocol and VOSviewer thresholds**

| Element         | Description                                               |
|-----------------|-----------------------------------------------------------|
| Database        | Web of Science Core Collection                            |
| Period covered  | 1997-2026                                                 |
| Extraction date | 03.05.2026                                                |
| Document types  | No additional filter was applied regarding document type. |
| Search query    | "digital transformation" AND "public services"            |
| Search field    | Topic                                                     |

| Element                              | Description                                                             |
|--------------------------------------|-------------------------------------------------------------------------|
| Initial results                      | 1,877 documents                                                         |
| Software                             | VOSviewer                                                               |
| Keyword co-occurrence threshold      | Minimum 50 occurrences; 28 of 6,624 keywords included                   |
| Country co-authorship threshold      | Minimum 25 documents and 1 citation; 31 of 114 countries included       |
| Organization co-authorship threshold | Minimum 10 documents and 1 citation; 17 of 2,491 organizations included |

*Source: Author's processing based on Web of Science Core Collection and VOSviewer outputs.*

Level one of analysis answers RQ1 by analyzing the theme structures of DG studies using the keywords' co-occurrence technique. Figure 1 not only presents the top 10 most frequently used terms but also shows the linkages and clustering of concepts in the DG area. It shows that there is indeed an existing core concept in the field, with “digital transformation” as the central theme that links the conventional area of e-government studies to new areas such as innovation, governance, artificial intelligence, trust, performance, and the modernization of public services.



**Figure 1. Keyword co-occurrence network in digital transformation and public services literature**

*Source: Author's processing in VOSviewer based on Web of Science Core Collection data.*

The most visible term in the network is “digital transformation”, with 541 occurrences and a total link strength of 873. This clearly shows that digital transformation acts as the primary organizing principle in the studied body of literature. Second to digital transformation is the term “e-government” with 242 mentions and a cumulative link strength of 557, indicating that the field of study is closely associated with the conventional literature on electronic government services. Other central terms include “innovation”, “management”, “digitalization”, “technology”, “governance”, “transformation”, “government”, “digital government”, “artificial intelligence”, “information”, “services”, and “public administration”.

Positioning “digital transformation” and “e-government” in the network reveals that research on the issue relies on a transition from traditional approaches to e-government towards digital government approaches. In other words, e-government can be considered a phenomenon implying the use of digital technologies in rendering public administration services through the Internet. In its turn, digital

transformation refers to more profound transformation of public administration processes as regards the possibility of delivering public value. This implies that according to bibliometric analysis, the field of digital government does not overlook the problem of e-government.

A second important thematic area is represented by the terms "innovation", "management", "governance", "framework", and "challenges". These keywords show that researchers are interested not only in the adoption of technologies, but also in the managerial and institutional conditions that enable or constrain digital transformation. This direction is particularly relevant for public administration because technological modernization depends on administrative capacity, leadership, organizational flexibility, regulatory adaptation, and the ability to coordinate complex digital projects across institutions.

The third thematic category can be attributed to technological advancement. Terms such as "artificial intelligence," "big data," "ICT," "internet," "technology," and "digital economy" underscore the growing significance of technological advancements in shaping the future of public service provision. Artificial intelligence stands out as one of the most prominent terms, implying that contemporary literature pays close attention to automated decision-making, prediction, intelligent service delivery, chatbots, and algorithmic governance.

The fourth theme deals with public service impacts and citizen-centered aspects. Terms such as "public services," "services," "performance," "trust," "adoption," and "impact" suggest that the literature is now drawing connections between digital transformation and the creation of public value. It is significant because digital technology does not necessarily enhance public administration; its significance lies in whether it increases accessibility, simplifies processes, enhances service delivery quality, builds trust, and makes a difference in public sector performance.

In addition, the presence of "COVID-19" on the map is another indicator of the development of post-pandemic research. The pandemic created a need for remote public service delivery, citizen-institution communication, and robust administrative infrastructure. While the total link strength associated with "COVID-19" is lower than that of more conventional terms such as digital transformation, e-government, and governance, the term's inclusion in the map reveals its integration into the research landscape.

**Table 2. Compact synthesis of the main bibliometric groups**

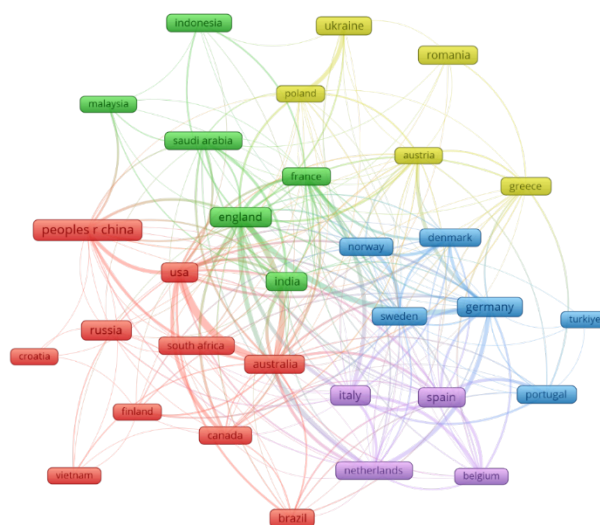
| <b>Dimension</b>                           | <b>Main groups identified in the dataset</b>                                                                              |
|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Very high-frequency keywords               | Digital transformation; e-government; innovation                                                                          |
| High-frequency keywords                    | Management; digitalization; technology; governance; transformation; government                                            |
| Public administration and service keywords | Digital government; public administration; public sector; public services; services; performance; trust; adoption; impact |
| Technology-oriented keywords               | Artificial intelligence; big data; ICT; internet; digital economy                                                         |
| Countries with more than 100 documents     | China; England; Russia; United States; Italy; Spain                                                                       |
| Countries with 75–99 documents             | Germany; Brazil; Australia                                                                                                |
| Countries with 50–74 documents             | India; Romania; Ukraine; Greece; Indonesia                                                                                |

| Dimension                               | Main groups identified in the dataset                                                                                                                                              |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Most visible organizations by documents | Bucharest University of Economic Studies; National Economic University; University of Brasilia; Russian Academy of Sciences; Delft University of Technology; University of Seville |

*Source: Author's processing based on VOSviewer outputs.*

The pattern implies that digital government studies are transitioning from a purely technological view of electronic service delivery to a more institutional/governance view. This means that the study of digital government is no longer organized solely in terms of digitalizing services but in terms of transforming public administrations, creating public value, and integrating new technologies in governance.

The second order of analysis addresses RQ2 by examining the structure of international cooperation at the national level. As Figure 2 depicts, while the field has broad global coverage, international scientific cooperation is not evenly distributed across the world map. Instead, many clusters indicate that digital government studies are affected by both geographical proximity and academic specialization. The countries included in the visualization are those that exceeded the criteria of having at least 25 documents and citations. It is possible to observe the density of the graph, which proves that the topics under study have attracted researchers worldwide. Nevertheless, there are still many inequalities present in the field.



**Figure 2. Country co-authorship network in digital transformation and public services literature**

*Source: Author's processing in VOSviewer based on Web of Science Core Collection data.*

Regarding the production of scientific literature, the leading nation in the study is China, with 176 publications. England and Russia follow these, each having 120 papers; the United States with 119; Italy with 112; Spain with 109; Germany with 97; Brazil, Australia, India, Romania, Ukraine, Greece, Indonesia, Portugal, Sweden, the Netherlands, France, Canada, and Norway. From these numbers, we can see that the literature on the topic under study originates not only from Western academic circles but also from other continents and regions.

The citation structure portrays an alternative picture. Germany leads the list with respect to the number of citations, recording 2,438 citations, followed closely by China, which records 2,436 citations. This is followed by the United States, which records 2,192 citations; England, with 2,064 citations; Italy, with 1,727 citations; Austria, with 1,394 citations; Spain, with 1,240 citations;

Denmark, with 1,136 citations; Australia, with 1,052 citations; and Norway, with 818 citations. It is evident from the findings that certain countries are productive and at the same time cited.

Total link strength demonstrates the level of cooperation. England demonstrates the largest total link strength with 107, while Australia has 88, the US has 84, Germany has 77, Italy has 63, the Netherlands has 59, Spain has 58, France has 56, Austria and India have 44, and China has 43. Thus, these numbers suggest that productivity and cooperation may be distinct concepts. While China ranks first in productivity, England is a leading nation in network collaboration. Moreover, although Australia has fewer publications than China, England, the US, Italy, and Spain, it has a high total link strength.

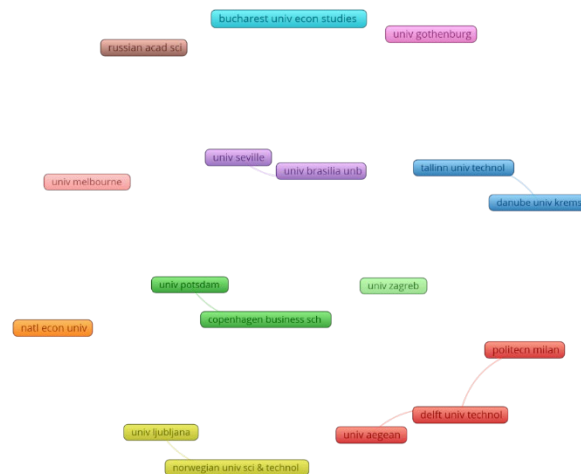
The map provides insights into several collaboration groups. Firstly, the map groups China, the USA, Australia, Canada, Brazil, Russia, and South Africa together. Secondly, there is a clear group comprising countries such as Germany, Denmark, Norway, Sweden, Portugal, and Türkiye. Thirdly, a cluster including Italy, Spain, the Netherlands, and Belgium has been identified, and yet another group comprises countries such as England, France, India, Saudi Arabia, Malaysia, and Indonesia. Collaboration does not just depend on geographical proximity but is also affected by academic affiliation.

Romania's contribution to the network is based on 65 papers, 309 references, and an aggregate strength of 8 connections. The position of Romania in the network indicates the participation of Romania in the scientific discourse; however, the international co-authorship intensity of Romania is relatively low. This finding may be perceived as a motivation for future research, which should imply greater involvement in international projects and comparative research on digital public services and public sector modernization.

It can be concluded from the country-level visualization map that scientific leadership and network centrality do not coincide to some extent. For instance, China is one of the countries characterized by high productivity, whereas countries such as England and Australia are more central in terms of collaboration density. It is essential to note that influence in science is not measured solely by the number of publications, but it also reflects the ability to integrate different research communities of different countries into one network.

Finally, it can be seen that the collaboration map among countries reveals the existence of an international distribution but unequal integration of scientific studies devoted to digital government. Only a few countries become key players in cooperation with one another, whereas other countries play a peripheral role in joint authorship. Further research on the topic might involve more countries from Eastern Europe, Southeast Europe, Latin America, Africa, and Asia.

Level three of the analysis builds on the previous research question (RQ2) in that it extends the analysis from an examination of countries to an examination of organizations. It can be observed from Fig. 3 that a new structure emerges when comparing the map from the country perspective with that of the organization. Although collaboration is quite dense among countries, it is not very coherent among organizations, with fewer strong ties among institutions.



**Figure 3. Organizational co-authorship network in digital transformation and public services literature**

*Source: Author's processing in VOSviewer based on Web of Science Core Collection data.*

From the organizational map above, one can deduce that, despite the visibility and thematic consistency of digital government studies across the globe, the organizational structures are not well-connected. Therefore, in addition to efforts to increase the number of studies conducted and published, there should be a greater focus on institutional connections and collaborations.

The organization publishing the highest number of articles is Bucharest University of Economic Studies, with 21 papers. The other institutions following are the National Economic University, the University of Brasilia, and the Russian Academy of Sciences, each having 13 papers. Others with 12 papers each include Delft University of Technology and the University of Seville. Other institutions with 11 papers each include the Polytechnic University of Milan, the University of Aegean, and the University of Gothenburg. There are several institutions with 10 publications each, including Copenhagen Business School, Danube University Krems, Tallinn University of Technology, Norwegian University of Science and Technology, University of Ljubljana, University of Melbourne, University of Potsdam, and University of Zagreb.

In terms of citation impact, Danube University Krems stands out with 1,098 citations, despite having only 10 documents. This suggests the presence of highly influential publications associated with this institution. National Economic University follows with 528 citations, while Polytechnic University of Milan records 417 citations, Copenhagen Business School 308 citations, Delft University of Technology 291 citations, and University of Potsdam 257 citations.

But the total strength of links is usually quite low. The highest total strength of links is observed at Delft University of Technology, which totals 2. All other institutions have a total link strength of either 0 or 1. It is, therefore, clear that the organization's authorship network is not very strong.

This finding is relevant because it shows a difference between country-level and organization-level collaboration. At the country level, the network appears dense and internationally connected. At the organizational level, however, the network is dispersed into small components, with many isolated or weakly connected institutions. This may be explained by the interdisciplinary nature of digital government research, which is often produced by researchers affiliated with different departments, such as public administration, management, information systems, economics, political science, or urban studies. It may also suggest that international collaboration often occurs through individual academic relationships rather than through stable institutional consortia.

The map of organizations is informative regarding the presence of European institutions within the research area under study. The list of visible contributors includes organizations from Romania, Austria, Denmark, the Netherlands, Italy, Spain, Sweden, Estonia, Slovenia, Croatia, and Norway,

among others. In this sense, it can be assumed that European academic institutions make significant contributions to the study of digital transformation in public services. However, the network's fragmented nature suggests that institutional collaboration would be useful for its further development.

Taken together, the three bibliometric maps demonstrate that the thematic evolution of digital government research appears more consistent than its collaboration networks. The keyword map shows a dense set of keywords built around digital transformation, e-government, governance, innovation, and public service provision. At the same time, the map of country collaborations suggests an extensive and rather dense international network that nevertheless exhibits uneven geographical distribution, with developed countries more heavily represented than countries at a peripheral stage of development. However, the organizational collaboration map shows no signs of consistency, as international collaboration occurs primarily through individual scholars and their national connections.

## Conclusions

This paper mapped the thematic structure and collaboration patterns of digital government literature, based on 1,877 documents indexed in the Web of Science Core Collection and analyzed through VOSviewer. The results indicate that digital transformation is more than just another subject area; it is actually the conceptual center of the domain, linking past e-government studies to new trends in governance, innovation, technology, trust, adoption, performance, and public service modernization. The outcomes of keyword co-occurrences reflect an evident change from e-government to digital transformation. This fact implies that the subject in question is no longer confined to offering government services through technological means but focuses on organization transformation, adaptation of governance instruments, and value generation through governmental projects. These outcomes are indicative of growing interdisciplinarity in the subject matter and the involvement of views and methods of such disciplines as public administration, information systems, management, governance, and innovation studies. Moreover, evident growth in such topics as artificial intelligence, big data, COVID-19, trust, adoption, and performance is observed.

The results from the analysis of the collaboration reveal an important structural inequality that exists within the subject area. For example, while the subject area is internationally recognized due to a number of participating countries, there is a clear discrepancy between productive and central collaboration. Although countries like China generate numerous publications, other countries like England seem more central within the subject area when it comes to collaboration. It is important to recognize that scientific dominance includes collaboration among countries.

The structural distinction between the maps of country and organization represents an important discovery. While there seems to exist relatively higher levels of collaboration among countries, collaboration within organizations is still divided and lacking any strong institutional connection. Thus, even though there exists worldwide recognition of digital government research, its integration is poor and the motivation to collaborate depends more on the initiatives of individual researchers rather than institutional connections.

The limitations of the study are inherent to the use of the Web of Science Core Collection, selected keywords, and VOSviewer thresholds that can potentially fail to include some relevant or emerging contributions. The future studies in this area can be focused on the analysis using both the Web of Science and Scopus databases with the application of bibliometric approaches longitudinally, as well as focusing on sub-topics like artificial intelligence in public services, digital transformation and trust, or digital government and public sector performance, etc. On the whole, it can be stated that the area of digital government becomes more and more developed and complex with high thematic development but poor collaboration of institutions and research networks. While being globalized, it

is far from being integrated with only some countries having central positions, while others remain peripheral.

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