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ELECTRONIC GOVERNMENT IN THE FIELD OF PUBLIC ADMINISTRATION: A SCIENTOMETRIC ANALYSIS BASED ON THE WEB OF SCIENCE (2014-2023)

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ABSTRACT

This scientometric analysis examines bibliographic metadata from 123 articles on electronic government in the field of Public Administration, published between 2014 to 2023. The study relies on the Web of Science database for study selection and employs the bibliometric software VOSviewer for examination and visualization of the results. The analysis of bibliographic metadata reveals a growing scientific production on the subject, with relative diversity in terms of countries and institutional affiliations. Moreover, there is a concentration of this literature in relevant journals in the field of administration, particularly in Public Administration. Brazil notably emerges as a significant contributor to this debate, both in the number of articles published on the topic and in scientific dissemination. Additionally, co-citation, bibliographic coupling, and co-word analysis contributed to the identification of three research agendas: (i) Open Government and the Evolution of Public Administration; (ii) Citizen-User Participation and Trust in Technology; and (iii) Public Policy Implementation, Innovation, and Artificial Intelligence.

KEYWORDS: Scientometrics, Electronic Government, Public Administration, VOSviewer.

GOVERNO ELETRÔNICO NO CAMPO DA ADMINISTRAÇÃO PÚBLICA: UMA ANÁLISE CIENTOMÉTRICA A PARTIR DA *WEB of SCIENCE* (2014-2023)

RESUMO

Esta análise cientométrica mensura metadados bibliográficos de 123 artigos sobre governo eletrônico no campo da Administração Pública, publicados entre 2014 e 2023. Como fonte utiliza-se a base de dados *Web of Science* para seleção de estudos e o *software* bibliométrico *VOSviewer* para o escrutínio e visualização dos resultados. A análise dos metadados bibliográficos revelou uma produção científica sobre o tema em ascensão, com relativa pluralidade em termos de países e filiações institucionais, bem como uma literatura bastante adensada em revistas relevantes do campo da administração e, em particular, a Administração Pública. Ganha destaque a presença do Brasil como um país contributo deste debate, tanto na publicação de artigos sobre o tema, como em sua veiculação e divulgação científicas. Por fim, ressalta-se que as análises de cocitação, acoplamento bibliográfico e coocorrência de palavras contribuíram para a identificação de três agendas de pesquisa, a saber: (i) Governo Aberto e a Evolução da Administração Pública; (ii) Participação e Confiança no Uso da Tecnologia pelo Cidadão-Usuário; (iii) Implementação de Políticas Públicas, Inovação e Inteligência Artificial.

PALAVRAS-CHAVE: Cientometria, Governo Eletrônico, Administração Pública, VOSviewer.

1 INTRODUCTION

The debate on the impact of technologies on public administration has garnered increasing attention and highlights their proliferation in diverse contexts, especially for their potential to address public issues. The incorporation of these technologies signifies the modernization of the State and the delivery of more efficient services to citizens, which in turn demands management practices that can adapt to ever-changing demands (Przeybilovicz, Cunha & Meirelles, 2018; Furtado & Jacinto, 2011).

From this perspective, the guiding question of this research stems from the following premise: What are the main characteristics of the scientific output that covers the relationship between public administration and electronic government in the Web of Science database between the years 2014 and 2023?

The literature on this subject has emphasized a prevailing trend characterized by management principles or tools: the enhancement of transparency mechanisms, open government, accountability, and e-government. This has shaped the functioning of the public sector and its policies, underscoring the participatory role of citizens in these processes, both through interaction in networks and the growing use of Information and Communication Technologies (ICTs) (Cavalcante, Lotta & Oliveira, 2018). However, we must also examine the latest trends and shortcomings within this literature, particularly during and post the Covid-19 pandemic, where the utilization of ICTs has become indispensable for overall service delivery and particularly crucial for public administration as a result of social isolation measures.

Scientific activity can be analyzed using indicators designed to measure scientific production and performance. For this purpose, scientometrics, also known as the "science of science", offers methods to evaluate the activity of researchers, knowledge areas, institutions, and countries (Silva, Prado, Alcântara, Tonelli & Pereira, 2018; Silva, Hayashi & Hayashi, 2011).

Using scientometrics as our methodological approach, our primary objective in this article is to map recent research on electronic government within the field of public administration, while identifying the broader outlines of this literature by analyzing bibliographic metadata from 123 articles sourced from the Web of Science. This study takes an exploratory approach and employs the bibliometric software VOSviewer[1], version 1.6.15. Additionally, we seek to identify the main research themes on this subject, along with their intellectual foundations (theoretical-methodological frameworks), and contemporary research fronts.

The article is structured as follows: first, we present our methodological approach. Next, we analyze the data, which is segmented into two categories: monadic (frequency-based) and

[1] VOSviewer is software used for building and visualizing bibliometric networks. These networks may include journals, researchers, or individual publications, and are built based on citation relationships, bibliographic coupling, co-citation, or co-authorship. Additionally, the software offers text mining functionality, allowing the construction and visualization of networks showing the simultaneous occurrence of key terms extracted from a corpus of scientific literature. For more information, visit: http://www.vosviewer.com/.

dyadic (relational). Then, we discuss the results to demonstrate the main research agendas identified in the surveyed literature. Finally, we provide our concluding remarks.

2 SOURCES, MATERIALS AND METHODS

While the terms scientometrics and bibliometrics are often used interchangeably, there are nuances between them. The former refers to the study of the scientific field itself, encompassing different types of research aimed at developing policies for Science, Technology, and Innovation (ST&I). On the other hand, bibliometrics entails the application of statistical techniques and research methods to bibliographic units (Clemente, Oliveira, Horochovski, Junckes & Azevedo, 2022; Ferreira & Silva, 2019).

Nalimov and Mulchenko (1971) formulated a pioneering definition of scientometrics: the study of aspects pertaining to the development and structure of science, initially centered on citation analysis as a measure of impact and on evaluating scientific productivity. Scientometrics delineates trends in intellectual landscapes through comprehensive bibliographic analyses (Kim, Zhu & Chen, 2016; Qiu, Zhao, Yang & Dong, 2017; Egghe, 2005; Yang, Yuan & Dong, 2020).

When analyzing a particular topic, scientometrics allows us to grasp the content of scientific articles through their titles, keywords, abstracts, institutions, methods, authorships, and bibliographic references (Ferreira & Silva, 2019). It serves as a valuable tool in literature reviews, even prior to the actual reading stage, guiding researchers toward the most influential works when mapping a given field, thereby reducing the subjective bias of the analyst (Zupic & Cater, 2015).

The emergence of specialized software designed for processing scientometric indicators has significantly enhanced such analyses. These tools facilitate the visualization of networks of (and with the potential for) scientific collaboration, considering citations among authors, journals, and articles (Silva et al., 2011). There are numerous software options available for this type of research. One notable example is VOSviewer, which offers “routines for summarizing and visualizing large datasets” (Wolfram, 2017, p. 97).

For the methodological design of our study, we followed the framework proposed by Zupic and Cater (2015), which outlines a workflow for conducting scientometric mapping, as detailed below.

2.1 Research design

Our research design began by defining the guiding question: what are the main characteristics of the scientific production analyzing the relationship between public administration and electronic government in the Web of Science database from 2014 to 2023? This inquiry unfolded into additional research questions (RQs):

- RQ1 What are the general characteristics of this literature (temporal evolution, journals publishing on the topic, countries, and institutional affiliations of researchers)?
- RQ2 What are the intellectual foundations and scientific domains of this debate (whom do the articles cite)?
- RQ3 What are the contemporary research fronts in this debate (how does the literature organize itself into distinct agendas)?
- RQ4 What are the main study themes and how have they evolved over time?

The primary objective is to map out, based on the literature available in the Web of Science database, the main characteristics of this scholarly production, its recent trends (over the last 10 years), and the most significant shortcomings, particularly in light of the Covid-19 pandemic.

2.2 Data compilation

Our selected database, Web of Science, is multidisciplinary and indexes only the most cited journals in their respective fields. It includes a citation index that provides information on the documents each article references and those referencing it, encompassing 9,000 indexed journals (Capes, 2020).

We devised our search criteria by combining keywords and utilizing parameters such as titles, abstracts, and keywords of scientific documents, along with the use of quotation marks and the Boolean operator OR to construct the search string (Table 1). After retrieving the documents using this string, we conducted further refinements. From a broad array of documents covering various topics related to public administration, we narrowed down our research to focus specifically on the topic of interest.

Table 1: Creation of the Search String in the Database.

"public management" OR "public administration"
Refinement:
"electronic government" OR "e-government" OR "e-gov" OR "egovernment" OR "egov" OR "e-service"

Source: Developed by the authors.

Next, we applied filters with the following inclusion (I) and exclusion (E) criteria:

- (I) Articles in journals;
- (I) Published in Portuguese, English, and Spanish;
- (I) From the fields of Management, Public Administration, and Political Science;
- (E) Publications outside our defined period, 2014 to 2023;
- (E) Written in languages other than those mentioned;
- (E) From fields other than those previously defined;
- (E) Opinion pieces, editorials, letters, conference texts, etc.

In the initial search, we encompassed all areas available in the database. This yielded 21,382 records in the search conducted on February 10, 2024. Subsequently, we narrowed down

the search by applying the first filter with terms relevant to the topic under analysis, resulting in 1,161 studies. After applying the inclusion and exclusion filters, we were left with a total of 123 documents, forming our analytical sample[2].

2.3 Analysis and visualization

VOSviewer provides tools that enable a precise analysis of scientometric data, offering network visualization layouts, i.e., maps of scientific production. There are two sets of scientometric indicators: (i) scientific performance indicators, which measure productivity and academic impact; and (ii) scientometric mapping indicators, which are based on the relational attributes of scientific articles (Clemente, 2022; Leydesdorf & Milojevic, 2015). This research considered the indicators listed in Table 2.

Table 2: Scientometric Indicators.

DIMENSION	INDICATOR
Quantitative	- Most productive institutions and countries. - Annual volume of publications.
Impact	- Number of citations received by articles, authors, and journals.
Scientific Mapping	- Author co-citation: reveals the theoretical-methodological foundations underpinning the corpus of analyzed texts, as indicated by the co-occurrence of authors in bibliographic reference lists. The greater the co-citation among authors, the stronger their connection and similarity. - Bibliographic coupling of documents: reveals how the analyzed literature is divided into research fronts, as demonstrated by the number of references shared by two or more documents. The greater the overlap of bibliographies, the stronger their connection and similarity. Mirrors co-citation. - Co-word analysis: reveals the semantic and conceptual field of an area or topic, as demonstrated by the connection between terms, expressions, and words that appear repeatedly in the titles, keywords, and abstracts of articles.

Source: Developed by the authors based on Clemente (2022) and Silva & Bianchi (2011).

VOSviewer calculates the Total Link Strength, which indicates the vertices (nodes) with greater centrality based on the number of relationships each possesses (Van Eck & Waltman, 2018). This measure is similar to weighted degree centrality in network analysis. In this article, we

[2] For replicability purposes, here is an excerpt from the search query provided by Web of Science: *"Results for "public management" OR "public administration" (Topic) and "Electronic Government" Or "E-government" Or "E-gov" Or "Egovernment" Or "Egov" Or "E-service" (Search within all fields) and 2023 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 or 2015 or 2014 (Publication Years) and Political Science or Management or Public Administration (Web of Science Categories) and Article (Document Types) and English or Portuguese or Spanish (Languages)"*.

used the Total Link Strength measure to identify prominent texts, authors, and keywords on the generated maps, revealing the "backbone" of the surveyed literature, i.e., the central vertices for the flow of content within the scientific discourse on electronic government in the field of public administration.

As an auxiliary tool for qualitative synthesis in scientometric mapping, we selected and read the 3 most central articles from each cluster of the bibliographic coupling map (Figure 6) (Clemente et al., 2021). The purpose of this strategy was not to conduct a literature review, but to qualitatively understand and validate the results derived from the scientometric methodology.

2.4 Interpretation

Finally, the results are presented based on our analysis of the 123 surveyed articles. We begin by outlining the general characteristics of the publications and then delve into the scientific organization of the field. It is important to emphasize that in the research design adopted here, the interpretation stems from the data itself, not the other way around – a bias control strategy (Zupic & Carter, 2015).

3 FINDINGS

In this section, we will present data related to the attributes of the 123 articles within the database. We will begin by discussing monadic data through frequency analysis, examining the general characteristics of this literature (RQ1). Following that, our focus will shift to dyadic data, specifically relational data, which forms the basis for scientometric mapping techniques (RQ2, RQ3, and RQ4).

3.1 Characteristics of the Literature on Electronic Government in the Field of Public Administration

Our analysis will initially focus on addressing RQ1, which pertains to productivity aspects. In this regard, when examining annual production within the chosen 10-year timeframe (Figure 1), the year 2022 emerges with the highest volume of publications (25), closely followed by 2020 and 2023 (both with 18 publications). Conversely, the lowest volume is observed in the year 2018 (4 publications). Overall, there is an upward trend line, suggesting the hypothesis of a sustained interest within the scientific community in this subject, possibly influenced by the impact of ICTs on public administration in recent years.

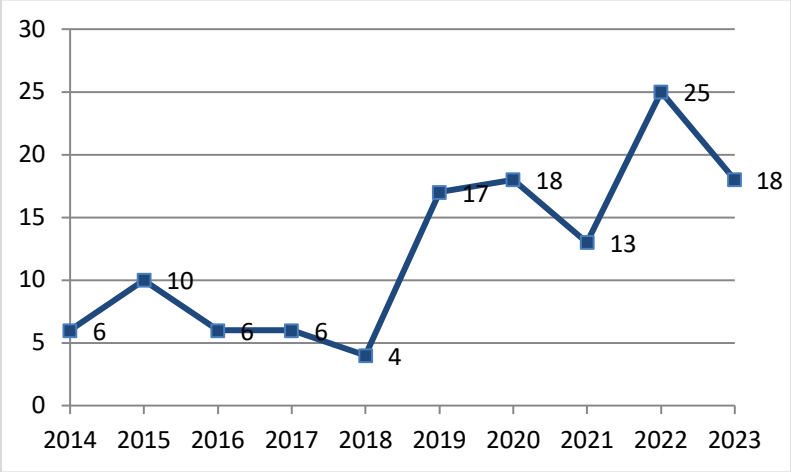

Figure 1: Annual Distribution of Publications.

Another significant aspect to consider regarding the general characteristics of a given bibliography is to examine its main outlets for scientific communication. Therefore, Figure 2 presents the top 10 journals indexed in the Web of Science that have published the most research between 2014 and 2023. The *International Review of Administrative Sciences* stands out with 11 articles – more than twice the number published by the second and third-ranked journals (5 each), *Administration Society* and *Central European Public Administration Review*. The Brazilian journal *Revista de Administração Pública* also ranks among the central journals with 4 articles. It is noteworthy that all the journals in Figure 2 exclusively focus on the field of Administration, particularly Public Administration – highlighting the strong connection between the study of electronic government and this academic domain.

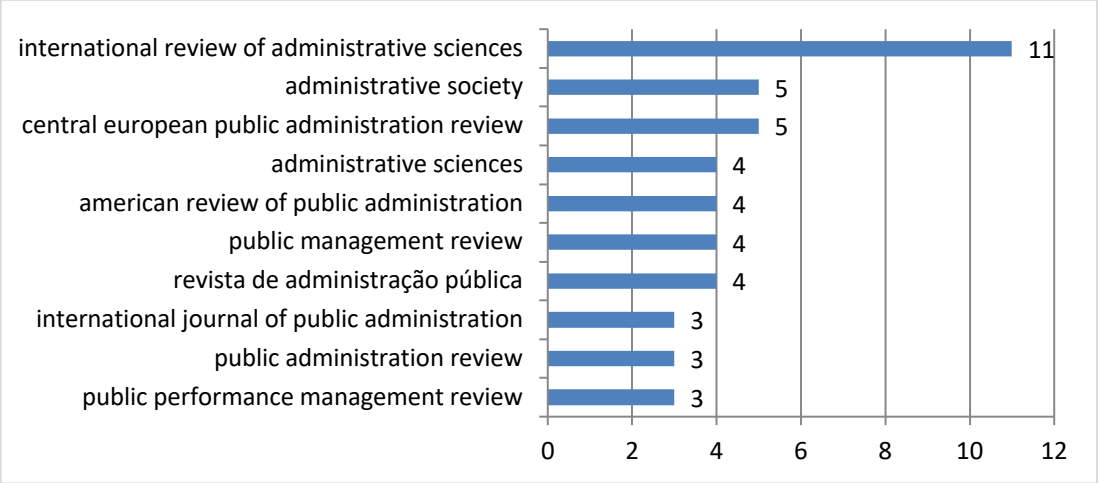

Figure 2: Journals with the Most Publications.

Regarding the researchers' countries (Figure 3), the USA leads with 21 publications, followed by Brazil with 15, and then Spain and Germany with 10 each. The prominent position of Brazil in second place underscores the significance of Brazilian research in the field of Public Administration. The 10 countries from which researchers studying electronic government originate demonstrate a relative plurality, including both central nations (USA, Germany, England) and peripheral countries (Brazil, Romania), as well as diverse cultural and linguistic backgrounds

(China, Italy, Spain, Croatia, Czech Republic). These findings suggest that countries worldwide are seeking ways to adapt to the new technological panorama of the 21st century.

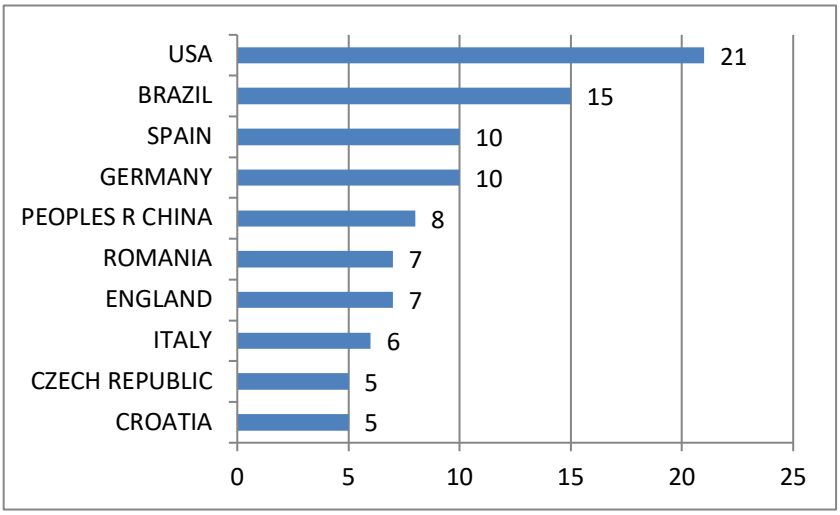

Figure 3: Countries of the Researchers.

Identifying the locations of researchers and research groups studying the topic is crucial, and Figure 4 offers a more detailed analysis by displaying their institutional affiliations. The listed universities contribute to the aforementioned relative plurality. Notably, Brazilian presence is once again evident among the top 10 institutions, with the *University of Brasília* (UNB) ranking third (with 4). Ahead of it are the *German University of Administrative Sciences Speyer* (Germany, 5) and, in the top position, the *Bucharest University of Economic Studies* (Romania, 6).

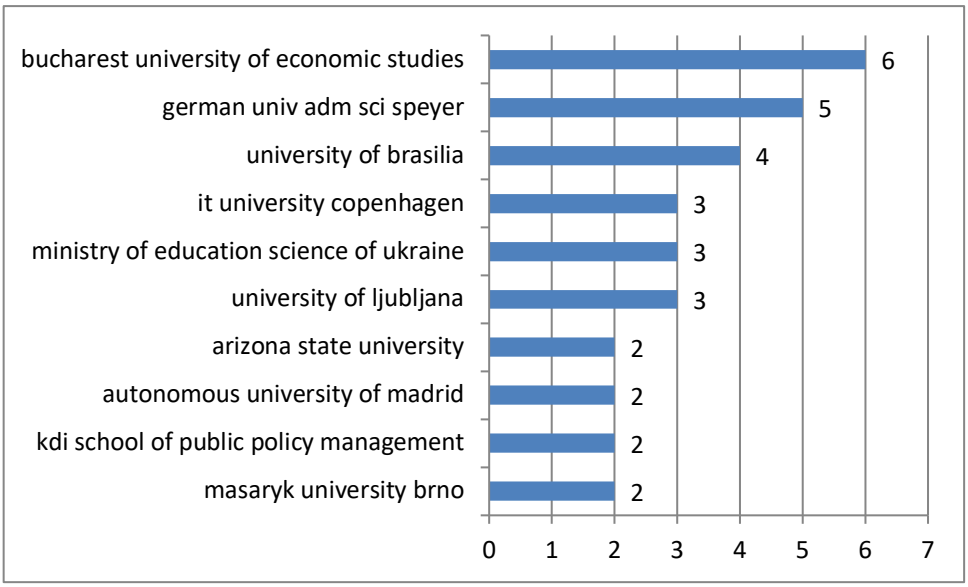

Figure 4: Institutional Affiliations.

The data compiled on scientific productivity allowed us to answer RQ1 and grasp the general pattern of publications regarding the quantity of publications over the years. Additionally, it sheds light on the international attributes established by researchers, their institutional affiliations, and the journals in which they publish most frequently.

3.2 The Intellectual Foundations of Electronic Government in Public Administration

As recommended by Codato (2018), the utilization of well-established scientometric mapping indicators should primarily focus on hierarchies, connections, and reciprocal influences, offering a diverse range of information beyond impact. Hence, a crucial indicator is co-citation. Our understanding is that frequently co-cited works indicate the intellectual foundations (the scientific background) upon which theories, concepts, or methods of a specific scientific area or literature are grounded (Zupic & Cater, 2015). Co-citation patterns serve as mapping tools for understanding the intellectual structure of a particular scientific field (Yen-Tsang, Dultra-de-lima & Pretto, 2013).

Figure 5, generated using the VOSviewer software, displays the co-citation map of authors from our analyzed corpus. Table 1 outlines the three most central authors of each cluster in Figure 5, based on the Total Link Strength measure. This methodology allows us to pinpoint the main figures in each cluster. The premise is that the greater the total strength of connection of a node (author), the more they have been co-cited with other authors, indicating their presence in a large number of bibliographic reference lists—thus, establishing them as central authors. The decision to select the three most central authors of each cluster (rather than the most cited authors in the network as a whole) is justified by the attempt to comprehend the primary niches of concepts and methods underlying the debate on electronic government[3]. Regarding the characteristics of the co-citation map, we observed four clusters (Figure 5), which are discussed below.

[3] This strategy will also be applied to the other maps presented, (word co-occurrence and bibliographic coupling).

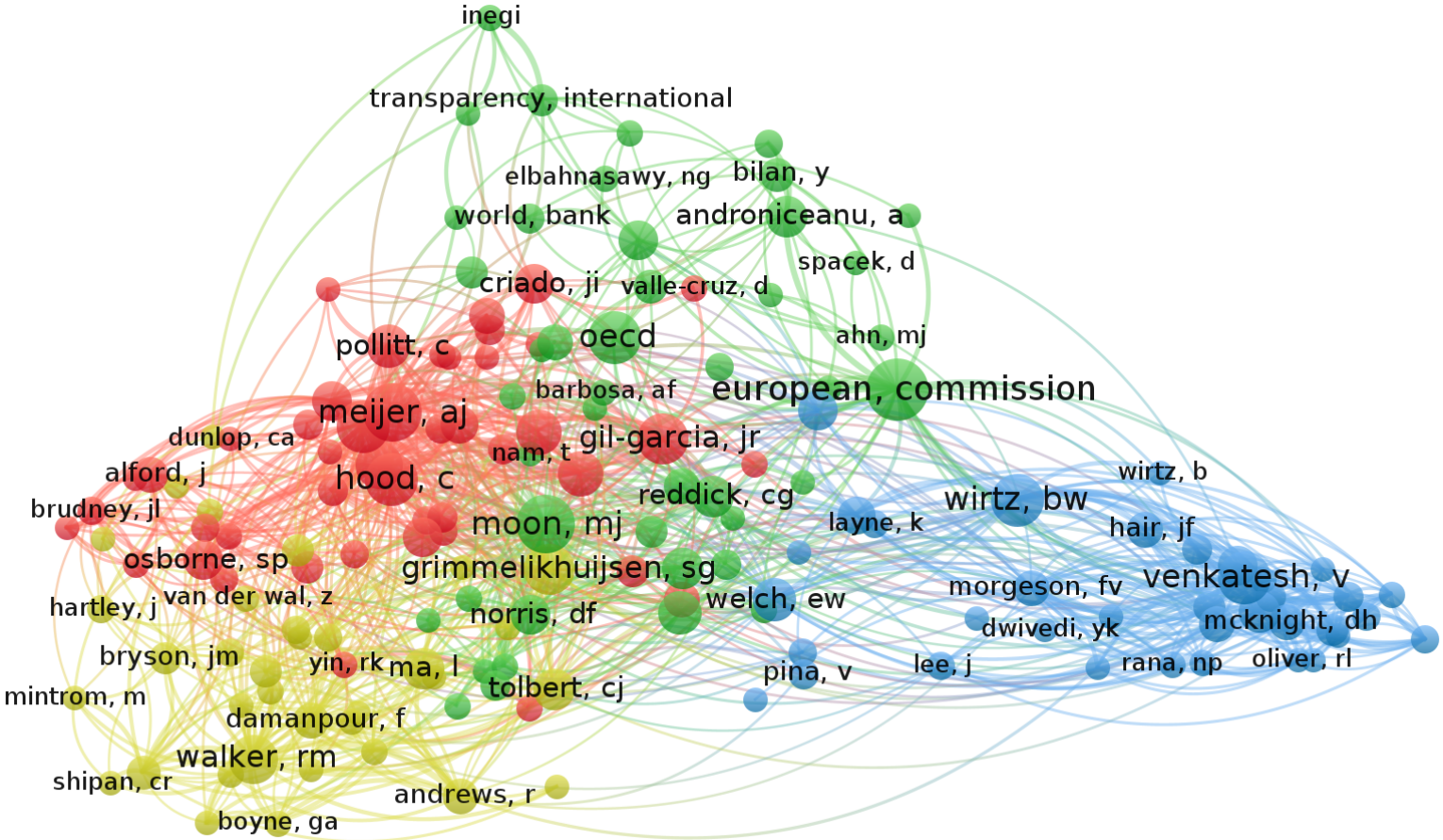

Figure 5: Co-citation Network.

Source: Developed by the authors using Web of Science and supported by VOSviewer. Parameters: Unit of analysis: cited authors; counting method: full counting; minimum occurrences: 5; normalization method and layout: LinLog/modularity; minimum items per cluster: 5; Final N of 161 authors connected by 4,338 edges divided into 4 clusters.

Table 1: Central Authors by Cluster.

Authors	Citations	Total Link Strength	Clusters
Meijer, A. J.	34	683	
Walker, R. M.	23	535	
Hood, C.	26	449	
Moon, M. J.	34	626	
Mergel, I.	27	514	
European, Commission	39	443	
Venkatesh, V.	27	530	
Grimmelikhuijsen, S. G.	25	461	
Davis, Fd	16	333	
Wirtz, B.W.	27	434	
Dunleavy, P.	21	361	
Tolbert, C. J.	16	333	

In the red cluster, Meijer, Walker, and Hood emerge as the central authors, whose research focuses on Smart Cities, open government (Meijer & Bolivar, 2016; Meijer, Curtin & Hillebrandt, 2016), innovation in public management (Damanpour, Walker & Avellaneda, 2009), transparency and new public management (NPM) (Hood, 2001; Hood & Heald, 2006).

In the green cluster, an institution, the European Commission, stands out as one of the most frequently cited authors, co-cited along with Moon and Mergel. The scientific domain of this cluster revolves around debates on the evolution of electronic government and its transformations (Moon, 2002; Mergel, Edelmann & Haug, 2019), citizen satisfaction, participation, and trust (Welch, Hinnant & Moon, 2005; Mergel, 2013).

In the blue cluster, Venkatesh, Grimmelikhuijsen, and Davis are the central authors, whose research focuses on the acceptance and use of technology by citizen-users (Venkatesh; Morris, Davis & Davis, 2003; Davis, 1989), and transparency (Grimmelikhuijsen, Porumbescu, Hong & Im, 2013).

Lastly, the yellow cluster features central authors Wirtz, Dunleavy, and Tolbert, whose research topics include artificial intelligence (Wirtz, Weyerer & Geyer, 2019), open government (Wirtz & Birkmeyer, 2015), the crisis of NPM, the onset of e-government (Dunleavy, Margetts, Bastow & Tinkler, 2006), and digital citizenship (Mossberger, Tolbert & McNeal, 2007). The co-citation analysis enabled us to answer RQ2, concerning the intellectual foundations of electronic government in the field of Public Administration. RQ3 will be addressed in the next section.

3.3 Research Fronts on Public Administration and Electronic Government

The bibliographic coupling indicator is a valuable tool to illustrate the research fronts within the analyzed corpus. It operates on the premise that the more common citations two or

more articles share, the greater their similarity (Zupic & Carter, 2015). The bibliographic coupling map (Figure 6) consists of five clusters. The distribution of scientific documents across these clusters reveals a highly cohesive discourse on electronic government in public administration. However, nuances exist, as detailed in Table 2. This table encapsulates both quantitative information regarding the centrality of each article and qualitative insights derived from the summary of each article (Clemente et al., 2021).

The yellow cluster comprises research that focuses on gaining a comprehensive understanding of the dynamics of public administration, innovation, and open government in various contexts. Young (2020) highlights the implementation of open data platforms and the institutional and political risk factors influencing this implementation. One notable finding is the influence of demand from wealthier and technologically proficient residents. In turn, Fan, Meng & Wei (2020) explore the relationship between fiscal slack, environmental pressures, and technological innovation in online public services. Their study suggests that in demanding environments, fiscal slack may not significantly influence technological assimilation, whereas in more relaxed environments, relative fiscal scarcity has some relevance. Park & Kim (2022) address gaps in empirical research by examining the effects of open government, focusing on the Global Initiative known as the Open Government Partnership (OGP). They demonstrate that OGP adoption did not have a direct effect on corruption or government effectiveness, but rather that legal and economic factors moderated these effects.

The purple cluster incorporates texts addressing the interaction between citizens and electronic public services, exploring themes such as uncertainty management, ensuring continuity in service usage, and the escalating influence of social media on public administration. Venkatesh et al. (2016), for instance, focus on effective strategies for managing citizens' uncertainty in e-government services, emphasizing transparency and trust as key elements to mitigate this problem. The authors propose that reducing uncertainty, along with ensuring information quality and optimizing interaction channels, are interconnected factors that shape citizens' intentions. Piehler et al. (2016) follow a similar approach, proposing an integrative coherent model of continuity intentions in the use of electronic public services. They emphasize the pivotal role of citizens' expectations and the factors influencing the delivery of these services. Meanwhile, Wirtz et al. (2020b) address the growing impact of social media platforms in the context of public administration. In addition to identifying and testing the determinants that explain citizens' intentions to use social media channels in public services, they also explore how this intention influences the recommendation of these services to others through word of mouth.

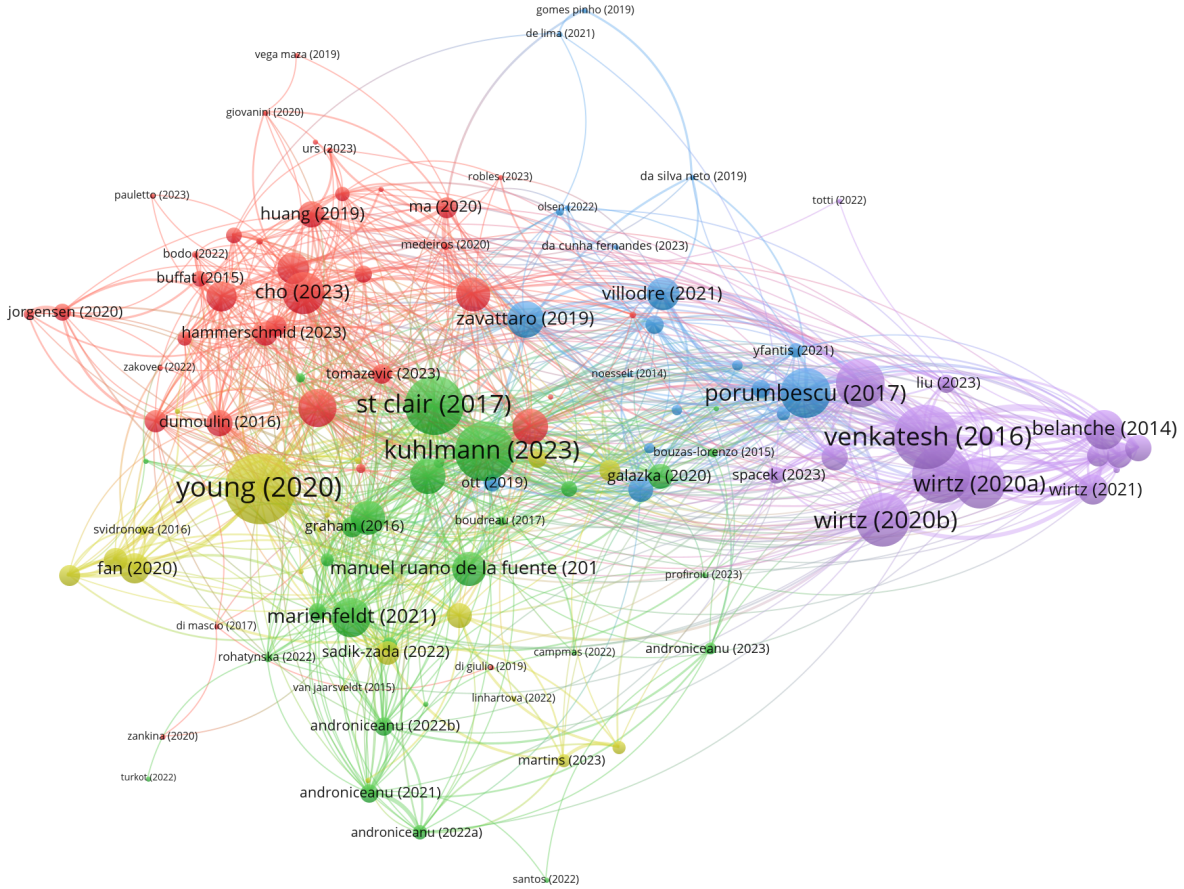

Figure 6: Bibliographic Coupling Network.

Source: Developed by the authors using VOSviewer. Parameters: minimum of three citations. The size of the node (circles) represents the citation frequency, while the distance between edges (lines) represents their importance to the topic, enabling the observation of nucleuses and research trends. Unit of analysis: documents, counting method: full counting, minimum occurrences: zero, normalization method and layout: LinLog/modularity, minimum items per cluster: 5. Final count: 119 articles connected by 1329 edges divided into 5 clusters

Table 2: Most relevant articles in each cluster.

Articles	Citations	Total Link Strength	Clusters	Abstract
Young (2020)	28	146		The study analyzes the institutional factors influencing the implementation of open data platforms in U.S. cities. It identifies institutional and political risks and obstacles across over 1,500 agencies in 60 cities. The study emphasizes the association between department type and administrative capacity with the quantity of available open data files. Municipal institutional and demographic characteristics suggest a potential influence of the demand from wealthier and technologically proficient residents.
Fan, Men & Wei (2020)	9	62		Explores the relationship between fiscal slack, environmental pressures, and technological innovation in online public services. The findings emphasize that the significance of fiscal slack depends on the environment for explaining technological innovation, with environmental pressures being more critical. In demanding environments, fiscal slack may not significantly influence technological assimilation, whereas in more relaxed environments, relative fiscal scarcity may have some relevance.
Park & Kim (2022)	4	51		Addresses gaps in empirical research by examining the effects of open government, focusing on the Global Initiative known as the Open Government Partnership (OGP). After collecting longitudinal data from sources such as the Center for Systemic Peace, the United Nations, and the World Bank, the panel data analysis revealed that the adoption of the OGP did not have a direct effect on corruption and government effectiveness. Instead, legal and economic factors moderate these effects. The study contributes both theoretically and practically to the debate on open government, electronic government, and collaborative governance.
Venkatesh et al. (2016)	178	132		The study investigates the management of citizens' uncertainty in e-government services, emphasizing transparency and trust as key means to mitigate this problem. The authors propose that reducing uncertainty, along with ensuring information quality and optimizing interaction channels, are interrelated factors influencing citizens' intentions. The findings suggest that information quality and the characteristics of the interaction channel predict usage intentions. Transparency and trust act as mediators and moderators of the effects of these characteristics on users' intentions and satisfaction.

Piehler et al. (2016)	17	119		Introduces an integrative coherent model of continuity intentions in the delivery of electronic public services. The study places emphasis on the role of citizen expectations and their determinants in the delivery of electronic public services. The model underwent testing in four German cities, and the results demonstrate that the concepts within this multi-theoretical approach are compatible, providing insight into the cognitive processes of citizens that drive continuous usage intentions.
Wirtz et al. (2020b)	6	112		Addresses the growing use of social media platforms in the realm of public administration. Alongside identifying and testing the factors that explain citizens' intentions to use social media channels in public services, the article also explores how this intention influences the recommendation of these services to others through word of mouth. Provides insights into the creation of social media apps by public entities, placing emphasis on the factors that influence citizens' willingness to use the Facebook pages of public institutions and recommend them to others.
St Clair, Hicks & Isett (2017)	8	123		Investigates the characteristics associated with highly cited articles in Public Administration, with a particular focus on the theoretical relevance of high-impact contributions. The article employs citations as a measure of academic influence, and adopts a bibliometric approach to understand the factors associated with to the most cited articles over the past 20 years. The findings suggest that theoretical development, the journal of publication, and strategic positioning in relation to the target audience play significant roles in academic impact. The theoretical and methodological evolution aligns with the maturity of subdisciplines, reflecting Kuhn's ideas on scientific evolution.
Kuhlmann & Heuberger (2023)	21	121		The ongoing digital transformation in public administration is poised to fundamentally reshape the landscape of service delivery, administration, and local governance in Europe. The article discusses the unintended negative consequences of digital reforms in the public sector, providing guiding principles for implementing digital changes in organizations. Furthermore, it underscores the significance of e-government as a post-New Public Management (NPM) trend. The analysis delves into the current state of digitalization in local administrations, addressing implementation challenges and examining the impacts on both employees and citizens.
Marienfeldt (2021)	3	81		The study delves into the institutional and organizational conditions that drive national e-government reforms in EU countries to yield a high availability of e-services. It identifies three configurations of sufficient conditions for the high availability of e-services: government capacity coupled with bureaucratic HR practices, a centralized

				state structure, and a focus on managerial innovation. The article underscores the importance of administrative effectiveness in digital transformation and suggests that countries can benefit from learning from those with the most effective institutional and organizational characteristics.
Porumbescu (2017)	86	102		The study aims to conduct a thorough evaluation of the relationship between transparency in the public sector and trust in the government. The analysis explores the use of transparency tools, including social media and e-government websites, in connection with citizens' trust in the government. The study finds a positive correlation between the use of public social media channels and trust in the government. However, the use of e-government websites did not demonstrate a significant correlation with trust in the government, but a strong negative relationship emerged as the frequency of respondents exercising "voice" increased.
Zavattaro & Brainard (2019)	20	76		The article introduces a framework to comprehend how millennials' preferences in social media usage can assist public administrators in adapting their approach to foster micro-meaningful encounters in digital spaces, thereby generating public value. The article advocates for meaningful interactions and the promotion of public values, contrasting with the traditional one-way approach to social media usage by governments. Additionally, the article suggests changes in the use of social media tools to promote public values such as collaboration, dialogue, and transparency.
Villodre, Reynaers & Criado (2021)	3	69		Analyzes the disparity in the provision of public information on Twitter between state agencies and ministries in Spain. The findings suggest that state agencies tend to actively disseminate public information, while ministries adopt a more passive approach to dissemination. Underscores the influence of social media on transparency and participation, especially within state agencies.
Cho (2023)	1	86		Tracing the bibliometric evolution of Dunleavy et al.'s "New Public Management Is Dead", the study investigates its impact on the administrative reform debate, highlighting influential themes such as public value, administrative reform trajectories, and e-government. In contrast to Dunleavy et al., the literature suggests that the wave of management reform is not linear, reform ideas are complementary, and NPM remains an important tool. The study suggests that future research should focus on integrating e-government and administrative reform and explore the negative impact of e-government on democracy.
Van der Wal	22	79		This study compiles cutting-edge empirical research on innovation in the public sector in the Asia-Pacific region. It

& Demircioglu (2020)				explores the drivers and outcomes of innovation, with a particular emphasis on cross-country comparisons. The findings suggest that public employees are inclined to seek innovation opportunities, but their innovative behavior is influenced by cultural norms, which also impact the level of leadership support.
Kontogeorgis & Varotsis (2021)	1	74		The study delves into the implementation and evolution of e-government in Greece, offering insights, policy recommendations, and suggestions for designing e-government benchmarks. The article assesses Greece's progress in e-government over time compared to other countries and examines the role of internal audit and transparency in digital public services. The findings reveal slow progress in Greece's digital transformation, spotlighting shortcomings in e-government policies and the imperative for proactive measures to enhance effectiveness.

The green cluster, on the other hand, contains publications addressing both academic aspects and practical challenges encountered in digital transformations and the implementation of electronic services. St Clair, Hicks & Isett (2017) employ a bibliometric approach to identify essential factors influencing the impact of articles in the field of public administration. Their study highlights how theoretical evolution aligns with the maturity of subdisciplines, following the concepts of scientific evolution proposed by Kuhn. Meanwhile, Kuhlmann & Heuberger's (2023) research delves into digital transformation in public administration, particularly in Europe, unveiling the unintended impacts of these reforms and offering guiding principles for implementing digital changes in organizations. Furthermore, their study underscores the importance of e-government as a post-NPM trend and evaluates the present state of digitalization in local administrations, taking into account implementation obstacles related to citizens and employees. The third publication (Marienfeldt, 2021) examines the factors driving the high availability of e-services resulting from national e-government reforms in EU member states. Thus, the focus is on the importance of government capacity, bureaucratic HR practices, centralized state structure, and managerial innovation.

The blue cluster revolves around the intersection between government transparency, citizen trust, and the strategic use of social media. Porumbescu (2017) assesses the relationship between transparency and public trust in the government through the use of social media networks and e-government websites. The research highlights that social media usage correlates positively with trust in the government, whereas the use of government websites shows no significant correlation. Zavattaro & Brainard (2019) introduce an analytical framework to understand millennials' social media usage preferences, with the goal of aiding public administrators in adapting their approach to foster micro-meaningful encounters in digital spaces, thereby promoting the development of public values. The authors contrast this approach with the traditional one-way use of social media by the government, proposing changes to promote values such as collaboration, dialogue, and transparency. The third study (Villodre, Reynaers & Criado, 2021) examines the disparity in the provision of public information on Twitter between state agencies and ministries in Spain. The study concludes that state agencies tend to actively disseminate public information, whereas ministries are more passive in their dissemination efforts. The authors suggest that social media has a positive impact on transparency and participation within state agencies.

Finally, the red cluster compiles publications that contribute to understanding the role of digital government, innovation, and e-government across various contexts, while also delving into the debate surrounding the involvement of street-level bureaucrats in the policy implementation process. Cho (2023), for instance, utilizes bibliometrics to analyze the evolution of Dunleavy et al.'s (2006) "New Public Management Is Dead", highlighting its influence in the debate on administrative reform. According to Cho (2023), the management reform wave is nonlinear: reform ideas are complementary, and NPM continues to be a crucial tool, suggesting future research should focus on the integration between digital government and administrative reform, as well as the negative impact of digital government on democracy. Another study (Van der Wal &

Demircioglu, 2020) aggregates research in the Asia-Pacific region, delving into innovation in the public sector and indicating that while public officials aspire toward innovation, their behavior is influenced by cultural norms. Finally, Kontogeorgis & Varotsis (2021) analyze the implementation and evolution of e-government in Greece, providing insights for benchmark design. They underscore slow progress in digital transformation, deficiencies in e-government policies, and emphasize the need for proactive measures to achieve effectiveness.

3.4 The Thematic Field on Public Administration and Electronic Government

Our final analysis tackles RQ4, aiming to identify the main research themes in the literature and how they have evolved over time. This entails conducting a co-word analysis, focusing solely on the keywords extracted from the articles in the database. The accompanying map (Figure 7) illustrates the semantic and lexical landscape of the literature on electronic government within the field of Public Administration. Co-word analysis follows a mathematical logic akin to the co-citation method: the more frequently two words appear together in the articles' keyword lists, the stronger their connection, indicating they belong to the same lexical field (Zupic & Cater, 2015). Table 3 supplements this analysis by showcasing the most central terms based on the total strength of their connections, which, as previously noted, reveals vertices within the network clusters.

We find that the field has relatively clear demarcations. For instance, the red cluster centralizes words such as govern, public administration, management, digitalization, policy, and sector – in perfect alignment with the scope of our article. The green cluster, on the other hand, focuses on transparency in the delivery of public services, including words such as services, transparency, adoption, technology, information, trust, and satisfaction. The blue cluster is related to the previous cluster, but with a greater emphasis on electronic participation as a means of social control: participation, accountability, social media, framework, local, and co-creation. Lastly, the yellow cluster intersects with studies on public policy implementation, particularly concerning street-level bureaucrats and their exercise of discretion, as well as recent impacts on public administration brought about by artificial intelligence: street-level bureaucracy, discretion, reflection, work, and artificial intelligence.

In addition to verifying the subdivision of themes within a given literature, it is also crucial to understand how these themes have evolved over time. VOSviewer facilitates this analysis through the Overlay Visualization feature, which illustrates the temporal evolution of a co-word map. This allows us to observe shifts in research agendas – identifying themes that are either declining or emerging (Figure 8). The more purple a node (word), the longer it has been prevalent; while a more yellow node indicates a more recent appearance in article keywords. Thus, research agendas related to satisfaction, accountability, and website analysis are in decline in this literature. Conversely, themes such as artificial intelligence, co-creation, and Covid-19 have been gaining prominence, capturing the recent attention of the scientific community focused on electronic government.

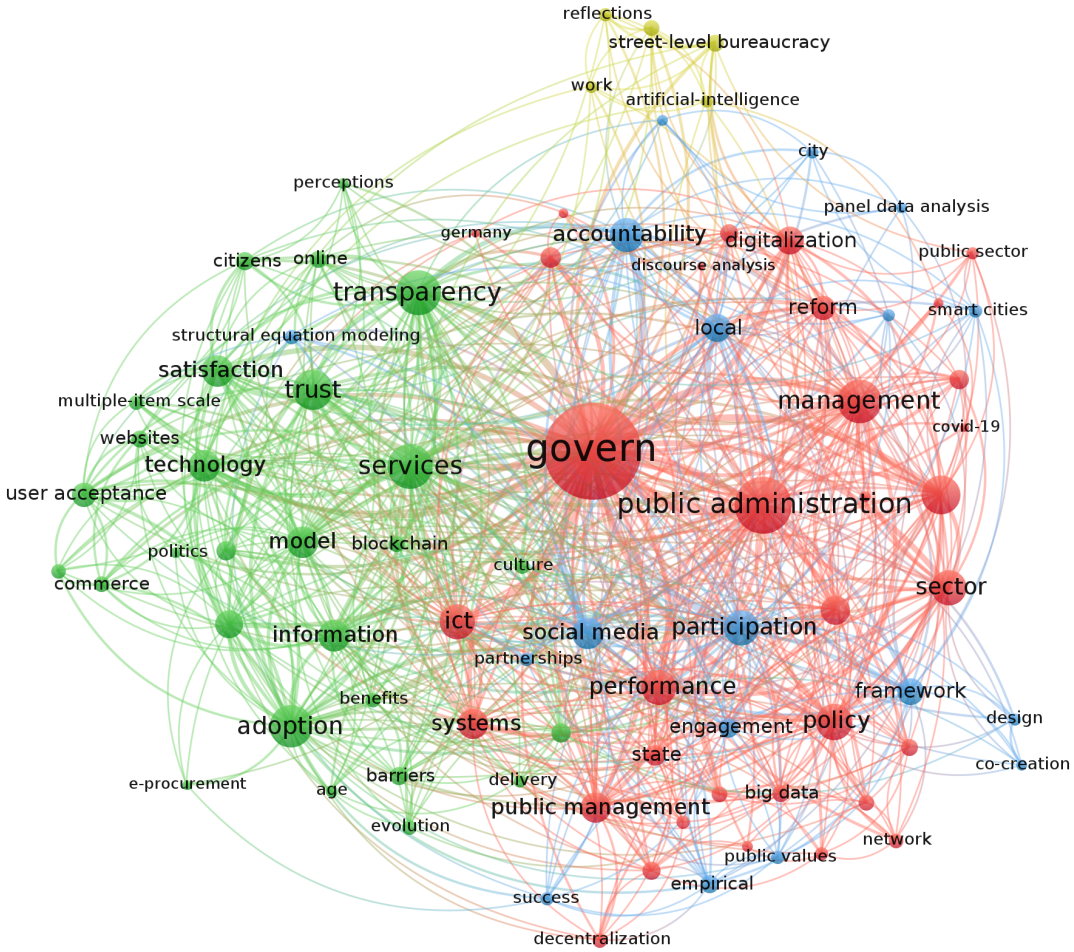

Figure 7: Co-word Network.

Source: Developed by the authors using VOSviewer. Unit of analysis: all keywords, counting method: full counting, minimum occurrences: 2, normalization method and layout: LinLog/modularity, minimum items per cluster: 5, final N of 85 words connected by 834 edges divided into 4 clusters.

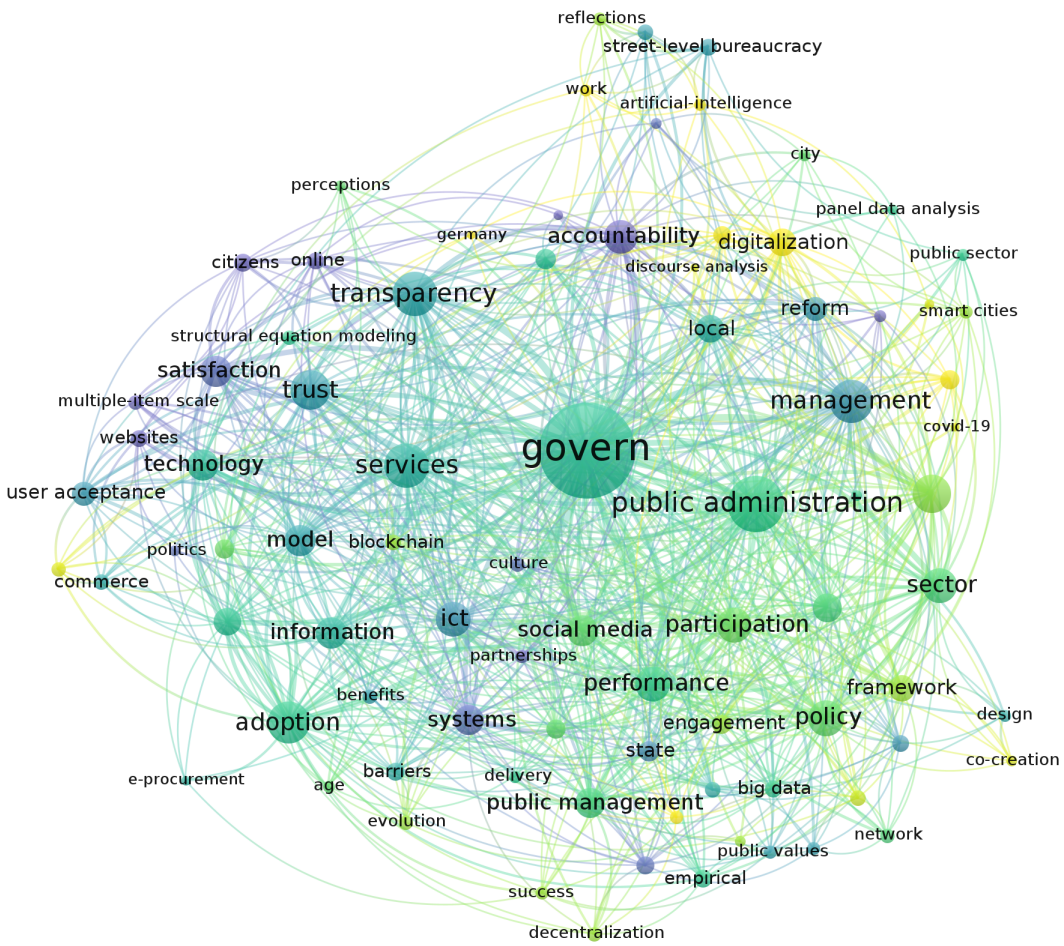

Figure 8: Co-word Network, Temporal Evolution of Terms

Table 3: Central Terms

Keywords	Occurrences	Total Link Strength	Clusters
Govern	113	494	
Public Administration	43	185	
Management	23	112	
Services	21	118	
Transparency	19	116	
Adoption	17	103	
Participation	14	75	
Accountability	13	71	
Social Media	8	60	
Street-level Bureaucracy	4	20	
Discretion	3	16	
Reflections	2	12	

4 DISCUSSION

The reviewed literature exhibited a consistent upward trend from 2014 to 2023, with a particularly notable spike in 2022, indicating a significant rise in the volume of publications. Possible hypotheses for this surge could be attributed to the Covid-19 pandemic, which spurred a rise in scientific output across all disciplines. Another contributing factor could be the advancement of ICTs and their profound impact on public administrations worldwide in the digital age.

This aspect becomes further reinforced when we consider the origin of researchers dedicated to studying e-government. The diversity is evident, spanning across both central and peripheral nations with diverse cultural and linguistic backgrounds. These findings are indicative of the global efforts to adapt to the new technological landscape of the 21st century. The significant presence of Brazilian researchers is notable, as reflected in the institutional affiliations, countries of origin, and the journal *Revista de Administração Pública*, which ranks among the journals with the most publications on this subject.

Moreover, when considering the main channels for scientific communication, the primary journals focusing on e-government belong to the field of Public Administration. However, there is untapped potential for further exploration of the e-government topic in journals within the fields of Political Science, Sociology, and Economics, as these disciplines also delve into the relationship between the State and society.

But what are the general characteristics of this literature? How can we summarize its main research agendas? By integrating the data from the presented scientometric maps and reviewing the most central articles in each cluster, we have crafted a narrative synthesis that categorizes this bibliography into three major agendas. These agendas are outlined below to address the guiding question of this article.

4.1 Open Government and the Evolution of Public Administration

This research agenda can be summarized by its thorough examination of the dynamics of public administration, reforms, innovation, and open government across various contexts, alongside digital transformations and the implementation of electronic public services. Articles focusing on this theme often include keywords such as govern, public administration, management, public management, digitalization, policy, sector, and transparency.

The theoretical and methodological foundations for this agenda are provided by Hood (2001) and Hood & Heald (2006), who discuss the crisis of NPM and the onset of digital governance and electronic government. These topics are also addressed by Dunleavy, Margetts & Bastow (2006), Moon (2002), and Mergel, Edelmann & Haug (2019). The theme of open government is typically supported by the work of Wirtz & Birkmeyer (2015), while transparency is grounded in the works of Grimmelikhuijsen et al. (2013), Hood (2001), and Hood & Heald (2006). Additionally, authors such as Meijer & Bolivar (2016) and Meijer, Curtin & Hillebrandt (2012) are frequently referenced in discussions regarding a more contemporary topic: smart cities.

Examples of articles within this research area include those that discuss the theoretical evolution of administration and the maturity of subdisciplines (St Clair, Hicks & Isett, 2017), as well as the digital transformation in public management, its unintended impacts, and principles for digital changes (Kuhlmann & Heuberger, 2023). Cho (2023), on the other hand, delves into administrative reform, linking it to digital government and addressing its negative impacts on democracy. Similarly, the analysis of the implementation of open data platforms (Young, 2020) and the effects of open government (Park & Kim, 2022) are also part of this agenda.

4.2 Citizen-User Participation and Trust in Technology

This research front focuses on the interaction between citizens and electronic public services. It explores topics such as uncertainty management, continuity in the use of e-services, citizen trust and participation, and the growing influence of social media in public administration. Keywords commonly associated with this agenda include adoption, technology, information, trust, satisfaction, participation, accountability, social media, framework, local, and co-creation.

As for the authors responsible for the theoretical and methodological framework for this agenda, cited names include Welch, Hinnant & Moon (2005) and Mergel (2013), who address topics related to citizen satisfaction, participation, and trust. Venkatesh et al. (2003) and Davis (1989) discuss the acceptance and use of technology by citizen-users; while Mossberger, Tolbert & McNeal (2007) focus on digital citizenship.

Within our analyzed textual corpus, examples of works in this agenda include articles on managing uncertainty in e-government services, emphasizing transparency and trust as crucial elements for reducing uncertainties (Venkatesh et al., 2016). Additionally, Piehler et al. (2016) also introduce an integrated model for electronic public services, focusing on citizen expectations. Similarly, Wirtz et al. (2020b) explore the impact of social media on public administration,

analyzing usage intention and providing recommendations. In a similar vein, we find publications examining the relationship between information provision, transparency, and government trust via social media (Porumbescu, 2017; Villodre et al., 2021), as well as articles seeking to understand the social media preferences of millennials (Zavattaro & Brainard, 2019).

4.3 Public Policy Implementation, Innovation, and Artificial Intelligence

The final agenda encompasses publications that contribute to understanding the role of digital government, innovation, and e-government in myriad contexts. This agenda also addresses the debate surrounding the role of street-level bureaucrats in the process of implementing public policies in a digitalized context. Keywords frequently used in these articles include services, street-level bureaucracy, discretion, reflection, work, and artificial intelligence.

This agenda is intellectually grounded in authors such as Wirtz, Weyerer & Geyer (2019), who engage with an extremely contemporary theme: the use of artificial intelligence in public policy management processes. Similarly, the debate on innovation in public management references Damanpour, Walker & Avellaneda (2009).

Examples of articles within this agenda include those analyzing the availability of e-services following national e-government reforms, governmental capacity, bureaucratic practices, and innovation orientation (Marienfeldt, 2021). Similarly, articles exploring the relationship between fiscal slack, environmental pressures, and technological innovation in online public services (Fan et al., 2020) also fall within this agenda. Van der Wal & Demircioglu (2020) emphasize the impact of cultural norms on public employees' drive for innovation, whereas Kontogeorgis and Varotsis (2021) address the implementation and evolution of e-government, underlining shortcomings and stressing the necessity of proactivity for achieving effectiveness.

CONCLUDING REMARKS

The objective of this study was to map recent literature on electronic government in the field of Public Administration using the Web of Science database. We accomplished this objective insofar as we answered the guiding question of our research: What are the main characteristics of the scientific production that explores the relationship between public administration and electronic government in the Web of Science database between 2014 and 2023?

We characterized the main elements within this literature, with the primary focus being on identifying its research agendas, named as follows: (i) Open Government and the Evolution of Public Administration; (ii) Citizen-User Participation and Trust in Technology; (iii) Public Policy Implementation, Innovation, and Artificial Intelligence. It is worth noting that the latter consists of the most recent line of research on the topic, while the other two are already well-established agendas among scholars devoted to these themes.

Our analysis also revealed that the topic of e-government is no longer isolated as a standalone “discussion panel”. Instead, within the examined timeframe, we observed that this debate is intricately intertwined with traditional themes in Political Science, Public Policy, and Public Administration, such as social participation, institutional trust, political culture, public policy implementation, street-level bureaucracy, governance, and state capacity.

However, upon analyzing the results, we have identified several knowledge gaps that merit further exploration. For example, there is a lack of consideration for criteria measuring the efficiency and effectiveness of digital services, as well as the various types of transactions in e-government. Particularly within the Brazilian context, where internet issues pose unique challenges, there is a shortage of studies addressing access, connectivity, speed, and digital exclusion. These studies could encompass both deficiencies in the public sector and citizens’ experiences as users of these services. Furthermore, we observed significant gaps in research regarding the implementation, expansion, and impacts of 5G technology on digitalization in public administration, encompassing topics such as cloud storage and data security. Comprehensive and context-specific studies in these areas hold the potential to generate insights for enhancing services and improving technological infrastructure in Brazil.

While scientometrics provides valuable techniques for conducting scientific mappings, it is important to acknowledge that quantitative analysis alone cannot replace thorough literature reviews on this topic. As a recommendation for future research, we propose conducting a systematic review that comprehensively covers the relationship between public administration and e-government, perhaps focusing on a more in-depth investigation of the three agendas suggested here. Additionally, the 10-year timeframe adopted fails to encompass the entire bibliography on the subject, and the choices of filters related to the areas of knowledge (Management, Public Administration, and Political Science) pose other limitations. Moreover, the Web of Science database does not encompass all global scientific production. Future research could expand the scope to include other bibliographic databases.

However, although this study does not amount to an extensive literature review, but rather an analysis of the literature through scientometric resources, the methodological potential cannot be disregarded. The use of the VOSviewer software, with its mathematical calculations, allowed us to discern the contours of the academic debate explored here. In conclusion, we emphasize that this represents just an initial step in a more comprehensive research endeavor, one in which we hope more researchers will join.

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