SAYIŞTAY DERGİSİ
JOURNAL OF TURKISH COURT OF ACCOUNTS

Cilt/Volume: 35
Sayı/Issue: 132
Mart/March 2024

ISSN: 1300-1981
eISSN: 2651-351X
Araştırma Makalesi/Research Article

MAPPING THE DIGITAL FRONTIER: BIBLIOMETRIC AND MACHINE LEARNING INSIGHTS INTO PUBLIC ADMINISTRATION TRANSFORMATION

DİJİTAL SINIRIN HARİTALANMASI: KAMU YÖNETİMİNDEKİ DÖNÜŞÜME DAİR BİBLİYOMETRİK VE MAKİNE ÖĞRENMESİ ANALİZLERİ

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ABSTRACT

Digital transformation significantly influences public administration by integrating advanced technologies such as artificial intelligence, blockchain, and big data analytics across various governmental functions. In this study, the use of LDA alongside advanced bibliometric techniques such as citation analysis and co-citation networks to explore the evolution and current status of digital transformation in public administration provides a structured examination of large data sets

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Submitted /Gönderim Tarihi: 18.03.2024
Revision Requested/Revizyon Talebi: 04.04.2024
Last Revision Received/Son Revizyon Tarihi: 10.04.2024
Accepted/Kabul Tarihi: 11.04.2024
Corresponding Author/Sorumlu Yazar: Cagle, M. N.
To Cite/Atıf: Damar, M., Köse, H. Ö., Cagle, M. N. and Özen, A. (2024). Mapping the Digital Frontier: Bibliometric and Machine Learning Insights into Public Administration Transformation. TCA Journal/ Sayıştay Dergisi, 35(132), 9-41. https://doi.org/10.52836/sayistay.1455036

obtained from the Web of Science, providing a thematic and intellectual insight into the field. Analyzing 628 articles, our research highlights how traditionally engineering-associated technologies are increasingly applied within the social sciences, transforming public management processes and policies. Our findings reveal that digital transformation in public administration is predominantly driven by external pressures rather than internal organizational initiatives. The importance of this study lies in its ability to map and visualize the transformative impact of digital technologies on governance structures, policy-making processes, and public engagement. Revealing that the data-based, more transparent and participatory nature of public administration has increased, the study not only maps the thematic evolution of public administration but also discusses the consequences of these transformations for policy makers and public administrators. Integrating digital tools has enhanced service delivery and operational efficiency but also presents challenges, such as the need for comprehensive cybersecurity strategies and continuous adaptation to technological advancements.

ÖZ

Dijital dönüşüm, yapay zeka, blokzinciri ve büyük veri analitiği gibi ileri teknolojilerin çeşitli devlet işlevlerine entegrasyonu, kamu yönetimini önemli ölçüde etkilemektedir. Bu çalışmada kamu yönetimindeki dijital dönüşümün evrimini ve mevcut durumunu keşfetmek amacıyla atıf analizi ve eş-atıf ağları gibi ileri bibliyometrik tekniklerin yanı sıra LDA'nın kullanımı, Web of Science'dan elde edilen büyük veri setlerinin yapılandırılmış bir şekilde incelenmesini sağlayarak, alanın tematik ve entelektüel yapısına dair derinlemesine bir anlayış sunmaktadır. 628 makalenin analizi, geleneksel olarak mühendislikle ilişkilendirilen teknolojilerin sosyal bilimlerde giderek artan bir şekilde kullanıldığını ve kamu yönetimi süreçleri ile politikalarını nasıl dönüştürdüğünü göstermektedir. Araştırmamız, kamu yönetiminde dijital dönüşümün kurum içi girişimlerden ziyade dış baskılar sonucunda şekillendiğini ortaya koymaktadır. Bu çalışmanın önemi, dijital teknolojilerin yönetim yapıları, politika yapma süreçleri ve kamu katılımı üzerindeki dönüştürücü etkisini haritalayarak ve görselleştirerek göstermesinde yatmaktadır. Kamu yönetiminin veriye dayalı, daha şeffaf ve katılımcı niteliğinin arttığını ortaya koyan çalışma, kamu yönetiminin tematik evrimini haritalamakla kalmayarak aynı zamanda bu dönüşümlerin politika yapıcıları ve kamu yöneticileri için sonuçlarını da tartışmaktadır. Dijital araçların entegrasyonu, hizmet sunumunu ve operasyonel verimliliği artırmış, ancak kapsamlı siber güvenlik stratejilerine olan ihtiyacı ve teknolojik gelişmelere sürekli adaptasyon gerekliliğini de beraberinde getirmiştir.

Keywords: Digital Transformation, e-Government, Mapping, Visualization, Literature Mining

Anahtar Kelimeler: Dijital Dönüşüm, e-Devlet, Haritalama, Görselleştirme, Literatür Madenciliği

INTRODUCTION

Over recent years, globalization and competitive pressures have compelled organizations, including public sector organizations, to adopt and prioritize technological advancements. This shift is not merely about keeping pace. Rather, it leverages technology to reshape operational and competitive strategies fundamentally. Technology, aimed at responding to societal needs

and economic challenges, is at the heart of significant transformations in business practices and the structure of institutions. Consequently, embracing digitalization and digital transformation has become essential for organizations striving to navigate the complexities of today's environment effectively.

In particular, the public sector is witnessing a pivotal shift towards digitalizing services, a trend gaining momentum globally. This movement towards digitalization is not just about adopting new tools but is transforming the fabric of public administration in various countries. The introduction of digital technologies is making the processes within the public sector more efficient, transparent, and participatory. This evolution is driving a shift towards more interactive governance, with improved decision-making processes and enhanced accountability. Such advancements are proving to be key in strengthening the principles of democratic governance, highlighting the critical role of digital transformation in the modern era.

While the impacts are significant and expectations are high, it is important to remember that research on digital public administration is still evolving. As this body of literature expands, we'll be able to delve deeper into its various facets, developments, contributions, and possibilities. In our study, we will explore the literature on digital transformation in public administration using bibliometric techniques and machine learning, specifically through Latent Dirichlet Allocation (LDA) topic modeling. To this end, we will focus our examination on the abstracts and titles of scholarly articles, which serve as windows into the essence and emerging trends of the field. This approach is designed to unearth a deeper comprehension of the public sector's technological evolution and shed light on its prospective trajectories.

Reviewing the literature reveals that the field of public administration has been the subject of numerous bibliometric studies. For example, Özmen (2023) conducted a bibliometric analysis focusing on 'bureaucracy,' 'digital,' and 'electronics,' drawing on data from the Scopus database. Similarly, Budak and Özçelik (2022) undertook a bibliometric study to examine the scientific landscape surrounding the digitalization of government, utilizing data from the Web of Science (WoS) database. Despite these varied analyses within public administration, there appears to be a gap in literature specifically addressing digital transformation in this sector. This study is the first in public administration to integrate bibliometric research with machine learning techniques. It aims to become a valuable resource for researchers, policymakers, bureaucrats, and other stakeholders in the public sector.

1. DIGITALIZATION AND DIGITAL TRANSFORMATION

Rapid advancements in digital technologies are significantly reshaping our professional and personal spheres, introducing changes that were once hard to imagine (Al-Ruithe et al., 2018). At the heart of these transformations lies the digitalization process, which involves the integration of digital technologies into various sectors, fundamentally altering how these industries operate (Manny et al., 2021). This shift is not confined to the mere adoption of new technologies; it extends to profound changes in our interactions, work dynamics, and cognitive processes.

Clarke (2020) expands on this by noting that digitalization revolutionizes physical products and redefines organizational structures and strategic methodologies. Adopting innovative technologies enables organizations to overhaul their operations, significantly enhancing efficiency and productivity. This is a global phenomenon, with digital technologies fostering greater connectivity and collaboration across organizations, as Damar and Özen (2023) noted.

The conversation surrounding digital transformation is gaining momentum in academic spheres across Türkiye and the global community, propelled by the rapid integration of digital technologies into daily life (Damar and Çiçek, 2023). This movement towards digital transformation, as Parida et al. (2019) describe, emerges from the foundational digitalization process, which involves strategically leveraging digital technologies to overhaul traditional business models, opening up novel revenue streams and value propositions. Manny et al. (2021) further expand on this concept, illustrating that digital transformation encompasses more than mere digitalization. It involves profound changes across organizational and institutional frameworks, setting the stage for various innovations and advancements.

Building on this, digital transformation extends its influence beyond the traditional realms of information systems and the IT sector, penetrating diverse domains such as transportation, construction, energy, and public administration (Baldini et al., 2019). It represents a paradigm where digital tools, methodologies, and extensive data pools are increasingly integral to our social and economic infrastructures. This fusion of digital and physical dimensions is forging a new, interconnected reality, as highlighted by Ossewaarde (2019). Consequently, contemporary research within information technology management and

operations management is increasingly focused on understanding the profound impacts of digital transformation. The multifaceted impact of digital transformation on society, particularly its ability to remodel institutional structures and processes, is well-documented by Frank et al. (2019). This underscores the comprehensive and varied effects digital transformation exerts across different facets of society.

Delving into the components of digital transformation, it becomes clear that it comprises three interconnected elements: digital objects, platforms, and infrastructures. Each plays a pivotal role in the digital transformation ecosystem. A digital object, for instance, can range from a software application to various forms of media content, each adding unique functionality or enhancing the value of a product or service for the end-user. This granularity in understanding the components of digital transformation helps in appreciating how these elements collectively contribute to transforming businesses and societal functions through digital means. Digital platforms provide a unified architecture and set of services that host these digital objects. Digital infrastructure, meanwhile, involves the tools and systems that offer communication, collaboration, and computing support to foster innovation. Key technologies in digital transformation often include social media, mobile technology, analytics, cloud computing, and the Internet of Things (IoT), with a growing emphasis on advanced Industry 4.0 and IoT technologies. These technologies integrate information and communication into physical systems across public administration (Ancillai et al., 2023). Cyber-physical systems optimize traffic flow by dynamically adjusting traffic signals, enhancing urban mobility (Lee, 2008). Augmented reality (AR) enhances training effectiveness by simulating emergency response scenarios for public safety personnel, providing a safe, controlled learning environment (Billinghurst et al., 2015). Robotics improve efficiency and reduce human error in routine tasks such as data entry and surveillance in public spaces. At the same time, artificial intelligence (AI) aids in processing vast datasets to inform policy decisions, improving public sector decision-making (Wirtz & Müller, 2018). Big data analytics support strategic planning and resource management, leading to more informed governance (Klievink et al., 2017). Finally, cloud computing facilitates the scalable and efficient management of IT resources, ensuring reliable public service delivery (Mell & Grance, 2011). Thus, public administration must incorporate these technologies into business processes and establish their roles across various sectors.

2. DIGITAL TRANSFORMATION IN PUBLIC ADMINISTRATION AND GLOBAL EXAMPLES

Numerous countries and international organizations are now striving to harness digital technologies to support their long-term strategies. These technologies are pivotal in addressing structural issues related to efficiency and effectiveness within institutions.

To create a seamless narrative that connects the three provided texts, one could approach the task by highlighting a logical progression of ideas, where each text builds upon the insights or challenges presented in the previous one. Here's how these texts can be interconnected in a cohesive paragraph: The drive for enhanced performance and efficiency in the public sector is increasingly being met through digital transformation, aiming for faster, more effective, and higher-quality service delivery. This transformation, as outlined by Di Giulio and Vecchi (2023), necessitates a robust governance framework to tackle the inherent coordination and collaboration challenges, thereby fostering inclusive socio-economic changes. In response to such needs, the OECD's 2016 report serves as a strategic guide for governments to craft digital strategies that promote open and inclusive public sectors and stimulate national development through enhanced social engagement and governmental transparency. The importance of these strategies and the urgency for digital transformation were further underscored by the global pandemic in 2019, as highlighted by Mergel et al. (2023).

The COVID-19 crisis, with its enforced lockdowns and the resultant push towards online public service provision, vividly demonstrated the critical need for a digitalized public sector to ensure the continuation of proactive and effective service delivery, thereby accelerating the digital governance agenda and reinforcing the interconnectedness of governance frameworks, strategic planning, and real-world contingencies. A rising number of central and local governments are exploring the use of applications powered by information and communication technologies. Specifically, the expanding adoption of sensors and data transmission technologies enables more refined instrumentation and highly precise measurements. This advancement allows for the creation of substantial data volumes, supports real-time data flow, and may require the deployment of sophisticated analytics or algorithms.

The discussion on the imperative for digital transformation, the establishment of governance frameworks, and the strategic guidance provided by entities like the OECD, culminating in the urgent push towards digitalization prompted by the COVID-19 pandemic, naturally leads us to the evolving role of artificial intelligence in public sector management. As digital transformation initiatives continue to expand, driven by the necessity for improved efficiency and responsiveness, the public sector is increasingly looking towards advanced technologies to enhance service delivery further. Incorporating these technologies with their capability to develop and apply sophisticated algorithms and computational methods presents a promising frontier in the ongoing efforts to optimize public institution management.

To craft a cohesive introductory paragraph that integrates the specifics of AI's role in digital transformation with a broader perspective on the diversity of digital transformation initiatives in the public sector globally, we can weave these two texts together while ensuring that the focus remains balanced and not overly concentrated on any single technology: The advent of digital transformation in the public sector marks a significant shift towards more responsive, efficient, and personalized public service delivery. While integrating Artificial Intelligence (AI) through virtual assistants and informational agents represents a key facet of this transformation, it is one part of a broader, multifaceted initiative. These initial steps towards harnessing AI-driven solutions to tackle governmental inefficiencies signify a technical evolution and a growing area of political discourse, reflecting the critical role of digital technologies in enhancing public services.

This shift towards digital innovation extends beyond AI, encompassing a variety of technologies and strategies tailored to meet the unique challenges and opportunities within different global contexts. Across the globe, studies have explored the vast landscape of digital transformation, from the adoption of cloud computing in Saudi Arabia's public sector to the digital overhaul in the Portuguese Ministry of Environment and from the exploration of sustainable digital tools in India's Punjab Region to the examination of digital transformation barriers and motivators in Dutch public organizations. These studies underscore the diverse approaches and technologies employed to drive digital transformation, each contributing to a richer understanding of how public administrations can leverage digital innovations to serve their citizens better. For example, Sarwar et

al. (2023) delved into the most effective and sustainable digital transformation tools and strategies for the public sector in India's Punjab Region. Tangi et al. (2020) examined the obstacles and motivators behind digital transformation in Dutch public organizations. Al-Ruithe et al. (2018) explored the adoption of cloud computing in Saudi Arabia's public sector. Simmonds et al. (2021) analyzed digital transformation in public sector and corporate services from 2010 to 2017 through case studies in New Zealand.

Furthermore, Alvarenga et al. (2020) conducted a study on the digital overhaul and information management within the Portuguese Ministry of Environment. In Italy, the lessons from the digital transformation journey were investigated by Datta et al. (2020). Therefore, the potential of digital transformation lies not just in specific technologies but in a holistic approach that considers the array of tools, strategies, and contextual factors that collectively redefine public sector management and service provision on a global scale. Thus, this study aims to critically evaluate the existing research on digital transformation within public administration to uncover prominent themes, titles, research patterns, and the thematic landscape of the field and shed light on the state and trajectory of digital transformation in this vital sector.

3. RESEARCH METHODOLOGY

3.1. Objective of Study and Research Questions

As mentioned before, this study aims to meticulously evaluate the research landscape of digital transformation within the field of public administration. This investigation delves deep into the existing literature by utilizing advanced bibliometric analyses and cutting-edge Latent Dirichlet Allocation (LDA) topic modeling machine learning techniques. The bibliometric analysis employed in this study involves comprehensive citation analysis and co-citation networks that help map the relationships and influence among various scholarly articles. This method allows for identifying key trends and thematic clusters within the extensive data extracted from the Web of Science database. Latent Dirichlet Allocation (LDA), a form of unsupervised machine learning, is specifically utilized to discover topics that these documents contain automatically. LDA analyzes the abstracts and titles of scholarly articles to detect underlying topics, providing a nuanced understanding of the intellectual structure and evolving

themes in digital transformation within public administration. Our exploration is guided by an array of carefully considered inquiries that seek to unravel the multifaceted dynamics of digital transformation in public administration, focusing on how these technologies reshape the governance and service delivery landscape. These inquiries include examining how digital tools and strategies are implemented within public sector operations, the challenges and opportunities these technologies present, and their broader implications for efficiency, transparency, and public engagement. By focusing on these targeted questions, our research aims to provide a comprehensive analysis of the evolving role of digital technologies in reshaping the strategies and operations of public administrations.

Central to our investigation is an analysis of (1) the temporal distribution and impact of publications within this domain, scrutinizing both the frequency of publications over time and their resonance in the academic community as reflected by citation counts. Concurrently, we delve into (2) the structural aspects of research dissemination, examining the funding sources and the accessibility of these studies, gauged through their open access status.

Our inquiry extends to the geographic and institutional landscape of digital transformation research, aiming (3) to highlight the countries, institutions, and researchers at this field's forefront. This facet of our analysis seeks to map out the global and organizational collaboration networks that propel the advancement of digital transformation in public administration. Visualization in the context of public administration research refers to creating visual representations of data or concepts to make complex information more accessible and understandable. This can include charts, graphs, maps, and other graphical elements to illustrate trends, patterns, and relationships (Friendly, 2008). Mapping, on the other hand, often refers to the systematic representation of data or the relationships between different elements within a system. This can involve creating visual diagrams or frameworks that outline the flow of information and dependencies or integrating various digital technologies within public administration processes (Börner et al., 2015).

Moreover, the publication venues of this body of research warrant close examination. Our study looks into (4) the journals that frequently house these discussions and the foundational texts that underpin them, thereby uncovering the pivotal sources that shape the discourse on digital transformation in public

administration. At the heart of our investigation are the themes and topics that characterize this research domain. Through our analysis, we aim (5) to distill the core subjects that have captivated scholarly attention, tracing the evolution of thematic focuses over time and identifying emerging areas of interest. This thematic exploration is enriched by applying LDA topic modeling, which promises (6) to reveal the underlying patterns and novel titles that encapsulate the current and future directions of digital transformation research in public administration.

Through this comprehensive inquiry, our study endeavors to sketch a detailed thematic map of digital transformation in public administration, offering insights into the prevailing research patterns, pivotal themes, and innovative titles that define this evolving field.

3.2. Data Source, Data Characteristics and Search Term

The data used in this study were retrieved from the Web of Science (WoS) Core Collection at different times to access the most accurate dataset for various periods. Indeed, after analyzing the relevant dataset, the keywords related to digital transformation were confirmed, and the final dataset suitable for the research question was retrieved on 01/02/2024. The bibliometric data source obtained contains only research articles and review articles. In this study, a total of 628 articles, comprising 600 research articles and 28 review articles, published between 2000-2024 and indexed by the Science Citation Index-Expanded (SCI-Expanded), Social Sciences Citation Index (SSCI), Arts and Humanities Citation Index (A&HCI), and Emerging Sources Citation Index (ESCI) in the WoS database, have been analyzed using bibliometric techniques. These articles involve 1,664 researchers from 983 different institutions across 78 different countries.

The data obtained were processed through various operations in Microsoft Office Excel and plaintext formats to make them suitable for analysis. Within our dataset, subject to our research, various data such as topic headings, researcher keywords, reference data, citation data, researchers, institutions, countries, journals, and funding have been analyzed using bibliometric methods. The abstracts and titles of the articles were clustered through LDA topic modeling analysis, and the prominent topics over the years were mapped. The dataset was obtained by filtering documents in the Public Administration research field, specifically articles and review articles, based on titles and keywords.

The keywords used were as follows: "digital transform*" or "digital innovation*" or "e-innovation*" or "electronic innovation*" or "electronic transform*" or "digitalization*" or "digitalisation*" or "digitization*" or "digitisation*" or "digital servitization" or "open innovation*".

3.3. Analyses, Techniques Used for Analysis and Implementation Tools

Methods such as bibliometrics, scientometrics, and informetrics focus on uncovering a specific topic's patterns, connections, and demographic characteristics in the literature (Yang and Yuan, 2017). In scientometric studies, summary statistics of authors, keywords, and citations are provided with various metrics, and the results of advanced data analyses in terms of co-authorship, temporality, and clustering can be presented with network and density visuals. Text analytics and network models are utilized (Hosseini et al., 2018). In such studies, bibliometric data provided by scientific databases like Web of Science (WoS), Scopus, and PubMed are frequently used.

Various applications and software environments, such as Microsoft Office Word, Microsoft Office Excel, VOSviewer, the R programming language, the Bibliometrix library, and the Biblioshiny application, were utilized for the analyses. Additionally, the Scikit-Learn machine learning library in the Python programming language was employed for LDA topic modeling analysis. WoS (Clarivate Analytics) reports and queries obtained from the database were used to examine the demographic fabric of the selected field. Within the scope of advanced data analyses, to reveal the scientific perspectives of the field, citations, co-citations, co-authors, co-words, demographic characteristics, and in this context, the connections between journals, countries, institutions, clustering analyses, and network models were uncovered and presented visually. In this context, the VOSviewer software and the clustering-based network extraction algorithm operating within this software were utilized.

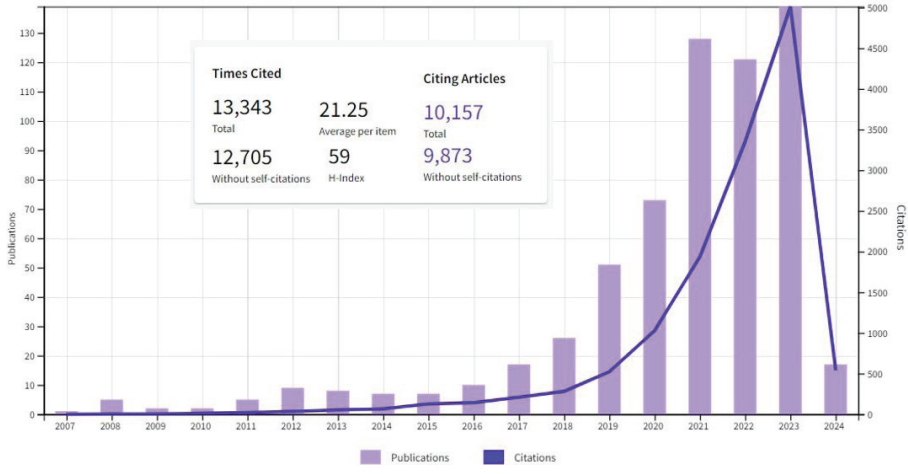
4. FINDINGS

4.1. General Statistics

In our study, we accessed 829 documents related to digital transformation and digital innovation in the field of public administration. The final types of documents obtained are as follows: articles (f: 600), proceeding papers (f: 175), book chapters (f: 36), review articles (f: 28), editorial materials (f: 14), book

reviews (f: 8), meeting abstracts (f: 3), corrections (f: 2), a book (f: 1), a reprint (f: 1), and a retracted publication (f: 1). In our final dataset, a total of 628 documents were accessed, comprising 600 research articles and 28 review articles. The documents were published in 124 journals between 2007-2024 and found their place in the literature. The average age of the documents is 3.34 years, and the annual growth rate is 24.93%. The total number of citations received by the 628 works over the years is 13,343, with an average citation count per work of 21.25. Additionally, the citation count for the topic in question is a high value of 59.

Figure 1: Times Cited and Publication Over Time



The languages in which the 628 articles comprising our study were produced are as follows: English (f: 598, 95.22%), Hungarian (f: 3, 0.47%), Portuguese (f: 2, 0.31%), Russian (f: 19, 3.02%), Spanish (f: 2, 0.31%), and Turkish (f: 4, 0.63%). Additionally, the open access status in the relevant field is all open access (f: 276, 43.94%). The distribution of the studies according to the Web of Science indexes is as follows: SSCI (f: 500, 79.61%), SCI-Expanded (f: 2, 0.38%), ESCI (f: 97, 15.44%).

4.2. Authors, Affiliations and Country Patterns

Table 1 displays the list of researchers who produced the relevant studies, sorted by country. The 628 research and review articles were produced by 1,664 researchers from 983 institutions across 78 countries (Table 1, Table 2).

Table 1: Distribution of Researchers Producing Related Studies by Country

Ranking	Country	CPA	N	%	Ranking	Country	CPA	N	%
1	England	1,713	92	14.65	21	India	167	13	2.07
2	Italy	2,839	75	11.94	22	Portugal	72	13	2.07
3	China	1,044	62	9.87	23	Romania	74	11	1.75
4	Germany	1,323	59	9.39	24	Poland	67	10	1.59
5	Spain	1,298	48	7.64	25	Turkiye	121	10	1.59
6	USA	1,259	48	7.64	26	Croatia	136	9	1.43
7	France	1,906	47	7.48	27	Greece	83	8	1.27
8	Finland	1,300	37	5.89	28	Hungary	28	8	1.27
9	Sweden	1,285	37	5.89	29	Scotland	124	8	1.27
10	Russia	417	33	5.25	30	Estonia	119	7	1.11
11	Netherlands	769	32	5.09	31	Malaysia	42	7	1.11
12	Norway	754	32	5.09	32	Singapore	127	7	1.11
13	Switzerland	480	23	3.66	33	Taiwan	148	7	1.11
14	Australia	484	22	3.50	34	Wales	16	7	1.11
15	South Korea	351	22	3.50	35	Colombia	266	6	0.95
16	Brazil	740	21	3.34	36	Czech Republic	32	6	0.95
17	Denmark	792	21	3.34	37	Pakistan	133	6	0.95
18	Belgium	605	17	2.70	38	Slovenia	112	6	0.95
19	Canada	295	15	2.38	39	South Africa	275	6	0.95
20	Austria	205	13	2.07	40	Vietnam	92	5	0.79

***CPA:** Citations Per Article

Table 2: List of Researchers by Higher Education Institutions (N>5)

Ranking	Organization	Country	ACPA	CC	N	%
1	University of Vaasa	Finland	58.46	760	13	2.07
2	Lulea University of Technology	Sweden	66.83	802	12	1.91
3	University of Turin	Italy	58.00	696	12	1.91
4	HSE University National Research University Higher School of Economics	Russia	17.90	179	10	1.59
5	Russian Presidential Academy of National Economy Public Administration	Russia	3.30	33	10	1.59
6	Centre National De La Recherche Scientifique	France	75.75	606	8	1.27
7	Parthenope University Naples	Italy	65.88	527	8	1.27
8	Polytechnic University of Milan	Italy	77.50	620	8	1.27
9	University College of Southeast Norway	Norway	30.13	241	8	1.27
10	University of London	England	5.50	44	8	1.27
11	Complutense University of Madrid	Spain	16.29	114	7	1.11
12	Daegu Gyeongbuk Institute of Science Technology	South Korea	10.86	76	7	1.11
13	Loughborough University	England	16.29	114	7	1.11

Ranking	Organization	Country	ACPA	CC	N	%
14	University of Bern	Switzerland	8.71	61	7	1.11
15	University of Potsdam	Germany	36.57	256	7	1.11
16	University of Reading	England	31.43	220	7	1.11
17	Bucharest University of Economic Studies	Romania	7.67	46	6	0.95
18	Johannes Kepler University Linz	Austria	18.17	109	6	0.95
19	Tampere University	Finland	19.67	118	6	0.95
20	University of Cambridge	England	11.67	70	6	0.95
21	University of Naples Federico II	Italy	36.83	221	6	0.95
22	Wageningen University Research	Nerherlands	20.50	123	6	0.95

*__ACPA:__ Average Citation Per Articles, CC: Citation Count

As shown in Table 2, the top five most productive institutions in the relevant field are, in order: University of Vaasa from Finland, Luleå University of Technology from Sweden, University of Turin from Italy, HSE University (National Research University Higher School of Economics) from Russia, and Russian Presidential Academy of National Economy and Public Administration from Russia. The field's top ten most productive countries are England, Italy, China, Germany, Spain, USA, France, Finland, Sweden, and Russia (Table 2). Additionally, the top three most productive authors in the field are Vinit Parida (f: 9), JinHyo Joseph Yun (f: 8), and KyungBae Park (f: 5). The value of international co-authorship in the articles within the research field is 35.35%, and the value for single-authored documents is 91.

4.3. Document, Journal and Reference Patterns

Thirteen thousand three hundred forty-three citations have been made to the 628 works, with an average citation per article (ACPA) value of 21.25. The h-index (HI) value of these publications is a high value of 59. Below are the journals where the relevant publications were most frequently published (Table 3) and the most cited research on WoS (Table 4). In the field of public administration, the journal Technological Forecasting and Social Change has published 46.33% of the total publications on digital transformation. Moreover, 12 of this journal's top 15 most cited articles are in the publication set.

In the 628 works subject to the study, 36,736 references were used, citing 14,632 different sources. When a co-citation analysis is performed on these sources, the top ten most frequently cited sources are Technological

Forecasting and Social Change (f:1763), Research Policy (f:1168), Strategic Management Journal (f:725), Journal of Business Research (f:718), Technovation (f:518), Journal of Cleaner Production (f:486), Government Information Quarterly (f:432), Journal of Product Innovation Management (f:386), Academy of Management Review (f:356), and Industrial Marketing Management (f:354). Additionally, according to Bradford's Law in the field of public administration, the journal Technological Forecasting and Social Change is in the first zone. The journals in the second zone include European Planning Studies, Journal of Rural Studies, Public Management Review, Voprosy Gosudarstvennogo I Munitsipalnogo Upravleniya-Public Administration Issues, Science and Public Policy, Sustainable Development, Futures, and International Journal of Public Administration.

4.4. Research Area and Content Analyses

In the relevant dataset, the ten research areas most frequently associated with the articles are, in order: business economics (f: 355, 56.52%), environmental sciences ecology (f: 67, 10.66%), geography (f: 66, 10.51%), urban studies (f: 48, 7.64%), government law (f: 31, 4.93%), development studies (f: 30, 4.77%), social issues (f: 18, 2.86%), science technology other topics (f: 16, 2.54%), social work (f: 11, 1.75%), and educational research (f: 8, 1.27%). The research is associated with 21 different research areas, excluding public administration.

Table 3: Journals with the Highest Number of Publications on Digital Transformation in the Field of Public Administration

Ranking	Journal Name	Research Area(s) the Journal Focuses On	Index	5DED	HI	ACPA	CC	N	%
1	Technological Forecasting and Social Change	Business; Regional & Urban Planning	SSCI	12.00	51	3.05	9.618	291	46.33
2	European Planning Studies	Environmental Studies; Geography; Regional & Urban Planning; Urban Studies	SSCI	3.50	8	6.84	219	32	5.09
3	Journal of Rural Studies	Geography; Regional & Urban Planning	SSCI	5.90	8	19.26	366	19	3.02
4	Public Management Review	Management; Public Administration	SSCI	5.80	11	26.05	495	19	3.02
5	Voprosy Gosudarstvennogo I Munitsipalnogo Upravleniya Public Administration Issues	Public Administration	ESCI	0.20	3	1.37	26	19	3.02
6	Science and Public Policy	Environmental Studies; Management; Public Administration	SSCI	2.80	8	20.00	240	12	1.91
7	Sustainable Development	Development Studies; Green & Sustainable Science & Technology; Regional & Urban Planning	SSCI	10.10	3	1.83	22	12	1.91
8	Futures	Economics; Regional & Urban Planning	SSCI	3.50	6	22.64	249	11	1.75
9	International Journal of Public Administration	Public Administration	ESCI	1.90	3	3.63	29	8	1.27
10	Asia Pacific Journal of Public Administration	Public Administration	ESCI	1.50	3	3.86	27	7	1.11
11	Foresight	Regional & Urban Planning	ESCI	2.00	2	2.00	14	7	1.11
12	Nispacee Journal of Public Administration and Policy	Public Administration	ESCI	0.90	4	6.86	48	7	1.11
13	Regional Studies	Economics; Environmental Studies; Geography; Regional & Urban Planning	SSCI	5.10	5	17.00	119	7	1.11
14	Central European Public Administration Review	Public Administration	ESCI	0.60	3	4.83	29	6	0.95
15	Journal of Social Policy	Public Administration; Social Issues; Social Work	SSCI	2.90	2	5.17	31	6	0.95
16	Data Policy	Public Administration	ESCI	2.70	1	0.80	4	5	0.79
17	International Review of Administrative Sciences	Public Administration	SSCI	2.60	2	6.60	33	5	0.79
18	Public Money Management	Public Administration	SSCI	2.40	4	36.60	183	5	0.79
19	Social Policy Administration	Development Studies; Public Administration; Social Issues; Social Work	SSCI	3.00	4	34.80	174	5	0.79
20	Amme Idaresi Dergisi	Public Administration	SSCI	0.10	1	1.00	4	4	0.63
21	Australian Journal of Public Administration	Public Administration	SSCI	2.20	2	10.50	42	4	0.63
22	Civil Szemle	Public Administration	SSCI	0.30	1	1.00	4	4	0.63
23	Growth and Change	Development Studies; Regional & Urban Planning	SSCI	3.00	3	15.75	63	4	0.63
24	Journal of European Public Policy	Political Science; Public Administration	SSCI	4.70	3	6.00	24	4	0.63
25	Lex Localis Journal of Local Self-Government	Political Science; Public Administration	SSCI	0.50	1	0.25	1	4	0.63

5DED: Five-Year Journal Impact Factor, N: Article Count; C: Citation Count, **ACPA:** Average Citation Per Articles, HI: H-Index

Table 4: Most Cited Articles on Digital Transformation in the Field of Public Administration

Ranking	Article Title	Researchers	Journal	5YJIF	Journal Research Area	Year	TC
1	Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective	Frank, AG; Mendes, GHS; (...); Ghezzi, A.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2019	444
2	The Internet of Things: Building a knowledge management system for open innovation and knowledge management capacity	Santoro, G.; Vrontis, D.; (...); Dezi, L.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2018	339
3	The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization	Kohtamäki, M; Parida, V; (...); Gebauer, H.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2020	258
4	Antecedents, moderators, and outcomes of innovation climate and open innovation: An empirical study in SMEs	Popa, S; Soto-Acosta, P and Martinez-Conesa, I.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2017	234
5	Implementing Open Innovation in the Public Sector: The Case of Challenge.gov	Mergel, I and Desouza, KC	Public Administration Review	7.70	Public Administration	2013	184
6	Citizen Participation, Open Innovation, and Crowdsourcing: Challenges and Opportunities for Planning	Seltzer, E and Mahmoudi, D.	Journal of Planning Literature	5.20	Regional & Urban Planning; Urban Studies	2013	162
7	Impact of digital transformation on the automotive industry	Llopis-Albert, C; Rubio, F and Valero, F	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2021	160
8	Social media and innovation: A systematic literature review and future research directions	Bhimani, H; Mention, AL and Barlatier, PJ	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2019	158
9	Open innovation in SMEs: Exploring inter-organizational relationships in an ecosystem	Radziwon, A and Bogers, M.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2019	145
10	Linking circular economy and digitalization technologies: A systematic literature review of past achievements and future promises	Chauhan, C.; Parida, V. and Dhir, A.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2022	143
11	The interplay of leadership, absorptive capacity, and organizational learning culture in open innovation: Testing a moderated mediation model	Naqshbandi, MM and Tabche, I.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2018	143
12	Internationalization, digitalization, and sustainability: Are SMEs ready? A survey on synergies and substitution effects among growth paths	Denicolai, S; Zucchella, A and Magnani, G.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2021	141
13	How can SMEs successfully navigate the VUCA environment: The role of agility in the digital transformation era	Troise, C.; Corvello, V.; (...); O'Regan, N.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2022	132
14	The impacts of digital transformation on the labor market: Substitution potentials of occupations in Germany	Dengler, K. and Matthes, B.	Technological Forecasting and Social Change	12.00	Business; Regional & Urban Planning	2018	124
15	New development: COVID-19 as an accelerator of digital transformation in public service delivery	Agostino, D; Arnaboldi, M. and Lema, MD	Public Money & Management	2.40	Public Administration	2021	119

*5YJIF: Five-Year Journal Impact Factor; TC: Total Citation

When evaluating the density of articles according to the UN Sustainable Development Goals, the top ten prominent themes are industry, innovation, and infrastructure (f: 238, 37.89%), no poverty (f: 48, 7.64%), quality education (f: 39, 6.21%), decent work and economic growth (f: 31, 4.93%), sustainable cities and communities (f: 26, 4.14%), responsible consumption and production (f: 25, 3.98%), reduced inequalities (f: 21, 3.34%), good health and well-being (f: 19, 3.02%), climate action (f: 14, 2.22%), zero hunger (f: 13, 2.07%). Figure 2 displays the keywords used by researchers in their articles (Figure 2a), article titles (Figure 2b), and abstracts (Figure 2c). The graphs were obtained using the Louvain Clustering Algorithm with Co-occurrence Network analyses.

Figure 2: Co-occurrence Network for Author's Keywords, Titles and Abstracts

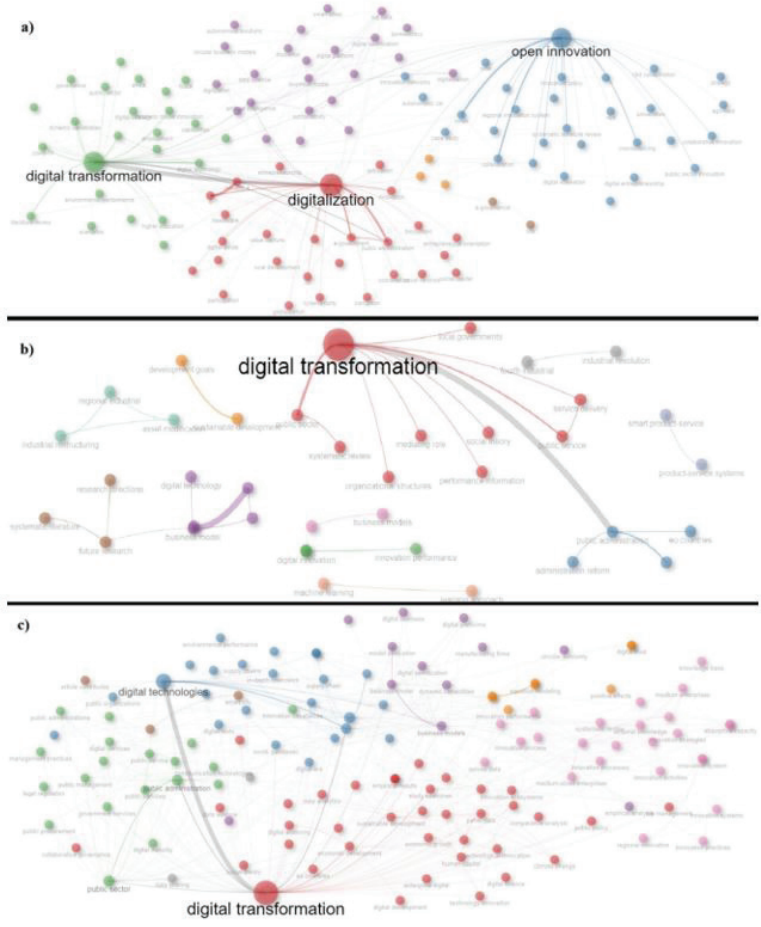


Figure 3 displays word clouds representing six topics obtained from machine topic modeling LDA analysis. Additionally, a trend topic analysis has been conducted over the years based on article abstracts (Figure 4). This reveals the prominent topics over the years in the field of digital transformation in public administration. The examinations have shown that, aside from digitalization, open innovation, and digital transformation, the relevant topics include e-government, servitization, COVID-19, supply chain, small and medium-sized enterprises (SMEs), rural development, machine learning, artificial intelligence, sustainability, green innovation, collaboration, Industry 4.0, automation, social media, e-governance, sustainable development, climate change, business model, crowdsourcing, entrepreneurship, higher education, university-industry collaboration, open government, open science, open data, open sources, innovation policy, innovation management, blockchain, robotics, cloud computing, big data and big data analytics, cyber security, 3D printing, 5G technology, augmented reality, virtual reality, and smart city.

Figure 3: Topic Modeling LDA Analyses for Article Abstracts and Titles

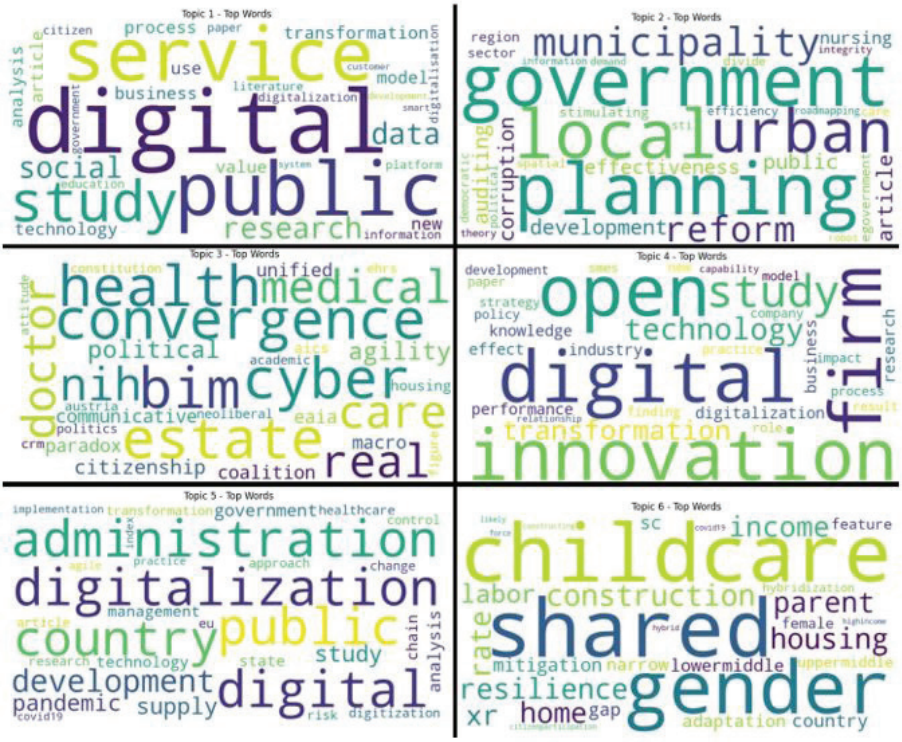
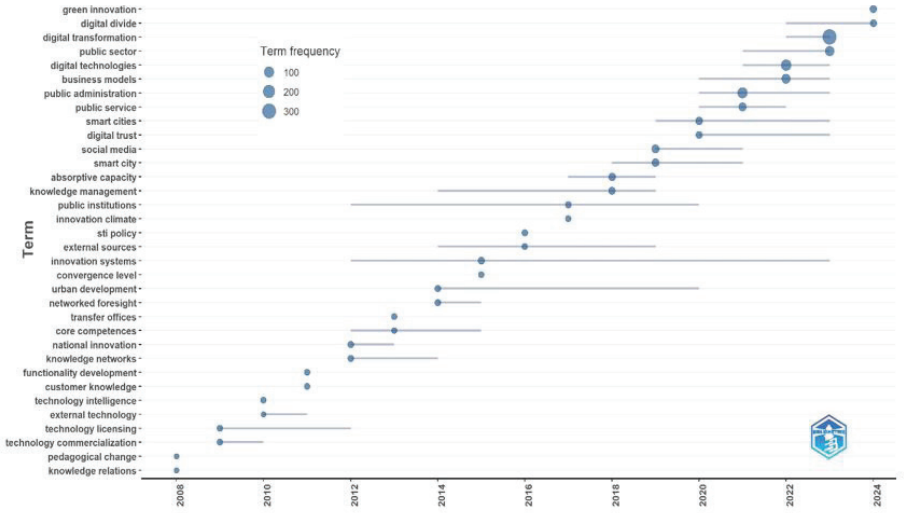


Figure 4: Trend Topics Analyses Bigrams View for Article Abstracts



5. DISCUSSION

Digital transformation can be characterized as a continual renewal, modernization, and adaptation, driven by information and communication technologies, to align institutional practices with the evolving demands of the time, informed by sector-specific needs. Institutions that excel in this transformative journey consistently gain a competitive edge. Within this context, public administration emerges as an especially critical domain. Accordingly, analyses of digital transformation within the existing literature hold substantial potential for contributing valuable insights to this field.

Analyzing this compelling area of interest, Meeteren et al. (2022) observed that academic publications on digital transformation have seen remarkable growth, doubling annually from 58 in 2015 to 3380 in 2021. This uptrend is mirrored in the literature on public administration, highlighting a growing focus on digital transformation within the public sector. Leveraging bibliometric techniques, which allow for examining a field's intellectual framework and identifying pivotal contributions (Annarelli et al., 2021), this study provides an exhaustive analysis of field studies. It does so by scrutinizing citation frequencies, journal contributions, and the content of publications through citation and co-citation analyses.

Moreover, digital transformation management and its associated challenges have become prominent topics in research. Studies conducted in Portugal by Alvarenga et al. (2020) and in the Netherlands by Tangi et al. (2020) reveal that digital transformation efforts yield only limited impact at the institutional level. Although there is a profound transformation in processes, employee roles, and information systems, the social fabric within organizations appears minimally influenced by these changes. Furthermore, the analyses suggest that external pressures are the main drivers behind institutional change, contrary to the anticipation that internal motivation would spearhead digital transformation efforts.

Özmen's (2023) review revealed that the terminology within the field has evolved. Between 2014 and 2016, "e-government" was a prevalent term, but from 2016 to 2018, there was a noticeable shift towards the use of "bureaucracy" and "digital technology." Post-2020, terms like "digital bureaucracy," "digital transformation," and "digital economy" gained prominence, with "digital bureaucracy" increasingly preferred over "e-government." The research also highlighted a geographic concentration of studies, with the majority originating from the United Kingdom (42), the USA (39), Australia (18), Canada (15), and Indonesia (12). This trend aligns with the findings of our study.

Digital transformation is poised to remain a critical phenomenon for both public and private entities for the foreseeable future. As technologies advance, institutions will inevitably adapt their processes to keep pace with these technological developments, leading to substantial modifications in organizational structures. Consequently, a paradigm shift is anticipated in public administration, spurred by advancements in information technologies like artificial intelligence, machine learning, and data analytics.

Our research underscores open innovation as pivotal in fostering sustainable competitive advantage and corporate growth in digital transformation. The open innovation model encourages institutions to adopt a more collaborative stance, proactively incorporating external contributions and forging partnerships for idea generation and developing new products or services (Jain, 2023). It becomes evident at this point that organizations across both the public and private sectors stand to gain significantly by engaging more deeply with academic institutions.

The literature on open innovation has highlighted a variety of focal areas, including open innovation in small and medium-sized enterprises (SMEs) (Radziwon and Bogers, 2019), the role of open innovation practices in firms that prioritize sustainability (Milana and Ulrich, 2022), the utilization of smart technologies in open innovation communities (Olmedilla et al., 2019), the impact of open innovation on startup success (Audretsch et al., 2023), the influence of open innovation on the innovative performance of universities (Ye et al., 2020), factors driving the adoption of open innovation in public organizations (De Coninck et al., 2023), and the challenges and strategies of implementing open innovation in the public sector (Mergel and Desouza, 2013; Yuan and Gasco-Hernandez, 2021).

A key component of digital transformation strategies in public administrations is adopting the open government model to enhance citizen access to public services. Digital technologies provide ample opportunities for improving the organization of institutional structures and processes and reinforcing the connection between citizens and the administration.

The literature points to various challenges and obstacles in the digital transformation of the public sector, often framing them within the socio-technical context of institutions. Technical challenges encompass the complexity and incompatibility of technologies, cybersecurity risks, inadequate infrastructure and dependency on external resources, the absence of technical standards and interoperability, and outdated legacy systems (Gangneux and Joss, 2022; Damar and Özen, 2023; Yukhno, 2022). Studies examining the nexus between digitalization and organizational agility underscore the pivotal role of big data analytics in enhancing organizational agility (Ciampi et al., 2022). In an era where economic and social activities are increasingly centered around data, big data technologies have become essential for the real-time management of processes, thereby enhancing the efficiency of public service delivery to citizens (Yukhno, 2022). Furthermore, big data is steadily emerging as a critical resource for policy-making in both the public and private sectors.

Sustainability and green development represent another focal area within public administration research on digital transformation (Razzaq and Yang, 2023). This body of research regards digital transformation as a crucial strategic asset for sustainability efforts. For example, Razzaq and Yang (2023) illustrated in their study that digital finance facilitates the digital transformation

of businesses in China and supports green growth by mitigating energy poverty. Zhang and Du (2023) found that digital development reduces urban carbon emissions in Chinese cities. Similarly, Hung (2023) identified that in Vietnam, digitalization, alongside green investment and financial development, plays a significant role in sustaining the country's robust economic growth. Harnessing digital transformation to enhance environmental performance is a key strategy for advancing sustainability (Li and Lin, 2023; Tuğaç, 2023; Schulz et al., 2020).

A significant body of research has explored the impact of COVID-19 as a catalyst for accelerating digital transformation in the public sector. These studies cover a range of topics, including the digital transformation of public service delivery during the pandemic (Agostino et al., 2021), modifications in managerial processes (Minchenko, 2023), the shift to remote work (Fischer et al., 2023), and the enhancement of intergovernmental collaborations in ICT and R&D in response to the health crisis (Lee et al., 2023).

Digital transformation has propelled big data, artificial intelligence (AI), and data analytics to the forefront of global discourse. In our research, themes such as AI, automation, robotic process automation, and machine learning have emerged as key areas within public administration in tandem with digital transformation efforts. It's widely acknowledged that AI and related technologies are becoming more ingrained in our daily lives. These technologies hold particular significance and critical value, especially in environments where public resources are managed and deployed through data-driven approaches.

The domains of e-government and e-governance are prominently featured in the digital transformation literature within public administration. Dobrolyubova (2021) highlighted that digital transformation efforts in the public sector often emphasize the e-government phase. Ismayilova (2014) noted that while e-government research has predominantly been focused on developed nations, developing countries are progressively focusing on this area. Arias et al. (2019) have shown that e-government initiatives, particularly in developing countries, can substantially affect public administration, enhancing citizen satisfaction by reducing bureaucratic hurdles and cutting public spending. The expanding scope of academic research into areas such as the integration of the Internet of Things (IoT) with e-government (Shao et al., 2023), the role of e-government in combating corruption (Castro and Lopes, 2023), and the quality of e-government services (Patergiannaki and Pollalis, 2024) mirrors the advancements made in this field.

Within digital transformation research in public administration, other key technologies include blockchain, cloud computing, and the Internet of Things (IoT). Blockchain is often heralded as a robust and secure technology that can revolutionize various economic sectors. Its applications are already proving successful in underpinning digital transactions across diverse fields such as the electricity market, trade, cryptocurrencies, and stock trading. The exploration of blockchain's potential in other economic domains and public administration, including banking and insurance, is gaining momentum (Bozdoğanoğlu, 2023; Rot et al., 2020; Talapina, 2020). Auditing is another area poised for significant change through adopting these technologies, with future projections for both public and private sector audits relying heavily on these advancements (Özen and Damar, 2023; Köse and Polat, 2021). Furthermore, in the context of IoT, cloud computing and blockchain stand out as essential for ensuring effective communication and robust data security.

CONCLUSION

The digital transformation of public administration is now recognized as a critical prerequisite for nations' economic and social advancement. The COVID-19 pandemic has vividly illustrated that amidst escalating crises, vulnerabilities, and uncertainties, it is imperative to fortify public administration by adeptly incorporating new technologies into operational processes and executing institutional transformations grounded in technological advancements. Scholarly research and publications in this domain serve as invaluable assets for guiding the transformation trajectory in public administration for individual countries and leveraging best practices. Nonetheless, the body of literature on this subject is evolving and tends to follow the rapid pace of technological progress.

This study undertakes a thorough examination of research on digital transformation in the public sector through bibliometric analysis, aspiring to be an invaluable asset for researchers in the field. It delves deeply into leading journals, impactful studies and scholars, and the affiliations and countries of these researchers. The analysis underscores how technological innovations are multidimensionally redefining the framework of public administrations. Findings suggest that external pressures predominantly drive institutional change, while the anticipated internal drive does not invariably lead to tangible digital

transformation. Thus, in nations with centralized governance structures, such as Türkiye, digital transformation within public entities should be approached more centrally.

Advancements in digital transformation have been noted across various sectors worldwide, including banking, finance, health, and, to some degree, the public sector (Damar and Özen, 2023). Nonetheless, given its crucial importance, governments should intensify their focus on the education sector. This sector's significance lies in the merger of the era with knowledge and the longstanding role of knowledge as a cornerstone for modern societies. The latest information technologies should be leveraged to revolutionize the education sector, especially in higher education institutions. However, this transformation should extend beyond physical infrastructure enhancements and updates to hardware and software. It necessitates the backing of senior management and the guidance of leadership that recognizes the institutional benefits of digital transformation.

A key insight from this research is that technologies and concepts traditionally linked to engineering, such as augmented reality, virtual reality, cloud computing, robotics, blockchain, machine learning, artificial intelligence, the Internet of Things, big data, and big data analytics, have recently made significant inroads into the social sciences. These technologies are now among the most influential tools reshaping public administration. Additionally, notable themes identified in our study include e-government, COVID-19, small and medium-sized enterprises (SMEs), open innovation, open government, open data, cyber governance, entrepreneurship, smart cities, crowdsourcing, university-industry collaboration, business models, green innovation, and firm innovation. Future research on the digital transformation of public administration should delve deeper into these areas. Another suggestion is integrating courses on artificial intelligence, machine learning, data management, business analytics, and data analytics into the public administration curriculum. Such an inclusion would better equip field professionals to contribute effectively to this transformation and support a more robust institutional evolution.

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DİJİTAL SINIRIN HARİTALANMASI: KAMU YÖNETİMİNDEKİ DÖNÜŞÜME DAİR BİBLİYOMETRİK VE MAKİNE ÖĞRENMESİ ANALİZLERİ

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GENİŞLETİLMİŞ ÖZET

Bu çalışmanın amacı, kamu yönetimi araştırma alanındaki dijial dönüşüm konulu araştırmaların, bibliyometrik ve LDA topic modeling makine öğrenmesi teknikleri ile yapılan analizler ile değerlendirmesini gerçekleştirmek, literatürde öne çıkan konu ve başlıkları, araştırma örüntülerini, alandaki tematik konu haritasını ortaya koymaktır. Elde edilen bulguların gelecekteki araştırmalara ışık tutması ve uygulama çerçevesine katkı sunması beklenmektedir.

Çalışmada kamu yönetimi araştırma alanındaki dijital dönüşüm konulu makaleler bibliyometrik yöntemler ile analiz edilmektedir. Veriler Web of Science (WoS) Core Collection üzerinden çeşitli dönemlerde en doğru veri setine erişebilmek için farklı dönemlerde çekilmiş; ilgili veri seti üzerinde gerçekleştirilen analizler sonucunda dijtal dönüşüm konusunda anahtar kelimelerden emin olunarak araştırma sorusuna uygun son veri seti 01/02/2024 tarihinde çekilmiştir. Çalışmada 2000-2024 tarih aralığında yayınlanmış 628 makale, 1,664 araştırmacı, 983 farklı kurum, 78 farklı ülke bibliyometrik teknikler ile analiz edilmiştir. Veri setimiz içinde bibliyometrik yöntemler ile konu başlıklarında, araştırmacı anahtar kelimelerinde, referans verileri, atıf verileri, araştırmacı, kurum, ülke, dergi ve fon gibi pek çok veri bibliyometrk yöntemler ile analiz edilmiştir. Makalelerin özet ve başlıkları Latent Dirichlet Allocation (LDA) topic modeling analiz yöntemi aracılığı ile kümelenmiş ayrıca, yıllar içinde öne çıkan konular haritalanmıştır.

Literatür, kamu sektörünün dijital dönüşümünün önündeki çeşitli zorlukları ve engelleri tanımlamakta ve bunları genel olarak kurumların sosyal-teknik perspektifiyle eşleştirmektedir. Teknik engeller arasında teknolojilerin karmaşıklığı ve uyumsuzluğu, güvenlik tehditleri, altyapı eksikliği ve dış kaynak kullanımı, teknik standartların ve birlikte çalışabilirliğin eksikliği ve sistem mirası yer almaktadır. Dijitalleşme ve örgütsel çeviklik arasındaki ilişkiye odaklanan

araştırmalar, bu alanın önemli itici güçleri olarak büyük veri analitiği yeteneklerini öne çıkarmaktadır. Ekonomik ve sosyal hayat giderek daha fazla veri odaklı hale geldikçe, büyük veri teknolojileri kamu hizmetlerinin vatandaşlara daha verimli sunulması için süreçlerin gerçek zamanlı olarak yönetilmesinde kilit araçlara dönüşmektedir. Büyük veri, kamu kurumları ve özel işletmeler için giderek artan bir şekilde politika oluşturmanın temel aracı haline gelmektedir.

Kamu yönetimi alanında dijital dönüşüm çalışmalarının yoğunlaştığı bir başka araştırma alanı sürdürülebilirlik ve yeşil kalkınmadır. İncelenen araştırmalarda, dijital dönüşüm sürdürülebilirlik için önemli ve çok değerli bir stratejik araç olarak değerlendirilmektedir. Araştırmalar, dijital finansın işletmelerin dijital dönüşümünü desteklediğini ve enerji yoksulluğunu azaltarak yeşil büyümeyi teşvik ettiğini ortaya koymaktadır. Çevresel performansı iyileştirmek için dijital dönüşümden yararlanmak, sürdürülebilirlik açısından kritik önem taşımaktadır.

Kamuda dijital dönüşüm sürecine hız kazandıran küresel gelişme olarak COVID-19'un kamu yönetiminin dijital dönüşümüne etkisi hakkında pek çok çalışma gerçekleştirilmiştir. Bu çalışmalarda COVID-19 döneminde kamu hizmetlerinde dijital dönüşüm, değişen yönetsel süreçler, evden çalışma, tüm yönetim süreçlerine bilişim teknolojilerinin dahil edilmesi gibi konulara odaklanmıştır.

Dijital dönüşümle birlikte büyük veri, yapay zeka ve veri analitiği, dünya çapında en çok sözü edilen kavramlar haline gelmiştir. Araştırmamızda da kamu yönetimi alanında dijital dönüşüm ile birlikte yapay zeka, otomasyon, robotik otomasyon, makine öğrenmesi gibi konu başlıkları ön plana çıkmıştır. Bilindiği gibi her geçen gün yapay zeka ve yapay zeka ile ilişkili teknolojiler hayatımıza daha fazla girmektedir. Bu teknolojiler, özellikle kamu kaynaklarının veri merkezli kullanılığı sistemlerde oldukça değerli ve kritik önemdedir.

Genel olarak dünyada bankacılık, finans, sağlık ve kısmen kamu sektöründe dijital dönüşüm konusunda gelişme kaydedildiği söylenebilir; fakat özellikle eğitim sektörüne devletlerin daha fazla önem vermesi gerektiği açıktır. Bunun en temel nedeni, sektörün kritik değeridir. Çağın bilgi ile harmanlandığı ve bilginin yüzyıllardır çağdaş toplumlar için anahtar olması burada temel nedendir. En güncel bilişim teknolojilerinin eğitim sektörünün, özellikle yükseköğretim kurumlarının dönüşmesinde aktif olarak kullanılmalıdır. Fakat bu dönüşüm sadece

fiziki altyapı ve diğer donanım ve yazılım güncellemesinden ibaret bırakılmamalı, üst yönetimin desteği ve dijital dönüşümün kurumsal kazanımlarının farkında olan liderlik anlayışı ile şekillenmelidir.

Teknolojik dönüşümler şu anda kamu yönetimlerinin yapısını yeniden şekillendirmektedir; fakat dijital kamu yönetimi konusundaki literatür, henüz gelişme aşamasındadır. Özetle literatür teknolojik gelişmlerin arkasından gelmektedir. Gerçekleştirilen bu çalışma bu noktada alan araştırmacıları için önemli bir kazanım sunmaktadır. Kamu sektöründeki dijital dönüşüm aratırmalarını yaptığı bibliyometrik analizler ile kapsamlı bir şekilde değerlendirerek alan araştırmacıları için önemli bir bilgi kaynağı sunmaktadır.

Araştırmazın en önemli sonuçlarından birisi, artırılmış gerçeklik, sanal gerçeklik, bulut bilişim, robotik blok zincir, makine öğrenmesi, yapay zeka, nesnelerin interneti, büyük veri ve büyük veri analitiği gibi normalde doğrudan mühendislik alanı ile ilişkilendirilmiş teknolojilerin ve kavramların son yıllarda artık sosyal bilimler alanına daha fazla girdiği ve kamu yönetimini dönüştüren en güçlü araçlar haline gelmiş olmasıdır. Bu nedenle kamu yönetimi alanında yapay zeka, makine öğrenmesi, veri yönetimi, işletme analitiği ve veri analitiği gibi derslerin müfredata eklenmesi önerilmektedir. Bu sayede alan uzmanlarının bu dönüşümde daha etkin rol alması ve kurumların daha sağlıklı dönüşmesi gerçekleşebilir.