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BIBLIOMETRIC ANALYSIS OF STUDIES ON DIGITALIZATION IN LOCAL GOVERNMENTS

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Abstract:
The aim of this study is to make a holistic review of research on digitalization in local governments. In this Scopus database, 57 studies including the phrases "local purpose" and "digitization" in the title, summary and keywords were examined. The bibliometric analysis of the obtained data was performed using the R Studio program. When the results were evaluated, it was observed that the studies were between the years 2000-2023. While it was determined that there were a total of 21 studies between 2000-2019, it has been observed that the studies in this field have increased gradually in the last 4 years, with 36 studies as of 2020. The most studies were published in 2021 and 2022, with 11 publications each. Local government (27) and digitization (15) are the most used keywords. The countries with the highest number of studies are China (17), England (14) and the USA (8). In addition to these, when the bibliometric analysis results are examined, the most widely published source on this subject is Sustainability (5). The most published authors are Baud, I., Denis, E. Pfeffer, K. Scott, D. and Sydenstricker-Neto, J., with 2 publications each. The most cited journals are Sustainability (24) and Government Information Quarterly (23). The countries of the most cited authors are China (120) and the Netherlands (67). In this study, important information is obtained by examining the conceptual, social and intellectual structure of the literature.

Keywords: Local Governments, Digitization, Bibliometric Analysis, Scopus.

JEL: H1, C1, O33

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INTRODUCTION

Major research gaps are observed in the digital transformation of public administration in terms of the provision of local government services, administrative procedures and its impact on employees (Kuhlmann & Heuberger, 2023, 147).

The concept of digitalization is the process of acquiring information on various platforms by digitizing the obtained data (Ersöz & Özmen, 2020, 171).

After decades of reform and modernization, one of the current challenges for public administration is digital transformation (Kregel, Distel & Coners 2022, 201).

We know from previous research that the design and governance structure of institutional reforms play an important role in their implementation and impact, and this of course also applies to digitization projects in local governments (Kuhlmann & Heuberger, 2023, 152).

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The digital transformation of public administration is expected to fundamentally reshape the institutional environment of local service delivery, management and governance in Europe (Kuhlmann & Heuberger, 2023, 147).

With the rapid progress of technology in the digital age of the 21st century, developments such as the internet of things, big data, cyber systems, embedded systems, cloud computing technologies, artificial intelligence, learning robots and virtual reality have accelerated the digital transformation process (Karaca & Öztürk, 2019, 529).

One of the most recent and effective innovations in the history of humanity is technology. Major developments in technology throughout history have led to significant changes both in social structures and in the roles of the individual in society (Altun, 2020, 169). The last stage that technology has reached is digitalization and the transformation it has brought about in human and social life. The concept of digitalisation is the process of acquiring information on various platforms by digitising the obtained data (Ersöz & Özmen, 2020, 171). The paradigm shift experienced turns into digital with the effect of technology (Özer, 2017, 457).

The prominence of digitalisation is a necessity created by the conditions. Digitisation and digital transformation, which are a result of technological developments, are a response to the search for new solutions. The transition to a post-industrial society that accelerated the implementation of scientific and technical progress, strengthening the processes of uncertainty and risks, crisis situations, requires a constant search for new management solutions (Sherimova, Isabekov, Alkeev, Yermekova & Ostryanina, 2022, 2). Especially since a few years, digitalisation has been taking place in all areas of life more effectively than ever before. Digital technologies have the strong potential to become a key differentiator in the transition process to a sustainable economy and society, in the post-pandemic context (Radu & Petcu, 2021, 94). Digitalisation provides great advantages to organisational structures. Theoretically, digitisation favors organisational transformations that reduce cost, making organisations smaller, leaner, less complex, and less resource-intensive (Dony & Maure, 2022, 9).

Different organisational structures in the world are going through a major transformation process in parallel with the developments in technology. The areas affected by digitalization have reached dimensions that will affect all sectors and even social life, as well as the telecommunication sector (Ormanlı, 2012, p. 33). Digitalisation has begun to be used effectively in organisations with different functions and scopes, from the public to the private sector, from international organisations to local small enterprises. Today, the convenience of digital technology has begun to be used in all kinds of transactions of the society and the individuals who make it up. The delivery of digital public services is sustainable at local and national level (Boban & Klarić, 2022, 1151).

The majority of the studies on digitalisation are about the effects on companies (Pazarçeviren and Okyay, 2023), digital transformation (Manana & Mawela, 2022) and the new senior management position managing digitalisation (Tumbas, Berente & Brocke, 2017). However, digitalisation affects not only companies, but also every field in which managerial work is done. One of the areas where digitalisation is used effectively is public administration and local administrations, which are its sub-areas. New digital technologies are recognised as a necessary scientific and informative basis for increasing the effectiveness of local government (Kalinichenko et al., 2021, 1). Administrative benefits and advantages are expected from the digitalisation of practices in local governments. In particular, digitisation is becoming central to the transformation of the local public sector and is expected to increase the efficiency, effectiveness and quality of services (Dony & Maure, 2022, 11). Local governments, which have an important position in social life today, have to benefit from information processing and technological applications in all fields of activity. Local governments can benefit from technology by successfully implementing digital transformation. In today's conditions where technology is dominant, digitalisation has become a necessity. What should be accepted in digital transformation in local governments is the acceptance of the necessity of using big data appropriately (Brown & Klein, 2021, 96). We claim that the impact of digital transformation in the

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public sector presupposes an organisational culture that recognises and values data-in-use, by which is meant the practical application of data for a specific purpose, particularly by staff who deliver services (Brown & Klein, 2021, 81).

Digitisation has different application areas in local government. In the studies, digital applications in local governments can be in different areas. One of the first local governments to implement digital management is municipalities. According to Kalinichenko etc. (2021); There are two main development vectors of digitalisation in the management process in municipalities: the digital technology management process and the relations of digital communication technologies with society, the governed, real and legal persons. With digital applications, the service quality of local governments increases and the sustainability of services is ensured. Initiatives are needed in order to strengthen the existing structure in local governments and to achieve a sustainable structure. In regions where local governments are responsible, digital initiatives should be used to increase initiatives, investments and ensure development. Like any entrepreneurship, digital entrepreneurship attracts investment and people by promoting the formation of ties and local networks (Rodrigues, Franco, 2021, 1). Another administrative application of digital transformation in local governments is the convenience it brings within the scope of supervision. One of the advantages of digitalisation in local governments is that it is an important lever for financial savings (Dony & Maure, 2022, 11). With digitalisation, local governments can provide fiscal discipline and tighten austerity when necessary (austerity management). Digitalisation is ultimately a potential factor that mitigates the negative effects of decentralisation on cost savings (Patrucco, Agasisti & Glasc, 2021, 630).

Another application area of digitalisation in local governments is the applications with the digital city (smart city). The application of modern and innovative information and communication technologies to the daily life and functioning of the local community and their connection with political and administrative institutions is an important element for modern public administration and good governance (Boban and Klarić, 2022, 1150). Thus, the opportunity for the people to participate in local administrations arises and the quality and efficiency of service increases. Another application of the advantages of technology and digitalisation in local governments is public services. It gives an idea about technology applications in local governments, understanding of technological change and municipal use of welfare technologies (Frennert, 2019, 641). It is important to reflect digitalisation practices in local governments not only on their technological problems, but also on the social dynamics associated with it (Chua, Graaf, Kraus, 2022, 242). Many services in local governments have begun to be offered in electronic environments (Yıldırım, 2021, 67). In this context, digitalisation should be utilised to the maximum extent in subjects such as education and health. There is an increasing implementation of digital education programs at the local government level (Cahlikova & Bundi, 2020, 145). Implementation of digital services in improving the provision of local community services; the availability of social services such as traffic, public transport, health care, education, water and gas supply, and the transmission of various information to the concerned citizens (Boban & Klarić, 2022, 1152).

In this study, academic studies in the field of digitalisation in local governments in the scopus database were examined. In the second part, the 10 most cited studies were examined. In the third section, the method of the study and bibliometric analysis are explained. In the fourth section, the findings are interpreted. Finally, the results obtained in the 5th section are explained.

1. RELATED WORKS

In the literature research of this study, the top 10 most cited studies from the studies on digitalisation in local government were examined. The most cited 10 of the 57 articles used in the study are presented in the tables 1 and 2.

Table 1. Publication Information

Author	Title	Publication	NO
Feng S., Zhang R.and Li G.	Environmental Decentralisation, Digital Finance and Green Technology İnnovation	Structural Change and Economic Dynamics, 61, 2022, pp.70–83.	1
ElMassah S. and Mohieldin M.	Digital Transformation and Localising the Sustainable Development Goals (SDGs)	Ecological Economics, 169, 2020, pp. 1-12	2
Baud I, Scott D., Pfeffer K., Neto J., Denis E.	Digital and Spatial Knowledge Management in Urban Governance: Emerging Issues in India, Brazil, South Africa, and Peru	Habitat International, 44, 2014, pp. 501-509.	3
Georgiadoua Y., Banab B., Bechta R., Hoppec R., Ikingurad J., Kraaka M., Lancea K., Lemmensa R., Lungod J., McCalla M., Miscionea G. and Verplanke J.	Sensors, Empowerment, and Accountability: a Digital Earth View from East Africa	International Journal of Digital Earth, 4 (4), 2011, pp. 285-304.	4
Herdiyanti A., Hapsari P. and Susanto, T.	Modelling the Smart Governance Performance to Support Smart City Program in Indonesia	The Fifth Information Systems International Conference 2019, pp. 367-376.	5
Gonzalez O, Koivisto H., Mustonen J. and Keinänen-Toivola M.	Digitalisation in Just-In-Time Approach as a Sustainable Solution for Maritime Logistics in the Baltic Sea Region.	Sustainability 2021, 13, 1173, pp. 1-24.	6
Ren X., Zeng G. and, Gozgor G.	How does Digital Finance Affect Industrial Structure Upgrading? Evidence from Chinese Prefecture-level Cities.	Journal of Environmental Management, 2023, 330, pp. 1-13.	7
Pappel I., Tampere T. and Draheim D.	Implementation of e-invoicing Principles in Estonian Local Governments.	Proceedings of the European Conference on e-Government, ECEG Volume Part F129463, 2017, pp. 127-135.	8
Reintam L., Kull A., Palang H. and Rooma I.	Large-scale Soil Maps and a Supplementary Database for Land Use Planning in Estonia	Journal of Plant Nutrition and Soil Science, 2022, 166 (2), pp. 225-231	9
Wei Zhang, Siqi Zhao, Xiaoyu Wan	Industrial Digital Transformation Strategies Based on Differential Games	Applied Mathematical Modelling, 98, 2021. pp. 90-108	10

Source: Authors, 2023

Table 2. Method and Results Information

NO	Method	Results
1	Using panel data on listed companies and cities in China. Regression model and analysis.	First, reform the modern financial system, promote the integration of traditional financial institutions with digital finance, and strengthen the support of digital finance for enterprises' green technology innovation. Second, the government should develop differentiated innovation incentive policies to increase technology innovation investment

NO	Method	Results
		among manufacturing and private enterprises. Third, the environmental decentralisation system should be further reformed, and central environmental protection supervision should be strengthened.
2	Case method	Localisation allows governments to effectively tailor sustainable development strategies at the local level, which can be boosted with digital transformation. Localisation requires local governments' effective planning by ensuring that budgetary allocations reflect the priorities of local communities.
3	Case Study, Discourses	Knowledge management, KM discourses concerned issues: strategic urban planning and integrated land use planning; determining geographic boundaries in urban development discourses; streamlining work processes of local governments, and mapping poverty and needs assessments.
4	Collecting citizen-level data on the quality of water services.	Africa's contribution to Digital Earth will be idiosyncratic, based on local innovations in participatory sensing, and responsive to local and global Development agendas such as the United Nations Millennium Declaration. It will require sustained research involving technical and social scientists, from African and international academic institutions.
5	Case study	The proposed model results in 29 indicators in three different domains and seven aspects of assessment. The model can serve as a reference for smart governance performance evaluation to support smart city aspects of assessment. The model can serve as a reference for smart governance performance evaluation to support smart city initiatives in Indonesia.
6	Case study	The main bottlenecks in the process of information exchange in ordering pilotage were identified. An improved business model and business logic, that allows the rational use of resources and reduces CO_2 emission and the pressure on the environment, was developed.
7	89 Chinese prefecture-level cities from 2011 to 2020.	Digital finance development significantly boosts industrial structure upgrading in Chinese cities. Digital finance and industrial structure upgrading exhibit positive spatial spillover effects. Digital finance indirectly affects industrial structure upgrading through innovation, entrepreneurship and the structure of household consumption channels. The influence of digital finance is more significant in cities with more developed economies, less financialisation and lower income inequality.
8	Data analysis.	The architectural overview of the whole framework will be given along with the necessary integrations and digitalised workflows.
9	Large scale soil mapping	A soil map at the scale 1:10,000 serves as a major important document for land owners and local governments, which allows them to use soil information in their daily activity. Data indicating the suitability of any soil for any crop should be entered in a database.
10	Differential game model, numerical simulation and case study.	By sharing the cost of traditional enterprises and digital technology providers, local governments can significantly increase the degree of effort of traditional enterprises and digital technology providers, and

NO	Method	Results
		the amplitude of increase is equal to the optimal cost sharing ratio of local governments. From the perspective of the level of industrial digitisation and the total benefits of the cooperative ecosystem, govern- ment subsidies as an incentive strategy can effectively improve the level of industrial digitisation.

Source: Authors ,2023

2. METHODOLOGY AND METHOD

Bibliometric analysis is the process of making and evaluating information about scientific publications using statistical and mathematical methods. This method of analysis provides a quantitative and qualitative assessment of scientific activity using metrics such as the number of articles published in a research field, the number of citations, the influence of authors, the effectiveness of journals, and so on.

Bibliometrics was first described in 1963 by de Solla Price in his book "Little Science, Big Science". (de Solla Price, 1963). Price came up with the idea of measuring scientific activities by making statistical analyses on scientific publications and citation citations. This study laid the foundations of bibliometrics and bibliometric analysis.

The following steps are usually followed to perform bibliometric analysis (de Solla Price, 1963; Alsharif et al, 2020, Donthu, 2021).

- Data collection: It is necessary to compile a dataset comprising scholarly publications related to the subject matter of interest. This dataset can be obtained from bibliographic databases or online platforms for scientific publications.
- Data preprocessing: The collected dataset needs to undergo preprocessing. Standardise the dataset by organising information such as author names, titles, journal names, and publication dates into a consistent format.
- Determining metrics: Based on the objectives of the bibliometric analysis, establish the metrics to be employed. Examples of metrics include publication count, citation count, and journal impact factor.
- Data analysis: Conduct an analysis of the dataset using the selected metrics. Explore relationships between publications, assess author impact, and evaluate journal effectiveness. Interpret the findings using statistical analyses and visual representations.
- Evaluation of results: Assess the analysis results to generate insights into the relevant field. Identify significant trends, highly cited publications, and influential authors. This information can inform academic strategies, contribute to field development, and identify potential collaborations.

In this study, the studies in the Scopus database were used as a database for data collection. During the data preprocessing, the studies were scanned based on title, abstract and keywords, and 57 studies were clustered, including the expressions "local" and "digitisation". These studies were examined within the determining metrics of bibliometric analysis with the R Studio program. The data analysis results are explained in part 4, Result and Discussion. In the conclusion part, the results obtained are evaluated.

3. RESULT AND DISCUSSION

The results obtained as a result of the bibliometric analysis carried out in this study are explained by visualising with 10 figures and 3 tables.

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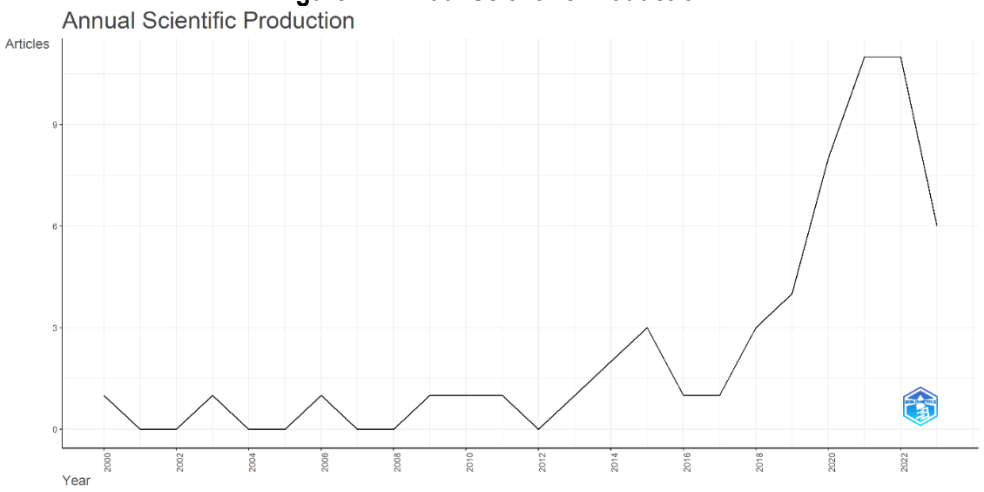
Figure 1. Annual Scientific Production



According to Figure 1, the most studied publications were 11 studies in 2022 and 2021. In 2020, 8 studies were conducted. Between 2000 and 2019, the number of publications varies between 0-4.

Table 3. Publication Types and Publication Numbers of Study

Types	Numbers
Article	35
Book	1
Book Chapter	2
Conference Paper	16
Conference Review	3
Total	57

Source: Authors ,2023

According to the results of the study, a total of 57 articles were prepared, including 35 articles, book 1, book chapter 2, Conference Paper 16, Conference Review 3, in studies conducted in the field of local governments and digitalisation.

Figure 2. Average Citations Per Year

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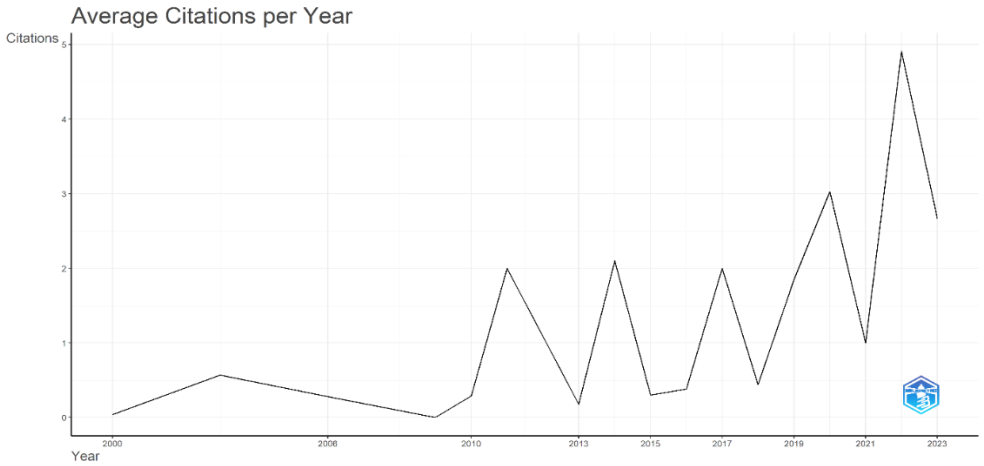
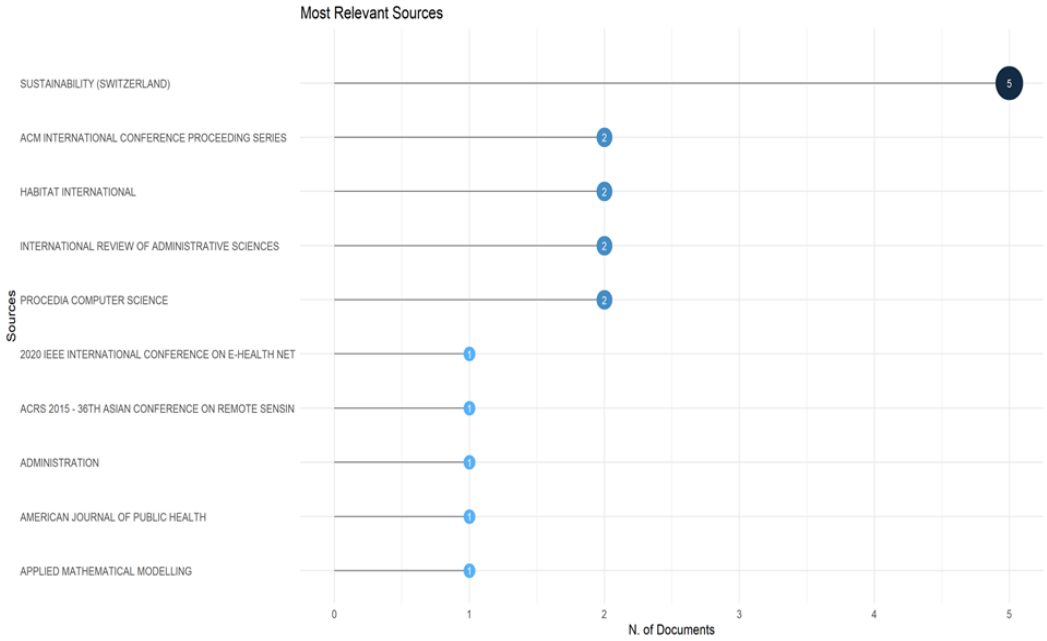


Figure 2. Average Citations Per Year

According to Figure 2, the annual average number of citations is at most 4.91 in 2022. The minimum average number of citations was 0 in 2009.

Figure 3. Most Relevant Sources



According to Figure 3, the most publications are in Sustainabiliy (5), ACM International Conference Proceeding Series, Habitat International, International Review of Administrative Sciences and Procedia Computer Science have 2 publications each, the rest have only one publication.

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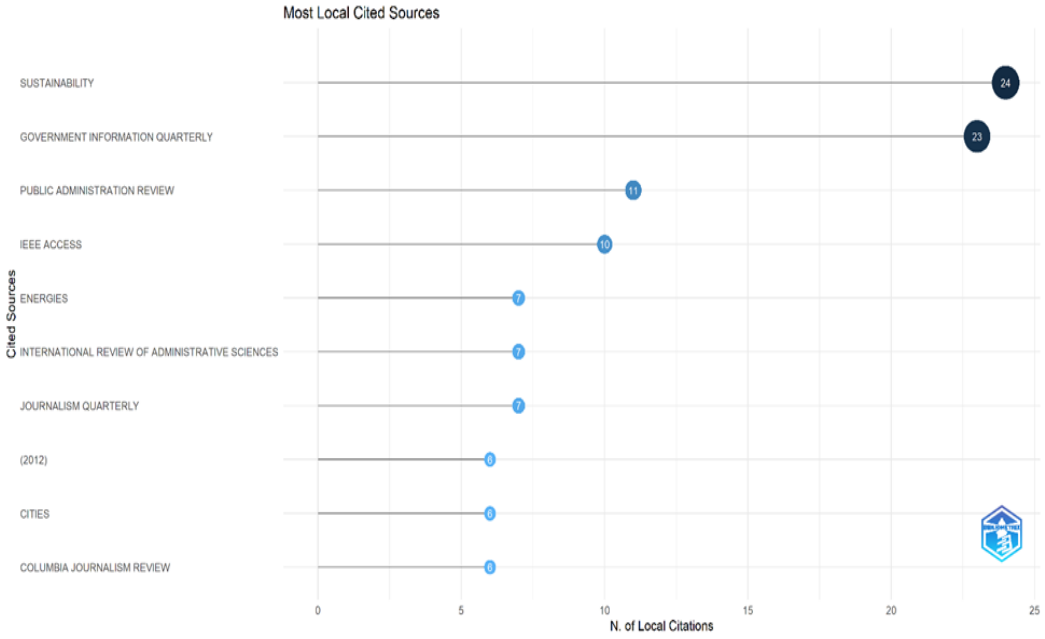
Figure 4. Most Local Cited Sources



According to Figure 4, the most cited journals are Sustainability (24), Government Information Quarterly (23), Public Administration Review (11) and IEEE Access (10).

Table 4. Source Local Impact

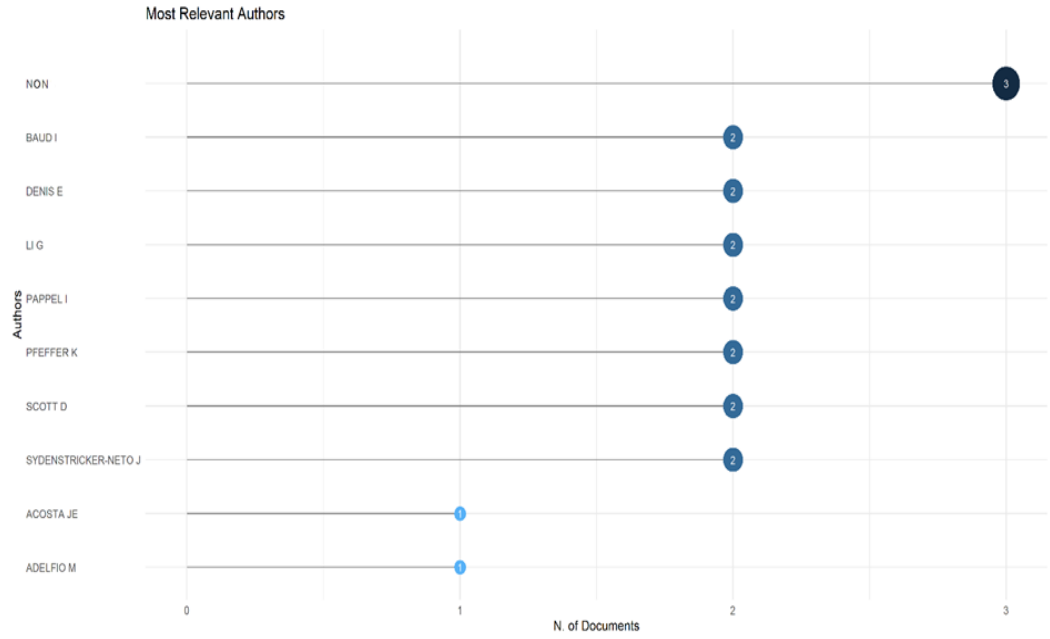
Publısher	h_index	TC	NP	PY_start
SUSTAINABILITY (SWITZERLAND)	3	29	5	2019
HABITAT INTERNATIONAL	2	41	2	2014
INTERNATIONAL REVIEW OF ADMINISTRATIVE SCIENCES	2	4	2	2023
2020 IEEE INTERNATIONAL CONFERENCE ON E-HEALTH NETWORKING, APPLICATION AND SERVICES, HEALTHCOM 2020	1	1	1	2021
ACM INTERNATIONAL CONFERENCE PROCEEDING SERIES	1	9	2	2019
ADMINISTRATION	1	1	1	2021
AMERICAN JOURNAL OF PUBLIC HEALTH	1	9	1	2014
APPLIED MATHEMATICAL MODELLING	1	10	1	2021
COMPLEXITY	1	5	1	2021
CONTRIBUTIONS TO ECONOMICS	1	1	1	2019
ECOLOGICAL ECONOMICS	1	83	1	2020
ELEARNING AND SOFTWARE FOR EDUCATION CONFERENCE	1	1	1	2020
ELECTRONIC JOURNAL OF INFORMATION SYSTEMS IN DEVELOPING COUNTRIES	1	3	1	2020
ENERGIES	1	1	1	2021
ENVIRONMENTAL MANAGEMENT	1	1	1	2022
FRONTIERS IN ENVIRONMENTAL SCIENCE	1	6	1	2022
HUMAN RIGHTS REVIEW	1	3	1	2020
INTERNATIONAL JOURNAL OF DIGITAL EARTH	1	26	1	2011
INTERNATIONAL JOURNAL OF E-PLANNING RESEARCH	1	8	1	2018
JOURNAL OF ENVIRONMENTAL MANAGEMENT	1	12	1	2023
JOURNAL OF LIBRARY SCIENCE IN CHINA	1	1	1	2021

Publisher	h_index	TC	NP	PY_start
JOURNAL OF PLANT NUTRITION AND SOIL SCIENCE	1	12	1	2003
PROCEDIA COMPUTER SCIENCE	1	19	2	2019
PROCEEDINGS - 2013 7TH INTERNATIONAL CONFERENCE ON COMPLEX, INTELLIGENT, AND SOFTWARE INTENSIVE SYSTEMS, CISIS 2013	1	2	1	2013
PROCEEDINGS OF THE 2015 INTERNATIONAL CONFERENCE ON GREEN COMPUTING AND INTERNET OF THINGS, ICGCIOT 2015	1	3	1	2016
PROCEEDINGS OF THE 5TH IBERIAN CONFERENCE ON INFORMATION SYSTEMS AND TECHNOLOGIES, CISTI 2010	1	4	1	2010
PROCEEDINGS OF THE EUROPEAN CONFERENCE ON E-GOVERNMENT, ECEG	1	14	1	2017
PROGRAM	1	5	1	2006
STRUCTURAL CHANGE AND ECONOMIC DYNAMICS	1	98	1	2022
THE BOTTOM LINE	1	1	1	2000
TOWN PLANNING REVIEW	1	3	1	2022

Source: Authors ,2023

According to Table 4, there are 3 journals with H index different from 1. These are Sustainability (3) respectively, the total number of citations is 29, and a total of 5 publications have been published on this subject since 2019. Habitat International (2) has been publishing on this subject since 2014 with a total of 41 citations and a total of 2 publications. International Review of Administrative Sciences (2) has been publishing on this subject since 2023, with a total number of citations of 4 and a total number of publications of 2. Although The Bottom Line was the first journal to publish on this subject in 2000, it remained in 1 h index, 1 citation and 1 publication.

Figure 5. Most Relevant Authors



According to Figure 5, there are 3 publications with anonymous authors. It has 7 authors as Baud I, Denis E., LI G, Pappel I., Pfeffer K., Scott D. & Sydenstricker-Neto J., with the two most published publications.

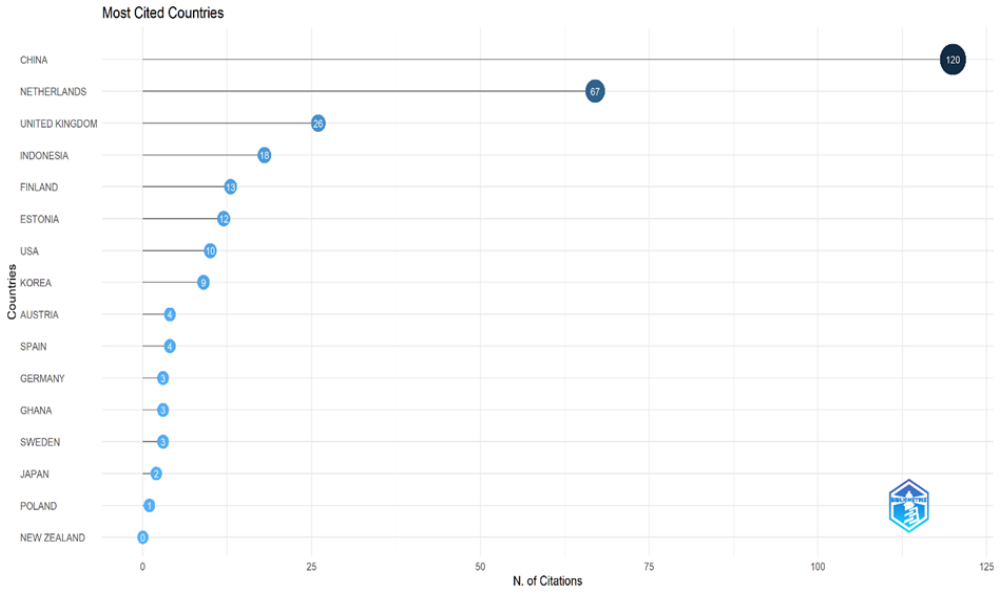
Table 5. Countries Production Overtime

Region	Freq
CHINA	17
UK	14
USA	8
ESTONIA	5
NETHERLANDS	5
POLAND	5
FRANCE	4
FINLAND	3
HUNGARY	3
JAPAN	3

Source: Authors ,2023

According to Table 3, the countries that contributed the most in terms of the number of publications over the years are China (17), England (14) and the USA (8), respectively.

Figure 6. Most Cited Countries



According to Figure 6, the most cited countries are China (120), Netherlands (67), England (26), Indonesia (18), Finland (13) and Estonia (12). The least cited country is New Zealand (0).

Figure 7. Most Global Cited Documents

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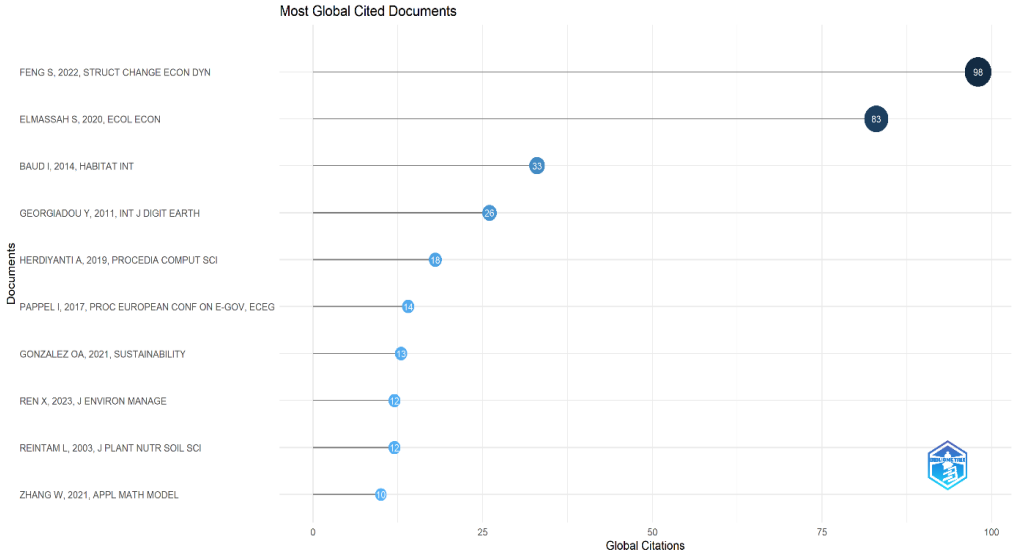
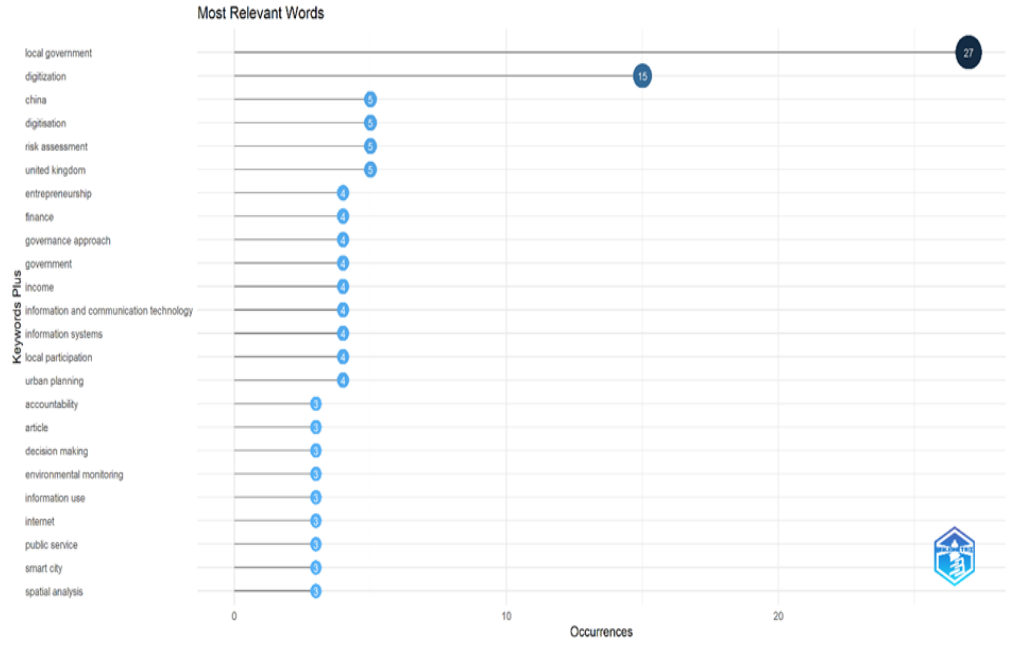


According to Figure 7, the most cited sources worldwide are Feng S., 2022, Struct change econ dyn (98), Elmassah S, 2020, Ecol Econ(83) and Baud I., 2014, Habitat Int (33).

Figure 8. Most Relevant Words



Based on words repeated at least 3 times, the most frequently repeated words are shown in Figure 8. The most recurring words are “Local Government” (27) and “Digitisation” (15).

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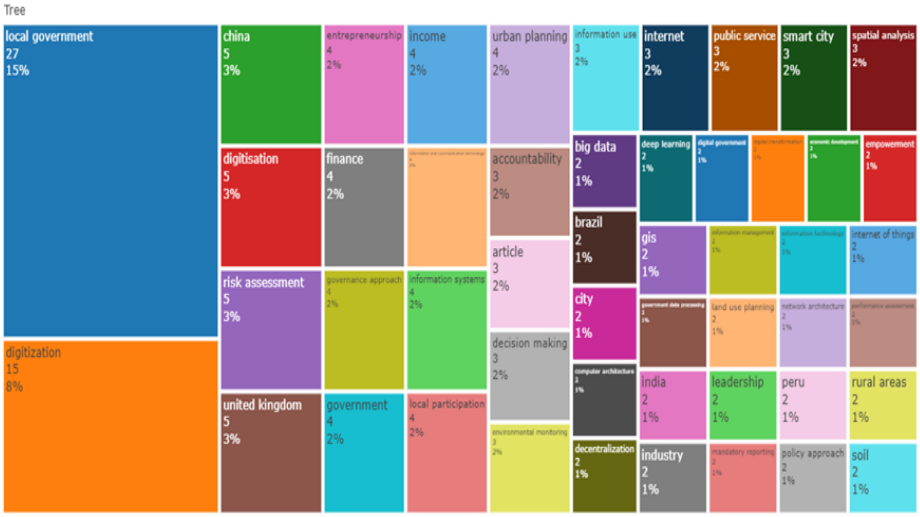
Figure 9. Word Cloud

The word cloud is shown in Figure 9. In Figure 9, the most used keywords are highlighted in large font.

Figure 10. Tree Map



The Word Tree is shown in Figure 10. In this map, which was prepared based on the 50 most frequently used words, it is observed that Local Government is the most frequently used word with 15%.

CONCLUSIONS

According to the results obtained in this study, a total of 57 documents were published in 49 sources between the years 2000-2023 on local governments and digitalisation. The annual increase rate of publications is 8.1%, and while there was only one publication in the first years, it has been observed that this subject has been studied more and more in recent years. The number of authors is 160. This shows that many articles have more than one author. The number of single-authored documents was determined as 10. While the international co-authorship rate was 22.81%, the co-authorship per document was calculated as 2.96. Based on the documents published on local governments and digitalisation, it was determined that 224 keywords were used. In addition, a total of 2194 references were used in 57 documents. The average age of the documents published by

the authors was calculated as 4.42. This result shows that there is a publication on this subject every 4 years. The average number of citations per document was determined as 7,298. This indicates that the number of citations on the subject is increasing gradually. As a result, the increase in 57 publications in 23 years on local governments and digitalisation indicates that more attention should be paid to this issue.

AUTHORS CONTRIBUTIONS

The author/authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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