

*Original Research*

## **Scientometric Introspect of Digital Citizenship in Scopus Database From 1999 to 2022**

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### **Abstract**

Literary warrants on 'Digital Citizenship' published since its inception are still countable. The search executed to identify the bibliometric literature on 'Digital Citizenship' retrieved a meager outcome. Therefore, the study was pivoted with the data retrieved from the SCOPUS database. By utilizing normalized data and citation analysis to evaluate the influence across the various groupings, it is possible to see an almost linear rise in 2021 on the topic. Statistical and visual modeling software tools (R-Biblioshiny, Bibliometrix) were used in the study. It examines what this means for how bibliometric methodologies are used and disseminated in various situations. The study by the authors addressed bibliometric analysis and categorization of articles as per Ribble and Choi. Moreover, the paper discussed three field Plots (Sources-Keywords-Authors) and the most relevant authors. Furthermore, the study tried to testify to the fitness of Bradford's Law, trending topics on the subject, co-occurrence network by keywords, topic growth over the year, and a thematic map of topics from 1999 to 2022. The results were quite impressive. out of a total of 377 articles on digital citizenship, a scattering of subjects with numerous overlapped concepts like digital literacy, digital competence, higher education, technology, digital divide, cyber-bullying, information literacy, digital citizenship education, privacy, secondary education, adolescents, digital education, empowerment, primary education, university students have been identified.

**Keywords:** Digital Citizenship, Bibliometrics, Lotka's Law, Bradford's Law, Co-occurrence Network, Scientometrics.

### Introduction

Trend Analysis is the widespread practice of collecting information and attempting to spot a pattern. Digital Citizenship is the continuously developing norm of appropriate, responsible, and empowered technology used, although the term evolved from the early years of the 1990s. The definition of Digital Citizenship is "the norms of behavior about technology use" and understanding its complexity by "issues of technology use, abuse, and misuse" (Ribble, Bailey & Ross, 2004). Ribble first developed nine elements that make the sub-components of Digital Citizenship. Digital Access, Digital Commerce, Digital Communication, Digital Literacy, Digital Etiquette, Digital Law, Digital Rights and responsibilities, Digital Health and wellness, and Digital Security are the structural components of Digital Citizenship (Ribble, 2011). Later, he grouped these nine elements of digital citizenship into three broader categories, namely: Respect, consisting of Digital Access, Digital Etiquette, and Digital Law; Educate, comprising Digital Commerce, Digital Communication, and Digital Literacy, and lastly Protect consisting of Digital Health and Wellness, Digital Rights & Responsibility and Digital Security (Ribble, 2020). Choi, in 2016, categorized "Digital Citizenship" into four segments: *Ethics, Media and Information Literacy, Participation/Engagement, and Critical Resistance*. He further identified sub-components of each category by a comprehensive literature study. The first component, Ethics, is comprised of three sub-components- (a) safe, responsible, ethical use of technology and the internet, (b) digital awareness, and (c) digital responsibilities and rights. Digital Access, Technical Skills, and psychological capabilities are under the following components: Media and Information Literacy. The participation/Engagement component deals with political, socio-economic, and cultural participation. Lastly, Critical Resistance combines two sub-components: recognition of existing power structures and political activism or resistance (Choi, 2016). The categorical division and sub-divisions of the "Digital Citizenship" concept by Choi and Ribble are interconnected and somewhat similar. This study tries to compare the distribution of information according to both categorizations. These concepts will help us understand which categorization is more helpful in distributing information according to the context of the articles studied.

Earlier studies mainly focused on bridging the digital divide gap by providing access and access to information, Communication, and technology. However, the rapid growth in the use of technology, the internet, and social media is shifting society toward a digital society. The participation of citizens in digital society is emerging as the concept of digital citizenship. The contemporary Library and Information Science deal with all the components so robust that information professionals knowingly or unknowingly perform as 'Digital Citizens' in the social sphere. Barring its initial usage in the '90s, the concept gained momentum in later 2019s when the global pandemic taught the human race to survive on technology. A quick survey (BASE search engine) of existing literary warrants reveals that during 2020-2021, nearly 2047 primary documents were published on 'Digital Citizenship in the English language, contrary to the collective sum of literary warrants published before 2020. Hence, the proliferation of literature has increased in the last two years compared to previous years.

The purpose of the study is not only to identify the subjectivity of the contents but also to identify the objectivity of the subject's development over time. This scientometric study on "Digital Citizenship" aims to highlight the growth and impact of the concept as a subject from its inception. The study focuses on the following objectives: (a) To understand the correlation among terminologies in "Digital Citizenship," (b) To compare the dataset categorization by

Ribble and Choi to trace the cluster of information distribution, (c) To analyze the growth trend of “Digital Citizenship” in terms of trending topics and growth of sources, and (d) To identify the Co-occurrence network and thematic analysis of digital citizenship.

### Conceptualization of Digital Citizenship

The term ‘digital citizenship’ refers to a recent emerging concept primarily associated with education, but the concept is not limited to one discipline. The effective use of technology for disseminating information is the responsibility of digital citizens, along with the compilation of ethics, socio-cultural aspects, and democratic participation. Digital citizenship implies how individuals use digital technologies to perform and create their identities and social roles. Furthermore, citizens' participation and engagement in the change process are frequently linked to digital citizenship. Therefore, digital citizenship can be a method for governments to "update democracy" (Rahm, 2018, p 44). Presently, courses on Digital Citizenship are being rendered by several profit and non-profit organizations or institutions, including Harvard Graduate School of Education. Several online course platforms like Microsoft, Future Learn, Udemy, and others impart Digital Citizenship and media literacy courses. The focal point of these courses is to develop skilled and knowledgeable persons for effective use of the internet and digital technologies. Hence the basic structure of Digital Citizenship can be portrayed in Figure 1.



*Figure 1: Periphery of Digital Citizenship*

Digital Citizenship pivots around including social sciences subjects and should have defined characteristics like a) being confident and capable of using ICT and b). Using technology to participate in educational, cultural, and economic activities. c). Developing and using critical thinking skills in cyberspace (Mahadir, Baharudin & Ibrahim, 2021). Digital citizenship helps to transform society into a knowledge society with several components. The study highlights the themes mentioned above, and sub-themes of digital citizenship are the most engaging concepts among the authors. Our study also reflects the five most important characteristics of a good digital citizen related to the above core elements: inclusive, informed, engaged, balanced, and alert.

### Literature Review

Teaching Essential digital competencies for citizenship and teaching can be enhanced and supported by a specific learning platform (Guerrero-Romera et al., 2021). When digital technologies become a part of everyday life in most of society, it changes how we work, organize, communicate, and make relations. It also changes the relationship between the state and its citizens - a relationship usually conceptualized as citizenship. To capture this transformation, a new concept of digital citizenship has emerged. Comparative content analysis of at least ten definitions captured from scientific literature reveals two notions of digital citizenship: digital competence while others focused on critical and activist aspects (Fernández-Prados, Lozano-Díaz & Ainz-Galende, 2021). As the young generations are playing a significant role in using social media for communicating civic issues, the promotion of digital citizenship education in schools is necessary, which can be obtained by including six main factors in the curriculum: (i) societal values and ideas, (ii) use of ICT, digital tools and technology, (iii) handling of information and knowledge, (iv) civic related teaching and learning, (v) comprehensive conceptualization of social media and its use, and (vi) civic engagement (Christensen, Biseth & Huang, 2021). A systematic review of the literature and thematic content analysis on digital citizenship, digital competence, digital literacy, and information and communication technology (ICT) skills from SCOPUS, Google Scholar, and PROQUEST brought out three main themes working as catalysts in the educational landscape. These are digital readiness, digital citizenship competencies, and educational policies (Prasetyo, Naidu, Tan & Sumardjoko, 2021). A comparative literature study under the academic scenario of digital citizenship identifies four segments: Digital rights and privacy, Political engagement, Digital Public Service, Training, and Learning (social right to education) (Jæger, 2021). Digital citizenship acts as a bridge to the empowerment of citizens with their participation in systematic training and professional use of digital technology and instruments in educational, social, and public arenas (Manzuoli, Vargas Sánchez & Duque Bedoya, 2019).

### Materials and Methods

The study focused on bibliometric analysis techniques to explore the various aspects of digital citizenship. The study sample was chosen from the SCOPUS database, one of the most comprehensive tertiary sources on social science. The database contains 1743 publications on digital citizenship. The authors used the phrase search technique on "Digital Citizenship" in the SCOPUS field TITLE-ABSTRACT-KEYWORD to refine the data. A total of 616 publications are retrieved during the period 1999-2022. Out of 616 publications, the authors only included 377 articles for the study (accessed on 18<sup>th</sup> Oct 2022) (Figure 2). The authors extracted the data in CSV format (Comma Separated Value), consisting of all authors' names and affiliations, keywords supplied by the authors, abstracts, and cited references. Here, the study employed Biblioshiny from the Bibliometrix extension of the R package to evaluate the data. The study used bibliometric techniques to show the growth trend of the subject, keyword co-occurrence, top publishing sources, core journals of the topic, and author productivity in digital citizenship.

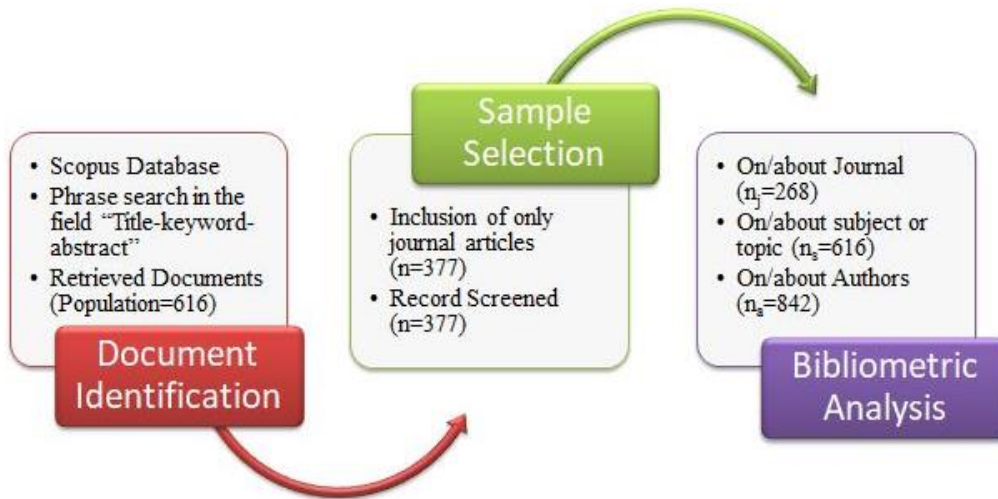


Figure 2: Flow Chart of Methods

### Results

Analysis of the dataset and the interpretation are discussed in this section. The authors analyzed 268 journals or sources, 377 documents, and 842 authors to justify the objectives of the study. Table 1 shows all the primary information regarding the datasets, which includes the time duration, document types, author collaboration, and other related information. For example, 377 documents contained 17183 references with an average of 2.115 citations per year per document. Therefore, the annual growth rate of the topic of digital citizenship is 27.48%, according to the dataset. In addition, the table highlighted 1155 authors' keywords (DE) in 377 research articles.

Table 1  
Primary information of the dataset

Main information about the data	
Timespan	1999:2022
Sources (Journals, Books, etc.)	268
Documents	377
Average years from publication	3.54
Average citations per document	11.19
Average citations per year per document	2.115
References	17183
Document types	
Article	377
Document contents	
Keywords Plus (ID)	559
Author's Keywords (DE)	1155
Authors collaboration	
Single-authored documents	101
Documents per Author	0.448
Authors per Document	2.23
Co-Authors per Documents	2.49
Collaboration Index	2.7

Table 2 and Figure 2 portray a tabular and a graphical representation of articles categorized per Ribble's REP (Respect, Educate, and Protect) concept. Ribble sub-grouped each concept of REP into three divisions, as shown in Table 2. First, manual classification is done through the abstract, keywords, and title to distribute the articles according to such categorization. Then, the exact phrase is searched in Scopus, taking all types of documents (Column 3- In Scopus) and further narrowed to Article types of data (column -4 Doctype-AR-with phrase). Using the phrase for a document has non-agreement in some cases with the study.

Table 2  
Comparative distribution of articles in SCOPUS and Ribble's classifications

Concept terms (Ribble)	Number of documents studied	In Scopus (with the phrase)	DOCTYPE-AR (with phrase)
Digital Citizenship (All)	28		
<b>Respect</b>			
Digital Etiquette	18	20	13
Digital Access	42	797	471
Digital Law	39	93	51
<b>Educate</b>			
Digital Literacy	146	5299	3210
Digital Communication	28	36010	18767
Digital Commerce	14	136	71
<b>Protect</b>			
Digital Rights and Responsibility	15	7	5
Digital Security	15	554	217
Digital Health and wellness	32	10	6
	377		

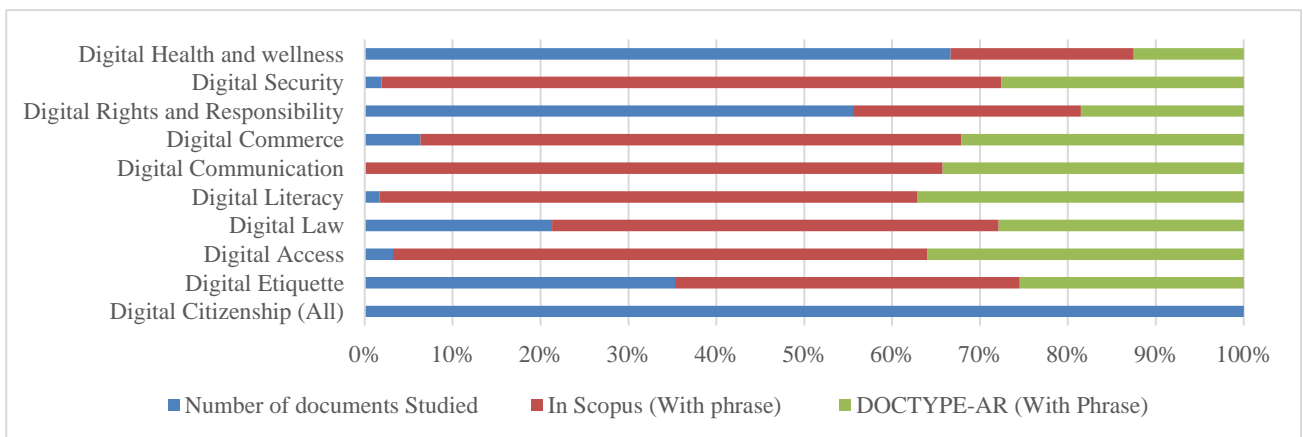


Figure 2: Comparative diagram of documents in Scopus and Ribble's Categorization

Table 3 and Figure 3 portray a tabular and visual representation of articles categorized per four "Digital Citizenship categories" by Choi (2016), who divided the categories into sub-components. First, manual classification is done through the abstract, keywords, and title to distribute the articles according to such categorization. Then, the exact phrase is searched in

Scopus, taking all types of documents (Column 3- In Scopus) and further narrowed to Article types of data (column -4 Doctype-AR-with Phrase). Using the phrase for a document has non-agreement in some cases with the study.

Table 3  
Comparative distribution of articles in SCOPUS and Choi’s classifications

Concept Terms (Choi)	Number of documents Studied	In Scopus (with the phrase)	DOCTYPE-AR (with phrase)
<b>Ethics</b>			
Safe, Responsible, Ethical use of technology & internet	30	0	0
Digital Awareness	146	52	28
Digital Rights and Responsibility	15	7	5
<b>Media and Information Literacy</b>			
Digital Access	42	797	471
Technical Skills	28	13802	8796
Psychological capabilities	22	181	136
<b>Participation/Engagement</b>			
Political Engagement	18	3676	2631
Socio-economic Engagement	22	7	6
Cultural Engagement	20	526	369
<b>Critical Resistance</b>			
Recognition of existing power structures	10	0	0
Political activism or resistance	24	3322	2187

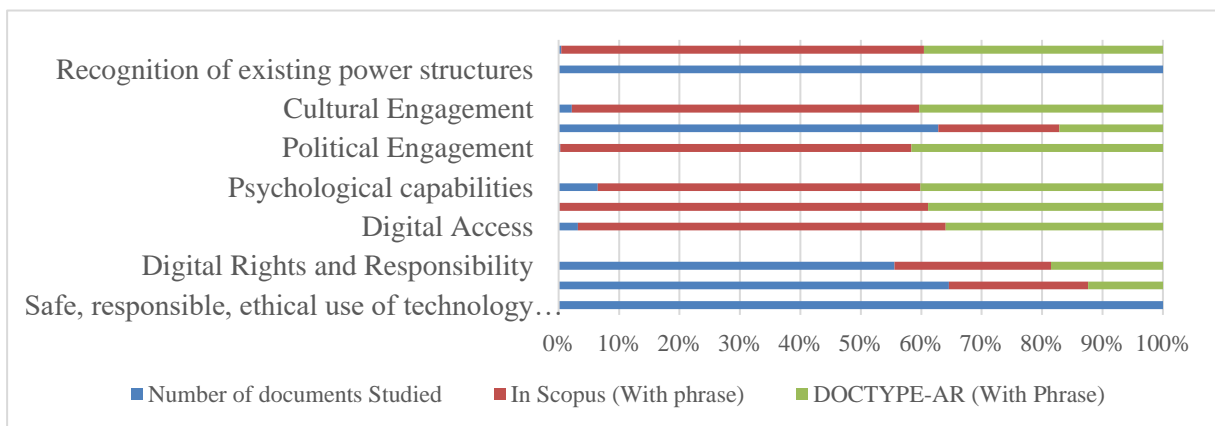


Figure 3: Comparative distribution of articles in SCOPUS and Choi’s classifications

A total number of 842 authors emerged for the study. Figure 5 depicts the top 10 most relevant authors who published digital citizenship articles. Martin F leads the list with six publications, 65 citations, and four h-index. Followed by Akcil U, Calzada I, Choi M, Raman A, and Wang C have the same number of digital citizenship publications, while the h-index is different, respectively 4, 2, 3, 3, and 3.

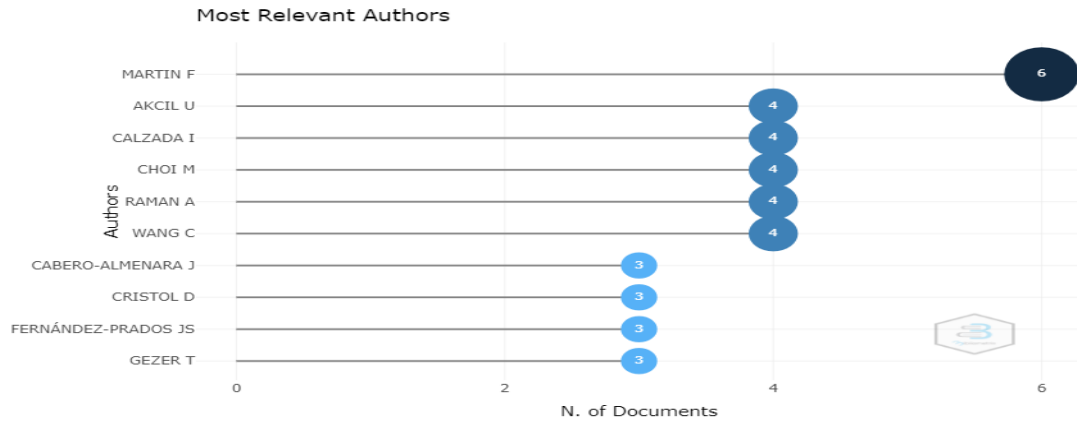


Figure 5: Top 10 Most Relevant Authors

Bradford (1934) prescribed the law of scattering to identify the core sources of a specific topic. He divided sources into three zones with the proportion of 1: n: n<sup>2</sup>. Table 5 and Figure 7 illustrate the distribution of the journals into the three zones.

Table 5

Bradford Law –Journal distribution based on Zones

ZONE	Total Journals	Total journal (%)
Zone 1	39	14.55
Zone 2	105	39.17
Zone 3	124	46.26

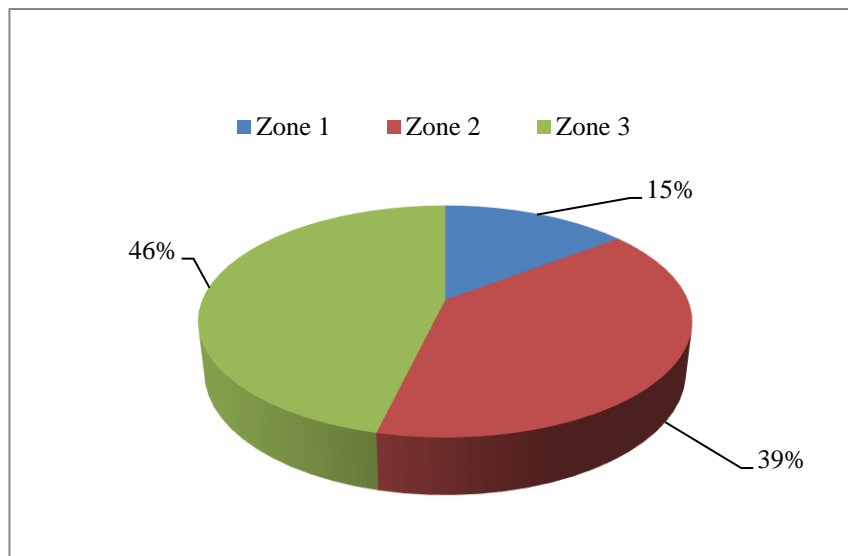


Figure 7: Division of Journals based on Zones

A total of 268 sources are processed to identify the three main zones. Zone 1 is considered a core zone that contains 39 core journals on digital citizenship. Education Society and Technology, Citizenship Studies, and the International Journal of Communication are a few core journals on digital citizenship, as shown in Figure 8—the subsequent zones comprised 105 and 124 journals, respectively.



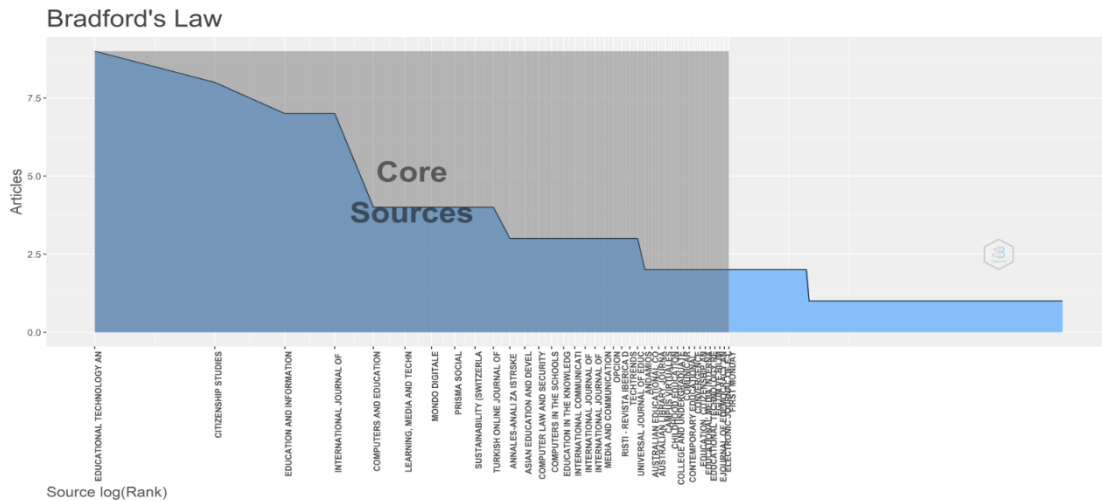


Figure 8: Bradford's law (Journal Distribution)

Figure 9 represents the top ten journals regarding the total number of articles produced from 1999-2022. It has been observed that the Education Technology and Society journal has the most publications, followed by the International Journal of Communication, Citizenship Studies, and others. Furthermore, it has been demonstrated that digital citizenship began to gain importance in 2008.

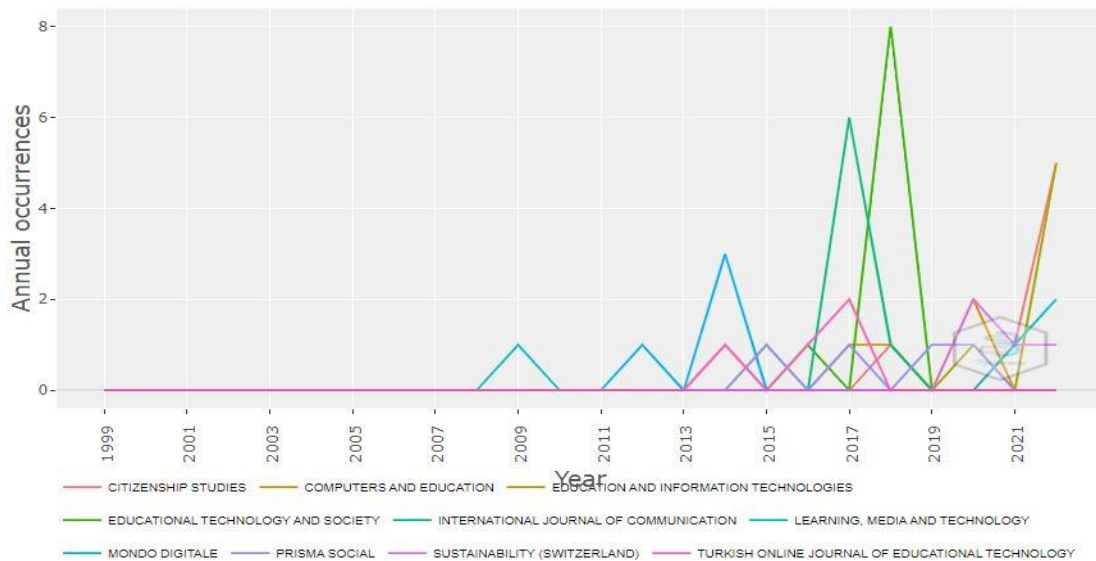


Figure 9: Growth of the Sources

Table 6 demonstrates the top 20 trending digital citizenship topics based on the authors' keywords. A total number of 1155 keywords are obtained from the datasets. After analyzing the keywords, the term 'digital citizenship' had the highest frequency, with 194, followed by Digital Literacy, with 33, citizenship with 23, and social media, with a frequency of 21, mentioned from highest to lowest frequencies. The table also reveals the quartile years of each topic. For example, among the keywords, the term 'Digital Citizenship Education' belongs to the most recent timeline from 2020-2021.

Table 6

*Trending topics on Digital Citizenship*

Item	Freq	Quar-1	Med	Quar-3
Digital Citizenship	194	2017	2019	2021
Digital Literacy	33	2018	2020	2021
Citizenship	23	2014	2019	2021
Social Media	21	2018	2020	2022
Digital Competence	16	2019	2020	2022
Higher Education	15	2020	2020	2021
Technology	14	2016	2017	2020
Digital Divide	13	2018	2019	2021
Cyber-Bullying	12	2018	2020	2021
Internet	11	2013	2016	2020
Information Literacy	11	2016	2018	2019
Covid-19	11	2021	2022	2022
Media Literacy	8	2013	2018	2020
Social Networks	8	2014	2018	2020
Surveillance	7	2017	2017	2017
Digital Citizenship Education	7	2020	2021	2021
Digital Identity	6	2010	2015	2018
Education	6	2017	2018	2021
Democracy	5	2011	2014	2017
Activism	5	2016	2017	2017

The study focused on the "Digital Citizenship" concept through the co-occurrence network using author-provided keywords. Figure 10 reveals that 'Digital Citizenship' co-occurred with all the keywords retrieved. The terms Digital Citizenship, Digital Literacy, Citizenship, social media, Digital Competence, and Digital Divided are interconnected and have helped the researchers grow the topic. COVID-19 also has a frequency of 11, which triggers the topic's growth. In this figure, 50 nodes are used to demonstrate network analysis.

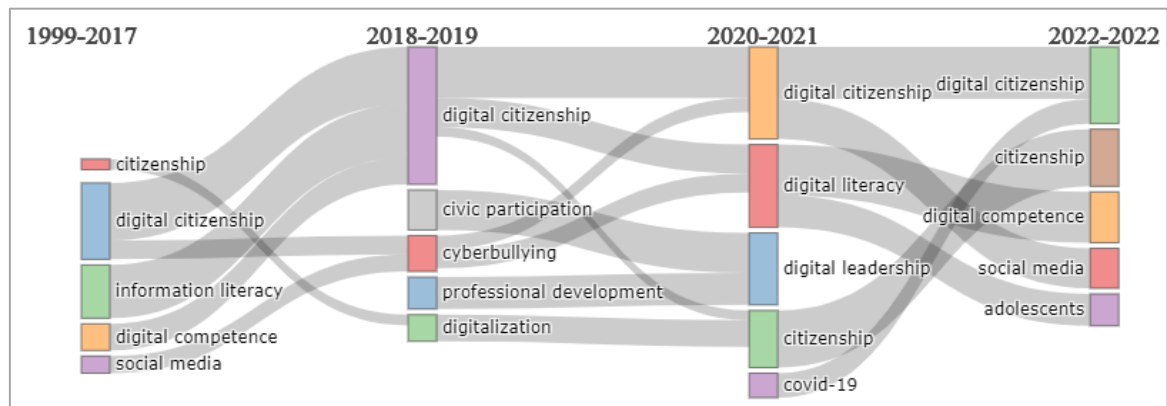


keywords, 50 are used to identify the thematic map of keywords divided into 6 clusters. The first cluster represents Surveillance, which includes Activism, Snowden, and Facebook. Cluster label ICT (Information Communication and Technology) comprises Professional Development, Technology, Leadership, Digital Leadership, and Civic Participation. While Twitter, Digital Skills, Digital Inclusion, E-Participation, and Social Inclusion are included in a cluster of COVID-19. Surveillance, ICT, and COVID-19 belong to the niche theme in the thematic map, which is considered to be of limited importance in the field. On the other hand, Digital Citizenship, Citizenship, and social media are concerned with a Basic theme that is essential for the concept of 'Digital Citizenship' and transversal to the different research areas of the field (Aria, Misuraca & Spano, 2020).

Table 7  
Thematic Map of Topics from 1999-2022

Keywords	Cluster Label	Theme
Surveillance, Activism, Snowden, Facebook	Surveillance	Niche
ICT, Professional Development, Technology, Leadership, Digital Leadership, Civic Participation	ICT	Niche
Social Media, Education, Digital Activism, Youth, Digital Media	Social Media	Basic
Citizenship, Internet, Media Literacy, Social Networks, Digital Identity, Digitalization, Democracy, Digital Citizen, Covid-19 Pandemic, Digital Inequality, E-Government, Identity, Civic Education	Citizenship	Basic
Digital Citizenship, Digital Literacy, Digital Competence, Higher Education, Technology, Digital Divide, Cyber-bullying, Information Literacy, Digital Citizenship Education, Privacy, Secondary Education, Adolescents, Digital Education, Empowerment, Primary Education, University Students, Young People	Digital Citizenship	Basic
Covid-19, Twitter, Digital Skills, Digital Inclusion, E-Participation, Social Inclusion	Covid-19	Niche

Figure 12 depicts the evolution of the literature on 'Digital citizenship'. The dataset is divided into four segments to evaluate the thematic development of the author-provided keywords to acquire a clear image of the topic growth. From 1999 to 2017, Digital citizenship, information literacy, digital competence, social media, and citizenship evolved. Since 2018, the term digital citizenship has increased its periphery. Civic participation, cyber-bullying, professional development, and digitization evolved from 2018 to 2019. Moreover, Digital literacy, digital leadership, COVID-19, adolescents, and other terms increased its popularity during 2020-2022.



### Discussion

Literary warrants on 'Digital Citizenship' proliferated over the years by engulfing numerous connotations of digital activities. The study carried out a bibliometric analysis to investigate the importance of the concept of 'digital citizenship'. The study included the author's productivity, topic growth, core sources on Digital citizenship, and Ribble's categorizations. The authors found that the expansion of Digital citizenship is dynamic, with an annual rate of 27.48%. The study is based on the 377 articles in the SCOPUS database from 1999-2022. During this time frame, 874 authors have been involved with the concept of Digital citizenship, with Martin F. being the most influential author in Digital citizenship with the article fractionalized 1.5 and the number of documents 6. The study identified 39 core sources on digital citizenship, and the most influential journal is Education Technology and Society, which has high citations. It is found that the term Digital citizenship is the most frequent in the dataset.

Digital citizenship is merged with several concepts to increase its dimension. The terms retrieved in the study are limited to only two significant themes: Basic and Niche Themes. It was found that COVID-19 is a triggered concept of digital citizenship, although it is of limited importance. Various terms like Digital Identity, Digitalization, Democracy, Digital Inequality, E-Government, Digital Literacy, Digital Competence, Higher Education, Technology, Digital Divide, and others are intertwined with digital citizenship as an essential concept to develop the field. In contrast, categorizing articles on "Digital Citizenship," a chunk of literature dealt with public administration, democracy, and government. Hence, the initial inquiry of the corpus had issues with grouping those contents under Ribble and Choi's prescriptions, as they have yet to utter about governance.

Moreover, 'Digital Commerce' is unfit for clubbing literature on Public Administration and the government. Concepts like 'stateless citizenship' and 'liquid citizenship' (Calzada, 2022) fueled the issues more explicitly. As stated by Ribble, 'Digital Law' is always to be ensured and enacted by the state. Thus, all the articles under public administration and the government are kept under 'Digital Law.' In a blog, Ribble's contour of 'Digital Citizenship' pivots around nine elements (Ribble, 2011) grouped into three core principles in 2020. Choi (2016) prescribed four elements of digital citizenship. The interrelationship of ideas is explicitly vivid for both the proponents and is reflected in Table 2.

Objectives of the study are mitigated by identifying the terminological correlation of "Digital Citizenship" using the Scopus database and comparing them with Ribble's and Choi's recommendations. Moreover, the study empirically categorized a clustered pool of information

distribution by identifying the core sources and author productivity in digital citizenship. Finally, the study identified that most authors address the problem of digital literacy and awareness for extending digital citizenship. The study has been instrumental in tracing the growth pattern of "Digital Citizenship" in terms of trending topics and the growth of sources along with the thematic portrayal of digital citizenship.

### Conclusion

In this technology-driven society, "Digital Citizenship" is one of the emerging concepts proliferating, especially post-pandemic. From its inception, it has changed its dimensions, raising more interest among researchers to contribute to diversified research on this topic. The present study identified the topic's bibliographic growth, including the author's productivity, core source, and topic growth. Furthermore, the authors distributed the dataset according to the categorization suggested by Ribble (2011) and Choi (2016). This study identified the terminologies related to Digital Citizenship, which may act as catalysts in promoting digital literacy, skill enrichment, and encouraging digital awareness and digital security among the citizens, ensuring their participation and engagement in the digital society. This study is limited to a single database, i.e., the SCOPUS database while focusing only on articles. Richardson, Martin and Sauers (2021) mentioned two divergent terms with the same connotation in Choi's categorization. Both categorizations seem fuzzy and need more clarifications and ratifications for denoting all related concepts of Digital Citizenship. For example, while manually studying the articles, we found that government is essential to Digital Citizenship. However, the categorizations have yet to consider it as neither a component nor a sub-component. However, the government is interconnected with digital law, political engagement, and Digital Rights and responsibilities. However, it is a sub-component of 'Responsible Governance' for educating the citizens on digital society, digital rights, safety, law, and even digital literacy for promoting digital citizenship.

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