

# Quantifying global digital journalism research: a bibliometric landscape

Global digital  
journalism  
research

1337

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Received 27 January 2022

Revised 16 April 2022

13 June 2022

Accepted 13 June 2022

## Abstract

**Purpose** – The purpose of this paper is to present a comprehensive analysis of the current status and development of the digital journalism field from 1987 to 2021 using the Dimensions database.

**Design/methodology/approach** – Using the Dimensions.ai database, 1734 articles were identified through search strategies which were published from 1987 to 2021. The downloaded results were analysed using specific parameters with the help of bibliometric and science mapping tools: Biblioshiny, VOSviewer and CiteSpace. The key contributions of the present comprehensive bibliometric study of the digital journalism field can be seen in terms of the following aspects: (1) Publication analysis from the perspectives of publication growth, key journals, contributing authors, institutions and countries done through Biblioshiny package. (2) Citation network analysis from the perspective of co-citation structure of papers, authors, countries and institutions done through VOSviewer. (3) Timeline analysis and keywords burst detection to identify hotspots and research trends in digital journalism with the help of CiteSpace.

**Findings** – The first paper with the keyword digital journalism was published in the year 1989. From 2011 onwards, there has been growth in digital journalism literature. The most popular journal in digital journalism studies is *Digital Journalism*, *Journalism*, *Journalism Practice*, *Journalism Studies*. Lewis, S.C. has contributed the most number of papers in digital journalism. Further, authors from the countries the USA, Spain, Brazil and UK have contributed immensely. The citation network of authors, institutions and countries contributing to digital journalism studies has also been explored in the study. Through burst analysis, hot topics in digital journalism were identified.

**Originality/value** – The paper provides a complete overview of the growth of digital journalism literature published from 1987 to 2021. The originality of this work lies in the triangulation of Biblioshiny, VOSviewer and CiteSpace software to present various aspects of bibliometric study. Findings of the study can help the researchers to identify areas as well as journals, authors, institutions working actively in the field of digital journalism.

**Keywords** Digital journalism, Bibliometric analysis, Publication analysis, Citation analysis, Timeline and burst detection, Citation

**Paper type** Research paper

## Introduction

Every research study or paper produced by researchers in a field of study is based on and shaped by existing knowledge. According to Snyder (2019), “when reading an article, independent of discipline, the author begins by describing previous research to map and assess the research area to motivate the aim of the study and justify the research question and hypotheses referred to as a theoretical framework or research background”. The past 15 years have witnessed a significant increase in journalism research leading to rapid advancement in journalism theory (Karlsson and Sjoavaag, 2016). Digital journalism studies are interdisciplinary



Library Hi Tech  
Vol. 40 No. 5, 2022  
pp. 1337-1358

© Emerald Publishing Limited  
0737-8831

DOI 10.1108/LHT-01-2022-0083

to a considerable extent (Steensen and Westlund, 2020). With this exponential growth of fragmented and multidisciplinary papers, taking stock of older research has become complex. Popular methods for research overviews are literature review, meta-analysis and bibliometric analysis (Donthu *et al.*, 2021). Of all the three methods, bibliometric analysis is the easiest and most effective way to track trends in any area, especially when there is a larger dataset and a broader scope (Braun *et al.*, 1997). Bibliometric studies enable researchers to (1) get a comprehensive overview, (2) identify knowledge gaps, (3) find out ideas for investigation and (4) place research contributions within the field (Donthu *et al.*, 2021). Bibliometric studies can be used to study (1) performance analysis and (2) science mapping of a field. Performance analysis is a standard practice where the contribution of research components (authors, journals, institutions, countries, citations) is studied.

In contrast, science mapping studies the relationship between the research components. The present study intends to address the identified research gap and examine digital journalism literature with bibliometric methods. To the best of our knowledge, this is the first work that performs a detailed and systematic mapping of published papers on digital journalism.

Journalism is nothing new in the modern history of mankind; journalism's evolution dates back to the 16th century. Even though earlier newspapers were intended to be publishers of the government, the system of publishing the news was established by the Republic of Venice in the 16th century (Infelise, 2002). A similar establishment was also recorded in the time of the Han Dynasty, China, in the 17th century as a publicly published news bulletin (Walravens, 2009). Though the first mention of privately-owned news publishing was found during the rule of the Ming Dynasty in China (Brook, 2011). With the evolution of mankind, journalism has shifted its dimensions from time to time. This continuous evolution of journalism has enabled this domain to embrace new technologies with time. The embracement of technology has transformed everything about journalism, from its structure to the presentation (Pavlik, 2000). With the advancement of the World Wide Web in the late 1990s, like any other industry or profession, journalism has also embraced this new connectivity throughout the world (Deuze, 2001). The penetration of social media platforms has again opened up a new era for mankind. Like other professionals or general people, journalists have also started using this platform for personal and professional use (Hedman and Djerf-Pierre, 2013). This usage of social media and online platforms triggers a new journalism domain, later termed digital journalism (Burgess and Hurcombe, 2019). Digital journalism has been defined as news produced and consumed in a digital environment (Deuze and Witschge, 2018). In other words, digital journalism involves using digital technologies to research, produce and deliver news or information to a computer-literate audience (Carlson, 2003). Based on the use of technology, journalists have marked a boundary between digital journalists and non-digital or traditional journalists (Vos and Ferrucci, 2019; Ferrucci and Vos, 2017). A digital journalist utilises digital tools such as smartphones, tablets, laptops, voice recorders, digital video recorders, blogs, email, and self-publishing tools during newsgathering or communication routines, unlike non-digital or traditional journalists (Mari, 2019).

Regarding the origin of digital journalism, there is a considerable debate among scholars. According to Salaverria (2019), the source of digital journalism predates the advent of the Internet. In 1987, the National Science Foundation created an enhanced nationwide digital network known as the NSFNET, which was a direct precursor to today's Internet (Maryville University, 2020). During this period, Aumente (1987) feels that studies on digital devices like computers in journalism started. Until the late 1980s, studies focused on adopting "new technologies" in journalism (Salaverria, 2019). Carlson (2003) stresses that digital journalism research gained tremendous momentum after launching the first news publication on the Internet. The authors, therefore, considered 1987 as a benchmark for collecting data on digital journalism in the present study.

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The prominence of this technology-driven domain can be understood as a network like Al Jazeera launching its AJ+ in digital form (Zayani, 2021). Therefore, it would be interesting to use the standard bibliometric methodology to analyse published papers on digital journalism and provide valuable and comprehensive insights like year-wise research output, authorship patterns, leading contributors (countries, authors, institutions) and publication sources.

### Literature review and identification of research gap

A review of the literature indicates that Routsalainen (2018) first systematically mapped the future of journalism through horizon scanning methods based on Nieman Lab predictions of Harvard University. Another study by Steensen and Westlund (2020) analysed the various facets of *Digital Journalism* journal (a significant journal in digital journalism studies) using data from Google Scholar, Web of Science, Scopus and *Journal of Citation Reports*. However, a bibliometric approach is missing in these studies, which is a methodological flaw. Ramos-Rodrigue and Ruiz-Navarro (2004) believe that analysing large bibliographic datasets using classic review methods, not bibliometrics is cumbersome and impractical. Bibliometrics can provide a complete overview of a field and future research directions. According to Xie et al. (2020), “with significant objectivity and advantages in quantitative and modelled macro research, bibliometrics is a mature literature analysis and information mining method”.

Scholars in different fields have used bibliometric analysis to show the current status, and future research directions in a particular discipline or a narrow research theme such as board diversity (Baker et al., 2020), green supply chain management (Maditati et al., 2018), innovativeness (Marchiori et al., 2021), big data and artificial intelligence (Munim et al., 2020), green finance (Zhang et al., 2019), but such studies are missing in the field of journalism more precisely digital journalism. Researchers could not find any previous work related to bibliometric mapping of the digital journalism field, due to which previous works on narrow themes helped formulate the present study’s research plan. In the earlier works related to bibliometric mapping of an area, two research approaches were found: (1) bibliometric study of a particular subject such as computer science with or without focus on a particular country/region (Kumar and Garg, 2005; Uddin et al., 2015; Singh et al., 2015b) (2) bibliometric study of a narrower subject such as cloud computing with or without focus on a particular country/region (Heilig and Voß, 2014; Gupta et al., 2015; Awan and Abbas, 2022).

Bibliometric analysis, in particular, reveals the emerging trends in an article, quantify the performance of journals, understand co-authorship pattern and explore the intellectual structure of a field (Donthu et al., 2021; Verma and Gustafsson, 2020). Given the gaps mentioned above, the paper attempts to quantify the published articles on global digital journalism research using science mapping tools and bibliometric methods from 1987 to 2021 to provide critical facts related to digital journalism research. For easy understanding and interpretation, this paper has addressed the quantitative analysis in three parts: (1) publication analysis, (2) citation network analysis, (3) timeline analysis and burst detection. The critical contributions of the present comprehensive bibliometric study of the digital journalism field can be seen in terms of the following aspects:

- (1) Publication analysis from the perspectives of publication growth, key journals, contributing authors, institutions and countries done through the Biblioshiny package.
- (2) Citation analysis from the co-citation structure of papers, authors, countries and institutions done through VOSviewer.
- (3) Timeline analysis and keywords burst detection to identify hotspots and research trends in digital journalism with the help of CiteSpace.

**Objective**

The study was conducted using the Dimensions.ai database with the following objectives:

- (1) To obtain an overview of currently available published works on digital journalism.
- (2) To analyse contributions in terms of author, country, and affiliation.
- (3) To assess the impact of research output in digital journalism research.
- (4) To identify the keywords and hot topics with the highest citation burst.

**Methodology**

Research articles indexed in the Dimensions database under digital journalism have been used to address the objectives effectively using a bibliometric landscape. Dimension database includes 119 million publications worldwide from 87,000 journals and 1.4 billion citations (Dimensions, 2021). Dimensions database is a freely available source of bibliographic data, including citation data. With the validation of the database in the previous studies (Thelwall, 2018; Singh *et al.*, 2021), researchers may not rely on expensive proprietary data sources like Scopus and Web of Science for bibliometric studies.

Researchers preferred Dimensions over other databases due to their higher coverage than Scopus and Web of Science (Visser *et al.*, 2021). Previous studies such as Guerrero-Bote *et al.* (2021) have also highlighted that the Dimensions database has 25% more coverage than Scopus. Similarly, Martín-Martín *et al.* (2021) conclude that citation coverage in the Dimensions database surpasses Web of Science in all areas except Physics and Mathematics and Chemical and Material Sciences. Thelwall (2018) and Singh *et al.* (2021), in their studies, have also found a strong correlation between Scopus and Dimension in citation counts, making it a feasible option for bibliometric analysis.

*Search strategy*

Text: 'Digital journalism' 'Online journalism' in title and abstract.

We limited our search to "digital journalism" and "online journalism" as Strukov (2020) asserts that the transition to digital journalism means more than more effective use of digital tools, which encompasses all other related forms like "cyber journalism" and "multimedia journalism".

*Publication type: article*

The query was performed on 30th November 2021. We have excluded other categories like book chapters, conference proceedings, and other documents as our primary concern was exploring the literature published in journals. Finally, the search as mentioned above strategy obtained 1,734 articles published from 1987 to 2021. Findings have been divided into three sections: (1) publication analysis, (2) citation network analysis and (3) timeline and burst analysis.

Several well-known indicators have been used in this research work in terms of derived indicators and measurements.

*H-index*

H-index is considered a measure of influence in bibliometrics (Donthu *et al.*, 2021), proposed by Jorge Hirsch, and used for evaluating the scientific output of a researcher (Ball, 2005). Quantifying a researcher's scientific work is needed to assess and compare funding and tenure decisions (Ball, 2005; Hirsch, 2005). According to Hirsch (2005), "A scientist has index  $h$  if  $h$  of their  $N_p$  papers have at least  $h$  citations each and the other  $(N_p-h)$  papers have fewer

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than  $\leq h$  citations each". An  $h$ -index of 40, for example, means that the scientist has published 40 articles that have at least 40 citations (Bormann and Daniel, 2007).

### *G-index*

G-index is considered a measure of impact (Donthu *et al.*, 2021) introduced by Egghe (2006) as an improvement of the  $h$ -index, which gives more weightage to highly cited articles. A significant disadvantage of the  $h$ -index was that it did not consider highly cited papers, as once the paper entered the  $h$ -core, further citations received were irrelevant (Schreiber, 2008). G-index is defined as "[given a set of articles] ranked in decreasing order of the number of citations that they received, the  $g$ -index is the (unique) largest number such that the top  $g$  articles received (together) at least  $g^2$  citations" (Publish or Perish 4 User's Manual, 2016). A  $g$ -index of 10, for example, means that the top 10 papers of a scientist have been cited at least 100 times (10<sup>2</sup>).

### *M-index*

M-index is the  $h$ -index divided by the number of years since the author's first publication (McInerney, 2011; Robinson *et al.*, 2019). M-index represents the median number of citations to publications whose number of citations is equal to or smaller than  $h$  (Choi and Seo, 2021; Derrick *et al.*, 2011).

### *Publication analysis*

Publication analysis is a sub-domain of bibliometric analysis used to evaluate the performance of a field using the number of publications and citations (Cobo *et al.*, 2015). Through publication analysis growth of publications in digital journalism, key authors, institutions, journals and countries will be identified. Citation network analysis visualises the citation network of authors, institutions and countries. Timeline and burst analysis was conducted to analyse the keywords in-depth and identify research hotspots.

Moral-Munoz *et al.* (2020) have carried out an exhaustive study of various science mapping and bibliometric tools, which were used as a reference to identify the tools which can be used to meet the objectives of the present study and three instruments: the Biblioshiny package of RStudio developed by University of Naples Federico II; VOSviewer developed by Leiden University, and CiteSpace developed by Chen from Drexel University were found useful.

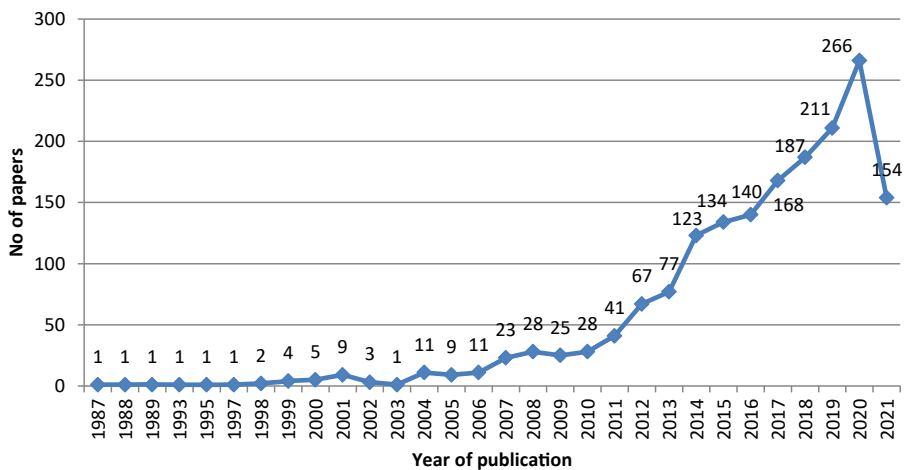
## **Results**

### *Publication analysis*

The first point to be addressed in this paper is to understand the publication trend of digital journalism. Therefore, we analysed the collected articles in five aspects based on their productivity, i.e. the growth of the research domain, top 20 most productive (1) journals, (2) countries, (3) institutions, and finally (4) authors along with respective derived indicators. These analytical results are represented in different tables and plots for better visualisation in the following subsections.

*Growth of digital journalism field.* The publication growth was the first aspect to be explored in publication analysis. The collected scholarly articles from the Dimensions database are thus plotted in Figure 1. In this timeline, it is understandable that digital journalism's growth started after 2004. This is the same year when the concept of Web 2.0 was coined. The user-generated content triggers the digital platform's embracement across the domains, and digital journalism was nothing different. Another continuous growth can be seen after 2009, which is the time when social media platforms have shown their potential by

**Figure 1.**  
Growth of publication  
in digital journalism  
(1987–2021)



bagging millions of users worldwide on several platforms. And it is evident that in recent years like 2019 and 2020, the growth of such scholarly articles has been phenomenal. In 2021, there is a decline in the number of publications on digital journalism. In 2021, the COVID-19 pandemic was at its peak, and studies (Ndlovu and Sibanda, 2021; Rhoads, 2021; Sukmono and Junaedi, 2021) have highlighted the transition of digital journalism towards mobile journalism, where mobile technology was used to capture, curate and distribute live contents. The present study only involved papers on “digital journalism” and “online journalism”, and there is a high chance that articles on “mobile journalism” has been ignored.

*Most productive 20 journals in the field of digital journalism research.* In the second approach of publication analysis, journal-based computations have been performed. Key 20 journals in the digital journalism field have been identified and listed in Table 1. These 20 key journals accounted for approximately 44% of total publications in this research area. Along with the total publication counts for these most productive 20 journals, impact indicators (citations, h-index, G-index, M-index) also have been computed. These renowned sources’ starting years and impact factors have been collected, showing that the most prominent journals were established around or after 2000. This is the time when the field of digital journalism observed its growth as well. The publication growth added new dimensions after 2012 when the most prominent journal in the area with the same name was started. Table 1 shows that the *Digital Journalism* journal is the most abundant source with 175 papers which account for 10.79% of total publications in the field of digital journalism, followed by *Journalism* with 92 papers (5.30%) and *Journalism Practice* with 79 papers (4.55%).

Regarding citations, the *Digital Journalism* journal published from 2012 has received maximum citations (3,079), followed by *Journalism Practice* with 2,608 citations published from 2007. Also, in the case of the Impact factor, H-index, and M-index, the *Digital Journalism* journal has emerged as the prominent one in the field. However, the *Journalism Practice* journal has led the table in G-index (50), followed by the *Digital Journalism* journal (48).

*Identifying the top 20 countries propagated digital journalism research.* In this section of publication analysis, the motivation was to explore the major countries which have contributed to the progression of research in the digital journalism domain. In this process, we have identified the top 20 countries based on their publication share in the field. Further, the publication share has been computed in percentage ratio. The country-wise performance is also evaluated using two types of collaboration criteria: (1) single country publications (SCP)



Journal	E std	Impact factor*	Total papers	Total citations	h index	g index	M Index
<i>Digital Journalism</i>	2012	7.986	175	3,079	31	48	3.1
<i>Journalism</i>	2001	4.436	92	1,342	20	34	0.952
<i>Journalism Practice</i>	2007	2.537	79	2,608	23	50	1.533
<i>Journalism Studies</i>	2000	3.741	64	1,208	16	33	0.727
<i>M/C Journal</i>	1999	–	57	214	7	14	0.304
<i>Brazilian Journalism Research</i>	2005	–	34	26	3	4	0.176
<i>Journalism and Mass Communication Educator</i>	2008	–	29	75	4	7	0.285
<i>Media And Communication</i>	2014	2.465	29	230	7	14	0.87
<i>New Media and Society</i>	2012	8.061	23	642	11	23	1.1
<i>Pacific Journalism Review</i> “ <i>TeKoakoa</i> ”	2004	–	23	29	3	4	0.166
<i>Journalism and Mass Communication Quarterly</i>	1998	4.128	19	108	4	10	0.166
<i>African Journalism Studies</i>	2015	0.8	18	33	4	4	0.571
<i>Estudios Sobre El Mensaje Periodístico</i>	2013	–	18	11	2	2	0.222
<i>Communication and Society</i>	1970	–	17	28	3	4	0.057
<i>Media International Australia</i>	2010	1.193	17	65	4	7	0.333
<i>Information Communication and Society</i>	2001	5.422	15	867	8	15	0.38
<i>Revista Observatã³Rio</i>	2017	–	15	1	1	1	0.2
<i>Publizistik</i>	2010	–	13	149	5	12	0.416
<i>Journal of Applied Journalism and Media Studies</i>	2013	–	12	18	3	4	0.333
<i>Nordicom Review</i>	2007	–	11	124	5	11	0.333

**Note(s):** \*Impact factor of the journals as per journal list of 2016 and the – sign implies that those journals were not SCI indexed

**Table 1.** Key 20 journals in the field of digital journalism

and (2) multiple country publications (MCP). These criteria have been derived from the idea of Intra and Inter-Country Collaboration, where SCP eventually interprets the Intra-Country Collaboration and MCP interprets the Inter-Country Collaboration (Sweileh *et al.*, 2017). The computed results are listed in Table 2. The United States of America (USA) emerged as the top contributing country among all the parameters except the collaboration ratio values (both in SCP and MCP ratio). These ratios eventually show the share of their paper in Intra-Country and Inter-Country collaboration, respectively. These results show that the USA played a vital role in propagating the ‘Digital Journalism’ research area, followed by Spain and Brazil according to all the absolute numbers and the share of total publications in the domain. Surprisingly, China has been seen in the lower part of the analysis, whereas in most research analyses, China shares the top spots with the USA (Tran *et al.*, 2019; Andreo-Martinez *et al.*, 2020). Even in some recent studies, China was noted as the top contributor to different disciplines, e.g. full-endoscopic spine surgery (Lin *et al.*, 2020), microbial fuel cells (Khudzari *et al.*, 2018), coronavirus research (Mao, 2020), etc. In the case of digital journalism, the reason behind this reverse condition might be the ‘state-prenureship’ in digital journalism. The Chinese government’s policy of leading and funding statehood in digital journalism instead of critical journalists might also be a barrier to its research and nourishment of the field (Fang and Repnikova, 2022).

*Leading 20 relevant institutions/organisations involved in digital journalism research.* The top-performing countries give a broader perspective on the key players in the digital journalism research domain. To have a more detailed understanding, we further identified this domain’s

LHT 40,5	Country	Articles	Publication share (%)	SCP	SCP ratio	MCP	MCP ratio
	USA	255	14.7	198	0.776	57	0.223
	Spain	102	5.8	72	0.706	30	0.294
	Brazil	91	5.2	79	0.868	12	0.131
	UK	84	4.8	71	0.845	13	0.154
	Australia	54	3.1	40	0.741	14	0.259
<b>1344</b>	Germany	33	1.9	26	0.788	7	0.212
	Russia	33	1.9	30	0.909	3	0.09
	Canada	25	1.4	18	0.72	7	0.28
	Sweden	25	1.4	13	0.52	12	0.48
	Netherlands	23	1.3	16	0.696	7	0.304
	Switzerland	18	1	14	0.778	4	0.222
	Denmark	17	0.9	13	0.765	4	0.235
	Norway	15	0.8	12	0.8	3	0.2
	Belgium	14	0.8	13	0.929	1	0.0714
	China	13	0.7	10	0.769	3	0.230
	Singapore	13	0.7	9	0.692	4	0.307
<b>Table 2.</b> Top 20 most productive countries in digital journalism research	Finland	12	0.6	9	0.75	3	0.25
	South Africa	12	0.6	9	0.75	3	0.25
	Ukraine	12	0.6	12	1	0	0
	Indonesia	11	0.6	10	0.909	1	0.09

top-performing institutions and their countries. [Table 3](#) illustrates the top 20 most relevant institutions/organisations in digital journalism research. The University of Groningen leads the list with a maximum of 19 contributions, followed by Nanyang Technological University and the University of Seville, each contributing 15 publications. The top two institutes are from Netherlands and Singapore, respectively, though both of these countries are not even featured within the top 5 countries in the earlier result. Therefore, it can be summarised that the digital journalism research domain has been addressed by different institutions spread across the

Institutions	Country	Articles
University of Groningen	Netherlands	19
Nanyang Technological University	Singapore	15
University of Seville	Spain	15
Oslo Metropolitan University	Norway	13
Complutense University of Madrid	Spain	12
Deakin University	Australia	11
Temple University	US	11
University of Gothenburg	Sweden	11
University of Oregon	US	11
University of The Basque Country	Spain	11
University of Wisconsin–Madison	US	11
University of Zurich	Switzerland	11
The University of Texas At Austin	US	10
University of Sydney	Australia	10
Carlos Iii University of Madrid	Spain	9
Queensland University of Technology	Australia	9
University of Pennsylvania	US	9
University of São Paulo	Brazil	9
Federal University of Rio Grande Do Sul	Brazil	8
George Washington University	US	8

**Table 3.**  
Top 20 relevant  
institutions involved in  
digital journalism  
research



globe. The respective country might not be among the key players in propagating the research domain, but some institutes do enhance this versatile domain.

*Top 20 most productive authors in digital journalism literature.* As it has been noticed, the broader view on contributors is not the same in the case of most productive affiliations. Therefore, the more acceptable analysis grade was performed using the lenses of the topmost productive authors in digital journalism. To do so, the top productive 20 authors have been listed in Table 4. The fractional frequency and the number of papers indexed under each author have also been calculated.

Fractional frequency is used to assess the contribution of authors used in bibliometric research to provide a fraction of credit to each author contributing to a paper (Sivertsen *et al.*, 2019; Piovashini and Mallick, 2021). It can be observed from Table 4 that Lewis, S.C. and Westlund, O contributed the highest number of papers, with 12 papers indexed for each of the authors, followed by Hess, K (11) and Carlson, M (10). Regarding the fractional frequency, the contribution is the highest on the name of Robie D from AUT University with 9, followed by Carlson M (7.67). These statistics show that, though authors like Lewis or Hess have contributed to several papers, the partial contributions of authors like Robie or Carlson stand higher. They have contributed to the field to propagate further, like other prominent authors on the list.

#### Citation analysis

The productivity of any research field is not alone enough to provide a substantial understanding of the same. Impact analysis of the produced research is also very much needful to have a better and broader aspect. Citation analysis has been used as a valuable tool to assess the impact of research outputs in several previous such studies (Radicchi *et al.*, 2008; Bornmann and Daniel, 2008; Prathap and Gupta, 2009; Banshal *et al.*, 2014, 2016, 2018, 2019; Singh *et al.*, 2015a, b; Singhal *et al.*, 2015; Marisha *et al.*, 2017). In this league, the collected pieces of literature have been analysed using different citation analysis techniques. First, the most cited papers have been identified from the collected set, and then the citation network has been plotted in three different contributing factors identified earlier.

Authors	Current affiliation	No. of papers	Fractional frequency
Lewis SC	The University of Texas At Austin	12	6.00
Westlund O	Oslo Metropolitan University	12	4.42
Hess K	Deakin University	11	4.50
Carlson M	University of Minnesota	10	7.67
Robie D	AUT University	9	9.00
Tandoc EC	Nanyang Technological University	8	3.08
Hermida A	University of British Columbia	7	5.50
Karlsson M	Karlstad University	7	3.42
Deuze M	University of Amsterdam	6	4.17
Eldridge SA	University of Groningen	6	3.83
Ferrucci P	University of Colorado–Boulder	6	4.00
Gutsche Re	Florida International University	6	3.33
Mabweazara HM	Falmouth University	6	4.58
Peters C	Roskilde University	6	3.25
Robinson S	University of Wisconsin–Madison	6	2.92
Usher N	Washington University	6	4.50
Aiestaran A	University of the Basque Country	5	1.37
Allan S	Cardiff University	5	3.50
Carson A	La Trobe University	5	3.25
Steensen S	Oslo Metropolitan University	5	2.75

**Table 4.**  
Top 20 most  
productive authors

*Top 20 most cited articles in the field of digital journalism.* The first aspect explored for citation analysis is the topmost cited papers among the collected set. The top 20 most cited articles have been listed in [Table 5](#) along with the DOI citations. Also, two more derived measurements were calculated; one is TC per year which is self-explanatory from the name. The second measurement deduced is Normalised Total Citations (Normalized TC); like the fractional frequency, the Normalised TC is calculated to provide equal credit of citation to all the authors of the paper. For example, for a list of  $N$  papers, where  $X$  is the number of authors contributing to the paper and  $Y$  is the total citation received by the paper, the normalised citation count of each article is  $Y/X$  and the normalised total citation is the sum of normalised citation count of  $N$  papers ([Smithsonian Astrophysical Observatory, n.d.](#)).

From [Table 5](#), it can be seen that the work of Hermida, A (2010), published in *Journalism Practice*, tops the chart with 499 citations (41.58 citations per year), followed by Lewis, S.C. (2012) work in *Information, Communication and Society* with 435 citations (43.5 citations per year) and Deuze, M (2006) work in *The Information Society* with 310 citations (19.37 citations per year). Again, the normalised TC has shown a similar kind of thing like the fractional frequency, as in terms of total citations, the work by Hermida can be said to be the most impacted paper published in the field. According to the Normalised TC, the work by Bakir published in 2017 leads the tally with more than 26 citations (normalised). Also, It is pretty surprising to find only one paper published in the *Digital Journalism* journal in the list, one of the reputed and significant journals in the digital journalism field.

*Citation network of authors.* The citation has been assessed using the citation network plot to find the authors' relationship. A total of 2,510 authors have contributed to the digital journalism literature, and 59 authors have been cited 100 or more 100 times. In total, 49 authors constitute the largest citation network in digital journalism, as shown in [Figure 2](#). The network has been drawn using the VOSviewer tool. From [Figure 2](#), it can be seen there are primarily three clusters that have been made (each colour in the plot depicts a cluster). The node's size indicates the author's citations, and the line between the authors shows co-cited publications. The figure helps to conclude Lewis S.C. and Deuze M have constituted the most number of citations being the clusters' centre point evident through the node size.

*Citation network of institutions.* In the second approach of citation network, the citation links have been plotted using the affiliation in terms of institutes. In total, 650 organisations or institutions have contributed to digital journalism literature, out of which works from 63 institutions have been cited 50 or more than 50 times represented in [Figure 3](#). The links between the nodes indicate the institutions that have been cited together, and the node size shows the number of citations. Oslo Metropolitan University showed the highest link strength (98), followed by the University of Gothenburg (67).

*Citation network of countries.* The final block of the citation network drawn is based on the countries affiliated. From the collected data through dimensions, it was found that about 69 countries have contributed to digital journalism research. Out of 69 countries, 36 have contributed at least 5 papers, and 32 countries show a strong citation network, as seen in [Figure 4](#). The links between the nodes indicate the countries that have been cited together, and the node size shows the number of citations. Like productive countries, the USA draws the most citations in the block. The USA has strong link strength (313), followed by Norway (155).

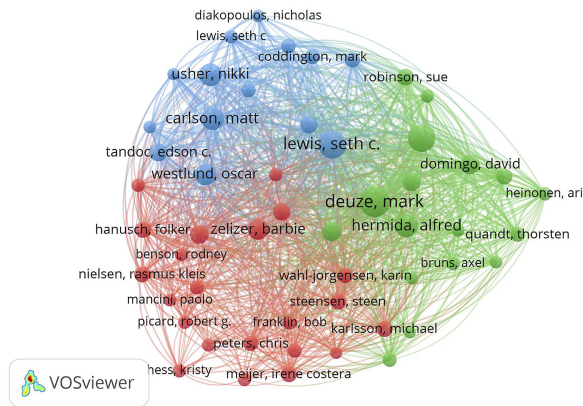
*Timeline analysis and burst detection.* Timeline analysis and burst detection is a methodology to identify articles that have received attention in a field during a particular period. According to [Zhou et al. \(2019\)](#), "a research cluster containing a certain quantity of articles with citation burst can be considered a new research field". Researchers, therefore, used this methodology to identify the top 10 keywords which are emerging topics from the digital journalism literature. According to CiteSpace, 51 keywords from the data collected from Dimensions had citation bursts. The 51 keywords are represented in [Figure 5](#), and 10

Paper	DOI	Total citations	TC per year	Normalized TC
Hermida A, 2010, <i>Journalism Practice</i>	10.1080/ 17512781003640703	499	41.583	12.644
Lewis SC, 2012, <i>Information Communication &amp; Society</i>	10.1080/ 1369118X.2012.674150	435	43.5	17.174
Deuze M, 2006, <i>The Information Society</i>	10.1080/ 01972240600567170	310	19.375	10.365
Harcup T, 2016, <i>Journalism Studies</i>	10.1080/ 1461670X.2016.1150193	273	45.5	23.477
Deuze M, 2007, <i>Journalism Practice</i>	10.1080/ 17512780701504864	232	15.467	13.647
Lewis Sc, 2013, <i>Journalism Practice</i>	10.1080/ 17512786.2013.859840	203	22.556	12.145
Chang Rm, 2014, <i>Decision Support Systems</i>	10.1016/J.DSS.2013.08.008	189	23.625	9.626
Pavlik, 2000, <i>Journalism Studies</i>	10.1080/ 14616700050028226	188	8.546	4.845
Bakir V, 2017, <i>Digital Journalism</i>	10.1080/ 21670811.2017.1345645	183	36.6	26.945
Anderson C, 2012, <i>New Media &amp; Society</i>	10.1177/1461444812465137	179	17.9	7.067
De La Pea N, 2010, <i>Presence Virtual and Augmented Reality</i>	10.1162/PRES_A_00005	168	14	4.257
Correa T, 2010, <i>Journal of Computer-Mediated Communication</i>	10.1111/J.1083- 6101.2010.01532.X	155	12.917	3.928
Jacobi C, 2015, <i>Digital Journalism</i>	10.1080/ 21670811.2015.1093271	141	20.143	9.419
Karlsson M, 2011, <i>Journalism</i>	10.1177/1464884910388223	139	12.636	7.509
Flew T, 2011, <i>Journalism Practice</i>	10.1080/ 17512786.2011.616655	130	11.818	7.022
Hermida A, 2012, <i>Journalism Practice</i>	10.1080/ 17512786.2012.667269	125	12.5	4.935
Lawrence Rg, 2013, <i>Journalism Studies</i>	10.1080/ 1461670X.2013.836378	124	13.778	7.419
Clerwall C, 2014, <i>Journalism Practice</i>	10.1080/ 17512786.2014.883,116	120	15	6.112
Carlson M, 2014, <i>Journalism</i>	10.1177/1464884914545441	118	14.75	6.01
Loosen W, 2012, <i>Information Communication &amp; Society</i>	10.1080/ 1369118X.2012.665467	114	11.4	4.501

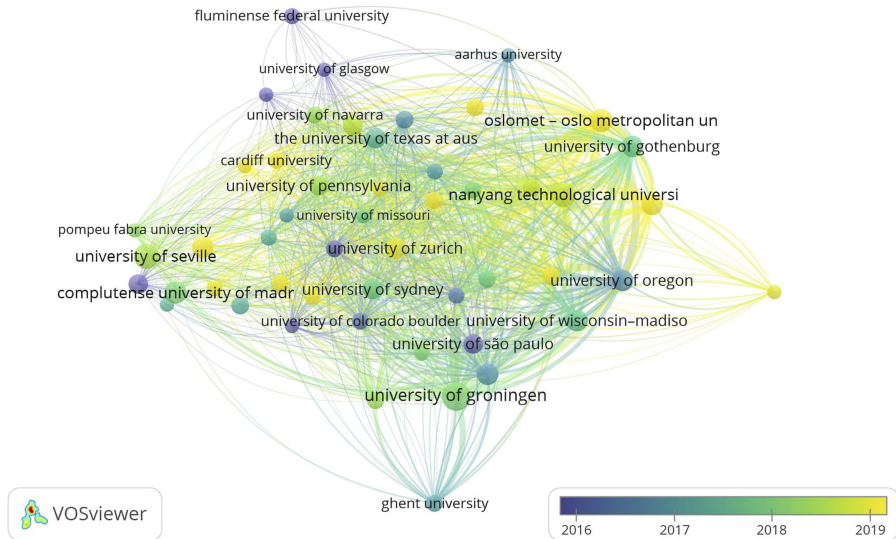
**Table 5.**  
Top 20 most cited  
articles in the field of  
digital journalism

popular keywords with timelines have been illustrated in Figure 6. The cluster view (Figure 5) from 1990 to 2021 provides an overview of the research areas within digital journalism. The node size represents the overall frequency of occurrence of keyword terms, while the coloured rings of the nodes represent yearly time-slices. In the bibliographic landscape, each cluster represents a thematic concentration. According to Chen *et al.* (2014), “each cluster indicates a group of tightly coupled references which represents the intellectual base of a research speciality”. It can be seen that the popular hot topics in digital journalism literature are professionalisation tendencies, the digital age, journalistic authority and digital journalism studies. Adding the time-zone view (Figure 6) provides additional insights by mapping the highly cited and critical documents that constitute the knowledge base of digital journalism and the timing of when new topics emerge. Figure 6 shows the evolution of themes

**Figure 2.**  
Co-citation network of authors



**Figure 3.**  
Citation network of institution



(professionalisation tendencies, digital age, journalistic authority and digital journalism studies) that could be considered central to digital journalism over time.

Table 6 illustrates the top 25 references with the highest citation bursts. Citation burst is a powerful indicator used to determine the most active areas in research (Citespace101, n.d.). Citation bursts indicate that a particular publication is associated with a surge of citations. Therefore, the publication has attracted much attention from the scientific community. In addition, if a cluster contains many nodes with intense citation bursts, then the cluster reflects an active area of research. The start of a blue line marks when an article is published, the beginning of a red segment marks the beginning of a burst period, and the end of the red segment marks when the burst period is over (CiteSpace, n.d.).

In the last column of Table 6, the length of the lines represents the period 1990 to 2021, where red lines indicate the time of bursts. A high burst can be seen in the second half of the

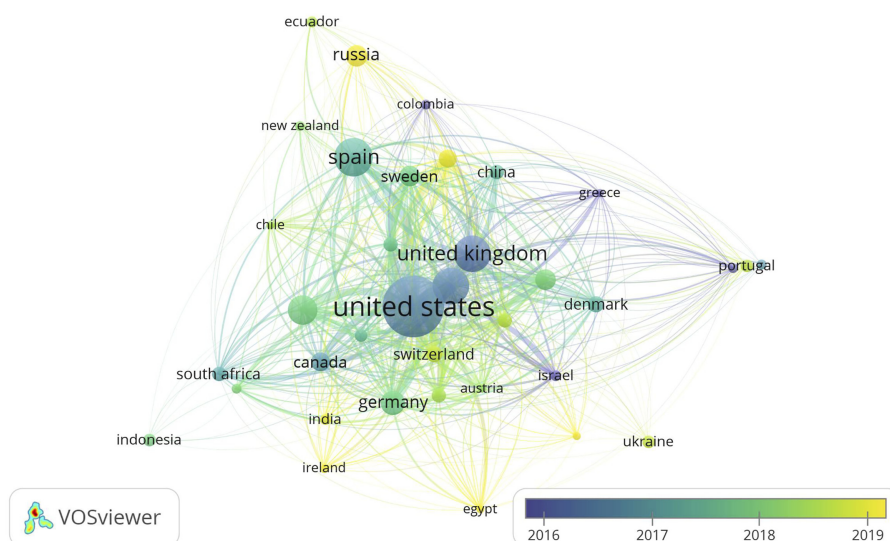


Figure 4. Citation network of countries

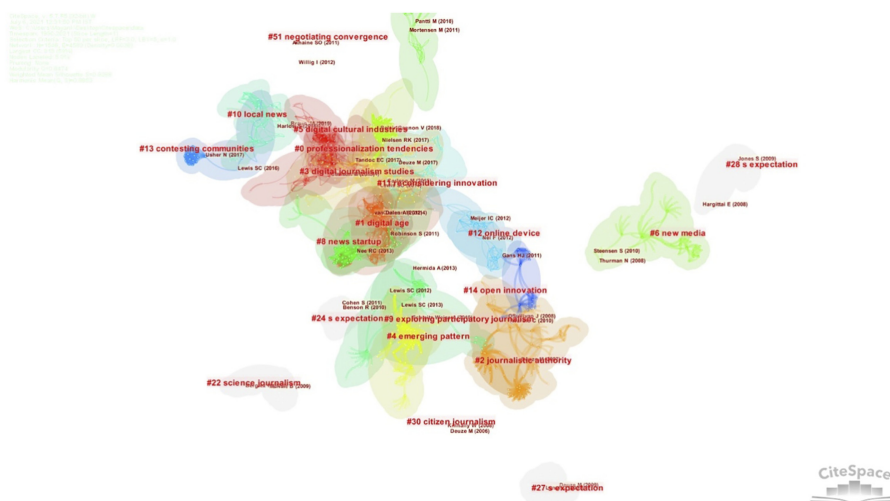


Figure 5. Cluster view of digital journalism literature keywords with citation burst

time period. The study of Bonini tops the list with a high burst strength of 10.11, followed by the study of Couldry (9.86) and Chouliaraki (9.86).

### Discussion

This study has found significant influential aspects of digital journalism literature. These noteworthy aspects provide implications for future core research. The study finds that 1734 papers were published on digital journalism from 1987 to 2021. Research papers on digital journalism can be seen from 1987, gaining momentum from 2004 onwards, emphasising the





**Figure 6.**  
Timeline review of growth of digital journalism field with top 10 keywords

significance of this research area. A large number of articles on digital journalism were contributed by journals having impact factors like *Digital Journalism* (7.986), followed by *Journalism* (4.436), *Journalism Practice* (2.537) and *Journalism Studies* (3.741). However, there is a difference in *h*-index, *g*-index and *m*-index among the key 20 journals identified in the study. It can be concluded that an article having a high *h*-index may or may not have a high *m*- or *g*-index, which has also been validated in previous bibliometric studies (Awan and Abbas, 2021). A list of crucial 20 journals related to digital journalism is mentioned in the results section. Findings further reveal that the *Digital Journalism* journal contributed the most papers (175), maximum citations (3,079), *h*-index, *g*-index and *m*-index, among other journals. This is the most impactful journal that researchers can consult for their future research in digital journalism, and libraries may also subscribe to this journal. In 2019, the *Digital Journalism* journal introduced Digital Journalism Studies Compass (DJS) as a resource for those transitioning into digital journalism studies and advancing their theories (Eldridge et al., 2019).

The study's findings further revealed that researchers from the USA contributed most articles, i.e. 255 (198 SCP, 57 MCP), followed by Spain, Brazil and UK. Researchers found similar results in a scientometric study of automated journalism, with the USA ranking first in global output and Germany and Spain following Xu and Lan (2020). As a result of its extensive research infrastructure and collaborative efforts, the USA has also been a leader in several other research fields such as communication research (Moreno-Delgado et al., 2021), data science (Purnomo et al., 2020), e-participation (Qi et al., 2018), and food waste and data labelling (Patra et al., 2020) etc.

Researchers from other countries like Australia, Germany, Russia, Canada, etc. have contributed to the digital journalism literature, but their share of contribution is comparatively less. Because Russia and China are considered superpowers, it is surprising that they make a minimal contribution to digital journalism. The literature from these countries could be in Russian and Chinese rather than English, making it impossible to cover it in the present study. A study of researchers from less productive countries should look for collaboration with the most productive countries in digital journalism. Moreover, the involvement of researchers around the globe indicates the importance of digital journalism as a field of research.

References	Year	Strength	Begin	End	1990 - 2021
Bonini T, 2019, Social Media + Society, V5, P2056305119880006, DOI 10.1177/2056305119880006, DOI	2019	10.11	2019	2010	
Couldry N, 2020, Social Forces, V99, P0, DOI 10.1093/sf/soz172, DOI	2020	9.86	2020	2009	
Chouliaraki L, 2017, Popular Communication, V15, P78, DOI 10.1080/15405702.2017.1281415, DOI	2017	9.86	2017	2009	
Caliandro A, 2020, Social Media + Society, V6, P2056305120924779, DOI 10.1177/2056305120924779, DOI	2020	9.86	2020	2009	
Dahmen NS, 2015, Digital Journalism, V4, P658, DOI 10.1080/21670811.2015.1081073, DOI	2015	9.45	2015	2009	
Carlson M, 2019, Digital Journalism, V7, P1, DOI 10.1080/21670811.2019.1601577, DOI	2019	9.45	2019	2009	
Borges-Rey E, 2015, Digital Journalism, V3, P571, DOI 10.1080/21670811.2015.1034526, DOI	2015	9.25	2015	2010	
Alper M, 2013, New Media + Society, V16, P1233, DOI 10.1177/1461444813504265, DOI	2013	9.02	2013	2011	
Gibbs M, 2014, Information Communication + Society, V18, P255, DOI 10.1080/1369118x.2014.987152, DOI	2014	8.93	2014	2006	
Gillespie T, 2020, Big Data + Society, V7, P2053951720943234, DOI 10.1177/2053951720943234, DOI	2020	8.93	2020	2006	
Duguay S, 2017, Media International Australia, V166, P20, DOI 10.1177/1329878x17737407, DOI	2017	8.86	2017	2009	
Hariman R, 2018, Journalism & Communication Monographs, V20, P318, DOI 10.1177/1522637918803354, DOI	2018	8.56	2018	2005	
Highfield T, 2016, Communication Research and Practice, V2, P47, DOI 10.1080/22041451.2016.1155332, DOI	2016	8.56	2016	2005	
Hesmondhalgh D, 2019, Social Media + Society, V5, P2056305119883429, DOI 10.1177/2056305119883429, DOI	2019	8.56	2019	2005	
Helmond A, 2015, Social Media + Society, V1, P2056305115603080, DOI 10.1177/2056305115603080, DOI	2015	8.25	2015	2005	
Gillespie T, 2010, New Media + Society, V12, P347, DOI 10.1177/1461444809342738, DOI	2010	8.08	2010	2006	
Jerslev A, 2015, Celebrity Studies, V7, P249, DOI 10.1080/19392397.2015.1095644, DOI	2015	7.71	2015	2005	
Karadimitriou A, 2016, The Digital Transformation of the Public Sphere, V0, P321, DOI 10.1057/978-1-137-50456-2_16, DOI	2016	7.49	2016	2005	
Carlson M, 2018, Digital Journalism, V6, P406, DOI 10.1080/21670811.2018.1445003, DOI	2018	7	2018	2009	
Lasorsa DL, 2011, Journalism Studies, V13, P19, DOI 10.1080/1461670x.2011.571825, DOI	2011	8.17	2012	2016	
Hermida A, 2010, Journalism Practice, V4, P297, DOI 10.1080/17512781003640703, DOI	2010	6.6	2013	2014	
Lewis SC, 2012, Information Communication + Society, V15, P836, DOI 10.1080/1369118x.2012.674150, DOI	2012	9.09	2014	2017	
Lewis SC, 2014, Digital Journalism, V3, P19, DOI 10.1080/21670811.2014.927986, DOI	2014	7.4	2017	2019	
Tandoc EC, 2014, New Media + Society, V16, P559, DOI 10.1177/1461444814530541, DOI	2014	7.4	2017	2019	
Deuze M, 2017, Journalism, V19, P165, DOI 10.1177/1464884916688550, DOI	2017	8.87	2018	2021	

Table 6. Top 25 references with highest citation bursts



University of Groningen, Netherland; Nanyang Technological University, Singapore and the University of Seville are the top two institutions actively involved in digital journalism research. In diverse research areas, including paediatric asthma (Fan *et al.*, 2022), pandemic studies in economics (Mahi *et al.*, 2021), microfinance performance (Akter *et al.*, 2021), old industrial buildings (Li *et al.*, 2021), etc., the University of Groningen from the Netherlands has been the most influential organisation. Research impact has placed the University of Groningen in the top 100 of the ARWU Shanghai and Times Higher Education (THE) World University rankings (University of Groningen, 2022).

Lewis S.C. and Westlund O are the authors from The University of Texas At Austin and Oslo Metropolitan University, Norway, respectively, having a maximum contribution of 12 papers to digital journalism literature. It is noteworthy that a researcher from Norway is a key contributor who is also an editor of the *Digital Journalism* journal. Researchers can set Google Scholar email alerts to get a push notification and keep themselves updated on the new works from the most productive authors in digital journalism. As per the Google scholar profile, Lewis S.C. has research interests in journalism, emerging media, media sociology, journalism studies and digital journalism. Westlund O's profile describes him as actively engaged in digital journalism studies, mobile technology and media management.

Citation analysis was used in the study to identify the most cited articles in digital journalism literature. Findings show that the work of Hermida, A (2010), published in *Journalism Practice*, tops the chart with 499 citations (41.58 citations per year), followed by Lewis, S.C. (2012) work in *Information, Communication and Society* with 435 citations. In addition to standard bibliometric characterisation, the study calculated Normalised total citation to provide equal credit of citation to all the authors of a research paper. The work of Bakir, published in 2017, received the highest normalised citations of 26. The results further indicate that about 59 authors have been cited more than 100 times. These works are essential readings that will be useful for researchers in digital journalism. The study also explores the citation network of authors, institutions and countries. Popular hot topics in digital journalism literature were identified through CiteSpace, including professionalisation tendencies, the digital age, journalistic authority and digital journalism studies.

## Conclusion

The paper presented a comprehensive bibliometric review of digital journalism literature published from 1987 to 2021 and indexed in the Dimensions.ai database. The application of standard bibliometric parameters such as performance analysis and science mapping analysis to analyse digital journalism literature has remained neglected by the researchers. The study found how journals contributed to the field of digital journalism. The study can help researchers uncover the emerging trends and patterns of publications in digital journalism. Moreover, the study can be a tool for understanding the application of bibliometric analysis in journalism.

In our first objective, we sought to obtain an overview of published works on digital journalism. The study uses advanced bibliometric tools such as VOSviewer, CiteSpace, and Bibliometrix package to analyse the datasets. Overall, the study presents a detailed characterisation of published works on digital journalism which is very informative, valuable and first of its kind on the theme.

To address our second objective of analysing contributions based on author, country, and affiliation, we have used publication analysis to identify critical components of digital journalism research, namely influential works, journals, authors, and organisations, using the Biblioshiny package in R Studio. For the third objective of assessing the impact of journalism research output, we have used VOSviewer to identify the citation networks of authors, institutions and countries. To achieve our last objective, identifying the keywords and hot

topics with the highest citation burst, we used CiteSpace. We found that professionalisation tendencies, digital age, journalistic authority and digital journalism studies dominated. Future avenues of research are identified through our research. We emphasise the importance of further research, expanding the current research field to include new interdisciplinary or emergent topics and building on theoretical and empirical studies. Given the high number of publications in the last decade, digital journalism research is expected to evolve rapidly and significantly.

The main limitations of this bibliometric study are related to the database and research sources. Our sample is drawn from the Dimensions database. However, some papers may still be missing despite the database's capacity. Even so, we believe the sample of articles accurately reflects digital journalism research during the study period. Future studies may be conducted to analyse other narrower research themes in digital journalism. Researchers can use databases like Web of Knowledge and Scopus to analyse journals' and countries' productivity and map the collaboration pattern.

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