Journal of Science and Knowledge Horizons

ISSN 2800-1273-EISSN 2830-8379

Mapping Altmetrics: A Bibliometric Analysis Using Scopus (2012-2024)

1 Guechairi Samira- university of Blida 2(Algeria) *, s.guechairi@univ-blida2.dz

https://orcid.org/0000-0002-7680-8925

Date of send: 19 / 04 / 2024	date of acceptance: 29 / 05 /2024	Date of Publication:30/ 06/2024

Abstract:

This study conducts a comprehensive bibliometric analysis of the altmetrics landscape from 2012 to 2024, aiming to explore key trends, influential contributors, and thematic concentrations in scholarly discourse. The Bibliometrix package in R made it easy to conduct a bibliometric study on altmetrics using data extracted from Scopus. This allowed for an in-depth examination of publication trends, influential authors, and thematic concentrations. VOSviewer was used to visualize bibliometric data, which gave information about co-authorship networks and thematic clustering in the altmetrics literature. The United States emerged as the foremost contributor in terms of publication frequency. Key words such as "bibliometrics," "social media," and "journal impact factor" were identified as central themes in the altmetrics discourse, reflecting the multidimensional nature of scholarly evaluation in the digital age.

Keywords: Altmetrics; bibliometric analysis; Bibliometrix; Scopus; bibliometric; journal impact factor; multidimensional

* Guechairi Samira

 ISSN 2830-8379 (print) ISSN 2800-1273 (online)

Introduction

Recently, the assessment of scholarly influence has progressed beyond conventional citation-based measurements to include a wider range of digital involvement, referred to as altmetrics. Altmetrics provides insights into the online coverage that academic publications receive, including mentions in blogs, news websites, and social media platforms. The significant change in academic evaluation has generated substantial interest among researchers, institutions, and publishers.

The study of (Priem et al. n.d.) introduced the idea of social web metrics, also known as altmetrics, in 2010. It pertains to the measurement of scientific outputs inside social web platforms, including Facebook, Twitter, blogs, news media, and online reference management tools. Altmetrics seeks to enhance the analysis of scientific activities by examining the influence of outputs in other formats, such as blogs and databases. This approach goes beyond the usual method of assessing the impact of scientific outputs solely through journal papers.(Costas et al., 2015)

Although altmetrics is being increasingly used, there is still a requirement for thorough bibliometric research to comprehend the current state, patterns, and influential individuals in this field. Prior studies frequently concentrate on particular facets of altmetrics, resulting in deficiencies in our comprehension of the wider academic conversation.

Furthermore, it is imperative to conduct further study on the reliability and validity of altmetrics as markers of research effect. It is essential to fill these gaps in research in order to improve our comprehension of scholarly communication in the digital era and enhance the evaluation methods employed by academic stakeholders. The objective of this study is to contribute to the ongoing scholarly evaluation by conducting a comprehensive bibliometric analysis of the altmetrics landscape. This will be accomplished by directing attention towards significant patterns, influential individuals, and thematic clusters.

This study aims to perform a thorough bibliometric examination of the altmetrics landscape spanning the years 2012 to 2024. In order to accomplish this purpose, the following goals will be pursued:

1. To clarify significant patterns in the uptake and utilization of altmetrics throughout the study.
2. To identify significant individuals who are impacting the conversation around altmetrics.
3. To examine the theme concentrations present in the altmetrics literature and to investigate their temporal history.
4. To evaluate the dependability and accuracy of altmetrics as measures of research influence.

The present study aims to investigate the following research questions:

1. What are the changes in the production of altmetrics papers from 2012 to 2024?
2. During the study period, whose authors have had the greatest influence in the field of altmetrics?
3. Which academic journals have served as the principal platforms for disseminating altmetrics research?
4. Which documents are most commonly referenced in the field of altmetrics?
5. Which countries have made the most substantial contributions to the literature on altmetrics?

Literature review:

Many scholarly investigations examine the subject of altmetric from various perspectives. Thelwall et al. (2013) examines the correlation between altmetrics and Web of Science citations for PubMed papers, revealing statistically significant relationships between higher altmetric scores and citations across different altmetrics, with the exception of Google+ postings. Nevertheless, the relationship between altmetrics and citations may be influenced by time and coverage constraints, indicating the need for caution when utilizing altmetrics to rank publications.

According to Zahedi et al. (2014), Mendeley offers the highest number of altmetrics, and there is a moderate association between the number of readers and citations on Mendeley. Although altmetrics, specifically Mendeley readership counts, exhibit potential as supplementary indicators, it is crucial to acknowledge their limits and underscore the necessity for additional research.

Mohammadi and Thelwall (2014) discover a stronger association between Mendeley readership counts and citations in the social sciences as opposed to the humanities, indicating the possibility of capturing the movement of knowledge across different fields. The study highlights the initial evidence of Mendeley reading data's influence in many sectors.

Holmberg and Thelwall (2014) examine the differences in how researchers from different fields use Twitter for academic communication. This highlights the significance of Twitter as a medium for facilitating communication within certain academic fields among researchers.

Sud and Thelwall (2014) suggest alternative metrics assessment methods, highlighting the significance of identifying factors that impact the establishment of alternative metrics. The work proposes a systematic approach to prioritize evaluation approaches in order to evaluate the appropriateness of altmetrics for academic assessment and information retrieval.

Hausstein et al. (2014) discover diverse use of online technologies among bibliometricians and differing viewpoints on the potential value of altmetrics. Although online tools have the ability to provide impact data, it is necessary to do deeper investigation in order to comprehend their significance in study evaluation.

The study conducted by Bornmann (2015) provides a thorough analysis of altmetrics, focusing particularly on microblogging, online reference managers, and blogging. The author conducts a more in-depth examination of the correlation between altmetrics and traditional citation counts. The study highlights the varying degrees of connection between altmetrics and traditional citations, with a specific focus on the strongest correlation seen with online reference managers. Altmetrics can function as supplementary indicators for evaluating the influence of research. In their study, Costas et al. (2015) investigates altmetric indicators across different scientific fields, emphasizing the scarcity of altmetric counts on social media platforms in publications and the very feeble correlations identified between altmetrics and citations. While altmetrics can function as supplemental indicators, more investigation is necessary to grasp their significance in the assessment of research fully.

According to Hausstein et al. (2015), there is a significant gap between the extent of social media presence and citations, which may be ascribed to many variables that influence metrics related to social media and citations. While social media analytics might be a beneficial complement to other indicators, it should not be seen as a replacement for citations. This highlights the need to use a complete methodology for assessing studies. In Ortega's (2015) study, the author examines the relationship between social and usage metrics (altmetrics) and bibliometric indicators at the author level. The study also evaluates the possibility of these metrics as proxies for assessing research effect. The research reveals a limited correlation between altmetric and bibliometric indicators at the author level, primarily attributed to the dependence of altmetrics on the specific site. This highlights the many aspects of research performance that are measured by altmetrics, which are separate from the influence of citations at the author level.

Mohammadi et al. (2015) analyse the reading trends in different fields by analyzing Mendeley data and evaluate the relationship between Mendeley readership and citation counts. It has been observed that there exists a correlation between Mendeley's readership and citations, indicating usage patterns that are comparable to the influence of citations. Mendeley reading data has the ability to serve as a reliable indicator for early impact evaluation, emphasizing its importance in comprehending scholarly influence.

In her work, Haustein (2016) examines and analyzes the existing obstacles encountered in the field of altmetrics, with particular emphasis on heterogeneity, data quality concerns, and interdependencies. In addition, the reliability of altmetrics is impeded by data quality concerns such as correctness, consistency, and replicability. The research emphasizes the necessity of tackling these problems in order to guarantee a precise and uniform evaluation of the impact of research.

Research Gap:

Despite the considerable body of study on altmetrics, there remains a need for bibliometric studies that delve into the correlation between altmetrics and conventional literary metrics. This highlights the necessity for additional inquiry in this particular domain. In response to these deficiencies, we present our bibliometric investigation on altmetrics with the aim of identifying the most prolific authors, countries, affiliations, journals, article count, and citations to be taken into account in Altmetrics documents. This study utilizes the Scopus database for document retrieval and employs Bibliometrix and VOSviewer for the analysis and visualization of findings.

Methodology: tools and materials

The objective of this study is to conduct a bibliometric analysis of the field of "Altmetrics" with the purpose of offering a comprehensive understanding of global trends in Altmetrics research from 2012 to 2024. This analysis will encompass various aspects, including the identification of the most productive authors, countries, academic institutions, and journals, the number of articles and citations relevant to Altmetrics studies, as well as the examination of citation trends and the co-citation network among references.

The Scopus database is used as a data source for Altmetrics because of its status as one of the biggest databases globally, offering data to academics, institutions, governments, decision-makers, and other relevant stakeholders.(Yusnaini et al., 2023) So, we search in Scopus for title, abstract, and keywords with these keywords: ("altmetrics" or "altmetric"); this is the formula used in Scopus:

TITLE-ABS-KEY ("altmetric" OR "altmetrics") AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))

As we mentioned in Figure 1, we extracted 1948 documents in all areas. So, we limited the type of documents to articles and the English language, and the final result was 1236 documents. Data collection was carried out on 02/04/2024.

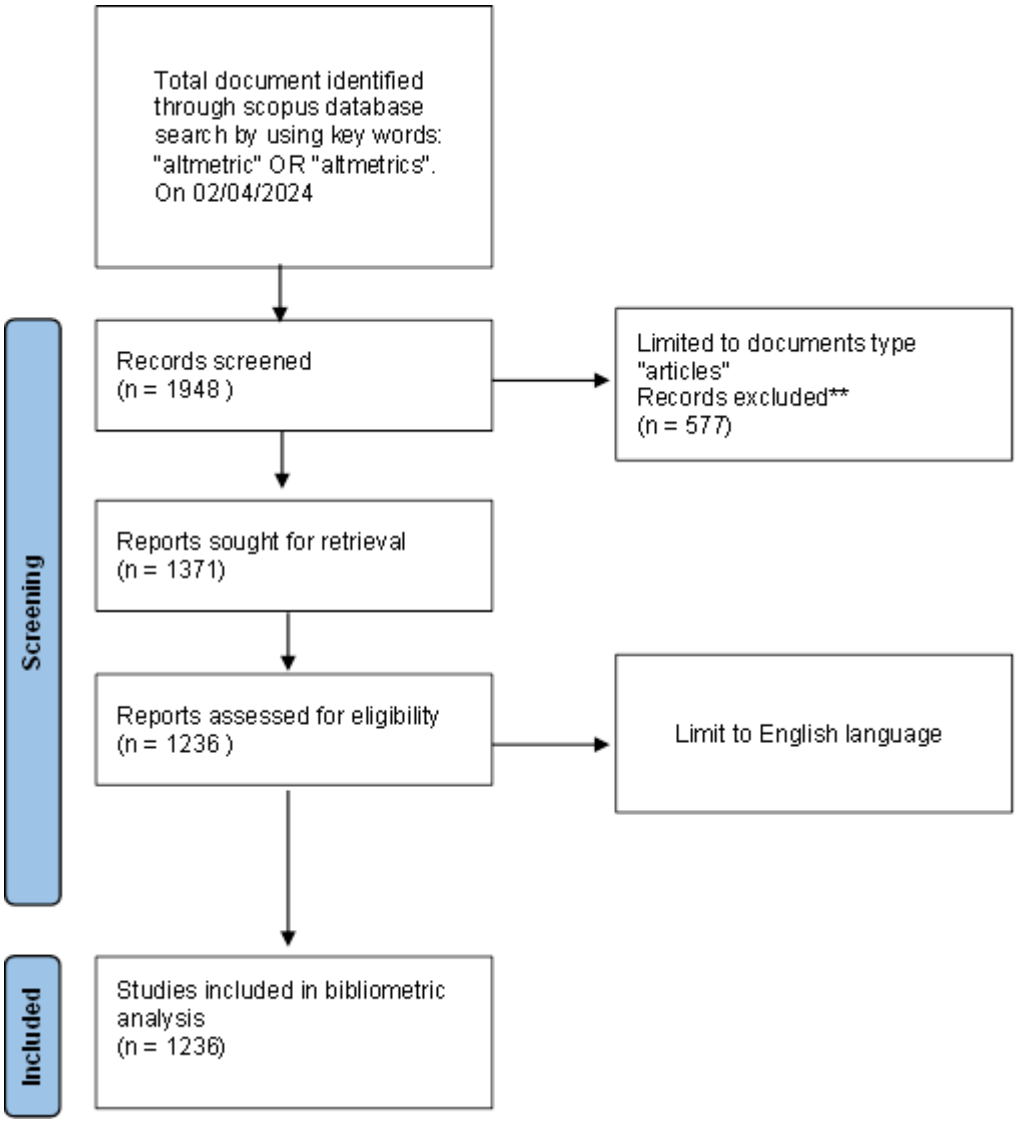


Figure 1: PRISMA flow chart for selecting documents for this study.

In order to do a bibliometric analysis on "Altmetrics," we use a biblioshiny tool based on the R programming language, namely R studio. This tool offers comprehensive data via the utilization of CSV files. The web-based application known as Biblioshiny operates under the Bibliometrix R package. The present application serves as an open-source tool designed for the purpose of doing bibliometric analysis in quantitative research. The development of this tool is attributed to Aria and Cuccurullo (2017). After translating and uploading bibliographic data in R, the Bibliometrix R program offers descriptive and other research-structure analysis. The descriptive analysis offers a concise overview of the yearly progress in research, the authors who contribute, the papers published, the nations involved, and the most significant keywords.(Aria & Cuccurullo, 2022)

The literature mapping in this research was conducted using VOSviewer software, which is a robust tool for generating a visualization map based on the specific

region of interest. The data will be transformed into an interconnected map using VOSviewer (Husaeni & Nandiyanto, 2022). VOSviewer is mainly designed for the analysis of bibliometric networks. However, it may also be used to generate, display, and investigate maps using many types of network data. (van Eck & Waltman, 2015)

Results:

Main information:

Table 1: descriptive statistic

MAIN INFORMATION ABOUT DATA	
Timespan	2012:2024
Sources (Journals, Books, etc)	497
Documents	**1236**
Annual Growth Rate %	24.6
Document Average Age	4.19
Average citations per doc	16.68
References	37568
DOCUMENT CONTENTS	
Keywords Plus (ID)	2948
Author's Keywords (DE)	2385
AUTHORS	
Authors	3086
Authors of single-authored docs	143
AUTHORS COLLABORATION	
Single-authored docs	186
Co-Authors per Doc	3.6
International co-authorships %	25
DOCUMENT TYPES	
Article	1236

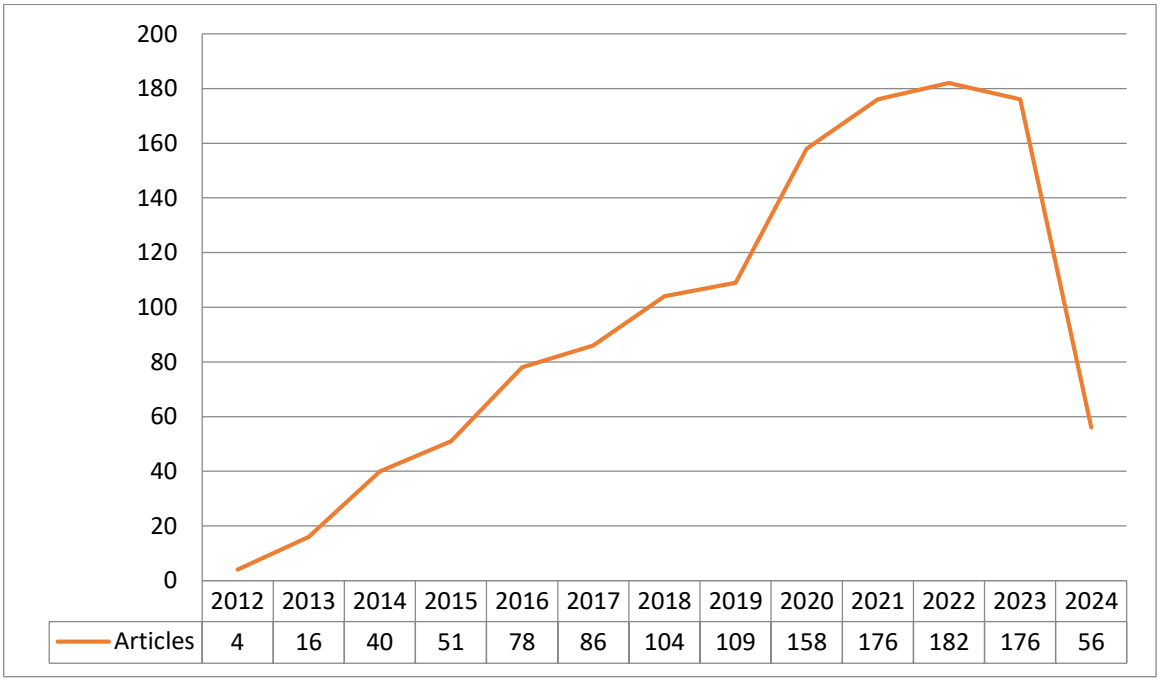
Source: Elaborated by author based on R Studio using biblioshiny.

The bibliometric analysis encompasses data from 2012 to 2024 from 497 publications, resulting in a corpus of 1236 documents. Notably, the field exhibits a robust annual growth rate of 24.6%, indicating increasing interest in altmetrics within library and information science. The documents, with an average age of 4.19 years, receive an average of 16.68 citations, showcasing their impact. With 37,568 references cited, the dataset reflects a rich network of scholarly connections. Keyword analyses reveal diverse themes, with 2948 Keywords plus (ID) and 2385 Author's Keywords (DE) identified. Collaboration is evident, with 3086 authors contributing, 143 single-authored documents, and an average of 3.6 co-authors per document. Approximately 25% of collaborations involve

international co-authorships, highlighting global engagement. All documents are classified as articles, emphasizing the focus on scholarly research.

Analysis by year:

Figure 1: Annual scientific production

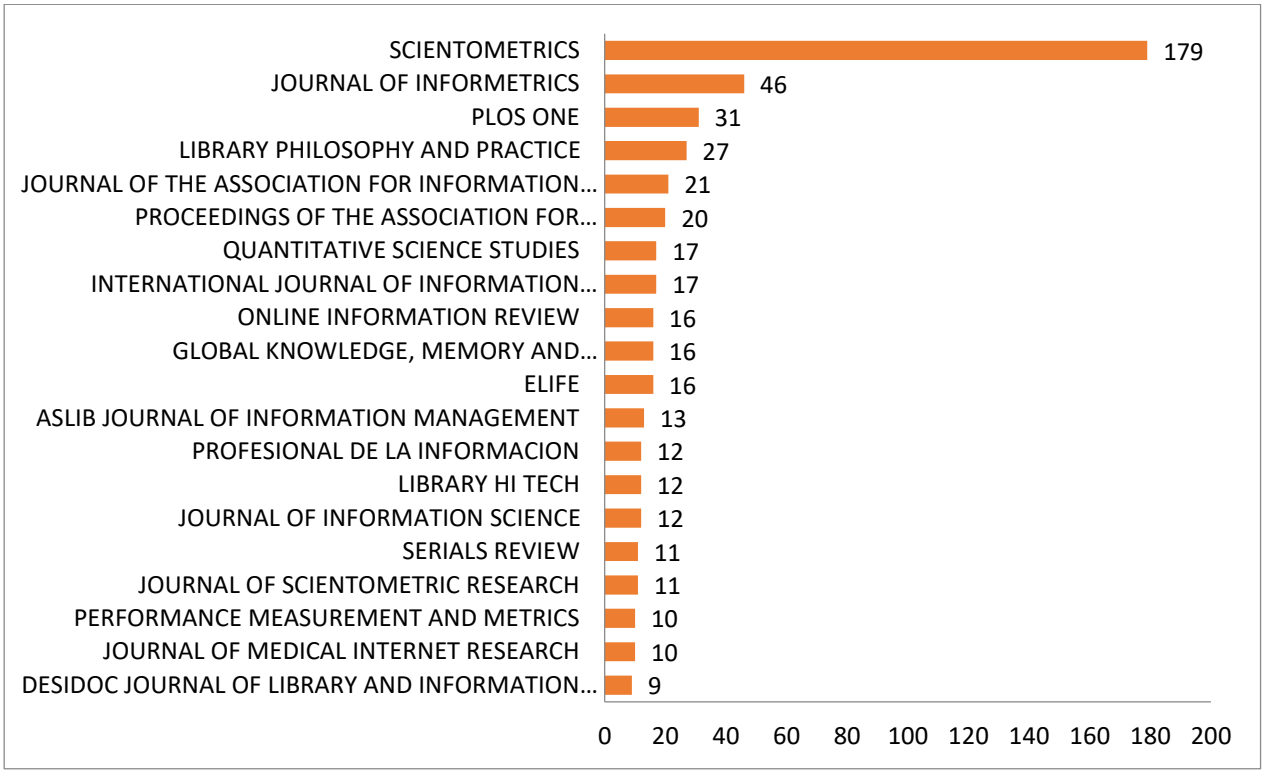


Source: Elaborated by author based on Scopus.

Figure 2 shows how the number of articles about altmetrics changed over twelve years, from 2012 to 2024. The data indicates a steady increase in research output, suggesting that more scholars are interested in altmetrics. At first, there were only four articles in 2012, but this number grew to 16 in 2013 and 40 in 2014. In the following years, there was continuous growth, reaching peaks of 176 articles in 2021 and 2023. However, there was a slight decrease in 2024, with 56 articles. This pattern highlights the growing importance of altmetrics in academic research and evaluation.

Most relevant sources:

Figure2: most relevant sources.



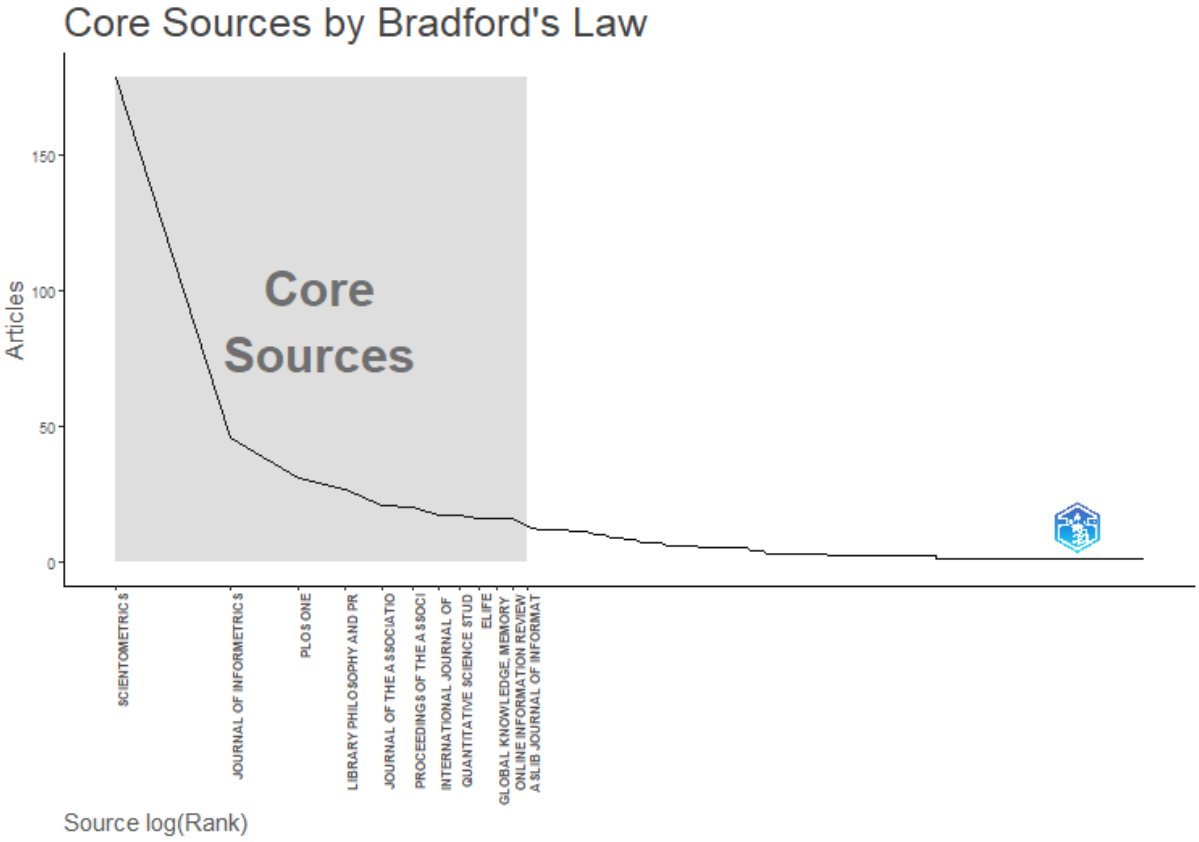
Source: Elaborated by author based on Scopus.

Analyzing the most relevant sources in altmetrics research reveals a diverse landscape characterized by prominent contributors and multidisciplinary engagement. Leading the list, Scientometrics emerges as a prolific source with 179 articles, indicating its significant influence in the field. Following closely, the Journal of Informetrics and PLOS ONE contribute substantially, with 46 and 31 articles, respectively, reflecting their commitment to advancing the scholarly discourse on altmetrics. Other notable sources, such as the Journal of the Association for Information Science and Technology (JASIST) and Proceedings of the Association for Information Science and Technology (ASIS&T), underscore the importance of established journals and conference proceedings in disseminating altmetrics-related research. Additionally, a range of journals spanning library science, information management, and quantitative studies contribute significantly, highlighting the interdisciplinary nature of altmetrics research and its impact across various domains. Overall, the analysis underscores the vibrant and multifaceted landscape of altmetrics research, with diverse sources contributing to its evolution and advancement.

Core sources by Bradford's law:

The figure 3 illustrates the application of Bradford's Law of Core Journals, a bibliometric principle that describes the distribution of scholarly articles across journals in a particular field. According to Bradford's Law, the number of articles published in a given subject area tends to follow a predictable pattern, with a few core journals publishing a significant portion of the literature, followed by a larger number of journals contributing progressively fewer articles.

Figure3: core journals by bradford's law



Source: Elaborated by author based on Scopus and biblioshiny.

The figure 3 presents data related to the Bradford Law of Core Journals, which describes the distribution of articles across journals in a given field.

Zone 1 comprises journals with the highest frequency of articles, indicating core journals that publish most research in the field. Scientometrics tops the list in Zone 1 with a frequency of 179 articles, followed by other influential journals such as the Journal of Informetrics and PLOS ONE.

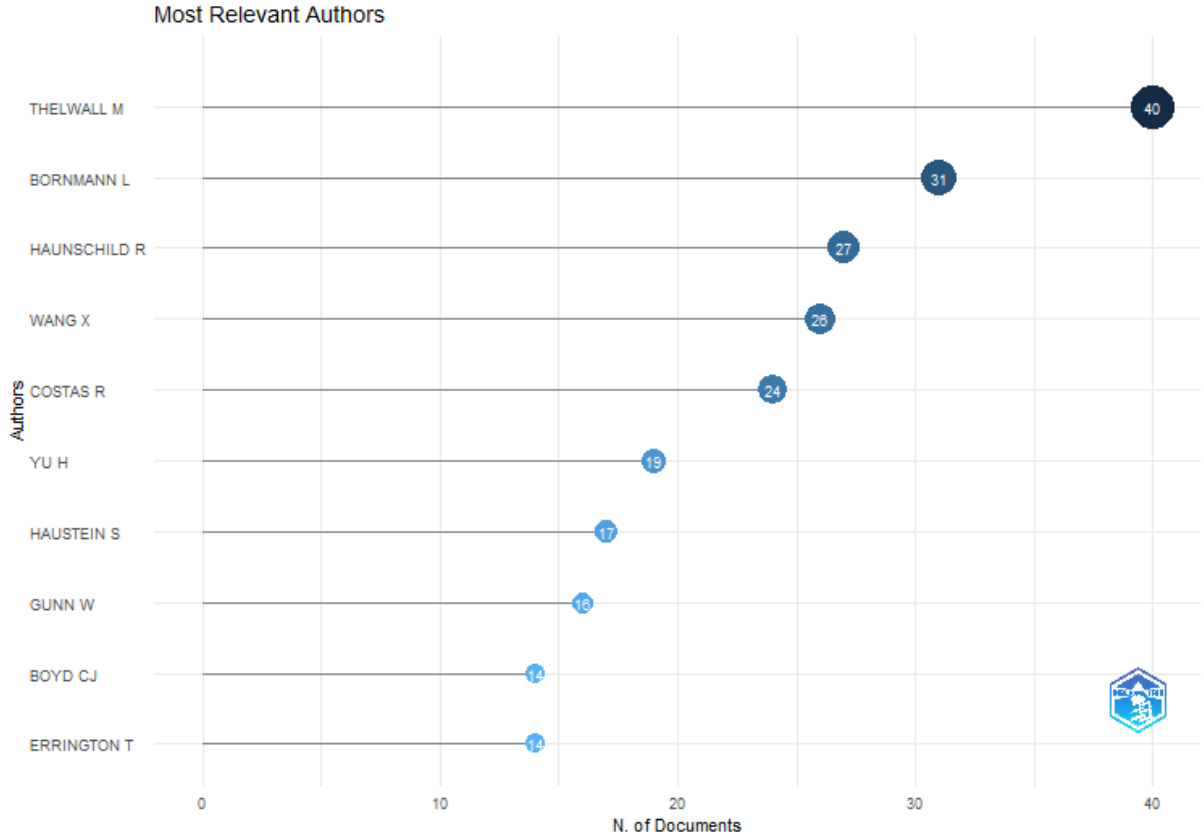
Zone 2 encompasses journals with fewer articles that contribute significantly to the field. Journals in this zone may cover specialized topics or niche areas within altmetrics research. Examples include the Journal of Information Science, Serials Review, and Journal of Medical Internet Research.

The data analysis provides insights into the distribution of research output across journals, highlighting core journals that dominate the field and lesser-known

journals that contribute to its diversity. This understanding is essential for researchers seeking to navigate the scholarly landscape and identify key sources for their research in altmetrics.

Most relevant authors:

Figure 4: most relevant authors

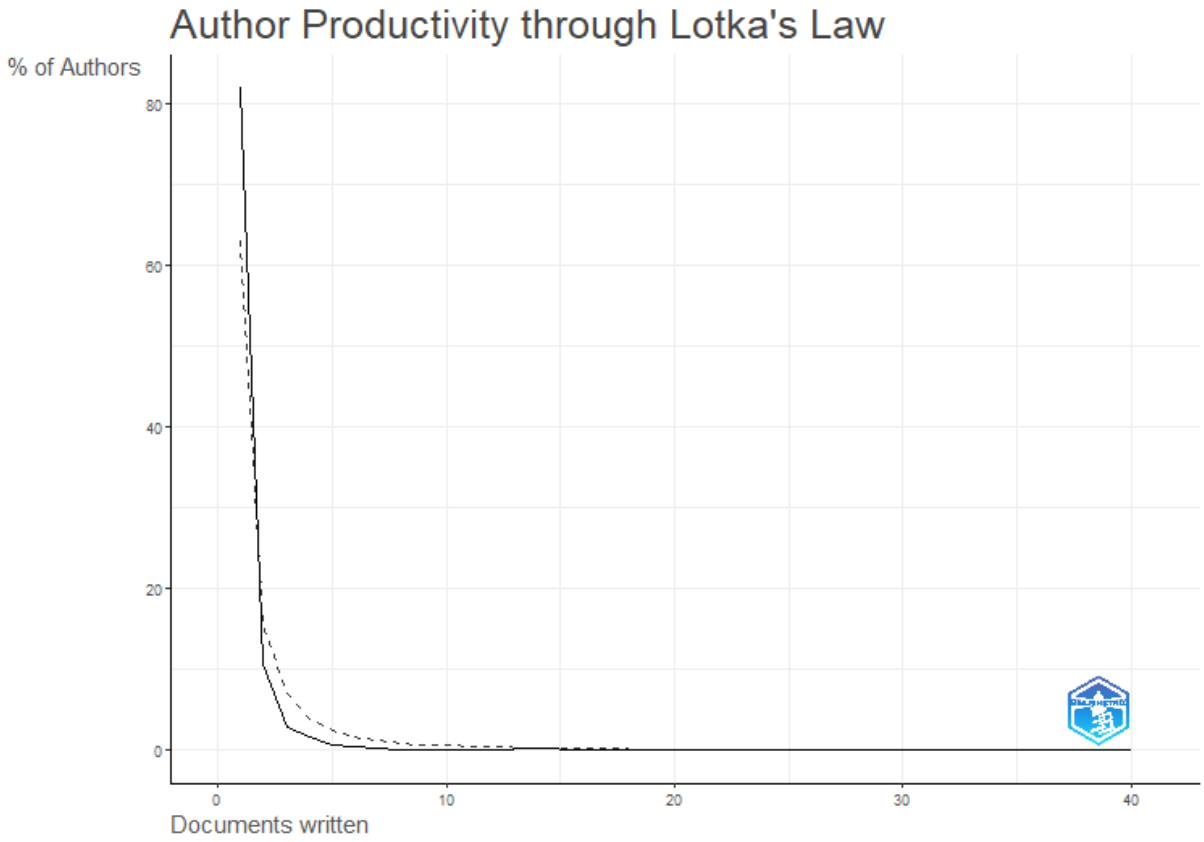


Source: Elaborated by author based on Scopus and biblioshiny.

Figure 4 provides a comprehensive understanding of their significance within the field. Mike Thelwall emerges as a standout figure 4 with 40 articles and an impressive H-index of 74, indicative of his substantial impact and authority in altmetrics research. Lutz Bornmann follows closely behind with 31 articles and an H-index of 62, further solidifying his prominence and contributions to the field. Rüdiger Haunschild has produced a significant amount of work. However, his 27 papers have a relatively low H-index of 22, indicating a less significant influence. This synthesis of quantitative data not only highlights the productivity of these authors but also offers valuable insights into their scholarly influence, enriching our understanding of the landscape of altmetrics research and the key figures shaping its discourse.

Author productivity through Lotka's law:

Figure 5: author productivity through Lotka's law.



Source: Elaborated by author based on Scopus and biblioshiny.

Figure 5 outlines the authors' distribution based on the number of articles they have published, forming the basis for an analysis of Lotka's Law of Productivity. Lotka's Law posits that the number of authors who have published specific articles decreases exponentially as the number of articles increases. By examining Figure 5, we observe a pattern where many authors have published only one article, with the frequency of authors decreasing as the number of articles published increases. This distribution aligns with Lotka's Law, which is further corroborated by plotting the data on a logarithmic scale. The resulting curve tends towards a power-law distribution, indicating adherence to Lotka's Law. Such analysis sheds light on the productivity distribution among authors, highlighting the disproportionate contribution of a few prolific authors compared to the majority who contribute fewer articles. Understanding this distribution is crucial for evaluating scholarly communication patterns and assessing the impact of research outputs, particularly in the context of altmetrics research, where quantifying scholarly influence is paramount.

Most relevant affiliation:

Table 3: most relevant affiliation

N	Affiliation	Country	Articles
01	DALIAN UNIVERSITY OF TECHNOLOGY	China	58
02	THE AFFILIATED HOSPITAL OF SOUTHWEST MEDICAL UNIVERSITY	China	57
03	WUHAN UNIVERSITY	China	57
04	HALLYM UNIVERSITY COLLEGE OF MEDICINE	South Korea	56
05	UNIVERSITY OF WOLVERHAMPTON	United Kingdom (UK)	48
06	LEIDEN UNIVERSITY	Netherlands	44
07	NANYANG TECHNOLOGICAL UNIVERSITY	Singapore	35
08	UNIVERSITY OF TORONTO	Canada	33
09	SCIENCE EXCHANGE	United States (US)	32
10	INFORMATION TECHNOLOGY UNIVERSITY	Pakistan	29

Source: Elaborated by author based on Scopus and biblioshiny.

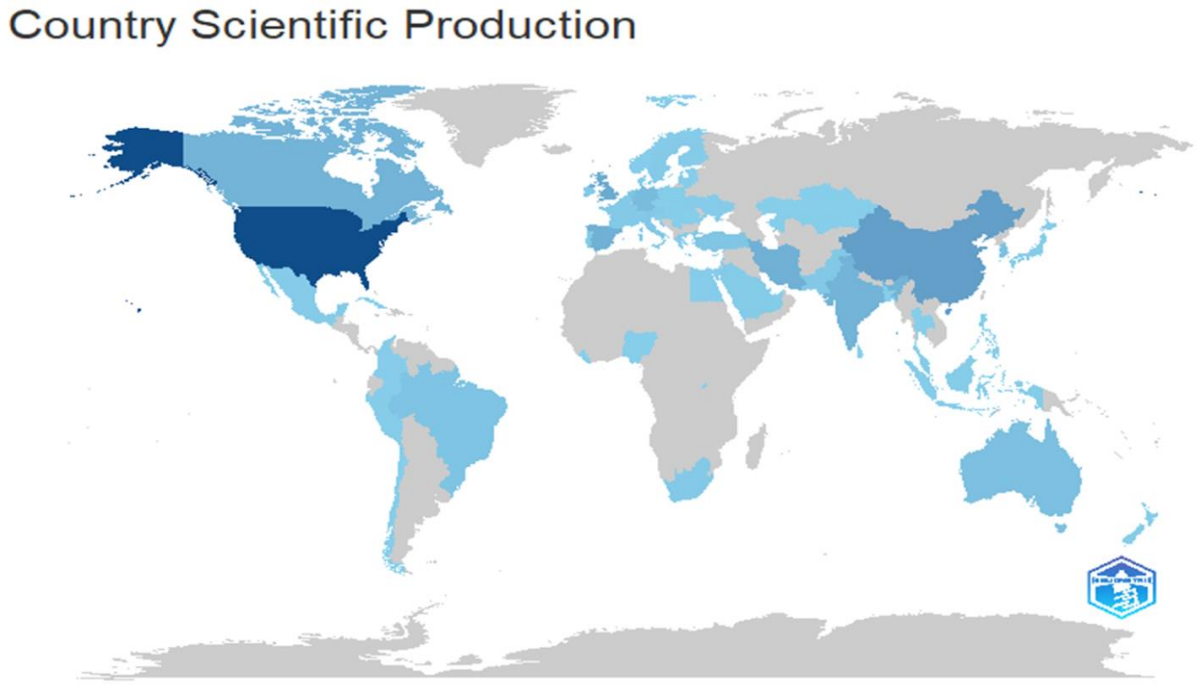
Table 3 provides insights into the most relevant affiliations within the realm of altmetrics. Dalian University of Technology, The Affiliated Hospital of Southwest Medical University, and Wuhan University are leading contributors, each boasting many articles, with 58, 57, and 57 publications, respectively. These institutions are closely followed by Hallym University College of Medicine, University of Wolverhampton, and Leiden University, each demonstrating substantial engagement in scholarly discourse with 56, 48, and 44 articles, respectively. The prominence of these affiliations underscores their active participation and influence within the academic community, particularly in the context of altmetrics, where the impact and visibility of research outputs are assessed. Furthermore, the diversity of affiliations in the table, ranging from universities to medical centers and research institutes, reflects the interdisciplinary nature of altmetrics research and its relevance across various academic domains. Such analysis offers valuable insights into the distribution of scholarly activity among different institutions and highlights the pivotal role these affiliations play in shaping the landscape of altmetrics.

Country scientific production:

Table 4: country scientific production.

Rank	Region	Freq
01	USA	1249
02	CHINA	436
03	UK	320
04	SPAIN	270
05	IRAN	268
06	CANADA	242
07	INDIA	241
08	GERMANY	161
09	AUSTRALIA	127
10	SOUTH KOREA	107
11	BRAZIL	93
12	NETHERLANDS	73
13	TURKEY	71
14	SINGAPORE	49
15	PAKISTAN	47

Figure 6 : country scientific production



Source: Elaborated by author based on Scopus and biblioshiny.

Table4 and figure 6 show the scientific production of countries within the domain of altmetrics, offering valuable insights into global research trends. The United States emerges as the most contributors, with a substantial frequency of 1249 publications, highlighting its dominant position in the field. Following closely behind are China and the United Kingdom, with frequencies of 436 and 320,

respectively, underscoring their significant contributions to scholarly discourse in altmetrics. Spain and Iran occupy the subsequent ranks, each demonstrating considerable scientific output with frequencies of 270 and 268, respectively. The presence of countries such as Canada, India, and Germany within the top ranks further elucidates the international scope and engagement in altmetrics research. This analysis provides a comprehensive overview of country-level scientific production in altmetrics, elucidating the distribution of research activity across different regions and emphasizing the global nature of scholarly endeavors in this domain.

Most cited documents:

Table 5: most 10 cited documents.

Paper	Article title	Total Citations
(Thelwall et al., 2013)	Do Altmetrics Work? Twitter and Ten Other Social Web Services	706
(Costas et al., 2015)	Do "altmetrics" correlate with citations? Extensive comparison of altmetric indicators with citations from a multidisciplinary perspective	506
(Zahedi et al., 2014)	How well developed are altmetrics? A cross-disciplinary analysis of the presence of 'alternative metrics' in scientific publications	273
(Haustein et al., 2015)	Characterizing social media metrics of scholarly papers: The effect of document properties and collaboration patterns	240
(Hou et al., 2018)	Emerging trends and new developments in information science: a document co-citation analysis (2009–2016)	218
(Mohammadi & Thelwall, 2014)	Mendeley readership altmetrics for the social sciences and humanities: Research evaluation and knowledge flows	217
(Holmberg & Thelwall, 2014)	Disciplinary differences in Twitter scholarly communication	216
(Sud & Thelwall, 2014)	Evaluating altmetrics	213
(Haustein et al., 2014)	Coverage and adoption of altmetrics sources in the bibliometric community	204
(Priem et al., 2012)	The Altmetrics Collection	198

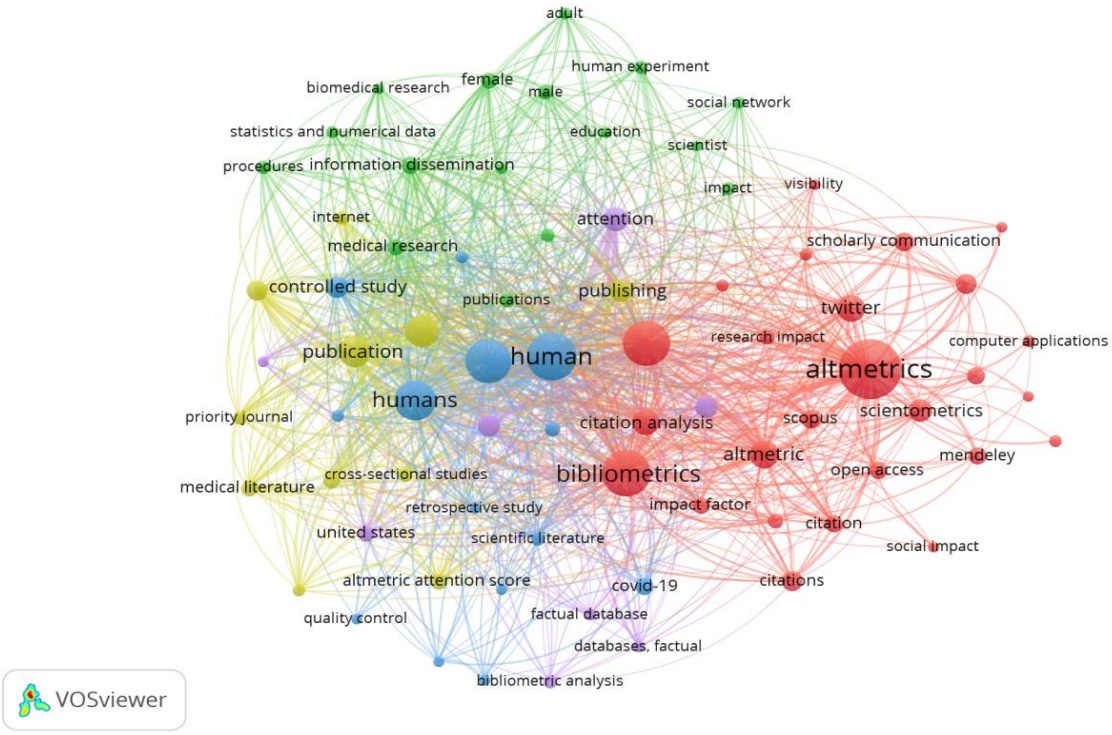
Source: Elaborated by author based on Scopus and biblioshiny.

Table 5 offers the most frequently cited documents in the field of altmetrics, highlighting significant research and important contributions to academic conversation. The study "Do Altmetrics Work?" by Thelwall et al. (2013) is at the top of the list. With a notable citation count of 706, the article "Twitter and Ten Other Social Web Services" holds considerable importance in assessing the effectiveness of altmetrics in measuring scholarly influence. The study conducted by Costas et al. (2015) investigates the relationship between altmetrics and

citations in different fields, resulting in 506 citations. Furthermore, it is worth noting that the research conducted by Zahedi et al. (2014), Haustein et al. (2015), and Hou et al. (2018) has made significant contributions to the field, as evidenced by their respective citation counts of 273, 240, and 218. The documents above explore various facets of altmetrics, encompassing the creation and acceptance of alternative metrics, the analysis of social media metrics, and emerging patterns in information science. The increasing importance and recognition of altmetrics in evaluating the impact of research and scholarly communication practices are highlighted by the prominence of these works.

Most relevant key words:

Figure 7: most relevant key words.



Source: Elaborated by author based on Scopus .VOSviewer and

Figure 7 presents an analysis of the most relevant terms in the field of altmetrics, emphasizing significant themes and concepts commonly found in academic literature. Significantly, the concepts of "bibliometrics," "social media," and "journal impact factor" are prominently included in conversations about the assessment and distribution of research, with frequencies of 505, 496, and 345, respectively. The increasing significance of metrics and online platforms in evaluating and conveying intellectual influence is shown by the popularity of these phrases. Furthermore, the use of terms like "human," "humans," and "article" signifies a concentration on research that centers around humans and scholarly publications, highlighting a significant emphasis on the involvement of

individuals and their contributions to academic conversations. Moreover, "attention" and "altmetrics" signify the growing focus on alternative metrics and the necessity to supplement conventional citation-based measurements with more comprehensive indications of research influence. It provides valuable insights into the emerging environment of scholarly communication and assessment techniques by elucidating the dominant themes and concepts within the altmetrics literature.

Conclusion:

In conclusion, this bibliometric study offers a comprehensive overview of the altmetrics landscape, highlighting key trends and influential scientists shaping scholarly discourse from 2012 to 2024. The analysis encompasses a corpus of 1236 documents, revealing scientometrics as a prominent source and authors like Mike Thelwall as significant contributors. The dominance of the United States in publication frequency underscores its pivotal role in driving altmetrics research.
The most cited document, "Do Altmetrics Work?" by Thelwall et al. (2013), underscores the enduring relevance of seminal works in shaping altmetrics research. Furthermore, the prominence of key concepts such as "bibliometrics," "social media," and "journal impact factor" highlights the multidimensional nature of altmetrics research.
Future research endeavors could explore the evolving landscape of altmetrics, particularly in emerging fields such as artificial intelligence and data science. Additionally, there is a need to delve deeper into the integration of altmetrics into scholarly evaluation frameworks, addressing challenges such as data quality and standardization. By advancing our understanding of altmetrics, researchers can better navigate the complex dynamics of scholarly communication in the digital age and inform evidence-based decision-making in academia.

Foot note:

1. Bornmann, L. (2015). Alternative metrics in scientometrics: A meta-analysis of research into three altmetrics. *Scientometrics, 103*(3), 1123–1144. Scopus. https://doi.org/10.1007/s11192-015-1565-y
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 ISSN 2830-8379 (print) ISSN 2800-1273 (online)