

# THE ROLE OF TWITTER IN BUSINESS, ECONOMICS, AND FINANCE RESEARCH: A BIBLIOMETRIC ANALYSIS

DIAN KURNIANINGRUM<sup>1</sup>, NUGRAHA NUGRAHA<sup>2</sup>, DISMAN DISMAN<sup>3</sup>, BUDI SUPRIATONO PURNOMO<sup>4</sup>, MUYANI KARMAGATRI<sup>5</sup>

<sup>1,5</sup>Bina Nusantara University, Entrepreneurship Department, Jakarta, Indonesia

<sup>1,2,3,4</sup> Universitas Pendidikan Indonesia, Management Study Program, Bandung, Indonesia

E-mail: <sup>1</sup>dian\_k@binus.ac.id

## ABSTRACT

The Twitter application was launched in 2006 and quickly became popular. In line with the increasing popularity of Twitter, many studies have linked the role of Twitter with business, economic and financial development. This bibliometric research aims to provide an overview of research developments regarding the role of Twitter in business, management, accounting, economics, econometrics, and finance and provide insight into what topics have not been touched on for research. This research retrieves journal publication data from Scopus and then visualises the data to provide an overview of the journal's contribution and performance using VOS viewer. This report will be divided into research background, bibliometric method, research methods, research results (publication structure, citation structure, and graphical analysis of publications), and research conclusion. The author and country who publish most related articles come from the United States. The publisher which publishes the most is an information system and information management publisher; the other productive publisher is the one that specialises in business, management, and marketing. Keywords that often arise beside Twitter are social media, sentiment analysis, Facebook, Covid-19, social networks, machine learning, big data, text mining, and natural language processing. The research conclusion contains key funding from bibliographic analysis and the study's limitations. To enrich the studies, other researchers can utilise different data sources, such as the Web of Science and Google Scholar, which can also be used as references. Additional data processing, such as Cite Space and SciVal, can also be added to deepen the analyses.

**Keywords:** *Twitter, Bibliometric analysis, Business, Economics, Finance.*

## 1. INTRODUCTION

Twitter is a microblogging application launched in 2006 [1]. Users are allowed to share 140 characters in this application, and the sharing is then known as "tweets" [2]. The popularity of Twitter then increasingly uphill. Twitter has become the seventh most used social media application in the world. As of January 2023, Twitter users worldwide have reached 556 million, which has increased by 27.4% compared to the previous period [3].

In line with the increasing popularity of Twitter, many studies have linked the role of Twitter with business and economic development. Twitter is an important source of information that is widely accessed by the public and a source of data that business and economic researchers can utilise. Twitter can provide real-time access and opinions from various diverse sources. From Twitter, researchers can obtain market information and social trends. The data collected is then analysed using

sentiment analysis. The research conclusion can provide an overview of overall market conditions and solve existing problems.

This bibliometric research was conducted to analyse scientific publications about the role of Twitter in business, economic and finance. This study aims to provide an overview of research developments regarding the role of Twitter in business, economics and finance. This study also provide insight into what topics have not been researched to find research novelty.

Research results using a bibliometric approach have been published in many reputable journals worldwide. Bibliographical data was compiled to identify tendencies and patterns of scientific publications and their influence on the academic community. Altarturi et al. [4] utilise bibliometric analysis to map research related to agricultural e-commerce. This research describes the most recent and popular topics widely researched regarding agricultural e-commerce [4]. Martinez-Lopez et al.

[5] used bibliometric analysis to map European Journal of Marketing publications. This research retrieves journal publication data from Scopus, then visualises the data to provide an overview of the journal's contribution and performance [5]. Bai and Li [6] researched e-commerce developments using co-word analysis. Researchers found that the development of e-commerce research was in line with the development and application of technology in society [6]. Nahr and Heikkila et al. [7] utilise bibliometric analysis to map research related to green finance. The study aims to find the latest issues related to green finance [7]. Nobanee and Ellili [8]

mapped out research on stock memes. Meme stocks are stocks that have gained popularity as a result of social sentiments [8]. Bahuguna et al. [9] in their research attempted to map research on the topic of green human resources. Researchers observed research changes related to green human resources management for seventeen years to discover what had not been mapped in green human resources management research [9]. Based on previous bibliographic research, Donthu et al. [10] compiled an overview or guidelines that researchers interested in doing a bibliometric analysis can utilise [10].

Table 1: Annual Citation Structure (Based on Scopus Base Data)

Year	Total Paper (TP)	Total Citacions (TC)	TC/TP	≥ 100	≥ 50	≥ 25	≥ 10
2006	0	0	-	0	0	0	0
2007	2	1	0,50	0	0	0	0
2008	7	37	5,29	0	0	0	0
2009	25	1481	59,24	2	5	6	7
2010	74	4728	63,89	13	14	20	27
2011	130	7240	55,69	29	41	55	72
2012	101	5144	50,93	12	19	32	45
2013	203	11023	54,30	25	43	68	102
2014	169	5966	35,30	17	34	52	88
2015	273	5540	20,29	19	41	83	126
2016	254	7083	27,89	14	37	68	127
2017	314	6890	21,94	8	36	82	149
2018	340	6743	19,83	16	43	87	140
2019	428	5144	12,02	6	16	62	152
2020	475	5488	11,55	4	24	68	162
2021	482	3126	6,49	1	4	24	98
2022	531	932	1,76	0	0	2	17
2023	82	63	0,77	0	0	1	1

This research report will be divided into several parts. The first part contains the research background. In the second part, the researcher will briefly explain the bibliometric method. The third part contains research methods from bibliometric analysis, while the fourth part presents the results. The research results presented in this paper include a bibliometric analysis of a collection of published articles. The fourth part presents the publication structure, citation structure, and graphical analysis of publications with related themes. The fifth part is the research conclusion, which contains key funding

from bibliographic analysis and the study's limitations.

## 2. BIBLIOMETRIC METHODS

Bibliometric analysis has become one of the most popular analyses used in research. Researchers use bibliometric analysis for various reasons, such as to discover the latest research trends, finding collaboration patterns, determining novelties, and exploring certain topics from previous research[11]. This analysis's popularity has coincided with technological advances, which have led to the availability of accessible scientific databases such as

Scopus, Google Scholar, and Web of Science. This integration promotes bibliometric Technological developments have also encouraged methodologies, commonly used in information the emergence of bibliometric software such as science, shifting to business research. Gephi, Leximar, and VOS viewer [10]. Another cause is the mixing of cross-disciplinary research.

Table 2: Publication Rating Based on Number of Citations.

Rank	Cited by	Titles	Authors	Year
1	8251	Users of the world, unite! The challenges and opportunities of Social Media	Kaplan A.M.; Haenlein M [12]	2010
2	2529	Social media? Get serious! Understanding the functional building blocks of social media	Kietzmann J.H.; Hermkens K.; McCarthy I.P.; Silvestre B.S. [13]	2011
3	927	We're all connected: The power of the social media ecosystem	Hanna R.; Rohm A.; Crittenden V.L.[14]	2011
4	908	Emotions and information diffusion in social media - Sentiment of microblogs and sharing behavior	Stieglitz S.; Dang-Xuan L.[15]	2013
5	814	You are where you tweet: A content-based approach to geo-locating Twitter users	Cheng Z.; Caverlee J.; Lee K. [16]	2010
6	812	What drives social commerce: The role of social support and relationship quality	Liang T.-P.; Ho Y.-T.; Li Y.-W.; Turban E.	2011
7	785	The impact of new media on customer relationships	Hennig-Thurau T.; Malthouse E.C.; Friege C.; Gensler S.; Lobschat L.; Rangaswamy A.; Skiera B. [17]	2010
8	691	Custodians of the internet: Platforms, content moderation, and the hidden decisions that shape social media	Gillespie T. [18]	2018
9	603	How large U.S. companies can use twitter and other social media to gain business value	Culnan M.J.; McHugh P.J.; Zubillaga J.I. [19]	2010
10	589	Social media competitive analysis and text mining: A case study in the pizza industry	He W.; Zha S.; Li L. [20]	2013
11	572	Introduction to the special issue social commerce: A research framework for social commerce	Liang T.-P.; Turban E. [21]	2011
12	554	How Does Brand-related User-generated Content Differ across YouTube, Facebook, and Twitter?	Smith A.N.; Fischer E.; Yongjian C. [22]	2012
13	504	Social media as a destination marketing tool: Its use by national tourism organisations	Hays S.; Page S.J.; Buhalis D. [23]	2013
14	486	Technology acceptance model (TAM) and social media usage: An empirical study on Facebook	Rauniar R.; Rawski G.; Yang J.; Johnson B. [24]	2014
15	486	Is the medium the message? Perceptions of and reactions to crisis communication via twitter, blogs and traditional media	Schultz F.; Utz S.; Göritz A. [25]	2011
16	457	Community intelligence and social media services: A rumor theoretic analysis of tweets during social crises	Oh O.; Agrawal M.; Rao H.R. [26]	2013

Table 2: Publication Rating Based on Number of Citations (Continued)

Rank	Cited by	Titles	Authors	Year
17	454	Geo-located Twitter as proxy for global mobility patterns	Hawelka B.; Sitko I.; Beinat E.; Sobolevsky S.; Kazakopoulos P.; Ratti C. [27]	2014
18	444	Social interaction via new social media: (How) can interactions on Twitter affect effectual thinking and behavior?	Fischer E.; Reuber A.R. [28]	2011
19	430	Engaging stakeholders through Twitter: How nonprofit organisations are getting more out of 140 characters or less	Lovejoy K.; Waters R.D.; Saxton G.D. [29]	2012
20	410	Predicting crime using Twitter and kernel density estimation	Gerber M.S. [30]	2014
21	405	Classifying latent user attributes in Twitter	Rao D.; Yarowsky D.; Shreevats A.; Gupta M. [31]	2010
22	376	Keeping up with the digital age: How the American Red Cross uses social media to build relationships	Briones R.L.; Kuch B.; Liu B.F.; Jin Y. [32]	2011
23	364	Following celebrities' tweets about brands: The impact of Twitter-based electronic word-of-mouth on consumers source credibility perception, buying intention, and social identification with celebrities	Jin S.-A.A.; Phua J.[33]	2014
24	361	Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: Trends, OGC standards and application examples	Kamel Boulos M.N.; Resch B.; Crowley D.N.; Breslin J.G.; Sohn G.; Burtner R.; Pike W.A.; Jezierski E.; Chuang K.-Y.S.[34]	2011
25	355	Are social media replacing traditional media in terms of brand equity creation?	Bruhn M.; Schoenmueller V.; Schäfer D.B. [35]	2012
26	333	Social Media in Disaster Risk Reduction and Crisis Management	Alexander D.E. [36]	2014
27	326	Dialogic communication in 140 characters or less: How Fortune 500 companies engage stakeholders using Twitter	Rybalko S.; Seltzer T. [37]	2010
28	325	Topic sentiment analysis in twitter: A graph-based hashtag sentiment classification approach	Wang X.; Wei F.; Liu X.; Zhou M.; Zhang M. [38]	2011
29	318	The impact of social and conventional media on firm equity value: A sentiment analysis approach	Yu Y.; Duan W.; Cao Q. [39]	2013
30	317	Insights from hashtag #supplychain and Twitter analytics: Considering Twitter and Twitter data for supply chain practice and research	Chae B [40]	2015
31	317	Spatial, temporal, and socioeconomic patterns in the use of twitter and flickr	Li L.; Goodchild M.F.; Xu B. [41]	2013

Table 2: Publication Rating Based on Number of Citations (Continued)

Rank	Cited by	Titles	Authors	Year
32	314	Economic uncertainty before and during the COVID-19 pandemic	Altig D.; Baker S.; Barrero J.M.; Bloom N.; Bunn P.; Chen S.; Davis S.J.; Leather J.; Meyer B.; Mihaylov E.; Mizen P.; Parker N.; Renault T.; Smietanka P.; Thwaites G. [42]	2020
33	314	Tweet sentiment analysis with classifier ensembles	Da Silva N.F.F.; Hruschka E.R.; Hruschka E.R., Jr.[43]	2014
34	307	Impacts of luxury fashion brand's social media marketing on customer relationship and purchase intention	Kim A.J.; Ko E. [44]	2010
35	305	Crisis communication online: How medium, crisis type and emotions affected public reactions in the Fukushima Daiichi nuclear disaster	Utz S.; Schultz F.; Glocka S.[45]	2013
36	301	How is the mobile internet different? Search costs and local activities	Ghose A.; Goldfarb A.; Han S.P. [46]	2013
37	294	The structural virality of online diffusion	Goel S.; Anderson A.; Hofman J.; Watts D.J.[47]	2016
38	294	The role of dissemination in market liquidity: Evidence from firms' use of Twitter™	Blankespoor E.; Miller G.S.; White H.D. [48]	2014
39	287	Engagement with Social Media and Social Media Advertising: The Differentiating Role of Platform Type	Voorveld H.A.M.; van Noort G.; Muntinga D.G.; Bronner F. [49]	2018
40	275	Intrinsic vs. image-related utility in social media: Why do people contribute content to Twitter?	Toubia O.; Stephen A.T.[50]	2013
41	273	Electronic word-of-mouth and online reviews in tourism services: The use of twitter by tourists	Sotiriadis M.D.; van Zyl C. [51]	2013
42	252	Does Twitter matter? The impact of microblogging word of mouth on consumers' adoption of new movies	Hennig-Thurau T.; Wiertz C.; Feldhaus F. [52]	2015
43	251	Beyond the geotag: Situating 'big data' and leveraging the potential of the geoweb	Crampton J.W.; Graham M.; Poorthuis A.; Shelton T.; Stephens M.; Wilson M.W.; Zook M. [53]	2013
44	249	Whose and what chatter matters? the effect of tweets on movie sales	Rui H.; Liu Y.; Whinston A. [54]	2013
45	248	TOM: Twitter opinion mining framework using hybrid classification scheme	Khan F.H.; Bashir S.; Qamar U. [55]	2014
46	244	Tweets and trades: The information content of stock microblogs	Sprenger T.O.; Tumasjan A.; Sandner P.G.; Welpel I.M.[56]	2014
47	243	The early bird catches the news: Nine things you should know about micro-blogging	Kaplan A.M.; Haenlein M.[57]	2011
48	241	Mining topic-level influence in heterogeneous networks	Liu L.; Tang J.; Han J.; Jiang M.; Yang S. [58]	2010
49	240	Predicting information credibility in time-sensitive social media	Castillo C.; Mendoza M.; Poblete B. [59]	2013
50	239	Tweet, tweet, tweet: A content analysis of nonprofit organisations' Twitter updates	Waters R.D.; Jamal J.Y. [60]	2011

Table 3: Authors Based on Number of Publications

Rank	Author	University	Country	Document
1	Rui, H.	University of Rochester	United States	12
2	Naraine, M.L.	Brock University	Canada	9
3	Saxton, G.D.	York University	Canada	9
4	Burton, S.	Brock University	Canada	8
5	Caverlee, J.	Texas A and M University	United States	8
6	Liu, X.	New York University	United States	8
7	Pegoraro, A.	Laurentian University	Canada	8
8	Saura, J.R.	Juan Carlos University	Spain	8
9	Shokouhyar, S.	Shahid Beheshti University	Iran	8
10	Soboleva, A.	University of Western Sydney	Australia	8
11	Kar, A.K.	Indian Institute of Technology	India	7
12	Liu, H.	Arizona State University	United States	7
13	Shen, D.	Nankai University	China	7
14	Stieglitz, S.	University of Duisburg-Essen	Germany	7
15	Abeza, G.	Towson University	United States	6
16	Araujo, T.	University of Amsterdam	Netherlands	6
17	Etter, M.	King's College London	United Kingdom	6
18	Ganguly, N.	Indian Institute of Technology Kharagpur	India	6
19	Gloor, P.A.	MIT Center for Collective Intelligence	United States	6
20	He, W.	National Science Foundation	United States	6
21	Mirbabaie, M.	University of Bremen	United States	6
22	Nakagawa, J.	Komazawa University	Japan	6
23	Tiago, F.	Universidade dos Açores	Portugal	6
24	Watanabe, N.M.	University of South Carolina	United States	6
25	Yan, G.	University of South Carolina	United States	6
26	Ye, X.	Texas A&M University	United States	6
27	Anagnostopoulos, C.	Hamad Bin Khalifa University	Qatar	5
28	Bala, P.K.	Indian Institute of Management Ranchi	India	5
29	Becken, S.	University of Surrey	United Kingdom	5
30	Bouri, E.	Lebanese American University	Lebanon	5

Core data from bibliometric analysis tends to be massive and objective. However, the results of the study can be objective and subjective [10]. The results of the bibliometric analysis can be used to describe and map cumulative scientific knowledge from previously unstructured researched fields. The results of a good bibliometric study can be a solid foundation for advancing a knowledge area because its results allow researchers to get an overview in just one step, identify research gaps, and find new ideas from research.

Initial discussions related to the bibliometric analysis itself started in 1950 [61], so it can be said that bibliometric analysis is not new. Bibliometric analysis was originally part of library and information science [10]. But now, the method is developing and used in other fields of science.

Based on data retrieved from Scopus on 3 April, 2023, using the keyword “bibliometric” in the fields “Business, Management, and Accounting” and “Economics, Econometrics, and Finance,” the number of publications with related keywords has reached 4870 publications. This achievement was

driven by the progress of the development of scientific research itself. The availability of large data sets has made the classic review method impractical [62]. Currently, many researchers have used bibliometric analysis in the field of electronic commerce [4], [6], [7], [63], finance [8], [64], [65], human resources [9], [66], [67], management [68]–[71], and marketing [72], [73].

A part from bibliometric analysis, there are other analytical tools commonly used by researchers to process large datasets, meta-analysis, and systematic literature review [74]. Similar to bibliometric analysis, meta-analysis is classified as a quantitative

analysis that uses large amounts of literature data, but the literature used tends to be homogeneous or less diverse. Meta-analysis also produces publication bias, which can negatively impact research validity [10]. Systematic literature review uses a classic approach; it will be better to be used in a narrow, focused, and limited scope. Systematic literature is used in niche research. The number of papers reviewed was also limited. The number ranges from 40 to 300 documents [75]. Systematic reviews rely on qualitative techniques, so they are vulnerable to bias in the authors' interpretation [76].

Table 4: Publisher and Key Word of the Publication.

Rank	Resources	Document	Key Word	Document
1	International Conference On Information And Knowledge Management Proceedings	208	Social Media	1422
2	Public Relations Review	79	Twitter	1194
3	International Journal Of Recent Technology And Engineering	68	Social Networking (online)	958
4	Developments In Marketing Science Proceedings Of The Academy Of Marketing Science	63	Sentiment Analysis	366
5	Lecture Notes In Business Information Processing	62	Facebook	237
6	Knowledge Based Systems	61	Knowledge Management	199
7	Technological Forecasting And Social Change	36	Data Mining	176
8	Journal Of Business Research	34	Machine Learning	159
9	International Journal Of Information Management	33	Social Networks	150
10	Decision Support Systems	31	Big Data	147
11	International Journal Of Scientific And Technology Research	31	COVID-19	
12	Internet Research	29	Social Network	120
13	Springer Proceedings In Business And Economics	29	Marketing	107
14	International Journal of Sport Communication	28	Text Mining	102
15	Cartography And Geographic Information Science	27	Internet	98
16	Public Administration And Information Technology	26	Social Media Platforms	91
17	Strategic Direction	26	Classification of Information	82
18	Cities	22	Commerce	81
19	Big Data and Cognitive Computing	20	Forecasting	77
20	Humanities And Social Sciences Communications	20	Social Network Analysis	74
21	Journal Of Political Marketing	20	Learning Systems	72
22	Technology In Society	20	Natural Language Processing	69
23	Business Horizons	19	Semantics	66
24	Journal Of Communication Management	19	Information Management	65
25	ACM Transactions on Information Systems	17	Behavioral Research	63



Tabel 4: Publisher and Key Word of the Publication (Continued)

Rank	Resources	Document	Key Word	Document
26	Corporate Communications	17	Natural Language Processing Systems	63
27	Journal Of Contingencies and Crisis Management	17	Communication	61
28	Research Anthology on Strategies Using Social Media As A Service And Tool In Business	17	Microblogging	60
29	Finance Research Letters	16	Social Networking Sites	60
30	International Journal of Advertising	16	Sales	59

According to Donthu [10], researchers can take four steps to compile a bibliometric analysis. The four steps are: defining the objectives and scope of the bibliometric study, choosing a bibliometric analysis technique, collecting data, conducting a bibliometric analysis, and reporting the research findings [10].

In the first step, defining the purpose and scope of the study, the researcher is asked to describe the topic to be analysed. The issue to be chosen must have a broad reach so that the analysis results will be met the expectation [77].

The second step is to choose a bibliometric analysis technique. The selection of analytical methods must be adjusted to the research objectives. Two approaches can be used in conducting a bibliometric analysis, performance analysis and science mapping [10]. Performance analysis examines the contribution of each basic research topic in a particular field. This analysis is descriptive, following the characteristics of bibliometric analysis. Performance analysis reviews research profiles that include authors, institutions, countries, and journals. Science mapping examines the relationship between basic research topics. Science mapping techniques include a citation, co-citation, bibliographic coupling, co-occurrence, and coauthorship analysis.

The third step is to collect data. After choosing a bibliometric analysis technique, researchers are advised to determine the main topics that will be used as the basis for research; these topics must have a large and broad scope but focus on a particular field of study [74]. The researcher must also consider where to get the database. Different database sources have different formats. So, it's good for researchers to focus on pulling data from just one database [78]. After the withdrawal, the dataset must be cleaned.

The final step in the bibliometric analysis is to conduct the bibliometric analysis and report the

findings. Researchers carried out bibliometric analysis, both performance analysis and scientific mapping. The analysis results are then discussed and concluded in a report. In this report, the researcher also conveys findings that can help those who read the report.

### 3. RESEARCH METHODS

Twitter microblogging has become an important data source for researchers in the last few decades. This study uses a bibliometric analysis approach to present data regarding research related to social media Twitter in the fields of business, management, accounting, economics, econometrics and finance. Furthermore, it is hoped that the results of this study will provide an overview to the readers regarding research topics in related fields that have not been studied.

Specifically, this study aims to answer several questions. The first question is how are the publication structure and citation of Twitter topics in business, economics, and finance. The second question is how to analyze the co-citation, bibliographic coupling, and co-occurrence of publications on Twitter topics in business, economics, and finance.

Researchers need a large amount of paper data to make a bibliometric analysis. The data for the paper were pulled from the Scopus database on 23 February, 2023. The data needed is the paper title, abstract, keywords, author, researcher affiliation, citation, year of paper publication, country, and publisher. Data were retrieved using the keyword "Twitter"; the fields are limited to "Business, Management, and Accounting" and "Economics, Econometrics, and Finance." Papers withdrawn are limited to English papers only. Based on data retrieved from Scopus using predetermined limits, it is known that 3891 papers discuss this topic.



The data is then analysed using performance analysis and scientific mapping. Researchers use VOS viewer software to help make maps based on co-citation, bibliographic coupling, and co-occurrence.

#### 4. RESEARCH RESULT

From the data collection results, the researcher will divide the analysis into two parts. In the first part, the researcher will conduct a performance

analysis, then proceed with scientific mapping. In performance analysis, researchers will analyse the structure of publications and citations. Then researchers will discuss papers, authors, institutions, publishers, and countries considered the most productive in conducting research. In the science mapping section, researchers will analyse these journals' co-citation, bibliographic coupling, and co-occurrence.

Table 5: University and Country Rankings

Rank	University	Document	Country	Document
1	The University of Texas at Austin	25	United States	1234
2	University of South Carolina	25	India	393
3	University of Georgia	25	United Kingdom	344
4	Arizona State University	24	China	210
5	University of Florida	23	Germany	191
6	Bina Nusantara University	23	Spain	185
7	Temple University	22	Australia	181
8	Texas A&M University	21	Canada	158
9	Universiteit van Amsterdam	20	Italy	138
10	Indiana University Bloomington	20	Indonesia	110
11	Massachusetts Institute of Technology	20	Netherlands	89
12	Tsinghua University	19	France	84
13	Kansas State University	18	Turkey	79
14	Hong Kong Polytechnic University	18	South Korea	77
15	Universidad Rey Juan Carlos	18	Malaysia	68
16	University of Maryland, College Park	18	Hong Kong	63
17	Indian Institute of Technology Delhi	18	Japan	57
18	Griffith University	18	Switzerland	52
19	Amity University	18	New Zealand	47
20	University of Massachusetts Amherst	17	Ireland	44
21	Pennsylvania State University	16	Saudi Arabia	44
22	Nanyang Technological University	16	South Africa	43
23	Queensland University of Technology	16	Singapore	42
24	Deakin University	16	Greece	39
25	University of Birmingham	16	Portugal	37
26	Peking University	15	Russian Federation	37
27	Northeastern University	15	Sweden	37
28	York University	15	Iran	36
29	Universitas Indonesia	15	Brazil	35
30	West Virginia University	14	Denmark	35

#### 4.1 Publication Structure and Citation

Twitter was first launched in 2006 (Java et al., 2009). Based on data pulled from Scopus, Twitter publications relating to Business, Management, Accounting, Economics, Econometrics, and Finance were first conducted in 2007. Over time, the number of studies on Twitter-related topics continued to grow. Figure 1 provides an overview of the number of Twitter publication documents in business, management, accounting, economics, econometrics, and finance from 2006 until data was collected, 23 February, 2023. In Figure 1, it can be seen that the publication trend of related topics has an increasing trend, 2022 was the most productive year. The number of publications in that year reached its peak. A more detailed description of the publication structure is presented in Table 1.

The structure of journals with Twitter topics in the fields of business, management, accounting, economics, econometrics, and finance is presented in Table 1. The initial research was conducted in early 2007, the number of publications on related topics has continued to increase from year to year. In 2022 the number of papers with related topics reach 531 publications. However, the highest number of citations was in 2013 with a total of 11,023 citations. In terms of the proportion of total citations to total papers, the highest proportion was in 2011 reaching 55.90. The second highest proportion was in 2013 with a ratio of 54.30, followed by 2012 with a proportion of 50.93. Papers with citations above 100 were made the most in 2011, with 29 documents. The second position was in 2013; there were 25 papers with more than 100 citations. A complete description of large-impact publications is described in Table 2.

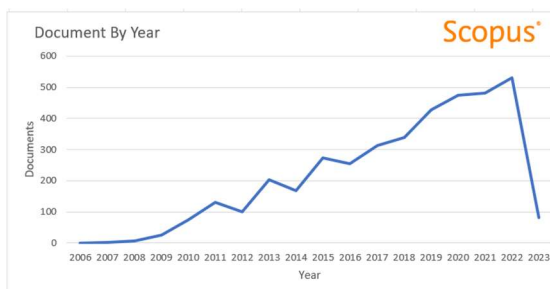


Figure 1: Number of Twitter Publications (1 January 2006-23 February 2023).

Table 2 presented data related to the 50 paper publications with the highest number of citations published on Scopus. The most cited paper is from Kaplan et al. [12]. The paper clarifies social media definition. This paper was mentioned 8,251 times. The second most cited paper is from Kietzmann et

al. [13], with 2,529 citations. This paper studied how social media could impact a firm's reputation, sales, and life. Next are documents cited 900 times, the article from Hanna et al. [14] with 927 citations, gives business insight into how to use social media to achieve their objectives, and the paper from Stieglitz et al. [15] with 908 citations, introduced sentiment analysis to proof how emotions and information diffusion could affect the social media user. The report from Cheng et al. [16] was cited 814 times. This article discusses how to utilise Twitter to predict user location that can be used to map business consumers. Another article with many citations is from Liang et al. [79] cited 812. This article discusses social commerce and how to maximise its use.

According to data from Table 2, the papers included in the list of the 50 most cited papers were from 2013. Thirteen papers with related topics were published then and had high citation ratings. The publication in 2011 contributed eleven papers that were classified as papers that had a high citation level. Then followed by publications in 2014 with nine publications and in 2010 with eight publications.

Table 3 presents the data of authors who have published the most papers with related subjects. H. Rui of the University of Rochester, United States, authorises the most published works on related topics. Based on data from Scopus, H. Rui has published 12 works. Next rank is held by Naraine from Brock University Canada and Saxton from York University Canada, each person published 9 papers. Author from United State are author who published most paper. The are eleven United States author that include in the list; Rui, H from University of Rochester, Caverlee, J. from Texas A&M University, Liu, X. from New York University, Liu, H. from Arizona State University, Abeza, G. from Towson University, Gloor, P.A from MIT Center for Collective Intelligence, He, W. from National Science Foundation, Mirbabaie, M. from University of Bremen, Watanabe, N.M. from University of South Carolina, Yan, G. from University of South Carolina, Ye, X. from Texas A&M University, and Becken, S. from University of Surrey.

Analysis of publication structure and citations is continued by presenting data on 30 publishers that publish the most on related topics, 30 keywords that appear the most in published documents, 30 universities that produce the most published papers, and 30 countries that most often publish articles on related topics. The data is presented in Table 4 and Table 5

The most productive publishers in publishing papers on related issues as shown in Table 4 are the International Conference on Information and Knowledge Management Proceedings, with a total of 208 articles; Public Relations Review, with a total of 79 paper publications; and the International Journal Of Recent Technology And Engineering with a total of 68 papers. The keyword that appears most often in publishing documents with related topics, as shown in Table 4, is “social media,” used in 1422 documents. The next keyword is “Twitter,” which is found in 1194 documents, and the keyword “social network (online),” which appears in 958 documents. The universities that published the most papers with related themes, as shown in Table 5, were The University of Texas at Austin, the University of South Carolina, and the University of Georgia, with 25 articles each. Then followed by Arizona State University, with 24 papers published, and the University of Florida and Bina Nusantara University, with 23 papers each. The countries that published the most papers on related topics, as shown in Table 5, were the United States, with a total of 1,234 documents, India, with 393 articles, the United Kingdom, with 344 publications; and followed by China, with a total of 210 papers.

#### 4.2 Graphical Analysis of Publications

To deepen and complete the bibliometric analysis, the researcher uses graphical network mapping, a program capable of visualizing publication datasets. The tool used in this research is VOS viewer 1.6.17 which Eck and Watzman popularised [10], [80]. The VOS viewer visualisation results are like dots or circles with a certain distance and colour. The circles or dots on the map indicate the proportion of citation weights for each label. The greater the size of the circles, the more the weight of the citation. The colour of the links is based on the cluster division. Cluster analysis is used to identify interrelated groups in co-citation maps, bibliographic coupling, or co-occurrence analysis. While the distance between points describes the relationship and strength between each network (link strength). The farther the distance, the greater the attachment, and vice versa. First, this study will analyse co-citations from a collection of journals based on the Scopus database. Then the analysis will be continued with bibliographic coupling analysis and co-occurrence analysis.

##### 4.2.1 Co-citation analysis

Co-citation analysis assists users in identifying relationships between two or more articles that authors frequently cite together. This analysis is

useful for identifying frequently cited articles for a particular topic. From the co-citation results based on author names, VOS viewer will build a map where each network represents articles from an author who are frequently cited together. This study examines the co-citation of Twitter research topics using the author’s unit analysis. Table 6 shows the citations and total link strength of the authors of Twitter publications whose posts have been cited by other authors. Data shown in Table 6 is clarified by Figure 2. Figure 2 illustrates the network map of co-citation based on the author, divided into six clusters. The data visualized is limited by the author having a minimum number of 100 citations; the network consists of 225 authors. Based on the data from Table 6 and Figure 2, the authors whose papers have the strongest co-citation relationship were Hanleim (ESCP Europe, France), with 424 citations and 7571 link strength, Wang Y. (Temple University, Philadelphia, USA) with 418 citations and 7496 link strength, Liu, Y (China Information Technology Security Evaluation Center, Beijing, China) with 382 citations and 7867 link strength, Kaplan (ESCP Europe, France) with 379 citations and 6871 link strength, and Liu, B (Fudan University, Shanghai, China) with 377 citations and 6852 link strength.

##### 4.2.2 Bibliographic coupling analysis

Bibliographic coupling analysis in VOS viewer can identify and analyse relationships between documents or articles based on cited references. This technique identifies pairs of documents with references that are significantly the same. The more references they have in common, the closer the bibliographic coupling is.

Table 7 is the result of data processing from the bibliographic coupling analysis using sources as the unit of analysis. The minimum document number is 5 with 0 citations; this limitation shows 174 networks meet the criteria. Publications with the most citations are published in Business Horizons. Business Horizon published 19 documents, which has already cite 12.773 times and build 1.925 link strength. The next publications are the International Conference on Information and Knowledge Proceeding, Public Relations Review, Decision Support System, and the International Journal of Information Systems. The visualization of Table 7 is illustrated in Figure 3. Figure 3 shows that International Conference on Information and Knowledge Proceeding has the biggest circle. It indicates that the publisher publishes the most papers with related topics but does not have the biggest link strength. Business Horizon holds the biggest link

strength because its paper is cited the most by other papers.

Table 6: Co-Citation from Author

No	Author	Citations	Total Link Strength
1	Haenlein M.	424	7571
2	Wang Y.	418	7496
3	Liu Y.	382	7867
4	Kaplan A.M.	379	6871
5	Liu B.	377	6852
6	Zhang Y.	373	7630
7	Chen H.	365	6626
8	Zhang J.	358	7297
9	Zhang M.	354	8427
10	Li X.	353	7191
11	Wang X.	352	6876
12	Liu H.	339	6909
13	Boyd D.	337	6206
14	Saxton G.D.	334	5763
15	Thelwall M.	305	5344
16	Bollen J.	298	5563
17	Palen L.	291	6327
18	Waters R.D.	288	5155
19	Ellison N.B.	287	4761
20	Chen Y.	284	5694
21	Coombs W.T.	281	4845
22	Zhang X.	280	5214
23	Park H.	278	5918
24	Stieglitz S.	278	6612
25	Kim J.	276	4794
26	Mao H.	275	5092
27	Bruns A.	267	5117
28	Li J.	265	5463
29	Blei D.M.	262	4750
30	Li Y.	258	4867

Table 8 is the result of a bibliographic coupling analysis using the country as the unit of analysis. The data retrieved has the following limitations: the minimum number of documents from the country is 5, and the minimum number of citations is 0. By using these limits, 66 networks are available. As a result, the United States is ranked first, with 1.224 documents cited 39,117 times with 99.340 link

strength. The next rank is France. France only published 84 documents but cites 9.913 times and has 10.801 link strength. Then the next rank is held by the United Kingdom, Canada, and Germany. Figure 4 visualizes bibliographic coupling data by country as describe in Table 8. It shows how the United States dominates the influential publication of related topics.

#### 4.2.3 Co-occurrence analysis

Co-occurrence analysis can be used to analyse the relationship between words that appear frequently in a collection of publications. This analysis can be used to find topics and themes or gain an in-depth understanding of a subject. Table 9 lists the fifty keywords most frequently used by publications on related issues. The minimum number of keyword occurrences used is 10, so 148 links meet this limit. Based on data from Table 9, the most frequently used keywords are Twitter and social media. The next keywords are sentiment analysis, Facebook, Covid-19, social networks, machine learning, big data, text mining, and natural language processing. Based on data from Table 9, we can conclude that most of the research using Twitter in business, management, accounting, economics, econometrics, and finance is closely related to social media. Most researchers use sentiment analysis, machine learning, and text mining for data processing. And the Covid-19 give greatly influenced many research topics; there were 137 occurrences with covid-19 as the keyword. Figure 5 visualises co-occurrence data from keywords using VOS viewer. The relationship between Twitter and social media is very close, considering that the public commonly uses Twitter to share information. Facebook become one of the social media most widely associated with research related to Twitter. Sentiment analysis and machine learning became the most widely used data processing tool to process research related to Twitter.

#### 5. CONCLUSION

Papers related to Twitter in Business, Management, Accounting, Economics, Econometrics, and Finance were first published in 2007. Judging from the trend, the number of journal publications with related topics has increased yearly. This increase shows that many issues can still be explored by utilising Twitter to understand related fields; Business, Management, Accounting, Economics, Econometrics and Finance. The most cited related topic paper is Kaplan and Haenlein's [12] "User of the World, unite! The Challenges and Opportunities of Social Media". The next article that

has been widely cited is by Kietzman et al. [13] entitled “Social Media? Get Serious! Understanding the Functional Building Blocks of Social Media”. Another paper is from Hanna et al. [14] entitled

“We’re all connected: The Power of the social media ecosystem”. These three papers provide advice to companies on how to maximise the use of social media.

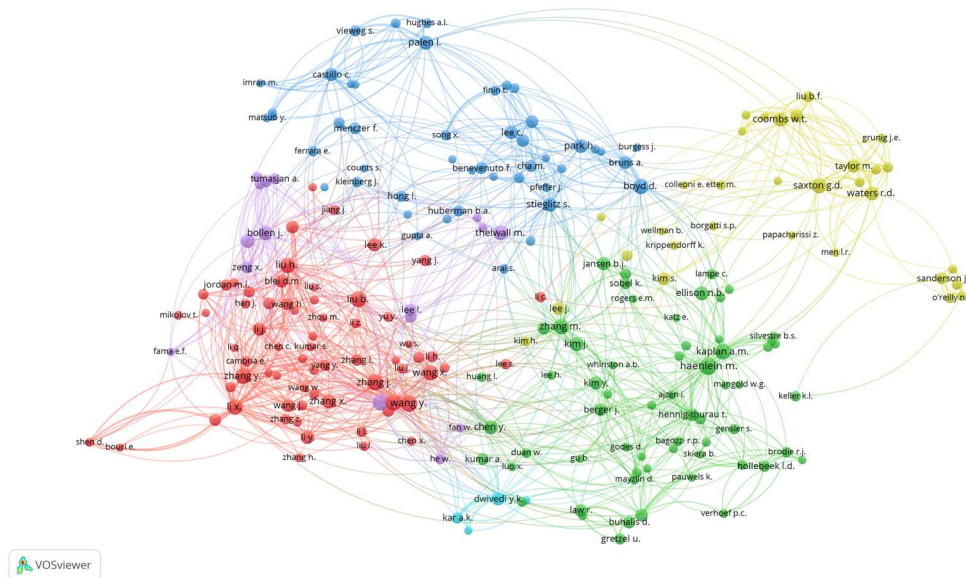


Figure 2: Co-Citation berdasarkan author.

Another analysis related to the structure of publication citations is continued by presenting the rank of the authors who have written the most publications, the order of publishers who have published the most publications, the rank of keywords that appear the most, and the order of universities that have published the most articles with related issues, and rank of countries with related subject publications.

A conclusion can be drawn based on the author's rank; the authors who dominate publications on related subjects come from the United States. This conclusion aligns with the ranking of universities that publish the most articles. The five universities with the most publications are from the United States. The finding also aligns with publications ranking by country. The country with the most publications on related issues is the United States, with 1234 papers. The second rank is India; the paper published is only a quarter of the United States. It manages to publish 393 publications. Several authors who have other influences come from Canada, Europe, India, and China. Based on co-citation analysis with author unit analysis, as shown in Figure 2, the clusters formed tend to create between authors in a particular area.

Based on Figure 3, from the results of the bibliographic coupling analysis based on sources, publishers who publish articles related to the topic are information systems or information management journals. Other journals that also publish these related topics are business, management, and marketing journals.

Based on co-occurrence analysis using keywords as unit analysis, researchers can conclude keywords that often appear on related research topics. Keywords that often arise are Twitter, social media, sentiment analysis, Facebook, Covid-19, social networks, machine learning, big data, text mining, and natural language processing. From these keywords, we can conclude that many researchers connect Twitter with social media and social networks. Word sentiment analysis, machine learning, text mining, and natural language processing demonstrate Twitter's data processing techniques that researchers often use. Twitter was also widely used for research during the Covid 19 pandemic. Research using Twitter is considered a new topic. This first research only appeared in 2007 and is less than twenty years old. Analysis of keywords can help researchers to find topics that have not been touched on or have not even been touched by other researchers. In conclusion, by utilising this bibliometric analysis, the researcher



can discover the novelty of the research and find insights about publications from research on related topics.

This research is limited to only using data from Scopus and then processing and visualising it using the VOS viewer. Researchers understand that many journals have not been mapped in this study. To

enrich the analyses, other researchers can utilise different data sources, such as the Web of Science and Google Scholar, which can also be used as references. Additional data processing, such as Cite Space and SciVal, can also be added to deepen the analyses.

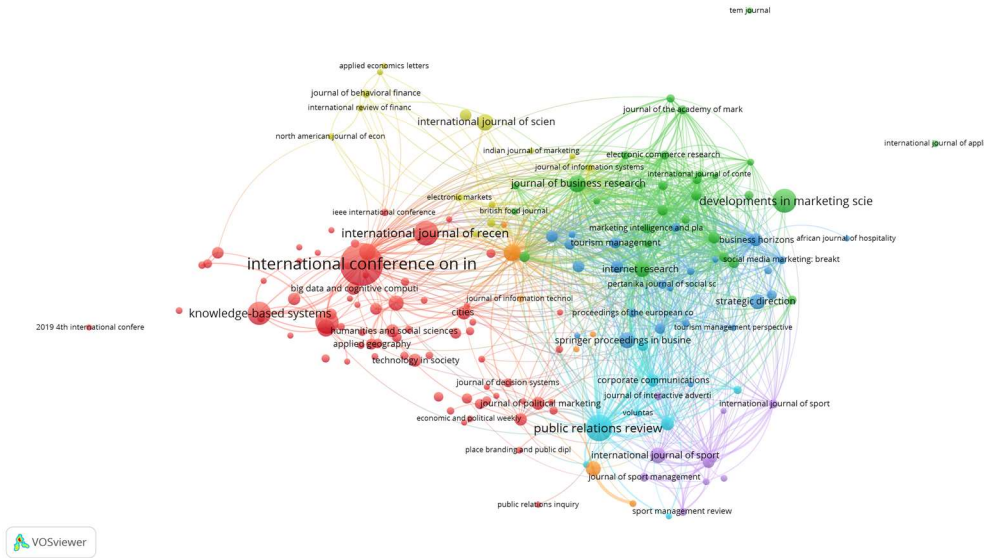


Figure 3: Bibliographic Coupling Using Sources as a unit analysis

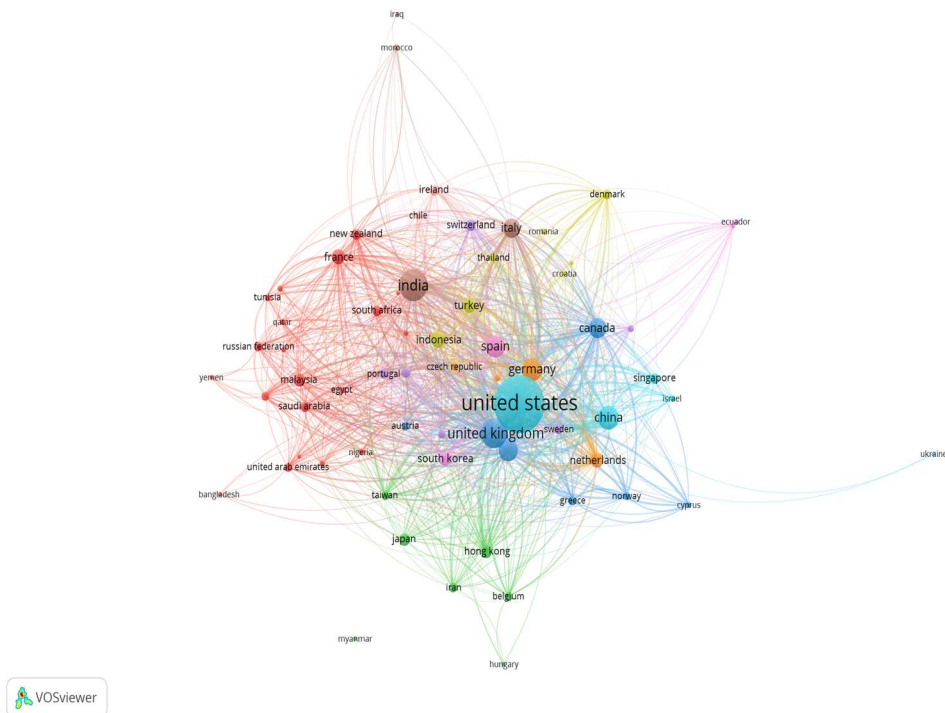


Figure 4: Bibliographic Coupling Using Country as a unit analysis

Table 7: Bibliographic Coupling Using Sources as a unit analysis

No	Source	Documents	Citations	Total Link Strength
1	Business Horizons	19	12773	1925
2	International Conference on Information and Knowledge Management, Proceedings	208	7570	1452
3	Public Relations Review	79	5319	2840
4	Decision Support Systems	31	2528	1129
5	International Journal of Information Management	33	2065	2517
6	Knowledge-Based Systems	61	1957	669
7	Cartography and Geographic Information Science	27	1915	658
8	International Journal of Electronic Commerce	5	1448	231
9	Mis Quarterly: Management Information Systems	12	1057	1021
10	Journal of Management Information Systems	7	1034	668
11	Journal of Advertising	8	934	941
12	Internet Research	29	892	3252
13	Technological Forecasting and Social Change	34	890	606
14	Journal of Business Research	34	858	2722
15	Journal of Enterprise Information Management	6	736	896
16	Applied Geography	14	727	320
17	Journal of Interactive Marketing	6	661	751
18	Marketing Science	7	657	55
19	Information and Management	11	635	284
20	Tourism Management	14	605	1054
21	Journal of Business Venturing	6	600	182
22	Current Issues in Tourism	13	587	903
23	Journal of Research in Interactive Marketing	12	584	1032
24	Information Systems Research	14	555	61
25	Industrial Marketing Management	12	490	1751
26	Journal of Political Marketing	20	481	403
27	Management Research Review	6	473	811
28	Journal of Marketing	8	462	585
29	Journal of Contingencies and Crisis Management	17	434	621
30	Corporate Communications	17	423	1542

Table 8: Bibliographic Coupling Using Sources as a unit analysis

No.	Country	Documents	Citations	Total Link Strength
1	United States	1224	39117	99340
2	France	84	9913	10801
3	United Kingdom	341	9856	48513
4	Canada	157	6939	21468
5	Germany	190	6459	24301
6	Netherlands	87	4620	16772





Table 9: Co-occurrence Using Keywords as a unit analysis

No	Keyword	Occurrences	Total Link Strength
1	Twitter	1183	2054
2	Social media	1146	1804
3	Sentiment analysis	305	626
4	Facebook	169	477
5	Covid-19	137	267
6	Social Networks	132	216
7	Machine Learning	129	278
8	Big Data	117	250
9	Text Mining	91	214
10	Natural Language Processing	68	152
11	Social Network Analysis	68	119
12	Social Network	53	82
13	Data Mining	52	95
14	Content Analysis	50	107
15	Social Media Analytics	50	99
16	Engagement	47	106
17	Crisis Communication	46	92
18	Marketing	45	103
19	Social Networking Sites	43	88
20	Social Media Marketing	42	70
21	Communication	41	92
22	Microblogging	41	77
23	Classification	40	82
24	Corporate Social Responsibility	39	80
25	Deep Learning	39	72
26	Topic Modeling	39	75
27	Social Networking	35	57
28	Public Relations	34	68
29	User-Generated Content	33	77
30	Web 2.0	33	69

Table 9: Co-occurrence Using Keywords as a unit analysis (Continued)

No	Keyword	Occurrences	Total Link Strength
31	Instagram	32	101
32	Sentiment	31	54
33	Social Media Analysis	31	44
34	Tweets	31	55
35	Opinion Mining	30	70
36	Internet	29	65
37	Youtube	29	119
38	Twitter Data	27	34
39	Social Medium	26	16
40	Clustering	25	46
41	Customer Engagement	23	53
42	Network Analysis	22	37
43	Topic Modelling	22	49
44	Tourism	22	52
45	Bitcoin	21	46
46	Information Diffusion	21	30
47	Social Influence	21	47
48	Social Network Sites	21	24
49	Sustainability	21	43
50	Text Classification	21	45

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