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Research Article

Mapping the literature of social network ties in business and management field: A bibliometric study

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ABSTRACT

In recent years, academics have focused increasingly on social network connections across different organisations. Social networking for businesses is a topic that crosses many disciplines, including social sciences, computer science, engineering, management, education, sociology, and psychology, so it's no surprise that definitions, methods, and approaches to social networks are constantly debated. Based on a data set of 3466 publications from the Scopus database, the goal of this study is to map the previous literature on social network ties of organisations to the business and management area. The data set was taken from the Scopus database to investigate the main authors, the number of publications, the most influential journals, the most used keywords and the top productive institutions and countries. The goal of this study is to map the previous literature on the social network ties of organisations to the business and management area. The most influential publications, authors, journals, and keywords are thus identified using four methods of bibliographic analysis, as follows: bibliographic coupling, analysis of co-occurrence of authors' keywords, and analysis of co-authorship (a) countries and (b) authors. According to the study's findings, the USA is the most prolific country, having over 900 publications in the past five years, followed by China and the UK. The publication trend has increased over the last 5 years in the business and management field and will keep increasing because of the growing interest of researchers and practitioners in the given field. Knowledge-based systems are found to be the top productive journal and Hong Kong Polytechnic University is the most influential institution with the highest number of publications.

Keywords: *Social Networks; Network Ties; Social Capital; Bibliometric Analysis; VOS Viewer; Scopus Database*

1. INTRODUCTION

The term "networking" refers to a process of sharing information and communicating with others, such as in a collaborative learning community (Cho et al., 2007; Tang et al., 2019). A network, on the other hand, is made up of many small, comparable elements that are integrated into a larger system that may share information. A social network is a community of interconnected individuals and organisations, as well as the relationships that exist between them. Social networks provide better user interactions and

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commitments in which users can share experiences and connections to broaden their knowledge base and develop and maintain professional relationships among themselves.

In social science literature, a social network is a patterned set of relationships between two or more persons, or actors. It is illustrated in Fig. 1. Individuals, groups, and organisations that make up the network are referred to as "actors," a term that encompasses all types of information/knowledge processing entities (Granovetter, 1985). The characteristics of a social network also influence social capital, which refers to the resources on hand through business and personal networks. Organizations and people both have social capital. The mapping and measuring of relationships and flow among people, groups, organizations, computers, websites, and other actors is called social network analysis (SNA). The points (actors) on the network are called nodes while their relationship (connection) is called a network tie. A is a node in the diagram, and its connections to B, C, D, E, F, G, H, I, J, and K are network ties. In direct ties, nodes are connected through a single network tie whereas in indirect ties nodes are connected only through other nodes (hence the name). As shown in Fig. 1, A has one direct tie with B and is connected indirectly to the other nodes in the network.

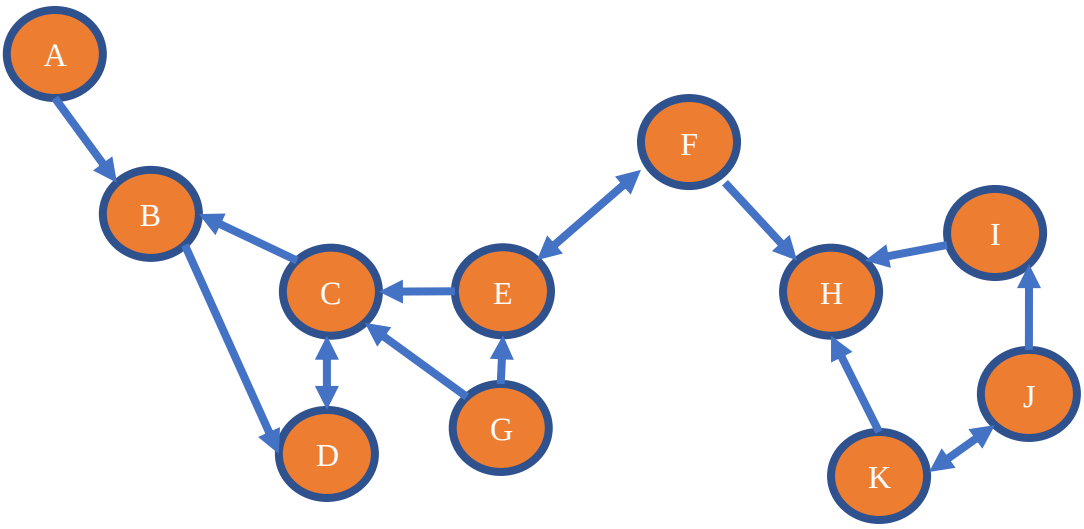

Fig. 1. An example of a typical Social Network

To find information and solve problems, people heavily rely on their networks of relationships. Knowledge is becoming increasingly important for firms competing in a rapidly changing environment as a result of increased globalisation and intense competition (Cengiz, 2006; Grant, 1996). Chesbrough, (2006) established the significance of networks in open innovation and indicated that it is important for organisations to engage external actors as a source of knowledge to sustain innovation in firms. Organizations of all sizes are increasingly relying on external networks. Innovation is viewed as a result of various interactions among various actors (Toigo, 2017). Networking is known to spur innovation(Öberg, 2019; Welsh et al., 2021). According to social network research, each person's social relationships provide both opportunities and constraints when it comes to accessing valuable resources like trust, information, knowledge and social support (Marineau et al., 2016). Social network ties are the channels for the exchange of all kinds of

resources. The contents of the resources flowing through these channels include psychological resources like trust and social support and instrumental resources like information resources or workplace expertise. (Ali Al-Atwi, 2020; Ibarra, 1993).

Through social networking, business owners and managers make an effort to cultivate and nurture relationships with people who work for other companies and organisations over time. Social networks are typically seen as helpful for identifying opportunities and mobilising the resources needed to take advantage of them, as well as for creating new opportunities for network expansion (Bai et al., 2021). Since they benefit firms in terms of finances, technologies, marketing, and social aspects, the social networks of organisations have gotten a lot of attention as contributors to sustainability (Jack et al., 2008). Furthermore, networks are investigated on different levels defined as interpersonal, interunit, or inter-organizational networks (Brass et al., 2004). The social network ties of organisations have emerged as a hot topic in management research, particularly in the context of innovation studies (Dagnino et al., 2015; Toigo, 2017).

Our main objective is to map the past trends of the social network. This article can be used as a guide for those who want to investigate these topics in-depth, and this research could provide theoretical insights about the importance of having strong and weak network ties in business and management literature. This article will provide support for those who want to study these themes in an integrated manner, and this study may provide theoretical insights. To accomplish our goals, we used a bibliometric approach to the terms social network and network ties. Dagnino et al. (2015) studied a similar concept in general, concerning innovation and determine the main themes and performed a bibliometric analysis based on data extracted from the database of the Social Sciences Citation Index, owned by Thomson Reuters. Recently Su et al., (2020) performed a bibliometric analysis on social network analysis (SNA). A similar study by Toigo, (2017) analysed the effect of networks on innovation in the context of SMEs through bibliometric analysis. Tang et al., (2019) conducted a bibliometric analysis of educational networking outside of the context of an organisation. Similarly, some researchers (Zhu & Wang, 2018) studied the concept in the supply chain network context while others (Skute et al., 2019) conducted similar research on the university-industry collaborations perspective. This study is, by far, the first bibliometric study on social network ties of organisations in the context of business and management research, to the best of the author's knowledge.

2. METHODOLOGY

The Scopus database was used for this research. For several reasons, this database was chosen as a research platform. First, the Scopus database is one of the largest abstract and citation-based databases of peer-reviewed literature, covering journals, books, and conference proceedings from around the world (Baas et al., 2020)(Sikandar & Abdul Kohar, 2022). Second, Scopus indexes the abstracts of most articles published in other databases, providing comprehensive coverage of articles. Using the snowball sampling method, the sample could be expanded to other databases from this database (Silveira & Zilber, 2017). Scopus is also user-friendly and supports a variety of software tools for retrieving data for bibliometric analysis, including authors, titles, publishing years, cited references, abstracts,

institutions, and countries (Sikandar, HumaAbbas et al., 2022). It also allows for a preliminary analysis of citation numbers over time and the identification of the most cited authors and articles.

Through bibliometric analysis, the researchers statistically examine the authors, institutions, countries, and cooperation among authors, subject areas, and keywords and published articles in the given period in the selected field. In this regard, this study addresses the following research questions

1. How has the research on social network ties in the business and management field evolved over the past 5 years?
2. What are the most productive journals, countries and institutions related to social network ties literature?
3. Who are the most productive authors in the given area?
4. Which authors contributed the most by doing collaborative research?
5. What are the most popular keywords associated with social network ties research in business and management research?
6. Which countries have contributed the most by doing collaborative research?

The data for this study was gathered in the second week of August 2021 using the SCOPUS database and focused on the data from the past 5 years that is 2016-2020. The leading search keyword was "Network Ties" and "Social Network". The search string was "TITLE-ABS-KEY ("network ties" OR "social network") AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016)) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))". Based on the research parameters, we found 128702 search results in the SCOPUS database. To avoid misunderstandings in similar terminology and to keep the study around the desired aims, we purposefully did not look for any related terms.

The search and selection criteria for the articles are shown in Fig. 2. We received 128702 articles as a result of the main search string on the Scopus database, which was then narrowed down using various search criteria. For example, to observe the most recent publication trend in the area under study, we only selected articles published in the previous five years, yielding 56376 articles. Our main goal is to study the publication trends and main areas of research under the business and management field so after applying this criterion we got 4793 resulting articles. The concept of a social network has been extensively researched in the fields of computer science, engineering, and social science. To keep things simple, we only examined one area. To maintain the study's quality, the documents included for analysis were only research articles, and only journals were included as sources. After selecting all of the published articles in the said field that were written in English, we came up with 3466 articles on which we performed bibliometric analysis.

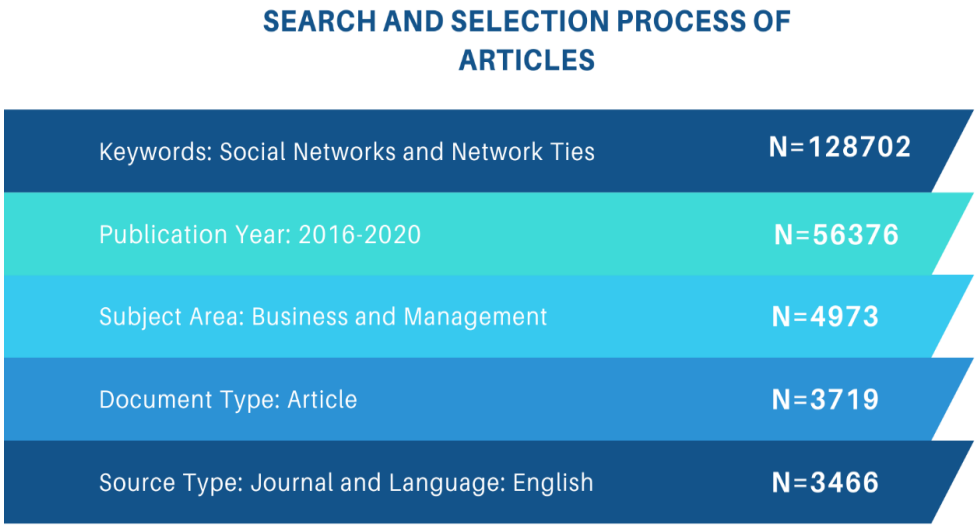

Fig. 2. Search and selection criteria of articles

The word "bibliometric" is defined as the application of books and other communication methods of mathematical and statistical approaches (van Eck & Waltman, 2010). A bibliometric study is when statistical tools are used to determine qualitative and quantitative changes in a scientific research topic, as well as to construct the profile of publications on the topic and to find trends (De Bakker et al., 2005). Bibliometric is an approach for assessing and monitoring research topic development through the organization and linkage of the fundamental information from publications such as citations, authors, co-authors, journals and keywords (Ferreira, 2018; Koseoglu et al., 2016). The bibliometric analysis allows researchers to examine research studies in terms of analytically influential contributions and their connections to the conceptual development of a field. Bibliometric data analysis has been used by many scholars (Salam & Senin, 2022; Sikandar et al., 2021; Vaicondam et al., 2022) to figure out how a scientific issue has evolved. They looked at the distribution of publication dates, author countries, researcher overviews, and the number of citations in online literature databases to discover the past trend in literature (Wenjia Zhu & Guan, 2013).

3. ANALYSIS AND DISCUSSION OF RESULTS

This section will discuss the descriptive analysis of the articles selected for this study.

3.1. Publication Trend

Fig. 3 shows the past publication trends in the literature on social network ties in business research. The increasing trend demonstrates the growing interest of researchers in the given field. The number of published articles has increased from 573 to 827 articles per year just in the field of business and management making a total of 3466 articles published in the past five years. We are expecting a rise in this trend in the coming years which is also highlighting the global significance of networking for businesses.

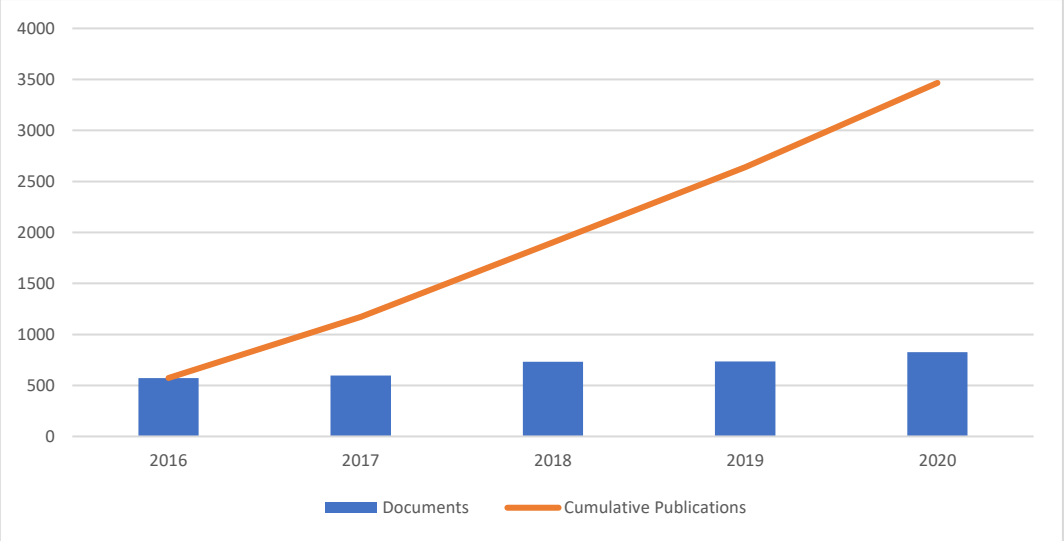

Fig. 3. Research trends in the past 5 years

3.2. Most Productive Journals

Table 1 highlight the top 10 journals that published scientific articles on the topic of social network ties. It shows that Knowledge-Based Systems, Journal of Cleaner Production and International Journal of Recent Technology and Engineering are among the top 3 journals with 126, 72 and 70 publications respectively. Table 1 also shows the cite score of the journals.

Table 1. Top 10 journals

No.	Name of the Journal	Total Publications (%)	TP	Cite Score 2020
1	Knowledge-Based Systems	3.6	126	11.3
2	Journal Of Cleaner Production	2.1	72	13.1
3	International Journal of Recent Technology and Engineering	2.0	70	
4	Technological Forecasting and Social Change	1.9	66	12.1
5	Journal Of Business Research	1.5	52	9.2
6	International Journal of Scientific and Technology Research	1.4	48	0.2
7	Cities	1.1	37	8
8	Decision Support Systems	0.9	30	10.5
9	Management Science	0.8	26	7.2
10	Technology In Society	0.8	26	4.2

3.3. Most Productive Countries

The top ten most productive countries are listed in Table 2 and Fig. 4. According to the data, the United States is the most productive country in terms of social network ties publications, followed by China and the United Kingdom. In the last five years, the United States had 939 publications, compared to 464 and 354 for China and the United Kingdom, respectively. As a result, the United States is regarded as the top country in terms of research production.

Table 2. Most Productive Countries

Country	Publications
United States	939
China	464
United Kingdom	353
Australia	206
Spain	198
India	189
Italy	164
Canada	140
Germany	140
South Korea	139

Fig. 4. Most productive Countries

3.4. Most Influential Authors

The top ten influential authors who published in the area of social network ties are illustrated in Fig. 5. Fronzetti Colladon, A., Shen, G.Q., Horak, S. are the top 3 authors with 12 8 and 7 publications respectively in the area of social network ties.

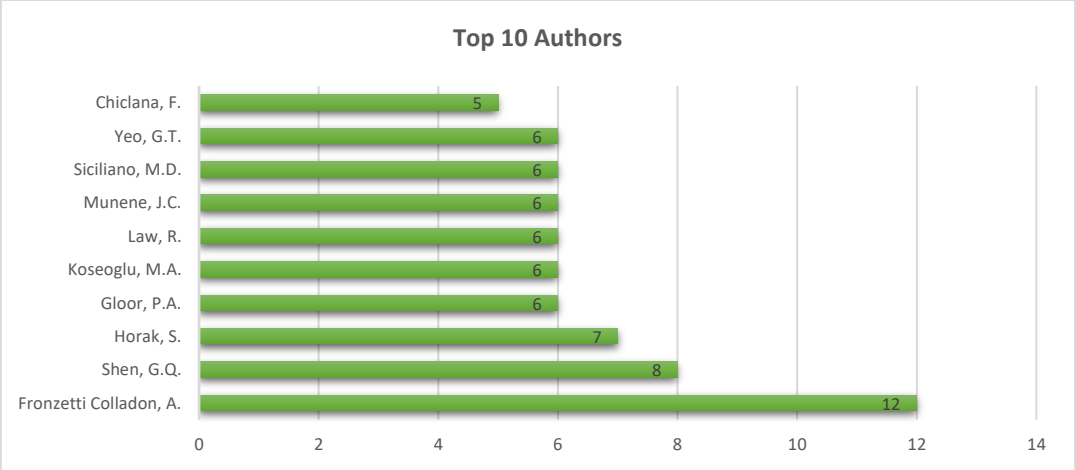

Fig. 5. Top 10 Influential authors

3.5. Most prolific institutions

The most prolific institutes that researched the area of social networks in the business and management field are listed in Table 3. Hong Kong Polytechnic University (Hong Kong) is the top institute with 52 publications, followed by Tsinghua University (China) and City University of Hong Kong (Hong Kong) with 30 and 25 publications each. Here it can be noticed that though the country with the greatest number of publications is the United States, however none of the institutions of the US has made it to the top 3 list. However, the University of Florida (US) is ranked fourth with 23 publications.

Table 3. Most Productive Institutions

No.	Name of the Institution	Country	No. of Publications
1	Hong Kong Polytechnic University	Hong Kong	52
2	Tsinghua University	China	30
3	City University of Hong Kong	Hong Kong	25
4	University of Florida	US	23
5	Sun Yat-Sen University	China	23
6	National University of Singapore	Singapore	23
7	Xi'an Jiaotong University	China	22
8	The University of Texas at Austin	US	21
9	Universidad de Granada	Spain	21
10	Università degli Studi di Roma Tor Vergata	Italy	20

4. BIBLIOMETRIC MAPS

4.1. Analysis of Co-authorship (Authors)

We have conducted a co-authorship analysis (authors) in this section to investigate the contributions of authors by doing collaborative work in the field. The main research method for studying research collaboration is co-authorship analysis (Chen et al., 2019). The number of co-authorship relationships between the researcher and other researchers has been shown through links. A researcher's co-authorship connections with different academics represent the total link strength (TLS) showing how strong those links are (Van Eck & Waltman, 2018).

The minimum number of authors for co-authorship analysis was set to 5 and the minimum number of citations for an author was set to 5. Only 154 authors out of 7713 fitted the criteria. Among the 154 authors, 119 were well connected, forming 15 clusters, 319 links, and 486 TLS (Fig. 7). It also indicates how these 119 authors are well-connected and have made a significant contribution to the research through collaborative efforts. Fig. 6 shows a glimpse of the bibliometric map demonstrating the analysis of co-authorship (authors).

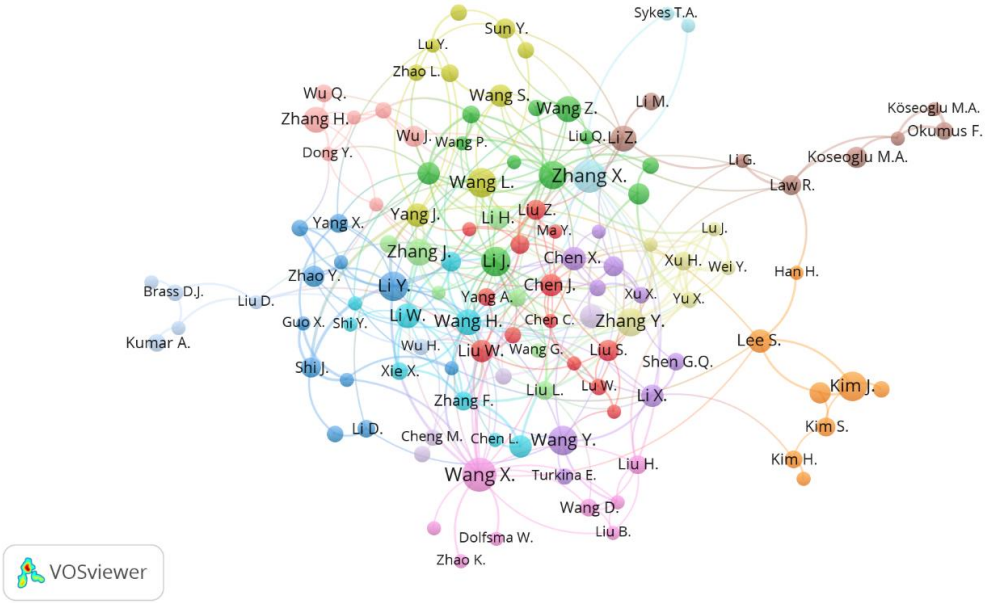

Fig. 6. A screenshot Co-authorship analysis of authors (Network Visualization Mode)

After a thorough examination, we found that Zhang Y. has the maximum total link strength of TLS being 128, with 108 citations and 18 total published documents. It was followed by Zhang X. with a TLS of 27 with 388 citations and 24 published documents. The author with the third-highest total link strength (TLS) is Wang X. with 27 TLS, 266 citations and 27 published documents. Table 4 shows the top 20 authors' documents, total link strength, and citations.

Table 4. Top 20 Authors through Co-authorship Analysis

Author	Documents	Citations	Total Link Strength
Zhang Y.	18	108	28
Zhang X.	24	388	27
Wang X.	27	266	27
Li Y.	20	187	27
Wang H.	16	333	25
Li J.	20	191	23
Liu X.	18	236	19
Tang J.	12	265	18
Yu X.	6	20	18
Yang J.	13	285	17
Zhang F.	8	131	17
Shi J.	9	69	16
Xu H.	8	55	16
Xu Y.	5	34	16
Zhao Z.	7	219	15
Li W.	14	146	15
Li Z.	15	336	14
Li H.	11	164	14
Wang J.	9	140	14
Liu W.	11	126	13

4.2. Analysis of Co-authorship (Countries)

The analysis of country co-authorship highlights the linkages of various researchers from throughout the world, hence the minimum number of countries was chosen 5. This means that only countries with at least five publications are considered. Therefore, 76 countries out of 136 met the criteria. Fig. 7 shows the proximity of the two countries denotes their strong ties. 73 countries were linked together. Fig. 7 illustrates the screenshot from the VOSviewer software showing all the affiliated countries.

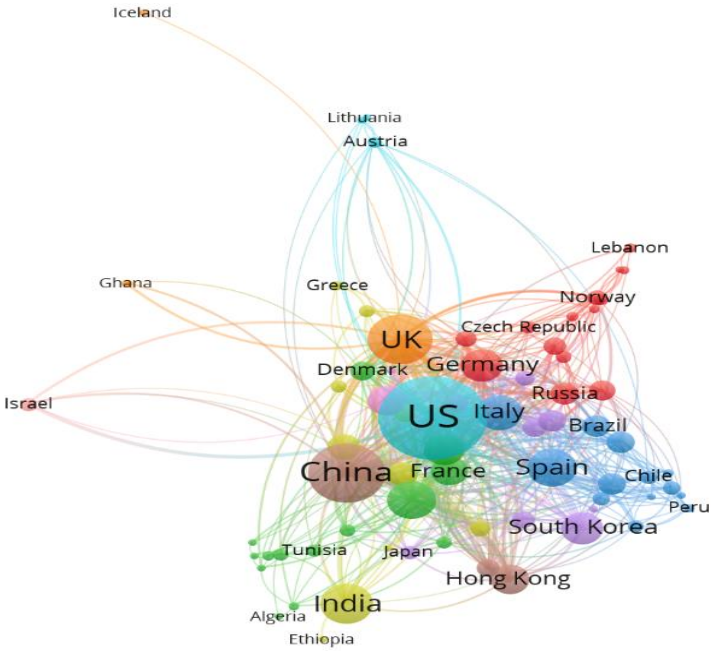

Fig. 7. A screenshot Co-authorship analysis of countries (Network Visualization Mode)

According to co-authorship analysis of countries, the country that has the maximum linkages with other countries is the United States. It has 55 links with a total link strength of 649, 1103 publications, and 14653 citations. Such a big number of published articles show the benefits of co-authorship. The UK is the second most productive country, which has 58 links with a total link strength of 405, 404 publications, and 6762 citations. And China is the third most productive country, which has 9 links with a total link strength of 397, 555 publications, and 7910 citations. Table 5 shows the top 20 countries by their total link strength, the number of publications, and total citations.

Table 5. Top 20 Countries through Co-authorship analysis

Country	Links	Total Link Strength	Documents	Citations
United States	55	649	1103	14653
United Kingdom	58	405	404	6762
China	39	397	555	7910
Australia	38	223	235	3125
Hong Kong	21	167	137	2357
Spain	35	149	230	3237
Germany	28	143	163	1956
Canada	34	141	159	2428

Country	Links	Total Link Strength	Documents	Citations
Netherlands	31	134	138	1543
Italy	31	123	195	2264
France	28	116	128	1645
South Korea	22	92	165	1758
Belgium	18	65	55	526
Sweden	21	64	77	939
Singapore	16	59	53	862
Denmark	20	56	58	685
Taiwan	15	55	104	1200
Switzerland	20	52	42	348
Malaysia	18	51	84	523
Portugal	23	50	78	1179

4.3. Analysis of Co-occurrence (keywords)

Co-occurrence refers to the number of times a keyword appears in a paper (Callon et al., 1983). Total link strength represents the number of times a term occurs in a publication. The occurrence of keywords can be determined by the number of networks.

The threshold for keyword occurrences was set to 10 while importing Scopus data into the VOS viewer for keyword analysis. This resulted in the identification of 421 keywords out of 113054. In the next step, these keywords were then substituted with similar keywords, yielding 12982 keywords, 348 of which satisfied the criterion. That means just 348 keywords met the criteria of 10 occurrences per term. As earlier mentioned, a single term's number of repetitions was limited to ten, resulting in eight distinct keyword clusters. Fig. 8 shows the total keywords after removing extraneous and irrelevant terms such as country names and techniques, which resulted in 348 keywords forming 9 clusters, 8515 links, and a TLS of 23583.

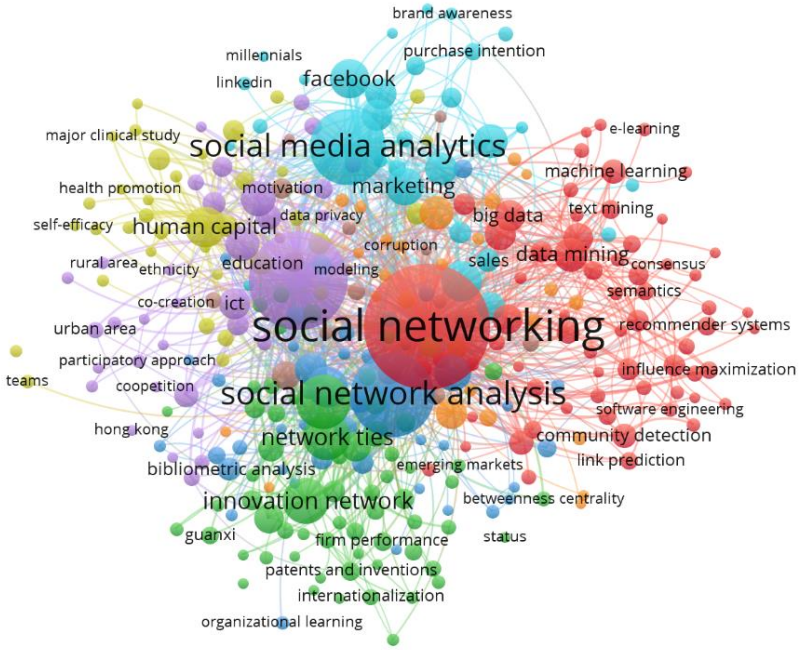

Fig. 8. Snapshot of Co-occurrence of keyword analysis (Network Visualization mode)

Some of the keywords with the most occurrences and highest total link strength are social networks, social network analysis, social media analytics, human capital, social capital theory, innovation network, network analysis, decision making, e-commerce, marketing, network ties, internet, article, social sciences computing, data mining, fakebook, ICT, tourism development, consumer behaviour and knowledge management.

On the other hand, some of the articles with the fewest appearances are also shared, i.e. leadership, value creation, personality, organizational learning, participation, reciprocity, job search, social entrepreneurship, business networks, sharing economy, credibility, digitalization, absorptive capacity and knowledge diffusion. This suggests that more research is needed in the corresponding areas. We can deduct from this analysis that more research is needed in the above-mentioned field to obtain a better knowledge of the concept and expand the literature. Table 6 shows the result of co-occurrence analysis below

Table 6. Results of co-occurrence of keyword analysis (top 20 keywords)

Keywords	Links	Total Link Strength	Occurrences
Social Networks	347	5683	1742
Social Network Analysis	275	1521	540
Social Media Analytics	229	1468	443
Human Capital	140	805	127
Social Capital Theory	178	607	230
Innovation Network	171	582	161
Network Analysis	176	569	130
Decision Making	169	551	108
E-Commerce	152	548	125
Marketing	154	519	111
Network Ties	170	466	178
Internet	134	464	95
Article	90	461	65
Social Sciences Computing	151	408	78
Data Mining	116	402	87
Facebook	98	360	121
ICT	126	350	77
Tourism Development	97	342	90
Consumer Behavior	105	335	75
Knowledge Management	124	330	70

4.4. Bibliographic coupling (Documents)

Fig. 9 shows the analysis which was done in VOSviewer with bibliographical coupling. Like co-citation, bibliographic coupling is a measure of similarity using an analysis of citation to demonstrate a resemblance between documents. Bibliographic connections are made when two works in their bibliographies refer to common third work. It is a signal that the two works are likely to deal with a similar topic (Martyn, 1964). We used the "full counting" approach, and the unit of analysis was "documents". The criteria for the lowest number of citations for a publication was set to 20.

Among all the 4173 papers, 617 met the criterion, and the overall strength of the bibliographical coupling links with other papers will be determined for all of them. There

are 115 articles in the largest set of related items. A total of 9 clusters with 784 linkages and 1436 link strengths have been constructed from 115 items.

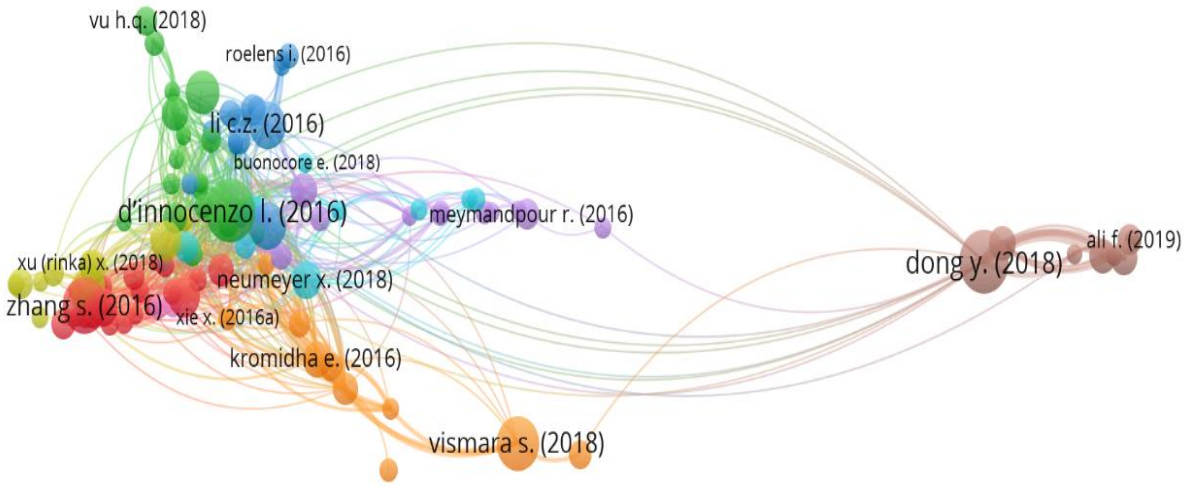

Fig. 9. Bibliographic coupling network of publications

Through bibliometric coupling analysis, we found that the document published by (Dong et al., 2018) has a maximum total link strength of 88 and 210 citations. It was followed by (Iurkov & Benito, 2018) with TLS 87 and 23 citations and (Polzin et al., 2018) with TLS 85 and 56 citations respectively (Table 7). Similarly, Table 7 lists the top 20 items according to the TLS.

Table 7. Top 20 publications through Bibliographic coupling

Document	Citations	TLS
Dong Y. (2018)	210	88
Iurkov V. (2018)	23	87
Polzin F. (2018)	56	85
Kromidha E. (2016)	70	78
Muller E. (2019)	64	73
Chen L. (2019b)	35	72
Neumeyer X. (2019a)	40	71
Zhang H. (2018)	63	69
Hong Y. (2018)	42	64
Yamin M. (2018)	37	64
Peng H. (2016)	20	60
Casanueva C. (2016)	63	55
Dubois D. (2016)	85	53
Kim S. (2018)	28	52
Zheng X. (2016)	118	51
Martínez-Pérez Á. (2019)	20	50
Klyver K. (2018)	25	50
Neumeyer X. (2018)	76	49
Nowell B. (2018)	36	47
Park E. (2018)	29	45

5. CONCLUSION AND DISCUSSION

This study, through bibliometric analysis, has discovered the latest publication trends in the scientific literature on social network ties between organisations in the context of business and management. The concept of social networks is widely studied in various disciplines but the researchers in this study focused on the development of the concept in the business and management field. A dataset of the past 5 years was taken from the Scopus database to perform this bibliometric study. The study's findings lead us to the conclusion that the body of literature in the respective industry is rising gradually. This trend is predicted to continue in the future too due to increased globalisation and fierce competition among enterprises. Countries are continuously working to study the effect of social network ties on enterprises. Our findings suggest that the United States is the largest contributor to social network ties research with more than 900 publications in the past five years. It was followed by China and United Kingdom.

Knowledge-based systems are found to be the top productive journal and Hong Kong Polytechnic University is the most influential institution with the highest number of publications. Our findings also suggest the top associated keywords with social network ties research and highlighted the areas (by studying the least occurred keywords in the current literature) to gain insights into the fields where there is still room for further research.

As a result, our findings may be used to stimulate further research aimed at generating inquiries based on this bibliometric analysis to validate (or invalidate) alternative explanations (Furrer et al., 2008). By assessing the literature of the past five years about social network ties of organisations and identifying emerging trends in the literature and promising areas for future research, we hope that this paper has provided valuable insights for future researchers.

6. LIMITATIONS AND FUTURE DIRECTIONS

The literature on social network ties is very comprehensive we could not perform this analysis on all the disciplines, so we rather focused on one area which is business and management. Future researchers could extend this study to different disciplines where social networks are being studied widely such as computer science, engineering and social sciences. We chose the Scopus database for our bibliometric analysis because it covers a wide range of articles; however, future researchers could conduct a similar study using another database, such as the Web of Science. We have conducted this study in the past five years, future researchers could extend this time duration and make a comprehensive study over a larger span period.

Author Contributions:

This work was the output of collaborative research between researchers from different nationalities and institutions. Ahmad Ijaz and Abrar Ullah are responsible for the conceptualization of the idea, manuscript preparation. Huma Sikandar is responsible for conducting the bibliometric analysis using the VOS viewer software and interpretation of the results. The prepared manuscript was reviewed

and amended by Nohman Khan and Muhammad Hassan helped with revisions and addressing the reviewer's comments. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement:

Data associated with this research will be available on request.

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Conflicts of Interest:

The authors declare no conflict of interest.

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