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Knowledge Transfer and Networks: A Bibliometric Approach Through Performance Analysis, Science mapping, and Dynamic Network Analysis

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Abstract
Knowledge transfer has been identified as one of the main drivers of innovation and business success in a knowledge-based economy, and networks represent strategic drivers that can facilitate it. This nascent discipline has attracted scholars' attention from different perspectives, which led to some disorder in the literature. With the aim of providing a comprehensive overview of the state of the art, this paper conducts a bibliometric analysis of 774 articles published in top business and management journals of the Web of Science from 2000 to 2020. Using VOSviewer and SciMat complementary software, productivity analysis, science mapping, and dynamic network analysis were performed. This study identifies the most influential contributors to the field and presents an evolution of the research area, a description of the thematic clusters, and a research agenda.

Keywords Knowledge transfer · Networks · Bibliometric analysis · Collaboration · Research agenda

JEL Classification D83 · D85 · O32 · O33

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Introduction

Previous literature has evidenced the importance of knowledge as an intangible asset in a knowledge-based economy (Grant, 1996). In a complex world where it is unimaginable to think of actors in isolation, knowledge transfer (KT)[1] has been identified as a crucial process to have access to external information, resources, and agents. Indeed, KT has been considered one of the main determinants of business success (Tsai, 2001), and the literature has shown how efficient KT can lead to sustainable competitive advantages (Zhang & Zhang, 2018). When a firm becomes a member of a collaborative network, it has easier access to knowledge and, consequently, to strategic resources that could not be accessed without collaboration. Thus, a collaborative network is a concept strongly linked to KT (Aalbers et al., 2013; Cabrera-Suárez et al., 2018).

Beyond the academy, policy makers and managers have evidenced this interest by different initiatives for achieving KT through networks. The European Commission has created the Knowledge Valorisation Platform[2] to connect European actors; share best practices, knowledge, and experience; and, consequently, turn research results into innovative practical uses that bring economic value and societal benefits. Another example of the value of KT is the so-called third mission of universities (Baglieri et al., 2018), which is becoming increasingly important. Academics are no longer required only to produce science, but also to be able to transfer it to industry and society. In this sense, some models like the Triple Helix (Etzkowitz & Leydesdorff, 1995) or the Quadruple Helix (Carayannis & Campbell, 2009) have been proposed to analyse KT between agents. The Horizon Europe[3] strategy also seeks to foster the creation of collaborative knowledge networks based on the evidence of the importance of transferring knowledge and generating applications with social and economic impact.

KT has its roots in knowledge management (KM) literature, whose origins date back to the 1960 s (Gaviria-Marin et al., 2019). However, it was not until 2000 that the concept of KT was defined (Argote & Ingram, 2000). Despite being a young discipline, the study of KT and its networks has attracted the attention of researchers and practitioners because of its potential influence on strategic decision making at the business and policy levels. As it is still a nascent area, researchers have tried to approach it from multiple perspectives, although most of the attention comes from the study of business management.

Furthermore, bibliometric methods are attracting increasing scientific interest because they make it possible to objectively and quantitatively explore the state of the art of a given discipline from large bibliographic samples (Lin et al., 2023; Sánchez-Robles et al., 2023). Therefore, they have great potential in examining

[1] All the acronyms are summarised in the Appendix.

[2] https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/eu-valorisation-policy/knowledge-valorisation-platform_en

[3] https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe_en

research prospects and identifying categories of published works (Xu et al., 2021). Although KM has been studied by bibliometrics (Gaviria-Marin et al., 2019), the specific topic of KT and networks has not been addressed yet and constitutes an emergent research area that has been approached from different perspectives, providing some confusion in the literature. As a consequence, our intention here is to develop a bibliometric study on KT and networks with the aim of reaching a better understanding of the discipline. This general objective is specified in three research questions that will be answered through the paper: RQ1. Who are the most influential contributors in the field? RQ2. How has the discipline evolved? RQ3. What are the main emergent research areas, and which are the principal future avenues of the discipline? To do so, this work applies the two basic methods of bibliometrics (Noyons et al., 1999) — productivity analysis and scientific mapping — and makes use of additional techniques such as complex network analysis to enrich the results. While each of these methods is well-established, the integration of all three offers an innovative perspective on KT research trends, which goes beyond conventional bibliometric studies. This integrated approach allows for an examination of both static and dynamic dimensions, ensuring a robust overview of the field.

The paper is structured as follows: the "Methodology" section describes the working methodology. The "Results" section presents the results of the research (productivity analysis, science mapping, and network analysis). The "Discussion and Conclusion" section summarises the main conclusions, with a special focus on the identification of future lines of research.

Methodology

Data Collection

The data source of this study is the Web of Science (WoS) Core Collection. The WoS is an internationally recognised scientific platform among researchers that records high-quality studies and has become one of the main tools for both searching and evaluating different types of publications (Thelwall, 2008). Bibliometric researchers consider the WoS one of the most relevant databases because it provides essential metadata, including abstracts, references, number of citations, lists of authors, institutions, countries, and the journal impact factor (IF) (Archambault et al., 2009; Huang & Chang, 2008; Mongeon & Paul-Hus, 2016). Including additional databases such as Scopus would expand the volume of documents but could introduce inconsistencies in citation metrics and metadata formats, complicating the analysis without necessarily improving its robustness for the study's specific aims. Indeed, prior studies (Zhu & Liu, 2020) note that Web of Science's selective indexing helps reduce noise in citation analysis by focusing on high-quality sources; however, this selectivity may also result in the omission of certain high-impact studies that are indexed in Scopus.

To obtain our sample, a Boolean search was conducted in June 2021 (see Table 1). With the aim of having complete years and guaranteeing objective comparison between time periods, only documents published between 2000 and 2020

Table 1 Search procedures

		Boolean search	Total publications
1	Keyword search	((“knowledge transfer*” OR “innovation transfer*” OR “R&D transfer*”) AND network*)	1,848
2	Index	SCI-EXPANDED, SSCI	
3	Time period	2000–2020	1,734
4	WoS categories	Management AND Business	826
5	Document type	Article	775
6	Language	English	774

*Data search was conducted on 19th June 2021

were considered. In addition, this cutoff allows us to examine KT and networks within an established, stable context, setting a reliable baseline for understanding how KT functioned prior to the structural changes brought about by the Covid-2019 pandemic.[4] Based on these criteria, 1,734 papers were identified. Given that our interest is on the organisational level, we focus our selection on the areas of *business* and *management*. In addition, results were filtered by document type and language, selecting only articles written in English to guarantee readability. Our final sample is constituted by 774 studies and 1,788 authors, which were analysed following the two-step bibliometric procedure recommended by Noyons et al. (1999). After that, we enriched our research by using some additional metrics, as Donthu et al. (2021) suggest.

Bibliometric Analysis Methods

Bibliometrics are becoming increasingly popular. If the term “bibliomet*” is searched for in the WoS,[5] about 14,000 results are returned. Furthermore, there has been a three-fold increase in the number of publications indexed in the JCR that make use of bibliometrics in the last five years. This is because it is an objective academic literature review method that provides a comprehensive overview of a particular area of research and allows us to glimpse research trends with the scientific rigour that other techniques lack (Donthu et al., 2021). This popularity is enhanced because it is the only methodology that combines quantitative and qualitative procedures as well as accessibility to scientific databases (WoS, Scopus, PUBMED, Psycoinfo, etc.) and specialised bibliometric software (VOSViewer, SciMAT, CiteSpace, BiblioShiny, BibExcel, etc.).

[4] Covid-19 introduced rapid shifts in KT mechanisms—most notably through an accelerated shift to remote work, digital collaboration, and virtual networks—which would have fundamentally altered the findings if included. In contrast, this study’s deliberate focus on pre-pandemic data allows us to capture the underlying trends and interactions within traditional KT frameworks, providing a solid foundation from which post-pandemic shifts can be compared in future studies.

[5] The search was conducted in July 2021.

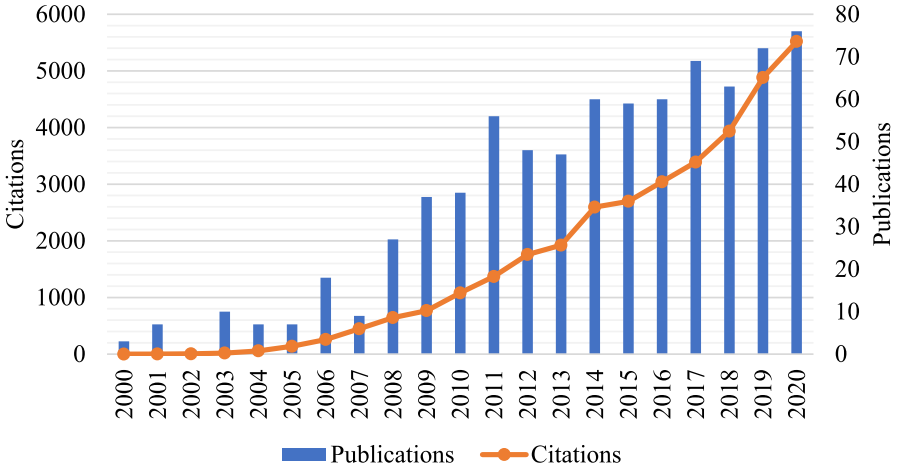


Fig. 1 Publication and citation evolution (2000–2020)

According to Noyons et al. (1999), bibliometrics make use of two main techniques: performance analysis and science mapping. In addition, other enrichment techniques can be used, which go a step further by incorporating network structure metrics (Donthu et al., 2021). The objective of this bibliometric analysis is to show the structural and dynamic aspects of scientific research. The development of computer technologies has allowed this methodology to be improved and positioned as an interesting methodological option to evaluate the structures of science. Performance analysis uses a wide range of techniques, including word frequency analysis, citation analysis, and counting publications by country, universities, research groups, or authors (Thelwall, 2008). Science mapping provides a spatial representation of how different scientific actors are related to one another (Small, 1999). Network analysis complements the previous techniques by giving additional information related to centrality and density metrics (Cobo et al., 2011).

This study's methodological approach combines performance analysis, science mapping, and dynamic network analysis to provide a multifaceted understanding of the literature. While each of these methods is well-established, our integration of all three offers an innovative perspective on KT research trends, which goes beyond conventional bibliometric studies. This integrated approach allows for an examination of both static and dynamic dimensions, ensuring a robust overview of the field.

Results

This section presents the results of our three-step analysis. First, our performance analysis identifies the most influential journals, authors, and documents within the field of KT and networks. After that, we present the science mapping results. Finally, we use network metrics to enrich the analysis.

Performance Analysis

KT and collaborative networks are a recent research topic that has gained interest in recent years (see Fig. 1). Specifically, in 2008 the number of publications tripled that of the previous year and has been growing steadily ever since, reaching the maximum number of articles ($n = 76$) and citations ($n = 5519$) in 2020.

The sources where this research has been published are highly widespread: the 774 articles in this study have been published in 159 different journals. The more frequent journals (11 or more papers) are shown in Table 2. Most of them are leading journals in the *business* and *management* fields (the 2020 impact factor [IF] of 88% of the journals exceeds 3.0, with an IF average of 6.1). Among the top 20 (actually 21, because of a draw), six journals exceed 1000 citations. This analysis suggests the existence of a strong heterogeneity of journals that focus on topics such as innovation, international studies, marketing, or human resources, among others. This implies that it is a discipline that receives interest from different fields.

Table 2 Top 20 journals according to total publications

	Journal	TP	% TP	TC	Q*	IF
1	*Journal of Knowledge Management*	44	5.69	1,062	Q1	8.182
2	*Organization Science*	28	3.62	4,354	Q2	5.000
3	*Journal of Technology Transfer*	26	3.36	310	Q2	5.783
4	*Journal of Business Research*	25	3.23	679	Q1	7.550
5	*Strategic Management Journal*	23	2.97	2,113	Q1	8.641
6	*Journal of International Business Studies*	21	2.71	1,924	Q1	11.382
-	*Research Policy*	21	2.71	1,597	Q1	8.110
8	*Industrial Marketing Management*	19	2.46	428	Q1	6.960
-	*Knowledge Management Research & Practice*	19	2.46	179	Q3	2.744
10	*International Business Review*	16	2.07	645	Q2	5.915
-	*International Journal of Technology Management*	16	2.07	142	Q4	1.667
-	*Technovation*	16	2.07	869	Q1	6.606
13	*Technological Forecasting and Social Change*	15	1.94	365	Q1	8.593
14	*Journal of Business & Industrial Marketing*	14	1.81	173	Q3	3.462
-	*Journal of Management Studies*	14	1.81	1,309	Q1	7.388
16	*Journal of Management*	13	1.68	267	Q1	11.790
-	*Journal of World Business*	13	1.68	356	Q1	8.513
-	*Management International Review*	13	1.68	357	Q3	3.721
19	*Journal of International Management*	11	1.42	485	Q2	4.645
-	*Management Decision*	11	1.42	191	Q2	4.957
-	*R & D Management*	11	1.42	373	Q2	4.272

*When a journal is indexed in both categories (management and business), the highest quartile is indicated

TP total publications, *TC* total citations, *Q* quartile in the JCR, *IF* 2020 impact factor

The total number of authors in the 774 articles is 1788. Table 3 identifies authors with four or more contributions. Wilfred Dolfsma and Daniel Levin are the authors with the highest number of contributions (six each), followed by Rob Cross, Zaheer Khan, Yong Kyu Lew, Bill McEvily, and Ray Reagans (five each). According to the number of total citations, Bill McEvily and Ray Reagans are the academics with the highest impact (more than 3000 citations each) thanks to their seminal work on the structure of networks in KT (Reagans & McEvily, 2003) and the creation of an integrative framework on KM in organisations (Argote et al., 2003), among others. Charles Dhanaraj is very close to 1000 citations. Next, we found five authors with more than 300 citations (Rodolfo Baggio, Chung-Jen Chen, Ram Mudambi, Marco Tortoriello, and Paul Bierly III). Another remarkable fact is that 40% of the authors in this ranking are based in Europe (half of them are from Italy), and 32% of the sample comes from North America (28% from the USA). This allows us to conclude that the impact of the works in this area is high and that, despite being a global phenomenon, European and American-based researchers are the main leaders on the topic.

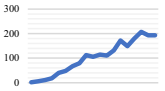
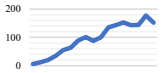
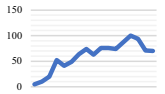
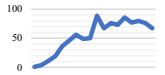
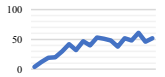
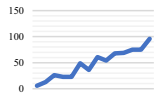
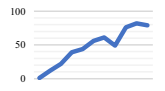
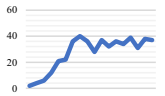
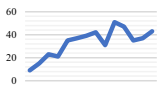
Finally, we identify the top 10 most-cited articles (Table 4). Four of them exceed 1000 citations, and the rest exceed 500. In all cases, they are considered seminal

Table 3 Top 21 authors by total publications

	Authors	TP	Affiliation	Country	TC	TC/TP, R	h
1	Dolfsma, W	6	Wageningen	Netherlands	93	15.5, 20	17
-	Levin, D.Z	6	Rutgers	USA	225	37.5, 13	12
3	Cross, R	5	Babson College	USA	87	17.4, 18	25
-	Khan, Z	5	Aberdeen	UK	119	23.8, 17	21
-	Lew, Y.K	5	Hankuk	South Korea	101	20.2, 18	12
-	Mcevily, B	5	Toronto	Canada	3,136	627.2, 1	19
-	Reagans, R	5	MIT	USA	3,055	611, 2	16
8	Baggio, R	4	Bocconi	Italy	315	78.8, 7	19
-	Chen, C.J	4	National Cheng Kung	Taiwan	523	130.8, 4	8
-	Dhanaraj, C	4	Temple	USA	949	237.2, 3	21
-	Fang, Sc	4	National Cheng Kung	Taiwan	124	31, 16	17
-	Lee, J	4	Korea	South Korea	36	9, 21	8
-	Lomi, A	4	Svizzera Italiana	Switzerland	126	31.5, 15	20
-	Makela, K	4	Aalto	Finland	294	73.5, 8	16
-	Molina-Morales, F.X	4	Jaume I	Spain	197	49.2, 10	20
-	Mudambi, R	4	Temple	USA	347	86.8, 5	23
-	Pedersen, T	4	Bocconi	Italy	173	43.3, 11	35
-	Rabbiosi, L	4	Copenhagen BS	Denmark	224	56, 9	10
-	Soda, G	4	Bocconi	Italy	131	32.8, 14	15
-	Tortoriello, M	4	Bocconi	Italy	333	83.3, 6	10
-	Walter, J	4	George Washington	USA	181	45.3, 12	15

TP total publications, *TC* total citations, *R* position in the ranking, *h* H index

Table 4 Top 10 cited publications

	Authors	Year	Title	Journal	TC	TC evolution*
1	Tsai, W.P.	2001	Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance	*Academy of Management Journal*	2,257	
2	Reagans, R.; McEvily, B.	2003	Network structure and knowledge transfer: The effects of cohesion and range	*Administrative Science Quarterly*	1,834	
3	Owen-Smith, J.; Powell, W.W.	2004	Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community	*Organization Science*	1,146	
4	Argote, L.; McEvily, B.; Reagans, R.	2003	Managing knowledge in organizations: An integrative framework and review of emerging themes	*Management Science*	1,097	
5	Hansen, M.T.	2002	Knowledge networks: Explaining effective knowledge sharing in multiunit companies	*Organization Science*	793	
6	Dhanaraj, C.; Parkhe, A.	2006	Orchestrating innovation networks	*Academy of Management Review*	775	
7	Sampson, R.C.	2007	R&D alliances and firm performance: The impact of technological diversity and alliance organization on innovation	*Academy of Management Journal*	608	
8	Volberda, H.W.; Foss, N.J.; Lyles, M.A.	2010	Absorbing the concept of absorptive capacity: How to realize its potential in the organization field	*Organization Science*	596	
9	Uzzi, B.; Lancaster, R.	2003	Relational embeddedness and learning: The case of bank loan managers and their clients	*Management Science*	567	
10	Dyer, J.H.; Hatch, N.W.	2006	Relation-specific capabilities and barriers to knowledge transfers: Creating advantage through network relationships	*Strategic Management Journal*	530	

X axis refers to the period under study (2000–2020)

works in the KM stream literature. Tsai (2001) is in the first position of the ranking. This document, which shows that the interaction between absorptive capacity and network position has positive effects on business unit innovation and performance, has settled the bases of the consequences of KT properties. Reagans and McEvily (2003), in the second position, concluded that social cohesion and network range

ease KT, over and above the effect of the strength of the tie between two people. Next, Owen-Smith and Powell (2004) demonstrate the importance of considering non-relational features of networks. Geographic proximity and the institutional characteristics of the key agents of a network influence the advantages of the rest. In sum, almost all these works approach KT from a static and structural perspective, trying to understand to what extent network structures influence the processes of knowledge exchange.

Science Mapping

To further characterise the subject matter, this section carries out a science mapping analysis of the bibliographic material. Science mapping, as described above, provides a spatial and representative view of how the different actors in a dynamically changing area of knowledge relate to each other (Small, 1999). With the aim of overcoming the limitations of bibliometrics (Tandon et al., 2021), we apply a combination of techniques that enables us to offer a complete overview of the subject. These techniques are bibliographic coupling, co-citation, co-authorship, and co-occurrence analysis (the latter in the "Network Analysis" section).

We used VOSviewer to analyse patterns of co-citation and co-authorship. VOSviewer calculates the *total link strength* (TLS), which measures the total strength of the links of an item with other items (Vallaster et al., 2019; van Eck & Waltman, 2014). Subsequently, the analysis is complemented by using SciMAT (co-occurrence) for the study of evolutionary dynamics, cluster identification, and analysis of centrality and density of the field under study.

Co-authorship Analysis

According to Martínez-López et al. (2018), co-authorship analysis measures the most productive set of documents and identifies units with the highest degree of joint publications, that is, the dynamics of collaboration. It has been shown how the study of co-authorships among academics contributes to richer scientific findings (Tahamtan et al., 2016). Here, collaborating scholars form a network (known as "invisible colleagues") that helps to improve the understanding of a research area (Crane, 1972).

The co-authorship network consists of 12 connected authors forming four clusters (Fig. 2 and Table 5). This network reflects few interactions between authors. Figure 2 shows how the geographical location of the researchers has a certain influence on the cluster's formation. It can be observed that in three out of the four clusters, there are two authors affiliated in the same country. That means that proximity facilitates co-authorship. If we attend to TLS, Cluster 2 is the one with the highest density in the network mesh. The higher the TLS density, the better the strength of connectivity of this author with the rest of the network. One possible explanation could be because, first, there are the two authors with a higher number of publications in the network, and second, because these two authors are also the ones with the highest number of citations. What is particularly interesting is the position that

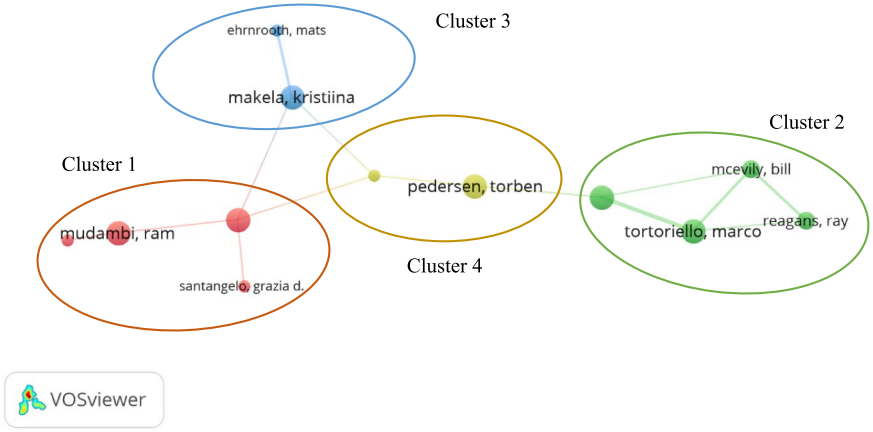


Fig. 2 Co-authorship analysis according to authors. *Note: Threshold criteria of a minimum of two documents; resolution 1.0; 12 of 183 authors are connected

Table 5 Cluster identification according to co-authorship (authors)

		Affiliation	Country	TP	TC	TLS
Cluster 1 — Red						
1	Buckley, P.J	Leeds	UK	2	84	1
2	Mudambi, R	Temple	USA	4	347	2
3	Rabbiosi, L	Copenhagen BS	Denmark	4	224	4
4	Santangelo, G.D	Copenhagen BS	Denmark	2	155	1
Cluster 2 — Green						
1	McEvily, B	Toronto	USA	5	3,133	7
2	Reagans, R	MIT	USA	5	3,052	5
3	Soda, G	Bocconi	Italy	4	131	5
4	Tortoriello, M	Bocconi	Italy	4	333	6
Cluster 3 — Blue						
1	Ehrnrooth, M	Hanken	Finland	2	128	2
2	Makela, K	Aalto	Finland	4	293	4
Cluster 4 — Yellow						
1	Minbaeva, D.B	Copenhagen BS	Denmark	2	167	3
2	Pedersen, T	Bocconi	Italy	4	173	2

TP total publications, *TC* total citations, *TLS* total link strength

takes Cluster 4, which acts as a central piece of the puzzle, being the connector of the rest of the clusters.

In the case of the co-authorship network by organisations (Fig. 3 and Table 6), a higher density in the network is observed. Five clusters were identified, and the top five universities in terms of total publications were selected. Geographically, many co-authorship relations are found in organisations within the same country. In

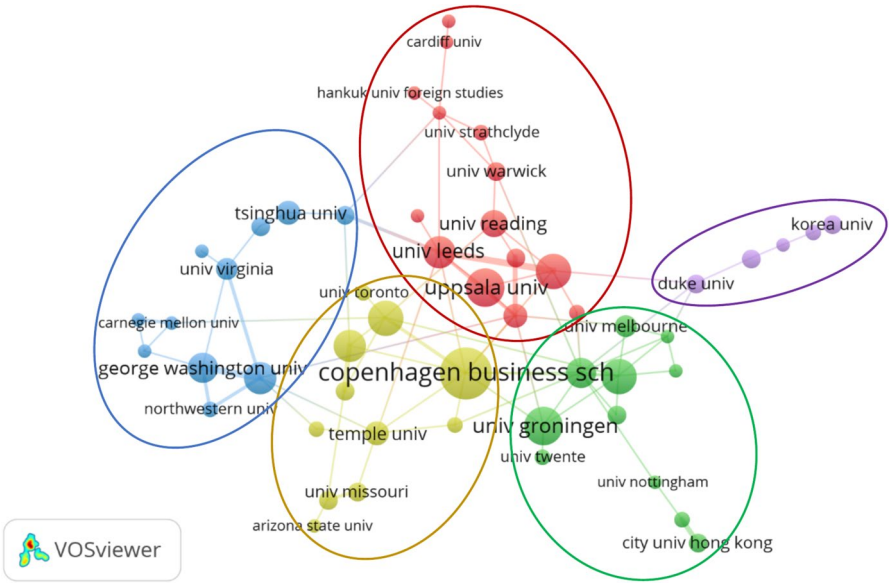


Fig. 3 Co-authorship analysis according to organisations. Note: Threshold criteria of a minimum of five documents; resolution 0.3; 52 of 879 organisations are connected

Cluster 1, three of the top five universities are from the UK. According to the TLS, this cluster has a lot of connectivity in the network. Cluster 2 is dominated by Dutch universities, Cluster 3 by USA universities, and Cluster 5 by South Korean universities. Cluster 4 does not allow us to see a geographical location path, as it is formed by universities of different countries. This analysis led us to see how universities from northern Europe tend to co-author densely with USA universities and some Asian universities, particularly from South Korea and China.

The co-authorship by country (Fig. 4 and Table 7) allows for the identification of two large clusters and three smaller ones. This is a quite dense co-authorship network. It should be noted that more than 50% of the countries that have published four or more documents are interconnected with other countries in the network. The countries with the greatest impact on the co-authorship network are the USA, UK, and China, as pointed out before. In terms of TLS, Cluster 1, led by the US, is the cluster with the highest density in the network, followed by Cluster 3, led by the UK. Other countries that seem to be very central and well connected in the network are France, Germany, Switzerland (Cluster 1), Italy, Spain (Cluster 3), and the Netherlands (Cluster 4). Clusters 2 and 5 are very dispersed in the network, which implies that, although their countries are connected in some way, they do not occupy a relevant role as intermediaries in the field.

Co-citation Analysis

Co-citation analysis identifies occurrences where two articles are jointly cited by one or multiple articles (Shiau et al., 2017). In a co-citation network, two publications

Table 6 Cluster identification according to co-authorship (organisations)

	Country	TP, R	TC, R	TLS, R
Cluster 1				
Aalto	Finland	9, 5	352, 4	10, 2
Leeds	UK	12, 3	327, 5	13, 1
Manchester	UK	13, 2	618, 1	9, 3
Reading	UK	10, 4	409, 3	4, 6
Uppsala	Sweden	14, 1	309, 6	3, 7
Cluster 2				
Erasmus	The Netherlands	11, 3	1,196, 1	10, 1
Tilburg	The Netherlands	13, 2	544, 3	8, 2
Groningen	The Netherlands	14, 1	307, 7	5, 4
Ljubljana	Slovenia	7, 5	308, 6	2, 9
Melbourne	Australia	8, 4	777, 2	3, 6
Cluster 3				
George Washington	USA	11, 2	411, 5	8, 2
Rutgers State	USA	12, 1	618, 4	11, 1
Tsinghua	China	9, 3	121, 10	2, 8
London	UK	7, 5	384, 6	5, 3
Virginia	USA	8, 4	286, 7	5, 4
Cluster 4				
Bocconi	Italy	13, 2	798, 6	8, 3
Brigham Young	USA	7, 5	1146, 4	5, 6
Copenhagen BS	Denmark	19, 1	1237, 3	11, 1
Insead	France	12, 3	1445, 2	6, 4
Temple	USA	9, 4	1119, 5	6, 5
Cluster 5				
Duke	USA	7, 1	395, 3	4, 1
Korea	South Korea	7, 2	142, 4	1, 5
Seoul Natl	South Korea	6, 4	58, 5	2, 2
Pennsylvania	USA	7, 3	416, 2	2, 3
Yonsei	South Korea	5, 5	536, 1	2, 4

Top five organisations by TP have been selected in each cluster

TP total publications, *TC* total citations, *R* position in the ranking, *TLS* total link strength

are connected when they co-occur in the reference list of another publication (Donthu et al., 2021). The major benefit of this technique is to identify the most influential items. In contrast, since it is based on the number of citations and accumulating citations takes time, this technique has the disadvantage that it is not able to identify emerging research niches or research trends.

Assuming that co-citation analysis helps to identify the most influential documents in a field, we can conclude that the KT literature is based on the understanding of learning networks, absorptive capacity, and the role of social capital in

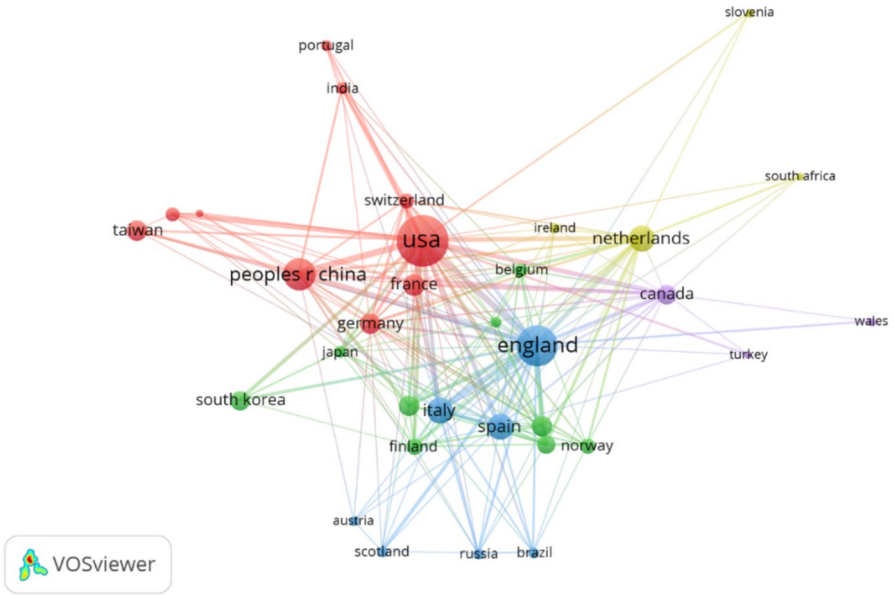


Fig. 4 Co-authorship analysis according to countries. Note: Threshold criteria of a minimum of four documents; resolution 0.75; 33 of 63 countries are connected

knowledge flows. In this regard, Fig. 5 shows a diagram of the reference relationships, and Table 8 identifies the three main clusters that we have labelled "Structure of collaboration networks" (Cluster 1), "Theoretical insights of knowledge" (Cluster 2), and "Social capital" (Cluster 3).

The first cluster analyses issues related to the formation of links as well as the study of structural characteristics of social networks. The work of Hansen (1999) presents the largest TLS, followed by Reagans and McEvily (2003) and Granovetter (1973). Powell et al. (1996) identify the importance of learning networks when the industry is knowledge-based, complex, and expanding. Reagans and McEvily (2003) argue that social cohesion and network rank facilitate KT, as they affect the motivation and ability of individuals. Ahuja (2000) finds that firms that possess accumulated technical, commercial, and social capital have advantages for linkage formation, and that firms without such capital have a chance if they generate a radical technological breakthrough. Granovetter (1985) and Uzzi (1997) focus their research on the importance of considering knowledge embeddedness in studies that analyse KT processes from a structural perspective. Finally, Granovetter (1973) demonstrated the cohesive power of weak ties, and Hansen (1999) and later Levin and Cross (2004) found that these ties are helpful for KT, but not when it is complex, since, in this case, strong ties are required.

The second cluster identified is built with papers that focus on the study of knowledge from a conceptual point of view. The papers with the highest TLS are Cohen and Levinthal (1990) and Tsai (2001). Grant (1996) lays the foundations of the knowledge-based theory on which this line of research is based. Kogut and

Table 7 Cluster identification according to co-authorship (countries)

	TP	TC	TLS
Cluster 1			
France	40	1,539	36
Germany	38	1,060	36
India	14	337	15
China	89	1,370	65
Portugal	11	140	6
Singapore	17	834	18
Switzerland	20	544	24
Taiwan	39	1,668	12
United Arab Emirates	5	76	6
USA	232	20,679	157
Cluster 2			
Australia	37	1,483	34
Belgium	15	338	22
Denmark	29	1,775	36
Finland	25	1,154	31
Japan	12	271	19
New Zealand	11	233	17
Norway	20	1,129	20
South Korea	34	1,008	15
Sweden	37	1,067	31
Cluster 3			
Austria	8	363	6
Brazil	10	167	15
England	143	5,876	139
Italy	58	2,008	55
Russia	10	194	18
Scotland	11	598	14
Spain	58	1,618	44
Cluster 4			
Ireland	9	255	10
Netherlands	59	2,754	60
Slovenia	7	308	4
South Africa	6	79	6
Cluster 5			
Canada	35	1,598	44
Turkey	5	132	6
Wales	7	279	4

TP total publications, *TC* total citations, *TLS* total link strength

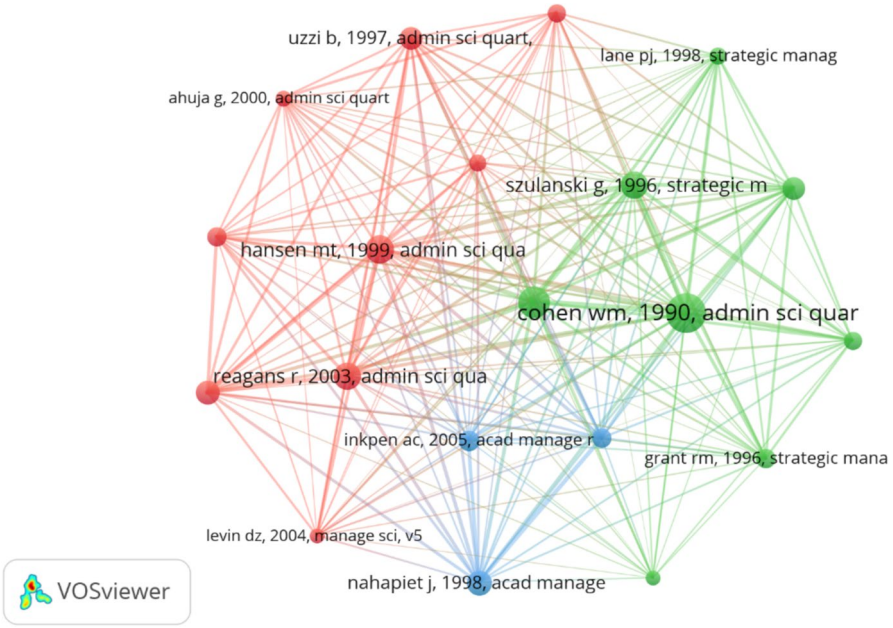


Fig. 5 Co-citation analysis according to references. Note: Threshold criteria of minimum number of citations of a cited reference: 100; resolution 1.10; 20 of 32,449 documents of the reference list are connected

Zander (1992) justify the existence of firms by arguing that knowledge resides in individuals rather than in markets. Szulanski (1996) identifies internal KT barriers, such as the lack of knowledge absorption capacity. In this sense, Cohen and Levinthal (1990) recognise the importance of having the ability to absorb knowledge to generate innovative capabilities. Lane and Lubatkin (1998) reconceptualise the construct of absorptive capacity, achieving greater explanatory power. Gupta and Govindarajan (2000) investigate KT processes in MNEs and find, among other conclusions, that knowledge inputs into a subsidiary are positively associated with the ability to absorb incoming knowledge. Finally, Tsai (2001), in his seminal work, concludes that central units will have a greater capacity to access new knowledge, but this will depend on the absorptive capacity and ability of the units.

Finally, the third cluster, which focuses on the study of social capital, has a lower presence in the network in terms of both the number of documents in the cluster and their centrality in the entire network. All three papers find a positive relationship between social capital and KT. Nahapiet and Ghoshal (1998) conclude that social capital facilitates the creation of new intellectual capital. Inkpen and Tsang (2005) propose conditions to promote KT in three different types of networks based on the dimensions of social capital. Finally, Tsai and Ghoshal (1998) show that social interaction and trust facilitate the exchange of resources and, consequently, product innovation.

Table 8 Cluster identification according to co-citation (references)

Source	Topic	TC	TLS
Cluster 1: ***Structure of collaboration networks***			
Hansen (1999), ASQ	Weak ties	189	1159
Reagans and McEvily (2003), ASQ	Cohesion and range	186	996
Granovetter (1973), AJS	Weak ties	159	912
Uzzi (1997), ASQ	Embeddedness, social structure, and competition	151	853
Granovetter (1985), AJS	Embeddedness in structures of social relations	113	651
Powell et al. (1996), ASQ	Learning networks	124	651
Ahuja (2000), SMJ	Linkage formation	107	646
Levin and Cross (2004), MS	Weak ties and trust	102	562
Cluster 2: ***Theoretical insights of knowledge***			
Cohen and Levinthal (1990), ASQ	Absorptive capacity	267	1224
Tsai (2001), AMJ	Absorptive capacity	213	1173
Szulanski (1996), SMJ	Stickiness of knowledge	184	972
Kogut and Zander (1992), OS	Knowledge-based theory	151	840
Grant (1996), SMJ	Knowledge-based theory	129	681
Lane and Lubatkin (1998), SMJ	Absorptive capacity	114	645
Gupta and Govindarajan (2000), SMJ	Knowledge flows	122	629
Podsakoff et al. (2003), JAP	Methods in behavioural research	100	435
Cluster 3: ***Social capital***			
Nahapiet and Ghoshal (1998), AMR	Social capital and advantages	171	949
Tsai and Ghoshal (1998), AMJ	Social capital and value creation	131	872
Inkpen & Tsang (2005), AMR	Social capital and networks	137	716

TC total citations, *TLS* total link strength

Bibliographic Coupling

Bibliographic coupling assesses the occurrence of a document reference in the bibliography of two or more publications (Ferreira, 2018). Unlike co-citation analysis, which identifies thematic clusters based on cited publications, bibliographic coupling identifies thematic clusters based on citing publications. Therefore, this technique is especially useful for discovering emerging themes and the latest developments. That is, this analysis can provide a representation of the present state of the research area (Donthu et al., 2021).

Table 9 and Figs. 6, 7, and 8 provide a bibliographic coupling representation. Within each category, the top five contributors have been selected according to the TLS. This analysis, which identifies current research trends, suggests that the study of social capital remains a developing and impactful area of KT literature. Filieri and Alguezaui (2014) conduct a systematic review in which they examine the role that the structure of social capital plays in KT and business innovation, and they

Table 9 Top five bibliographic coupling analysis according to TLS

		TP	TC	TLS
Document				
1	Filieri and Alguezaui (2014)	-	35	1629
2	Maurer et al. (2011)	-	177	1430
3	Khan et al. (2015)	-	32	1226
4	Najafi-Tavani et al. (2012)	-	41	1191
5	Kang and Hau (2014)	-	19	1191
Author				
1	Levin, D.Z	6	225	2870
2	Walter, J	4	181	2322
3	Dolfsma, W	6	93	2209
4	Soda, G	4	131	2010
5	Tortoriello, M	4	333	1831
Institution				
1	Copenhagen BS	19	1237	11,539
2	Uppsala	14	309	9239
3	Manchester	13	618	8448
4	Groningen	14	307	7805
5	Rutgers State	12	618	7786

TP total publications, *TC* total citations, *TLS* total link strength

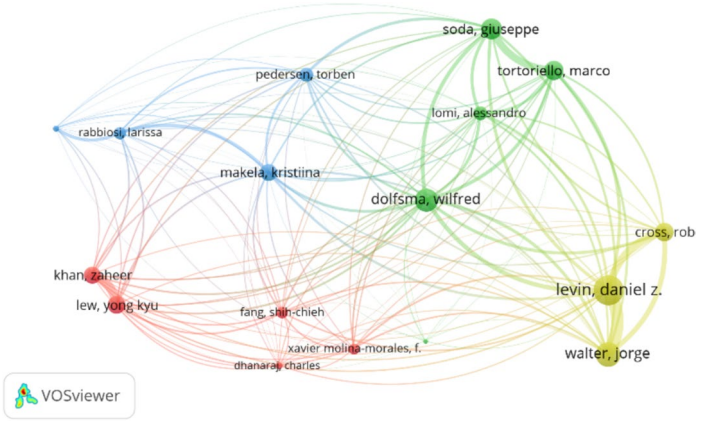


Fig. 6 Bibliographic coupling according to authors. *Note: Minimum number of documents: 4; resolution 1.10. 17 of 1,791. Node's size = TLS

find that different types of knowledge and KT processes are the missing links in the relationship between social capital and innovation. Furthermore, they identify how seemingly opposing configurations of social capital are complementary. Therefore, balancing different configurations of social capital will enable knowledge exchange and thus improve innovation outcomes. Maurer et al. (2011), in a widely cited paper,

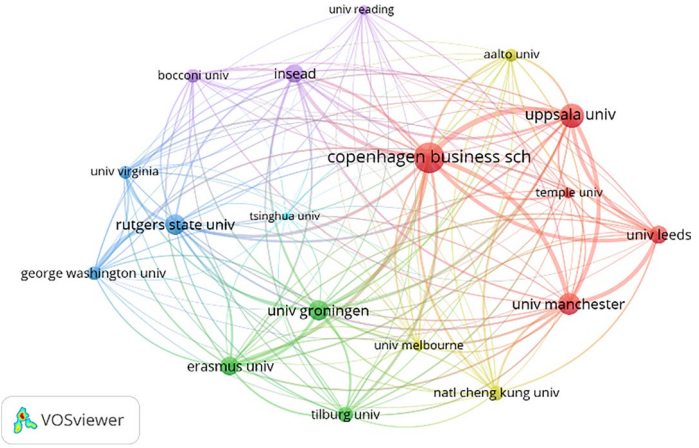


Fig. 7 Bibliographic coupling according to organisations. *Note: Minimum number of documents: 8; resolution 1.20; 18 of 879. Node's size = TLS

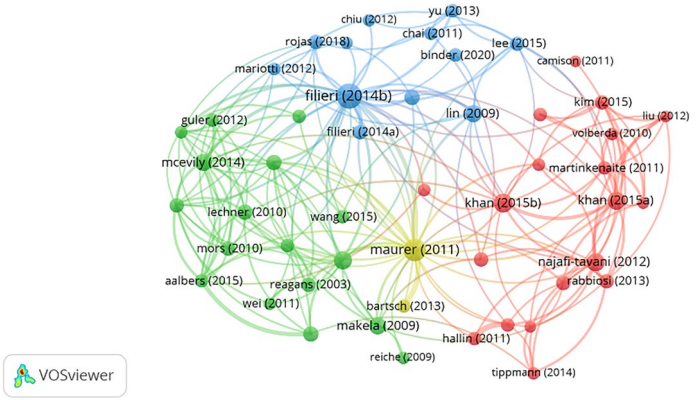


Fig. 8 Bibliographic coupling according to articles. *Note: No minimum number of citations required; resolution 1.05; 50 of 774. Node's size = TLS

found that KT mediates the relationship between the intra-organisational social capital of organisational members and the growth and innovation performance of the organisation. Other trending topics are related to the mechanisms of knowledge transmission and reception. Khan et al. (2015) found that while formal socialisation mechanisms enhance the understanding and speed of KT to local suppliers, informal ones enhance understanding but not speed. Kang and Hau (2014) concluded that the knowledge receiver's trust in colleagues and the perceived expertise of a sender source positively influences KT.

This technique also allows us to identify the origins of the discipline in terms of leading authors. Daniel Levin and Wilfred Dolfsma are the authors with more contributions to the area (6). However, Marco Tortoriello is the researcher with

the higher impact (333 citations). Other authors with influence in terms of TLS are Jorge Walter and Giuseppe Soda. Finally, our analysis suggests that the old continent is where the KT and networks research area was born. This analysis seems to be congruent with the results previously discussed in the performance analysis section.

Network Analysis

Evolution Analysis of the Field

We used SciMAT to analyse the topics and thematic areas of the 774 papers included in this study. The initial content analysis counted 2484 words extracted by the software from the titles and keywords of the complete sample. These words were subsequently evaluated and standardised by the research team in a laborious process. For instance, words like "MNEs", "MNCs", and "multinationals" are judged to be the same construct. After the standardisation and grouping process, 309 unique keywords were retained.

To analyse the evolutive dynamics of the field and following the previous literature, we break our sample into four five-year periods (the first one, with a small volume of existing works, includes six years). Figure 9 provides a preliminary picture of the evolution of the field. Each column represents a period and identifies a series of nodes that are groups of keywords. These keywords are connected through links of different types. The continuous links represent high intensity between terms. In addition, the thicker the links, the higher the co-occurrence of keywords. The

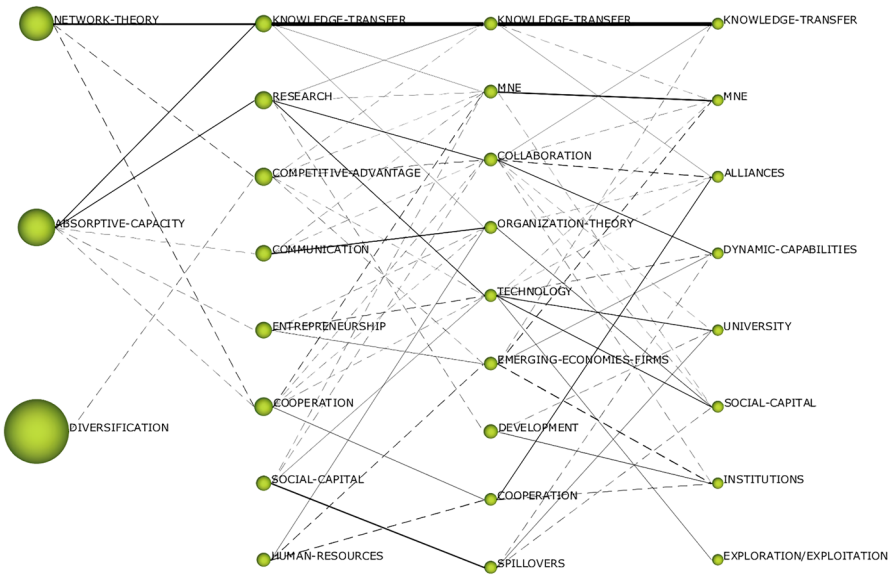


Fig. 9 Group of keyword evolution map (by co-occurrence). Note: Bubble size is determined by H-index. The greater the intensity of the ties, the more co-occurrence of groups of keywords between periods

discontinuous links represent the relation between the concepts with lower intensity. Finally, nodes' size is determined by the *H-index*. Note that accumulating citations requires time, so the size of the bubbles is sensitive to this, which explains their greater size in the first periods.

In the first stage *(2000–2005)*, academia was concerned with the study of network theory, strongly linked to KT in the following periods (Reagans & McEvily, 2003), as well as with concepts such as absorptive capacity (Chen, 2004; Tsai, 2001) and diversification (Breschi et al., 2003). Although diversification shows a large H-index, it is hardly connected to the rest of the concepts. In contrast, absorptive capacity constitutes, together with network theory, the origin of the KT discipline.

It is from the second period *(2006–2010)* when the term *KT* gains impact. In addition, other concepts such as human resources (Shaw & Williams, 2009), competitive advantages (Bou-Llusar and Segarra-Ciprés, 2006), entrepreneurship (Filatotchev et al., 2009), and communication (Joshi et al., 2007) emerged. Absorptive capacity, a key concept in the previous period, is strongly linked, besides to KT, to the concept of research (Vega-Jurado et al., 2008). Social capital emerged without being linked to previous concepts (Rottman, 2008), but with a strong impact in the following periods.

In the third stage *(2011–2015)*, the focus is placed on several items like MNEs (Mudambi et al., 2014), the dynamics of collaboration (Hewitt-Dundas, 2012), technology (Alexander & Martin, 2013), cooperation (Clausen, 2013), and spillovers (Kalapouti & Varsakelis, 2015), among others. Social capital from the previous period is now strongly linked to spillovers (Galunic et al., 2012) and communication, which was a concept with high impact between 2006 and 2010, and is linked to organisation theory (Hecker, 2012). However, if we focus on the continuous line from the origin, research is in this third period with collaboration and technology (Bozeman et al., 2013).

In the last period (*2016–2020)*, terms such as MNEs continue to be widely used, but other constructs emerge. The term cooperation from the third period is strongly linked to alliances (Korbi & Chouki, 2017) and collaboration to dynamic capabilities (O'Reilly et al., 2019). Also, technology is linked to university (Nilsen & Anelli, 2016), social capital (Al-Tabbaa & Ankrah, 2016), and ambidexterity (Sengupta & Ray, 2017). To sum up, if we focus only on the path built by the continuous links, which represent the strongest interaction between terms, we can see how the discipline has evolved from the study of absorptive capacity to the study of technology and collaboration and, finally, to dynamic capabilities, universities, social capital, and ambidexterity. These concepts are hot topics in the current literature.

Clustering and Network Properties

Following Cobo et al. (2011), Fig. 10 represents in different strategic diagrams the evolution of the area considering a three-dimensional space: centrality (X-axis), density (Y-axis), and the average number of citations (size of the themes).

Centrality measures the degree of interaction of a network with other networks (Callon et al., 1991) and can be defined as follows: $= 10 \times \sum e_{kh}$, where k is a keyword belonging to a given topic and h a keyword belonging to other topics.

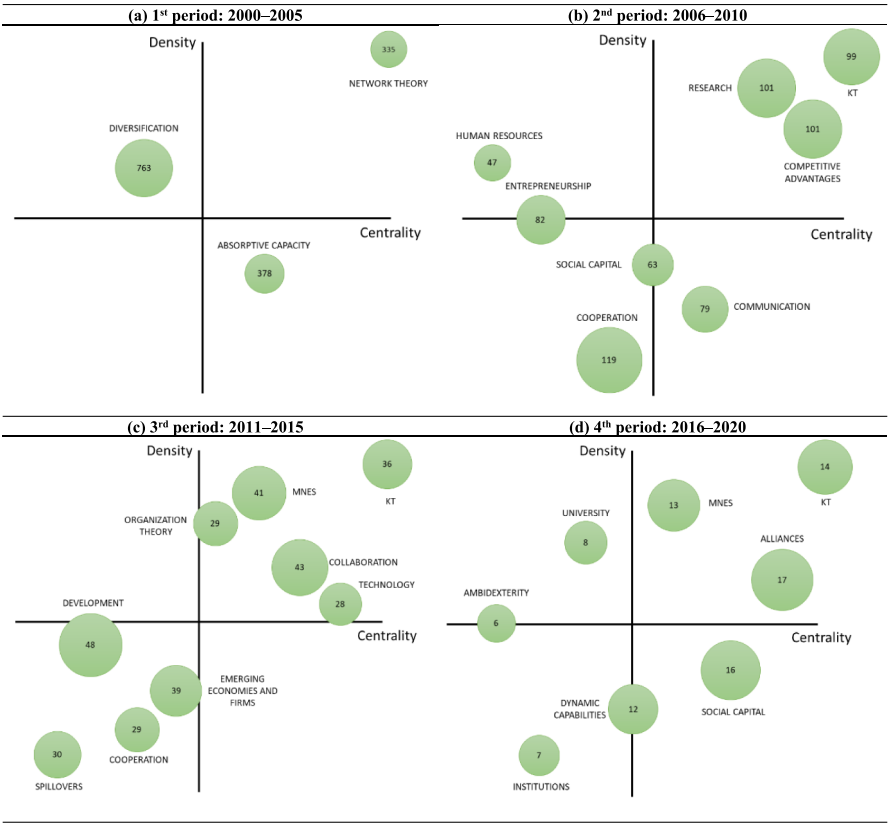


Fig. 10 Strategic diagrams based on co-occurrence of keywords (by periods)

Centrality measures the strength of external ties to other topics. We can read this value as a measure of the importance of a topic in the development of the entire research field. Density measures the internal strength of the network (Callon et al., 1991) and can be defined as follows: $d = 100\left(\sum e_{ij}/w\right)$, with i and j keywords belonging to the theme and w the number of keywords in the topic. Density represents a measure of the cohesiveness of a network, and it is commonly measured as the proportion of existing connections over the total number of possible connections in a network.

Four kinds of themes (clusters) can be identified according to the quadrant in which they are located (Cobo et al., 2011). Themes located in the upper-right quadrant can be considered the motor themes. They are related externally to concepts applicable to other themes that are closely related. Those themes are well developed and important for the structuring of the research field. Themes in the upper-left quadrant are very peripheral and specialised, so they have marginal importance for the field. Themes in the lower-left quadrant represent either emerging or disappearing themes. Finally, themes in the lower-right quadrant are important for the field

but are not developed enough. Thus, this quadrant groups transversal and general basic themes.

First period (2000–2005): Consistent with the previous point, three concepts are identified (see Fig. 10a). Two of these themes can be considered key due to their contribution to the field's growth: network theory (motor theme) and absorptive capacity (transversal theme). Given the novelty of the subject matter, this period is evidenced by very general terms, which attempt to lay the theoretical foundations of the discipline.

During the *second period (2006–2010)*, eight themes are identified and displayed in the strategic diagram (Fig. 10b). Among them, KT, research, and competitive advantages are considered as key due to the quadrant in which they are located (motor themes). This is the first time that the cluster KT appears in the analysis, so it can be considered as the moment where the discipline emerges. This second period is focused on the understanding of basic concepts in relation to knowledge flows, such as the consequences in terms of competitive advantages, research, or entrepreneurship. Communication is a transversal theme in this period, in which social capital also attracts researchers' attention. During this period, research on cooperation was impactful (119 citations on average), followed by the motor themes.

Third period (2011–2015): Continuing with the analysis, in this period (Fig. 10c) nine themes are identified, but with a different distribution and themes in comparison to the previous period. It is relevant to notice that there are no transversal or peripheral themes identified in this period. Four concepts (besides KT) are considered motor themes: MNEs, collaboration, technology, and organisation theory. Here, the field seems to be oriented toward an international and interorganisational context. Also, the field is likely to have an innovative and technological focus.

Finally, in the *fourth period (2016–2020)* eight research themes can be identified (Fig. 10d). Apart from KT, alliances (with the highest number of average citations) and MNE clusters represent the motor themes in these last years. It is important to highlight that in this period KT is analysed from an institutional and dynamic perspective (both emerging themes). Ambidexterity seems to also be an emerging theme related to KT research. That makes us think that KT still focuses on innovation literature. Social capital, which was identified in previous periods, is now showing high centrality but low density, which means that it can be classified as a transversal topic that continues reflecting attraction. Finally, research into universities is also contributing to the KT field, but in a peripherical way due to its specificity.

Discussion and Conclusion

The findings of this study provide meaningful insights into the evolving discourse on KT within the framework of the knowledge economy. By analysing 774 publications on KT and networks from the WoS database, this study identifies critical shifts in the theoretical landscape, particularly the convergence between resource-based view and network theory. This convergence reflects broader trends in the knowledge economy, where firms increasingly recognise that sustainable competitive advantage

emerges from an integrated approach combining internal capabilities with external networks (Foray, 2004).

Our results highlight how KT literature has evolved from a predominantly internal focus on firm resources to a more interconnected perspective, where internal and external knowledge sources are viewed as complementary. This progression aligns with Chesbrough's (2003) concept of open innovation, which emphasises that firms benefit from both internal R&D and external collaborations. By extending this approach within KT literature, our study underscores a key paradigm shift: knowledge is now regarded as a networked resource, dynamically flowing within and between organisations, which reflects the reality of an increasingly interconnected knowledge economy.

This study builds on and extends the foundational work of scholars such as Grant (1996) and Tsai (2001), who introduced the importance of internal capabilities and network positions, respectively, in facilitating KT. Grant's (1996) focus on knowledge as an internal asset laid the groundwork for understanding KT as a strategic resource, while Tsai (2001) highlighted how firms' network positions impact knowledge flow and innovation. Our study demonstrates how these concepts are increasingly intertwined, with KT literature evolving to acknowledge that organizations achieve innovation by leveraging both their internal resources and their network connections. This integration suggests that RBV and NT are not competing theories but complementary perspectives, advancing the discourse by offering a more holistic understanding of KT processes.

Further, our findings support Reagans and McEvily's (2003) emphasis on social cohesion and network range as essential elements of KT. By examining the relational and social aspects within network theory, our analysis confirms the central role of social capital in knowledge flows, as proposed by Nahapiet and Ghoshal (1998). This relational dimension, which includes trust, shared norms, and reciprocity, is critical for effective KT, as it facilitates the transfer of tacit knowledge often embedded in social interactions. Our study reveals that these relational aspects have gained increasing attention in recent KT literature, suggesting a deeper focus on the network qualities that support KT beyond simple structural connections.

In addition, by applying dynamic network analysis, our study contributes to the emerging research examining temporal changes in KT processes. Scholars such as Maurer et al. (2011) and Filieri and Alguezaui (2014) have previously identified the need to consider network evolution over time, particularly how relationships adapt as firms' strategic needs shift. Our findings align with their conclusions, emphasizing KT as a dynamic, evolving phenomenon that responds to changes within both firms and their external environments. This temporal perspective adds depth to the KT discourse, underscoring the adaptability of KT mechanisms as firms navigate complex, competitive landscapes.

Contribution to Knowledge Economy Literature

Our findings contribute to the knowledge economy literature by demonstrating how KT has become a foundational element in driving innovation and organisational

performance. The knowledge economy places a premium on intangible assets, particularly knowledge, as key drivers of value creation (Powell & Snellman, 2004). By mapping the evolution of KT literature, our study highlights how KT frameworks are adapting to the knowledge economy's demands for openness, connectivity, and collaboration.

Notably, this study's combined approach — utilising performance analysis, science mapping, and dynamic network analysis — reveals KT as increasingly interwoven with network structures. In doing so, our research not only supports Powell et al.'s (1996) early arguments on the role of networks in organisational learning but also provides empirical evidence of KT's structural interdependencies. This suggests that as knowledge becomes more decentralised, the capacity of firms to effectively exchange and apply knowledge is reliant on both their internal knowledge management systems and their external connectivity within knowledge networks.

In summary, this study advances the KT literature by integrating RBV and NT within the knowledge economy framework, demonstrating that firms maximise KT effectiveness by balancing internal resources with network-based knowledge access. By elucidating these shifts, this research provides a more comprehensive understanding of KT as a central element of the knowledge economy, offering scholars and practitioners a refined lens through which to view the increasingly networked nature of knowledge and innovation.

Emerging Research Topics

To sum up, it is worthwhile to mention that in the last five years, academia has shown special interest in more complex issues and methods (Huarng et al., 2021), together with others that have been maintained over time. Regarding the expected future avenues of the discipline, we can identify the following:

- *Multi-unit companies*: There is a large body of literature that tries to understand how knowledge flows interact within the firm (Hansen, 2002). However, our work has shown that, in recent years, there has been an increased focus on the analysis of inter-firm KT (Latorre et al., 2017; Vătămănescu et al., 2020). Improving the understanding of KT between companies with geographically dispersed business units is of particular interest given the current dynamics and needs of the industry (Kolympiris & Kalaitzandonakes, 2013). The levels of rivalry (Hallin & Lind, 2012) to which companies with dispersed units are exposed, as well as the dynamics of market technological and economic development, force them to engage in learning processes in order not to be left behind (Teigland & Wasko, 2009). In addition, these companies are influenced by different factors than single-unit companies that can affect KT practices. Cultural distance (Blomkvist, 2012), communication strategies (Fawad Sharif et al., 2020), and leadership style (Mabey et al., 2012) are some of the most interesting variables to study. Moreover, as digitalisation accelerates, multi-unit firms are increasingly relying on AI-based knowledge management systems to facilitate intra-organisational and inter-organisational KT, while

also addressing challenges related to data security and real-time collaboration. Future research could explore how artificial intelligence and blockchain-based verification mechanisms reshape KT processes within geographically dispersed firms.

- *New business models*: Globalisation and digitalisation have led to the development of new business models, most of them based on information technologies (IT). Organisations must fight with disruptive technologies and be prepared for change. As a result of this adaptation, the value of a company is created through digital assets that lead to new business models (Cassetta et al., 2020). There is not much research in this line, but recent literature (Eggers et al., 2022) insists on the need to deepen our knowledge about new business models. Given their intrinsic characteristics, KT processes can be very different from those already studied. As Bianchi and Mathews (2016) suggest, IT can contribute to reducing the distance and overcoming the commercial barriers between organisations by providing an additional channel for creating new relationships. Innovation is crucial in these organisations; therefore, being part of collaborative networks that facilitate access to external agents and resources is key (Malhotra & Temponi, 2010; Sanders, 2005). Future research may seek to characterise KT processes and strategies in these new business models, what consequences information exchange processes have on firms, how they differ from traditional firms in terms of structural determinants and characteristics, and what technologies are necessary to produce efficient KT. Emerging technologies such as blockchain are particularly relevant here, as they offer decentralised trust mechanisms that can facilitate secure and transparent KT across organisational boundaries. Similarly, AI-driven tools, including recommendation systems and automated knowledge extraction, are likely to become essential components of KT strategies in these digital-first business models. Future studies could examine the interplay between these technologies and new KT architectures.
- *Complex ecosystems*: In a knowledge-based economy, with many interconnected actors, the value of KT is vital (Cabrera-Suárez et al., 2018; Dung et al., 2021). The study of these flows, considering that they occur only between private organisations, is limited. Recent literature has shown interest in the study of ecosystems from a holistic perspective, considering that there are multiple types of agents involved (Carlisle et al., 2013). Among others, large scientific centres (BSC) (Ferrer-Serrano et al., 2021a, 2021b) — i.e. universities and research organisations — play a relevant role in knowledge-based ecosystems, as they are the main engine of knowledge generation. It is also important to consider that there are other agents in the context with an important supporting role in complex ecosystems, such as public administrations (Von Malmborg, 2004; Zou & Ghauri, 2008) and society (Carayannis & Campbell, 2009). This, together with the fact that the business literature is very interested in the institutional perspective (Bendickson et al., 2021), makes this analysis very attractive for future research. In addition, with the increasing use of digital platforms to mediate knowledge exchange in complex ecosystems, there is a need to study how digital infrastructures and governance models influence KT efficiency and inclusivity among diverse agents.

- *Social capital*: Our analysis has highlighted the strong interest in the analysis of social capital. Social capital theory has been applied to KT from both individual and organisational perspectives (Bartelt et al., 2020), providing a framework to explain this process along three dimensions: structural, relational, and cognitive capital (Chiu et al., 2006). According to previous research, social capital is a central axis to explain KT as it is a process that relies on social relationships and community connections (Bartelt et al., 2020; Choi, 2016). Li et al. (2021) identify the need for future work to jointly analyse all three dimensions to find out the real effect of social capital on KT. In addition, future studies may explore the different degrees of the effect of the dimensions of social capital in new business models. Emerging digital tools such as AI-powered community platforms could provide new ways to build, maintain, and measure social capital, which in turn could transform the dynamics of KT in both traditional and digital organisations.
- *Changing cycles*: Industries are dynamic and KT is an active process that requires time. Static approaches were very useful in the early stages of KT research, when the field was so underdeveloped that structural concepts were necessary to understand it (Gupta & Govindarajan, 2000; Lane et al., 2001). In contrast, current research requires longitudinal data, which seem to be strongly linked to the study of dynamic capabilities. Organisations have adaptative routines and processes to cope with market demands (Irwin et al., 2022) and turn strategic capabilities into sustainable competitive advantages (Teece & Lazonick, 2002). Their KT requires mechanisms of acquisition, emission, absorption, assimilation, recombination, and integration (Ferrer-Serrano et al., 2021a, 2021b). Thus, having dynamic capabilities can help to facilitate KT processes, make them more efficient, and even transform them into economic and innovative business results (Castellano et al., 2021). Future research could explore how digital transformation initiatives, particularly those leveraging AI-driven predictive analytics, influence the speed, adaptability, and success of KT across changing industry cycles.
- *Ambidexterity*: There is no doubt that innovation is supported by learning, and the absorption of new knowledge leads to change and innovation (Lin et al., 2013). In contrast, the effect of KT dynamics on ambidexterity has not been studied in detail. Although there are some studies suggesting how KT can be a good driver of innovation ambidexterity since it enables knowledge sharing and access (Cabeza-Pullés et al., 2020; Fu et al., 2018), there is no evidence showing how KT practices in collaborative networks facilitate innovation by exploring and exploiting at the same time. In this sense, we believe that further studies on the behaviour of the ambidextrous firm that actively participates in KT processes can serve to exemplify practices that can shed light on this underexplored avenue of research. Additionally, research could investigate how digital collaboration platforms and AI-enabled knowledge curation tools can support firms' efforts to simultaneously explore new knowledge domains and exploit existing capabilities.

Conclusion

This study offers a comprehensive bibliometric overview of the evolution of KT and network research over the past two decades. By combining performance analysis, science mapping, and dynamic network analysis, we identified key structural patterns and thematic shifts within the literature. Our results contribute by showing that the field has transitioned from a micro-level, firm-centred focus toward a more complex, dynamic, and ecosystem-based perspective. Moreover, we highlight the growing convergence between the resource-based view and network theory, suggesting that effective KT increasingly depends on integrating both internal capabilities and external networks.

The findings of this study also offer several actionable recommendations for policymakers and managers aiming to strengthen knowledge transfer in the contemporary economy (see Table 10). Public policy should promote public–private partnerships that facilitate knowledge co-creation and dissemination, particularly through digital knowledge-sharing platforms that enable broader and more inclusive participation. Investment in digital infrastructure is equally crucial, supporting the deployment of technologies such as blockchain for traceability and AI for knowledge mapping. Furthermore, targeted training and upskilling programmes can enhance firms' absorptive capacities, especially among small and medium-sized enterprises that may otherwise struggle to integrate external knowledge flows. At a regional level, policymakers should encourage the development of innovation hubs that bring together diverse stakeholders, fostering multi-directional knowledge flows and collaborative innovation. For managers, the implication is clear: firms must simultaneously cultivate robust internal knowledge assets

Table 10 Actionable recommendations

Policymakers	• Promote public–private partnerships to foster knowledge co-creation and broader dissemination, particularly via digital knowledge-sharing platforms • Invest in digital infrastructure to support scalable adoption of technologies like AI (for knowledge mapping) and blockchain (for traceability and secure KT) • Develop training and upskilling programs focused on improving firms' absorptive capacities, especially for SMEs with limited internal KT capabilities • Support regional innovation hubs that convene diverse actors—firms, academia, government—to catalyse multi-directional and inclusive KT ecosystems
Managers	• Strengthen internal knowledge assets by investing in organisational learning systems and codification practices • Engage in digital innovation networks, leveraging platforms and partnerships that enable real-time, cross-organisational KT • Adopt enabling technologies such as AI-based recommendation systems and blockchain contracts to improve the reliability, speed, and reach of knowledge flows
Researchers	• Strengthen internal knowledge assets by investing in organisational learning systems and codification practices • Engage in digital innovation networks, leveraging platforms and partnerships that enable real-time, cross-organisational KT • Adopt enabling technologies such as AI-based recommendation systems and blockchain contracts to improve the reliability, speed, and reach of knowledge flows

and strategically embed themselves in dynamic, digitally mediated innovation networks to remain competitive in an increasingly knowledge-driven economy.

Limitations and Future Research Avenues

This study is not free from limitations. One limitation is the reliance on citation counts as a proxy for scholarly influence, which may sometimes emphasise older, more established works over recent, innovative studies that have yet to accumulate citations. This can potentially skew our analysis toward long-standing theories and established research paradigms, although we have attempted to mitigate this by including dynamic network analysis, which captures temporal trends. Although this study focuses on general KT patterns rather than identifying the latest breakthroughs, we acknowledge that emerging trends may be underrepresented. Future research could supplement traditional citation analyses with alternative metrics such as altmetrics, usage statistics, or field-weighted citation impacts to better capture novel and rapidly developing areas of knowledge. For instance, Altmetric Attention Scores capture non-traditional forms of impact such as mentions in policy documents, news media, and social platforms, thereby reflecting broader societal engagement. Similarly, Mendeley readership counts can serve as early indicators of scholarly interest, particularly for recently published works that have not yet accumulated citations.

Another limitation is the quantitative nature of these methods, which may overlook qualitative nuances within individual publications. While science mapping and network analysis provide an overarching view of KT discourse, they do not delve into the specific theoretical arguments or empirical findings of each work. To address this, future research could complement our approach with a qualitative content analysis of key publications to provide a more in-depth perspective on the arguments underpinning KT theory.

The dataset was collected through the WoS with the purpose of obtaining higher-quality results. This choice limits the number of publications. Future research could extend this study by incorporating additional databases such as Scopus to capture a broader range of publications and to validate whether the observed knowledge transfer patterns hold across different indexing platforms. In addition, some exclusion criteria were imposed to improve the performance analysis, which also limited the final sample. Moreover, some indicators can lead to inconsistencies when used to compare different publications or authors. Hence, each indicator should be read together with the other ones, for example, the h-index. Another limitation is that the WoS count system attributes more importance to articles with multiple authors or affiliations compared to articles with a single author, although the scientific mapping performed with VOSviewer allows, at least partially, neutralising this limitation (Gaviria-Marin et al., 2019). Still, it would be of interest to use other software that can deliver complementary information. Finally, to provide better comparability and achieve better alignment to the research questions of this study, only the business and management fields in the WoS were chosen as a unit of analysis.

An additional limitation arises from the reliance on citation counts as the primary performance metric. Citation-based indicators tend to favour older, more

established works over recent or emerging studies, potentially biasing the visibility of newer contributions. Although this study focuses on general KT patterns rather than identifying the latest breakthroughs, we acknowledge that emerging trends may be underrepresented. Future research could supplement traditional citation analyses with alternative metrics such as altmetrics, usage statistics, or field-weighted citation impacts to better capture novel and rapidly developing areas of knowledge.

Finally, a key limitation of this study is the exclusion of articles published after 2020. While this decision was made deliberately to ensure the analysis captured KT and networks in a stable, pre-pandemic environment, it inherently restricts the applicability of the findings to the rapidly evolving post-Covid context. The pandemic catalysed major shifts toward remote work, digital collaboration, and virtual networks, fundamentally altering KT mechanisms. While this exclusion maintains methodological consistency, it constrains the study's capacity to account for recent disruptions in knowledge transfer practices driven by digital transformation and the rise of remote work. Future research should build upon the baseline established in this study by investigating how these transformations have reshaped knowledge transfer dynamics. Longitudinal comparisons between pre- and post-pandemic periods could provide deeper insights into the resilience, adaptability, and reconfiguration of KT processes in increasingly digitalised environments. Each of these limitations thereby provides opportunities for future work for academics, researchers, and practitioners.

Despite these limitations, our study's integrated methodological approach represents an innovative contribution to bibliometric analysis in KT research. By combining performance analysis, science mapping, and dynamic network analysis, we provide a more comprehensive perspective on how KT literature has developed, enabling a better understanding of the intellectual structure and evolution of this field.

Appendix

	Acronym	Description
1	TP	Total papers
2	TC	Total citations
3	Q	JCR 2020 Quartile
4	h	H index
5	IF	Impact Factor
6	TC/TP	Citations per publication
7	R	Position in the ranking
8	KT	Knowledge transfer
9	MNEs	Multinational enterprises
10	TLS	Total link strength
11	R&D	Research and development
12	KM	Knowledge management
13	JCR	Journal Citations Report

	Acronym	Description
14	JIF	Journal Impact Factor
15	BSC	Big Science Centres
16	IT	Information Technology

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Data Availability Data available under request.

Declarations

Conflict of interest The authors declare no competing interests.

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