TRANSACTIVE MEMORY SYSTEMS: A BIBLIOMETRIC ANALYSIS

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Abstract: *This paper explores the relationship between transactive memory systems (TMS) and organizational performance through a bibliometric analysis. The analysis examines publications in the Web of Science database from 1975 to 2023, focusing on those that connect TMS with knowledge and performance in an organizational context. The results reveal a growing interest in TMS research, particularly since 2010. The analysis identifies key concepts such as team performance, knowledge management, and intellectual capital. It highlights the increasing importance of managing intangible resources like knowledge in the digital age. The findings suggest a strong link between well-developed TMS and improved organizational performance. TMS facilitates knowledge sharing, expertise utilization, and team coordination, ultimately leading to better outcomes like innovation, efficiency, and creativity. The paper concludes that TMS represents a strategic management resource, especially for knowledge-intensive organizations. It emphasizes the need for further research to fully understand the potential of TMS in supporting such organizations.*
Keywords: *TMS, transactive memory system, technology, knowledge, performance.*

Introduction

Transactive memory system (TMS) has been defined by Wegner (1987) as the group-level equivalent of the individual memory system, plus shared meta-knowledge about "who and what knows". As Wegner (1995; 1987) cited in Andrei (2021, p. 394) indicated, TMS consists of the knowledge housed within the minds of individual team members combined with metamemory indicating each member's particular areas of expertise and the established division of responsibilities that governs how information is acquired, retained, and retrieved across the team. Consequently, “team functioning relies on knowing who the knowledge experts are, what their specific expertise is, and how to access and integrate this expertise via communication, interaction, and collaboration to create added value.” Although in the last 20 years TMS have attracted the attention of many researchers in the fields of cognitive psychology, organizational psychology, information systems and management (Peltokorpi & Hood, 2019), the exploration of the topic in the literature in Romania is still in a nascent stage, references to TMS being found only in the study of the performance of teams (Andrei, 2021) and in the field of cognitive psychology (Curșeu et Rus, 2005).

Considering the literature (Ren & Argote, 2011; Cao & Ali 2018; Peltokorpi & Hood, 2019, Levi & Askay 2020) showing that a functional TMS serves as a comprehensive repository of diverse knowledge that, when leveraged strategically, possesses the capability to yield favourable impacts on organizational performance and success metrics (Madison et. al, 2021), we considered the topic of particular interest and conducted a bibliometric analysis research, which we present below.

Bibliometric analysis: method and results

A bibliometric analysis research was conducted to perform a statistical evaluation of TMS-related literature published between 1975 -2023 and indexed in the Web of Science.

The analysis started with an inventory of all studies indexed in the Web of Science that dealt with the concept of transactive memory, gradually narrowing down the area of investigation to the studies that considered TMS in the knowledge fructification equation and focused on performance achievement in the organizational context. The bibliometric analysis was carried out in February 2023 and considered the use of information obtained from the Web of Science (WoS) Core Collection as a data source, using the search function provided by WoS.

The results returned by the WoS search were analysed in 3 successive phases.

In a first phase, WoS indexed documents published between 1975 -2023 in English language and containing the words "transactive memory" in the topic were considered in our search. The search results showed that the first publications that addressed the topic "transactive memory" appeared in WoS in 1985, with only a few other papers appearing in the following years until 2010, the year in which the topic began to gain momentum, with 78% of the total of 724 WoS indexed articles that included the keyword "transactive memory" being published in the period 2010-2022 (see Table 1).

In the second step a simultaneous search was made in the topic articles for the keywords "transactive memory AND knowledge". This search indicated 1988 as the year of the first articles. Of the total of 643 WoS indexed articles that included "transactive memory AND knowledge" in the topic discussed, 83% were published between 2010-2022. Furthermore, the WoS search for the period 1975 -2023 for "transactive memory AND knowledge" showed a total of only 241 published papers including both keywords in the abstract of the paper.

In step 3, we narrowed the area of investigation by searching WoS for the period 1975 - 2023 for papers containing 3 keywords - "transactive memory AND knowledge AND performance" in the abstract.

Table 1. Papers on TMS topic indexed in Web of Science between 1975-2023

Keywords	No. of papers	Year of 1st paper	% published after 2010
Transactive memory (în Topic)	724	1985	78%
Transactive memory AND Knowledge (în Topic)	643	1988	83%
Transactive memory AND Knowledge AND Performance (în Abstract)	93	2006	80.64%

(Source: Web of Science, Feb 2023)

Narrowing the search by using 3 keywords - "transactive memory AND knowledge AND performance" - we obtained a total of 93 papers indexed in Web of Science (WoS) for the period 1975 -2023, with first publication in 2006, and over 80% of the papers being published after 2010. Of the 93 papers containing in abstract all 3 keywords - transactive memory and knowledge and performance - more than 80% belong to management and

business-related categories (see Table 2). More than 50% of the 93 papers are indexed in the Management category of Web of Science - see Table 2).
Given the increasing concentration of articles in recent years (Table 1), and the framing of most of them in the MANAGEMENT category (Table 2), it can be concluded that the literature points to the opportunity for a comprehensive analysis of the transactive memory system as a strategic management resource.
Therefore, the bibliometric analysis considered papers indexed in WoS that have in the abstract the keyword "transactive memory" as well as the words "knowledge" and "performance", setting 1975-2023 as period, and articles written in English as type of paper.

Table 2. Web of Science category

Web of Science category	No. of articles	% of the total of 93
Management	50	53.763
Business	17	18.280
Information Science Library Science	17	18.280
Psychology Applied	12	12.903
Computer Science Information Systems	10	10.753
Engineering Industrial	9	9.677
Operations Research Management Science	8	8.602
Education Educational Research	6	6.452
Computer Science Interdisciplinary Applications	5	5.376
Computer Science Software Engineering	5	5.376
Psychology Experimental	5	5.376
Psychology Multidisciplinary	5	5.376
Psychology Social	5	5.376
Social Sciences Interdisciplinary	4	4.301
Engineering Electrical Electronic	3	3.226
Ergonomics	3	3.226
Psychology	3	3.226
Behavioral Sciences	1	1.075
Business Finance	1	1.075
Computer Science Artificial Intelligence	1	1.075
Economics	1	1.075
Education Scientific Disciplines	1	1.075
Environmental Sciences	1	1.075
Health Care Sciences Services	1	1.075

(Source: WoS, Feb 2023)

The result of the search for "transactive memory AND knowledge AND performance" in the abstracts of the WoS indexed papers was exported from the Web of Science as a text file (.txt) with the option "complete records and cited references" for further analysis using the bibliometric analysis software VOSviewer (van Eck & Waltman, 2023). The text file exported from Web of Science containing all information on authors, titles, abstracts, sources, topics covered, years of publication and references for each article, was then loaded into VOSviewer to perform data analysis and generate visualization maps of keyword co-occurrence, citations and source co-citation, bibliographic linkages, prominent authors and countries of origin.
Table 3 provides a summary of the search protocol underlying the bibliometric analysis carried out using VOSviewer software (van Eck & Waltman, 2023).

Table 3. Bibliometric analysis protocol

Source of data extraction:	Web of Science (WoS)
Keywords:	*transactive memory* AND *knowledge* AND *performance*
Categories:	all categories
Type of document:	articles
Perioada:	1975 – 2022
Language:	English
Software for data analysis:	VOSviewer

The data extracted from Web of Science were analysed with the VOSviewer software which allowed the inventory and visualisation of similarities, keyword co-occurrence (Table 4 and Fig. 2), citations and co-citation of sources with bibliographic linkage highlighting, prominent authors and their countries of origin. The analysis of bibliographic couplings indicated overlap in reference lists based on the acceptance that two papers are bibliographically coupled if there is a third paper cited by both papers (Kessler, 1963). Thus, the co-citation analysis led to the detection of the most prominent co-cited sources (both authors and journals) as shown in Table 5 and Table 6.

Moreover, the co-citation analysis showed how ideas are interlinked between the contributions of different authors.

The first VOSviewer analysis was based on the text in the article titles and abstracts (Fig.1) which showed the prominence of the keyword 'performance' and ‘group performance’ for cluster 1, 'transactive memory', 'team performance', 'trust' and 'knowledge sharing' for cluster 2, respectively 'TMS', 'team', and 'communication' for cluster 3. "Communication" is the keyword with the highest number of occurrences and the highest link strength in cluster 1, followed by the keyword "expertise", "transactive memory", "knowledge", "performance" and "team performance". "Transactive memory system" is the keyword with the most occurrences and the highest link strength in cluster 2, followed by the synonyms "transactive memory-systems" and "transactive memory systems" and the keyword "information-technology". "Trust", "coordination", "knowledge management", "knowledge transfer" are the keywords with the highest occupancy and link strength in cluster 3 (details Table 4 and Fig. 2).

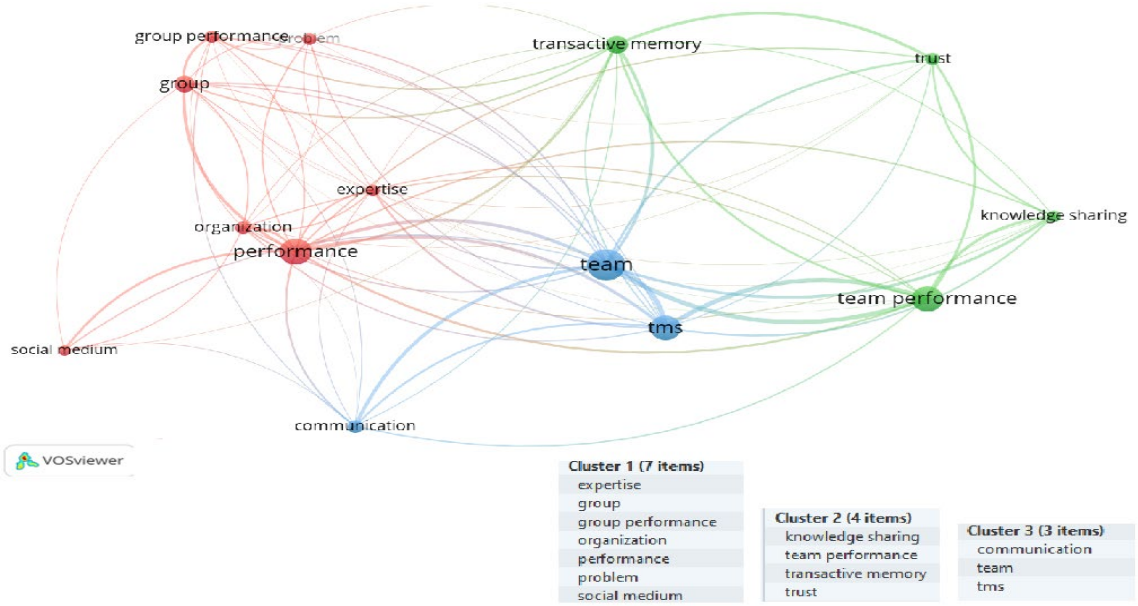

Fig.1. Clusters

The results of the analysis of keyword co-occurrence are presented in Table 4 .and Fig. 2.

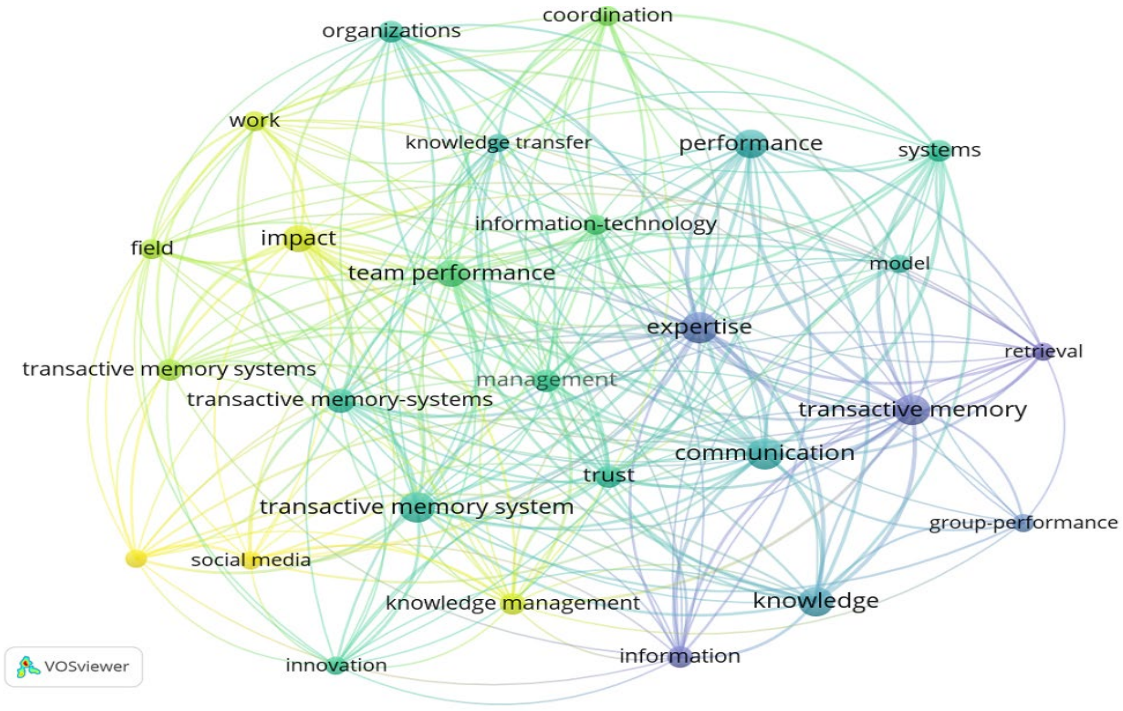

Fig 2. Co-occurrence of keywords

Table 4. Co-occurrence of keywords

Keyword	Cluster	Occurrences	Total link strength
communication	C1	15	74
coordination	C3	6	32

expertise	C1	15	66
field	C1	6	24
group-performance	C1	5	14
impact	C2	11	50
information	C1	7	28
information-technology	C2	6	35
innovation	C2	5	21
knowledge	C1	13	50
knowledge management	C3	7	29
knowledge transfer	C3	5	26
management	C3	8	36
model	C1	5	18
organizations	C3	7	31
performance	C1	12	54
retrieval	C1	5	25
social media	C2	5	25
systems	C1	7	38
team performance	C1	11	54
transactive memory	C1	14	59
transactive memory system	C2	14	51
transactive memory systems	C2	16	65
transactive memory-systems	C2	9	40
transformational leadership	C2	5	24
trust	C3	8	42
work	C2	6	27

In order to identify the most important authors who contributed to TMS literature, a co-citation analysis was carried out considering the authors of the articles as the unit of analysis. VOSviewer software was used to inventory co-citation links, considering that “a co-citation link is a link between two articles that are both cited by the same paper" (Van Eck & Waltman, 2023 p. 27).

Table 5 and Fig 3. detail the results of the analysis, showing Lewis (94 citations; 935 total link strength) and Wegner (89 citations; 864 total link strength) - the one who introduced the concepts of transactive memory and TMS - as the most cited authors, followed closely by Hollingshead (70 citations and 855 total link strength) and Moreland (63 citations; 733 total link strength).

Table 5. Most cited authors

Author	Citations	Total link strength
"Akgun, AE"	29	303
"Austin, J"	22	301
"Brandon, DP"	21	243
"Faraj, S"	22	267
"Hollingshead, AB"	70	855
"Lewis, K"	94	935
"Liang, DW"	30	358
"Moreland,RL"	63	733
"Peltokorpi, V"	25	312
"Ren, YQ"	20	238
"Stasser, G"	28	381
"Wegner, DM"	89	846

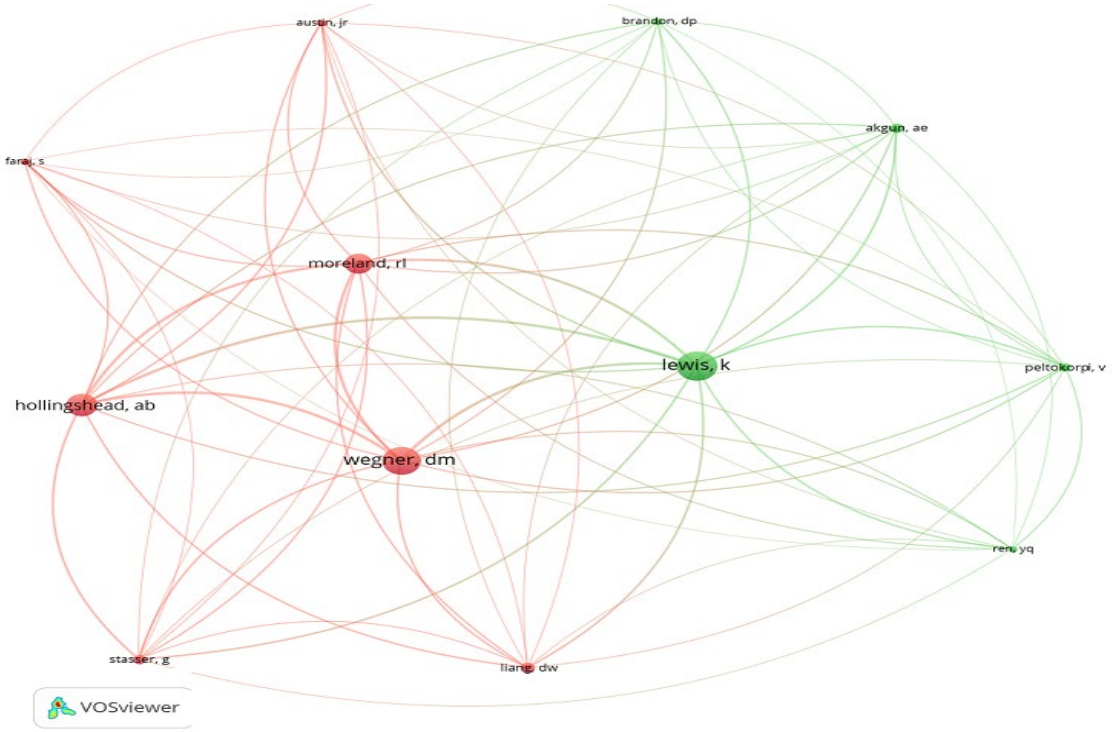

Fig.3. Co-citations: most cited authors

Similarly, in order to identify the most important sources co-cited in articles retrieved from the Web of Science, a co-citation analysis was performed considering the cited journals as the unit of analysis.

Table 6 and Fig 4. detail the results of the co-citation link analysis carried out using VOSviewer, indicating that the Journal of Applied Psychology (209 citations; 6959 total link strength) leads the ranking, followed by Organization Science (140 citations; 4654 total link strength) and slightly below: Management Science (100 citations and 3264 total link strength) and Academy of Management Journal (90 citations; 3494 total link strength).

Table 6. Co-citation sources: journals

Source	Citations	Total link strength
acad manag ann	20	754
acad manage j	***90***	***3494***
acad manage rev	61	2247
admin sci quart	77	2724
commun res	22	746
comput hum behav	40	1482
group organ manage	20	770
inform manage-amster	38	1487
inform syst res	25	953
int j inform manage	22	936
j appl psychol	***209***	***6959***
j bus res	28	1264

j exp soc psychol	39	1340
j knowl manag	22	812
j manage	58	2222
j manage inform syst	27	1109
j organ behav	29	1052
j pers soc psychol	84	2579
leadership quart	22	1065
manage sci	***100***	***3264***
mis quart	72	2766
organ behav hum dec	84	2745
organ sci	***140***	***4654***
pers soc psychol b	37	1304
psychol bull	20	755
small gr res	25	942
soc cognition	22	582
strategic manage j	41	1437
theories group behav	46	1368

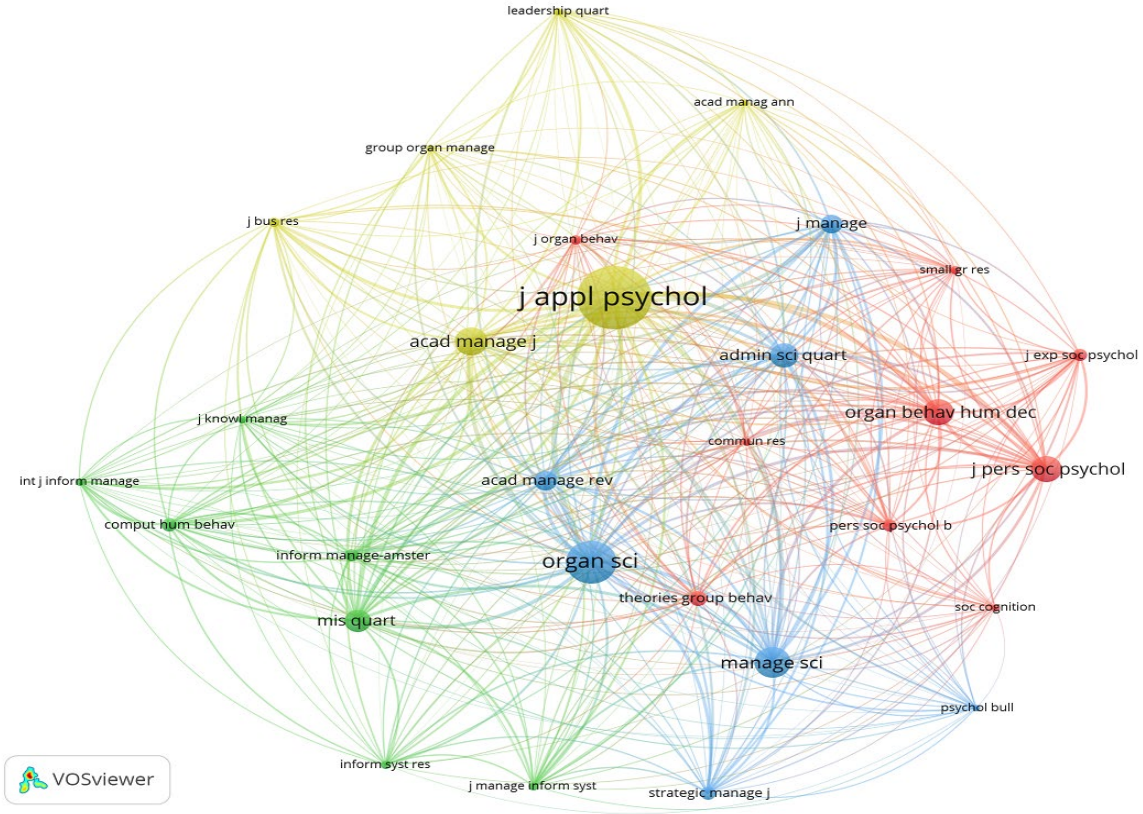

Fig. 4. Co-citation sources: main journals

Analysis of the countries of origin of studies and citations (Fig 5 and Table 6) shows only 8 countries, with USA (20 documents, 1509 citations, 57 total link strength) at the top, followed by China (15 documents, 537 citations, 57 total link strength).

Table 6. Countries of origin of studies and citations

Country	Documents	Citations	Total link strength
USA	20	1509	57
China	15	537	57
Taiwan	8	277	24
Netherlands	3	212	15
Germany	3	108	6
England	2	132	6
South Korea	2	38	7
France	2	7	6

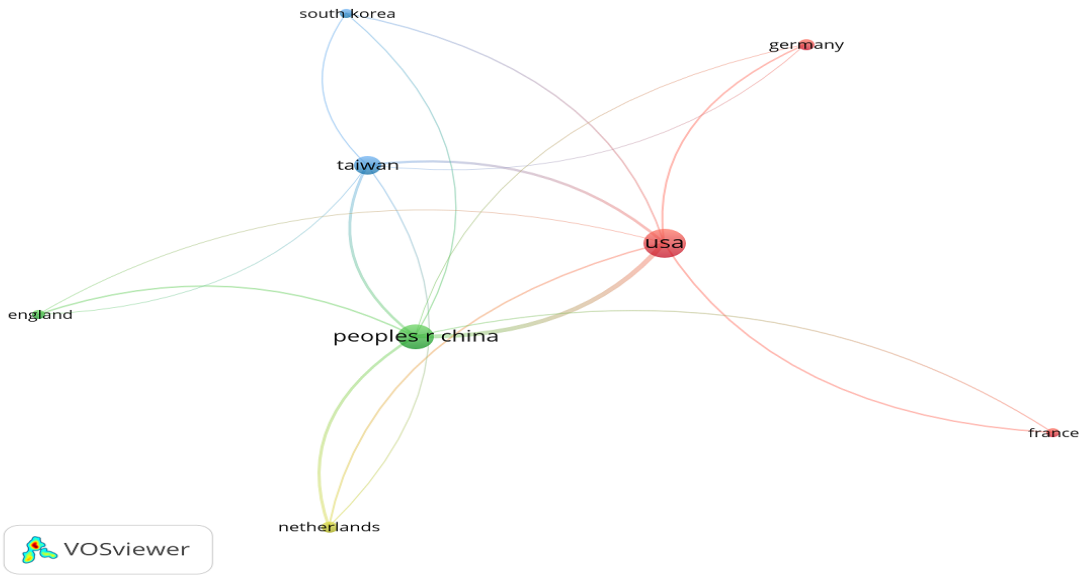

Fig.5. Countries of origin of studies and citations

Discussions

The result of the bibliometric analysis reveals a growing interest in TMS research, particularly since 2010. The analysis highlights key concepts such as team performance, organizational performance and knowledge management, as well as the increasing importance of managing intangible resources like knowledge in the digital age.

The analysis of the literature addressing these concepts has indicated that the transition from industrial to digital society has shifted the focus away from the management of tangible resources towards the management of intangible resources and the capitalization of knowledge - considered to be of prime importance in gaining competitive advantage in more and more fields (Subramaniam & Youndt, 2005; Pucci, Simoni, & Zanni, 2015; Dumay, Guthrie, & Rooney, 2020). Thus, the success of firms has increasingly come to depend on the proper management of intangible resources, knowledge, and intellectual capital (Bontis, 2000), the literature (Dean & Kretschmer, 2007; Sharabati, Jawad, & Bontis, 2010; Herremans, Isaac, Kline, & Nazari, 2011) showing that the three sub-dimensions of intellectual capital, i.e. human capital (i.e. employee attitudes, motivation, knowledge and skills), relational capital (i.e. customer loyalty, supplier relationships, distribution channels, etc.) and structural capital (i.e. process routines and appropriate organisational structures) are mutually reinforcing.

The literature indicate that successful organizations rely on intellectual capital to gain a

sustainable competitive advantage (Bratianu et al, 2020), using as their main resource the exploitation of knowledge assets generated by teams of knowledge workers whose members use their expertise and experience to solve problems and create added value through innovation and new products (Lewis, 2003), transactive memory system (TMS) being particularly relevant for understanding knowledge capitalization processes in teams, as described in the literature (Wegner, 1987; Hollingshead, 2001).

TMS enables organizations and their constituent teams to attain elevated levels of performance output (Peltokorpi & Hood, 2019). As Lewis (2003, 2004) indicated, the development of a robust transactive memory system becomes especially critical when task execution depends on both the use and the integration of expertise held by different team members. As team members need to pool and coordinate their knowledge to accomplish their tasks, team effectiveness grows increasingly contingent upon the successful establishment of a well-functioning transactive memory system (Lewis, 2003).

The literature highlights that specialization, credibility and coordination between team members are very important aspects of TMS, (Lewis, 2003; Schein, 2010; Levi & Askay, 2020), influencing task and project delivery, efficiency, creativity, innovation, performance (Lewis 2004; Zhang et al. 2007; Zheng 2012; Anderson 2014; Lee et al. 2014; Mell et all. 2014; Cao & Ali 2018; Peltokorpi & Hood, 2019, Levi & Askay 2020). TMS is essential for sharing and integrating information, leveraging specialized expertise in organizations and thus improving performance (Austin 2003; Leonardi 2014; Lewis and Herndon, 2011). A well-developed TMS leads to improved performance behaviours such as team learning and creativity, as well as outcomes such as team effectiveness and efficiency (Austin 2003; Lewis et al. 2005; Ren and Argote 2011).

We can conclude that the analysis of the literature indicates a strong connection between transactive memory system (TMS), knowledge management and organizational performance. It shows that TMS development is essential for addressing strategic aspects of an organization management such as teamwork efficiency, improving creativity, innovation, and knowledge capitalization. Therefore, TMS should be seen as a strategic management resource, especially by the organisations operating in knowledge-intensive fields of activity. Further research is needed to understand the full support TMS can provide to the organisation operating in knowledge-intensive fields of activity.

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