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Original Research

Intellectual Structure of Knowledge in Collaborative Information Behavior: A Co-Word Analysis

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Abstract

Considering the increasing importance and gradual development of research on collaborative information behavior (CIB), this study aims to investigate the current intellectual structure of knowledge on this topic, providing researchers with a basis for its future direction and development. Hence, co-word analysis was conducted on documents from Web of Science and Scopus. The network structure of the most frequent keywords was visualized using VOSviewer software. A hierarchical clustering algorithm was used to form the square matrix comprising frequently repeated keywords. To do so, SPSS software, Ward's method, and Squared Euclidean distance method were employed, and clusters and co-word dendrogram of keywords were drawn. Furthermore, network characteristics of the co-word matrix, including centrality and density, were analyzed using UCINET software. Accordingly, quadrant and coefficient matrices were created for each cluster, centrality and density were calculated, and a strategic diagram was eventually drawn. The study comprised 316 documents published between 1992 and 2023. The most frequent keyword was "Collaborative information," and the most common co-word pair was "Collaborative Information**Information Use." Nine clusters emerged, encompassing topics such as computer-supported cooperative work, collaborative searching, system design, professional contexts, social Q&A, and collaborative learning. However, these clusters were largely undeveloped, marginal, and immature, reflecting the field's relative youth, unstable terminology, and secondary treatment in research. The findings underscore the need for further research on CIB as a central topic of the study to deepen our understanding of its diverse aspects.

Keywords: Collaborative Information Behavior, CIB, Intellectual Structure, Knowledge, Bibliometrics, Co-Word Analysis, Strategic Diagram.

Introduction

In recent years, collaborative information behavior (CIB) has been viewed as essential for many everyday life and task-related endeavors. The main reasons are the ever-evolving development of communication technologies and platforms (Sapa, 2022) and the growing availability of networked environments which are accompanied by challenges due to information overload, limited time, and lack of evaluation skills (Granikov, El Sherif,

Bouthillier & Pluye, 2022; Shah, 2013) defines CIB as an interactive and mutually beneficial process, which includes searching, retrieving, browsing, sharing, assessing, and synthesizing information in collaboration with others. CIB encompasses the process of finding information to satisfy group information needs, as well as intricate and dynamic interactions among and between users and information sources or information systems (Ndumbaro, 2023).

Over the last two decades, there has been a significant increase in research focus on CIB (Ndumbaro, 2023). Searching Web of Science and Scopus shows increase in CIB publications in various work tasks, organizational and everyday life contexts such as group-based educational settings (Hyldegård, 2006), patient care teams (Reddy & Spence, 2008), clinical service of a hospital (Fortea-Cabo & González-Teruel, 2022), highly politicized decision-making project management (Riley, Allen & Wilson, 2022) and leisure projects such as group traveling (Ye, Du, Hansen, Ashman, Sigala & Huang, 2021) and decision making in tourism (Du, 2022). In light of the increasing importance and gradual emergence and development of CIB, it is crucial to obtain a thorough understanding of its intellectual structure of knowledge to inquire into its progress over time and better comprehend its underlying research aspects. Intellectual structure refers to a set of prominent characteristics of the knowledge base that can provide a systematic and comprehensive understanding of the chosen scientific field. Thus, the intellectual structure of a scientific field encompasses its constituent research traditions, disciplinary composition, the topics it addresses, and the pattern of interrelationships among these topics (Shafique, 2013). Many studies have addressed the basic properties of the CIB research domain, including the antecedents and outcomes of CIS (Granikov et al., 2022), applied studies on CIB (Sapa, 2022), models of CIB (Ndumbaro, 2023), and methodological issues in CIS empirical studies (Hertzum & Hansen, 2019). Although these research endeavors have provided scholars with a deeper understanding of the various aspects of CIB, there remains a lack of a comprehensive understanding of its intellectual structure.

One of the techniques commonly used for analyzing the intellectual structure of a research domain is co-word analysis. It examines the relationships between the words used in various sections of a document, including the title, abstract, and keywords. (Ronda-Pupo & Guerras-Martin, 2012). Co-word analysis assumes that a group of aggregated keywords can suggest underlying themes and that co-occurrences of keywords can reveal interrelationships among these themes (Hu & Zhang, 2015). By employing co-word analysis, one can identify the major topics in a field, as well as its semantic structure and evolution over time.

Ever since Callon, Courtial & Laville (1991) introduced co-word analysis, it has been used to analyze various research domains such as prosthetic joint infection (Dong, Mei, Li & Xing, 2023), knowledge organization (Alipour, Soheili & Khasseh, 2022), library and information science (Hu, Hu, Deng & Liu, 2013; Mokhtarpour & Khasseh, 2021), ergonomics (Jafari Roodbandi, Choobineh, Barahmand & Sadeghi, 2022), recommendation systems (Hu & Zhang, 2015), coronavirus disease (Khazaneha, Tajedini, Esmaeili, Abdi, Khasseh & Sadatmoosavi, 2023), nanomedicine (Makkizadeh, 2019), water footprint and water resources (Sun, Lee, Li & Wang, 2022), iMertrics (Khasseh, Soheili, Moghaddam & Chelak, 2017), Vitamin D (Yang, Lv, Chen, Wang, Liu & Shi, 2019), information retrieval (Ding, Chowdhury & Foo, 2001) and tourism (Lian, Yu, Wang, Yuan & Hou, 2016). By far, no research endeavor has examined the intellectual structure of CIB using co-word analysis. Therefore, this article aims to fill this gap by addressing the following research objectives:

1. To examine the publication pattern of CIB research outputs

2. To identify the topics and subtopics running throughout CIB
3. To explore the interrelationships among CIB's topics and to represent them in terms of maturity and development

The findings of this study will offer a detailed overview and a better understanding of CIB global research outputs and intellectual structure, as well as a basis for its future research direction and growth.

Materials and Methods

This study was conducted to explore the intellectual structure of CIB. It includes identifying subject themes and subthemes running throughout CIB research and their interrelationships which is achieved using co-word and network analysis techniques. These bibliometric techniques count and analyze the co-occurrences of keywords in publications and map the relationships among concepts, ideas, and problems (Callon et al., 1991). The underlying premise of co-word analysis is that frequent words provide greater insights about the disciplines than less frequent ones (Lee & Su, 2010).

Data collection

Scopus and all editions of the Web of Science Core Collection databases were selected as data sources. Due to a lack of clearly defined boundaries and terminological confusion in CIB research (Sapa, 2022), a broad approach was taken to capture a variety of behaviors related to information and collaboration. Publications containing the terms "collaborative", "information", "behavior", "behaviour", or "seeking" in different combinations were searched in TITLE-ABS-KEY (Scopus) and Topic (Web of Science) fields to ensure a comprehensive review of the topic. It should be mentioned that a search by Topic searches in the title, Abstract, Author Keywords, and Keywords Plus fields of Web of Science records. To develop the search strategy, pilot searches were conducted, and the search results were evaluated to determine whether they were relevant or not. Eventually, it was decided to search as follows: In Scopus: TITLE-ABS-KEY ("collaborative information seeking" OR "collaborative information behavi*r") and in Web of Science: "collaborative information seeking" OR "Collaborative information behavi*r" (Topic)". Finally, to gain a comprehensive overview of CIB, no restrictions were applied on publication dates or document types.

Data analysis

To investigate the publication pattern, the CIB data were fed into Excel, and a trend chart was created. To analyze research hotspots and trends in CIB, co-word analysis was utilized. In this analysis, it is necessary to scrutinize keywords in terms of whether they are singular or plural and to exclude non-content, irrelevant, or overly general words. To accomplish this, keywords were sent to an expert within the same field to eliminate, merge, or alter words based on their relevance to the field. A third reviewer helped resolve disagreements between the author and the expert to reach a consensus. Keywords were chosen as the research sample for co-word analysis using Bradford's Law of Scattering, which was used to determine the threshold for selecting widespread keywords that have the potential to show major research topics of CIB. Once the keyword co-occurrence rate was established, a hierarchical clustering algorithm was utilized to generate a square matrix consisting of frequently occurring keywords. This process involved the use of SPSS software, Ward's method, and the Squared Euclidean

distance method, resulting in the creation of clusters and a co-word dendrogram. The network structure of the most commonly used keywords was then displayed using VOSviewer software. The clusters were carefully labeled and validated by another CIB researcher. Furthermore, network characteristics of the co-word matrix, including centrality and density, were analyzed using UCINET software ver. 6.0. In a network, when a node has many connections with others, it is considered to have high centrality and occupies a key position in the network. Centrality is therefore used to assess the degree of correlation between various topics. Likewise, a greater density signifies increased unity or a higher level of internal correlation among nodes. The research field's density indicates its ability to sustain and develop itself (Hu et al., 2013). The centrality and density of each cluster can be illustrated in a strategic diagram, providing insight into the dynamics of research themes (Hu & Zhang, 2015). A higher centrality suggests that a research topic holds a central position within the field, while higher density indicates the topic's maturity or promise. On the strategic diagram, the x-axis corresponds to the centrality degree and the y-axis to density, with the point of origin representing the average or median of the two axes. The diagram's four quadrants illustrate the various stages of research topics. Quadrant I features topics with high centrality and density, signifying maturity and core position in the field. Quadrant II contains topics that are well-developed but not central. In contrast, quadrant III highlights research topics that are marginal and receive little attention. Quadrant IV presents central issues in the field, but they are either undeveloped or immature (Hu et al., 2013). As part of our data analysis process, quadrant and coefficient matrices were generated for each cluster, and centrality and density measurements were calculated to draw the strategic diagram.

Results

A total of 316 documents published between 1992 and 2023 in Web of Science and Scopus were included in the study. The detailed search process is shown in Figure 1.

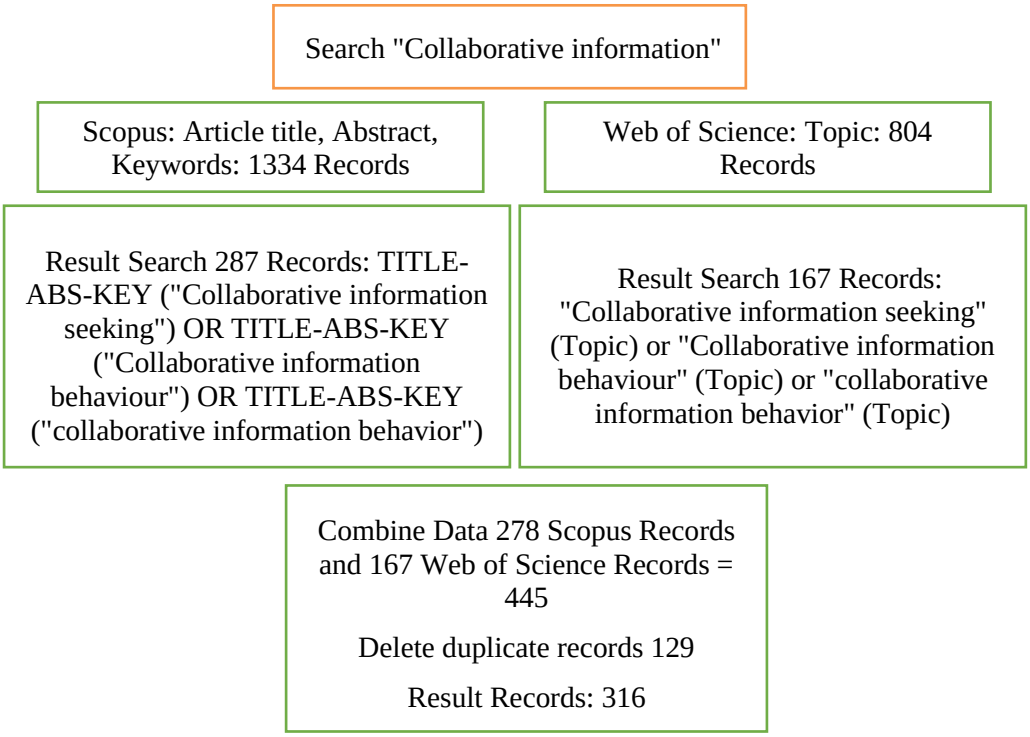


Figure 1: Detailed search process

The time curve of included CIB publications exhibits temporal variations in the trend (Figure 2), with the smallest number of articles published between 1992 and 2005 and the highest number of journals published in 2015. Over the first 10 years, publications have exhibited a general downward trend, albeit with some fluctuations.

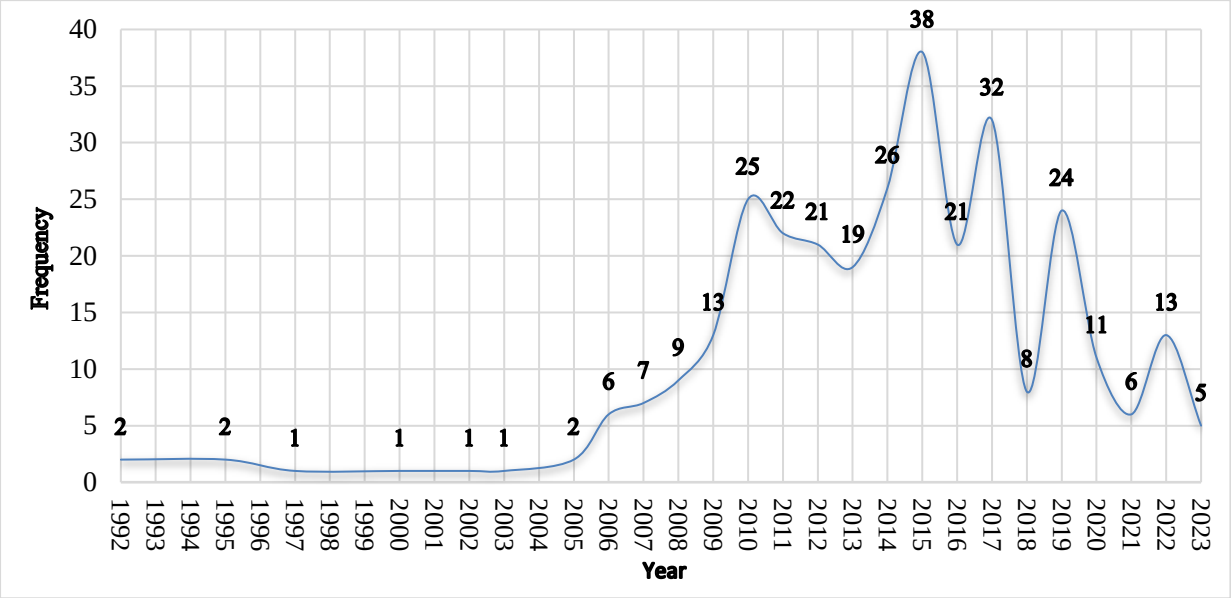


Figure 2: Number of publications in CIB by year

Main topics and subtopics running throughout CIB

Our analysis revealed that a total of 1,912 keywords were assigned to CIB documents, of which the 20 most frequent ones are listed in Table 1. The first five top frequencies belonged to "Collaborative Information" (with 108), "Information Use" (with 66), "Information Seeking" (with 65), "Information Retrieval" (with 46), and "Collaborative Information Seeking (CIS)", respectively.

Table 1
The frequency distribution of the 20 top co-words

Rank	Keywords	Frequency
1	Collaborative Information	108
2	Information Use	66
3	Information Seeking	65
4	Information Retrieval	46
5	Collaborative Information Seeking (CIS)	38
6	Collaborative Searches	36
7	Collaboration	24
8	Behavioral Research	18
9	Collaborative Information Behavior	16
10	Information Behavior	16
11	Computer-Supported Cooperative Work (CSCW)	14
12	Human Computer Interaction	14
13	Decision Making	13

Rank	Keywords	Frequency
14	Human	12
15	Search Engines	12
16	User Study	12
17	Collaborative Information Retrieval	11
18	Evaluation	11
19	Group Work	11
20	Exploratory Search	10

Table 2 shows the frequency distribution of the 20 persistent co-word pairs. “Collaborative Information**Information Use”, “Collaborative Information**Information Seeking”, and “Collaborative Information**Information Retrieval” are persistent co-word pairs.

Table 2
The frequency distribution of the 20 top co-word pairs

Rank	Co-words	Frequency
1	Collaborative Information**Information Use	61
2	Collaborative Information**Information Seeking	43
3	Collaborative Information**Information Retrieval	37
4	Information Use**Information Seeking	35
5	Information Use**Information Retrieval	23
6	Collaborative Information**Collaborative Searches	21
7	Information Seeking**Collaboration	18
8	Collaborative Information**Behavioral Research	16
9	Information Seeking**Information Retrieval	13
10	Collaborative Information**Human-Computer Interaction	12
11	Collaborative Information**Decision Making	12
12	Information Retrieval**Collaborative Searches	12
13	Collaborative Information**Information Behaviors	11
14	Information Use**Collaborative Searches	11
15	Collaborative Information**Search Engines	10
16	Collaborative Information**Websites	10
17	Collaborative Information**Collaboration	9
18	Collaborative Information**Computer-Supported Cooperative Work (CSCW)	9
19	Collaborative Information**Collaborative Information Retrieval	9
20	Information Use**Behavioral Research	9

Figure 3 displays the network structure of widespread keywords used in CIB. As explained in the method section, 65 keywords with frequencies higher than four were included in the analysis. Each circle represents a single keyword. The more frequently the keywords appear, the larger the size of the circles. In total, 1346 connections were made between 65 keywords.

Figure 4 illustrates the density of keywords calculated by VOSviewer software. It enables a quick overview of the key areas and higher-density keywords, which are highlighted in red and orange. The density decreases as we transition from the red area to the blue area. The size

of the circles represents the frequency of keywords. The closer a circle is connected to higher-density keywords, the higher its density, which makes it a topic of interest. As shown in Figure 4, “Collaborative Information”, “Information Retrieval”, and “Collaboration” all have a high density and are situated in the red area.

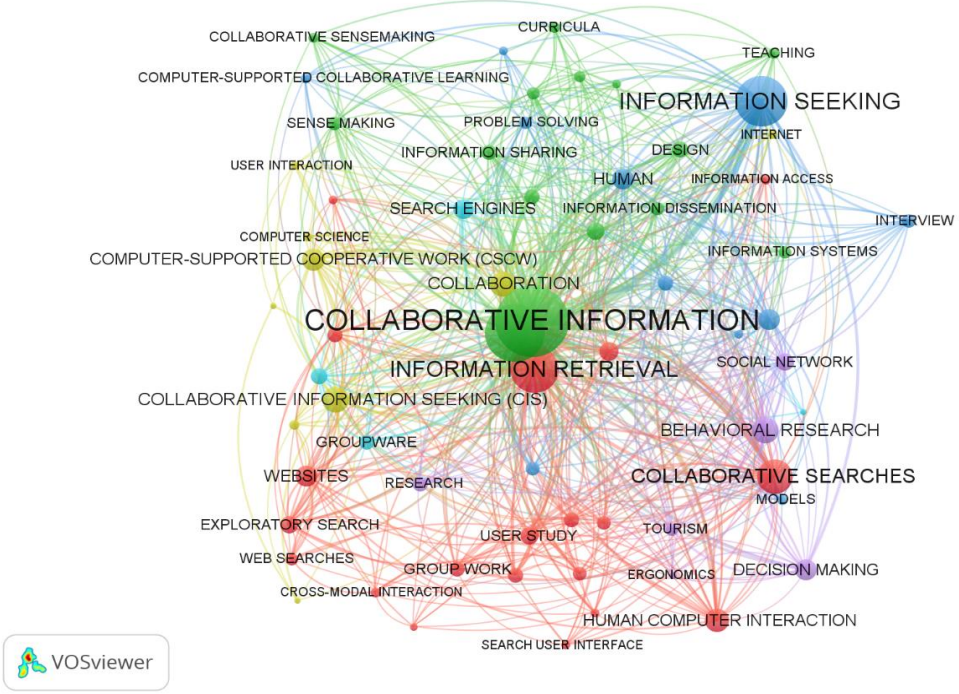


Figure 3: The network structure of 65 high-frequent keywords

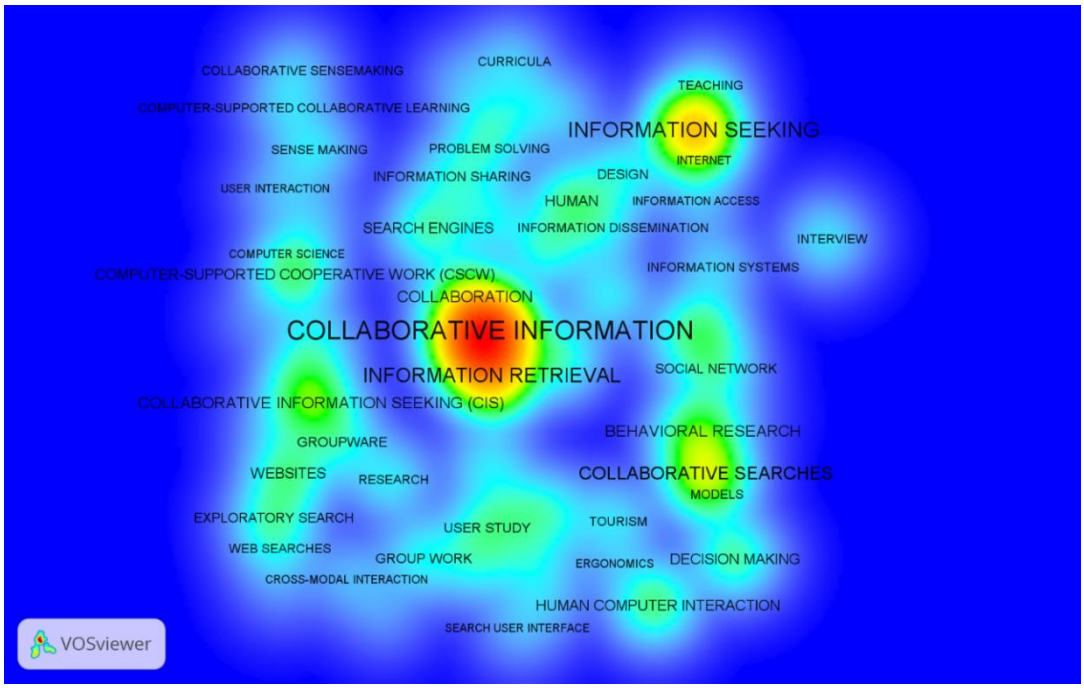
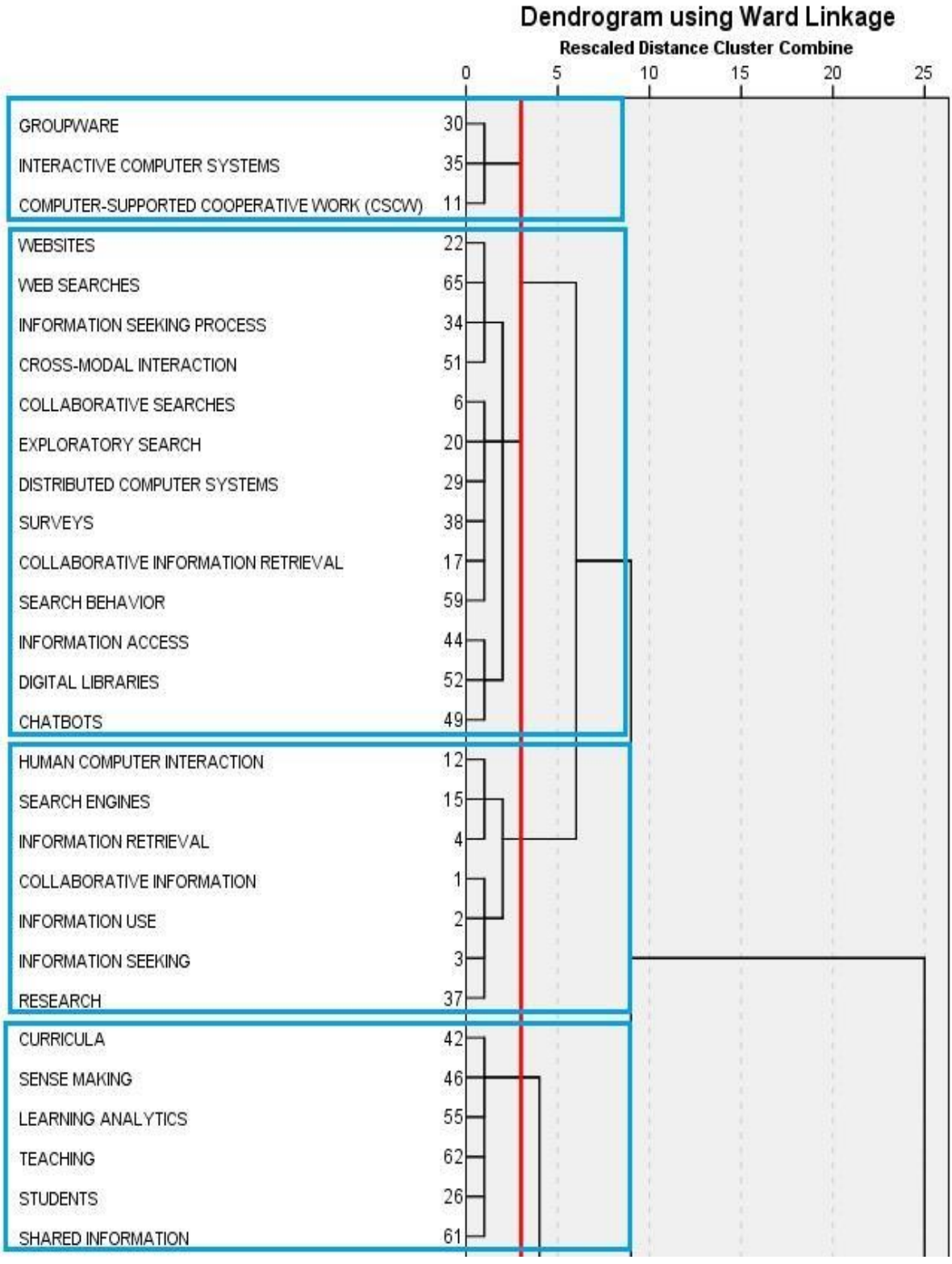


Figure 4: Density visualization map of keywords

A dendrogram of hierarchical clustering is illustrated in Figure 5. According to the dendrogram, the co-word analysis led to the creation of nine subject clusters. Related details are presented in Table 3, along with their description.



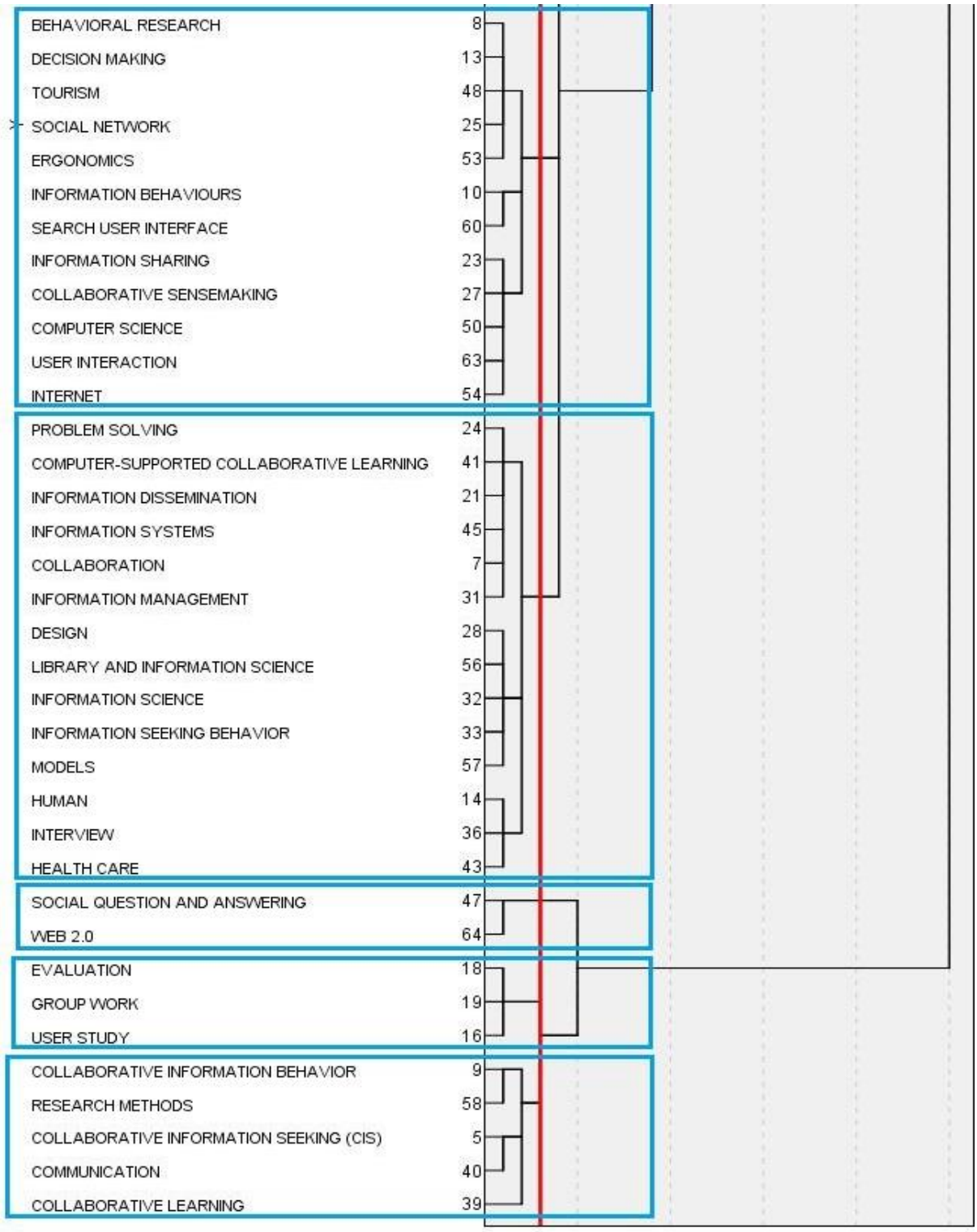


Figure 5: Dendrogram from hierarchical clustering with Ward's method

Table 3 presents the results of the hierarchical clustering analysis, which includes keywords in each cluster.

Table 3
Information on co-word clusters based on the dendrogram diagram

Cluster	Cluster theme	Keywords in the cluster	No. of keywords
1	Computer-Supported Cooperative Work	Computer-Supported Cooperative Work (CSCW); Groupware; Interactive Computer Systems	3
2	Collaborative Searching and Retrieval	Collaborative Searches; Collaborative Information Retrieval; Exploratory Search; Websites; Distributed Computer Systems; Information Seeking Process; Surveys; Information Access; Chatbots; Cross-Modal Interaction; Digital Libraries; Search Behavior; Web Searches	13
3	Collaborative Information	Collaborative Information; Information Use; Information Seeking; Information Retrieval; Human- Computer Interaction; Search Engines; Research	7
4	Learning and CIB	Students; Curricula; Sense Making; Learning Analytics; Shared Information; Teaching	6
5	CIB, system design and group performance	Behavioral Research; Information Behaviors; Decision Making; Information Sharing; Social Network; Collaborative Sensemaking; Tourism; Computer Science; Ergonomics; Internet; Search User Interface; User Interaction	12
6	CIB in a Professional and Organizational Context	Collaboration; Human; Information Dissemination; Problem Solving; Design; Information Management; Information Science; Information Seeking Behavior; Interview; Computer-Supported Collaborative Learning; Health Care; Information Systems; Library and Information Science; Models	14
7	Social Q &A	Social Question and Answering; Web 2.0	2
8	User Study	User Study; Evaluation; Group Work	3
9	CIB and Collaborative Learning	Collaborative Information Seeking (CIS); Collaborative Information Behavior; Collaborative Learning; Communication; Research Methods	5

Cluster 1. “Computer-Supported Cooperative Work”. Three keywords were included in this cluster. This area of study involves examining how individuals collaborate when using computer-based tools, such as groupware. The research in this field encompasses a wide range of interests, attracting experts from various academic fields, such as computer science and library and information sciences (George, 2003). This field is related to the cooperation aspect of collaboration, which involves individuals with shared interests working together to plan activities, assign roles, and pool resources to reach common objectives (Shah, 2010).

Cluster 2. “Collaborative Searching and Retrieval”. It is the second largest cluster created

by of co-word analysis. Consisting of 13 keywords such as “Collaborative Searches”, “Collaborative Information Retrieval”, “Information Seeking Process” and “Information Access”. Cluster 2 focuses on issues and aspects related to people working together to conduct searches and retrieve relevant content related to a shared information need.

Cluster 3. “Collaborative Information”. Comprising seven keywords, the cluster included keywords such as “Information Use”, “Information Seeking”, “Information Retrieval”, “Human Computer Interaction”, and “Search Engines”. Upon reviewing the dataset, it was revealed that “Collaborative Information” is an engineering-controlled term assigned primarily to conference abstracts and proceedings. Most of these documents are from the field of computer science. Therefore, it could be concluded that this cluster has a rather system-oriented approach to CIB.

Cluster 4. “Learning and CIB”. It consisted of 6 keywords, including “Students”, “Curricula”, and “Sense Making”. This relatively small cluster deals with learning through CIB.

Cluster 5. “CIB, system design and group performance”, There are 12 keywords in this cluster, including “Information Behaviors”, “Decision Making”, “Information Sharing”, “Computer Science”, and “Search User Interface ". The central theme of this cluster revolves around utilizing collaborative information technology to enhance group performance and facilitate informed decision-making.

Cluster 6. “CIB in a Professional and Organizational Context”. As the most significant cluster, it included 14 keywords such as “Information Dissemination”, “Problem Solving”, “Computer-Supported Collaborative Learning”, “Health Care”, “Information Systems”. As the keywords indicate, this cluster addresses CIB within an organizational context. This cluster has a system-oriented and behavioral approach.

Cluster 7. “Social Q & A”. As the smallest cluster, it consisted of two keywords, namely “Social Question and Answering” and “Web 2.0”.

Cluster 8. “User Study”. Consisting of 3 widespread keywords, this small cluster focused on “User Study”, “Evaluation”, and “Group Work”.

Cluster 9. “CIB and Collaborative Learning”. This cluster comprised five key words such as “Collaborative Information Behavior” and “Collaborative Learning”. It appears that it is associated with different collaborative information behavioral patterns during cooperative learning.

Strategic diagram

A strategic diagram is commonly utilized to illustrate the internal relationships within a cluster, as well as the interactions among different fields. A Strategic diagram considers both the network’s centrality and density, and thus can also describe the dynamics of research themes (Hu & Zhang, 2015). To begin with, a frequency matrix and the subsequent correlation matrix were formulated for each of the nine clusters. Using UCINET software, the centrality and density of each cluster, along with the mean value of centralities and densities, were calculated. Based on the centrality and density data for each cluster (Table 4), a strategic diagram was created to illustrate the maturity and coherence of each cluster (Figure 6).

Table 4
The centrality and density of clusters from co-word analysis

Cluster	Centrality	Density
1	0.1000	4.3333
2	0.3136	0.7564
3	0.3328	13.667
4	0.4000	1.0667
5	0.2655	0.7121
6	0.1838	0.6703
7	1	2
8	0.1667	2.3333
9	0.6667	0.7000

1) As shown in Figure 6, none of the clusters were positioned in quadrant I, indicating that none of the research topics in CIB has a high density and centrality. In other words, there are no mature, well-developed, well-connected, or core research areas in CIB.

2) Clusters 1 and 3 are located in quadrant II. This suggests that many researchers have paid attention to them, and these topics are developed and mature. However, their low centrality means they have little connection with other research areas and are not central. In general, Clusters 1 and 3 are more independent and mature research topics.

3) The majority of clusters are located in quadrant III, including C2, C5, C6, and C8. Their low centrality and density reveal that these research topics are marginal and immature. Many research areas are peripheral and underdeveloped in CIB. However, C8 is close to quadrant II and has a high potential for development.

4) C4, C7, and C9 are positioned in quadrant IV. They have high centrality and low density. In other words, they are at the core of CIB, but they are not mature.

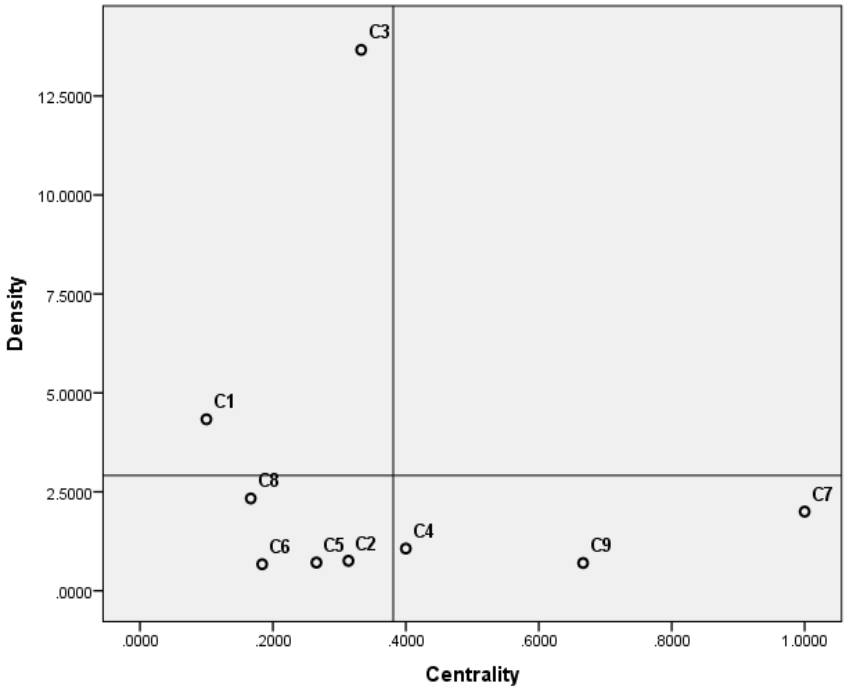


Figure 6: The strategic diagram of CIB 9 clusters

Discussion

This research has provided new insights into the current developments in the field of Collaborative Information Behavior (CIB) and has explained the relationships among its components using co-word analysis. In total, 316 documents containing 1912 keywords were examined in this study, representing a relatively small sample size. The findings showed that 1) research on the collaborative aspects of information behavior is still in its early stages 2) there is still a significant emphasis on individual aspects of information behavior and its collaborative and collective aspects are still underrated and underexplored and 3) Despite the increasing importance of CIB, there is still a lack of consensus on definitions, with many concepts being used interchangeably (Shah, 2013) - a phenomenon which Savolainen (2016) calls conceptual multiplicity (Granikov et al., 2022) Therefore, it is highly likely that researchers have used various concepts other than the keywords used for retrieving the dataset in this research.

"Collaborative Information" is the most frequent keyword. Upon reviewing the dataset, it was revealed that this keyword is primarily used in articles and conference papers published in the field of computer science, and it is an uncontrolled engineering term. "Collaborative information" is paired chiefly with keywords related to computer science, such as "information retrieval", "information use", and "collaborative searches". According to Hertzum and Hansen (2019), research on Collaborative Information Behavior (CIB) draws on various other areas, including computer-supported cooperative work, human-computer interaction, information seeking, library and information science, and social media. On the other hand, most of the keywords and pairs are related to activities rather than aspects and dimensions, such as influential factors, outcomes, and information resources. At the same time, they are relatively system-oriented and focus on user behavior.

On the other hand, they aim to create and evaluate technologies to support people in their collaborative search for information (Hertzum & Hansen, 2019). In summary, it appears that most research on CIB is still in the phase of understanding this phenomenon and conceptualizing its facets, rather than systematically analyzing it. Surprisingly, concepts such as information sharing did not emerge as a high-frequency keyword, which again may stem from the terminological instability in CIB or researchers' inattention to CIB as a research lens, including various concepts like information sharing.

Hierarchical clustering analysis led to the creation of 9 main subject clusters. The most significant cluster was "CIB in a Professional and Organizational Context" (14 keywords), whereas the smallest cluster was "Social Q &A". As Khasseh et al. (2017) mentioned, hierarchical clustering can reveal clusters within a particular field of study but is limited in showing interactions within clusters or determining centrality and maturity. Therefore, the strategic diagram is used in conjunction with hierarchical clustering in co-word analysis. The strategic diagram analysis revealed that none of the clusters were found to be mature, well-developed, well-connected, or core.

On the other hand, the majority of clusters (four Cs) are marginal and immature. This may be since research on the collaborative aspects of information behavior is relatively young. Another explanation could be the restrictions in CIB cumulative development stemming from unstable terminology (Sapa, 2022). Previous research has explored CIB from different perspectives with many of them focusing on it as their secondary topic. Accordingly, future research should focus on CIB as the main topic of the investigation to better understand its

various aspects.

Conclusion

This study shows that CIB is still in the phase of conceptualization and understanding. It is more of an umbrella term than a research field, and thus, more cumulative and interrelated research in CIB is needed. This study can help researchers understand the performance of CIB and suggest directions for further research. More analytical research is vital in CIB as its processes are deeply embedded in the social, cultural, and professional practices of today's lives. Without understanding CIB, tackling contemporary societal challenges, designing creative information objects and processes, developing an education environment, and designing information and research interventions would be challenging.

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References

Alipour, O., Soheili, F. & Khasseh, A. A. (2022). A co-word analysis of global research on knowledge organization: 1900-2019. *Knowledge Organization*, 49(5), 303-315. https://doi.org/10.5771/0943-7444-2022-5-303

Callon, M., Courtial, J. P. & Laville, F. (1991). Co-word analysis as a tool for describing the network of interactions between basic and technological research: The case of polymer chemistry. *Scientometrics*, 22(1), 155-205. https://doi.org/10.1007/BF02019280

Ding, Y., Chowdhury, G. G. & Foo, S. (2001). Bibliometric cartography of information retrieval research by using co-word analysis. *Information Processing and Management*, 37(6), 817-842. https://doi.org/10.1016/S0306-4573(00)00051-0

Dong, S., Mei, F., Li, J. j. & Xing, D. (2023). Global cluster analysis and network visualization in prosthetic joint infection: A scientometric mapping. *Orthopaedic Surgery*, 15(4), 1165-1178. https://doi.org/10.1111/os.13681

Du, J. T. (2022, March). Identifying gaps and gap-bridging strategies in collaborative information seeking and technology use among group travelers. In *Proceedings of the 2022 Conference on Human Information Interaction and Retrieval* (pp. 290-294). https://doi.org/10.1145/3498366.3505782

Fortea-Cabo, G. & González-Teruel, A. (2022). Culture of information and information exchange in a public hospital: A study based on the information orientation model and social network analysis. *Profesional de la Informacion*, 31(6), e310615. https://doi.org/10.3145/epi.2022.nov.15

George, J. F. (2003). Groupware. In H. Bidgoli (Ed.), *Encyclopedia of Information Systems* (pp. 509-518). New York: Elsevier.

Granikov, V., El Sherif, R., Bouthillier, F. & Pluye, P. (2022). Factors and outcomes of collaborative information seeking: A mixed studies review with a framework synthesis. *Journal of the Association for Information Science and Technology*, 73(4), 542-560. https://doi.org/10.1002/asi.24596

Hertzum, M. & Hansen, P. (2019). Empirical studies of collaborative information seeking: A review of methodological issues. *Journal of Documentation*, 75(1), 140-163. https://doi.org/10.1108/JD-05-2018-0072

Hu, C. P., Hu, J. M., Deng, S. L. & Liu, Y. (2013). A co-word analysis of library and information science in China. *Scientometrics*, 97(2), 369-382. https://doi.org/10.1007/s11192-013-1076-7

Hu, J. & Zhang, Y. (2015). Research patterns and trends of the recommendation system in China using co-word analysis. *Information Processing & Management*, 51(4), 329-339. https://doi.org/10.1016/j.ipm.2015.02.002

Hyldegård, J. (2006). Collaborative information behaviour: Exploring Kuhlthau's information search process model in a group-based educational setting. *Information Processing & Management*, 42(1), 276-298. https://doi.org/10.1016/j.ipm.2004.06.013

Jafari Roodbandi, A. S., Choobineh, A., Barahmand, N. & Sadeghi, M. (2022). Research outputs in ergonomics and human factors engineering: A bibliometric and co-word analysis of content and contributions. *International Journal of Occupational Safety and Ergonomics*, 28(4), 2010-2021. https://doi.org/10.1080/10803548.2021.1955495

Khasseh, A. A., Soheili, F., Moghaddam, H. S. & Chelak, A. M. (2017). Intellectual structure of knowledge in iMetrics: A co-word analysis. *Information Processing & Management*, 53(3), 705-720. https://doi.org/10.1016/j.ipm.2017.02.001

Khazaneha, M., Tajedini, O., Esmaeili, O., Abdi, M., Khasseh, A. A. & Sadatmoosavi, A. (2023). Thematic evolution of coronavirus disease: A longitudinal co-word analysis. *Library Hi Tech*, 41(1), 7-24. https://doi.org/10.1108/LHT-10-2021-0370

Lee, P.-C. & Su, H.-N. (2010). Investigating the structure of regional innovation system research through keyword co-occurrence and social network analysis. *Innovation*, 12(1), 26-40. https://doi.org/10.5172/impp.12.1.26

Lian, T., Yu, C., Wang, W., Yuan, Q. & Hou, Z. (2016). Doctoral dissertations on tourism in China: A co-word analysis. *Knowledge Organization*, 43(6), 440-461. https://doi.org/10.5771/0943-7444-2016-6-440

Makkizadeh, F. (2019). Intellectual structure of knowledge in the nanomedicine field (2009 to 2018): A co-word analysis. *Nanomedicine Research Journal*, 4(2), 101-110. https://doi.org/10.22034/nmrj.2019.02.007

Mokhtarpour, R. & Khasseh, A. A. (2021). Twenty-six years of LIS research focus and hot spots, 1990–2016: A co-word analysis. *Journal of Information Science*, 47(6), 794-808. https://doi.org/10.1177/0165551520932119

Ndumbaro, F. (2023). Models of collaborative information behaviour (CIB): A meta-synthesis. *Information Development*, 41(1), 242-258. https://doi.org/10.1177/02666669231158334

Reddy, M. C. & Spence, P. R. (2008). Collaborative information seeking: A field study of a multidisciplinary patient care team. *Information Processing & Management*, 44(1), 242-255. https://doi.org/10.1016/j.ipm.2006.12.003

Riley, F., Allen, D. K. & Wilson, T. D. (2022). When Politicians and Experts Collide: Organization and the Creation of Information Spheres. *Journal of the Association for Information Science and Technology*, 73(8), 1127-1139. https://doi.org/10.1002/asi.24618

Ronda-Pupo, G. A. & Guerras-Martin, L. Á. (2012). Dynamics of the evolution of the strategy concept 1962–2008: A co-word analysis. *Strategic Management Journal*, 33(2), 162-188. https://doi.org/10.1002/smj.948

Sapa, R. (2022). Library and Information Science Applied Studies on Collaborative Information Behavior. *Library and Information Science Research*, 44(4), 101204. https://doi.org/10.1016/j.lisr.2022.101204

Savolainen, R. (2016). Approaches to Socio-Cultural Barriers to Information Seeking. *Library & Information Science Research*, 38(1), 52-59. https://doi.org/10.1016/j.lisr.2016.01.007

Shafique, M. (2013). Thinking inside the box? Intellectual structure of the knowledge base of innovation research (1988–2008). *Strategic Management Journal*, 34(1), 62-93. https://doi.org/10.1002/smj.2002

Shah, C. (2010). Collaborative Information Seeking: A Literature Review. In A. Woodsworth (Ed.), *Advances in librarianship* (pp. 3-33). https://doi.org/10.1108/S0065-2830(2010)0000032004

Shah, C. (2013). Effects of Awareness on Coordination in Collaborative Information Seeking *Journal of the American Society for Information Science and Technology*, 64(6), 1122-1143. https://doi.org/10.1002/asi.22819

Sun, Y., Wang, Z., Lee, L. C., Li, X. & Wang, Y. (2022). A bibliometrics review of hotspots in water footprint research based on co-words network analysis. *Frontiers in Environmental Science*, 10, 1027936. https://doi.org/10.3389/fenvs.2022.1027936

Yang, A., Lv, Q., Chen, F., Wang, D., Liu, Y. & Shi, W. (2019). Identification of recent trends in research on Vitamin D: A quantitative and co-word analysis. *Medical Science Monitor*, 25, 643-655. https://doi.org/10.12659/MSM.913026

Ye, E. M., Du, J. T., Hansen, P., Ashman, H., Sigala, M. & Huang, S. S. (2021). Understanding roles in collaborative information behavior: A case of Chinese group travel. *Information Processing and Management*, 58(4), 102581. https://doi.org/10.1016/j.ipm.2021.102581