

Revolution of virtual teams in Remote Work - An early look at Indian Data

Archana

PhD Research Scholar, Graphic Era deemed to be University, Dehradun India

Dr Girish Lakhera

Associate Professor, Graphic Era deemed to be University, Dehradun India

Megha Ojha

PhD Research Scholar, Graphic Era deemed to be University, Dehradun India

Dr Amar Kumar Mishra

Professor, Graphic Era deemed to be University, Dehradun India

Abstract:

The purpose of this study is to systematically present the publication trends related to Revolution of virtual teams in Remote Work, which is an interdisciplinary concept. In order to fill this gap and contribute to the advancement of this field, the present study takes an exploratory approach by employing bibliometric analysis techniques. The analysis involved utilizing the R package and biblioshiny software to examine publications on the revolution of virtual teams. This study performed bibliometric analysis to investigate Revolution of virtual teams in Remote Work research between 1980 and 2022 using a sample of 1498 research papers from the scopus databases, with only published articles on Revolution of virtual teams in Remote Work. A bibliometric analysis reveals trends in Revolution of virtual teams in Remote Work publications, showing Revolution of virtual teams in Remote Work as an emerging topic and trends in current work environment research. However, it seems that Revolution of virtual teams in Remote Work is still a niche area of study.

Within the scope of the study, 588 publications were included in the analysis. Of the publications included in the analysis, of which 378 were chosen for further investigation. The research identified significant contributors to the field (the most productive author: Na Na.), articles with the greatest impact, the top journals in the field (the most active journal: Team performance Management), geographical areas under which research in the discipline is focused (the leading country: USA), and the universities emphasising remote work and virtual teams (leading university: Stanford University). The keyword “Virtual teams, Hybrid modelling, remote work stands out as the most frequently used keyword. This research analysis is based on data from the scopus database only; there will be some shortcomings in the findings. This research contributes to the field by exploring current developments in the field of Revolution of virtual teams in Remote Work, highlighting current gaps in the literature, and recommending future research in this field. The fact that the keywords “Virtual Team”, “remote work”, “hybrid modelling”, are frequently included in the literature shows that interdisciplinary academic studies in these fields are of great importance.

Keywords: Remote Work, Virtual Teams, Work from Home, Human Resource Management, Bibliometrics, RStudio

Introduction

Remote work is defined as employees performing their work outside the corporate office. It is characterized by the collaborative use of new information technologies as well as high flexibility and autonomy (i.e., Benz 2010; Brandt 2010). In contrast to location-based telework, remote work can take place at any time and place, including on a train or in a café (Chudoba et al. 2005). The term “smart work” has been used for work that focuses on the use of smart devices (Lee and Lee 2012), allowing teams to communicate and coordinate with each other regardless of location. For example, a team member may conduct a virtual meeting from home,

joined by another participant working from the office and a third from a train (Kauffeld 2020). Remote work is enabled by modern information and communication technologies (ICT). These virtual tools go beyond e-mail, chat, and video functions to include various management systems (e.g., knowledge and customer relationship management) and collaboration software that facilitate real-time access to shared information, synchronous communication, and virtual teamwork (Antoni and Syrek 2017; Kauffeld et al. 2016). Prior to the COVID-19 pandemic, this type of virtual teamwork was primarily a topic for global corporations with teams and locations spread across several continents. However, the pandemic's impact has shifted the focus to providing opportunities to work from home (Arntz et al. 2020; Handke and Kauffeld 2019). Some researchers have estimated that more than 30% of jobs in the United States could be performed remotely (Dingel and Neiman 2020). Similarly, Arntz et al. (2020) computed a teleworkability index for various occupations in Germany and found that about 31% of jobs could be carried out from home. In addition, the authors identified a further 12% of jobs containing a substantial proportion of tasks that could easily be performed remotely. Thus, the digital virtualization of traditionally physical technological resources is also happening at the level of human resources, because increasingly the presence of workers in the same place is not necessary. This implies an immense challenge for the new electronic leadership of teams of collaborators who are increasingly dispersed geographically. In the beginning, virtual teams were formed to facilitate joint creation and innovation among global or regional experts who did not have enough time to travel to fulfill the specialized tasks of the projects that required them. Today, virtual teamwork has evolved to a point where online collaboration is a way of working for national companies and more naturally for multinational or regional companies. The idea of virtual collaboration between

workers, or virtual teamwork VT, consists of a team working together from different physical locations using collaborative ICTs. In the last 20 years this modality has been in constant growth due to the evolution and maturity of the digital era in terms of speed of telecommunications, the power of the computer equipment, the naturalness of adaptation to the use of ICTs in the work of digital natives (born since 1990) and digital migrants (born before 1990). However, at the beginning of the 21st century it was difficult to have faith in VTs due to the low level of maturity of virtual teams which made companies skeptical about the efficiency of this way of working. By the early 2000s, studies showed that the number of VTs that achieved their goals was not very encouraging and there was a significant failure rate. A few years later, things had not changed that much either. In 2004, there was talk of significant challenges in the implementation of virtual teams (Piccoli et al., 2004). Another study (Brett et al., 2006) revealed that most people thought that virtual communication was not as productive as face-to-face interaction, while half of the respondents said they were confused and overwhelmed by collaboration technology. Even so, this happened a few years ago and as technology advanced, companies matured with the use of ICT tools, so these early conclusions from the beginning of the century were not believed to be accurate anymore. A more recent study in 2009, involving 80 global software teams, indicated that well-managed virtual teams using virtual collaboration can outperform face-to-face (FtF) teams. Additionally, a number of studies (Jarrahi and Sawyer, 2013), indicate that virtual or remotely distributed team collaboration can also improve employee productivity. origin of remote work in a virtual team is originally teleworking. Considering the above reasons and in view of finding ourselves in the midst of a rapidly evolving digital era coupled with a pandemic that has forced workers in many areas to perform remote work (Velicia-Martin et al., 2021) and aligned with an effective strategy to contain and mitigate rate of spread of infection (Brooks et al., 2020).

Literature Review

The exploration of global virtual teams originated in the early 1990s as a response to the prevailing belief that electronic networks alone were insufficient to establish network organizations. It was recognized that building such organizations would necessitate an entirely new sociology of organization (Jarvenpaa & Leidner, 1999). The rise of globalization, rapid technological advancements, and the accelerated formation of global value chains have contributed to the proliferation of project teams that primarily interact through electronic networks. Consequently, research in this field has also advanced, reaching its peak between 2020 and 2022, coinciding with the widespread adoption of virtual teams across the globe. The initial investigations into global virtual teams primarily focused on analyzing communication patterns and fostering trust among team members who were physically separated and hailed from different cultural backgrounds (Jarvenpaa & Leidner, 1999). After the initial recognition of the fragility and volatility of trust in global virtual teams (Jarvenpaa & Leidner, 1999), subsequent research emerged to explore strategies for establishing trust among team members (Sarker et al., 2011; Pinjani & Palvia, 2013; Grossman & Feitosa, 2018; Zakaria & Yusof, 2020). These studies also investigated the influence of trust on team cohesion (Jarvenpaa et al., 2004), the impact of power dynamics on trust development and overall team performance in global virtual teams (Panteli & Tucker, 2009). Cultural diversity, in addition to geographical distance, has been discussed as a factor affecting trust development within teams (Kirstein, 2011; Zakaria & Yusof, 2015). Ciesielska and Iskoujina (2012) examined the impact of trust on innovation within virtual teams. Furthermore, current literature emphasizes communication as a crucial element for the successful functioning of virtual teams (Maznevski & Chudoba, 2000; Sarker et al., 2011; Morgan et al., 2014; McLarnon et al., 2019; Glikson &

Erez, 2020). Trust within a global virtual team is influenced by the temporal dimension, which is characterized by a lack of shared history and future among team members. On the other hand, communication challenges arise from the geographic dispersion, cultural diversity, and reliance on electronic mediums for communication and work. Cultural diversity negatively impacts communication within the team, although the use of information and communication technology (ICT) can help alleviate this negative influence (Shachaf, 2008). Overcoming geographical distances is a hurdle, as mediated interactions, particularly text-based and asynchronous forms like email, hinder the development of strong working relationships and collaboration compared to face-to-face communication, which provides richer information (Panteli & Tucker, 2009). Scholars have focused on the significance of culture and language in global virtual teams and have found that both play a crucial role in effective knowledge sharing (Klitmøller & Luring, 2013). When there are substantial cultural differences and language diversity, face-to-face interactions are preferred for knowledge sharing because they allow for nonverbal cues and physical interactions that facilitate object manipulation and correction. Various factors are associated with global virtual teams, including trust, interpersonal relationships, cultural differences, leadership, and the impact of technology on communication and project delivery risk (Daim et al., 2012). Previous studies have examined different leadership styles and roles (Montoya-Weiss et al., 2001; Paul et al., 2004; Flammia et al., 2010; Jenster & Steiler, 2011; Carter et al., 2015; Zander, 2020; Castellano et al., 2021) as well as specific skills that effective team leaders possess (Kayworth & Leidner, 2001).

Effective virtual team leaders must possess several key abilities and skills. They need to fulfill multiple leadership roles simultaneously, maintain regular, detailed, and timely communication, act as mentors, and demonstrate a high level of understanding and empathy towards team members (Kayworth & Leidner, 2001; Mysirlaki & Paraskeva, 2020).

Furthermore, recent studies have investigated the role of motivation in virtual team leadership. Particularly, inspirational motivation can compensate for the lack of an inclusive group mindset that often arises from linguistic and cultural heterogeneity in global virtual teams (Lauring & Jonasson, 2018). The advantages and challenges of diversity within global virtual teams have also been the subject of recent research (Jimenez et al., 2017; Taras et al., 2019), along with exploring the learning and absorptive capacity of virtual teams (Batarseh et al., 2017; Hung et al., 2021), the influence of culture (Stahl & Maznevski, 2021; Tenzer et al., 2021), and the impact of cultural intelligence on the work and performance of team members (Presbitero, 2020a; Presbitero, 2020b; Richter et al., 2021). Consequently, Virtual Teams have been extensively discussed in various publications, but there is a lack of specific research that specifically addresses remote work and Virtual Teams. Regrettably, the overall structure and trends in this field have received little attention and exploration. To shed light on the nature of research on Virtual Teams, this study employs a bibliometric analysis of relevant publications. The objective is to evaluate existing research and identify potential avenues for future studies. According to Pritchard (1969), bibliometrics is defined as the mathematical and statistical analysis of bibliographic records. It encompasses a range of techniques that are typically classified as either citation analysis or co-citation analysis. Hoffman and Holbrook (1993) offer a comprehensive overview and discussion of these various methods. Citation analysis involves counting the direct references made to or received from other documents. On the other hand, co-citation analysis measures the association between documents or groups of documents through paired citations. Co-citation analysis employs methods such as bibliographic coupling, document co-citation analysis, author co-citation analysis, and co-word analysis (F.F. Charvet, 2008). Bibliometrics encompasses valuable applications such as identifying intellectual connections within scholarly communications and generating science

maps. In document co-citation analysis, documents are linked based on the frequency of shared citing articles, while bibliographic coupling links documents that have common references. Small (H. Small, 1973) played a key role in popularizing the co-citation approach, advocating its use to explore the "specialty structure of science" in one of his early works. Since then, co-citation analysis has been widely employed across various disciplines. Although bibliometric analysis has proven useful in numerous fields, studies applying bibliometrics to Virtual Teams are scarce. Despite over a decade of research on Virtual Teams, many fundamental questions about its domain and scope remain unanswered. This current research draws on existing academic literature to uncover the underlying structure of the field. It also provides insights into major publishing outlets and serves as a reference point for future studies, shedding light on trends and emerging paradigms in the realm of Virtual Teams.

Objective 1: The objective is to determine the volume of publications related to Virtual Teams, while also analyzing the prominent authors, institutions, and countries contributing to the body of literature on this topic.

Objective 2: The aim is to examine the thematic network present in studies focused on Virtual Teams.

Objective 3: The objective is to analyze the conceptual map of studies pertaining to the revolution of Virtual Teams in the context of remote work.

Objective 4: The aim is to explore the intellectual structure of studies that investigate the revolution of Virtual Teams in the realm of remote work.

2 Materials and methods

In order to address the research questions and offer a comprehensive overview of the existing literature on the revolution of Virtual Teams in remote work, a two-tier analysis was undertaken. This analysis involved conducting a bibliometric analysis of articles gathered from the Web of Science and Scopus databases, along with cluster analysis.

2.1 Selection of citation index

In line with the study conducted by Bartolini et al. (2019) and Zhang et al. (2019), this review utilized data from two databases: Clarivate Analytics' Web of Science (WoS) and Elsevier's Scopus. The inclusion of multiple databases was crucial to ensure a broader scope and enhance the reliability of the findings, considering the limitations and coverage differences of a single database. Zhu and Liu (2019) referred to these two databases as "world-leading and competing databases." Web of Science, recognized as an independent global citation database, is widely regarded as the most reputable publisher worldwide (C, 2017). On the other hand, Scopus is recognized as the largest database of peer-reviewed literature, encompassing not only scientific journals but also novels and conference proceedings. It offers a comprehensive and insightful overview of global research output across diverse disciplines such as science, technology, medicine, social sciences, and the arts and humanities (Elsevier, 2021). Both databases exhibit an interdisciplinary nature.

2.2 Selection of keywords

Keywords play a vital role in identifying relevant papers within databases (H. Aveyard, 2018). To address the challenge of narrowing down the literature, one approach is to conduct a keyword search on peer-reviewed journal publications related to the specific issue. In this study, the authors carefully considered various synonyms for the key terms "Virtual Teams" and "remote work" before selecting the appropriate keywords. It was observed that in some journals, terms such as "hybrid modeling" and

"work from home" were used instead of "virtual teams," despite the underlying concept being the same. Therefore, these three terminologies were included as keywords for the search. The asterisk (*) was employed as a wildcard symbol to expand the search scope, encompassing terms with similar meanings but different endings. The use of the asterisk allows for quick identification of word variants based on unique word stems (E. Aromataris, 2014). Moreover, the use of different terms like "virtual teams" and "virtual meetings" in various publications necessitated including both terminologies in the search, along with variations and synonyms of the term "remote work." To maintain consistency, the same keywords were employed in the search across both databases. The following search string was used to gather data from Web of Science (WoS): "Virtual Teams*" AND "virtual meeting*" (Title) or "remote work*" AND "work from home*" (Title) or "hybrid modeling*." Similarly, for the search on Scopus, the following search string was utilized: TITLE ("Virtual Teams*" AND "Remote work*") OR TITLE ("Work from home*" AND "hybrid modeling*").

2.3 Data collection and processing

To ensure a comprehensive exploration of the literature on Virtual Teams, no limitations were imposed on the publication year range. However, the search was focused on articles and review papers, and only publications in the English language were included. It is important to highlight that the absence of time restrictions was intentional, as the review aimed to provide an extensive overview and examine trends spanning from the inception of Virtual Teams research to the present. However, for specificity, only the titles of the documents were analyzed. After eliminating duplicates using the R package, a total of 544 articles were retrieved. Initially, 368 articles were obtained from Scopus, resulting in a final count of 82 distinct publications.

2.4 Analysis process

In order to gain a comprehensive understanding of Virtual Teams, a two-phase approach was employed. The study focused on two categories of bibliometric indicators. The first category involved traditional bibliographical data, including authors, affiliations, sources (such as journal names), and publication year. The second category involved extracting terms (such as words and phrases) from the titles and abstracts of research articles using natural language processing techniques. The analysis was conducted using the R programming language in both phases. During the second phase, clusters were identified, which played a significant role in selecting articles for further review. This step aimed to gain insights into the conceptual, social, and intellectual structure of the studies in the subject area.

2.5 Bibliometric analysis and software package

The bibliometrix R-package, an open-source software developed by Aria and Cuccurullo, was employed in this study. The R-package offers a range of tools specifically designed for conducting quantitative bibliometric research. It is written in the R programming language (M. Aria, 2017) and includes essential statistical and scientific mapping algorithms. In recent versions of the bibliometrix R-package (2.0 onwards), a web interface app called Biblioshiny was introduced. This addition assists users who are not proficient in the R language to generate bibliometric analysis output. Through the Biblioshiny interface, users can import data from Scopus or Web of Science databases in BibTex, CSV, or Plain Text formats. It also enables data filtering capabilities. For this study, the combined datasets from Web of Science and Scopus were imported into the R package using the features provided by biblioshiny. Further details about the analysis conducted in this study are elaborated in the results section.

3 Results

3.1 Data synthesis

This study delved into Virtual Teams research by examining the literature produced on the topic during the past fifteen years, commencing from 1995. The study aimed to address the following research questions: 1) Who are the primary contributors to Virtual Teams research, including research institutions, universities, countries and regions, and research communities? 2) What is the intellectual, conceptual, and social structure of Virtual Teams research? 3) How has Virtual Teams research evolved over time? Table 1 presents the synthesized data from the bibliometric analysis, providing a descriptive overview of Virtual Teams research. To conduct the cluster analysis, a comprehensive review of the literature was carried out, and the content was meticulously analyzed to identify the interconnections between publications within the clusters. Table 1 indicates that 378 articles were published in 162 journals by 770 authors over the period 1995–2022. The annual average number of publications is 10.5, the average number of citations per document is 45.4.

Table 1. Main information.

Timespan 1995:2023	Sources 162	Documents 378	Annual Growth Rate 10.41 %
Authors 770	Authors of single-authored 84	International Co-Authorship 20.63 %	Co-Authors per Doc 2.3
Author's Keywords (DE) 851	References 17805	Document Average Age 10.5	Average citations per doc 45.4

The overall information presented in Table 1 is discussed in detail in the following headlines of the study.

3.2. Annual Scientific Production

Over the period 1995–2022, 378 articles have been indexed in the scopus database. The first article on virtual team was published in 1995. Since 1995, there has been an increasing trend in compliance with academic research on virtual team. Although only 86 articles have been conducted within the 15-year period between 1995 and 2007, various articles have been published after 2007. The highest article production was recorded in 2022 with 35. 10.8% of all publications were conducted in 2022. More than half of the articles have been published within the last five years. The annual average growth rate of studies is 10.41%. In Figure 1, since the date of the first published article on Virtual teams was 1995, the milestones affecting the Virtual teams issue between 1995 and 2022 are shown. It is seen that the issues brought to the agenda regarding Virtual teams also affect the publication trend.

Figure 1 illustrates the distribution of documents related to virtual team over a span of 27 years (1995-2023). The trend reveals that 2022 witnessed the highest level of activity, with 35 documents being produced, closely followed by 18 articles published in 2020. It is important to consider that the figures for 2023 provided are based on publications within the first five months of the year, and it is anticipated that the number will likely rise by the end of the year. While the research on virtual team is garnering attention, there was a notable decline in publications in 2015, suggesting an unstable research interest in the field. The annual growth rate of publications related to virtual team stands at 10.41%. Additionally, Figure 2 presents the average number of citations per year, which exhibits an increasing trend but lacks consistency.

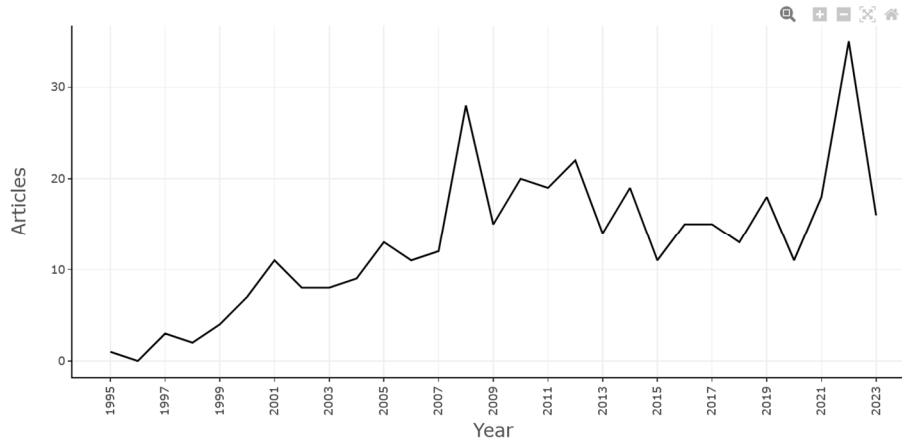


Figure 1. Virtual teams milestone (between 1995 to 2022)

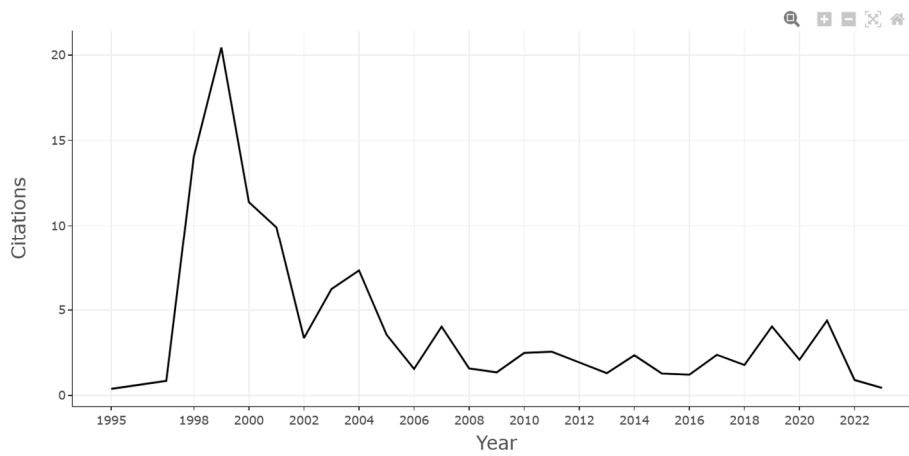


Fig 2. Citation

3.3. Keywords

“Virtual Team” ranks first in the list of keywords with the strongest links, with a total link strength of 632 SE (550) ranking second, whereas sustainability (476) ranks third (Table 2). The results indicate that the keywords “Virtual Team”, “hybrid modelling”, and “remote work” led the research study. Generally speaking, there is a direct link between occurrences and total link strength, with two exceptions.

3.4 Word Cloud, and Treemap

In Figure 3, the most frequently used words in articles related to virtual team are visually represented. In order to monitor the progression of keywords in virtual team research within remote work over time, a word cloud analysis was performed for two specific periods: 1995-2023. Figure 1 demonstrates a noteworthy and consistent interest in the area of virtual team particularly after 2007. The tree map indicates that " virtual team " is used in 17% of the articles. The size of the words in the word cloud reflects their frequency of use, with the most important words appearing in the centre for greater visibility due to their significant size. The tree map displays each term used and its corresponding magnitude.



Fig 3. Word cloud

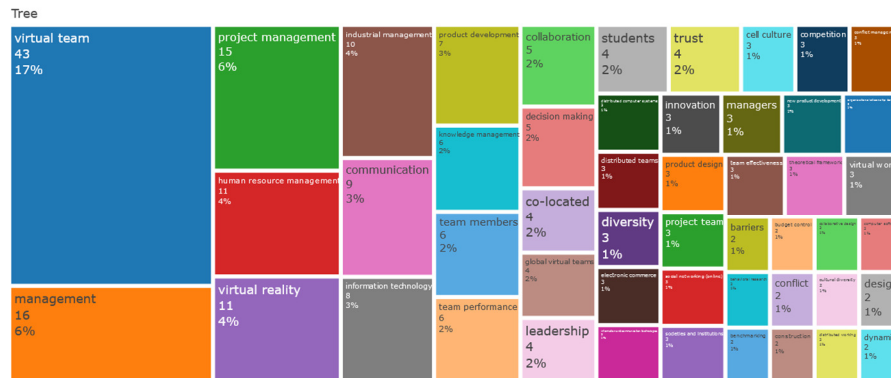


Fig 4. Tree Map

Scientific mapping techniques involve the creation of thematic maps that visually represent the conceptual framework of a specific research area (Figure 4). These maps utilize network analysis of word occurrences to elucidate the scientific discourse within the field, identifying key themes and patterns [60]. Density is employed to assess the coherence among nodes, while centrality measures the level of correlation between different elements [61].

The majority of scientific studies and citations related to "virtual teams" are clustered within the motor theme group, comprising specific keywords. These keywords have shown higher productivity in previous years, but their association with the subject has diminished over time. On the other hand, the term "project management" belongs to the emerging theme group, characterized by low intensity and centrality. It exhibits limited connections to other words and has relatively low relevance to the broader context.

3.5 Thematic map

Using density and centrality measures, a thematic map was generated and categorized into four distinct topological zones (Fig. 5). To capture a broader range of themes, the map was created through a semi-automated method that analyzed not only the titles of the references used in this study but also additional relevant keywords beyond the authors' keywords. This approach aimed to uncover more nuanced variations in the explored themes. The thematic analysis identified eight significant clusters: Virtual team, management, human resource management, decision making, innovation, networking, team effectiveness, and virtual collaboration, project management, knowledge management, virtual works, and electronic commerce. These clusters provide a logical organization of the articles based on common themes. Each cluster is associated with specific keywords. The first cluster, for instance, includes keywords such as Virtual Team Management and Human resource management. The second cluster consists of a single keyword, "decision making," and also encompasses themes related to innovation and online networking.

The third cluster primarily focused on the keyword "project team" and explored themes related to team effectiveness. Similarly, the fourth cluster revolved around the keyword "virtual collaboration" and also delved into

aspects of team effectiveness. The fifth cluster encompassed keywords such as "project management" and "product development." The sixth cluster included keywords such as "printing" and "model." The seventh cluster was centered around the keyword "knowledge management." Lastly, the eighth cluster incorporated keywords such as "manager" and "virtual works." Thematic map presents the theme derived within the literature. Theme located in the upper right quadrant, such as virtual teams and human resource management, are well-developed and play a crucial role in the research field. These themes have external connections and are considered motor or driving theme. They exhibit high density and centrality, signifying their importance for future research (R. Shawahna, 2021). Thus, it is recommended to give significant attention to themes like virtual teams and human resource management in future studies as they are likely to shape the direction of research in the field of Virtual Teams. The upper left quadrant of the thematic map encompasses specialized themes that exhibit well-established internal relationships but limited external connections. These niche themes indicate areas of rapid development, as evidenced by their high centrality but low density (M. Smith, 2021). Positioned at the intersection of the two quadrants at the top, the theme "virtual teams" demonstrates high centrality and moderate density. This theme holds a central position in the research area but calls for additional exploration from various perspectives.

Themes positioned in the lower left quadrant, such as "Benchmarking" and "electronic commerce," have low density and centrality in the network. These themes are considered to be developing or declining, as they have received limited attention in the literature (B.A. Niccum, 2017). It is important to investigate and explore these themes further.

Fig 5. Thematic Map

3.6 Country specific production and collaborations

Analyzing the distribution of research based on countries or regions can provide insights into their research capacity and uncover disparities among them (Huang,,2016). Collaborative efforts among academic institutions across different countries or regions play a crucial role in facilitating knowledge dissemination and academic exchange (Chen,2020). The collaboration world map visually represents the affiliations of authors based on their country of origin. When examining the connections between countries, the USA (United States of America) and UK (United Kingdom) emerge as the countries with the strongest links. This link strength directly influences the number of publications conducted by these countries. Figure 7 illustrates the intercountry connection map specifically focusing on virtual teams (VT).

The USA, being one of the most actively engaged countries in VT research, collaborates with the UK, China, and India, respectively. Despite the language differences between the collaborating countries, scholars from the USA demonstrate a greater inclination towards establishing multinational partnerships.

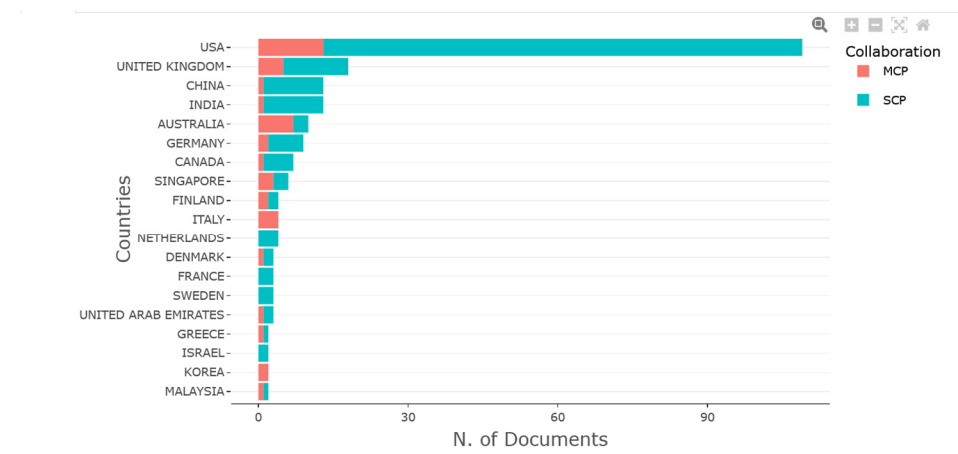


Fig 6. Most productive country

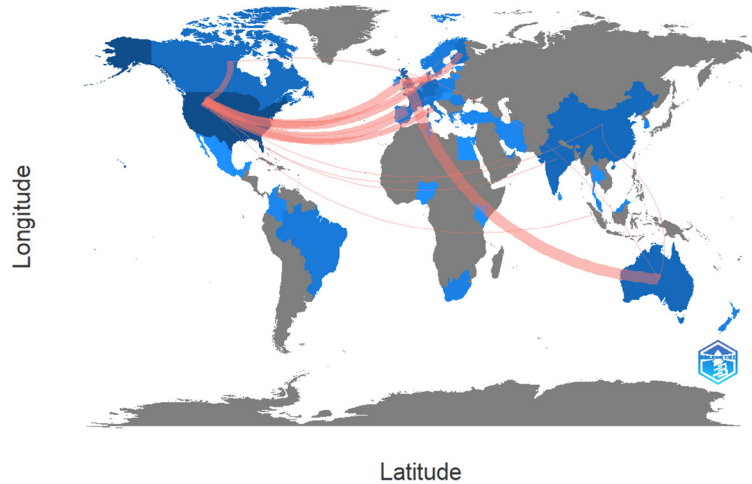


Fig 7. Three-field plot of Journals, authors, and abstract keywords

The figure below, labeled as Fig. 8, presents a three-field plot illustrating the connection between journal names, authors, and keywords extracted from the abstracts of the articles. Abstracts were chosen as the information source because they provide a broader perspective and contain significant details on key issues. In the plot, the three elements are linked by grey lines, indicating their interrelationships. The plot showcases how authors are associated with major keywords in the abstracts and the journals in which they publish. The size of each rectangle within the listing category corresponds to the number of papers associated with that element, with longer bars indicating greater prominence of the specific issue in the literature.

Starting from the left, the first element represents the journals. Notably, the top journals that have published the highest number of papers on the topic of Virtual Teams include Team Performance Management, Human Resource Management International Digest, and Organizational Science, as depicted by the mauve color. These journals are connected to several

authors, namely Na Na, Pazoos P, and Rosen B. The names of these authors are presented in the second element positioned in the middle.

The authors mentioned earlier are associated with publications in reputable journals, such as Na Na, who is linked to the journal "Human Resource Management International Digest," which is also connected to the keywords and sources. However, some other authors, like Taras V, Rosen B, and Hinds PJ, have not published in indexed journals and thus do not have any affiliation with the listed journals. On the right side of the plot, each author is connected to a list of frequently used keywords found in the abstracts. This plot specifically includes the top fourteen authors, and the size of the rectangle representing each author indicates the number of papers they have written. Notably, Na Na, Taras V, and Hinds PJ have the largest rectangles in the plot, all of which are of equal size. They are followed by Pazos P and Cramton, making them the top five most published authors in this context.

The third element of the plot showcases the most commonly used keywords extracted from the abstracts of the papers. Each keyword is linked to the authors who extensively covered the respective topic. There are fifteen keyword topics listed, with "Virtual Teams" being the most frequent, as indicated by the dominant light green rectangle. It is noteworthy that almost all registered authors utilized either "Virtual Teams" or related topics, aligning with the focus of this study on scientific papers concerning the revolution of virtual teams in remote work. Additionally, other notable keywords include "Trust," predominantly associated with Virtual Teams, as well as "Global Virtual Teams," "Team Performance," "Knowledge Sharing," and "Project Teams."

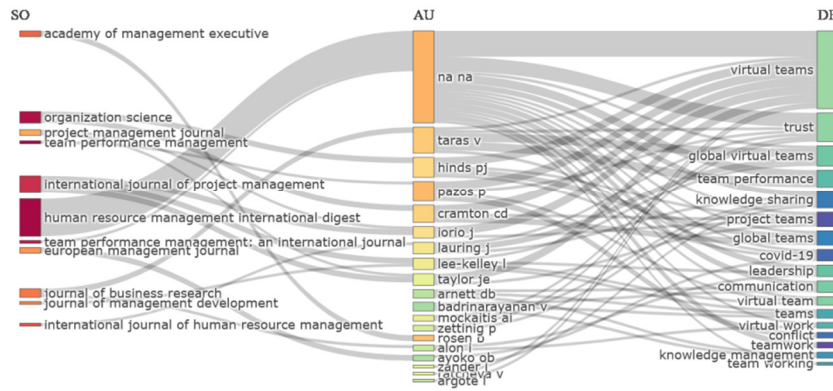


Fig. 8. Three-field plot of Journals, authors, and abstract keywords.

3.7 Source growth

Figure 9 displays the involvement of journals in virtual Team research, based on the number of affiliations produced per year. The line chart represents each university with a unique colour code, with the top five universities being the focus of the analysis due to their significant contributions. University of North California and Aarhus University of technology have shown consistent and substantial growth in their contributions. It is noteworthy that publications on Reevaluation of virtual Team by these universities began in 2021, and the number of publications increased annually after 2022. Since 1995, the remaining universities have contributed minimally.

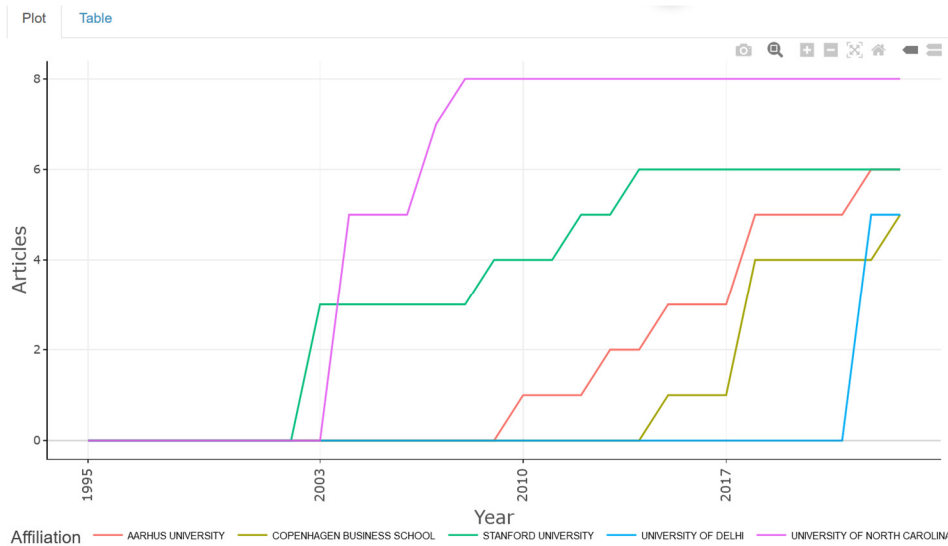


Fig 9. Source Growth

3.8 Conceptual map and topic dendrogram

A visualization of the contextual structure of frequently occurring words in articles on Virtual Teams was generated, resulting in a conceptual structure map. This map employed regional mapping, represented in Figure 10, to display the relationship between different words by utilizing bibliometric science's specific term known as Dim. The placement of each word on the map was determined by the values of Dim 1 and Dim 2, which facilitated the mapping of words with insignificant value differences.

The conceptual structure map consists of two sections: a red area and a blue area, both containing interconnected words. The red area, which includes the top five most frequently appearing words ('virtual teams', 'trust', 'team management', 'collaboration', and 'virtual reality') as illustrated in Figures 10 & 11, encompasses a diverse range of words. This

indicates that numerous research papers establish connections between the words listed in this region, which prominently features the top five words. On the other hand, the first network represents a distinct cluster comprising the interconnected words 'decision making' and 'project management'. This cluster suggests a customer-focused market, indicating a concentration of research in that specific area.

By analyzing the two clusters, a distinction can be made between a focus on the firm and a focus on the market. The larger cluster explores suitable business models for virtual teams and strategies to ensure their effectiveness, while the smaller cluster concentrates on the adoption of virtual teams by organizations. These findings align with the thematic map, which indicates the emergence of commercialization as a prominent theme.

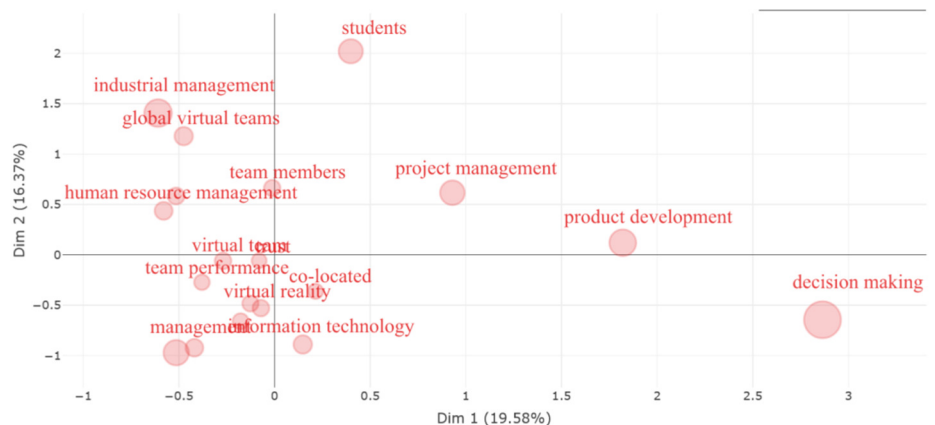


Fig. 10. Conceptual structure map.

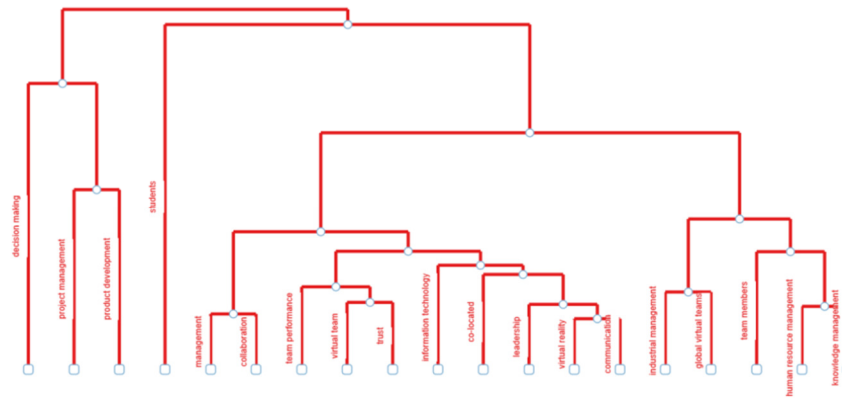


Fig. 11. Topic dendrogram.

4 Discussions

By employing bibliometric analysis, this study sought to provide a thorough investigation of scientific publications on virtual teams spanning different time periods. The research encompassed multiple facets, such as examining the thematic content of the publications, identifying influential scholars and their contributions, analyzing social networks and collaborations among institutions, countries, and regions over time, and conducting a thematic analysis of the virtual teams field, including its current status and potential future directions.

4.1 Demographics

This study makes several significant contributions to the existing knowledge. Firstly, it reveals that the inception of virtual teams research can be traced back to 1995, but the substantial growth in publications started in 2007. This indicates that the field of virtual teams is relatively young, providing valuable insights for scholars in terms of choosing

appropriate publishing outlets and identifying the key areas of focus within virtual teams research.

Additionally, a thorough review of relevant articles highlighted the notable work of Na Na. [38]. Their contributions primarily centered around the impact of virtual teams and virtual reality. This work has the potential to stimulate future discussions on the technological, market, and pedagogical aspects of virtual teams, shedding light on their unique features and characteristics.

4.2 Growth of Virtual Teams research

Moreover, the research uncovered dynamic nature of the virtual teams field, with the emergence and growth of terms such as "virtual teams," "project management," and "human resource management." The thematic analysis results indicated the emergence of new themes, particularly the association between virtual teams and "project management." Notably, the study projected that "virtual teams" will continue to be the most popular topic in 2021.

4.3 Limitations and avenues for future studies

Despite the rigorous approach adopted in this study, similar to other research endeavors, certain limitations should be acknowledged. Firstly, although a comprehensive set of keywords was utilized, there may still exist related aspects that were not adequately addressed. Secondly, the use of Scopus and Web of Science databases provided a wide range of studies; however, there might be relevant information present in studies outside of these databases. It is possible that certain studies might have been overlooked by relying solely on these two databases. Thirdly, the impact

factor of the journals where the articles were published was not employed as a filtering criterion for the analysis. As the peer-review process can vary across publications, readers may question the generalizability of conclusions drawn from certain articles. However, as indicated in Figure 3, which highlights the most relevant sources, the journals publishing virtual studies are often recognized as top-tier publications. Future studies could enhance the research by expanding the range of keywords and considering additional databases to ensure a more comprehensive analysis.

Furthermore, the study revealed the need for researchers to dedicate more time and effort to exploring the leadership aspects of virtuality within virtual teams. This aspect represents a promising avenue for future research in the field. Additionally, the scarcity of studies from Africa, Asia, and Australia indicates a need for more research conducted in these geographic regions to broaden the understanding of virtual teams. Fostered collaboration between researchers from Africa, Australia, Asia, and other parts of the world can also contribute to enriching the knowledge in this domain.

5. Conclusions

Since 1995, there has been a continuous and escalating scientific interest in the concept of virtual teams, with a pronounced intensification observed since 2007. Although the initial studies were conducted by American scientists, research on this topic is not confined to any particular region, country, or institution; it is a global phenomenon. In recent years, European scientists have emerged as the most productive authors in this field, but there has also been a noticeable increase in the involvement of Chinese scientists, attributed to the support provided by the Chinese government for scientific research. Starting from 2007, inter-institutional collaborations have been on the rise. The rapid advancements in information technologies have accelerated the progress of virtual collaboration.

The objective of this study was to comprehensively review the existing literature on virtual teams. This article serves as an example of a systematic literature review combined with bibliometric analysis. The main finding of this study underscores the increasing importance of exploring this area, particularly since the emergence of the COVID-19 pandemic. Although there is still much research to be conducted, there has been a relative decline in the number of publications on this subject in recent years compared to the period of 1998-2010. Nevertheless, technological advancements have enabled teleworking and collaboration within virtual teams, highlighting their significance in the current context. The anticipation of future pandemics and the cost-saving benefits of virtual collaboration will undoubtedly drive the adoption of this technology in the years to come. In terms of published documents, the United States has produced a higher number of publications on virtual

teams compared to other developed countries like the United Kingdom and Germany. Articles were found to be the most commonly published format, followed by conference papers, while books on this subject remain relatively limited in number. Building upon previous research [29], [126], it is essential to delve into the exploration of emotions, which is gaining increasing importance across various domains such as marketing. Other areas worth investigating include communication, technology, and trust.

While a significant amount of knowledge has been acquired about virtual teams in the past five years, there is still a gap in understanding the relationships between different aspects of virtual teams and how they interact. In future studies, researchers could gather additional bibliometric information from academic databases like Web of Science, Google Scholar, and Dimensions to complement and expand upon the findings of this study. It is crucial to explore the relationships between constructs using statistical techniques such as regression and structural equations. Furthermore, a systematic literature review combined with a bibliometric analysis can be employed to identify the specific constructs that warrant investigation. This work contributes to the existing body of research on the constructs and their interrelationships in virtual team studies, while also proposing avenues for future research. Additionally, it suggests the utilization of an integrated approach combining existing methods to achieve a higher number of precise results in literature reviews, which serves as a fundamental initial step in any investigation.

References

1. Brundtland, G.H. Our common future—Call for action. *Environ. Conserv.* **1987**, 14, 291–294. [[CrossRef](#)]
2. United Nations Development Programme. *World Energy Assessment: Energy and the Challenge of Sustainability*; UNDP: New York, NY, USA, 2000.

3. Vera, I.; Langlois, L.; Rogner, H.H. Indicators for sustainable energy development. In *Energy Indicators for Sustainable Development: Country Studies on Brazil, Cuba, Lithuania Mexico, Russian Federation, Slovakia and Thailand*; International Atomic Energy Agency: Vienna, Austria; United Nations: New York, NY, USA, 2007; pp. 5–16.
4. Zakari, A.; Khan, I.; Tan, D.; Alvarado, R.; Dagar, V. Energy efficiency and sustainable development goals (SDGs). *Energy* **2022**, *239*, 122365. [[CrossRef](#)]
5. Qudrat-Ullah, H.; Akrofi, M.M.; Kayal, A. Analyzing actors' engagement in sustainable energy planning at the local level in Ghana: An empirical study. *Energies* **2020**, *13*, 2028. [[CrossRef](#)]
6. Gunnarsdóttir, I.; Davidsdóttir, B.; Worrell, E.; Sigurgeirsdóttir, S. Sustainable energy development: History of the concept and emerging themes. *Renew. Sustain. Energy Rev.* **2021**, *141*, 110770. [[CrossRef](#)]
7. De Bellis, N. *Bibliometrics and Citation Analysis: From the Science Citation Index to Cybermetrics*; Scarecrow Press: Lanham, MD, USA, 2009.
8. Zupic, I.; Čater, T. Bibliometric methods in management and organization. *Organ. Res. Methods* **2015**, *18*, 429–472. [[CrossRef](#)]
9. Donthu, N.; Kumar, S.; Mukherjee, D.; Pandey, N.; Lim, W.M. How to conduct a bibliometric analysis: An overview and guidelines. *J. Bus. Res.* **2021**, *133*, 285–296. [[CrossRef](#)]
10. Lemaire, *Glossary of terms in sustainable energy regulation*. In *Sustainable Energy Regulation Network*; University of Warwick: Coventry, UK, 2004; pp. 7–11.
11. Sáez-Martínez, F.J.; Lefebvre, G.; Hernández, J.J.; Clark, J.H. Drivers of sustainable cleaner production and sustainable energy options. *J. Clean. Prod.* **2016**, *138*, 1–7. [[CrossRef](#)]
12. Rosen, M.A.; Farsi, A. *Sustainable Energy Technologies for Seawater Desalination*; Academic Press: London, UK, 2022.

13. Kung, C.C.; McCarl, B.A. Sustainable energy development under climate change. *Sustainability* **2018**, *10*, 3269. [[CrossRef](#)]
14. Sgouridis, S.; Csala, D. A framework for defining sustainable energy transitions: Principles, dynamics, and implications. *Sustainability* **2014**, *6*, 2601–2622. [[CrossRef](#)]
15. Chen, W.; Huang, Z.; Chua, K.J. Sustainable energy recovery from thermal processes: A review. *Energy Sustain. Soc.* **2022**, *12*, 46. [[CrossRef](#)]
16. Wu, Y.; Ghalkhani, M.; Afshar, E.A.; Karimi, F.; Xia, C.; Van Le, Q.; Vasseghian, Y. Recent progress in Biomass-derived nanoelectrocatalysts for the sustainable energy development. *Fuel* **2022**, *323*, 124349. [[CrossRef](#)]
17. Köppl, A.; Schleicher, S.P. What will make energy systems sustainable? *Sustainability* **2018**, *10*, 2537. [[CrossRef](#)]
18. Schmidt-Scheele, R.; Hauser, W.; Scheel, O.; Minn, F.; Becker, L.; Buchgeister, J.; Hottenroth, H.; Junne, T.; Lehr, U.; Naegler, T.; et al. Sustainability assessments of energy scenarios: Citizens' preferences for and assessments of sustainability indicators. *Energy Sustain. Soc.* **2022**, *12*, 41. [[CrossRef](#)]
19. Mustafa, J.; Almeahmadi, F.A.; Alqaed, S.; Sharifpur, M. Building a sustainable energy community: Design and integrate variable renewable energy systems for rural communities. *Sustainability* **2022**, *14*, 13792. [[CrossRef](#)]
20. Taylor, P.G.; Abdalla, K.; Quadrelli, R.; Vera, I. Better energy indicators for sustainable development. *Nat. Energy* **2017**, *2*, 17117. [[CrossRef](#)]
21. Nieto, N.; Noya, O.; Iturrondobeitia, A.; Sanchez-Fontecoba, P.; Pérez-López, U.; Palomares, V.; Rojo, T. On the road to sustainable energy storage technologies: Synthesis of anodes for na-ion batteries from biowaste. *Batteries* **2022**, *8*, 28. [[CrossRef](#)]

22. Unander, F. Energy indicators and sustainable development: The International Energy Agency approach. In *Natural Resources Forum*; Blackwell Publisher: Oxford, UK, 2005; Volume 29, pp. 377–391.
23. Shrestha, P. *Global Energy Use Projected to Nearly Double by 2050*; Energy Live News: London, UK, 2020; Volume 8.
25. Žičkienė, A.; Morkunas, M.; Volkov, A.; Balezentis, T.; Streimikiene, D.; Siksnylyte-Butkiene, I. Sustainable energy development and climate change mitigation at the local level through the lens of renewable energy: Evidence from Lithuanian case study. *Energies* **2022**, *15*, 980. [[CrossRef](#)]
26. Chen, J.; Kong, Y.; Yin, S.; Xia, J. A comparative method for assessment of sustainable energy development across regions: An analysis of 30 Provinces in China. *Energies* **2022**, *15*, 5761. [[CrossRef](#)]
30. United Nations. *Kyoto Protocol to the United Nations Framework Convention on Climate Change*; United Nations: New York, NY, USA, 1998.
34. Ren, J.; Sovacool, B.K. Quantifying, measuring, and strategizing energy security: Determining the most meaningful dimensions and metrics. *Energy* **2014**, *76*, 838–849. [[CrossRef](#)]
35. Su, C.W.; Khan, K.; Umar, M.; Zhang, W. Does renewable energy redefine geopolitical risks? *Energy Policy* **2021**, *158*, 112566. [[CrossRef](#)]
39. Yu, Y.; Li, Y.; Zhang, Z.; Gu, Z.; Zhong, H.; Zha, Q.; Yang, L.; Zhu, C.; Chen, E. A bibliometric analysis using VOSviewer of publications on COVID-19. *Ann. Transl. Med.* **2020**, *8*, 816. [[CrossRef](#)]
42. Li, J.; Ma, W.; Dai, X.; Qi, M.; Liu, B. China's Policy Environment's development and path from the perspective of policy sustainability: A visual analysis based on CNKI and WoS. *Sustainability* **2022**, *14*, 16435. [[CrossRef](#)]
49. Aria, M.; Cuccurullo, C. Bibliometrix: An R-tool for comprehensive science mapping analysis. *J. Informetr.* **2017**, *11*, 959–975.

[CrossRef]

50. Chen, C. The Citespace Manual; College of Computing and Informatics, Drexel University: Philadelphia, PA, USA, 2014; pp. 1–84.

51. Web of Science. Web of Science Core Collection. Available online: <https://clarivate.com/webofsciencegroup/solutions/web-of-science/>

(accessed on 12 December 2022).

52. Zhu, J.; Liu, W. A tale of two databases: The use of Web of Science and Scopus in academic papers. *Scientometrics* **2020**, *123*, 321–335.

[CrossRef]

62. Huang, Y.; Huang, Q.; Ali, S.; Zhai, X.; Bi, X.; Liu, R. Rehabilitation using virtual reality technology: A bibliometric analysis,

1996–2015. *Scientometrics* **2016**, *109*, 1547–1559. [CrossRef]

Brett, J., Behfar, K., and Kern, M. C. (2006). *Managing Multicultural Teams*. Brighton, MA: Harvard Business Review.

Piccoli, G., Powell, A., and Ives, B. (2004). Virtual teams: team control structure, work processes, and team effectiveness. *Inf. Technol. People* *17*, 359–379. doi: 10.1108/09593840410570258

Jarrahi, M. H., and Sawyer, S. (2013). Social technologies, informal knowledge practices, and the enterprise. *J. Organ. Comput. Electron. Commer.* *23*, 110–137. doi: 10.1080/10919392.2013.748613

Velicia-Martin, F., Cabrera-Sanchez, J.-P., Gil-Cordero, E., and Palos-Sanchez, P. R. (2021). Researching COVID-19 tracing app acceptance: incorporating theory from the technological acceptance model. *PeerJ Comput. Sci.* *7*:e316. doi: 10.7717/peerj-cs.316

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., et al. (2020). The psychological impact of quarantine and

how to reduce it: rapid review of the evidence. *Lancet* 395, 912–920. doi: 10.1016/s0140-6736(20) 30460-8

Benz, C. (2010). Online Forum mobile Arbeit. In C. Brand (Ed.), *Endbericht des Projektes "OnFormA"* (pp. 5–6). ver.di Bundesverwaltung. Brandt, C. (2010). *Mobile Arbeit – Gute Arbeit? – Arbeitsqualität und Gestaltungsansätze bei mobiler Arbeit [Remote work—good work? Work quality and work design aspects when working remotely]*. ver.di..

Chudoba, K.M., Wynn, E., Lu, M., & Watson-Manheim, M.B. (2005). How virtual are we? Measuring virtuality and understanding its impact in a global organization. *Information Systems Journal*, 15(4), 279–306. <https://doi.org/10.1111/j.1365-2575.2005.00200.x>.

Lee, H., & Lee, J. (2012). Developing a policy framework for smartwork: task, technology, people, organization and management. *J Digital Policy Manag*, 10(11), 145–164. <https://doi.org/10.14400/JDPM.2012.10.11.145>.

Kauffeld, S., Handke, L., & Straube, J. (2016). Verteilt und doch verbunden: Virtuelle Teamarbeit [English translation of article title]. *Gruppe. Interaktion. Organisation. Zeitschrift für Angewandte Organisationspsychologie (GIO)*, 47(1), 43–51. <https://doi.org/10.1007/s11612-016-0308-8>.

Antoni, C.H., & Syrek, C. (2017). Digitalisierung der Arbeit: Konsequenzen für Führung und Zusammenarbeit [Digitization at work: consequences for leadership and teamwork]. *Gruppe. Interaktion. Organisation. Zeitschrift für Angewandte Organisationspsychologie (GIO)*, 48(4), 247–258. <https://doi.org/10.1007/s11612-017-0391-5>.

Arntz, M., Ben-Yahmed, S., & Berlingieri, F. (2020). Working from home and Covid-19: the chances and risks for gender gaps. *Intereconomics*, 55(6), 381–386. <https://doi.org/10.1007/s10272-020-0938-5>.

Dingel, J. I., & Neiman, B. (2020). How many jobs can be done at home? (NBER Working Paper, 26948). *Journal of Public Economics*, 189, 104235. <https://doi.org/10.1016/j.jpubeco.2020.104235>.

Jarvenpaa, S. L., & Keating, E. (2021). When do good communication models fail in global virtual teams? *Organizational Dynamics*, 50(1). <https://doi.org/10.1016/j.orgdyn.2021.100843> Jarvenpaa, S. L., & Leidner, D. E. (1999). Communication and trust in global virtual teams. *Organization Science*, 10(6), 791–815. <https://doi.org/10.1287/orsc.10.6.791>

Jarvenpaa, S. L., Shaw, T. R., & Staples, D. S. (2004). Toward contextualized theories of trust: The role of trust in global virtual teams. *Information Systems Research*, 15(3), 250–267. <https://doi.org/10.1287/isre.1040.0028>

Sarker, S., Ahuja, M., Sarker, S., & Kirkeby, S. (2011). The role of communication and trust in global virtual teams: A social network perspective. *Journal of Management Information Systems*, 28(1), 273–309. <https://doi.org/10.2753/MIS0742-1222280109>

Pinjani, P., & Palvia, P. (2013). Trust and knowledge sharing in diverse global virtual teams. *Information & Management*, 50(4), 144–153. <https://doi.org/10.1016/j.im.2012.10.002>

Zakaria, N. (2017). Emergent patterns of switching behaviors and intercultural communication styles of global virtual teams during

distributed decision making. *Journal of International Management*, 23(4), 350–366. <https://doi.org/10.1016/j.intman.2016.09.002>

Grossman, R., & Feitosa, J. (2018). Team trust over time: Modeling reciprocal and contextual influences in action teams. *Human Resource Management Review*, 28(4), 395–410. <https://doi.org/10.1016/j.hrmr.2017.03.006>

Kirstein, K. D. (2011). The effect of cultural dimensions on the development of intra-team trust in global virtual teams. In *Distributed Team Collaboration in Organizations: Emerging Tools and Practices* (pp. 64–81). Igi Global. <https://doi.org/10.4018/978-1-60960-533-9.ch005>

Panteli, N., & Tucker, R. (2009). Power and trust in global virtual teams. *Communications of the ACM*, 52(12), 113–115.

Maznevski, M. L., & Chudoba, K. M. (2000). Bridging space over time: Global virtual team dynamics and effectiveness. *Organization Science*, 11(5), 473–492. <https://doi.org/10.1287/orsc.11.5.473.15200>

Morgan, L., Paucar-Caceres, A., & Wright, G. (2014). Leading effective global virtual teams: The consequences of methods of communication. *Systemic Practice and Action Research*, 27(6), 607–624. <https://doi.org/10.1007/s11213-014-9315-2>

Sarker, S., Ahuja, M., Sarker, S., & Kirkeby, S. (2011). The role of communication and trust in global virtual teams: A social network perspective. *Journal of Management Information Systems*, 28(1), 273–309. <https://doi.org/10.2753/MIS0742-1222280109>

McLarnon, M. J. W., O’Neill, T. A., Taras, V., Law, D., Donia, M. B. L., & Steel, P. (2019). Global virtual team communication, coordination, and performance across three peer feedback strategies. *Canadian Journal of*

Behavioural Science-Revue Canadienne Des Sciences Du Comportement, 51(4), 207–218. <https://doi.org/10.1037/cbs0000135>

Klitmøller, A., & Luring, J. (2013). When global virtual teams share knowledge: Media richness, cultural difference and language commonality. *Journal of World Business*, 48(3), 398–406. <https://doi.org/10.1016/j.jwb.2012.07.023>

Shachaf, P. (2008). Cultural diversity and information and communication technology impacts on global virtual teams: An exploratory study. *Information & Management*, 45 (2), 131–142. <https://doi.org/10.1016/j.im.2007.12.003>

Paul, S., Seetharaman, P., Samarah, I., & Mykytyn, P. P. (2004). Impact of heterogeneity and collaborative conflict management style on the performance of synchronous global virtual teams. *Information & Management*, 41(3), 303–321. [https://doi.org/10.1016/S0378-7206\(03\)00076-4](https://doi.org/10.1016/S0378-7206(03)00076-4)

Montoya-Weiss, M. M., Massey, A. P., & Song, M. (2001). Getting it together: Temporal coordination and conflict management in global virtual teams. *Academy of Management Journal*, 44(6), 1251–1262. <https://doi.org/10.2307/3069399>

Paul, S., Seetharaman, P., Samarah, I., & Mykytyn, P. P. (2004). Impact of heterogeneity and collaborative conflict management style on the performance of synchronous global virtual teams. *Information & Management*, 41(3), 303–321. [https://doi.org/10.1016/S0378-7206\(03\)00076-4](https://doi.org/10.1016/S0378-7206(03)00076-4)

Flammia, M., Cleary, Y., & Slattery, D. M. (2010). Leadership roles, socioemotional communication strategies, and technology use of Irish and US students in virtual teams. *IEEE Transactions on Professional Communication*, 53(2), 89–101. <https://doi.org/10.1109/TPC.2010.2046088>

Jenster, N. P., & Steiler, D. (2011). Turning up the volume in interpersonal leadership: Motivating and building cohesive global virtual teams during times of economic crisis. In W. H. Mobley, M. Li, & Y. Wang (Eds.), *Advances in Global Leadership* (Vol 6, pp. 267–297). Emerald Group Publishing Ltd.. [https://doi.org/10.1108/S1535-1203\(2011\)0000006014](https://doi.org/10.1108/S1535-1203(2011)0000006014)

Carter, D. R., Seely, P. W., Dagosta, J., DeChurch, L. A., & Zaccaro, S. J. (2015). Leadership for global virtual teams: Facilitating teamwork processes. In J. L. Wildman, & R. L. Griffith (Eds.), *Leading Global Teams: Translating Multidisciplinary Science to Practice* (pp. 225–252). Springer. https://doi.org/10.1007/978-1-4939-2050-1_10.

Kayworth, T. R., & Leidner, D. E. (2001). Leadership effectiveness in global virtual teams. *Journal of Management Information Systems*, 18(3), 7–40. <https://doi.org/10.1080/07421222.2002.11045697>

Lauring, J., & Jonasson, C. (2018). Can leadership compensate for deficient inclusiveness in global virtual teams? *Human Resource Management Journal*, 28(3), 392–409. <https://doi.org/10.1111/1748-8583.12184>

Stahl, G. K., & Maznevski, M. L. (2021). Unraveling the effects of cultural diversity in teams: A retrospective of research on multicultural work groups and an agenda for future research. *Journal of International Business Studies*, 52(1), 4–22. <https://doi.org/10.1057/s41267-020-00389-9>

Richter, N. F., Martin, J., Hansen, S., Taras, V., & Alon, I. (2021). Motivational configurations of cultural intelligence, social integration, and performance in global virtual teams. *Journal of Business Research*, 129, 351–367. <https://doi.org/10.1016/j.jbusres.2021.03.012>

26. A. Pritchard, *Statistical bibliography or bibliometrics*, Doc. 25 (1969) 348–349
27. D.L. Hoffman, M.B. Holbrook, The intellectual structure of consumer research: a bibliometric study of author cocitations in the first 15 years of the journal of consumer research, *J. Consum. Res.* 19 (1993) 505
28. F.F. Charvet, M.C. Cooper, J.T. Gardner, The intellectual structure of supply chain management: a bibliometric approach, *J. Bus. Logist.* 29 (2008) 47–73
29. H. Small, Co-citation in the scientific literature: a new measure of the relationship between two documents, *J. Am. Soc. Inf. Sci.* 24 (1973) 265–269
30. M. Bartolini, E. Bottani, E.H. Grosse, Green warehousing: systematic literature review and bibliometric analysis, *J. Clean. Prod.* 226 (2019) 242–258

31. M. Zhang, S. Guo, C. Bai, W. Wang, Study on the impact of haze pollution on resident's green consumption behavior: the case of Shandong province, *J. Clean. Prod.* 219 (2019) 11–19
32. J. Zhu, W. Liu, A tale of two databases: the use of web of science and scopus in academic papers, *Scientometrics* (2020) 1–15
33. C. Analytics, Web of Science. Trust Differ. Web Sci. Fact Book Available Online [Httpimages Info Sci. Thomsonreuters BizWebThomsonReutersScience 7Bd6b7faae-3cc2-4186-8985-A6ecc8cce1ee 7DCrvWoSUpsellFactbookA4FALRe-dits Pdf](http://images.info.sci.thomsonreuters.biz/web/thomsonreuters/science/7Bd6b7faae-3cc2-4186-8985-A6ecc8cce1ee/7DCrvWoSUpsellFactbookA4FALRe-dits/Pdf) (accessed 10 October 2017)
34. Elsevier About Scopus Abstract and Citation Database | Elsevier Available online: <https://www.elsevier.com/solutions/scopus> (accessed on 11 October 2021)
35. H. Aveyard, *Doing a Literature Review in Health and Social Care: A Practical Guide* (2018)
36. E. Aromataris, D. Riitano, Constructing a search strategy and searching for evidence, *Am. J. Nurs.* 114 (2014) 49–56
37. M. Aria, C. Cuccurullo, Bibliometrix: an R-tool for comprehensive science mapping analysis, *J. Informetr.* 11 (2017) 959–975
38. E.E. Petersen, R.W. Kidd, J.M. Pearce, Impact of DIY home manufacturing with 3D printing on the toy and game market, *Technologies* 5 (2017)
39. A. Vafadar, F. Guzzomi, A. Rassau, K. Hayward, *Advances in Metal Additive Manufacturing: A Review of Common Processes, Industrial Applications, and Current Challenges*; MDPI AG (2021) Vol. 11, pp. 1–33

40. A. Muñoz-Villamizar, E. Solano, C. Quintero-Araujo, J. Santos, Sustainability and digitalization in supply chains: a bibliometric analysis, *Uncertain Supply Chain Manag.* 7 (2019) 703–712
41. K.-Y. Tang, C.-C. Tsai, T.-C. Lin, Contemporary intellectual structure of CSCL research (2006-2013): a co-citation network analysis with an education focus, *Int. J. Comput. Support. Collab. Learn.* 9 (2014) 335–363
42. N. Hernández-Sellés, P.-C. Muñoz-Carril, M. González-Sanmamed, Computer-supported collaborative learning: an analysis of the relationship between interaction, emotional support and online collaborative tools, *Comput. Educ.* 138 (2019) 1–12
43. B. Berman, 3-D printing: the new industrial revolution, *Bus. Horiz.* 55 (2012) 155–162
44. D.J. Teece, Business models, business strategy and innovation, *Long Range Plann.* 43 (2010) 172–194
45. R. Shawahna, Q. Nairat, Research productivity in the field of physical exercise and epilepsy: a bibliometric analysis of the scholarly literature with qualitative synthesis, *Epilepsy Behav.* 121 (2021) 108058.
46. M. Smith, Y. Sarabi, What do interlocks do revisited a bibliometric analysis, *Manag. Res. Rev.* 44 (2021) 642–659
47. B.A. Niccum, A. Sarker, S.J. Wolf, M.J. Trowbridge, Innovation and entrepreneurship programs in US medical education: a landscape review and thematic analysis, *Med. Educ. Online* 22 (2017) 1360722

48. Huang, Y.; Huang, Q.; Ali, S.; Zhai, X.; Bi, X.; Liu, R. Rehabilitation using virtual reality technology: A bibliometric analysis,1996–2015. *Scientometrics* **2016**, 109, 1547–1559.
49. Chen,W.; Geng, Y.; Zhong, S.; Zhuang, M.; Pan, H. A bibliometric analysis of ecosystem services evaluation from 1997 to 2016.*Environ. Sci. Pollut. Res.* **2020**, 27, 23503–23513.