

Decoding Virtual Employee Engagement: A Bibliometric Analysis

Dematria Pringgabayu*, Disman, Rofi Rofaida

Universitas Pendidikan Indonesia

*Correspondence: demabayu5@gmail.com

ABSTRACT

*This study investigates virtual employee engagement using a bibliometric analysis methodology. The objective of this study is to collect information and data pertinent to virtual employee engagement. In conducting this study, the researcher collected and extracted data from the Scopus database. In July 2023, a total of 933 articles were discovered in the Scopus database. After that, VOSviewer is used for scientific mapping and analysis of publication performance, including identifying the contributions of authors, journals, countries, and the number of author keywords. The quantity of publications has increased significantly over the years. Several countries have contributed to publications on virtual employee engagement. The United States contributes the most to this publication subject, followed by India, the United Kingdom, Australia, China, Malaysia, the Netherlands, Germany, Pakistan, and France. Based on article documents production, the *Personnel Review* is the journal with the greatest influence because it produces 32 documents. While, the highest value number of citations is *"International Journal of Human Resource Management"* with the total number of 1.015 citations. In the field of virtual employee engagement research, *De Clercq D* and *Pereira R* is regarded as the highest number of document publication author; and *Knight C*, *Patterson M*, et al. are the most cited authors with 297 citations. The keyword presents key terminology from the field organized into six distinct categories colors (red, blue, green, yellow, purple and light blue). This study has a broad implication for virtual employee engagement perceptions. The findings can benefit many researchers to can utilize the data for their investigations with depth of information encourages field research.*

Keywords : *bibliometric analysis; virtual employee engagement*

INTRODUCTION

The development of digital technologies and flexible work arrangements in the twenty-first century have been significantly modified in the traditional boundaries of the workplace (Soga et al., 2022). This transition has been increased by global events such as the COVID-19 pandemic, which forced organizations around the world to implement remote working models immediately (de Klerk et al., 2021). This new work paradigm, often referred to as "virtual work," has brought with it a unique set of opportunities and challenges. The issue of sustaining and enhancing employee engagement in these virtual work environments is become one of the greatest obstacles. Besides that, understanding and encouraging employee engagement in these virtual work environments is significant for company or organization to be solved because it created challenges (Ahmed et al., 2020). Employee engagement, exhibited by enthusiasm, commitment, and involvement in work, has been associated with enhanced job performance, decreased turnover, and increased organizational success (Nagpal, 2022).

While employee engagement has been extensively studied in conventional work settings, its dynamics in virtual work environments remain relatively under-explored. Given the increasing prevalence of remote work and its likely continuance in the post-pandemic world, understanding employee engagement in virtual settings has become crucial (Yadav et al., 2019). This study offers bibliometric analysis as a powerful way for examining and revealing the scope and depth of literature on a particular topic in order to fill this research gap. It aims to investigate the concept of virtual employee engagement, examining its antecedents, outcomes, and the strategies to foster it. Extensive research has been conducted on employee engagement in conventional work settings, but the comprehension of employee engagement in virtual work contexts is still need to be explored. Thus, the purpose of this study is to conduct a bibliometric analysis of the current literature on virtual employee engagement. It attempts to map the intellectual structure of this research field, to identify its primary contributors, and to track the thematic evolution of this field over time. This methodology

enables the researcher to identify the most significant research trends, influential publications, and potential contribution in this research area, thereby providing a comprehensive view of the past, present, and future study of this field (Karakose et al., 2022). By employing bibliometric analysis to the study of virtual employee engagement, it is intended that this study will give contribution to develop and increase the number of research regarding this field of study.

This methodology enables the researcher to bridge the knowledge divide between traditional theories of employee engagement and their application in virtual or remote work contexts. By applying the perspective on the bibliometric landscape of virtual employee engagement, this study serves as a foundation for future academic inquiries and provides practitioners with a guide for effectively managing their virtual workforce. In a world where traditional workplace boundaries are becoming more flexible and psychological components of human resources are becoming more prominent, it has never been more crucial to understand the new concept of virtual employee engagement (Beckel & Fisher, 2022). Previous study has examined deeply at many aspects of virtual work and employee engagement, focusing on its connection to a wide range of organizational outcomes, especially during and after the covid-19 pandemic.

However, the literature is provided widely and mostly defined narrowly the concept of virtual employee engagement. It is leading to incomparable outcomes and conflicting results, and it is preventing a complete representation of the field. For instance, some studies have found that virtual work can lead to increased productivity due to reduced distractions, increased autonomy, and flexible working hours (Chafi et al., 2022; Pradipta & Martdianty, 2023; Šmite et al., 2023; Wang et al., 2021). In additions, study regarding employee engagement is also associated with the improvement of job performance and productivity (De Macêdo et al., 2020; Duran & Sanchez, 2021; Galanti et al., 2021). The growth of number in literature research regarding the new concept of virtual employee engagement as a combination of the term virtual work and the term employee engagement is still rarely in number. However, this scientific mapping study will discover and highlight the development, publication history, research contribution, and conceptual framework known as “virtual employee engagement”.

The context and keywords related to virtual employee engagement were the subject area of this bibliometric analysis. The vast majority of article papers have reached the conclusion that research on human resource management study is experiencing great development and concern among academics, but there are still a limited number of them that are focusing specifically on virtual employee engagement (Aboramadan, 2022; Azizi et al., 2021; Hamadamin & Atan, 2019; Vrontis et al., 2022; Werdati et al., 2020). It has been demonstrated that there is a small amount of literature on virtual employee engagement, particularly in bibliometrics research. Therefore, the purpose of this study is to conduct a bibliometric analysis and investigate virtual employee engagement as a central topic of discussion in numerous articles. It examines the publication data of articles published in journals that focus on the principal topic or commonly used keywords. In addition, the researcher endeavors to establish a connection between the keywords, which have been extensively used by numerous authors in journal articles over the publication years.

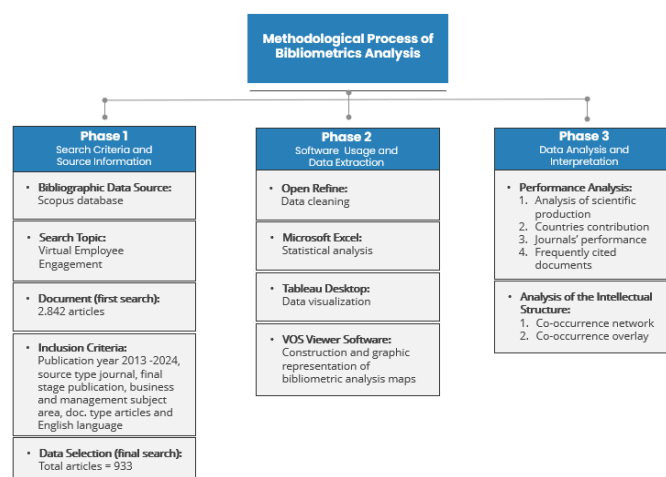
Specifically, the bibliometric data used in this study was obtained in July 2023 from the Scopus database, a well-known and widely used search engine for conducting bibliometric analyses (Rashid, 2023). The purpose of this research is to obtain a full understanding of virtual employee engagement through the application of bibliometric analysis techniques. In addition, researchers can use the findings of this data analysis and interpretation as a point of reference and a roadmap for further research on the topic of virtual employee engagement. The answers to the questions that are included below will provide insight into the results of this study: RQ 1: How is the trend of virtual employee engagement publication in scientific journals?

RQ 2: What is the contributive country to the development of this study?; RQ 3: Which journals have the most publication in virtual employee engagement?; RQ 4: Which authors have the most citation in virtual employee engagement publications?; and RQ.5: Which keywords are the most relevance on the subject of this publication?.

METHODS

In this study, a bibliometric analysis was utilized to acquire a comprehensive knowledge and interpretation of the visualization of the outcomes related with the use of mathematical and statistical

approaches that were found in scientific publications (Jiang et al., 2022). This quantitative method is frequently employed to map academic literature, revealing patterns and trends in publication research (Zhang & Eichmann-Kalwara, 2019). In addition, researchers can recognize patterns and predict possible future study outcomes. This process entails the accumulation of data on publication such as, keywords, authors, documents, citations and countries (Akther et al., 2022). The analysis of bibliometrics consists of two primary procedures such as performance analysis and science mapping (Tutar et al., 2023). As indicated in figure 1, the researcher follows a process that consists of three steps in order to carry out this study. These steps are the selection of search criteria and sources, the use of data extraction tools, and the analysis and interpretation of the collected data.



Source: processed data

Figure 1
Methodological Process of Bibliometrics Analysis

Bibliometric analysis is an excellent resource for researchers who would like to analyze publication trends since it enables the evaluation of research outputs in a wide variety of topic areas. This contributes to an excellent selection for researchers who want to examine publishing trends. As a result, identifying database sources that are applicable to a given subject is becoming an increasingly important. This is crucial for categorizing articles within a multidisciplinary bibliographic database to ensure that they are relevant to the research topic (Jotabá et al., 2022). Scopus was used for this analysis because of its recognition as the most comprehensive index of research paper citations and abstracts in the world (Singh et al., 2021). As a result, researchers in the academic field of bibliometrics rely significantly on the Scopus database. Researchers need to use relevant and acceptable keywords if their findings are intended to be as precise as possible. Identifying appropriate keywords is crucial to the success of bibliometric studies (Shakil et al., 2020). In order to obtain the intended information during the search procedure, it is also necessary to restrict the chosen keywords. In this investigation, the keyword selection criteria were derived from prior research on virtual employee engagement within the broader field of human research management. Several studies have highlighted the profound implications of virtual employee engagement study on crucial organizational outcomes, establishing it as a critical area of study in human resources. The concepts related to virtual employee engagement were used as keywords to explore the Scopus database for bibliographical results. The researcher conducted keyword queries in the Scopus database using specific functions or syntax, such as the (OR & AND) command, as illustrated in the following example: "virtual work*" OR "virtual job" OR "virtual office" OR "remote work*" OR "remote job" OR "remote employment" OR "telework*" OR "digital work*" OR "e-work*" OR "mobile work*" OR "online work*" OR "flexible work*" OR "cyber work*" OR "work from home" OR "homework*" OR "work from anywhere" OR "anywhere work*" OR "distance work*" OR "off-site work*" OR "telecommuting" OR "cloud work*" AND "employee engagement" AND PUBYEAR > 2013 AND PUBYEAR < 2024 AND (LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")).

In this study, the CSV (comma-separated values) file format was used to directly retrieve article data from the Scopus database in July 2023. In the following phase, Microsoft Excel 2013 and VOSviewer were utilized to evaluate and analyze all data outcomes. The application OpenRefine was used to cleanse the data in order to ensure accurate analysis results. OpenRefine software is essential for resolving the issue of redundant meta data, which includes multiple keywords and article keywords, despite the fact that a large number of bibliometric data appears to be accurate (Nazabal et al., 2020). VOS Viewer is used to convey the study's findings through the visualization of networks in the form of graphs, tables, and maps. Bibliometric analysis examines journal article production by nation, publisher, author, and most-cited articles. This research also performed a keyword network analysis and overlay analysis to find the most essential research topics and keyword themes for transparency.

Network analysis using VOS Viewer examined the article keywords' associations. The results are presented in the form of a network graph, which consists of nodes representing the keywords and network lines defining their interactions (Jo et al., 2021). The nodes are interconnected by network lines, and the size of a node increases proportionally to the frequency with which a term or group of keywords appears in the search results. Visually, the intensity of the links between keywords is depicted by lines that indicate common keyword co-occurrences, and the network's overlay indicates the frequency with which these connections occur (Aparisi-Torrijo & Ribes-Ginera, 2022). Consequently, the frequency of connections between nodes establishes their relative proximity, so this can fluctuate over time. There is a correlation between the number of links between two nodes and their physical proximity. This intimacy is affected by a number of factors, including the frequency of connection. Moreover, the color of the nodes surrounding the central node is a reflection of the association density and is used to distinguish and establish clusters among the nodes (Kainzbauer & Rungruang, 2019). Subsequently, an overlay analysis was conducted to determine the degree of correlation between the original research interests and the most recent publication interests. Using this method, researchers can discover the study topics that are currently prevalent in the most recent research questions (Siccardi & Villa, 2023).

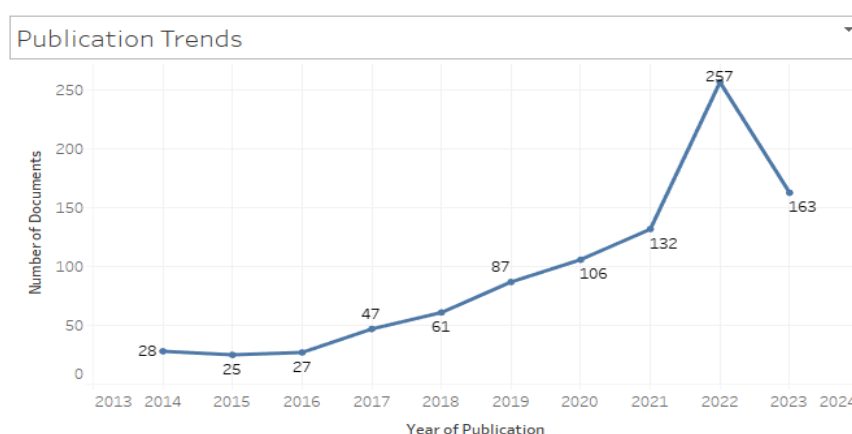
RESULT

After all of the steps in the process have been completed, a bibliometric analysis will be carried out so that the results of the study can be acquired. This will allow the conclusions to be drawn from the investigation. As one of the key grounds for the study's practical importance, the ability of bibliometric analysis to provide a comprehensive picture of a certain field of research is one of the most important factors. The evaluation of both qualitative and quantitative shifts within the realm of scientific study through the use of a variety of methodologies is what bibliometric analysis is. It involves activities such as constructing a publishing profile for a certain subject and analyzing the structural and trend features of research carried out in a particular field of study (Since January 2020 Elsevier Has Created a COVID-19 Resource Centre with Free Information in English and Mandarin on the Novel Coronavirus COVID- 19 . The COVID-19 Resource Centre Is Hosted on Elsevier Connect , the Company ' s Public News and Information Website . Elsevier Hereby Grants Permission to Make All Its COVID-19-Related Research That Is Available on the COVID-19 Resource Centre - Including This Research Content - Immediately Available in PubMed Central and Other Publicly Funded Repositories , Such as the WHO COVID Database with Rights for Unrestricted Research Re-Use and Analyses in Any Form or by Any Means with Acknowledgement of the Original Source . These Permissions Are Granted for Free by Elsevier for as Long as the COVID-19 Resource Centre Remains Active. A Look at the Focus Shift in Innovation Literature Due to Covid-19 Pandemic, 2020). The approach of bibliometrics may be broken down into two distinct subfields: performance analysis and scientific chart mapping, which is sometimes referred to as bibliometric mapping (Sarfraz et al., 2020). These concepts allude to different aspects of methodological construction. Examining the outcomes of the time period that came before it is the first step in the method.

Publication Trends

After conducting a thorough investigation into the data collection, it was decided that 933 document items should be used for the investigation being carried out in this study. As can be seen in

Figure 2, there is a degree of variability in regard to the whole number of document items that are created during the course of a certain time period. The year 2022 will see the biggest number of articles produced as a result of the creative efforts of a large number of academics working on publications relating to the subject of virtual employee engagement. Starting in 2016, continuing through 2017, 2018, 2019, 2020, and 2021, the total number of articles will grow from 27 to 132 over the course of the next four years. In addition, in 2021 there was a huge increase in the number of papers published, with the total number of articles going from 132 to 257. In that year, there were a total of 125 articles, which represented a fairly large increase in the number of articles published. Due to the fact that the year 2023 has not yet come to a close, the creation of articles in the current year is still being counted, even though there have already been 257 articles produced. As a result of the fact that many researchers are productive writers and are interested in the subject matter that is developing at a large rate, the number will continue to rise.

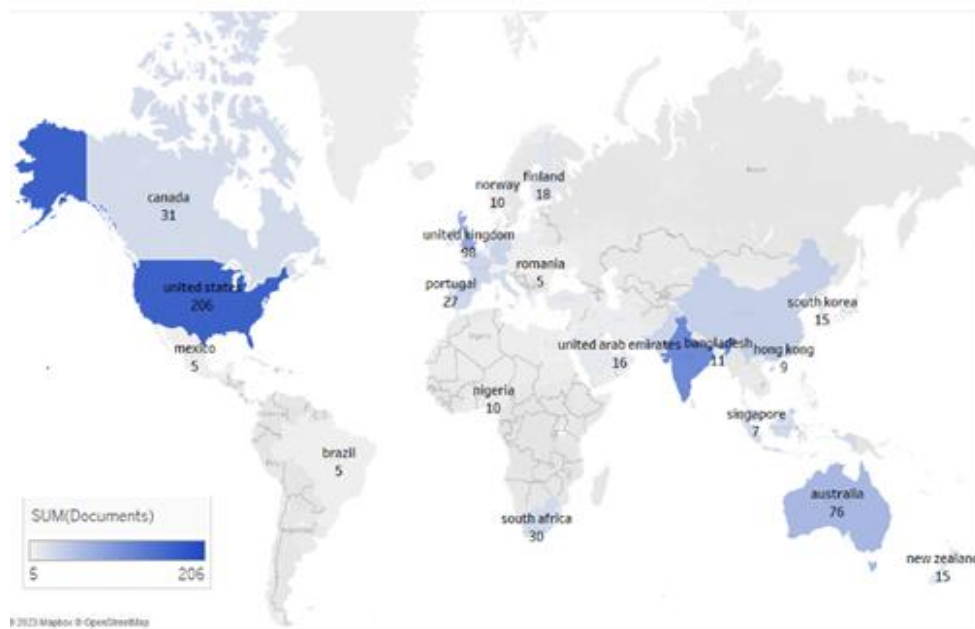


Source: processed data

Figure 2
The Trends of publication in Virtual Employee Engagement

Countries' Contribution to Virtual Employee Engagement

According to the examination of the data, there are 86 distinct nations that are attributed to the production of document items. These countries are classified as developed and developing countries, respectively. The theme of the published papers centers on the level of involvement experienced by remote workers. According to the statistics, it is very obvious that the United States, which serves as a representative for developed nations, is in the lead when it comes to contributing to these publications, with corresponding amounts of 206 document articles. Despite this, India, as a representation from the Asian nations, has published a total of 140 articles, making it the nation with the second-highest number of documents overall. Some nations are singled out for the significant contributions they have made, which has earned them spots among the top 10 countries that have contributed the most to the magazine. The following is a more detailed breakdown of the contributions made by these countries: the United Kingdom (98 articles), Australia (76 articles), China (46 articles), Malaysia (45 articles), the Netherlands (44 articles), Germany (38 articles), Pakistan (37 articles), and France (36 articles). In addition, as can be shown in Figure 3, a growing number of nations have made substantial contributions to the research being done on the topic of virtual employee engagement.



Source: processed data

Figure 3
Top 10 Countries of Articles Publication

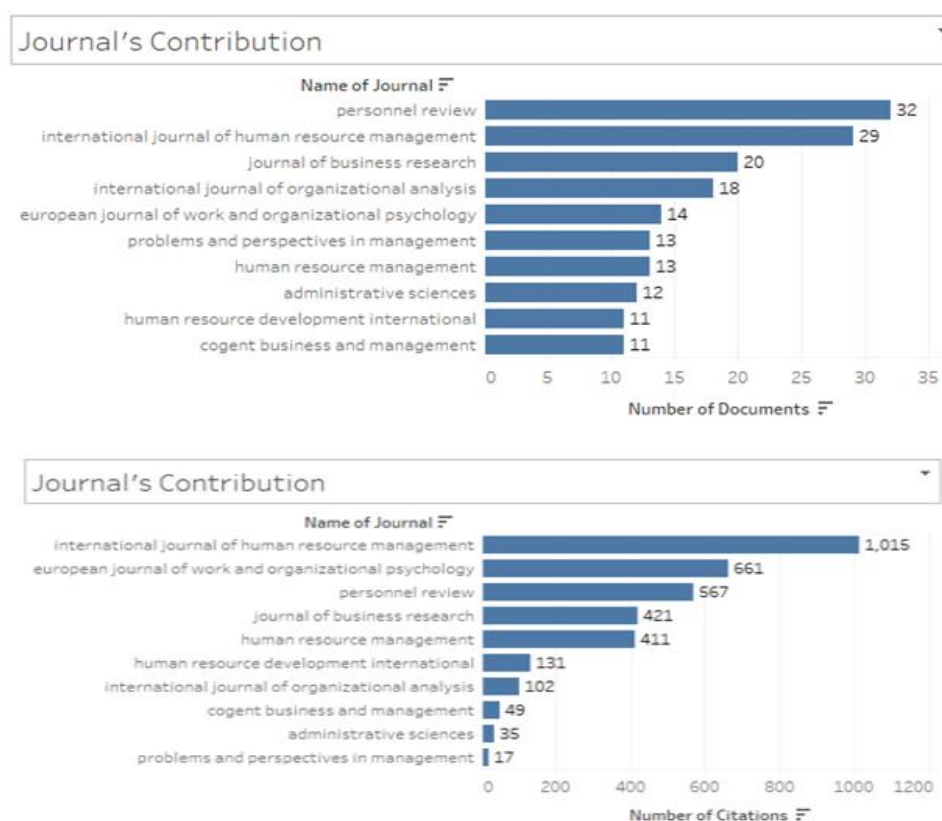
Journals' Contribution to Virtual Employee Engagement

Numerous academic journals publish research on the topic of virtual employee engagement, including some of the most prestigious with the greatest number of articles, such as the "Personnel Review" journal. Scholars with access to or possession of a vast number of academic resources have evaluated the significant increase in interest in this topic. A crucial publishing gaps for the growth of this field has been identified. Moreover, theoretical frameworks that elaborate virtual employee engagement are increasingly used to emphasize specific phenomena (Kleinaltenkamp et al., 2019). As a consequence, articles emphasizing the issues uncovered by various studies can be found in a vast array of journals. In terms of results, contributions, and impact, Figure 4 lists the best 10 journals in these disciplines. Using this information, the authors can classify journals and the articles they publish more precisely.

Information about the journals is presented in descending order of their significance, with the ten most influential journals highlighted. According to the analysis, 933 documents on the topic have been published in scholarly journals. With 32 publications to its honor, "Personnel Review" is the journal with the greatest influence. The second journal is "International Journal of Human Resource Management" with 29 articles, "Journal of Business Research" with 20 articles, "International Journal of Organizational Analysis" with 18 articles, "European Journal of Work and Organizational Psychology" with 14 articles, "Problems and Perspectives in Management" with 13 articles, "Human Resource Management" with 13 articles, "Administrative Sciences" with 12 articles, and "Human Resource Development Organizational" with 11 articles. It is reasonable to presume that "Personnel Review" is the primary source of these published papers, which could suggest that authors favor this publication when submitting their work.

However, based on the number of citations, it is noticeable that the number of cited journal articles produced by each author varies. The performance of the journal contributions based on the number of citations differs from those based on the number of documents. With 1,015 cumulative citations, "International Journal of Human Resource Management" has the highest value number of citations. The "European Journal of Work and Organizational Psychology" is ranked second with 661 citations. Followed by "Personnel Review" (567), "Journal of Business Research" (421), "Human Research Management" (411), "Human Resource Development International" (131), "International Journal of Organizational Analysis" (102), "Cogent Business and Management" (49), "Administrative Sciences" (35), and "Problems and Perspectives in Management" (17). A high number of citations for

a journal indicates that the research published in that journal has been extensively cited and utilized by other academic researchers. The high number of citations indicates that the journal's articles have had a significant impact on their respective academic discipline. They have influenced the direction of research, established significant benchmarks, or contributed to the advancement of the discipline through their insights. Consequently, a high number of citations is viewed as a positive indicator of a journal's impact and influence in its academic field.

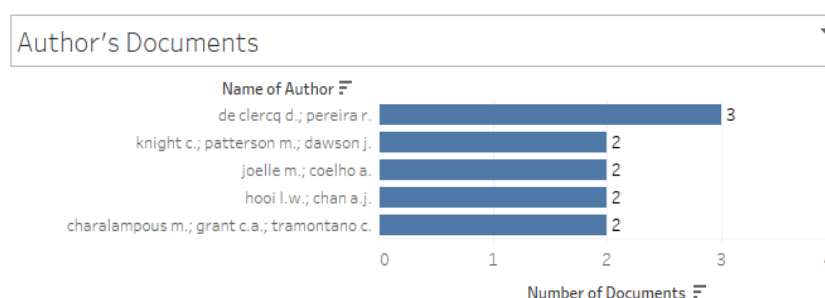


Source: processed data

Figure 4
Top 10 Journals' Contribution in Articles Publication

Authors' Contribution

According to the analysis result, De Clercq D and Pereira R are the most influential authors in the field of virtual employee engagement research. Compared to other authors, he has written three articles. Knight C, Patterson M, and Dawson J, who have published two articles, are in second place, followed by Joelle M, Coelho A; Hooi L W, Chan A J; and Charalampous M, Grant C A, and Tramontano C, who have also published two articles. Only two articles have been published by the remaining authors to demonstrate their substantial contributions to this expanding field of study. These five authors have contributed to the production of articles and documents considered to be the most prolific. In this study, a particular emphasis was placed on scholarly works from the last ten years, ensuring the incorporation of recent and germane insights on the subject of virtual employee engagement. After analyzing the data, it becomes apparent that the number of publications generated by different authors varies considerably. Different factors may account for these differences. For instance, each author may be interested in different areas of research, have access to different resources, and conduct their studies at varying depths within the study's topic.

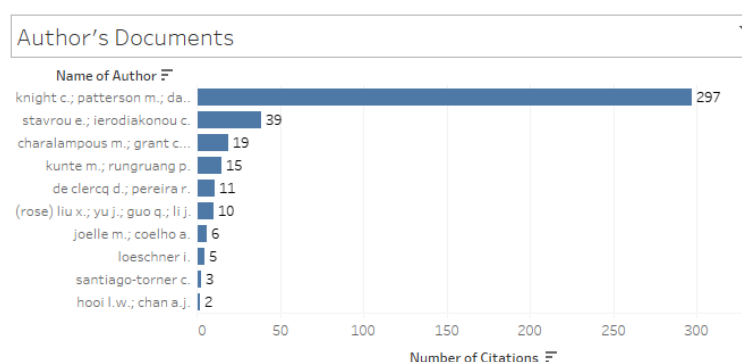


Source: processed data

Figure 5
Top 10 Authors with the highest number of documents publications

The Most Cited Authors

Numerous research papers on the subject of virtual employee engagement have been published over time. This bibliometric study employs a method that ranks articles according to the number of times they have been cited by other academicians or authors (Goyal & Kumar, 2021). This number represents the author's contribution to the publication on the topic of virtual employee engagement, a metric utilized in previous research. The greater impact and contribution a paper is believed to have had on the scientific community, the more times it is cited. By utilizing Scopus, it is possible to identify the authors whose work on virtual employee engagement has been cited the most frequently. In addition, among the 933 articles identified in this study, Knight C, Patterson M, et al. are the most cited authors with 297 citations in total. Stavrou E, Lerodiakonou C et al., with a total of 39 citations, is the second-most-cited author after the most-cited author. In this investigation, Charalampous M, Grant C, et al. rank third with 19 citations. Kunte M, Rungruang P et al., contributed 15 citations; De Clercq D, Pereira R., (11 citations); Liu X, Yu J, Quo Q et al., (10 citations); Joelle M, Coelho A., (6 citations); Loeschner I., (5 citations); Santiago-Torner C., (3 citations); and Hooi I W, Chan A J. Figure 6 depicts the contribution of these Authors to the total number of citations.



Source: processed data

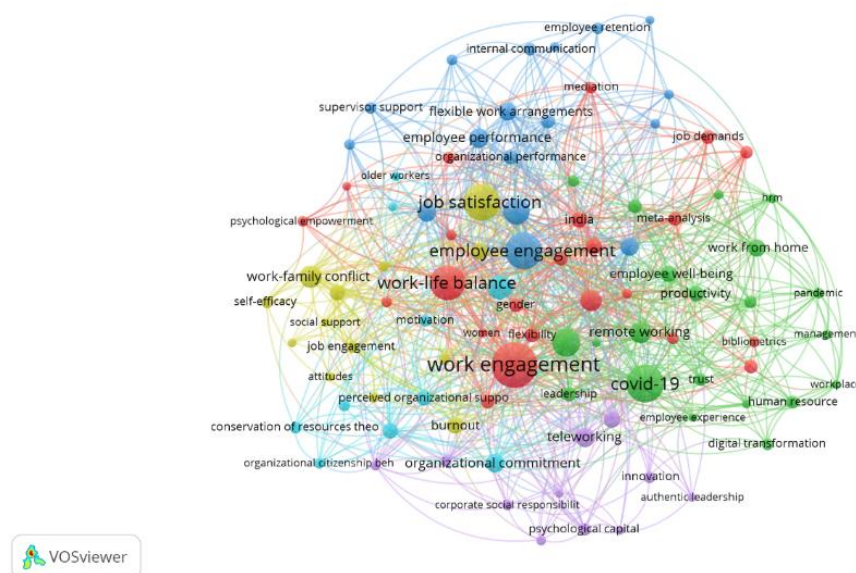
Figure 6
Top 10 Authors with the highest number of citations

The Most Used Keywords

This section will examine and display the keywords that are used in these publications as the most frequently, and its objective is to do accordingly. An interactive connection map may be generated with the help of the application VOSviewer, which shows which combinations of terms appear together the most frequently. The findings provide a list of the top 10 keywords that have been utilized in publications about virtual employee engagement. Additionally, it produced a visual representation of these terms, which is studied in the next part for your convenience.

The study that is most relevant to the topic areas can be brought to light by utilizing the keywords that appear most frequently (Chae et al., 2020). It is a frequent practice to evaluate the

relevance of publications in this way, with the primary focus being placed on the relationships that exist between citations or keywords (Mohammad Saif & Islam, 2022). It is possible to use the VOSviewer program to create this keyword network for the sake of research, which proved to be quite helpful. This is a valid use of the product. Figure 7 presents a network that displays the links between several terms that pertain to the concept of virtual employee engagement. Following the incorporation of all of the metadata into the keyword analysis, a total of 2,535 keywords were found to be present in the 933 publications that were pertinent. At least seven occurrences of each of these 2,535 keywords may be found throughout the text.



Source: processed data

Figure 7
The Connections between keyword occurrence used in articles document

The frequency of each term is graphically represented by the size of the nodes or circles, as well as the words that are displayed in the image. It may be deduced from the larger size of the circle as well as the length of the phrase that the keyword is used more frequently than the other keywords (Kişi, 2023). The length of the lines that connect the circles serves as an indication of how closely connected two keywords are; shorter lines imply a closer association (Prilatama & Churiyah, 2023). A line may be observed running from the first term to the other keywords in the image, as can be seen in the image. The thickness of the lines that link the keywords might vary; when the lines are thicker, it indicates that the keywords are more likely to co-occur and to be interconnected (Kirilmaz & Simsir, 2022). All of the circles with the same hue belong to the same group or cluster. In the accompanying table, you will see that VOSviewer has divided the keywords that were found in the various publications on virtual employee engagement into six separate groups.

Table 1
The Cluster of the Keywords.

Cluster 1 (Red)	Links	Total Link Strength	Occurrences
1. work engagement	57	145	89
2. work-life balance	45	83	58
3. human resource management	29	37	27
4. india	28	39	17
5. job crafting	19	35	17
6. flexibility	18	29	15
7. job demands	16	33	14
8. meta-analysis	19	25	14
9. stress	22	28	14
10. gender	19	22	13

11. job demands resources model	17	24	13
12. systematic literature review	11	15	13
13. job resources	17	33	12
14. artificial intelligence	12	17	11
15. job characteristics	15	17	11
16. mediation	17	28	10
17. bibliometrics	4	5	9
18. flextime	12	15	9
19. psychological empowerment	11	12	9
20. work design	11	11	9
21. telecommuting	13	14	8
22. meaningful work	9	10	7
23. women	11	14	7
Cluster 2 (Green)	Links	Total Link Strength	Occurrences
1. covid-19	49	111	65
2. well-being	36	64	41
3. remote working	27	48	26
4. work from home	26	39	19
5. employee well-being	21	30	18
6. productivity	25	37	17
7. leadership	31	38	15
8. virtual teams	18	25	13
9. hr practices	20	26	12
10. human resource	11	11	12
11. trust	15	18	12
12. digital transformation	9	12	11
13. commitment	12	14	10
14. pandemic	18	27	9
15. hrm	21	26	8
16. management	10	14	8
17. psychological well-being	10	12	8
18. communication	13	14	7
19. employee experience	15	18	7
20. employees	15	16	7
21. workplace	13	18	7
Cluster 3 (Blue)	Links	Total Link Strength	Occurrences
1. employee engagement	58	99	64
2. turnover intention	30	56	36
3. employee performance	22	30	23
4. job performance	31	35	22
5. performance	33	50	22
6. flexible work arrangements	28	42	21
7. organizational performance	18	20	15
8. organizational culture	13	17	13
9. internal communication	8	10	12
10. employee retention	11	16	10
11. supervisor support	12	19	10
12. organizational identification	12	12	9
13. social exchange theory	13	17	9
14. employee satisfaction	12	12	8
15. information technology	12	17	8
16. work-life conflict	6	6	8
17. talent management	5	7	7
Cluster 4 (Yellow)	Links	Total Link Strength	Occurrences
1. job satisfaction	47	115	64
2. work-family conflict	27	39	29
3. burnout	22	35	18
4. transformational leadership	16	27	18
5. quantitative	23	34	17
6. covid-19 pandemic	13	17	11
7. job engagement	17	20	11
8. self-efficacy	11	12	11
9. high performance work systems	4	11	9
10. knowledge sharing	11	11	9
11. attitudes	7	7	7

12. quality of work life	6	6	7
13. social support	15	18	7
Cluster 5 (Purple)	Links	Total Link Strength	Occurrences
1. teleworking	29	48	23
2. structural equation modeling	18	24	18
3. psychological capital	16	22	12
4. innovation	8	8	10
5. corporate social responsibility	5	13	9
6. emotional intelligence	17	20	9
7. affective commitment	18	20	8
8. creativity	11	12	8
9. authentic leadership	7	10	7
10. organizational climate	10	10	7
11. strategic human resource management	6	6	7
Cluster 6 (Light Blue)	Links	Total Link Strength	Occurrences
1. engagement	35	50	33
2. organizational commitment	21	38	22
3. emotional exhaustion	20	24	16
4. perceived organizational support	6	30	15
5. motivation	14	17	11
6. conservation of resources theory	10	12	10
7. human resource development	11	12	10
8. organizational citizenship behavior	11	15	9
9. older workers	8	12	8
10. idiosyncratic deals	9	9	7

Source: processed data

Based on the result, the keyword "work engagement" appears most often, showing up 89 times. The second most common keyword is "covid-19" which is used 65 times. Other frequently appearing keywords include "employee engagement" (64 times), "job satisfaction" (64 times), "work-life engagement" (58 times), "well-being" (41 times), "turnover intention" (36 times), "engagement" (33 times), "work-family conflict" (29 times), and "human resource management" (27 times). It can be seen in Table 2. These ten keywords have had a significant impact on the subject of this study. Particularly, "virtual employee engagement" as a focus keyword in the study that is used frequently. VOSviewer's keywords visualization shows how strong keywords are linked in the publication.

Table 2
The Top 10 Occurrence of the Keywords.

Keywords	Occurrences	Total Link Strength
1. work engagement	89	145
2. covid-19	65	111
3. employee engagement	64	99
4. job satisfaction	64	115
5. work-life balance	58	83
6. well-being	41	64
7. turnover intention	36	56
8. engagement	33	50
9. work-family conflict	29	39
10. human resource management	27	37

Source: processed data

Trend of Keywords

The software application known as VOSviewer is accountable for carrying out an in-depth investigation on the pattern of keyword use over all publishing years. This demonstrates the trend in the utilization of keywords from 2013 to 2024. Additionally, the shade of color that a node represents the total number of publications that have been connected to that article's keyword from one year to the next (Chauhan et al., 2022). The yellow nodes reflect more recent publications, whereas the blue nodes represent earlier phases that occurred throughout the research era (Islam, 2023). This classification of the most prevalent terms offers helpful insights into the subjects that have received the greatest controversy and have received the least amount of attention (Akinpelu & Nchu,

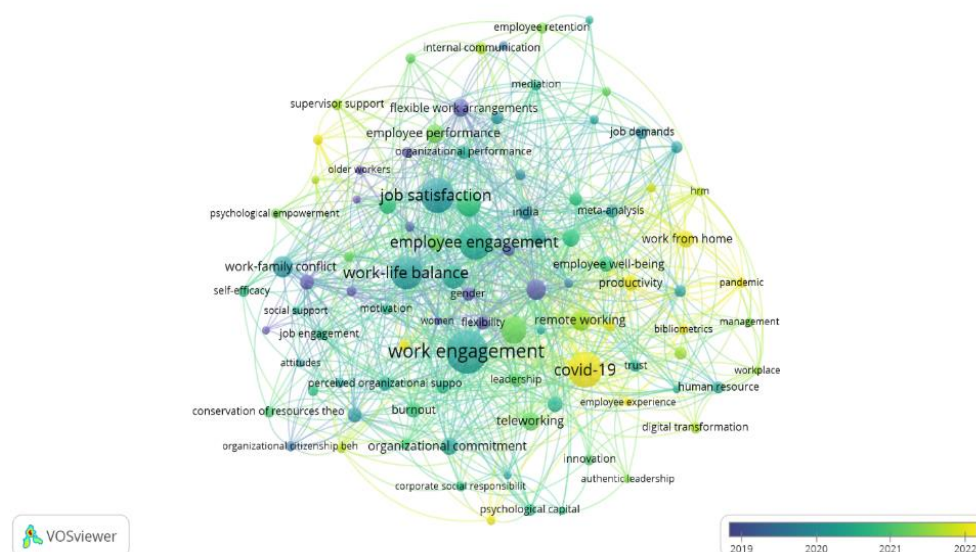
2022). With regard to Figure 8, a few of the keywords are considered to be new topics of interest for the research on virtual employee engagement. The terms "covid-19," "work from home," "employee experience," "artificial intelligence," "productivity," "pandemic," and "social exchange theory" are only few of the terms that fall under this category. Based on the term virtual employee engagement, it can be analyzed that some keywords are very rarely to be discussed. It means that these keywords have limited number of use and not many researchers have conducted research regarding these keywords. The possibility of the emergence of novelty research are still open widely.

Table 3
The Bottom 10 Occurrence of the Keywords.

Keywords	Occurrences	Total Link Strength
1. flexible work environment	1	7
2. home-based telework	1	9
3. remote work adjustment	1	6
4. virtual and hybrid work settings	1	6
5. working at home	1	6
6. flexible work options	2	6
7. virtual organizations	2	10
8. virtual work environment	2	16
9. virtual workspaces	2	13
10. flexi-place	3	10

Source: processed data

These phrases came to light during the most current investigation, which was conducted in the course of this research. This suggests that there is a significant amount of room for investigation and definition of what virtual employee engagement truly means and how it relates to other keywords, particularly in the context of research on human resource management. This is consistent with the themes covered that overlay analysis of bibliometric data on virtual employee engagement has produced excellent insights into the evolution of research, thematic clusters, and major contributors in this field. This is also consistent with the issues covered that overlay analysis of bibliometric data on virtual employee engagement has covered. The findings of the study indicated a shift away from an understanding of the fundamentals of the idea of virtual employee engagement toward an examination of its nuanced interactions with other variables.



Source: processed data

Figure 8
Overlay Visualization of the keywords in articles document publication trends

SIMPULAN

In conclusion, to investigate global research patterns on the virtual employee engagement, bibliometric approaches are utilized. It found 933 relevant publications on the subject by using Scopus database with the specific keywords used to search for articles. The first article to be published on the topic of virtual employee engagement appeared in 2013, and the number of publications on this topic continues to increase every year since 2015. According to the findings, the United States of America is the country that makes the greatest contributions to the field of publishing with 206 article documents, followed by India, as a representation from the Asian nations with 140 articles document, and then the United Kingdom (98 articles), Australia (76 articles), China (46 articles), Malaysia (45 articles), the Netherlands (44 articles), Germany (38 articles), Pakistan (37 articles), and France (36 articles). The majority of the works on the subject come from these countries. On the basis of the output of article documents, the "Personnel Review" is the journal with the greatest influence because it produces 32 documents. The highest value number of citations is "International Journal of Human Resource Management" with the total number of 1.015 citations. In the field of virtual employee engagement research, De Clercq D and Pereira R is regarded as the highest number of document publication author. In terms of the most productive and influential authors, Knight C, Patterson M, et al. are the most cited authors with 297. The author did a keyword analysis and came up with six different categories. This presents key terminology from the field organized into six distinct categories. The colors red, blue, green, yellow, purple and light blue represent the terms associated with each cluster. The findings of this study have a wide-ranging implication for the way that virtual employee engagement is perceived. It is possible that the frequency of keyword usage may direct future research. In conclusion, the findings can be of use to a wide variety of researchers. The data provided is available for researchers to use as a guide for their studies. Because of this depth of knowledge, field research may be encouraged.

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