20 Years Trend in Office Environment: Bibliometric Analysis and Future Research Agenda

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Abstract
Purpose: The purpose of this paper is to present the characteristics and evolution of the publications of the research on office environment.
Design/methodology/approach: This paper runs a Bibliometric Analysis of the literature on office environment which examines 152 publications using keyword and co-words analysis from SCOPUS for the period 2000-2022.
Findings: This study finds that the topic of office environment has been fluctuating for the past 22 years. The analysis also reveals the most cited authors and papers, including the most frequent topics in this research area, highlighting that current trends are moving toward green office, employee well-being and work from home.
Research limitations/implications: The analysis might have possibility of missing some crucial work on office environment while screening in data base. Because only published articles were selected, this study may have overlooked some information from other sources such as proceedings, textbooks, and conferences.
Practical implications: Potential research directions are also provided by suggesting specific research themes and conceptual approaches. This comprehensive exploration has provided valuable insights into the concept of office environment, its objectives, and its potential benefits for future research.
Originality/value: This paper provides a quantitative bibliometric analysis to revisit the extant literature.

Keywords: Office environment, workplace environment, employee well-being, bibliometric analysis, systematic literature review

Introduction
In the ever-changing world of today's global workforce, the office environment serves as a hub of productivity, collaboration, and creativity. It provides a setting for employees to engage in their everyday lives, influencing not just their job experiences but also their well-being and personal development. The office environment is more than just a physical area; it is a dynamic ecosystem that reflects current society's values, goals, and technological advances. Research has shown that the qualities of the workplace environment can significantly affect employee behavior, perceptions, and productivity (Kamarulzaman et al., 2011). As most of the employees work almost eight hours every day, as such the office environment has a tremendous impact on the daily lives of many people. The rapid transformation of the office environment witnessed during mid-2000's,

the most drastic and noticeable change in the office culture since the 19th century (Dmitry and Dimitry, 2021).

The traditional office paradigm has experienced tremendous transformation as we move further into the 21st century. Rapid technological advancements, changing demographics, and growing appreciation of the value of work-life balance have all had a significant impact on how we work and the places in which we operate. In particular, the COVID-19 epidemic sparked a shift towards remote and hybrid work patterns, challenging norms and forcing organizations to reconsider their strategies for office planning and administration (Pataki-Bittó and Kapusy, 2021).

The objective of this study is to analyse, through a bibliometric review of the empirical on office environment and the field of relevance. Bibliometric reviews have become a valuable instrument for the academic community in research evaluation and act as a guide for researchers established in this research area and for those who want to begin to delve into these topics (Ellegaard and Wallin 2015). In a similar way to recent bibliometric analyses (Cisneros et al. 2018; Kent Baker et al. 2020; Zheng and Kouwenberg, 2019), our study addresses the following research questions concerning the research on office environment:

Research Question 1: What is the volume of publication over the years?
Research Question 2: Which are the most productive countries?
Research Question 3: Which are the most productive journals?
Research Question 4: Which publications are the most cited in the research period?
Research Question 5: What are the most important research topics studied and potential research gap opportunities?

Our study makes several contributions to the literature. First, we identify publication standards in a recent, but consolidated branch of research concerning office environment. A systematic review is necessary to assess and analyse the development of this field of research given the plenty of papers on the subject. Second, the information segmented by years and by countries (RQ1, RQ2, RQ3) helps to detect the most important contexts in the research on office environment. In this regard, our study summarizes the recommendations on office environment and offers a guide for scholars to understand how research has reacted to changes. Third, we recognize the most relevant publications in the field and categorize the main themes and current dynamics of research on office environment (RQ4 and RQ5). The knowledge regarding research trends will help academics to learn about past and current research interests, which proves vital in shaping future research directions. In addition, several potential research avenues are identified. Concisely, our study provides a clear picture of research on office environment and contributes a significant advance in the literature to map intellectual structure and research trends in this topic.

The sample is composed of all the publications on office environment from the main collection of the SCOPUS, which is a fundamental input of the evaluation process in academia. Specifically, a total of 152 publications have been analysed to answer our research questions. Using the VOSviewer software, our paper maps research on office environment through the combination of techniques based both on performance analysis and science mapping, including the analysis of publications by year, country, journal, author, as well as a citation analysis and a content analysis.

Bibliometric Analysis

In recent years, bibliometric analysis has grown in prominence in business research (Donthu et al., 2020b, Donthu, Kumar, Pattnaik, & Lim, 2021, Khan et al., 2021), and its popularity can be attributed to the advancement, availability, and accessibility of bibliometric software such VOSviewer, and scientific databases such as Scopus and Web of Science. The popularity of bibliometric analysis in business research is not a fad but rather a reflection of its utility for (1) handling large volumes of scientific data, and (2) producing high research impact (Donthu et al, 2021). Moreover, a systematic approach to bibliometric analysis can disclose more precise information about publications, such as authors, repeating keywords, and citations (Ahmi & Mohamad, 2019). Considering the growing attention and relevance of office environment as a part of business and management area has been attaining, this study aims to map the literature through a bibliometric analysis that provides a reflection on the evolution of office environment during the period 2000–2022.

Methods

Data

The initial sample consisted of 152 documents from the main collection of SCOPUS from year 2000 to 2022 was collected. The documents regarding office environment have been compiled through a search in June 2023 in the topic field in titles, abstracts, and keywords (Zheng and Kouwenberg, 2019), by the expressions "office environment" and limited to the subject area in business, management, and accounting. The documents are also restricted to the studies that contain the terms "workplace" or "work environment" or "environment" or "office management" or "job satisfaction" or "job performance. The data selection process is summarized in Figure 1.

Method

Bibliometric analysis is a scientific computer-assisted review methodology that can identify core research or authors, as well as their relationship, by covering all the publications related to a given topic or field (De Bellis, 2009). Controlling, assessing, and evaluating research activity over time is made possible by bibliometrics analysis (Patra et al., 2006). In addition, Albort-Morant et al. 2018 mentioned this methodology allows structuring the research area as it develops as well as guides future lines of research. Therefore, bibliometric methods have become relevant in assessing institutional investigation and positioning future academic research (Daim et al., 2006; Ellegaard and Wallin, 2015).

A bibliometric analysis is capable of offering an analysis, among others, referring to the number of publications, the most influential authors, the countries where the topic has been most investigated or the journals that focus their publications on issues related to the object of analysis (Albort-Morant et al. 2018). To respond to our research questions, this paper presents different sections: the analysis of publications by year (RQ1); the analysis of research activity by country (RQ2); the analysis of publications by journal (RQ3); a citation analysis (RQ4); and a content analysis to present the main themes in this stream of research and the evolution of the most important trends (RQ5). The bibliometric analysis is based on a set of indicators that enable objectively measuring different aspects of publications, and allow a comparability between researchers, research groups, publications and organizations (Haustein and Larivière 2015).

There are three types of indicators (Durieux and Gevenois, 2010): (1) quantity, referring to the productivity of any unit of measure; (2) quality, which determines the impact of the research; (3) structural, which examines connections between publications, authors, or keywords.

Consistent with the recent literature (Behrend and Eulerich, 2019; Tunger and Eul- erich, 2019; Zheng and Kouwenberg, 2019), the VOSviewer software is employed in our analysis. This software was designed to construct and view bibliometric maps, and enables performing different actions such as zooming, scrolling, and searching as well as providing relevant graphical representations, which are significant advantages in comparison to other software (Van Eck and Waltman, 2010). Figure 1 presents the structure of the methodology.
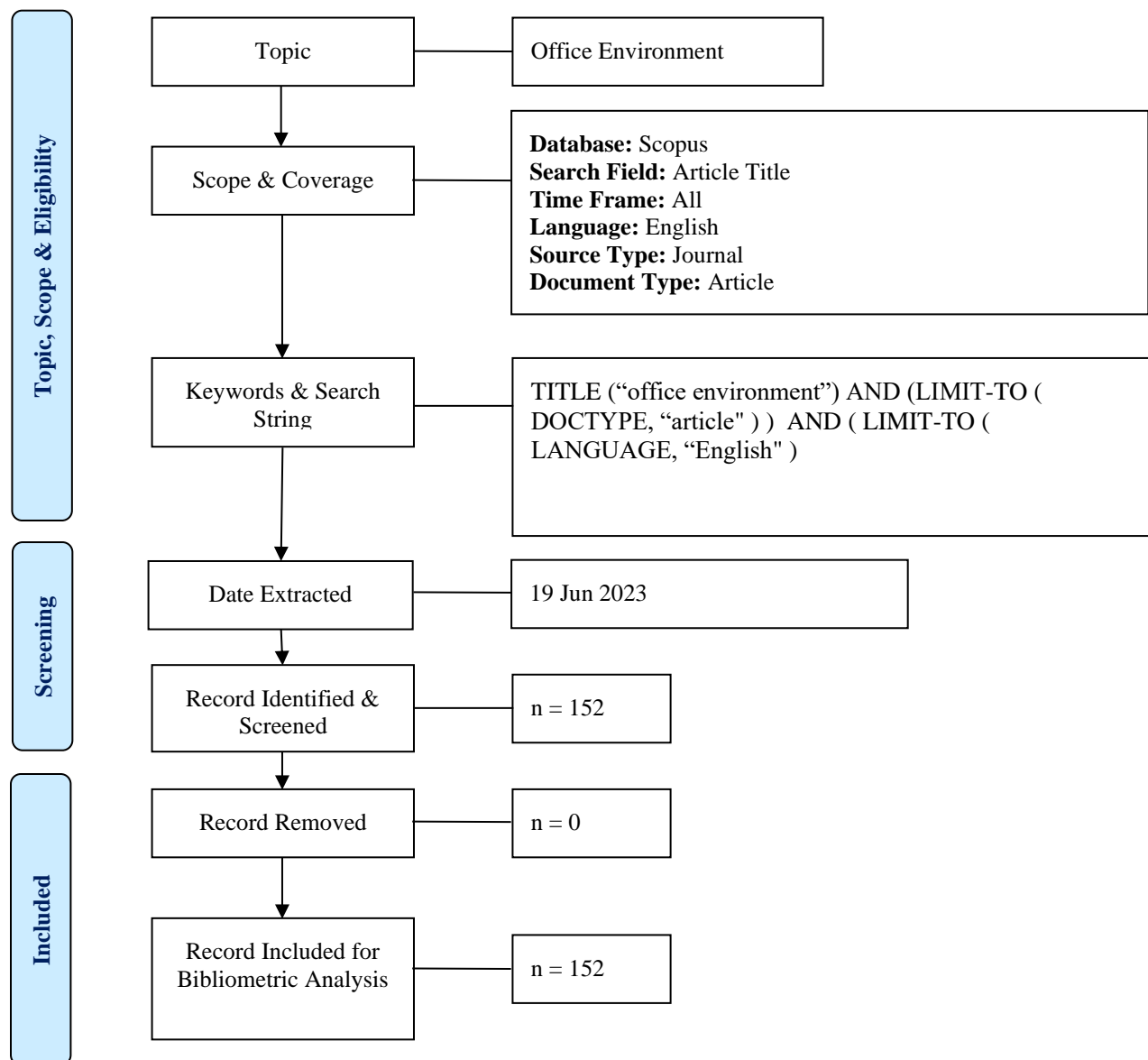

Figure 1: Flow Diagram of the Search Strategy

Source: Zakaria, R., Ahmi, A., Ahmad, A. H., & Othman, Z. (2020) Worldwide Melatonin Research: A Bibliometric Analysis of Published Literature between 2015 and 2019, Chronobiology International.

Modified from PRISMA: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7).

Results

Publication by Year

Figure 1 shows the evolution of research activity on office environment in the period 2000 to 2022, and several stages can be detected, where the effect of different international regulations on this specific research area is clearly visible. The findings show that office environment research activity has been fluctuating for the past 20 years. Various factors contributed to the research trends related as the workplace evolves in response to changing situations, it is expected that research in this area will adapt and reflect these changing dynamics.
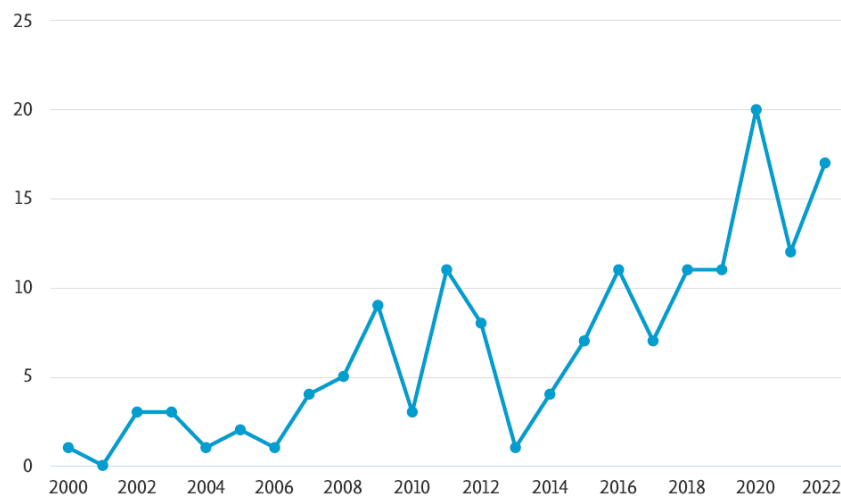

Figure 2: Publications by Year (SOURCE: SCOPUS)

First, during the period 2002–2006 the number of publications remained relatively stable, but low. The initial research on office environment likely appeared due to the future trend in the workplace and the workforce. Starting in the 1980's trends can be observed which affect the workplace and the workforce. The trends are the flexibilization of work accompanied by a decentralization of authority which takes place in an era of globalization (Oechsler, 2000). Many fundamental components of workplace environments may have been investigated and established by the early 2000s. During this time, the maturation of office environment topics resulted in less undiscovered options in the discipline and researcher could have diverted attention away from certain research topics.

Second, in the period 2007–2009, research on office environment rose significantly. In 2009, almost 10 documents were published. However, the number of publications on office environment starting 2010 until 2014 show fluctuation grown. In 2010 and 2013, the number of publications reduced unexpectedly. Growing interest in sustainability, digital technology, and healthcare research occurred during these years, which may have diverted attention away from workplace environment study. According to Reis et al. (2018), the quantity of articles on digital transformation in has dramatically increased since 2013.

Third, regardless of the fluctuation grown on those years, research activity on office environment has been in the last seven years strengthened and significantly higher than in previous years. Indeed, 66% of the documents were published between 2014 and 2022, which underlines the importance of office environment in recent research, and several reasons may be found to explain this increase. It is expected that the trend will continuously increase for the year 2023 as it reflects the current phenomenon of flexible working arrangement and work life balance.

The workforce has changed through time and has been influenced by a variety of events, notably more recently the COVID-19 pandemic, which has led to a sharp spike in publication in 2019–2020. The workplace is shifting towards a new hybrid model that combines owned space, co-working space, and Work from Home (WFH) (Pataki-Bittó and Kapusy, 2021; Benítez-Márquez MD et al, 2022).

The work environments, which have already been taken for granted in the past years, would be almost unthinkable for much of the traditional office workforce just over a decade ago. The current remote work lifestyle is not always beneficial for one's well-being and productivity, but it also brings many positive outcomes and conveniences (Markovitz, 2021). The transition to new remote and hybrid office work scenarios is not a completely new phenomenon, but rather a continuation of the ongoing processes, which are now taking an increasingly accelerating pace. The plentiful availability of personal computing devices, laptops, smartphones, tablets, and other gadgets with suitable software packages, as well as highly developed infrastructure of fast internet connectivity, both wired and mobile, along with the rapid digitalization of corporate business practices in various industries had led to the growing number of new work lifestyle precedents. As result, by 2005 work from home has already been taking a strong ground (Schlosser, 2006).

Publication by Countries

The analysis of the number of publications by country, which is shown in Figure 3, is based on the affiliation of the authors now of the publication of the paper. Several important discoveries are highlighted in this investigation. To begin, research on the office environment is dispersed across countries. A total of 10 countries contribute to the knowledge of this area. Following that, nearly half of the publications have ties to the United States (26), the United Kingdom (25), and the Netherlands (13). The United States and United Kingdom are frequently seen as leaders in the establishment of workplace trends, workplace design, and management practices. In the mid 1800 the so-called "office palaces" began to rise in the larger city centers of the United States and the United Kingdom (Duffy, 1999). As a result, research from these countries is seen as particularly pertinent and significant in creating the debate on office environments.
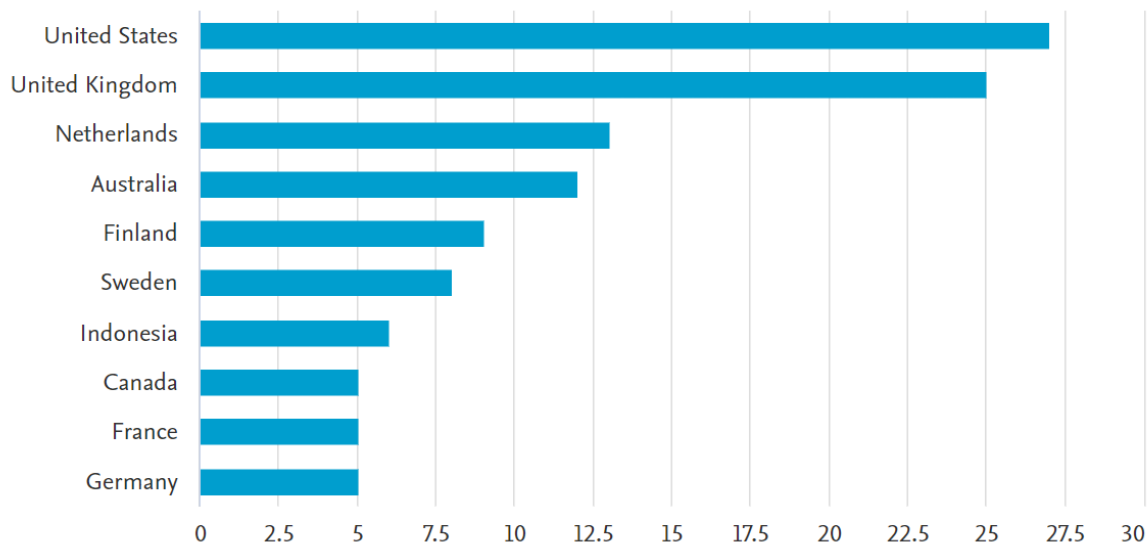
Figure 3: Publication by Country

Publication by Journal

The 152 documents from our sample have been published in 78 journals. The number of publications for each journal are shown in Figure 4. The main categories where these journals are classified are Business Management, Real Estate, Engineering and Health which shows the disciplinary character of this branch of investigation. The top 5 most relevant journals publishing articles on office environment are Journal of Corporate Real Estate, International Journal of Workplace Health Management, Property Management, Quality - Access to Success, Journal of Facilities Management. The use of keyword and topic of workplace and office environments leads to study of office environment appeared in these journals as in Table 1.

Our finding shows most of the Q2 journals which comprises with slightly lower impact factors, but nevertheless of high quality. These journals are still regarded as credible and produce important research. Majority of the articles published in Journal of Corporate Real Estate. Health, educational, office, and municipal real estate are examples of corporate real estate field. As such, majority of the office environment articles found in this journal.

Table 1: The Top 5 Journals

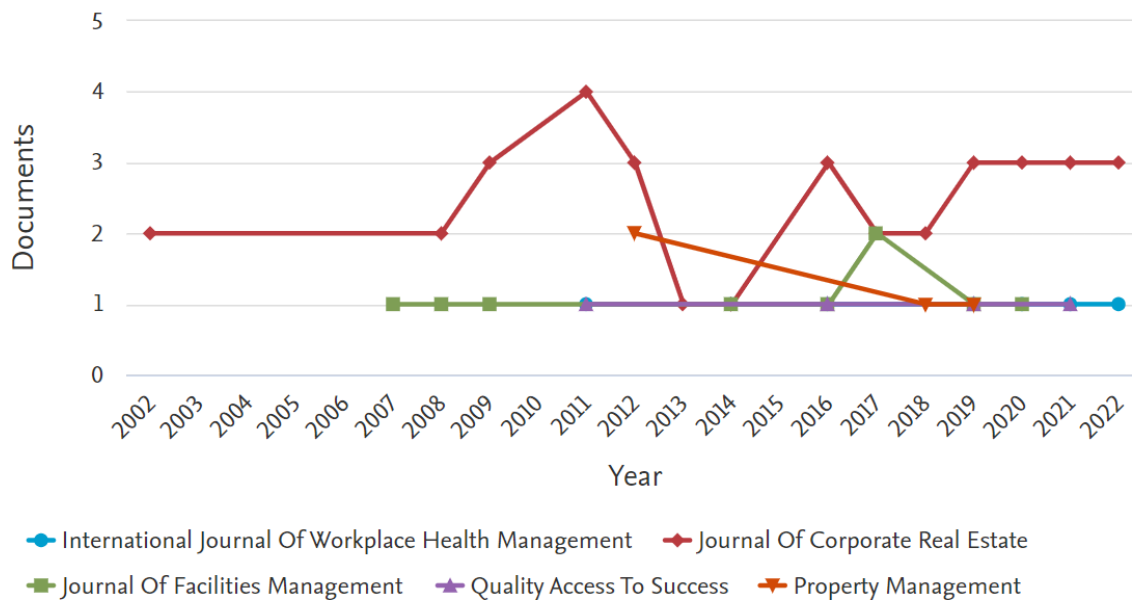| Journal	TP	Impact Factor	Quartile
Journal of Corporate Real Estate	34	3.8	Q2
International Journal of Workplace Health Management	7	3.2	Q2
Property Management	4	2.2	Q3
Quality-Access to Success	4	1.5	Q4
Journal of Facilities Management	9	3.6	Q2

Figure 4: The Top 5 Journals

Citation Analysis

Citation analysis shows the influence of publications in the literature (Merigó and Yang, 2017). Citation analysis has been extensively used to judge the impact of publications and as a measure of the scientific quality of researchers and institutions (Ellegaard and Wallin, 2015). At the same time, this analysis remains crucial for scholars to map the previous literature and position their research. Specifically, the analysis focuses on showing global citations, verifying the impact on the publications studied in this research (Kent Baker et al., 2020). Table 2 shows the 10 most cited documents.

The term office environment might also be referred to working environment, workplace and working conditions, therefore, the citation of the term office environment is not especially high. The highest and most influential citation is by Allouhi et al., (2015) with 441 citations, published by Journal of Cleaner Production. The authors concluded that buildings have considerably contributed to global energy consumption and greenhouse gas emissions. The use of the keyword "office" led to results on office building and illustrates the growing study on sustainable building.

Table 2: Top 10 Documents and Authors Most Cited

Publication	Authors	TC	Journal
Energy consumption and efficiency in buildings: Current status and future trends	Allouhi A.; El Fouih Y.; Kousksou T.; Jamil A.; Zeraouli Y.; Mourad Y.	441	Journal of Cleaner Production
An end user's perspective on activity-based office concepts	Appel Meulenbroek R.; Janssen I.; Groenen P.	171	Journal of Corporate Real Estate
The influence of office type on satisfaction and perceived productivity support	De Been I.; Beijer M.	167	Journal of Facilities Management

Title	Authors	Citations	Journal
Employee reactions to office redesign: A naturally occurring quasi-field experiment in a multi-generational setting	McElroy J.C.; Morrow P.C.	102	Human Relations
Workplace productivity and office type: An evaluation of office occupier differences based on age and gender	Haynes B.; Suckley L.; Nunnington N.	67	Journal of Corporate Real Estate
Impact of workplace connectivity on office productivity	Haynes B.P.	66	Journal of Corporate Real Estate
Occupier perceptions of green workplace environment: The Australian experience	Kato H.; Too L.; Rask A.	57	Journal of Corporate Real Estate
Personalization in non-territorial offices: A study of a human need	Brunia S.; Hartjes Gosselink A.	56	Journal of Corporate Real Estate
Energy demand and environmental impact of various construction scenarios of an office building in Morocco	Hamdaoui S.; Mahdaoui M.; Allouhi A.; El Alaiji R.; Kousksou T.; El Bouardi A.	53	Journal of Cleaner Production
Developing a gamified mobile application to encourage sustainable energy use in the office	Oppong-Tawiah D.; Webster J.; Staples S.; Cameron A.-F.; Ortiz de Guinea A.; Hung T.Y.	48	Journal of Business Research

Network Visualization Analysis

In a network visualization analysis, the keyword co-occurrence map was generated in VOSviewer. These keywords were generated comprising each cluster which represent by different colors, also referred as themes used in the literature. The size of each node in this analysis refers to frequency of occurrence and the proximity of nodes is determined by trends in co-occurrence, while the clustering of nodes by color is based on patterns of co-occurrence among various keywords in the review articles. Based on the visualization network in Figure 5, the most frequently co-occurring keywords reveals five clusters including "Office Environment", "Office Building", "Workplace", "Thermal Comfort" and "Productivity". The network reveals that the terms "Physiology," "Ergonomics," "Health" and "Occupational Health" were strongly associated with the cluster "Office Environments" as it has bolder edges connecting those term. As for the second cluster, term such as "Building," "Energy Utilization" and "Energy Efficiency" was strongly associated with the cluster "Office Building." While cluster 3 consisted of 9 terms associated such as "Lighting", "Office Layout", "Workplace Design" and "Visual Comfort" portrayed the common factors associated with the cluster of "Workplace". Next cluster is "Thermal Comfort" which widely associated with the keywords of "Indoor Air Pollution," "Thermal Environment" and "Ventilation." Cluster 5 was identified as the last cluster and this showed an interesting indicator that the "Productivity" was also discussed in an office environment topic with its associated keywords includes "Indoor Environment Quality", "Architecture Design" and "Environmental Quality".
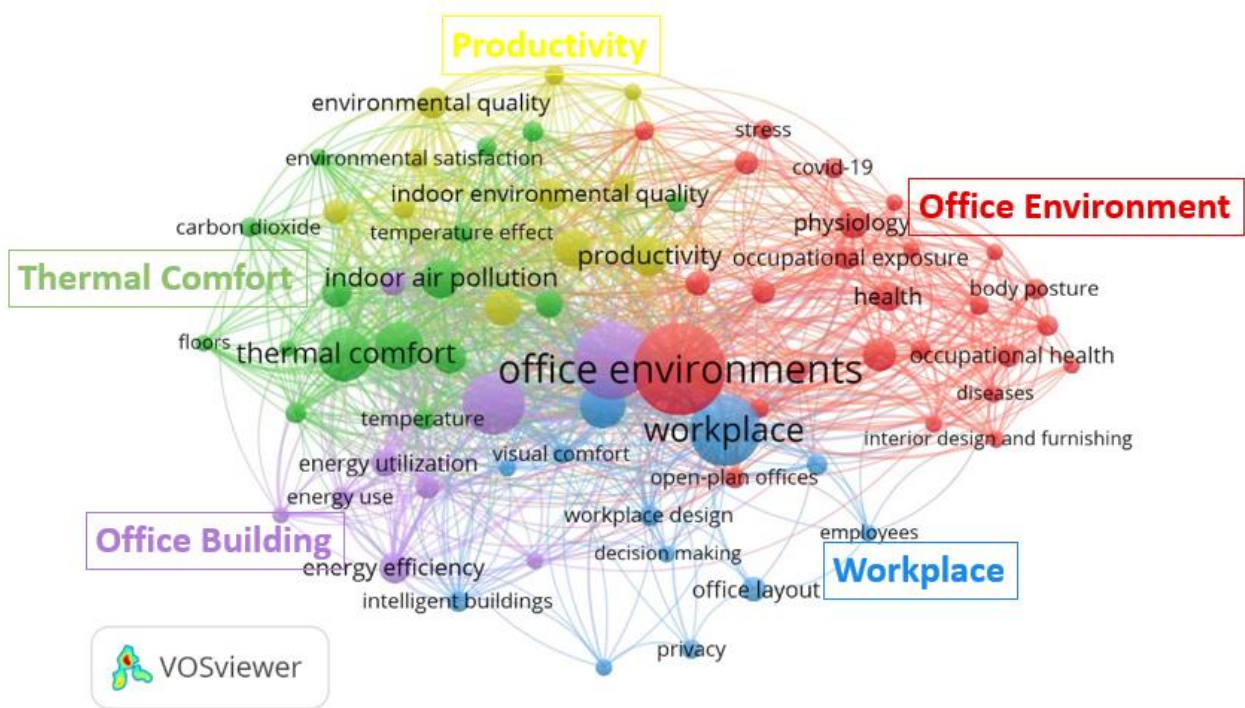
Figure 5: The Main Clusters Based on Keyword Co-Occurrence Analysis
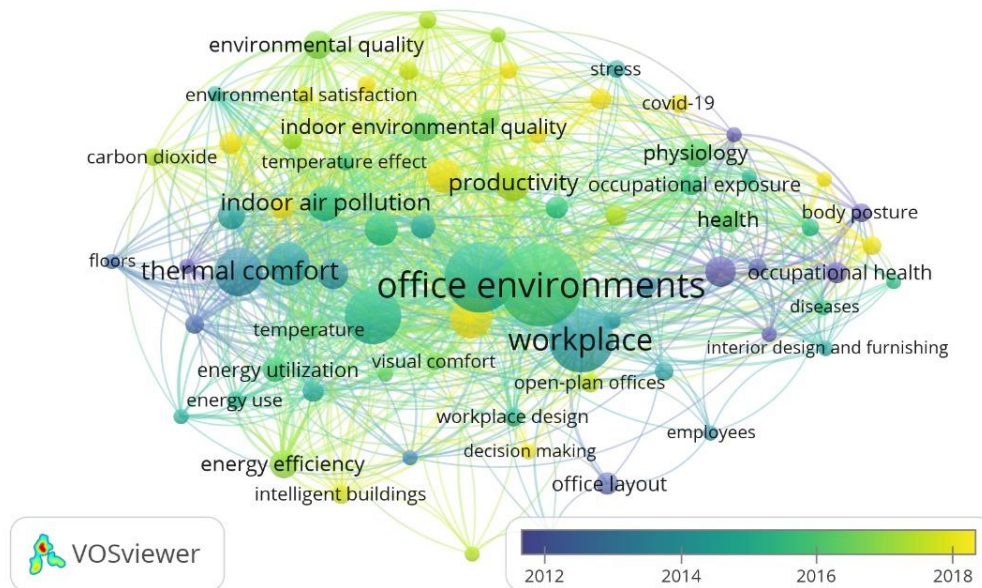
Overlay Visualization Analysis

Figure 6: Temporal Overlay on Keyword Co-Occurrence Map

Next analysis applied a temporal overlay on the keyword co-occurrence map shown above in Figure 6. The temporal overlay connects keywords to the publications date. Analysis of temporal overlays identifies the period during which a given topic was most frequently discussed. The temporal keyword co-occurrence map suggests that the current literature is focused on "Productivity", "Environmental Satisfaction" and "Intelligent buildings". Remarkably, the leading edge of this literature lies in exploring "Office Environment" on the "Productivity." The large number of yellow nodes on the upper side of the map clearly demonstrates this theme's supremacy.

Discussion

This section discusses the bibliometric analysis findings and identifies various areas for additional investigation on future research. As global transformation and the new ways of working, the office environment topic remains relevant. Based on our findings, the office environment was also mentioned in several publications in relation to employee productivity, job satisfaction, environmental satisfaction, and energy consumption. The office environments' influence on employee job satisfaction that defined as employee's perception of the psychosocial work environment as well as attitude towards work itself. A better fit between users and working environment can improve work-related outcomes like user satisfaction and productivity (Oswald *et al.*, 2015, Veitch, 2018). The office design impacted the office environment, health, and satisfaction of the employee (Danielsson, 2005).

Our findings also discovered a link between the office environment and environmental sustainability, with the most referenced articles focusing on the energy usage of the office building (Allouhi et al., 2015; Hamdaoui, S 2018). Recently, the green office concept has gained popularity among scholars, which has resulted in pro-environmental behaviors at work. (Bashirun SN et al, 2022). According to Kato et al (2009), the management perceived greater benefit of green workplaces that provide more psychological benefits (taking pride in the workplace environment) to employees than physical improvements (health and productivity gains). Moreover, health and wellness, which were already key factors in office environments prior to COVID-19, become a top concern for employees when choosing where to work and for renters when constructing their spaces that focus on employee well-being. The epidemic hastened the trend of remote work and stimulated extensive study on the drawbacks and advantages of working from home.

Limitations

Nonetheless, the analysis performed in this paper has certain limitations. First, this study analyzes the documents included in the SCOPUS database, and other databases can be considered for future research. Second, bibliometric research analyzes the documents based on the number of citations and the number of publications, without considering the content of the document. Third, our search criteria are based on our literature review, and other keywords could emerge in the future.

Conclusions

The bibliometric methodology has gained immense popularity in recent times due to the omnipresence and usefulness of bibliometric software and databases that ease the acquisition and assessment of large volumes of scientific data in business research, including in relatively new but highly rich areas such as artificial intelligence and big data (Makarius et al., 2020, Mustak et al., 2021). In our paper, this analysis is particularly relevant since research activity on office environment has gained increasing interest as most organizations are sensible nowadays in providing the physically and mentally health workplace.

Our bibliometric analysis addresses several specific research questions and interesting evidence, with direct implications for academics, has been found. First, even though the research activity has growth fluctuate, it also shown the increase activity for the last few years. The inconsistent and new emerging trend in this topic may explain the growth. Second, research on office environment has been primarily developed in the United State context and in United Kingdom. According to a study conducted by the Organization of Economy Cooperation and Development (OECD), the United States ranks 29th out of the 35 countries surveyed for workplace productivity. This is all occurring in a stressful workplace environment, as American workers are more stressed and worried than the global average. This evidence provides encouraging opportunities for scholars to study this subject area further. Third, the analysis of publishing activity by journal is helpful for academics in orienting their research. In this regard, although the main journals that contain publications on this topic are in the Business and Management category, our paper suggests that the future research trends may also consider social and well-being views, and this may enable positioning research on office environment in journals with a broader scope, thereby increasing the multidisciplinary nature of this stream of research. Other than that, the analysis of authors' productivity and influence proves vital for scholars to have an updated review of the literature, considering the most influential authors and therefore understanding the intellectual structure of this research line.

This analysis also reveals that research networks in this research area are generally small and limited to their own research groups or professional organizations. This encourages the creation of new working relationships and the expansion of collaborations. The consideration of fluctuating growth in this area enables recognizing the gradual transaction toward issues more linked to working from home and employee well-being. Furthermore, our findings suggest that future articles should reinforce theoretical frameworks and methodology by considering that the influence of the office environment is likely to be mitigated by contextual factors.

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