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Areas of Study on Sustainable Interior Design: Bibliometric Analysis of Cross-Regional Trends

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Abstract

As the global population continues to concentrate in cities, urbanization has resulted in an uneven distribution of adequate, safer, and more affordable housing. Many cities face significant disparities in housing prices. Sustainable interior design can help reduce housing costs and address human needs for comfort, health, safety, and a sense of community in housing occupancy, aligning with the United Nations Sustainable Development Goals and Principles. Consequently, experts and scholars in the field of architectural design are increasingly paying attention to it. This article presents a bibliometric analysis of all published Scopus databases on sustainable interior design from 1980 to 2023, offering a deeper discussion on the state of research in this field. The bibliometric analysis of the study period reveals data on annual scientific publications, average citations, locally cited literature, the most relevant sources, the countries of corresponding authors, national scientific production, and a national collaborative world map. The qualitative analysis section of the paper provides a detailed description of the most cited articles in terms of themes and methods, further enhancing our understanding of the research landscape in sustainable interior design.

Keywords: Interior Design, Sustainability, Sustainable Interior Design, Bibliometric, Methods and Subjects

Introduction

Housing serves as a shelter for human beings, offering both protection and security, along with comfort and independence, creating an intimate atmosphere for residents to coexist [1]. Beyond merely providing a place to live, housing should also cultivate an environment that empowers its occupants to carry out their daily tasks moreeffectively and engage in a variety of activities within the residential structure [2]. The concept of human needs has evolved over time, transitioning from a basic requirement for shelter to a broader understanding of a home that not only ensures protection but also provides physical and psychological comfort, along with recreational facilities for various activities [3]. As a result, the forms, methods, and uses of housing have undergone continuous evolution.

The shortage of space in homes has been a persistent challenge that the interior design industry seeks to address [4], with the underlying reasons constantly evolving. In China during the 1980s and 1990s, a surge in the birth rate led to households grappling with spatial constraints due to an increase in the number of occupants. Today, the issue is more closely tied to occupants' aspirations for a comfortable and healthy living environment [5]. Residences are no longer merely spaces for rest and dining but have transformed into areas

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for study, work, socialization, entertainment, and adapting to new needs, such as the home-based exercise and fitness trends saw during the COVID-19 period. While modern residential buildings are designed to meet current occupants' requirements, there is often a neglect of future needs, and the alignment of current housing space planning with these evolving needs [6-7]. This oversight contributes to the persistent challenge of space shortage. Prolonged dwelling in confined spaces can hurt the physiological and psychological well-being of occupants [8-11], deviating from the principles of sustainable development. Therefore, addressing the predicament of limited space in small apartments has appeared as a pressing aim for interior design researchers to achieve [12-13].

Bibliometrics serves as an analytical method for gauging the progress of a discipline, enabling a comprehensive analysis of the pertinent literature [14-15]. To assess research effectively, added indicators such as citation analysis and peer review are often necessary. These methods have consistently ensured a superior evaluation of scholarly work. In contemporary times, the generation of bibliometric reports has become more accessible, thanks to various tools like Google Scholar, the Web of Science (WoS), and SCOPUS, each equipped with enhanced citation processing capabilities. Despite its ease of use, Google Scholar's coverage poses challenges due to its unrestricted access to a broad spectrum of scholarly content [16]. Among the two most widely used search databases by academics across various scientific disciplines are WoS and SCOPUS [17]. Consequently, this study aims to decide the best research platform by comparing the coverage of "interior design" research in the SCOPUS and WoS databases.

Methodology

In this paper, a subject search was conducted on "interior design." Initially, two major databases used for collecting data on scholarly publications, namely Web of Science (WoS) and Scopus, were selected. To find a suitable database as a screening platform for literature, title searches were performed on both WoS and Scopus. The results showed that WoS retrieved 2,268 documents, while Scopus yielded a slightly higher count of 2,395 documents. This suggests that Scopus has a more extensive collection of documents compared to WoS, despite WoS being one of the largest and most reliable databases for literature retrieval and analysis [18]. On May 30, 2023, a title search on Scopus for "interior design" produced 2,395 articles, with 12,421 citations and an average of 5.18 citations per article. Figure 1 illustrates that, despite notable fluctuations in the quantity of publications in the field of "interior design" from 1930 to 2023, the citation frequency of related literature has consistently increased each year. This trend implies a gradual emphasis and growing attention to this area of research.

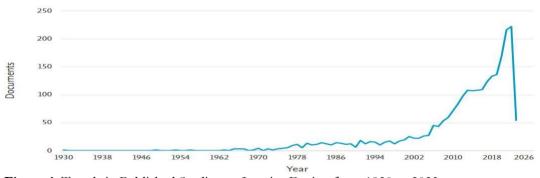


Figure 1: Trends in Published Studies on Interior Design from 1930 to 2023.

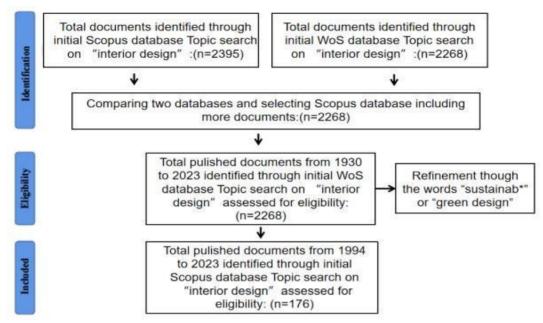


Figure 2: The Interior Design Bibliometric Analysis's PRISMA Flow Diagram.

Table 1: An Overview of the Key Information Found in the Bibliometric Data Collected.

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1994:2023
Sources (Journals, Books, etc)	101
Documents	176
Average years from publication	5.99
Average citations per documents	4.324
Average citations per year per doc	0.6098
References	4421
DOCUMENT TYPES	
article	101
book	1
book chapter	7
conference paper	59
conference review	1
editorial	1
note	7
review	3
short survey	2

A search in the Scopus database using the terms "green design" or "sustainab*" yielded 176 papers. Within the relevant literature, "interior design" received somewhat more citations than any other topic, averaging 4.324 citations per item. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart, depicting the data collection process, is presented in Figure 2. The finaldata analysis of these 176 pieces of literature was conducted using the R-Tool for detailed scientific mapping analysis, specifically with the BiBliometrix-package (http://www.bibliometrix.org/).

The crucial details of the bibliometric data gathered are presented in Table 1, outlining 59 conference papers, 3 reviews, 7 book chapters, and 101 articles. To gain insights into the latest sub-themes within the research field of interior design, particularly focusing on sustainable and green design aspects, a qualitative analysis was conducted on the 10 most often cited documents selected from the pool of 101 articles. The following sections provide a comprehensive overview, incorporating both qualitative and quantitative aspects.

Quantitative Analysis

Examination of the Publication Year

The annual scientific production of publications on sustainable and green interior design, spanning from 1994 to May 30, 2023, is illustrated in Figure 3. Over this 30-year period, 176 scientific papers were published, showing a consistent upward trend in the total number of publications per year. This trend evolved from a single publication in 1994 to 23 publications in 2022. The 30-year period can be divided intotwo distinct phases: from 1994 to 2011, where only a limited number of scholars globally focused on Interior Design Sustainability and Green Design, and from 2012 to 2023, during which publications surged year after year. Notably, 2017 and 2022 saw a doubling of publications compared to the preceding years. Despite minor fluctuations, such as a decline from 9 publications in 2015 to 3 in 2016, the overall trend since 2017 has been a continual annual increase in the number of publications.

The average number of citations per year for articles published from 1994 to 2023 is depicted in Figure 4. Notably, in 2009, only five papers were published, resulting inan average of 1.1 citations per publication. The year 2020 marked the highest number of publications and the highest average citation rate, reaching 1.5.

Figure 5 provides a clear representation of the top 10 articles with the highest local citations within the period from 1994 to 2023. Local citations are used to quantify the number of citations derived from articles within the studied collection. Interestingly, the top three high local citation articles all date back to 2009, boasting 15, 11, and 9 citations, respectively, as illustrated in the figure.

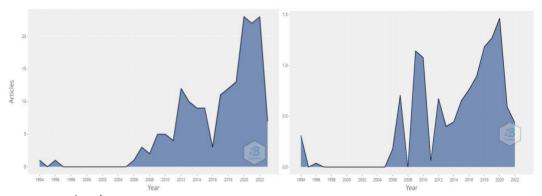


Figure 3 (left) Annual Scientific Output for Interior Design Sustainable and Green Design Research, 1994-2023 Figure 4 (right) The Average Yearly Citation Count for Papers Utilized in the Subject of Sustainable and Green Interior Design Research, Spanning from 1994 to 2023.

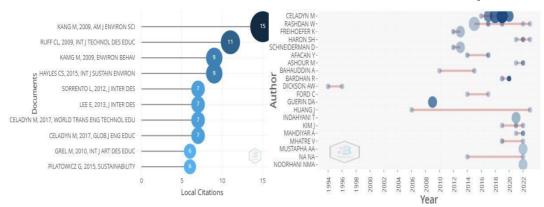


Figure 5 (left) The Top Ten Locally Referenced Papers in the Subject of Interior Design Research that are Sustainable and Green., **Figure 6** (right) Top 20 most Influential Authors' Works in Interior Design, Sustainability, and Green Design Research Fields between 1994 and 2023 (Authors' Timelines Shown by the Red Line, Publications by Bubble Size, and Total Citations Per Year by Color-Intensity of the Bubbles).

Analysis of the Authors

The output of the top 20 most relevant writers from 1994 to 2023 is visualized in Figure 6, with the writers' timeline represented by the red line. As an example, HUANG J published 2 papers in the field of Interior Design Sustainable or Green Design from 2006 to 2023, holding the author with the longest timeline. The size of each bubble is influenced by the quantity of articles published in that specific year, as indicated by RASHDAN W's 3 papers in 2015. Furthermore, there is a correlation between the intensity of the bubble color and the total number of citations received annually; for instance, CELADYN M's papers exhibit a higher citation rate than those of other writers. This graph reveals a discernible increase in the number of publications and citations in Interior Design Sustainable or Green Design articles, with a particularly notable surge in 2022. This suggests a growing interest among researchers and scholars in this field, signifying an emerging and expanding area of study.

Source Analysis

Figure 7 illustrates the top 10 publisher sources most relevant to Interior Design Sustainable or Green Design, with each source having three or more papers related to the field. Notably, SUSTAINABILITY (SWITZERLAND) stands out as the leading journal, publishing 11 papers between 1994 and 2023. Following closely, the IOP CONFERENCE SERIES: EARTH AND ENVIRONMENTAL SCIENCE journal secures the second position in the list with 10 relevant articles. The APPLIED MECHANICS AND MATERIALS journal and JOURNAL OF INTERIOR DESIGN both feature eight articles. Therefore, the first four journals in the figure are crucial resources for anyone researching Interior Design Sustainable or Green Design, especially when preparing a paper for submission.

Figure 8 visually represents the evolution of papers produced in the top 5 publications between 1994 and 2023. All the publications exhibit an upward trend, with the JOURNAL OF INTERIOR DESIGN being the first journal to feature articles in the field and maintaining steady growth over the 30 years. The SUSTAINABILITY (SWITZERLAND)

journal, introduced in 2015, has shown a substantial increase in the number of publications each year, and it is anticipated to surpass both the JOURNAL OF INTERIOR DESIGN and the IOP CONFERENCE SERIES: EARTH AND ENVIRONMENTAL SCIENCE journals, becoming the most consulted journal in the field by 2023. This trend suggests a dynamic landscape with an increasing focus on sustainable interior design research.

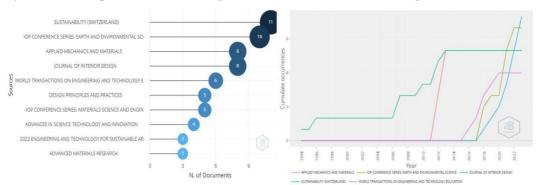


Figure 7: (left) Ranking of the top 10 most Pertinent Sites based on the Quantity of Papers Released on Green or Sustainable Interior Design Research, Figure 8 (right) Annual Incidence of the Top 5 most Relevant Sources in Interior Design Sustainable or Green Design from 1994 to 2023.

Analysis of the State

In 32 countries, a total of 167 papers in the field of interior design—either sustainable or green—were published. Figure 9 displays the top 20 nations in order of scientific output. The red line represents the corresponding author's publication rate in their home country, which may involve one or more international partners. The blue line in the figure indicates how many articles were published in the same nation. The titles of these publications are categorized as Single Country Publications (SCP) and Multi-Country Publications (MCP). As evident from the chart, the top three nations in the interior design industry are Malaysia (7), USA (19), and China (22). Notably, the USA and Cyprus engage in the highest number of international collaborations. This reflects the global nature of research efforts in sustainable and green interior design.

In Figure 10, the detailed breakdown of the total number of authors from the publication nation is presented. Figure 11 further illustrates the quantity of collaborative articles in the interior design, sustainable design, and green design research fields published in the top nations. The intensity of the blue hue in both figures signifies each country's total number of associated writers. From the deep blueshade representing the USA (with 49 authors) to the lightest blue shade indicating Austria (with only 1 author), each hue denotes the number of affiliated authors. Observing the color shades, it is evident that the United States of America and China are prominent leaders in the field of sustainable or green interior design research, withMalaysia ranking second. This visual representation underscores the collaborative efforts and contributions of authors from various nations in advancing research in this domain.

The number of collaborative publications between each nation and the thickness of the red line, as depicted in Figure 11, are directly correlated. A thicker red line signifies a higher number of collaborations between countries at both ends of this line. For example, the thick

red line from the USA to Korea indicates 2 collaborations, while the thin red line from the USA to China represents a single collaboration. Overall, it appears that the UK has close research collaborations with a number of other countries, emphasizing the interconnected nature of global research efforts in sustainable and green interior design.



Figure 9 (left) Top 20 Countries of Corresponding Authors (Red Line Indicates Single-Country Publication (SCP) and Multiple-Country Publication (MCP)), Figure 10 (right) Nation's Output of Scientists Global Map of the Field of Sustainable or green interior design study (Gray Color Indicates Unrelated Countries, Blue Color Indicates the Number of Writers Associated with Each Nation).

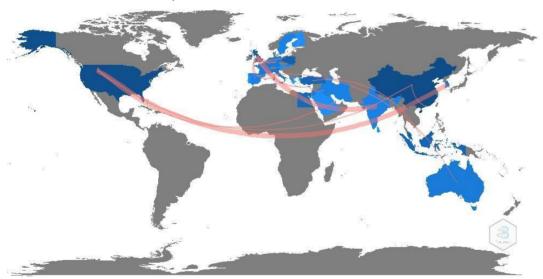


Figure 11: Global Cooperation Map for Interior Design, Sustainability, Or Green Design Research (Red Line Thickness Indicates the Number of Joint Publications, Blue Color Intensity Indicates the Number of Authors Associated with Each Nation, and Gray Color Indicates Unrelated Countries).

Subject Analysis

The analysis employed a keyword network to explore the primary subjects of publications on eco-friendly or sustainable interior design, with the network representing co-occurrences in the bibliographic dataset. By clustering the keyword network, it becomes possible to highlight several topics, with each keyword associated with a single topic. The resulting topic map,

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displayed in Figure 12, illustrates themes related to interior design that is sustainable or green design. In each bubble, a keyword network cluster is presented, with the cluster names indicating the words with the highest frequency. Notable themes include sustainable interior design, ecodesign, sustainable solution, bamboo, construction industry, architecture, and architectural design. The two most relevant theme indicators identified are sustainability and housing. This visualization gives an overview of the interconnected topics within sustainable interior design.

In the thematic map, the bubble's location is dictated by the density and centrality of the cluster, while the size of the bubble correlates with the frequency of occurrence of the clustered words. Within the discipline of interior design studies, centrality and density signify the degree of theme development and significance, respectively. Consequently, different regions of the thematic map represent various characteristics of the themes:

- The lower left corner indicates developing or declining themes.
- The lower right corner represents important and lateral themes.
- The upper left corner represents highly developed and isolated themes.
- The top right corner symbolizes motorized themes.

For example, terms like ecodesign, sustainable interior design, and sustainable solution are rare examples of themes representing the upper left corner, as they are highly developed and isolated motifs, indicating considerable progress at a modest level of relevance.

On the other hand, terms such as bamboo, construction industry, architecture, architectural design, sustainability, and housing are associated with five clusters referred to as basic and transversal topics. The most frequent keyword themes are housing, sustainability, and architectural design. However, architectural design stands out with the highest centrality, signifying its significance as a theme. This analysis provides insights into the landscape of themes within sustainable interior design, highlighting the frequency and centrality of key terms.

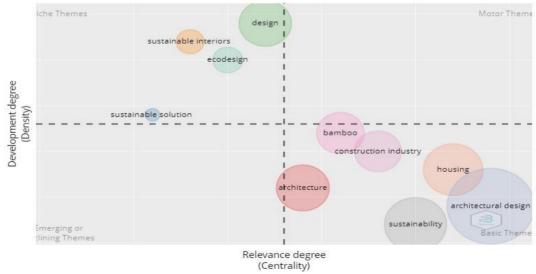


Figure 12: A Theme Map Representing Keyword Network Clusters in the Field of Interior Design Study Pertaining to Sustainable or Green Design (Bubble Size: The Clusters Word Occurrence).

Keyword Analysis

The configuration of the three domain diagrams provides a shared view of the keywords used in publications about sustainable interior design, as depicted in Figures 13 and 14. In Figure 13, a snapshot of the three primary metadata domains is presented, with AUTHOR on the right, SOURCE on the left, and KEYWORDS in the middle. This visualization aims to illustrate the correlation between the most popular terms, the most well-known writers, and the most reliable sources. Figure 13 highlights that authors such as Rashdan W, Bardhan R, Ashour M, Haron SH, Celadyn M, Schneiderman D, Dickson AW, Freihoefer K, Bahauddin A, and Afacan Y have extensively used keywords in their publications. Terms like interior design, sustainability, sustainable design, and sustainable interior design emerge as the most common keywords in the articles, frequently employed by the authors and popular in the journals. The sources associated with these keywords include the International Journal of Sustainability in Higher Education, Sustainability (Switzerland), Design Principles and Practices, and the International Journal of Design Education. Notably, Sustainability in Higher Education is identified as the top journal publishing on interior design in the context of sustainability. This information provides valuable insights into the key contributors, themes, and sources within sustainable interior design research.

Figure 14, generated by choosing three additional metadata fields, features the Keywords Plus field in the middle, Journals on the left, and Authors on the right. This graphic effectively illustrates the correlation among top authors, top journals, and top Keywords Plus. Keywords Plus are words or phrases that frequently appear in a title citation and are automatically generated by a computer. Analyzing Keywords Plus can unveil heated research topics representing the field of interior design research and aid readers in discovering the latest research trends. Figure 14 reveals that the Keywords Plus "computer-aided design" appears in the publication e3s Web of Conferences. This publication also features many articles on design methods, planning, interiors (building), interior design, sustainable development, and architectural design. On the other hand, keywords such as sustainability, architectural design, sustainable development, architecture, energy conservation, and design method are more commonly associated with the collection "Sustainability (Switzerland)." The widespread acceptance of architectural design is evident, as every top author has utilized it in their journals, and it is available across multiple publishers. The figure indicates that 80% of the authors are working on sustainable development, with their articles published in e3s Web of Conferences, Journal of Physics Conference Series, Applied Mechanics, and Materials, and IOP Conference Series. Authors like Ashour M, Harson SH, Rashdan W, and Celadyn M have contributed to "2022 Engineering and Technology for Sustainable Architectural and Interior Design Environments," while "World Transactions on Engineering and Technology Education" has published articles on sustainable interiors. Therefore, Figure 14 serves as a valuable tool for locating top journals in the research field of interior design sustainable or green design, providing guidance for submitting articles to specific journals.

Figure 15 presents a conceptual structure diagram that illustrates the link between terms found in all publications related to sustainable or green interior design. The diagram's center symbolizes the core of interior design that is sustainable or green, while the other two locations represent the average placement of the documents associated with each term. The words in each paper are interconnected in this conceptual structure, providing a visual representation of the relationships between various terms. This co-word network structure aids readers in better comprehending the topics within the study field and identifying new

research frontiers. Data reduction techniques, such as correspondence analysis (CA), can be applied to independently identify subfields based on the net analysis. CA is one method for reducing dimensionality in the creation of concept formation maps, allowing for a more nuanced understanding of the interconnections among different terms in the realm of sustainable or green interior design.

Figure 15 highlights the use of clustering to visually represent a set of known phrases by color. The keywords are separated into two distinct groups in the illustration. In the blue cluster, four terms representing indoor air quality, indoor air pollution, indoor air quality, and indoor environmental quality are contained. Within this cluster, each term is practically separated from the others. On the other hand, it is evident that the blue cluster comprises only 54 terms, while the red cluster has a significantly higher number. Terms closely related within the red cluster include shore protection, fluid dynamics, interior design and architecture, interior building, and sustainable interiors, as well as sustainable development and carbon. This clustering approach helps identify associations and relationships between different keywords within the field of sustainable or green interior design.

In Figure 16, a conceptual schematic for the term "Thematic Tree Diagram" is presented. The information depicted in Figure 15 is also reflected in this diagram, albeit from a different perspective. This conceptual framework tree displays two sets of keywords that are similar to each other. The distance between words or sentences serves as a proxy for height. Each tree represents a division and is appropriately positioned. The greater the distance between words, the less likely they are to appear in the same article. This thematic tree diagram provides a visual representation of the relationships and associations among keywords within the context of sustainable or green interior design.

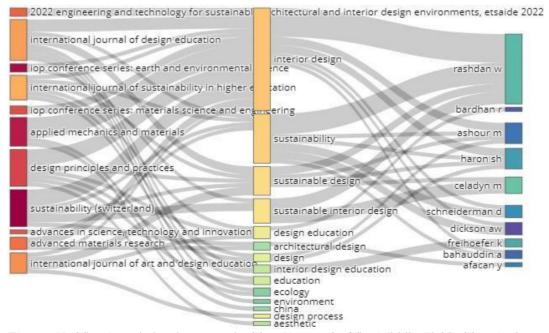


Figure 13: The Association between the Top Keywords (The Middle Field), Top Authors (The Right Field), and Top Sources (The Left Field) in Publications on Sustainable or Green Interior Design is Shown by a Three-Field Plot.

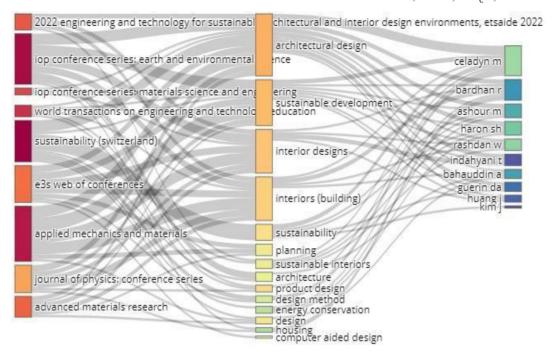


Figure 14: An Interior Design Sustainable or Green Design Publication's Relationship between its Top Keywords Plus (The Middle Field), Top Authors (The Right Field), and Top Sources (The Left Field) is Plotted in a Three-Field Manner.

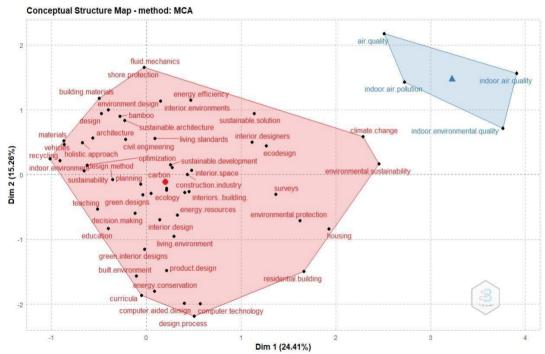


Figure 15: Conceptual Framework Diagram of Keywords Used in Publications on Sustainable or Green Interior Design (Dim.1 and Dim.2: Average Position of Articles Included in Each Term).

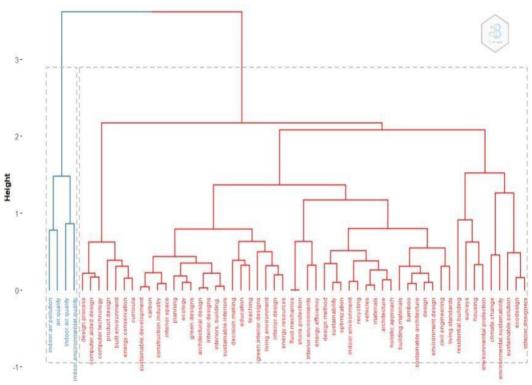


Figure 16: Conceptual Framework Subject Keyword Dendrogram from Sustainable or Green Interior DesignPublications (Height: the Separation between Word Clusters).



Figure 17 Top Keywords Plus in Publications on Sustainable or Green Interior Design (Font Size: Word Occurrences).

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Figure 18: Top Author's Terms in Publications on Sustainable or Green Interior Design (Font Size: Word Occurrences).



Figure 19: Top Title Terms in Publications on Green or Sustainable Interior Design (Font Size: Word Occurrences).



Figure 20: Top Abstract Words in Interior Design Sustainable or Green Design Publications (Font Size: WordOccurrences).

In certain situations, readers must promptly comprehend the terms that most accurately depict the subject under study. Figures 17, 18, 19, and 20 display Keywords Plus, Author Keywords, Title Keywords, and Abstract Words at the beginning of these sections. The depth of the article's content is revealed through the Keywords Plus. The author's keywords are crafted based on the author's subjective perspective and the content of the article. In bibliometric analysis, Keywords Plus and Author's Keywords demonstrated comparable effectiveness in examining content related to learning or culture; however, Keywords Plus provided a broader scope of information.

Figure 17 displays the Keywords Plus for sustainable or green interior design from 1994 through May 30, 2023. The significance of the keywords is indicated in the figure through varying font sizes and colors. Each term listed in Figure 17 has between 69 and 3 occurrences. Prominent keywords and top-ranking terms in this study domain encompass interior designs, architecture, sustainable development, and interiors (buildings). Writer's keywords are presented in Figure 18, ranging from 62 to 1 occurrence. Key terms include sustainable interior design, sustainable design, and interior design. Figure 19 displays the most relevant terms found in the title, such as interior design and sustainable design. Figure 20 depicts the most frequently occurring terms in the abstract. Popular abstract terms are commonly found in publications on green or sustainable interior design. In conclusion, the patterns of keywords in the author, title, and abstract are remarkably similar. Therefore, writing should aim to incorporate more relevant terms in articles, abstracts, and titles.

Figure 21 illustrates the count of top keywords between 2006 and May 30, 2023, related to sustainable or green interior design. Since 2008, architectural design has seen rapid growth as a research topic, reaching 69 occurrences in 2023. Keywords such as sustainable development, interior designs, and interiors (buildings) are increasingly prevalent in recent publications. The frequency of keywords such as sustainable development, interior designs, and interiors (building) in recent publications is on the rise. The gradual increase in research frequency from 2006 to 2023 suggests an expected growth in research on these topics within the field of sustainable or green interior design.

Word Growth

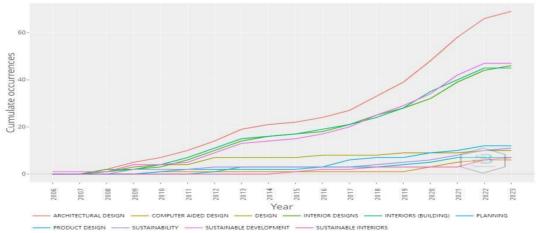


Figure 21: Top Keyword Occurrences Annually in the Subject of Interior Design Research that is Sustainable or Green from 2006 to 2023.

Qualitative Analysis

Between 1994 and May 2023, 176 papers were published in the literature related to sustainable interior design. Of these articles there are 101, and in this section, the 10 most cited articles are qualitatively analyzed.

Subjects

The most frequently cited themes in sustainable interior design articles encompass ecodesign, health, sustainable materials, indoor environmental quality, environmental attitudes, sustainable design, education, and design preference. Notably, 80% of these articles delve into environmental and human health issues in their case studies. Approximately 50% of the authors focus on the examination of the use and design of sustainable materials. While "sustainable material" used to be a prevalent abstract keyword in top keyword maps, it now appears in half of the relevant cited articles. However, only a limited number of papers combine subject keywords such as "sustainable interior design," "education," and "attitude" [19]. Titles involving "interior design," "sustainable materials," and "Theory of Planned Behavior (TPB)" are infrequently found in this collection, as only a few titles specifically concentrate on these aspects [20]. Sustainable interior design is a common topic in all cited articles, with the primary focus on environmental sustainability, the health and comfort of indoor users, and educational aspects, with less emphasis on economic considerations [21-23], as well as on the educational aspects of sustainable interior design, but both are less concerned with economics [19, 24, 25]. While many cited papers posit sustainable interior design as an optimal solution for improving theenergy efficiency of building spaces and satisfying user comfort and health [21-23], only one document expressly advocates for sustainable design of interior spaces based on user-centered design [22].

Methods

The literature on sustainable interior design research employs two main approaches for research and analysis methods: qualitative interview case studies and quantitative statistical analysis. Interestingly, only a limited number of articles utilize experimental methods [21]. A predominant focus of the cited papers involves investigating people'sattitudes and willingness to adopt sustainable interior design using questionnaires [19, 20, 22-25]. The statistical analyses employed commonly include descriptive statistics, Pearson's correlation analysis, regression analysis, and t-tests. The case study method is less frequently utilized, appearing in only three papers [26-28]. Through interviews, these studies explore the impact of users' preferred design of public spaces and optimized interior space design on sustainability indicators. Notably, a small number of articles incorporate virtual reality technology into their research. Diversity in research methods provides a comprehensive understanding of sustainable interiordesign from both qualitative and quantitative perspectives.

Conclusion

This paper presents an econometric analysis of the sustainable interior design research literature spanning from 1980 to 2023, utilizing Scopus data sources. The findings indicate considerable progress in sustainable interior design research, particularly in recent years. Notably, there was a turning point in 2017, after which annual publications on

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sustainable interior design have exhibited a steady increase. Among the contributing countries, China, the USA, and Malaysia stand out as the primary contributors to the publications, with China and the USA ranking first and second in article production. Sustainability (Switzerland) and IOP Conference Series: Earth and Environmental Science emerged as the most relevant journals for sustainable interior design. The bibliography reveals fundamental and intersecting topics, offering a comprehensive representation of terms like ecodesign, sustainable interior design, and sustainable solutions. Over the years, there has been a noticeable increase in the visibility of architectural design, sustainable development, interior designs, and interiors (building), while computer-aided design and sustainable interiors have gradually receded. Qualitative analysis highlights ecodesign and health as the most frequently mentioned research themes in the field of sustainable interior design research. Additionally, quantitative research and questionnaires emerge as the most used research methods and tools. These findings contribute to an enhanced understanding of potential future study areas within the field.

References

- 1. Rolfe, S., Garnham, L., Godwin, J. et al. Housing as a social determinant ofhealth and wellbeing: developing an empirically-informed realist theoretical framework. BMC Public Health 20, 1138 (2020). https://doi.org/10.1186/s12889-020-09224-0
- Obeidat, S. M., & Obeidat, I. M. (2022). Indoor Environmental Quality in Sustainable Interior Design and Its Impact on Individuals' Behavior in Residential Environment. In 2022 ASU International Conference in Emerging Technologies for Sustainability and Intelligent Systems (ICETSIS) (pp. 144-153). Manama, Bahrain. doi:10.1109/ICETSIS55481.2022.9888881.
- 3. Gad, M. M., & Aly, A. G. E. D. (2020). Study the Social Needs for Proper Housing. I OP Conference Series: Materials Science and Engineering, 974, 012016. doi:10.1088/1757-899X/974/1/012016
- 4. Rao, S., & Chou, C.-H. (2019, January). An Investigation of Overcrowding Among the UK Households. SSRN. https://ssrn.com/abstract=3183947 or http://dx.doi.org/10.2139/ssrn.3183947
- 5. Nasution, I. N., & Alvan, S. (2017). Optimization of Sustainable House in Urban Area. Procedia Engineering, 171, 250-257. https://doi.org/10.1016/j.proeng.2017.01.332
- 6. Ibrahim, I. A. (2020). Sustainable housing development: role and significance of satisfaction aspect. City, Territory and Architecture, 7, 21. https://doi.org/10.1186/s40410-020-00130-x
- 7. Lopez, R. (2010). Sense of place and design. focus, 7(1), 16.
- 8. Dockery, A. M., Moskos, M., Isherwood, L., & Harris, M. N. (2022, July 28). How Many in a Crowd? Assessing Overcrowding Measures in Australian Housing. AHURI Final Report No.382. Available at SSRN: https://ssrn.com/abstract=4178824
- 9. Keller, A., Groot, J., Matta, J., et al. (2022). Housing environment and mental health of Europeans during the COVID-19 pandemic: a cross-country comparison. Scientific Reports, 12, 5612. https://doi.org/10.1038/s41598-022-09316-4
- 10. Wang, X., & Liu, T. (2023). Home-made blues: Residential crowding and mental health in Beijing, China. Urban Studies, 60(3), 461-482. https://doi.org/10.1177/00420980221101707
- 11. Yoade, A.O., Olatunji, S.A., & Cirella, G.T. (2023). COVID-19 and the Built Environment: Informal Sector, Housing, and Shock Challenges in Nigeria. In G.T. Cirella (Ed.), Uncertainty Shocks in Africa (Advances in African Economic, Social and Political Development). Springer, Cham. https://doi.org/10.1007/978-3-031-21885-9_9

- 12. Hosseini, S., Nik, A., Uson, E., & Armesto, A. (2015). Flexible housing: The role of spatial organization to achieve functional efficiency. Archnet-IJAR: International Journal of Architectural Research, 2, 65-76. http://hdl.handle.net/2117/76247
- 13. Rao, S., & Chou, C.-H. (2019). An Investigation of Overcrowding Among the UK Households. SSRN. https://ssrn.com/abstract=3183947
- 14. Kalantari, A., Kamsin, A., Kamaruddin, H. S., et al. (2017). A bibliometric approach to tracking big data research trends. Journal of Big Data, 4, 30. https://doi.org/10.1186/s40537-017-0088-1
- 15. Ebrahim, S. A., Ashtari, A., Pedram, M. Z., Ebrahim, N. A., & Sanati-Nezhad, A. (2020). Publication Trends in Exosomes Nanoparticles for Cancer Detection. International Journal of Nanomedicine, 15, 4453-4470. https://doi.org/10.2147/IJN.S247210
- Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Sc opus: A comparative analysis. Scientometrics, 106, 213–228. https://doi.org/10.1007/s 11192-015-1765-5
- 17. Chadegani, A. A., Salehi, H., Yunus, M. M., Farhadi, H., Fooladi, M., Farhadi, M., & Ebrahim, N. A. (2013). A comparison between two main academic literature collections: Web of Science and Scopus databases. arXiv preprint arXiv:1305.0377. https://doi.org/10.48550/arXiv.1305.0377
- 18. Xu, Y., Majid, A., Zhu, G., & Mu, T. (2023). A Qualitative Study of the Sustainable-Oriented Modularity Methods Based on the Bibliometric Analysis. Academic Journal of Interdisciplinary Studies, 12, 277. https://doi.org/10.36941/ajis-2023-0114
- 19. Ruff, C. L., & Olson, M. A. (2009). The attitudes of interior design students towards sustainability. International Journal of Technology and Design Education, 19, 67–77. https://doi.org/10.1007/s10798-007-9038-0
- 20. Lee, E., Allen, A., & Kim, B. (2013). Interior Design Practitioner Motivations for Specifying Sustainable Materials: Applying the Theory of Planned Behavior to Residential Design. Journal of Interior Design, 38(4), 1-16. https://doi.org/10.1111/joid.12017
- 21. Ma, G., Liu, Y., & Shang, S. (2019). A Building Information Model (BIM) and Artificial Neural Network (ANN) Based System for Personal Thermal Comfort Evaluation and Energy Efficient Design of Interior Space. Sustainability, 11(18), 4972. https://doi.org/10.3390/su11184972
- 22. De Crescenzio, F., Bagassi, S., Asfaux, S., et al. (2019). Human centred design and evaluation of cabin interiors for business jet aircraft in virtual reality. International Journal of Interactive Design and Manufacturing, 13, 761–772. https://doi.org/10.1007/s12008-019-00565-8
- 23. Gou Z, Lau SS-Y, Shen J. Indoor Environmental Satisfaction in Two LEED Offices and its Implications in Green Interior Design. Indoor and Built Environment. 2012;21(4):503-514. https://doi.org/10.1177/1420326X11418700
- 24. Gürel, M.Ö. (2010). Explorations in Teaching Sustainable Design: A Studio Experience in Interior Design/Architecture. International Journal of Art & Design Education, 29, 184-199. https://doi.org/10.1111/j.1476-8070.2010.01649.x
- 25. Kang, M., & Guerin, D. A. (2009). The state of environmentally sustainable interior d esign practice. American Journal of Environmental Sciences, 5(2), 179-186. https://doi.org/10.3844/ajessp.2009.179.186
- 26. Hami, A., Moula, F. F., & Maulan, S. B. (2018). Public preferences toward shopping mall interior landscape design in Kuala Lumpur, Malaysia. Urban Forestry & Urban Greening, 30, 1-7. https://doi.org/10.1016/j.ufug.2017.12.019
- 27. Hayles, C. S. (2015). Environmentally sustainable interior design: A snapshot of current supply of and demand for green, sustainable or Fair Trade products for interior design practice. International Journal of Sustainable Built Environment, 4(1), 100-108. https://doi.org/10.1016/j.ijsbe.2015.03.006

- 2734 Areas of Study on Sustainable Interior Design: Bibliometric Analysis of Cross-Regional Trends
- 28. Hosseini, S. M. A., Yazdani, R., & de la Fuente, A. (2020). Multi-objective interior de sign optimization method based on sustainability concepts for post-disaster temporar y housing units. Building and Environment, 173, 106742. https://doi.org/10.1016/j.buil.denv.2020.106742