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Bibliometric Analysis of Health and Safety Risk Management in Highrise Building Construction

Jeffrey Victory[1*], Andri Irfan Rifai[2], Indrastuti[3], Muhammad Isradi[4]
[1,2,3]Universitas Internasional Batam, Batam, Riau, Indonesia
[4]Universitas Mercu Buana Jakarta, Jakarta, DKI Jakarta, Indonesia
Email: effreyvicto@gmail.com[1*], andri.irfan@uib.ac.id[2], indrastuti@uib.ac.id[3], isradi@mercubuana.ac.id[4]

ABSTRACT:
The building sector, particularly in the context of highrise buildings, presents unique health and safety risk management challenges. This bibliometric study seeks to examine and assess the current research on risk management in health and safety, specifically in highrise building development. By examining scholarly articles, this study seeks to identify key themes, trends, and gaps in the current knowledge base. A comprehensive search of relevant databases using VOSviewer yielded diverse scholarly articles, journals, and conference papers. The findings show 1000 studies comprising 469 journal articles, 478 books, seven monographs, two reports, and 41 additional formats. The visualization shows the keywords "Safety" and "Health" as the most impactful. The analysis reveals the evolution of research over time and the interdisciplinary nature of studies in this critical domain. The results of this study enhance our comprehension of the corpus of data and offer valuable suggestions for potential avenues of future investigation.
Keywords: Risk management, Health Risk, Safety Risk, Building Construction, Highrise Building.

INTRODUCTION

The construction sector is characterized by its dynamic nature, inherent risks, and complex challenges (Kim et al., 2020). During the actualization of construction projects, several obstacles may arise due to risk (Hou et al., 2020). These barriers might hinder the contractor's ability to attain the desired level of quality in their work and ultimately impact the project's outcome (Durdyev & Ismail, 2019). Construction projects are subject to several risks during their inception. The project manager's competence to deal with potential is essential in determining the outcome of a construction goal (Stanitsas et al., 2021). Many construction enterprises experience failure

or financial loss (Chen et al., 2019). The primary cause of failures or losses in building services is suboptimal decision-making processes when managing risks (Galli, 2021).

The planning and construction of highrise buildings in Indonesia have also consistently improved over the past few years (Berawi et al., 2019). Construction projects face complex conditions and potential risks like work accidents that impact efficiency, efficacy, quality, and cost. The construction of a highrise building must consider all possible complications that may arise (Fauzi et al., 2022). According to the Social Security Organizer Agency (BPJS) of Employment, the number of work-related accidents is increasing based on annual statistics of workplace accidents. The cause of the work accident is due to several factors, including the worker's negligence and the defective conditions in the working environment in the OHS warning application (Winge et al., 2019).

An accident during a construction project poses a significant risk, potentially disrupting or interrupting project work activities (Chou et al., 2021). Risk may be efficiently controlled by using risk management techniques, including the essential stages of risk identification, analysis, and reduction (Okpala et al., 2020). In the initiation phase of risk management, identification is performed (Azzahra et al., 2024). The term for this additional investigation is risk analysis. In construction activities, implementing OHS becomes a key point in creating a safe and comfortable working environment (Lingard et al., 2020).

Applying risk management from the start clarifies the goals and contributes to refining the project's scope (Aladağ, 2023). Risk management helps evaluate the importance of any limits that may be established and assess their influence on the project (Willumsen et al., 2019). A structured risk management framework enables the prompt identification and evaluation of possible hazards (Elghaish et al., 2021). Therefore, there is no need for contingency plans to cover the vast majority of potential occurrences. Consequently, the allocation of limited resources is focused on addressing the primary risks to optimize outcomes, specifically targeting areas where the most significant cost reductions can be realized and where the highest levels of risk are present.

Therefore, this research aims to examine the subject of Health and Safety Risk Management by employing the bibliometric VOSviewer technique, which enables writers to efficiently identify and address research gaps pertaining to this phenomenon on a global scale. This study utilizes a quantitative research approach to gather and analyze Risk Management publications systematically. The papers are selected based on their transparency and synthesis, allowing for a comprehensive assessment of the study findings. This research was carried out with the assistance of bibliometric, which is a statistical analytic approach that links text or keywords across publications. Bibliometric analysis is widely regarded as a valuable tool for generating datasets that may be used to enhance research quality (Ezugwu et al., 2021). Finally,

monitoring the trend of convergence all over the world is a crucial step in producing innovative results in the field of risk management.

RESEARCH METHODS

This study employs a technique for mapping literature sources from various journals accessible worldwide. The journals are published based on the specific study topics, particularly focusing on occupational health and safety risk management, and are aligned with the corresponding keywords. The bibliometric analysis employed for mapping these themes utilizes the software tools Publish or Perish and VOSViewer to examine the literature, which is then visualized through data mappings in accordance with the standards of scientific writing. This bibliometric study seeks to provide a thorough depiction of the present research patterns on a global scale in the domain of occupational health and safety risk management. The findings of this research provide significant insights and contribute to advancing knowledge in the field of occupational health and safety risk management.

The initial phase of the study involved gathering 1,000 publications explicitly discussing risk management in occupational health and safety in buildings, using the Publish or Perish software. These publications, spanning from 2000 to 2023, were collected to ensure a broad and inclusive data set. Subsequent steps included showcasing, interpreting, and examining the acquired results (Cavalcante et al., 2021). The data visualized by VOSviewer illustrated keywords, their associations, and density visualizations, offering a more comprehensive and in-depth understanding of key themes, trends, and interrelationships within the collected publications. This enhanced understanding facilitates a nuanced assessment of occupational health and safety in buildings, contributing significant insights and advancing knowledge in the field.

RESULTS AND DISCUSSION

Visualization of Research Keyword Connections

This study used Harzing's Publish or Perish version 8 program to collect 1000 research papers from the Crossref database associated with the specified keywords: risk management, Health Risk, Safety Risk, and Building Construction. The connections between the 1000 research journals gathered are shown using VOSviewer version 1.6.19.

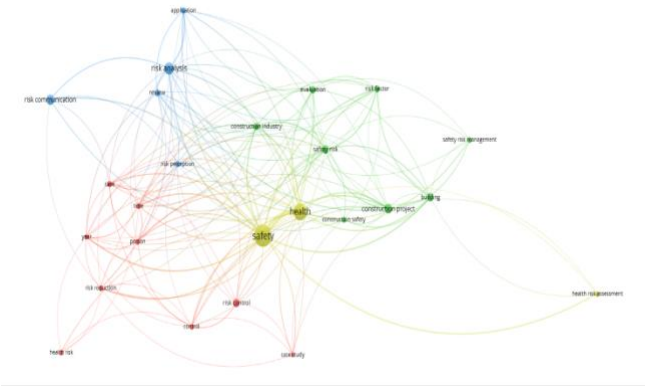

Figure 1. Visualization of the connections between research keywords

The data portrayed in Figure 1 points out, through utilizing the VOSviewer software's visualizations, that the terms Safety and Health are the most pertinent to the secondary keyword. This finding is consistent with the forthcoming research, which centers on managing health and safety risks for individuals employed in construction.

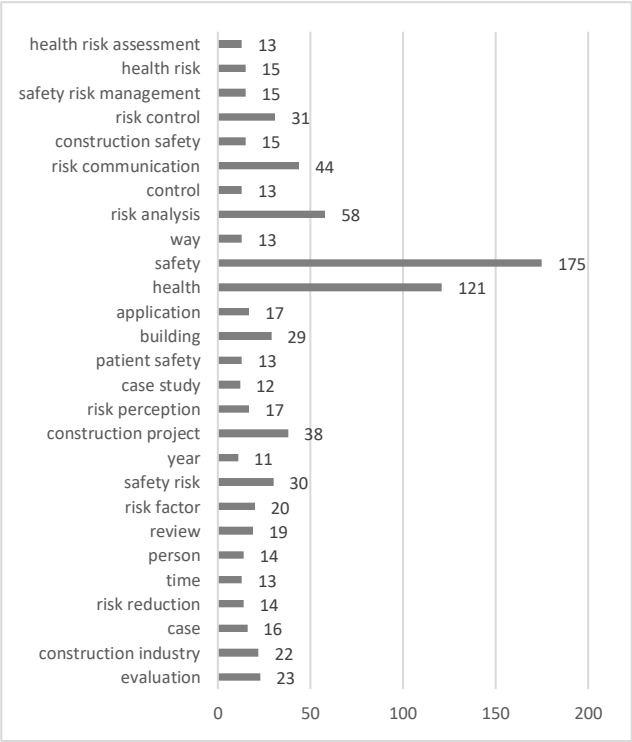

Figure 2. Keyword graphics based on the occurrence

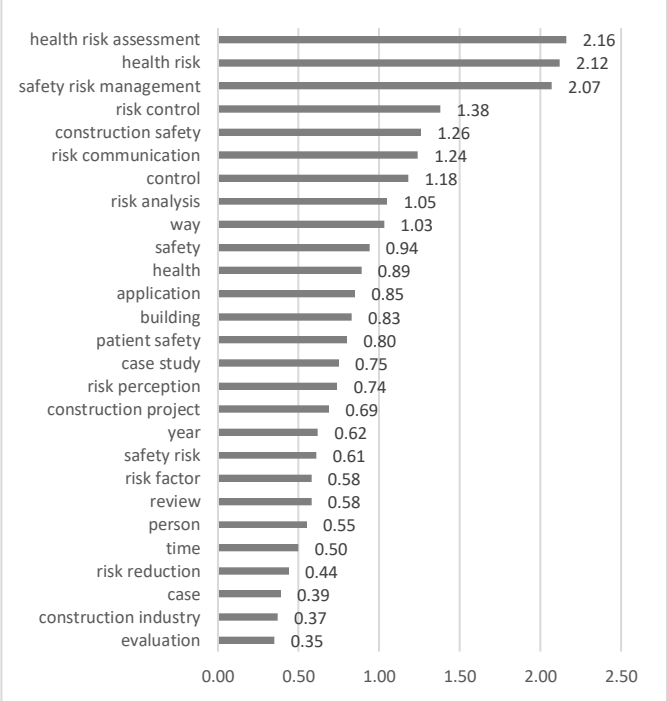

Figure 3. Keyword graphics based on relevance

Figures 2 and 3 provide information on the specified keywords. The chosen keywords are determined by the frequency and relevancy of the keywords employed in the research: Risk management, Health risk, Safety risk, and Building construction. In each of these graphs, additional keywords can still be employed in research despite the relatively low intensity.

Keyword Density

The Density visualization shown in Figure 4 illustrates that keywords are denser when they are represented by darker colors and bigger circle diameters. The higher the keyword density, the greater the frequency of research on this topic. If the color has a lightening effect and merges with the background, the quantity of studies will decrease. Figure 4 demonstrates that Safety and Health have the highest growth in research activity.

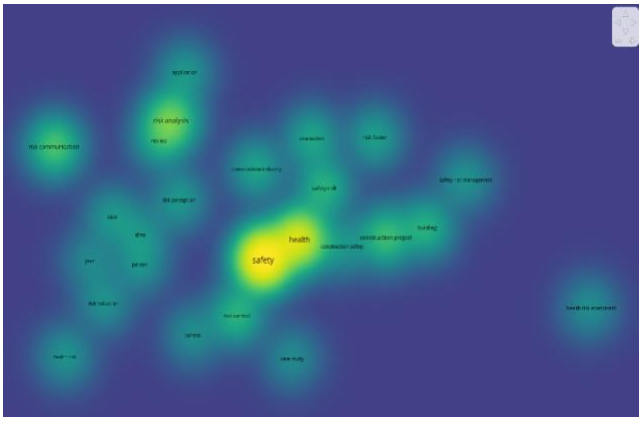

Figure 4. Keywords Density

Table 1 presents comprehensive information about the primary keywords from the aforementioned VOSviewer density visualization findings in an organized manner. According to the data in Table 1, the keywords Safety and Health contain the greatest number of keywords, with research appearing in as many as 175 and 121 studies. This demonstrates that the keywords with the highest density in this analysis are safety and health.

Table 1. Keywords by highest studies

Keywords	*Total Studies*
Safety	175
Health	121
Risk analysis	58
Risk communication	44
Construction project	38

Development of Publications by Year

Information on research about the management of health and safety risks is acquired from Crossref and subsequently gathered for analysis using Publish or Perish software. The data is derived from the period 2000 to 2023, which lasted 23 years. In conclusion, 1000 findings were meticulously collected for this study.

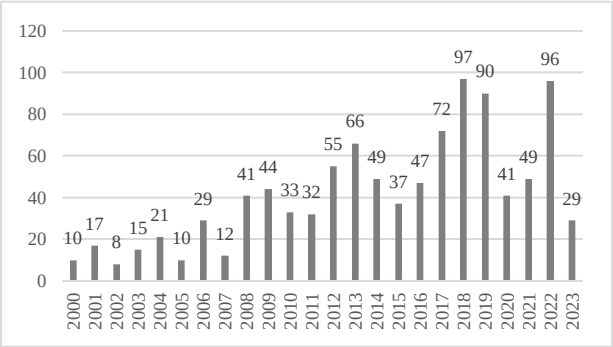

Figure 5. Annual study amount

Figure 5 displays total data from 1,000 investigations from 2000 to 2023. Over the previous 23 years, the image has decreased and grown in study subjects. There has been a large growth in the previous ten years, from 2013 to 2023, with a high in 2018, demonstrating that the trend in occupational health and safety research has improved.

Research Type Determined by Publisher and Classification of Research

The study collected originated from many publishers after undergoing the networking method. It demonstrates that the presence of a variety of publishers can facilitate the progress of scientific research. This publisher's data is globally interconnected with the field of civil engineering. The number of publishers in the spread data is derived from the grid using Harzing's Publish or Perish software, as shown in Table 2.

Table 2. Number of studies according to publisher

Publisher	***Studies***
Routledge	176
Federal Scientific Center for Medical and Preventive Health Risk Management Technologies	104
Elsevier	153
CRC Press	76
Wiley	68
Informa UK Limited	57
American Society of Civil Engineers	21

Furthermore, several categories of research may be effectively interconnected. Figure 6 shows the forms of research, including articles, books, journal articles, monographs, datasets, content, reports, and others. This publication is also associated with the publisher's source of the

corresponding research. Thus, the study aims to gather information, references, and literary sources of many kinds of research to examine the future effects of column distribution on road performance.

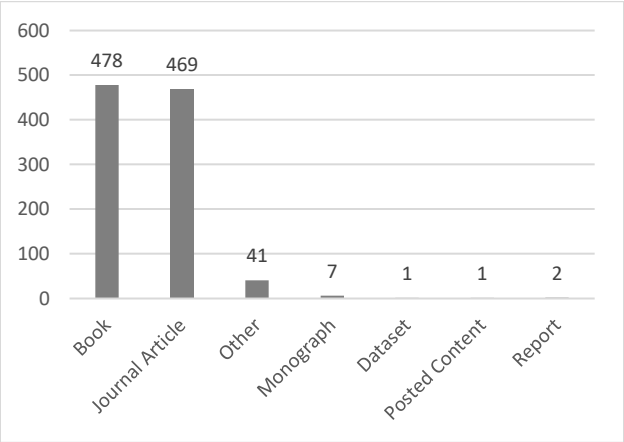

Figure 6. Number of Studies Based on Study Type

Type of Research by the Majority of Countries

Research conducted from any location characterizes the diversity of productive investigations. To characterize the current state of scientific inquiry, this diversity exhibits a distribution that corresponds to research topics from various regions of the globe. Country classifications are utilized in this data processing to determine precisely where the type of research is discussed the most. The criteria for categorizing the case study's country of origin are shown in Figure 7. According to the citation ranking of nations, the leadership place is determined by the amount of documentation and citations.

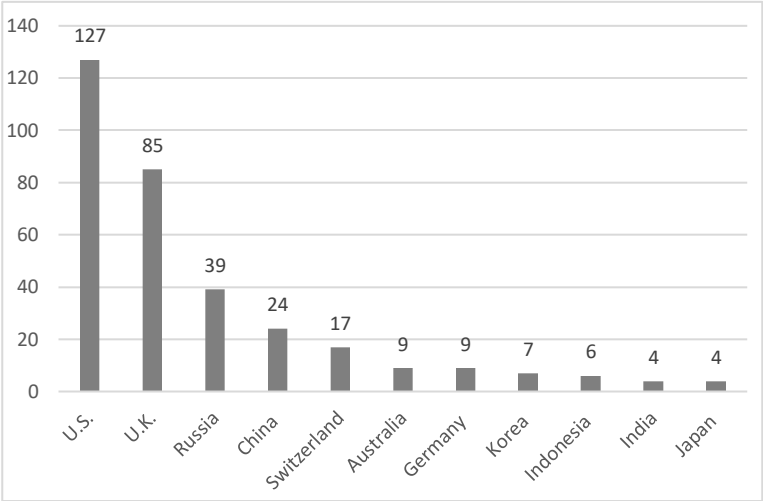

Figure 7. Distribution by country

Figure 7 depicts the distribution of a country case study that discusses related research. The United States has recently witnessed abundant research developments concerning workers' health and safety risk management in high-level buildings. This does not preclude the likelihood that this research advancement will persist and thrive in additional nations.

CONCLUSION

The study utilized bibliometric analysis to identify the correlation between research output, the significance of literature sources, and the latest developments in health risk management and workers' safety within the building construction sector. Using Harzing's Publish or Perish software and data from Crossref, 1000 research articles from 2000 to 2023 were examined, revealing two primary keywords—Safety and Health—and several associated keywords. These findings were disseminated across various academic platforms, including 469 journal articles, 478 books, 1 content item, 1 dataset, 7 monographs, 2 reports, and 41 additional formats. The analysis showed a consistent progression in research efforts on Health and Safety Risk Management, with 2018 being particularly noteworthy for having the highest number of studies (97). This trend indicates continuous growth and broadening of research in Occupational Health and Safety Risk Management each year, highlighting the significant development and increasing attention given to health and safety in construction. These findings underscore the importance for policymakers to prioritize these areas in their regulations and standards, and for practitioners in the construction industry to incorporate the latest research findings into their safety protocols and risk management strategies. Future research needs to explore emerging risks and innovative safety solutions to address the evolving challenges in the construction industry.

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