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Article

A Scientometric Analysis of Wellbeing Research in the Construction Industry

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Abstract: The significance of wellbeing in the construction industry has increased due to the high frequency of accidents. However, the existing research fails to comprehensively address the various aspects of wellbeing. To address this gap, we conducted a literature review on wellbeing in the construction industry and carried out a trend analysis of its multiple dimensions. A systematic review of 162 peer-reviewed journal articles was performed using scientometric analysis and qualitative trend analysis techniques. The results indicated that the discussion on wellbeing in the construction industry tends to overlook its multifaceted nature. Prominent publication outlets were identified, with a focus on environmental and physical wellbeing, while recognising notable contributions in the field of mental wellbeing and the limited contributions to other dimensions of wellbeing. This study offers valuable insights for both researchers and industry practitioners. Researchers can identify priority areas for future research based on the identified gaps, while construction companies can gain awareness of the potential relevance of wellbeing in the industry. This study contributes to the existing knowledge on wellbeing in the construction industry by analysing its various dimensions and providing research directions. It serves as a reference point for interpreting findings and offers guidance for future research endeavours.

Keywords: construction industry; qualitative techniques; scientometric; trend analysis; wellbeing



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1. Introduction

Wellbeing in the construction industry is becoming increasingly important due to the high incidence of accidents in the construction workforce. Globally, construction work is recognized as a hazardous occupation, with a 21.5% fatality rate, the highest compared to jobs in other industries in Europe, and the third highest for non-fatal injuries at 12.7% in Europe [1]. In the United Kingdom, 52% of fatal injuries are attributed to the construction industry [2], while in the United States, construction ranks second highest in occupational deaths [3]. Developing countries have also been impacted by these challenges, prompting significant concern, which has been further intensified by the COVID-19 pandemic [4]. As a result, there has been an increased focus on wellbeing in the construction industry.

The existing research on wellbeing in the construction industry falls short in comprehensively addressing all dimensions of wellbeing due to its intricate nature. Svane [5] introduced the term “wicked wellbeing” to capture the complexity and multifaceted aspects of wellbeing. Wellbeing encompasses a range of dimensions, such as “emotional wellbeing”, “physical wellbeing”, “social wellbeing”, “economic wellbeing”, “psychological wellbeing”, “mental wellbeing”, and “subjective wellbeing” [5–7], adding to its intricate nature. Despite this complexity, it is crucial to assess and prioritize wellbeing to enhance productivity and retain workforces, especially amid acute skilled worker shortages in the construction industry worldwide.

Therefore, a comprehensive approach to wellbeing is needed to encompass its multiple dimensions and enhance safety in the construction industry. Traditional measures that focus solely on fatalities fail to consider psychological factors such as anxiety, depression, and stress, which have been identified as contributors to mental health issues [7–9] and forms of injury. While there has been an increased focus on mental wellbeing in recent times [7,10], research on the construction industry primarily emphasizes environmental and physical wellbeing while neglecting other dimensions.

Due to the insubstantial knowledge regarding wellbeing in the construction industry and the limited literature available that thoroughly addresses this subject, this study aims to bridge these gaps by utilising an exhaustive research technique. This approach involves conducting a review that incorporates scientometric analysis and trend analysis. The overarching objective of this research is to develop a broader understanding of wellbeing in the construction industry by focusing on the following specific areas:

1. Ascertaining the existing research and prevailing trends pertaining to wellbeing in the construction industry;
2. Assessing the most influential scholarly works that delve into the topic of wellbeing in the construction industry;
3. Analysing the various dimensions of wellbeing and proposing potential research directions to facilitate further studies in this field.

This review on wellbeing in the construction industry carries significant implications for both academic researchers and industry practitioners. This article is organized into several sections: Section 2 offers an overview of the background information on wellbeing, Section 3 details the adopted research methodology, and Sections 4 and 5 present the findings and discussions. Lastly, Section 6 puts forward potential directions for future research in this field.

2. Background

The discussion on wellbeing originated from philosophy. Specifically, it has been traced back to the ideas of Aristippus of Cyrene and Aristotle [5], with each successive philosopher offering different conceptualisations that have shaped scholarly discourse [6]. Generally, wellbeing is seen as a robust assessment of a person's overall life, encompassing their health, state of mind, physical wellbeing, finances, and social connections [11]. A broader view considers wellbeing as a confident condition achieved through the simultaneous and harmonious satisfaction of various needs of individuals, cultures, teams, and organisations [12]. This perspective emphasizes the importance of finding a balance of satisfaction across different aspects of life. However, achieving such a balance can be challenging. Furthermore [12], this definition may seem idealistic, suggesting that individuals, organisations, and communities can advance together, leveraging their strengths to compensate for weaknesses. However, achieving balanced satisfaction in all aspects of life, both individually and organisationally, is often disrupted by uncontrollable factors like natural disasters and pandemic. Nevertheless, due to the vast applicability of wellbeing in today's globalized organisational settings, it is essential to examine its understanding from various perspectives.

A comprehensive understanding of wellbeing requires considering both subjective and objective perspectives. The existing literature suggests that wellbeing is examined using subjective and objective classifications to enhance comprehension [11–14]. Subjective wellbeing traces back to Aristippus of Cyrene's concept of "hedonic happiness" [6]. Subjective wellbeing, as defined by personal desires, interests, needs, and preferences, involves evaluating the balance of satisfaction across all aspects of life [13]. Alternatively, it has been argued that subjective wellbeing relates to attaining a balanced level of satisfaction in terms of emotional and psychological needs [14]. Essentially, subjective wellbeing focuses on how individuals assess their satisfaction regarding emotional and psychological aspects of life. Moreover, personal norms and values play significant roles in influencing one's evaluation of satisfaction levels and determining their wellbeing.

In contrast, the objective approach to wellbeing takes a perspective that is independent of personal feelings. It stems from Aristotle's contrasting concept of "eudemonic wellbeing" [5]. According to this viewpoint, objective definitions of wellbeing focus on evaluating satisfaction levels without being influenced by personal values and norms [11]. In other words, wellbeing is assessed based on the level of satisfaction experienced by an individual, measured using external metrics, regardless of their personal opinions [13]. Objective evaluations of wellbeing also consider the assessment of an individual's physical needs and their satisfaction level using external measurable metrics [12]. Some arguments suggest that the objective approach involves finding meaning through character development and discovering purpose in life [6]. Overall, the objective discussion revolves around the assumption that wellbeing is related to knowledge, virtues, or specific capabilities [15]. The viewpoint regarding an individual's satisfaction level will be determined through external validation and assessment.

Holistically, wellbeing should be defined as the overall evaluation of the subjective and objective satisfaction levels concerning the different needs of an individual.

The usage of the terms "wellbeing" and "wellness" in the literature has been varied, prompting the need for a more thorough evaluation. Some scholarly works use these terms interchangeably in their discussions [16–18]. This viewpoint suggests that wellbeing and wellness are essentially synonyms, both referring to the assessment of an individual's satisfaction level with respect to their subjective and objective needs. Conversely, other perspectives distinguish wellness and wellbeing as components of health, where wellbeing specifically pertains to subjective happiness, while wellness encompasses other aspects of health such as mental wellness, psychosocial wellness, and illnesses [16,19]. This viewpoint suggests that wellbeing and wellness are not identical and that each concept pertains to different elements, although both are integral to overall health. Another viewpoint considers health and wellbeing as components of wellness, with wellness representing a holistic approach to health and wellbeing [20]. It can then be argued that health, wellness, and wellbeing are contextually the same. Hence, in a broader sense, health, wellness, and wellbeing can all be regarded as subjective and objective evaluations of an individual's level of satisfaction with their needs. An investigation of health, wellness, and wellbeing requires various considerations. One aspect to consider is the spelling of wellbeing, which is commonly presented as either 'well-being' or 'well being' [5,14]. Additionally, there are different word associations related to wellbeing, such as 'emotional wellbeing', 'physical wellbeing', 'social wellbeing', 'economic wellbeing', 'psychological wellbeing', 'mental wellbeing', and 'subjective wellbeing', which further contribute to its complexity [5–7]. These dimensions have found applications in diverse fields, including education [18], economics, and politics [19], psychology [21], management [22], medical science [17], tourism [23], and construction [24]. Additional dimensions include digital wellness [25], digital wellbeing [26], health and safety [27], financial wellness [28], and financial wellbeing [29]. Due to the multitude of complex dimensions associated with wellbeing, it is no wonder that it is sometimes referred to as "wicked wellbeing" [5].

The construction industry has lagged behind in the discussion of wellbeing compared to the information technology and manufacturing industries, despite the longstanding interest in this topic dating back to the 13th century. Notably, studies have shown that the focus of wellbeing discussions in the construction industry on mental wellbeing [7,10] might have been largely influenced by factors such as the stressful nature of construction sites, the growing demand for health and safety measures, and, more recently, the pandemic [30]. Factors like anxiety, depression, and stress have been identified as contributors to mental health issues [9]. The persistent challenge posed by skilled labour shortages in the industry may also contribute to increasing stress, anxiety, and depression, further highlighting the wellbeing challenges faced that have not been addressed.

Furthermore, the demand for energy-efficient buildings has been linked to the increased focus on wellbeing. Users' behaviours regarding energy-saving strategies, driven by the high cost of living, can impact indoor environmental quality and, consequently, their wellbeing [31]. Wellbeing is associated with building performance, including energy efficiency and indoor environmental quality, which are influenced by design, operational efficiency, and maintenance practices [32]. This implies that the efficiency of building performance, particularly in terms of indoor environmental quality and energy efficiency, has an impact on the wellbeing of occupants in terms of high cost, stress, depression, and lack of satisfaction as well as environmental wellbeing in terms of carbon emissions.

The literature on wellbeing in the construction industry commonly includes evaluations of design decisions before and after construction, specifically in relation to the health outcomes of users [33–36]. These studies often have a narrow focus, primarily examining the subjective needs of users within a single case study project. As a result, it can be challenging to generalize the findings.

Overall, the research on wellbeing in the construction industry has not sufficiently explored its numerous dimensions, hence the need to delve into dimensions such as social wellbeing, digital wellbeing, psychological wellbeing, financial wellbeing, mental wellbeing, and subjective wellbeing, considering their implications for the workforce, organisations, and the environment.

3. Methodology

This research adopts science mapping for a holistic investigation of the existing literature on wellbeing in the construction industry. The choice of this method was predicated on its techniques of visualisation and analysis to enhance our understanding of the connections between studies [37,38]. Additionally, scientometric techniques define the interrelations between different forms of scientific knowledge and provide spatial representations of authors, documents, and disciplines [37–39]. This approach has also been adopted in previous related research on safety management in the construction sector [40] and construction safety and health [4]. However, there have been no prior holistic scientometric investigations of the existing literature on wellbeing in the construction industry. Therefore, in this study, we adopted a four-stage process of literature review, as illustrated in Figure 1, followed by a discussion of the process.

3.1. Step 1 (Scoping)

Due to the limited holistic research on wellbeing in the construction industry and the complex and contradictory usage of various terms, in this section, we aim to define the scope of the literature review. This approach was adapted from a previous scientometric review conducted by [37]. In the construction industry, wellbeing has been addressed from several perspectives: mental wellbeing [7], indoor environmental quality in terms of user wellbeing [31], and evaluations of design decisions before and after construction, specifically regarding the health outcomes of users [33–36]. Consequently, for a comprehensive approach, this study investigates the wellbeing of all categories of individuals, including both construction workers and dwellers in the built environment. Furthermore, this study views wellbeing as a comprehensive term encompassing wellness, health, and wellbeing within the construction industry. The objectives of this research are to identify the current research and trends regarding wellbeing in the construction industry, to examine the most influential scholarly works on wellbeing in the construction industry, and to propose research directions for further studies in this area.

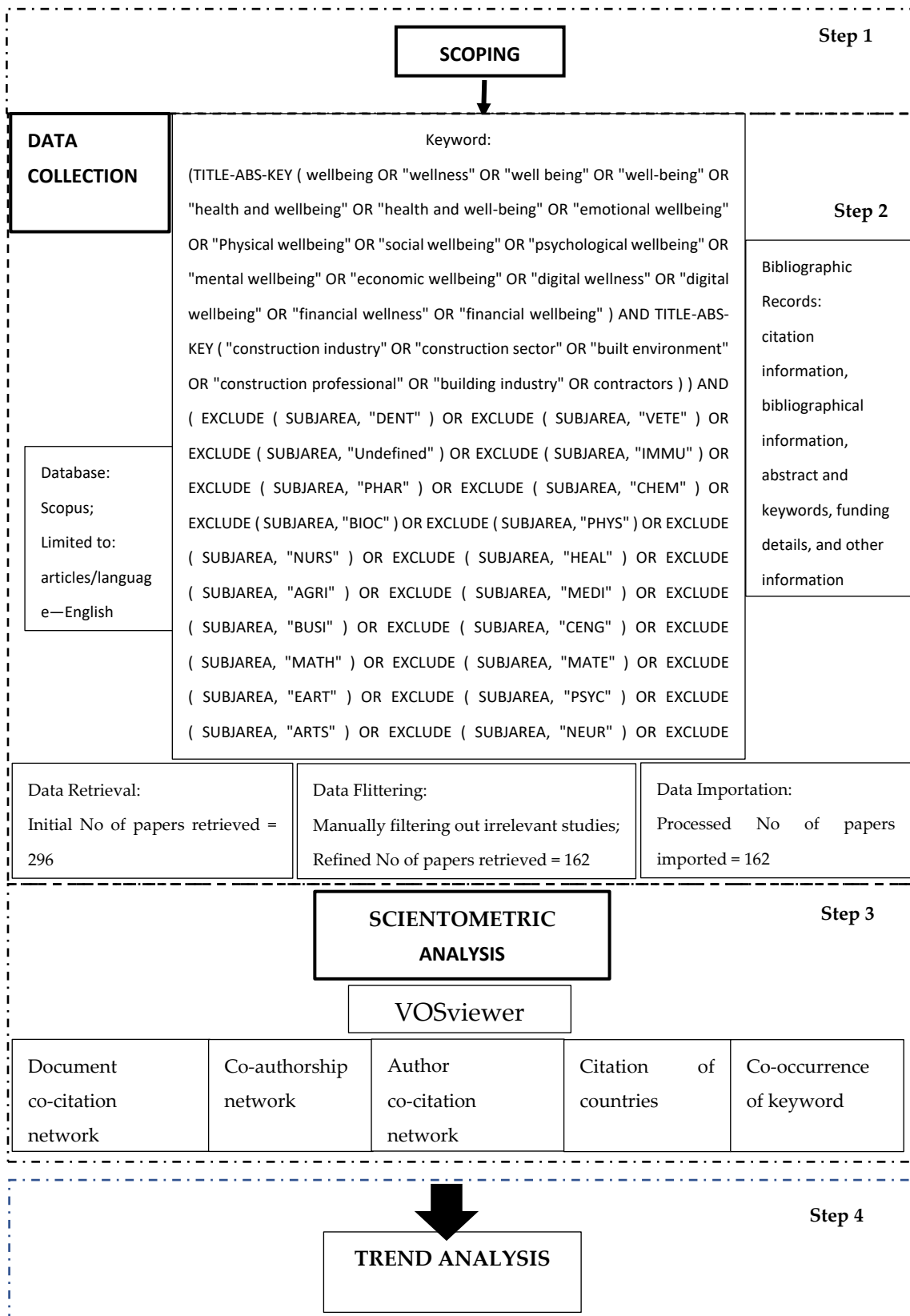


Figure 1. Research methodology.

3.2. Step 2 (Data Collection)

3.2.1. Database

The primary databases utilized for sourcing up-to-date construction studies were Web of Science, Google scholar, and Scopus. There are concerns about Google Scholar's suitability for scientometric analysis given that it enables publishing from predatory journals and lacks strict quality control [39]. Web of Science is renowned as a major database for scientific publications [37], while Scopus is recognized for its broader coverage of scientific publications and recent studies [41,42]. Therefore, Scopus was chosen as the database for this research due to its comprehensive collection of peer-reviewed articles, conference papers, and reviewed articles. It is worth noting that Scopus also includes other types of literature, such as editorials, book chapters, letters, and surveys. Therefore, as adopted by [38,41,42] regarding scientometric analysis purposes, this study focused exclusively on journal articles written in the English language to ensure a higher level of academic credibility.

3.2.2. Keyword Search

The search terms were categorized into two parts. The first part includes terms related to wellbeing, such as 'wellbeing' [17,18], 'wellness' [16,19], 'well-being' [5,14], 'health and wellbeing' [20], and 'subjective wellbeing' [5,7], and other dimensions of wellbeing. The second part includes terms related to the construction industry, such as 'construction industry' [43], 'built environment' [44,45], and 'building industry' [46]. Additionally, bibliographic records including citation information, bibliographical information, abstracts and keywords, funding details, and other relevant information were included for all retrieved documents. The exact search code used is as follows:

(TITLE-ABS-KEY (wellbeing OR "wellness" OR "well being" OR "well-being" OR "health and wellbeing" OR "health and well-being" OR "emotional wellbeing" OR "Physical wellbeing" OR "social wellbeing" OR "psychological wellbeing" OR "mental wellbeing" OR "economic wellbeing" OR "digital wellness" OR "digital wellbeing" OR "financial wellness" OR "financial wellbeing") AND TITLE-ABS-KEY ("construction industry" OR "construction sector" OR "built environment" OR "construction professional" OR "building industry" OR contractors)) AND (EXCLUDE (SUBJAREA, "DENT") OR EXCLUDE (SUBJAREA, "VETE") OR EXCLUDE (SUBJAREA, "Undefined") OR EXCLUDE (SUBJAREA, "IMMU") OR EXCLUDE (SUBJAREA, "PHAR") OR EXCLUDE (SUBJAREA, "CHEM") OR EXCLUDE (SUBJAREA, "BIOC") OR EXCLUDE (SUBJAREA, "PHYS") OR EXCLUDE (SUBJAREA, "NURS") OR EXCLUDE (SUBJAREA, "HEAL") OR EXCLUDE (SUBJAREA, "AGRI") OR EXCLUDE (SUBJAREA, "MEDI") OR EXCLUDE (SUBJAREA, "BUSI") OR EXCLUDE (SUBJAREA, "CENG") OR EXCLUDE (SUBJAREA, "MATH") OR EXCLUDE (SUBJAREA, "MATE") OR EXCLUDE (SUBJAREA, "EART") OR EXCLUDE (SUBJAREA, "PSYC") OR EXCLUDE (SUBJAREA, "ARTS") OR EXCLUDE (SUBJAREA, "NEUR") OR EXCLUDE (SUBJAREA, "ECON") OR EXCLUDE (SUBJAREA, "DECI") OR EXCLUDE (SUBJAREA, "ENER") OR EXCLUDE (SUBJAREA, "COMP") OR EXCLUDE (SUBJAREA, "ENVI")) AND (EXCLUDE (DOCTYPE, "cp") OR EXCLUDE (DOCTYPE, "re") OR EXCLUDE (DOCTYPE, "ch") OR EXCLUDE (DOCTYPE, "bk") OR EXCLUDE (DOCTYPE, "no") OR EXCLUDE (DOCTYPE, "cr") OR EXCLUDE (DOCTYPE, "sh") OR EXCLUDE (DOCTYPE, "ed") OR EXCLUDE (DOCTYPE, "er") OR EXCLUDE (DOCTYPE, "le") OR EXCLUDE (DOCTYPE, "dp")) AND (LIMIT-TO (LANGUAGE, "English"))).

3.2.3. Data Retrieval

The initial search for keywords, abstracts, and titles resulted in 296 articles, with no date range limit. This approach was adopted due to the limited number of studies available on wellbeing in the construction industry, as previous research suggests including all papers to ensure comprehensive coverage of indexed publications in Scopus [47]. However, conference papers, which are considered less influential publications [48], were excluded from the retrieved sample along with papers whose primary focus was not wellbeing.

Ultimately, a final sample of 162 articles was obtained, which is reasonably adequate compared to previous scientometric analyses that used much lower thresholds, namely, 50 [42] and 60 samples [38], respectively. The bibliometric data of 162 journal articles retrieved were obtained in Comma-Separated Values (CSV) format. Subsequently, the resulting CSV file was imported into VOSviewer (version 1.6.19), a software tool used to create scientific maps of research literature [38].

3.3. Step 3 (Scientometric Analysis)

3.3.1. Quantitative Method

For analysis in this study, the quantitative method of science mapping was employed. This method was selected due to its capability to handle large volumes of bibliometric data and uncover connections between publications and disciplines [49,50]. Additionally, it allows for the discovery of broader associations between concepts that may be overlooked during manual review [51]. Furthermore, the adoption of scientometric analysis enables the examination of countries, authors, publishing institutions, and journals, providing a scientific approach to mapping the literature [47].

3.3.2. Software

To conduct the scientometric analysis, VOSviewer (software) was utilized due to its advantageous features. It is known for its user-friendly nature and its ability to produce visually appealing and easily comprehensible results [41,42]. Moreover, VOSviewer has gained significant popularity among researchers in the construction field [38,41,42,51–53]. While Gephi (Version 0.10.1) is another commonly used software for scientometric analysis [42], it has been criticized for its limited analytical capabilities [38]. Compared to this, VOSviewer provides interactive capabilities and a range of tools for examining and clustering bibliometric data networks [39].

3.4. Step 4 (Trend Analysis)

In this study, we aimed to achieve specific objectives, which include exploring the existing research and prevailing trends related to wellbeing in the construction industry, analysing influential scholarly works on wellbeing within this field, and proposing research directions for future studies. Through an in-depth discussion, this study provides insights into trends and offers suggestions for further research. Adopting a review-based approach, like the one recommended by [41], will provide a framework and guidance for researchers in this field, enabling them to focus on potential areas of research and emerging topics in the study of wellbeing in the construction industry.

4. Results and Findings

4.1. Surge in Publications

Publications focusing on wellbeing in the construction industry have been documented from 1979 to 2023, as depicted in Figure 2. The pioneering study conducted by Lewis [54] published in the *Journal of the American Planning Association* explored the relationship between urban stress and the impact of the technological environment. This study emphasized the importance of understanding the interactions between humans and nature to effectively address stress in current urban settings and prevent its occurrence in future urban developments. Furthermore, among the highly cited papers, [55], whose corresponding work was published in the *Journal of Safety Research*, investigated the influence of individual resilience and safety climate on job stress and performance in the Canadian construction sector, while [56] examined the connection between community design and individuals' fear of crime in terms of wellbeing. These three influential papers have shed light on different dimensions of wellbeing, highlighting its multifaceted nature and underscoring the need for further exploration.

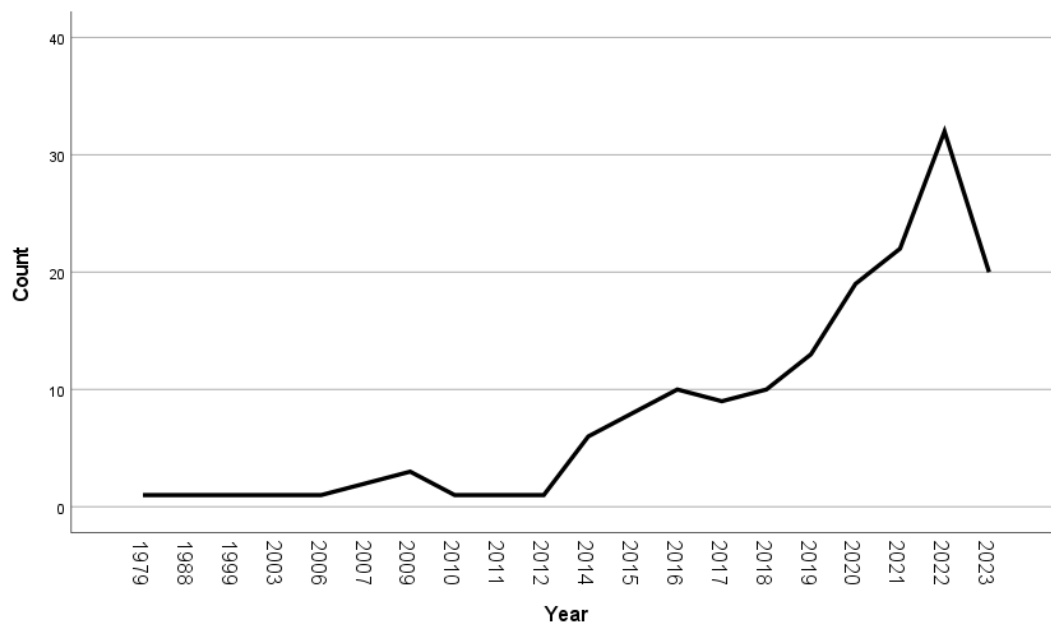


Figure 2. Surge in publications.

Researchers' interest in wellbeing in the construction industry has been rising, as depicted in Figure 2, showing the surge in publications from 2012 to 2023. This increase has been attributed to the adoption of new design strategies in building design, which aim to incorporate the psychologically beneficial effects of nature [57]. Furthermore, the emphasis on the significant role of urban planning in promoting human health and the recognition of the need for a clearer understanding of the relationship between planning and health, particularly from the perspective of built environment professionals, may have also contributed to the growing discourse [58]. Additionally, the COVID-19 pandemic might also have contributed to the upsurge [59,60].

4.2. Author Citation Network

Table 1 highlights the top five highly cited publications on the discourse of wellbeing in the construction industry. Chen [55] obtained 157 citations for their study, which focused on the stress experienced by construction workers. However, it should be noted that the findings of this research cannot be generalized due to the study's limited scope, as it was a case study conducted in the Canadian construction sector. Foster [56], also with 157 citations, examined the relationship between community design and individuals' fear of crime, with the latter falling under the category of environmental wellbeing. Ryan [61], with 152 citations, contributed to the discussion on wellbeing by exploring the concept of biophilic design, which relates to architectural design and falls under the category of environmental/physical wellbeing. Taking a different perspective on environmental wellbeing, Lowe [62] obtained 115 citations for their research on policies for wellbeing in construction. In contrast, Leyden [63] garnered 130 citations for their focus on subjective wellbeing in urban design. Overall, the most-cited literature in the discourse of wellbeing predominantly revolves around environmental and physical wellbeing. However, the influence of Chen [55] on research pertaining to construction workers' stress may have contributed to an increased focus on mental wellbeing, even though the research primarily relates to psychological wellbeing.

Figure 3 presents the author co-citation network, which consists of 706 total link strengths. The most influential researchers in this network are Sallis JF, Giles-Corti B, and Frank LD, indicating significant collaboration based on shared interests and/or institutional affiliations [38]. The co-citation density maps in Figure 3 visually represent similarities and identify nodes representing different scholarly works. Larger node sizes correspond

to higher co-citations and signify greater influence of the scholarly work in the field. Furthermore, the density of “links” between scholars reflects the frequency of citations received, illustrating the level of co-citation among them.

Table 1. Summary of most-cited publications on wellbeing in the construction industry.

Citations	Author and Year	Article	Keywords
157	[55]	Impact of individual resilience and safety climate on safety performance and psychological stress of construction workers: A case study of the Ontario construction industry	Canadian construction industry; injuries and accidents; positive psychological states; psychological health; safety climate
157	[56]	Neighbourhood design and fear of crime: A social-ecological examination of the correlates of residents’ fear in new suburban housing developments	Built environment; collective efficacy; crime; fear; walking
152	[61]	Biophilic design patterns: Emerging nature-based parameters for health and well-being in the built environment	Biophilia; biophilic design; complexity and order; mystery; pattern language; prospect–refuge theory; thermal comfort
130	[63]	Understanding the pursuit of happiness in ten major cities	Built environment; happiness; public sphere; social connections; urban design
115	[62]	Planning Healthy, Liveable and Sustainable Cities: How Can Indicators Inform Policy?	Indicators; integrated planning; liveability; Melbourne; social determinants of health
109	[64]	The relationship of built environment to perceived social support and psychological distress in Hispanic elders: The role of “eyes on the street”	Aging; built environment; Hispanics/Latinos; psychological distress; social support
94	[65]	Development of an early-warning system for site work in hot and humid environments: A case study	Artificial neural networks (ANNs); construction industry; early-warning system; heat stress; Hong Kong; occupational health and safety (OHS)
77	[66]	Is the construction sector sustainable? Definitions and reflections	Assets; environmental (natural) capital; human capital; man-made capital; social capital; sustainability; sustainable development; wealth; wealth accounting

Table 1. Cont.

Citations	Author and Year	Article	Keywords
57	[67]	Rethinking how built environments influence subjective well-being: a new conceptual framework	City; happiness; liveable; quality of life; sustainability; urban planning
49	[68]	Healing built-environment effects on health outcomes: environment–occupant–health framework	Buildings; built environment; healing; health; healthcare facilities; occupants; outcomes; wellbeing
35	[69]	Concepts of social sustainability based on social infrastructure and quality of life	Built environment; quality of life; social environment; social infrastructure; social sustainability
33	[70]	Data driven indoor air quality prediction in educational facilities based on IoT network	Artificial neural network; indoor air quality; IoT network; user-centred design
27	[54]	Healing in the Urban environment: A person/plant viewpoint	Healing in the Urban environment: A person/plant viewpoint
20	[71]	Toward environments and policies that promote injury-free active living-it wouldn't hurt	Injury prevention; physical activity; safety; unintentional injuries
17	[72]	Identifying streetscape features significant to well-being	Block-level analysis; coding systems; community design; environmental health; environmental measurement; streetscapes; urban planning; well-being
15	[60]	Coping with the COVID-19 pandemic: an exploration of the strategies adopted by construction firms.	Construction management; construction site; contract; coping strategies; coronavirus; COVID-19; pandemic; safety management
3	[73]	Unobtrusive occupancy and vital signs sensing for human building interactive systems.	Air conditioning; breathing rate; doppler ultrasonography; human; temperature; vital sign; humans; respiratory rate; temperature; ultrasonography, doppler; ventilation; vital signs

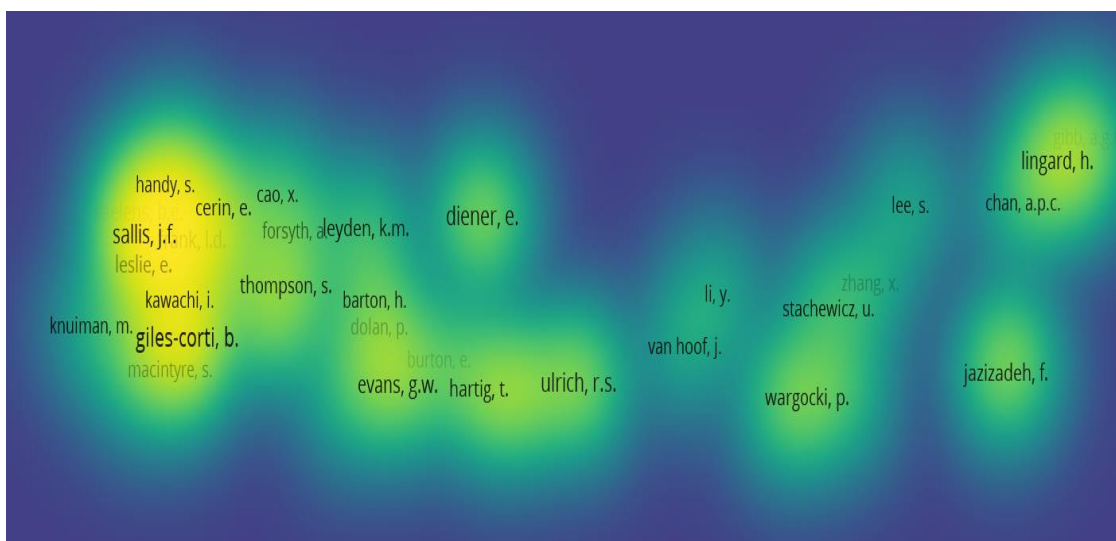


Figure 3. Author co-citation network density map.

4.3. Co-Author Citation Arranged by Organisation

In this study, we identified and analysed the most influential research institutions shaping the discourse on wellbeing in the construction industry. Co-author citation according to institution is significant in scientometric analysis, as it reflects the numbers of research papers and collaborations among institutions [42]. Table 2 reveals that the research institutions with the highest citations each have one paper in the network. The University of Western Australia and the University of Toronto, Canada, both received 157 citations. However, the University of Toronto, Canada, had two different departments, the Department of Civil Engineering and the Rotman School of Management, each being cited 157 times, resulting in a total of 314 citations for the university. Additionally, three institutions from the United States, namely, Terrapin Bright Green LLC, the University of South Carolina, and West Virginia University, had one publication each, with 152, 130, and 130 citations, respectively. Collaborations between research institutions have proven beneficial for the study of wellbeing in the construction industry, as exemplified by the partnership between West Virginia University, Morgantown, and the National University of Ireland, Galway, which resulted in 130 citations.

Table 2. Citations of publications on wellbeing in the construction industry according to organisation.

s/n	Organisation	Documents	Citations
1	Centre For the Built Environment and Health, School of Population Health, The University of Western Australia, 35 Stirling Highway, Crawley WA 6009, Australia	1	157
2	Construction Engineering & Management Group, Department of Civil Engineering, University of Toronto, Toronto, Canada	1	157
3	Rotman School Of Management, University of Toronto, Toronto, Canada	1	157
4	Terrapin Bright Green LLC, United States	1	152
5	Department Of History, Political Science, Philosophy and American Studies, University Of South Carolina Upstate, 800 University Way, Spartanburg, Sc 29303, United States	1	130
6	West Virginia University, Morgantown and National University of Ireland, Galway, Ireland	1	130
7	West Virginia University, Morgantown, Wv, United States	1	130

4.4. Origins of Research According to Countries

Table 3 reveals that the United States has the highest number of citations, with 806 citations from 33 published papers. However, in terms of publications, only the United Kingdom surpasses the United States, with 38 papers, but with only 533 corresponding citations. Australia, on the other hand, has a higher citation count than the United Kingdom, making it the second highest, with 678 citations from 31 publications. In addition to these three countries, other nations such as Canada contributed 8 publications, with 224 citations; Italy contributed 5 publications, with 128 citations; Egypt contributed 9 publications, with 58 citations; India contributed 5 publications, with 45 citations; New Zealand contributed 7 publications, with 37 citations; and Malaysia contributed 7 publications, with 7 citations, all of which reflect the global scope of the discussion on wellbeing in the construction industry. Notably, the total link strength of 8 from Table 3 indicates limited interactions and collaborations in the discourse surrounding wellbeing in the construction industry.

Table 3. Shows the origins of research arranged by country.

s/n	Country	Documents	Citations	Total Link Strength
1	United States	33	806	7
2	Australia	31	678	6
3	United Kingdom	38	533	8
4	Canada	8	224	5
5	Italy	5	128	0
6	Egypt	9	58	2
7	India	5	45	3
8	New Zealand	7	37	1
9	Malaysia	7	7	0

4.5. Publication Arranged by Sources

Table 4, generated using the scientometric analysis tool VOSviewer, identifies the major journal outlets for academic publications on wellbeing in the construction industry; this was achieved by setting a minimum threshold of five documents and two citations. Out of the 65 journal sources analysed, 9 met this threshold. Previous studies have emphasized the importance of conducting direct citation analysis to determine the prominence of journal sources in a specific field [38,47]. The most-cited journal in the field of wellbeing in the construction industry, as indicated in Table 4, is Health and Place, with 344 citations from 11 publications. Building Research and Information follows closely with 268 citations from 15 publications, while Archnet-IJAR (International Journal of Architectural Research) ranks third, with 202 citations. Other journals include the Journal of the American Planning Association with 158 citations, Architectural Science Review with 70 citations, Buildings, with 56 citations; the Journal of Building Engineering, with 39 citations; Building Services Engineering Research and Technology, with 35 citations; and Malaysian Construction Research Journal, with 2 citations.

Table 4. Publications on wellbeing in the construction industry arranged by journal name.

Number of Publications	Journal Name	Citations
11	<i>Health and Place</i>	344
15	<i>Building Research and Information</i>	268
7	<i>Archnet-IJAR *</i>	202
7	<i>Journal of the American Planning Association</i>	158

Table 4. Cont.

Number of Publications	Journal Name	Citations
6	<i>Architectural Science Review</i>	70
11	<i>Buildings</i> *	56
6	<i>Journal of Building Engineering</i>	39
6	<i>Building Services Engineering Research and Technology</i>	35
5	<i>Malaysian Construction Research Journal</i>	2

Note: *Archnet-IJAR* *: International Journal of Architectural Research. *Buildings* *: Journal on Building Science, Building Engineering and Architecture.

4.6. Co-Occurrence Keyword Network

Keywords serve as indicators of research themes, and co-occurrence networks allow for the identification of commonly used keywords that reflect the themes of publications [64]. Fractional counting, which is arguably preferred over full counting, has been adopted in previous co-occurrence keyword networks analysed using VOSviewer [41,47,65]. In this analysis, “All Keywords” and “Fractional Counting” were employed. Figure 4 displays the network of frequently used keywords, represented by nodes with line connections indicating link strength. The size of the keyword node corresponds to the frequency of the keyword’s appearance in the articles. Additionally, the colours of the nodes represent different clusters. Within this network, the most influential keywords are “Built environment”, followed by “Human wellbeing”, “Design”, “Health and Safety”, and “Living environment”.

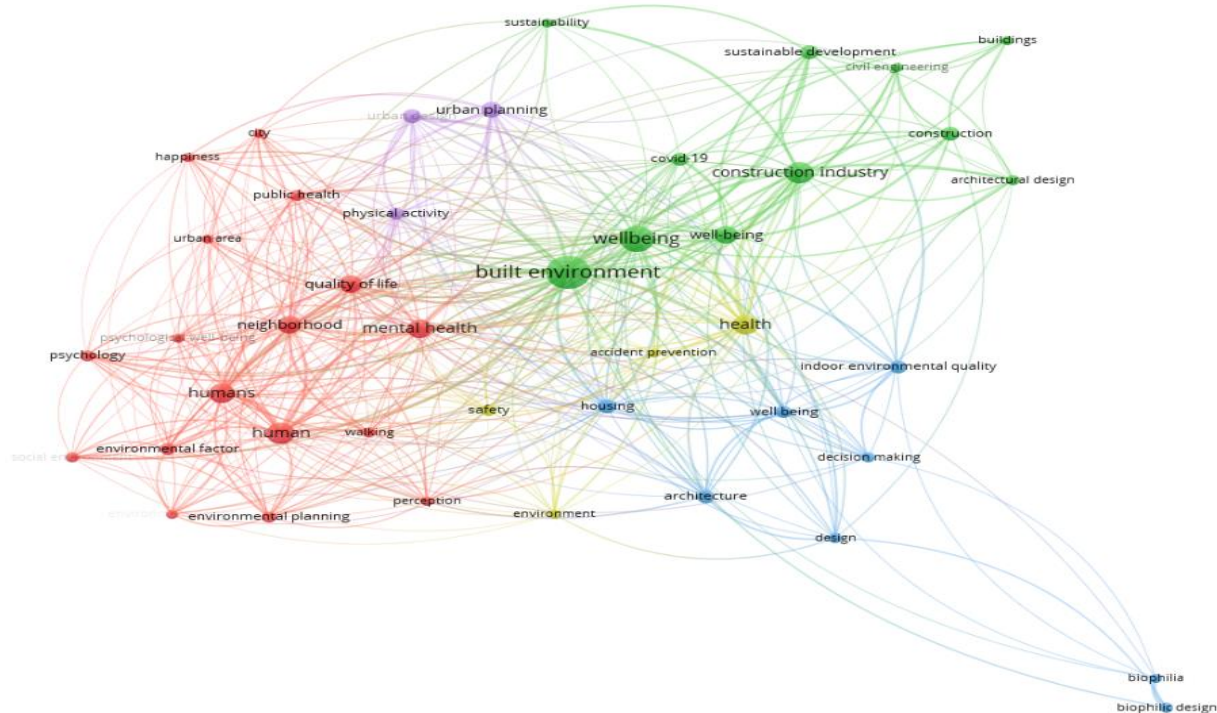


Figure 4. Network visualisation of keywords.

5. Discussion

Wellbeing in the construction industry is essential but often overlooked, requiring a greater focus on its various dimensions to enhance workforce health and organisational productivity. Wellbeing in the construction industry is better described as the overall evaluation of subjective and objective satisfaction levels of different needs of both the

construction force and individual dwellers in the built environment. However, research in the industry has primarily been conducted using keywords such as “Built environment”, “Human”, “Design”, “Health and Safety”, and “Living environment”, thereby neglecting the broader understanding of wellbeing shown in Figure 4. It is also important to recognize that other dimensions of wellbeing, such as emotional, social, digital, psychological, financial, and subjective wellbeing, also play vital roles in the overall wellbeing of workers in the construction industry. Therefore, the following discussion highlights the existing research gap in the discourse on wellbeing in the construction industry.

5.1. Human and Wellbeing in the Construction Industry (Cluster 1)

The discourse on health and safety in the construction industry has centred around the wellbeing of the workforce. However, accidents and hazardous work environments have led to a decline in worker wellbeing and performance, with a lack of attention given to underlying factors such as adverse working conditions that contribute to stress and mental health issues [40]. It was only through a study on psychological stress among construction workers that the significance of this occupational health aspect began to gain recognition [55].

Moreover, the results of this study are consistent with more recent research, highlighting the impact of mental health concerns in the challenging work environment, particularly in the context of the COVID-19 pandemic [7,10]. This has resulted in a surge of publications focusing on mental health. The demanding nature of the construction environment remains a key factor affecting the mental wellbeing of construction workers. This indicates that the wellbeing of construction workers is a multidimensional issue that requires creative intervention approaches.

The multidimensional nature of wellbeing, as revealed in the findings of this research, suggests the need for an alternative approach to mental health in the construction industry. One such approach focuses on the positive aspect of mental health, incorporating the concepts of happiness and psychological wellbeing to strive for excellence in mental health [8]. This emphasizes the importance of psychological wellbeing in attaining desired mental health outcomes. However, despite its significance, there has been limited research and implementation in the construction industry in this regard.

Despite the increasing focus on mental wellbeing, there are several perspectives that have yet to be explored. For instance, the construction industry, which is predominantly male-dominated, places additional stress on female workers. Factors such as stereotypes of female weakness, pressure to conform to masculine norms, sexual harassment, lack of flexibility, heavy workloads, the absence of female role models, and safety concerns have been identified as contributing to mental health issues among women in the construction industry [7]. This area of research remains largely unexplored but is crucial for the development of the construction industry.

5.2. Built Environment and Wellbeing in the Construction Industry (Cluster 2)

The network visualisation of keywords highlights the predominant focus on the built environment in the discourse on wellbeing, with various approaches recognising its intricate nature. For instance, there has been a significant amount of attention paid to a user-based perspective of mental health, exemplified by the field of neuro-urbanism. This interdisciplinary field explores the connection between the environment and the human brain, emphasising the impact of urban infrastructure on the mental wellbeing of urban dwellers [9]. This perspective may have evolved from studies on environmental wellbeing, underscoring the need for an interdisciplinary approach that integrates neuroscience and urban studies to promote the wellbeing of urban populations.

Research on environmental wellbeing has long been a focal point within the realms of sustainability and urban design. This is evident through the substantial number of publications primarily dedicated to this subject area. Table 1 shows that influential authors in this field have primarily focused on environmental wellbeing, agreeing that outdoor spaces

and neighbourhood conditions can negatively impact psychological and mental wellbeing [54,62,63,66,67]. While their work may not have covered wellbeing comprehensively, there is a consensus that the environment significantly influences residents' wellbeing. Factors such as safe environments, aesthetically pleasing buildings, and revitalized neighbourhoods contribute to positive psychological and mental wellbeing [54,63,66,67]. This suggests that typical construction workers, besides experiencing workplace stress, might also face additional stressors related to their environments. On the other hand, stress experienced because of their occupation could be mitigated through a therapeutic environment. Remarkably, this aspect has received limited attention in the research on wellbeing in the built environment.

5.3. Design and Wellbeing in the Construction Industry (Cluster 3)

The results highlight that wellbeing is not only associated with outdoor environments but also indoor spaces. Ryan [61], as shown in Table 1, has significantly influenced the discussion on design and wellbeing, particularly in relation to biophilic design. Ryan [61] argues that incorporating nature into the design of interior spaces positively impacts human wellbeing in psychological, cognitive, and physiological ways. However, biophilic design transcends the impact of buildings on wellbeing; it also involves integrating biophilic interior design features into the design process itself [74]. The goal here is to enhance individuals' wellbeing in building environments through the inclusion of design elements that promote psychological, cognitive, and physiological wellbeing.

Likewise, research on indoor environmental quality aligns with the benefits of biophilic design, acknowledging that various components of the built environment influence human wellbeing [70,75]. Factors such as thermal comfort in indoor spaces have been identified as determinants of user satisfaction, which is, in turn, linked to wellbeing. This is supported by the notion that human satisfaction is connected to indoor environmental quality, affecting physical and psychological wellbeing [71]. However, research on indoor environmental quality has been criticized for its lack of clarity regarding whether participant satisfaction with indoor quality is a determinant of wellbeing or an outcome of wellbeing [72]. Nonetheless, a comprehensive approach is necessary to fully grasp the multidimensional nature of wellbeing and the interconnectedness of its various dimensions.

5.4. Health and Accident Prevention in the Construction Industry (Cluster 4)

This research cluster primarily focuses on the impact of construction activities on the physical health of construction workers. The findings indicate that hazardous work environments have contributed to a decline in worker wellbeing and productivity, often resulting in fatal injuries at construction sites [76]. There is a growing consensus that the prevalent long and extended work hours in the construction industry may also contribute to fatalities and physical health issues among construction workers [76–78]. Although research has primarily concentrated on this aspect, the overall impact on the wellbeing of construction workers could be significant. For instance, [76] opined that there is a correlation between long hours spent operating vibrating machinery and physical health issues. Similarly, workplace policies deeply ingrained in the construction sector, such as competitive bidding processes and the enforcement of financial penalties for delays, lead to longer workdays that are detrimental to the health and welfare of employees [78].

Another perspective is that extended work hours add to the stress experienced by construction workers, adversely affecting their sleep and subsequently impacting productivity [79]. The prevailing culture and nature of the construction business environment contribute to fatigue, which has been identified as a cause of accidents and has negative effects on health and overall wellbeing [76]. Therefore, it is evident that the nature of the construction industry, characterised by extended hours of work, breeds health issues, thus impacting individuals' productivity and, by extension, organisational productivity.

Given these results, it is crucial to emphasise the necessity for additional critical research into this subject. Researchers can create efficient solutions for this industry to

lessen these problems and develop a more thorough awareness of the challenges faced by construction workers by investigating the numerous elements that affect their physical health and overall welfare. Scholars can also collaborate to develop a more resilient and encouraging sector by prioritising the health and safety of construction employees.

5.5. Living Environment and Wellbeing in the Construction Industry (Cluster 5)

The built environment's impact on human wellbeing, both positive and negative, has been well-established in the literature [54,63,66,67]. This influence is particularly significant for the construction workforce, a subset of individuals living in the built environment. Section 5.3 of this study highlighted that the built environment can affect occupants' psychological wellbeing, leading to the implementation of mitigating measures like biophilic design [70,74]. Factors such as indoor thermal comfort play a role in user satisfaction, and other aspects like safety climate, family bonds, living conditions, and societal acceptance are crucial for evaluating the living environment and its link to wellbeing [7,15,55,80]. However, limited research has been conducted on the wellbeing of construction workers and how their satisfaction with their living environments impacts their stress levels. This is an important area to explore, especially considering the hazardous nature of the construction industry [72]. Furthermore, subjective concerns about the challenging work environment in the construction sector, including problems like fatigue, burnout, and sexism against women in the industry [7,10], may not have been comprehensively evaluated. Considering the negative impact of workers' living environments, which encompasses indoor environment quality, safety climate, family bonds, living conditions, and societal acceptance [7,15,55,80], it is evident that the perceived satisfaction level of construction workers may be influenced by external factors like their living environments. Fatigue, often attributed solely to the construction industry's culture [76], may require re-evaluation to consider external factors such as poor safety attitudes, family conflicts, poor financial living conditions, and sexism [7,15,55,80], which could be precursors to the reported rates of fatigue. This area requires more research because it is crucial for the wellbeing of the construction workforce.

5.6. Wellbeing Dimension Analysis

The integration of scientometric analysis and qualitative trend analysis of existing mainstream publications in the construction industry enabled the categorisation of publications based on various dimensions of wellbeing, thereby bridging the existing research gap and informing future research directions. Table A1 presents a classification of the authors based on the identified dimensions and their primary research focuses with respect to specific aspects of wellbeing in the construction industry. Potential connections between the clusters and dimensions are also identified and emphasized (shown below).

(1) Environmental wellbeing: This dimension of wellbeing specifically examines the relationship between the outdoor or urban environment and human wellbeing [62,67]. Connecting clusters #2 and #5, it is crucial to acknowledge the influence of urban environments on the wellbeing of construction workers, as they are a subgroup of urban dwellers. While environmental wellbeing has garnered significant research attention, it is essential to shift focus towards the integration of all dimensions of wellbeing to comprehensively evaluate and clarify the factors and outcomes associated with the urban or outdoor environment.

(2) Physical wellbeing: This pertains to the influence of the indoor or physical environment on the wellbeing of individuals [80]. Clusters #2 and #3 are connected in this context, as the quality of the indoor environment affects the wellbeing of occupants. However, the impact on construction workers encompasses multiple dimensions. Both living space and office space play a role in the wellbeing of construction workers, an aspect that has received limited attention from researchers. Furthermore, there is a need for a comprehensive investigation into the interplay between indoor living spaces and outdoor working spaces and their effects on the psychological, mental, and subjective wellbeing of construction professionals.

(3) Social wellbeing: This dimension focuses on the influence of organisational culture, diversity, war, conflicts, and pandemics on construction workers and the broader population residing in built environments. The number of publications on wellbeing has increased due to the COVID-19 pandemic, which emphasizes its role as a determinant of social and psychological wellbeing. This has led to emerging research on psychosocial wellbeing in the construction industry. As highlighted in Cluster #1, the wellbeing of individuals, specifically construction workers, is interconnected with issues such as prejudice, stereotypes, harassment, gender inequality, and unsafe working conditions [7]. Examining this area is crucial due to the growing diversity within teams and international collaborations.

(4) Psychological wellbeing: Research in this area examines comfort, satisfaction, and overall functioning as key areas of focus. Environmental and physical wellbeing are assessed based on individuals' satisfaction with thermal, air, noise, light, and aesthetic comfort [31]. Wellbeing is closely associated with building performance, including energy efficiency and indoor environmental quality, which are influenced by design, operational efficiency, and maintenance practices [32]. It is important to differentiate this from psychological wellbeing as well as mental health. Psychological wellbeing encompasses overall functioning related to emotions, mood, satisfaction, fear, and comfort. Researchers should clearly delineate these different dimensions to avoid confusion. This highlights the necessity for a thorough examination of psychological wellbeing and its interconnectedness with other dimensions. Clusters #1 and #5 underscore the importance of interdisciplinary and interinstitutional collaborations for enhancing the quality of studies on psychological wellbeing in the construction industry.

(5) Digital wellbeing: The emerging field of digital wellbeing is in its early stages and requires further exploration. Research in this category primarily focuses on the use of technology for promoting wellbeing [73]. It is connected to cluster #4 due to its emphasis on accident prevention or interventions. While digital wellbeing is gaining interest among researchers, there is a need to investigate it as both a determinant and an outcome of wellbeing. The impact of prolonged computer use and, more recently, the use of virtual reality; building information tools; and digital engineering tools on the wellbeing of construction professionals should be examined. Additionally, the study of digital awareness as an outcome in the research on digital wellbeing is becoming increasingly important.

(6) Mental wellbeing: This dimension focuses on the mental health of the construction workforce, encompassing their thoughts, actions, and emotions while performing their assigned tasks. It is important to distinguish mental wellbeing from psychological wellbeing, although their interconnectedness with psychological, social, and digital wellbeing should be recognized. Exploring mental wellbeing as a positive outcome is an intriguing avenue. Cluster #4 is relevant for examining stressor prevention in the context of mental wellbeing regarding construction workers. However, factors like stress, fatigue, and injuries are common across all dimensions of wellbeing, potentially leading to mental health issues [40]. Moreover, the intersection of all the clusters may also contribute to mental health challenges. It is crucial for researchers to clearly differentiate the connections between mental wellbeing and the other dimensions of wellbeing. Thus, investigating mental wellbeing with respect to either its positive or negative aspects is an area that requires further research to facilitate better understanding and effective implementation within the construction industry.

(7) Subjective wellbeing: This dimension focuses on the premise that wellbeing is synonymous with "happiness", which can be traced back to Aristippus of Cyrene's concept of "hedonic happiness" [6]. In the construction industry, this concept has been applied to assess personal desires, interests, needs, and preferences across all aspects of life. These areas are crucial for a comprehensive exploration of wellbeing and the influence of personal preferences on determining satisfaction levels, which form the basis for evaluating wellbeing. The connection between cluster #1 and #5 highlights the possibility that construction workers' perceived satisfaction levels or fatigue may be influenced by personal biases rather than the construction environment itself. Therefore, it is essential to conduct further research on this theme to gain a deeper understanding of these dynamics.

(8) Physical health and wellbeing: Primarily focusing on the illness, injury, or health conditions that arise from the hazardous working environments in the construction industry [81], this topic has garnered significant attention in terms of research and implementation. However, the cause-and-effect relationship between physical health and overall wellbeing may be influenced by the connections identified in Clusters #4 and #5. This suggests the need to integrate other dimensions of wellbeing when investigating the underlying causes of behaviours that contribute to accidents. By doing so, a more comprehensive understanding can be achieved, leading to improved prevention mechanisms. It is important to recognize that individual decision making is influenced by various factors, and this understanding can contribute to both positive and negative outcomes.

(9) Financial wellbeing: This research theme specifically addresses the economic wellbeing of construction workers. However, despite the significant impact of rising energy costs and the financial downturn caused by COVID-19, this important dimension of wellbeing in the construction industry has been largely overlooked, which has been revealed in various sources (as shown in Table 3). The focus on reducing energy consumption to enhance indoor environmental quality (Cluster #3) may inadvertently lead to a decline in the quality of sleep, resulting in fatigue that can impair decision making and contribute to accidents (Cluster #4). Additionally, the psychological impact of financial wellbeing should not be disregarded. Unfortunately, as revealed in Appendix A, researchers have not paid sufficient attention to the topic of financial wellbeing in the construction industry.

5.7. Interventions for Positive Wellbeing

To fully understand the complexity of wellbeing in the challenging construction industry environment, collaboration, both interdisciplinary and intra-institutional, among institutions is essential. This collaboration can foster a better understanding of wellbeing and enhance its cultivation in the construction industry. The co-citation network density map of authors (Figure 3) reveals a lack of collaboration, with authors often working in isolation. Encouraging collaboration can promote interdisciplinary approaches and contribute to advancements in understanding and implementing wellbeing interventions in the construction industry.

In addition, collaboration between industry practitioners and researchers can integrate wellbeing measures into construction activities. Concerns such as job-related stress, fatigue, fear of falls, body pain, and burnout can be reduced through researched, tailored technology deployed via research and industry partnerships. For instance, a predictive model was used to determine therapeutic spaces for mental wellbeing [59]. Similarly, data were collected from construction workers using technology to mitigate sleep disorders caused by body pain [79]. Expanding technology deployment through research and industry partnerships has the potential to reduce the perceived hazardous nature of the construction industry and improve productivity by reducing construction workers' absenteeism due to poor wellbeing.

Overall, efforts to raise awareness about the influence of lifestyle, living conditions, and the environment on the wellbeing of construction workers are crucial. In addition, intervention approaches, like employee wellbeing education and health literacy campaigns, are designed to enhance construction workers' knowledge of health-promoting habits and stress management techniques, addressing both work-related and non-work-related stressors by providing necessary support and counselling.

5.8. Agenda for Future Research

1. Holistic Understanding of Wellbeing: Researchers should strive for a holistic understanding of wellbeing within the construction industry. It is imperative to recognize that wellbeing is a multidimensional concept, encompassing several dimensions. This comprehensive approach is vital for addressing the complex and interconnected nature of construction workers' overall wellbeing, as indicated in the clusters. Estab-

lishing precise and encompassing definitions of wellbeing should be the foundational step for future research endeavours.

2. **Targeted Interventions:** Stemming from the findings of this study, researchers should be dedicated to the development and testing of targeted interventions across the various wellbeing dimensions. These interventions should specifically address adverse working conditions and gender-specific wellbeing challenges within the construction industry. Targeted strategies can significantly improve working conditions and foster a more inclusive and supportive work environment, as evident from prior research [7]. Implementing such interventions represents a critical step toward enhancing the overall wellbeing landscape of the construction industry.
3. **Living Environment:** Future research endeavours should prioritize the investigation of factors like indoor environmental quality, safety climate, and societal acceptance for enhancing the living environment of construction workers. Understanding the profound influence of these factors on worker satisfaction and stress levels is paramount, especially given the inherently hazardous nature of the construction industry. As highlighted in Clusters 1 and 5, the need for an improved living environment for construction workers, encompassing aspects of both the physical and social milieu, cannot be overemphasised.
4. **Positive Mental Health:** Research efforts should explore avenues for promoting happiness and psychological wellbeing among construction workers. An in-depth examination of the impact of positive mental health on overall wellbeing and job satisfaction is warranted, as it is a relatively underexplored aspect within the construction industry (Clusters 1 and 2). Focusing on positive mental health can lead to a more content and mentally resilient workforce in the construction sector.
5. **Safety and Health:** Safety and health measures, in Cluster 4, have garnered significant attention. Nevertheless, it is crucial to continue researching health and accident prevention to enhance safety measures in the construction industry. This research should thoroughly explore the complex interplay between work conditions, physical health, and worker wellbeing. This exploration will provide valuable insights that can be used to effectively shape policies and practices, aligning with prior comprehensive research [76–78]. Such advancements in safety measures have the potential to bring about substantial reductions in injuries and health problems among construction workers.
6. **Financial Wellbeing:** Financial wellbeing is an essential area for future research within the construction industry. This topic holds particular importance due to the rising living costs, primarily attributed to high energy expenses and inflation. Previous studies have emphasized the critical role of this dimension in gaining a comprehensive understanding of construction workers' overall wellbeing [15,55,80]. Surprisingly, financial wellbeing has not received the attention it warrants. An in-depth exploration of the financial challenges faced by construction workers can offer valuable insights into enhancing their overall quality of life.

6. Limitations of This Study

The importance of this study cannot be overemphasised, yet it is crucial to consider its shortcomings. The substantial dependence on information only from the Scopus database is a notable restriction. Although Scopus boasts thorough coverage of papers, the use of this data source exclusively might have introduced some bias that could have affected this study's findings. It is crucial to consider these constraints when interpreting the results and to investigate further directions to ensure a more thorough comprehension of the issue.

It is also important to note that this study largely avoided looking into the “why” and “how” aspects in favour of focusing on the “what” questions gathered from the literature. Although this study adds useful information to the body of existing knowledge, a deeper investigation of the underlying causes and mechanisms might provide a broader understanding of this topic. This finding highlights the possibility for further exploration of the procedural and causal components of wellbeing in future studies.

While this study effectively identified numerous challenges in the field of construction industry wellbeing research, it is crucial to note that this study did not focus on uncovering the root causes of these issues. While recognising and documenting the difficulties is an essential first step, addressing the underlying factors and providing actionable remedies is imperative for advancing the state of research in this area. This approach will not only contribute to a more comprehensive understanding of the challenges but also lead to tangible improvements in the construction industry’s wellbeing landscape.

Indeed, it is imperative to acknowledge the limitations of this study, particularly concerning the subjectivity inherent in interpreting and assigning conceptual themes to each publication. The presence of vague conceptualisations and definitions of wellbeing in some papers further complicates the analysis and understanding of this topic. This ambiguity in definitions and concepts might have led to different classifications or interpretations from those intended by the authors in this study’s categorisation process.

7. Conclusions

This scientometric review assessed the dimensions of wellbeing within the construction industry. Analysing research trends from 1979 to 2023, it revealed a growing interest in wellbeing, with a particular emphasis on environmental, physical, and mental wellbeing. Key institutions and countries driving this research were identified, underscoring the global relevance of the topic. Prominent journals were recognized, emphasising the importance of academic platforms in disseminating knowledge.

Despite this progress, this study unveiled several critical gaps in construction industry wellbeing research. While many facets of wellbeing were explored, the impact of living environments on construction workers and the broader influence of construction activities on their wellbeing require further investigation. The interconnections between various dimensions, including social, psychological, and financial, call for a multidisciplinary approach to research. Technology’s role in both shaping and reflecting wellbeing deserves more attention. Additionally, this study revealed a need for more profound explorations of the “why” and “how” aspects of wellbeing.

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Appendix A

Table A1. Analysis of publications on dimension of wellbeing in the construction industry.

Dimensions	Authors	Count
Environmental Wellbeing: Research focuses on the intersection of the outdoor/urban environment and wellbeing	Bjørberg, & Temeljotov (2023); Fuller, et al. (2023); Anciaes, (2022); McGee, et al. (2022); Gjerde, & Vale, (2022) Bioria, (2021); Ross, et al. (2021); Cerletti, et al. (2021); Shirtcliff, et al. (2021); Sheppard, & McClymont, (2021); Gaspari, et al. (2020); Schootman, et al. (2020); Rice, (2020); Hanc, et al. (2019); Rice, (2019); Eker, et.al., (2018); Christian, et al. (2017); O’Sullivan, (1999); Shiue, (2016); Dolan, (2016); Arthurson, et al. (2016); Panda, & Marks (2015); Howden-Chapman, et al. (2015); Thompson, & Mitchell (2015); Zuniga-Teran, et al. (2017); Paine, & Thompson, (2017); Browne-Yung et al. (2016); Boyko, et al. (2015); Lowe, et al. (2015); Thompson, & Kent (2014); Pollack, et al. (2012); Leyden, et al. (2012); Foster, et al (2010); Knox, (2009); Grierson, (2007); Spokane, et al. (2007); Lewis, (1978)	37
Physical Wellbeing: Research focuses on the impact of the indoor/physical space on the wellbeing of occupants.	De la Hoz-Torres, et al. (2023); Bellini, et al. (2023); Sadek & Willis, (2023); Abed, et al. (2023); Venturini et al. (2022); Alhadedy & Gabr, (2022); McGee, et al. (2022); Cruz Astorqui, et al. (2022); DeLauer, et al. (2022); Willems, et al. (2022); Ling, et al. (2021); Willems, et al. (2020); Engelen, et al. (2022); Dorrah, & Marzouk, (2021); Fu, et al. (2021); Bae, et al.,(2021); Oliveira, et al. (2020); Rohde, et al. (2020); Jain, et al. (2020); Flores-Villa, et al. (2020); Nettleton, et al. (2020); Noguchi, et al. (2019); Sharpe, (2019); Clements, et al. (2019); Barrett, et al. (2019); Zhang, et al. (2019); Bean, & Hourahan, (2018); Chau, et al. (2018); Bunn, & Marjanovic-Halburd (2017); Mc, & Harrison, (2017); Nyrud, et al. (2014); Ryan, et al. (2014)	32
Social Wellbeing Research focuses on the impact of organisations, community, and disasters on construction workers and built environment dwellers	Tiwari, et al. (2023); Rashidfarokhi, & Danivska, (2023); Hartt, et al. (2023); Donegan, et al. (2022); Gurmu, et al. (2022); Rani, et al. (2022); Goodger, & Murray, (2022); Salami, et al. (2022); Kuboshima, & McIntosh, (2022); Furlan, et al. (2022); Agyekum, (2022); Azami, et al. (2022); Agbai, (2022); Subramaniam, et al. (2021); Abas, et al. (2021); Dodanwala, & Shrestha, (2021); Sturge, et al. (2021); Hussein, et al. (2021); Grum, & Kobal Grum (2018); Rajendran, et al. (2020); Grum, (2020); Hooper, et al. (2015); Thompson, & Kent (2014); Kent, & Thompson, (2014)	24
Psychological Wellbeing Research focuses on comfort, satisfaction, and overall functioning	Baumann, et al. (2023); Domjan, et al. (2023), Medhat Assem, et al. (2023) Omjan, et al. (2023); Ahmed Shaaban, et al. (2023); Idris, et al. (2022); Ekhaese & Hussain, (2022); Nwaogu, & Chan, et al. (2021); Mohammed, et al. (2020); Mondschein, & Moga (2018); Bornioli, et al. (2018); Watson (2018); Kobal (2018); Chen, et al. (2017); Ramzy, (2015); Soril, et al. (2014) Brown, et al, (2009)	17
Digital Wellbeing Research focuses on the deployment of technology for wellbeing	Salama, et al. (2023); Song, et al. (2023); Becerik-Gerber, et al. (2022); Raveendran, & Tabet Aoul, (2022); Pelletier, & Calautit, (2022); Pillsbury, et al. (2020); Aghamolaei, et al. (2021); Malakhatka, et al. (2021); Tagliabue, et al. (2021); Rice, (2021); Elrafie, et al. (2019); Perini, et al. (2017); Fisher-Gewirtzman, & Polak, (2019); Yi, et al. (2016); Miller, & Tolle, (2016)	15
Mental Wellbeing Research focuses on the mental health of the construction workforce	Frimpong, et al. (2023); Rotimi, et al. (2023); Ndaguba, et al. (2022); Jenkin, et al. (2022); Ma, & Ye, (2022); Hu, et al. (2021); Barua, et al. (2021); Chowdhury, et al. (2020); Osama, (2020); Marzukhi, et al. (2020); Pearson, et al. (2019); Ajayi, et al. (2019); Mahazir, & Jing, (2019); Ram, et al. (2017); Firdaus, et al. (2017)	15
Subjective Wellbeing Research focuses on the premise that wellbeing corresponds to “Happiness”	Leyden, et al. (2023); Ozbilen, & Akar (2023); Sadeghi, et al. (2022); Dang, et al. (2022); Carvajal-Arango, et al. (2021); Mouratidis (2018); Ma, et al. (2018); Pfeiffer, & Cloutier, (2020); Pfeiffer, & Cloutier, (2016); Gao, et al. (2016)	10
Physical Health and Wellbeing Research focuses on illness, injury, or health conditions	Sathvik, et al. (2023); Lingard & Turner, (2022); Pilkington-Cheney, et al. (2020); Edwards, et al. (2021); Tunji-Olayeni et al. (2017); Gibb, et al. (2015); Court, et al. (2009); Baggs, & Cunningham, (1988)	8
Financial Wellbeing Focuses on economic wellbeing	Biglieri, (2018); Khairov, et.al., (2016); Pearce, (2006); Blomgren, (2003)	4

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