International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Scholarly Publisher
RS Global Sp. z O.O.
ISNI: 0000 0004 8495 2390

Dolna 17, Warsaw,
Poland 00-773
+48 226 0 227 03
editorial_office@rsglobal.pl

ARTICLE TITLE	THE SYNERGY OF OPTIMIZING PROJECT MANAGEMENT PRACTICES FOR QUALITY MANAGEMENT IN RESIDENTIAL BUILDINGS
ARTICLE INFO	Imadeddine Reghiss, Riad Abadli. (2024) The Synergy of Optimizing Project Management Practices for Quality Management in Residential Buildings. *International Journal of Innovative Technologies in Social Science*. 4(44). doi: 10.31435/ijitss.4(44).2024.3034
DOI	https://doi.org/10.31435/ijitss.4(44).2024.3034
RECEIVED	12 October 2024
ACCEPTED	04 December 2024
PUBLISHED	07 December 2024
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THE SYNERGY OF OPTIMIZING PROJECT MANAGEMENT PRACTICES FOR QUALITY MANAGEMENT IN RESIDENTIAL BUILDINGS

Imadeddine Reghiss
Ph.D., Student, Faculty of Architecture and Urban Planning, LAVMF Laboratory, Université of Constantine 3, Algeria

Riad Abadli
Professor, Faculty of Economics, LAVMF Laboratory, University of Oum El Bouaghi, Algeria

ABSTRACT

This paper provides a bibliometric study based on data from Scopus and the VOS Viewer program to investigate the relationship between optimization strategies, project management, and quality management in the context of residential constructions. With an emphasis on a number of factors, including publishing nations, years, fields, authors, citations, and keywords, the analysis encompasses 85 articles from 1995 to 2023.
The main conclusions show that the top four nations in terms of the number of publications on this subject are China, the US, Australia, and Canada. The research reveals noteworthy patterns in the disciplines that have made contributions to this topic, suggesting that optimization in construction and management techniques is studied from a multidisciplinary perspective.
In order to improve the performance of residential building projects, the paper highlights the growing significance of combining optimization techniques with efficient project management and quality assurance. Additionally, it lists key works and prominent writers who have influenced the conversation in this field.
All things considered, this bibliometric study offers insightful information to scholars and professionals who are interested in the nexus of these important fields, indicating that interdisciplinary cooperation might result in better residential building project outcomes.

KEYWORDS

Project Management, Residential Constructions, Bibliometric Analysis, Optimization, Quality Management

CITATION

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1. Introduction

The synergy of optimizing practices in project management, particularly in the context of quality management for residential buildings, has become an increasingly important research subject. This topic is particularly relevant given the growing complexity and demands of construction projects, which require integrating various management techniques to ensure quality, cost-efficiency, and timely delivery. A bibliometric analysis based on data from the Scopus database, using VOS Viewer software, sheds light on the evolution of this field from 1995 to 2023. A total of 85 relevant studies were identified, providing a comprehensive overview of the contributions made by different countries and researchers in this domain.

Bibliometric analysis is a powerful tool for mapping the scientific landscape and understanding trends in research. By using VOS Viewer, a software designed for constructing and visualizing bibliometric networks, it is possible to explore co-authorships, citation networks, and keyword co-occurrences within the selected body of literature. This method allows for a detailed examination of how different regions and institutions

contribute to the optimization of project management practices in construction, particularly in terms of quality assurance. The use of Scopus as a data source ensures that the analysis covers a wide range of high-quality publications, providing robust insights into global research trends.

The article starts with an introduction to the issue of improving project management practices for quality management in residential structures. The study methodology part discusses the procedures of data collecting and the bibliometric analysis was carried out, followed by a presentation and discussion of the major findings. It finishes with a proposal that there is a need to employ new techniques for optimizing project management procedures for quality management in residential structures and expanding these practices in numerous nations.

2. Research Methodology

This research performed a bibliometric analysis, structured into four phases: keyword definition, database selection, article retrieval, and data analysis (Carvalho et al, (2013). The definition of keywords is regarded as the initial stage in conducting a bibliometric investigation, which are utilized in databases to locate publications mostly pertinent to the measurement.

In this instance, we employed the following keywords: “Optimization,” “project management,” “quality practices,” and “residential building.” The selection of keywords was determined by their popularity, principally by the frequency of terms recognized as significant search subjects for bibliometric analysis. A frequency threshold is typically employed to filter terms. This analysis was developed using the Scopus database.

The bibliometric data was obtained from Scopus and analyzed using VOS Viewer software. We selected the Scopus database due to its capability to facilitate the study of research through citation metrics, the identification of research trends, and the quantitative assessment of research outcomes (Van Eck & Waltman, 2014).

This collection comprises approximately 20,000 high-quality, peer-reviewed scientific articles published globally in more than 250 fields. The study database's specification can delineate the research parameters, since the whole collection of articles, once analyzed, can be constructed based on the outcomes derived from the specified database.

The research was done using precise restrictions, namely limiting the results to publications published from 1995 to 2023. The search was not constrained by the language of the articles. The program employed in this bibliometric investigation is VOS Viewer. It utilizes a novel and validated connection metric (Visualization of Similarities [VOS] mapping) and features a user-friendly interface; however, it offers less sophisticated options. VOS viewer employs a distance-based methodology and association strength normalization to see networks.

3. Bibliometric Analysis. The Synergy of Optimizing Project Management Practices for Quality Management in Residential Buildings

3.1. Research Growth.

The figure illustrates the progression of the synergy in the optimization of quality management practices in residential buildings over time. The data is represented by the number of documents published annually, which is indicative of the increasing interest and advancements in this field.

Key Points:

Initial Phases (1995-2005): From 1995 to 2000, there is minimal activity, with only a handful of documents being published annually. This implies that optimization practices in quality management for residential buildings were either in their infancy or not extensively documented. The gradual increase, which began around 2001, suggests an incremental but consistent increase in the focus on enhancing quality management practices.

Significant Growth (2006-2015): The number of documents experienced a significant increase from 2006 onwards, culminating in an apex around 2015. This period is characterized by a significant increase in the emphasis on the optimization of project management practices for quality control in residential construction, as well as accelerated development. The optimum years are indicative of a robust synergy between quality development initiatives and project management optimization.

Fluctuations and Decline (2016-2023): The number of publications experienced a significant decline after 2015, with some fluctuations occurring until 2020. This could indicate that the research emphasis has changed or that the discipline has reached a stage of maturity where fewer new developments are being documented. There is no recorded activity from 2021 to 2023, suggesting a potential stagnation or transition towards other emergent trends in construction quality management.

The figure illustrates a distinct progression in the optimization of quality management practices in residential structures. The mid-2010s were the apex of the synergy between these practices and project management, following which it experienced a decline. This trend may be indicative of changes in industry priorities or advancements that have rendered previous optimization methods less innovative or more standardized.

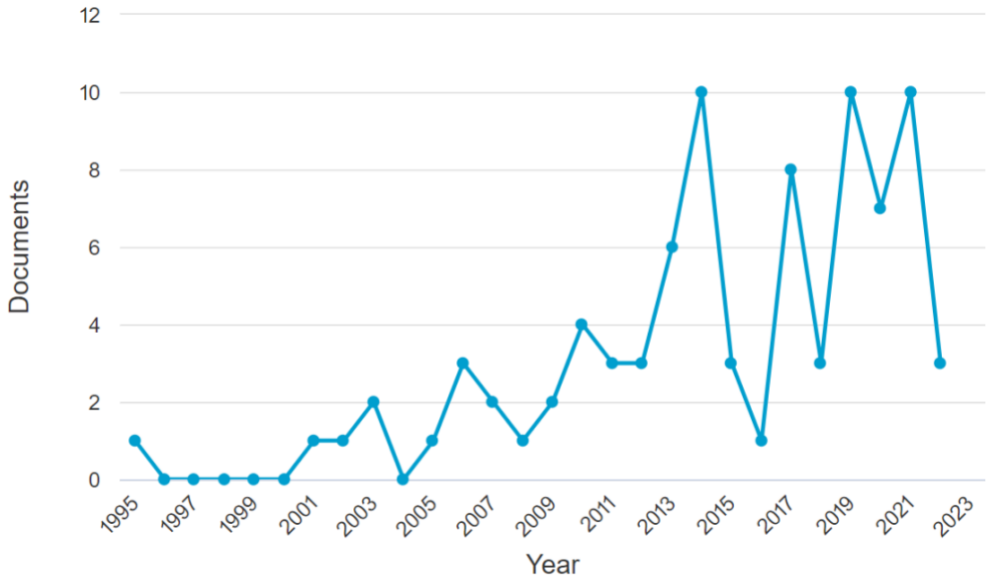

Fig. 1. Progression of the synergy in the optimization of quality management practices in residential buildings

3.2. The subject of Optimization of Quality Management Practices for Residential Buildings

The distribution of academic disciplines that have contributed to the optimization of quality management practices for residential buildings is depicted in this figure. The chart emphasizes the interdisciplinary character of this discipline, with Engineering contributing the most, at 40.7%. This dominance implies that engineering expertise is essential for addressing the technical and structural aspects of quality management in residential construction.

Following engineering, Business and Management also contribute significantly, accounting for 8.9% of the total. This highlights the significance of financial, managerial, and organizational strategies in guaranteeing that residential initiatives meet quality standards.

Significant contributions are also made by other disciplines, including Earth and Planetary Sciences (6.7%), Energy (6.7%), Environmental Sciences (6.7%), and Computer Science (7.4%). Most likely, these disciplines offer valuable insights into the environmental impact, energy efficiency, sustainability, and advanced computational methods for optimizing building processes.

Decision Sciences (4.4%), Social Sciences (3.7%), Materials Science (3.0%), and Mathematics (3.0%) make smaller but still significant contributions. To enhance quality management practices, these disciplines may concentrate on societal impacts, material innovations, mathematical modelling, and decision-making processes.

Finally, the category labelled as other (8.9%) represents supplementary fields that may not precisely fall into the aforementioned categories but still offer valuable insights into the overall management process.

This figure emphasizes the multidisciplinary endeavors necessary to improve quality management in residential structures. Engineering is the driving force behind this endeavor, but a diverse array of other disciplines also contributes to the process in a variety of ways.

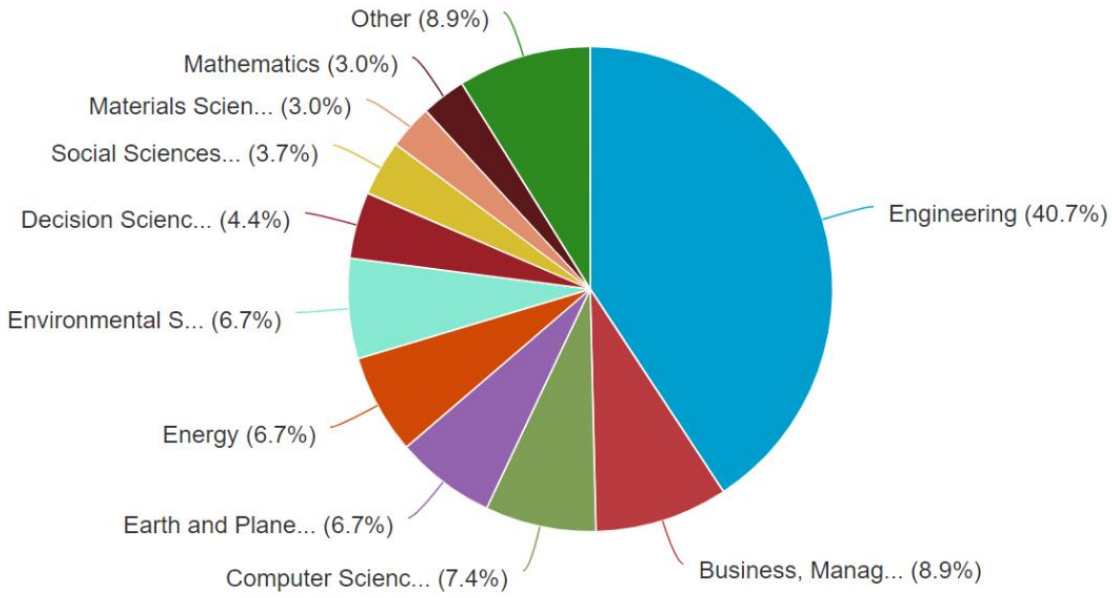

Fig. 2. Distribution of academic disciplines that have contributed to the optimization of quality management practices for residential buildings

3.3. Co-Occurrence Keywords Analysis

The figure illustrates the co-occurrence of keywords that pertain to the optimization of project management practices for quality practices in residential buildings. It emphasizes the interdependence of a variety of topics and concepts that are essential for enhancing project outcomes in this field.

The central position of "project management" in the integration of various aspects of quality management is indicated by its emergence as a key node at the center of the network. This nucleus is surrounded by a several of groupings that represent various thematic areas.

The blue cluster emphasizes the procedural and organizational aspects of assuring quality during construction, with a particular emphasis on quality assurance, construction projects, and scheduling. The red cluster is centered on optimization, quality control, and decision-making, indicating a significant emphasis on the enhancement of decision-making processes and the optimization of workflows concerning the construction industry. The green cluster encompasses keywords such as construction, life cycle, and costs, emphasizing the significance of cost management and the comprehensive consideration of a building's lifecycle, from design to completion. The figure illustrates the interconnections between project management practices and various concepts, including optimization, decision-making, and information management. It also demonstrates that the attainment of high-quality outcomes in residential construction projects is contingent upon a variety of factors, including scheduling, costs, and lifecycle considerations. This visualization emphasizes the synergy between these disciplines and identifies potential areas for further advancement in quality management practices.

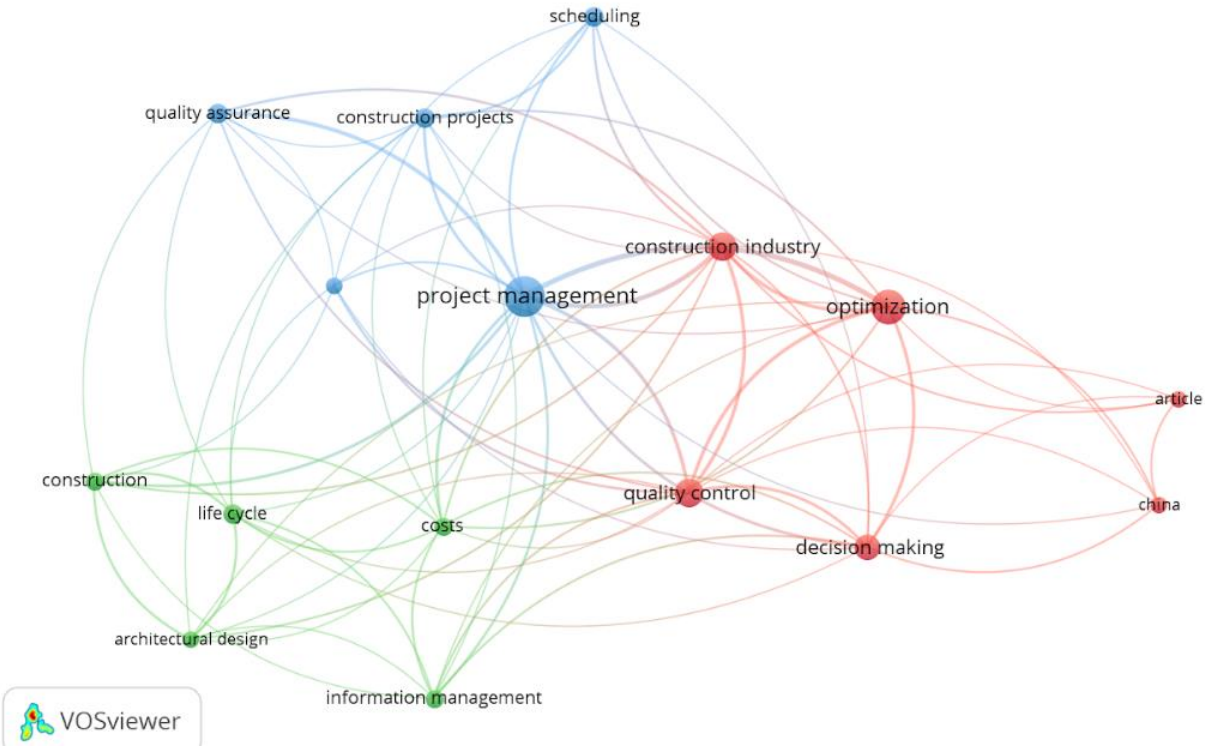

Fig. 3. Co-occurrence of keywords that pertain to the optimization of project management practices for quality practices in residential buildings

3.4. Geographical Distribution of Publications

The geographical distribution of countries that have contributed to research on the integration and optimization of project management practices for quality control in residential buildings is depicted in this figure. Four countries that are particularly noteworthy in this discipline are depicted in the heatmap. China is the most significant contributor, as evidenced by its vibrant yellow-green coloration, which implies a significant amount of research output or collaboration on this subject. The United States also plays a significant role, with a similar intensity, as it is actively involved in the optimization of project management practices for quality management in the construction industry. Australia and Canada are also visible on the map, albeit with a slightly reduced intensity, which suggests their moderate but significant contributions to the research. The global character of research on quality management in residential buildings is underscored by this map, which includes significant contributions from both Western and Eastern countries. The figure underscores the necessity of international and collaborative endeavors to promote the most effective practices in this field.

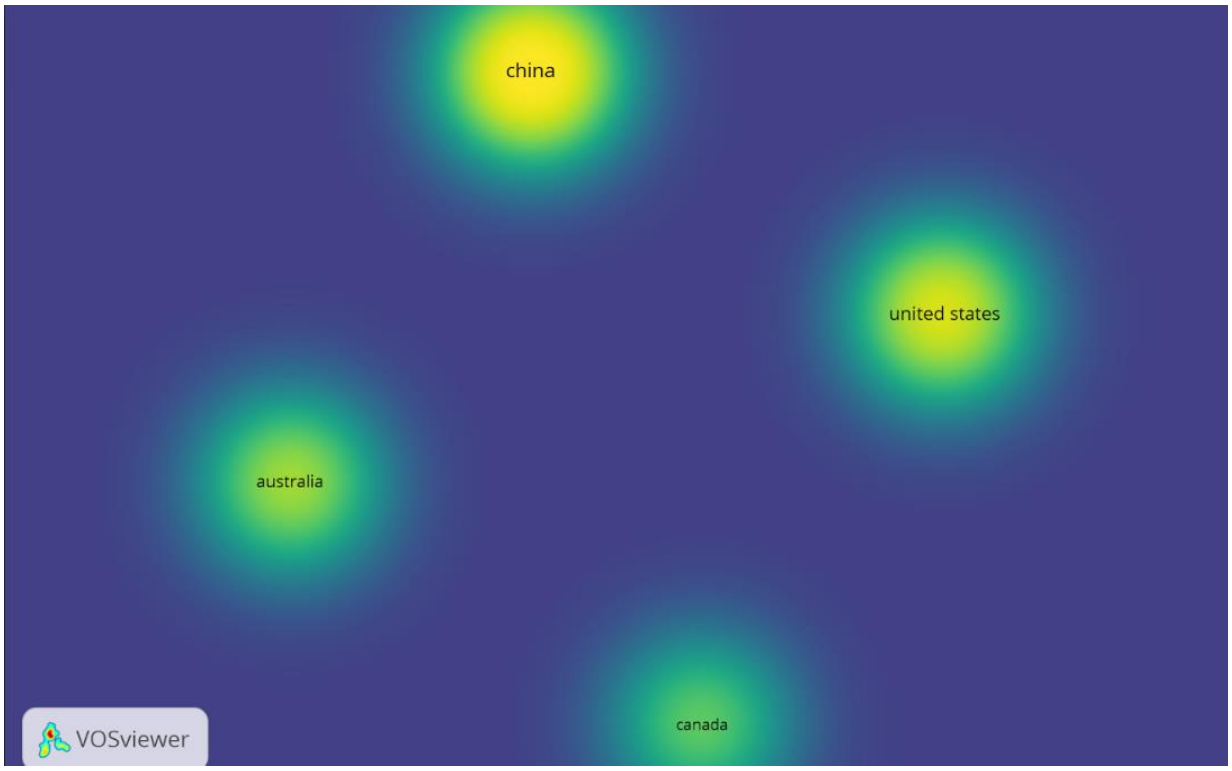

Fig. 4. Geographical distribution of publications

3.5. Citation Distribution

The number of citations per author and article concerning the optimization and integration of project management practices for quality practices in residential buildings is depicted in this figure. The citation count is represented by the size of each circle, with larger circles indicating more frequently cited works or authors. Forbes (2010) and Begum et al (2007) are particularly noteworthy for their contributions, which are extremely influential in this field, as evidenced by their substantial circles. These works are likely to be used as foundational references by other researchers who are investigating similar topics. Li and Durbin (2011), Amudo and Inanga (2011) are additional prominent authors whose research has also garnered significant attention.

Other authors such as Abdul-Rahman et al (2010), Sørensen and Jensen (2009), and Kallab and Al-Masri (2017) have smaller but notable citation counts, indicating their relevance in specific areas within the broader topic. The figure also emphasizes a diverse array of authors with lower citation counts, which suggests a widespread interest in this field of study. However, certain works have clearly had a more significant impact on the academic community. The existence of anonymous entries implies that certain sources may be classified as general or unspecified authorship, despite their continued relevance in the research landscape. In conclusion, this visualization emphasizes the influential publications and key contributors in the field of optimizing project management practices for quality management in residential structures. It emphasizes both established works and emergent research that is still influencing the field.

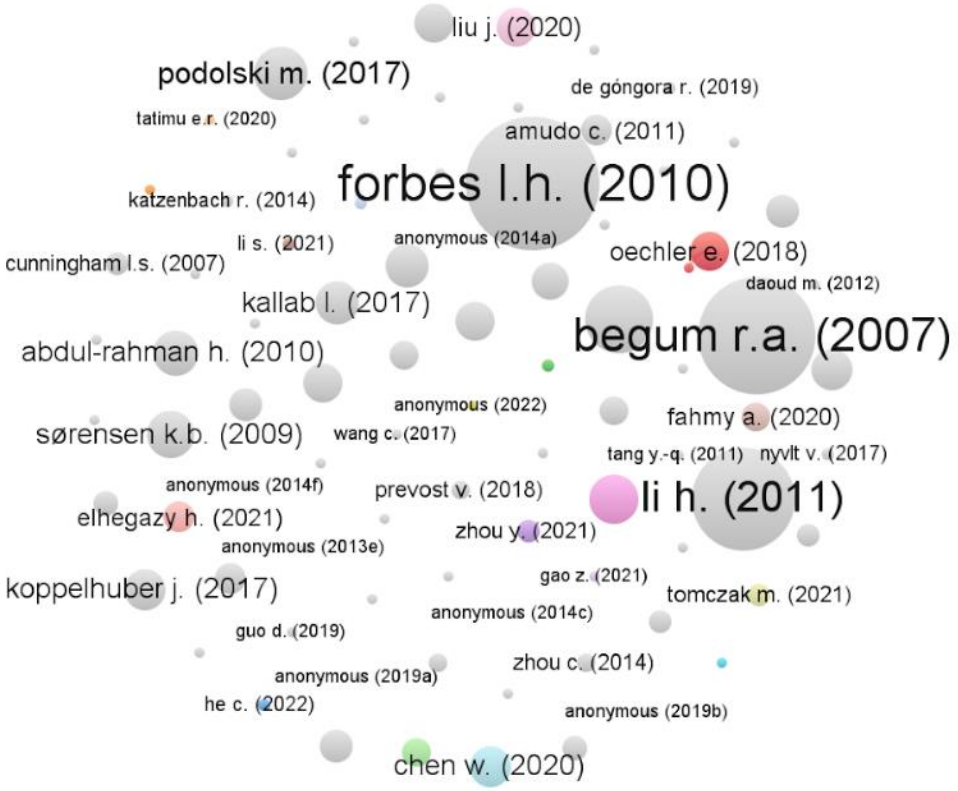

Fig. 5. Number of citations per author and article concerning the optimization and integration of project management practices for quality practices in residential buildings

4. Conclusions

The integration and optimization of project management practices for quality management in residential buildings are revealed by the bibliometric analysis, which reveals several key trends and insights. A distinct pattern has emerged in the development of research in this discipline, with minimal activity from 1995 to 2005, followed by a substantial increase in publications between 2006 and 2015. The apex of research activity is observed during this period, which underscores the increasing significance of optimising project management practices to enhance quality control in residential construction. Nevertheless, the decrease in publications after 2015 implies that the field may have attained a state of maturity or that new trends are arising, diverting attention from conventional optimisation techniques.

Another significant discovery is the interdisciplinary nature of this research, with engineering making the most significant contribution (40.7%) to the optimisation of quality management practices. Various aspects of residential building quality are also significantly improved by other disciplines, including business and management, earth sciences, energy, and computer science. This diversity emphasises the necessity of a comprehensive quality management strategy that incorporates technical, managerial, environmental, and computational insights.

The central role of project management in attaining high-quality outcomes is further underscored by the co-occurrence analysis of keywords. The close correlation between the terms "optimisation," "quality control," and "decision-making" suggests that it is essential to enhance decision-making processes and optimise workflows to achieve successful project outcomes. In addition, sustainable and efficient construction practices are contingent upon cost management and lifecycle considerations. China and the United States are the primary contributors to research in this field, which is indicative of their dedication to the advancement of construction quality standards. Australia and Canada also make significant contributions, indicating a global interest in enhancing residential building practices through optimised project management.

The citation distribution emphasises influential authors, including Forbes (2010) and Begum (2007), whose contributions have had a substantial impact on the discipline. The broad interest in this topic is

evidenced by the presence of numerous other authors with lesser citation counts. However, certain foundational works continue to influence a significant portion of the current research.

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