ISSN 2409-2665
Journal of Logistics, Informatics and Service Science
Vol. 12 (2025) No. 6, pp. 77-96
DOI:10.33168/JLISS.2025.0605

A Scientometric Review of Quality Management, Employee Satisfaction, and Organizational Effectiveness in the Construction Industry: A Visualization with CiteSpace

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Abstract. This study employs a scientometric approach to delineate the knowledge structure, evolutionary trajectory, and research frontiers at the intersection of quality management, employee satisfaction, and organizational effectiveness within the construction industry. Leveraging the CiteSpace software, a comprehensive analysis was conducted on 344 core documents retrieved from the Web of Science (WoS) Core Collection for the period 2010-2025. The analysis reveals a distinct paradigm shift in the research landscape, evolving from an initial focus on process-centric themes such as "lean construction" and "performance" towards a more human-centric paradigm. Recent research frontiers are increasingly centered on "transformational leadership," "safety climate," and most notably, "job satisfaction." Findings indicate that while the relationship between quality management and organizational effectiveness is well-established, the mediating role of employee satisfaction is an emerging and underexplored frontier. The research landscape is globally led by the USA and China, yet institutional collaboration networks appear fragmented. The study concludes that the field is undergoing a profound human-centric transformation, positing that investing in employee well-being is no longer a soft management option but a core strategic engine for driving quality improvement and maximizing organizational effectiveness.

Keywords: Quality Management, Employee Satisfaction, Organizational Effectiveness, Construction Industry, CiteSpace

1. Introduction

The construction industry, as a vital pillar of the national economy, plays a crucial role in socioeconomic development. It is not only the core force behind infrastructure construction, housing supply, and the improvement of industrial facilities but also a key engine driving growth in both public and private sectors (Hoo, 2010; Hossain, 2015). With the acceleration of urbanization and industrialization in China, the scale of the construction industry has continuously expanded. However, this growth has been accompanied by increasingly prominent issues in engineering quality management, which have become long-term challenges for the industry. The complexity of construction projects, including the coordination of multiple stakeholders, tight schedules, variable materials, and unpredictable environmental factors, makes it particularly difficult to maintain stable and reliable quality throughout the project lifecycle (Wang & Li, 2020; Wang & Zhang, 2021; Wu & Li, 2020). Effective quality management is not only fundamental to ensuring the lifespan and functionality of construction projects but also directly determines the development path and future direction of the entire construction industry (Wang Shengxia, 2021).

The scope of quality management extends far beyond the mere conformity of the final product; it has become deeply integrated into all levels of organizational management, serving as a key indicator of Organizational Effectiveness. An efficient quality management system can significantly enhance a company's market competitiveness, optimize cost control, and increase social satisfaction (An, 2019; Li & Li, 2020; Ma & Wang, 2021). In this process, the human factor, particularly Employee Satisfaction, plays a crucial role. Related studies, such as Herzberg's Two-Factor Theory, indicate that employees' intrinsic motivations, such as a sense of achievement, recognition, and personal growth, are core drivers for improving work quality and efficiency. Therefore, positive employee satisfaction can translate into higher work engagement and better quality output, thereby directly or indirectly promoting the improvement of overall organizational effectiveness (Jones & Smith, 2020; Lee & Kim, 2021). In the construction industry, quality management, employee satisfaction, and organizational effectiveness form a complex network of interconnected and interacting elements.

Academic research on quality management in the construction industry has matured, yielding abundant theoretical and empirical results. However, existing research also has certain limitations, such as a disconnect between theoretical frameworks and the practical challenges faced by quality management departments (Choi & Chu, 2008; Choi & Chu, 2011; Choi & Chu, 2010), and a research perspective that often focuses on micro-level empirical analysis, lacking a macroscopic, dynamic grasp of the knowledge structure, evolutionary trajectory, and research frontiers in this field. With the explosive growth in the number of relevant publications, traditional literature review methods are increasingly unable to comprehensively and objectively reveal the full picture and internal structure of this research area.

Against this backdrop, to overcome the subjectivity and limitations of traditional literature reviews in revealing the full landscape of a field, this study introduces the Scientometrics method. Leveraging the visualization analysis software CiteSpace, it conducts a systematic bibliometric analysis of the field of "quality management, employee satisfaction, and organizational performance in the construction industry." By quantitatively analyzing and visually presenting massive amounts of literature data, this method can objectively and clearly identify the core knowledge base, key research hotspots, and future evolutionary frontiers within the field (Chen, 2006).

This study selected the Web of Science (WoS) Core Collection database as the sole data source due to its authoritative literature quality and complete citation data, making it an ideal data foundation for knowledge mapping analysis. To construct a literature sample that is both comprehensive and precise, the retrieval time span was set from 2010 to 2025, and the document types were limited to "Article" and "Review." The search strategy adopted a modular approach by topic. However, to avoid missing literature due to the strong interdisciplinary nature of the research topic, a simple direct intersection of

three modules was not used. Instead, a more inclusive "pairwise combination" strategy was employed, as follows: First, a quality management module (independent variable) was constructed, including keywords such as "Quality Management," "Total Quality Management (TQM)," and "Lean Construction." Second, an employee satisfaction module (mediating variable) was constructed, including keywords such as "Employee Satisfaction," "Job Satisfaction," "Employee Engagement," and "work environment." Finally, an organizational performance module (dependent variable) was constructed, including keywords such as "Organizational Performance," "Project Success," and "Firm Performance." Three combined searches were performed using Boolean logic: (Quality Management Module AND Employee Satisfaction Module), (Employee Satisfaction Module AND Organizational Performance Module), and (Quality Management Module AND Organizational Performance Module). All searches were contextualized with "construction industry." After merging and deduplicating the results of the three searches, a total of 344 English documents highly relevant to the theme of this study were finally selected as the data sample for this visualization analysis.

This study aims to achieve the following specific objectives through CiteSpace's visualization analysis:

To sort out the knowledge map structure of quality management, employee satisfaction, and organizational effectiveness in the construction industry, clarifying the core knowledge base in this field.

To identify the core research forces in this field (including core authors, research countries/regions) and their collaborative networks, and to unearth key landmark literature.

To reveal the evolution and dynamic changes of research hotspots in this field, and to identify current research frontiers and potential future research trends.

2. Literature Review

2.1.The Theoretical Evolution and Core Frameworks of Quality Management

As a discipline, the intellectual roots of quality management can be traced back to the pursuit of craftsmanship and standards in ancient handicraft periods, but its evolution as a systematic theory began with the wave of industrialization in the early 20th century. Early on, Frederick Taylor, known as the "Father of Scientific Management," proposed concepts such as scientific division of labor and standardized production in his 1911 book "The Principles of Scientific Management." These ideas led to the creation of specialized quality inspection departments, making quality inspection an independent function within organizational processes for the first time, marking the nascent stage of quality management.

As industrial production became more complex, the theory and practice of quality management entered a rapid development phase. Hugh Hart introduced Statistical Process Control (SPC) and quality improvement theories in 1925, applying mathematical methods to quality monitoring. Subsequently, Dr. W. Edwards Deming, revered as the "Father of Modern Quality Management," emphasized the positive relationship between improving quality and increasing productivity. He proposed the famous "Deming's 14 Points" and the PDCA (Plan-Do-Check-Act) cycle. His theories aimed to lay a solid theoretical foundation for modern quality management through continuous quality improvement, encouraging employee participation, and integrating professional technology with modern management (Byrne, 2016).

TQM is one of the most widely applied quality management frameworks, a management method that achieves long-term success through customer satisfaction and continuous improvement. At its core, TQM represents a cultural shift within an organization, emphasizing that all employees, from top management to frontline workers, must actively participate in the quality improvement process (Chowdhury, 2020; Ahmed & Niazi, 2021). This theory advocates that quality should be a fundamental component of the organizational culture, requiring the collective effort of all stakeholders, including employees, suppliers, and customers. In the construction industry, TQM promotes regular project

evaluations, root cause analysis of defects, and efforts to eliminate inefficiencies in processes. Its ultimate goal is to ensure that projects meet or even exceed customer expectations through full employee participation and systematic process optimization (Salama & Baha, 2020).

Lean construction theory originated from lean manufacturing principles in the manufacturing industry and has been successfully applied to the construction sector. Its core philosophy is to deliver higher quality products at lower costs by eliminating waste, improving efficiency, and optimizing processes (Womack & Jones, 2021). "Waste" in lean construction is broadly defined as any activity that does not create value for the end customer, including waste of time, materials, and labor. This theory encourages all project team members, including contractors, suppliers, and clients, to collaboratively identify areas for improvement and foster a culture of cooperation. By applying lean techniques such as just-in-time delivery, prefabrication, and value stream mapping, construction projects can effectively reduce waste, shorten project durations, and enhance quality, thereby achieving high-quality output while controlling costs (Alves & Formoso, 2021).

Six Sigma, originally introduced by Motorola in the 1980s, is a data-driven quality management methodology focused on reducing process variation and defects. It utilizes statistical analysis and quality tools through a systematic DMAIC (Define-Measure-Analyze-Improve-Control) pathway to identify, analyze, and solve problems. The goal of Six Sigma is to reduce the defect rate of a product or service to 3.4 defects per million opportunities. In the construction industry, although its application is not as widespread as in manufacturing, its emphasis on data-driven decision-making and continuous process optimization provides a methodological framework for solving complex quality issues, such as reducing construction errors, optimizing material usage, and improving the stability of project delivery.

2.2.Research on Quality Management in the Construction Industry

When applying general quality management theories to the construction industry, its unique characteristics, such as long project cycles, huge investments, and multi-party collaboration, must be considered. Globally, the construction industry has developed diverse and increasingly refined quality management systems through long-term practice. Western developed countries, as pioneers of modern quality management, offer particularly valuable experience. Taking the United States as an example, the government plays a primary supervisory role in project quality by establishing a comprehensive legal and regulatory system and emphasizing a responsibility system of "who designs, takes responsibility; who builds, manages," ensuring the effective implementation of engineering quality (Kandampully & Suhartanto, 2000). Germany, on the other hand, has introduced professional third-party inspection agencies to conduct quality checks on new projects and has set extremely strict qualification requirements for practitioners. France, through a series of professional regulations such as the "Construction Law," has formed a strict quality assurance network with dual official and private supervision (Jin, 2004). In these practices, the ISO 9000 quality management system has been widely applied, emphasizing organizational management, process control, and continuous improvement, providing a standardized management framework for construction enterprises (Ahmed, Aoieong, & Tang, 2005).

China's construction industry quality management system has continuously evolved and developed based on international experience and in conjunction with national conditions. Its development history spans from the exploratory stage in the early days of the People's Republic of China, through the initial establishment of the system after the reform and opening-up, to the standardization and quality supervision strengthening stage since the 21st century. Currently, domestic construction industry quality management primarily relies on the core policy of "century-long plan, quality first," forming a comprehensive management model based on national standards and specifications (such as the "Code for Acceptance of Construction Quality"), enhanced by quality management system certifications like ISO 9001, supplemented by professional quality testing agencies, and actively applying advanced technologies such as Building Information Modeling (BIM) and drone inspections. From the ancient

pursuit of extreme architectural quality, such as the "responsibility to individual" system of the Nanjing City Wall in the Ming Dynasty, to modern scientific and information-based management methods, China's construction quality management continues to improve through inheritance and innovation (Goldratt & Cox, 1992).

In the complex process of construction service delivery, relying solely on processes and standards makes it difficult to comprehensively measure quality, and service experience has become an increasingly important dimension. Therefore, the theory of Service Quality has been introduced into the construction industry, providing a new perspective for evaluating and improving quality management. The SERVQUAL model proposed by Parasuraman et al. (1988) deconstructs service quality into five core dimensions, which are also applicable to assessing the quality management level of the construction industry.

2.3.The Crucial Role of Employee Satisfaction in Organizational Effectiveness

The successful implementation of quality management and the ultimate achievement of organizational effectiveness fundamentally depend on the most active factor within an organization—people. Without the active participation and efficient execution of employees, any advanced management system and process will remain mere empty talk. Therefore, from the perspective of management psychology and organizational behavior, examining the bridging role of Employee Satisfaction between quality management and organizational effectiveness is crucial for understanding management practices in the construction industry.

In the field of service science, there is a general consensus that the way an organization treats its employees directly affects how employees treat external customers. Therefore, high-quality internal service (the support, environment, and management provided by the organization to its employees) is a prerequisite for achieving high-quality external service and excellent organizational effectiveness. While a large body of research focuses on external customer satisfaction, its core principles apply equally to internal customers—that is, the organization's employees. An internal work environment that can satisfy employees typically possesses high levels of service quality characteristics, such as reliable processes, timely responses, and empathetic management.

Extensive empirical research has confirmed a direct positive relationship between employee satisfaction and organizational effectiveness. Satisfied employees are more likely to exhibit high levels of engagement, productivity, and loyalty to the organization, thereby directly promoting the improvement of organizational effectiveness (Akhbar and Parvez, 2009; Bond and Fink, 2003). In the construction industry, high employee satisfaction means lower turnover rates, fewer safety incidents, and higher quality craftsmanship, all of which are key manifestations of organizational effectiveness (Hafeez & Muhammad, 2012). Furthermore, recent research in the Nepalese insurance sector corroborates the positive impact of individual factors on organizational performance, finding that employee personality traits—specifically openness to experience, conscientiousness, and agreeableness—are significant positive predictors of organizational performance (Kaspal et al., 2025). This focus on complex influence mechanisms is not an isolated case; for instance, a study on Vietnamese SMEs also employed a mediation model, confirming that leadership and digital transformation competency positively impact green business performance by stimulating business innovation (Tran & Do, 2025). Research in Iraq's public sector confirms that knowledge management capabilities enhance employee performance, and importantly, reveals a complex moderating effect where training effectiveness specifically amplifies the positive impact of knowledge sharing and application on performance (Hasan et al., 2025). A study on tax organizations found that social capital (such as relational networks and shared values) enhances organizational performance, and demonstrated through a complex moderation model that this positive impact is significantly amplified when organizational trust is high (Hong, 2025). Therefore, employee satisfaction is not only a "barometer" of organizational health but also a crucial mediating variable connecting management practices with ultimate business

outcomes. An effective quality management system, by improving work processes, providing growth opportunities, and fostering a positive culture, can significantly enhance employee satisfaction, and this satisfaction will ultimately translate into tangible organizational effectiveness, forming a virtuous cycle of "excellent management → employee satisfaction → organizational efficiency." This virtuous cycle is further supported by research in the Malaysian ICT sector, which empirically demonstrated that among various HRM practices, fostering employee loyalty has the strongest negative correlation with turnover intention, directly linking human-centric management to organizational stability (Rahman et al., 2025).

3. Results and Discussion

3.1.Keyword Co-occurrence

Keyword co-occurrence analysis is a core method for revealing the main research hotspots and their interrelationships within a discipline by statistically counting the frequency of keywords appearing together in literature. High-frequency keywords represent research hotspots in the field over a period, while high-centrality keywords are typically "bridges" or "hubs" connecting different research topics, reflecting the knowledge structure of the field.

The keyword co-occurrence network generated in this study (see Figure 1) includes 379 nodes (N=379) and 1307 edges (E=1307), with a network density of 0.0182. The network's modularity Q-value is 0.5484, significantly greater than the critical value of 0.3, indicating a very prominent community structure in this research area; the average silhouette S-value is 0.8122, far exceeding the high homogeneity standard of 0.7, which suggests that the clustering results of this network division are of extremely high quality and exhibit strong internal homogeneity.

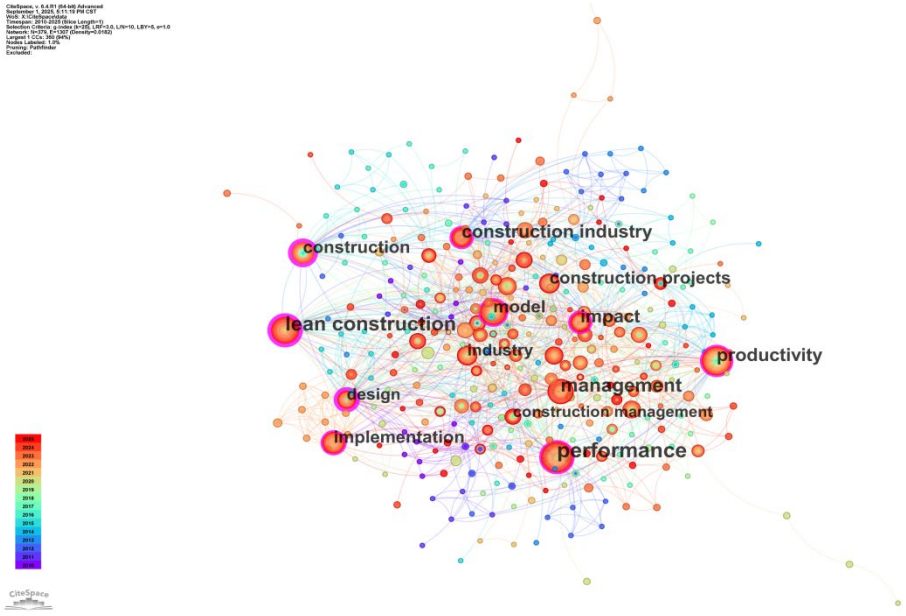

Fig.1: Keyword co-occurrence network

Table 1 lists the top 20 keywords by frequency and centrality, showcasing the core research framework in this field. As seen in the table, terms such as "performance," "lean construction," "management," and "impact" rank high in frequency, outlining the core of the research: using advanced management theories like "lean construction" as the primary method to deeply explore their "impact" on the "performance" of the construction industry. Keywords such as "lean construction," "design," "construction," and "performance" not only have high frequencies but also prominent betweenness centrality, indicating that they are key hubs connecting different research topics and form the backbone of the knowledge network in this field. This suggests that the research focus is not only on the results

(performance) but also on the processes and methodologies (lean construction, design, implementation) for achieving these results.

A deeper analysis of the keywords reveals that all three core themes of this study are present, but with different emphases. Keywords related to organizational effectiveness, such as "performance," "productivity," and "project success," appear very frequently and are absolute research hotspots in the field. Keywords related to quality management, such as "lean construction," "management," and "project management," also constitute the main content of the research. However, the keyword directly related to employee satisfaction, "job satisfaction," although it entered the Top 20, has a relatively low frequency (18 times) and appeared later (2017). Although the direct relationship between quality management and organizational effectiveness has been widely discussed, the mediating role of employee satisfaction in this context may be a relatively new or underexplored research direction, highlighting the innovative value of this study.

Table 1: Top 20 High-Frequency Keywords in Research Fields

No.	Count	Centrality	Year	Keywords
1	62	0.20	2010	performance
2	55	0.22	2011	lean construction
3	43	0.05	2010	management
4	39	0.17	2010	impact
5	38	0.19	2011	construction industry
6	34	0.16	2011	productivity
7	32	0.10	2010	model
8	29	0.06	2014	construction projects
9	28	0.22	2011	construction
10	28	0.11	2010	implementation
11	24	0.26	2010	design
12	24	0.08	2012	industry
13	19	0.09	2011	construction management
14	18	0.05	2017	job satisfaction
15	17	0.09	2011	framework
16	16	0.05	2011	project management
17	16	0.03	2020	project success
18	16	0.06	2014	human resource management
19	15	0.05	2010	project performance
20	15	0.08	2015	earned value management

3.2.Keyword Clustering

Keyword clustering analysis can organize hot words in co-occurrence networks into meaningful "thematic groups," thereby revealing the research structure and core issues of the field in greater depth. This study uses the LLR (Log-Likelihood Ratio) algorithm to cluster the keyword network and interprets the top 12 largest clusters (see Figure 2 and Table 2). According to the CiteSpace results, the network modularity Q value generated by this analysis is 0.5677, which is much greater than 0.3, indicating a significant community structure; the weighted average silhouette S value is 0.7719, which is higher than 0.7, indicating high internal homogeneity of the clustering results and reliable partitioning quality.

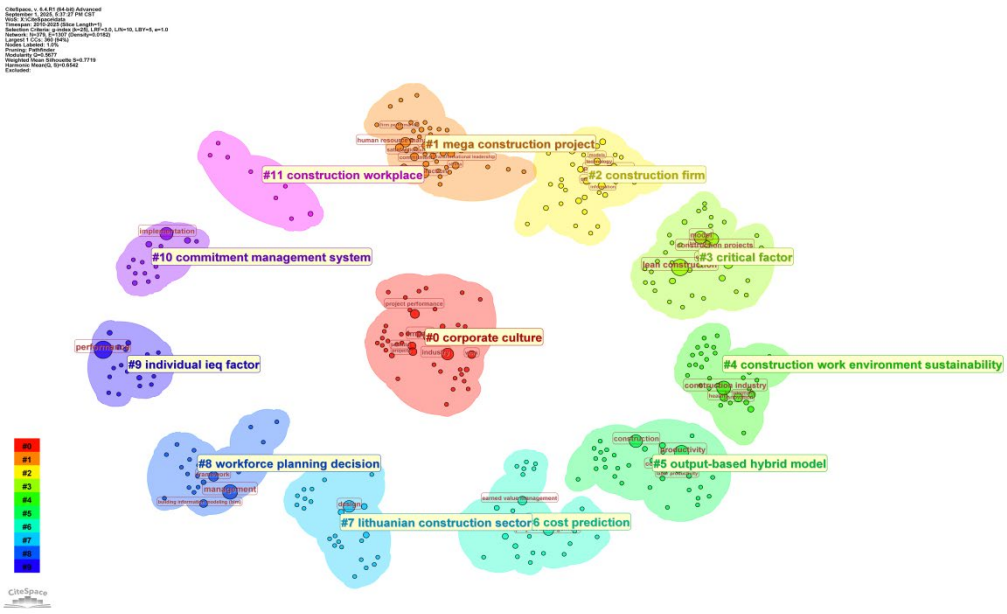

Fig.2: Hotspot Clustering Map of Research on Quality Management, Employee Satisfaction, and Organizational Effectiveness in the Construction Industry

Table 2: Hotspot Clustering Analysis Table of Research on Quality Management, Employee Satisfaction, and Organizational Effectiveness in the Construction Industry

Cluster ID (#)	Size	S	LLR Label	Core Keywords	Interpretation & Refined Label
0	43	0.676	corporate culture	corporate culture, total quality management, project performance, employee wellbeing, organizational support	Impact of Culture & TQM on Performance
1	42	0.825	mega construction project	mega construction projects, human resource management, job satisfaction, turnover intention, organizational commitment	HRM's Role in Mega Projects & Employee Outcomes
2	40	0.621	construction firm	construction firm, organizational performance, lean implementation, knowledge management, digital transformation	Drivers of Firm-Level Performance & Innovation
3	39	0.789	critical factor	critical factor, project performance, schedule performance, lean construction, success factors	Identifying Critical Success Factors in Lean Projects
4	38	0.835	construction work environment sustainability	sustainability, work environment, psychosocial risks, absenteeism, human performance	Workplace Sustainability, Health, & Human Performance
5	36	0.727	output-based hybrid model	model, productivity, performance, job satisfaction, innovation	Developing Models for Performance & Productivity

6	29	0.673	cost prediction	cost prediction, project controls, last planner system, lean management, schedule behavior	Lean Project Controls for Cost & Schedule
7	25	0.930	lithuanian construction sector	construction sector, workplace safety, earned value management, environmental management	Implementation of Regional Safety & Management Systems
8	23	0.833	workforce planning decision	workforce planning, labor productivity, employee performance, quality management system, psychosocial stressor	Optimizing Workforce Planning & Labor Productivity
9	21	0.792	individual ieq factor	individual factors, workspace satisfaction, employee satisfaction, customer satisfaction, labor productivity	Impact of Individual Factors on Satisfaction & Productivity
10	16	0.900	commitment management system	commitment management, implementation, lean human resource management, variability, feedback	Implementing Lean Systems for Commitment Management
11	8	0.962	construction workplace	construction workplace, safety climate, innovation, work environment, creativity	Fostering a Climate for Safety & Innovation

Clusters #2, #3, and #5 collectively form the core results-oriented cluster of research in this field. Cluster #2, "construction firm," is one of the largest clusters, indicating that the "firm" is the primary unit of analysis for measuring overall success. Core cited literature within this cluster, such as papers on "sustainable organizational performance" and "project success," confirms this focus. Cluster #3, "critical factor," and Cluster #5, "output-based hybrid model," further deepen this theme by focusing on methodologies for achieving success. The appearance of "critical success factors" in Cluster #3, and keywords like "model" and "productivity" in Cluster #5, highlight the field's commitment to identifying key drivers and creating frameworks to enhance organizational and project performance.

Clusters #0, #4, and #11 constitute the core environment and culture-oriented cluster of research in this field. Cluster #0, "corporate culture," is the largest cluster with 43 members, indicating that organizational culture is the most classic paradigm for exploring performance drivers. Its core cited literature, such as the paper titled "The Impact of Corporate Culture and Total Quality Management on Construction Project Performance," directly supports this. Cluster #4, "construction work environment sustainability," and Cluster #11, "construction workplace," deepen this theme, emphasizing the importance of both physical and psychological environments. The presence of keywords such as "sustainability," "safety climate," and "work environment" suggests that research is shifting from abstract cultural discussions to specific workplace aspects that affect employee well-being and, consequently, performance.

Clusters #1, #8, #9, and #10 are the most insightful human-centric and process-mechanism clusters in this analysis. Cluster #1, "mega construction project," highlights human resource management as a critical mechanism for success, especially in complex project environments. Its main cited literature focuses on topics such as "bundles of HR practices," "affective organizational commitment," and "toxic leadership," pointing to the direct impact of leadership and human resources on project outcomes. Cluster #8, "workforce planning decision," and Cluster #9, "individual IEG factor," delve deeper into the employee experience, with keywords like "employee performance measurement" and "employee satisfaction" at their core. The emergence of Cluster #10, "commitment management system," with an average year of 2022, points to a new frontier. It focuses on "lean human resource management" and

"management of commitments," providing a literature base for understanding how specific management systems can directly foster employee commitment and drive project success.

3.3.Keyword Burst Detection

Keyword Burst Detection analysis identifies terms that have suddenly garnered significant attention from scholars within a specific timeframe, thereby revealing the dynamic evolution of research frontiers. This study identified the 15 keywords with the highest burst intensity, with their start and end years and intensity shown in Figure 3.

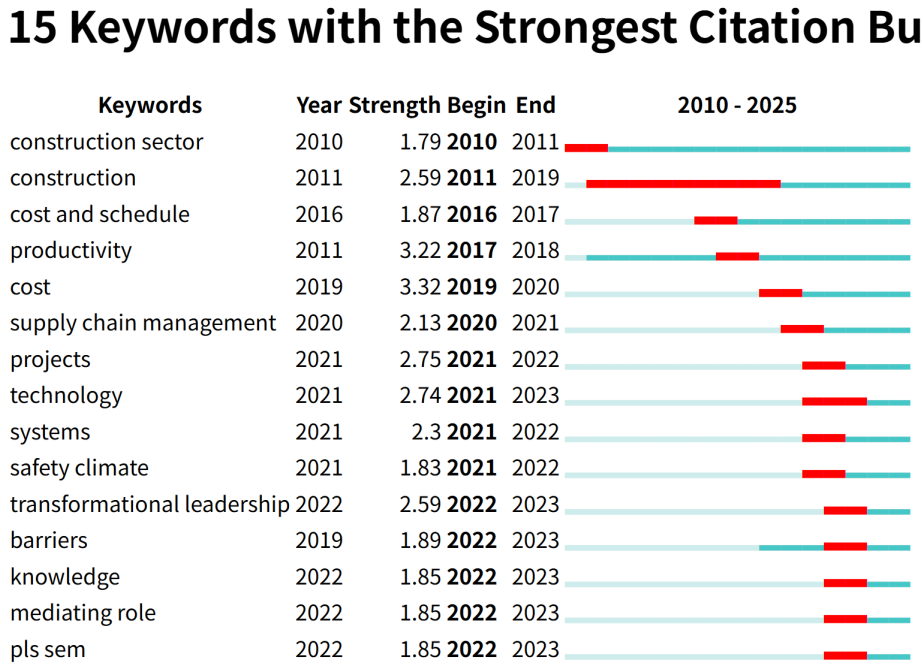

Fig.3: Keyword Bursts

The evolution of research frontiers can be broadly divided into three stages:

Stage 1 (2010-2018): Focus on Productivity and Basic Project Management. The earliest burst term, "construction sector" (2010-2011), marked the initial positioning of the research. Subsequently, "construction" (2011-2019) and "productivity" (2011-2018) showed long-lasting and high-intensity bursts, indicating that for a considerable period, improving the productivity of construction projects was a core frontier and a challenging problem in the field. The burst of "cost and schedule" (2016-2017) reflected a research focus on the classic constraints within the "iron triangle" of project management.

Phase 2 (2019-2021): Shifting to specific management methods and challenges. From 2019 onwards, research frontiers began to diverge and deepen. The emergence of the most intense burst term "cost" (2019-2020) indicated a renewed high focus on cost control. At the same time, the emergence of "supply chain management" (2020-2021) and "barriers" (2019-2023) marked a shift in research perspective from macro productivity issues to more specific management methods (such as supply chain management) and the practical obstacles and challenges encountered in implementing these methods.

Phase 3 (2021-Present): Moving towards new frontiers in technology, human factors, and complex models. From 2021 onwards, research frontiers have shown an explosive trend of diversification and theoretical deepening. Firstly, technology-driven research, represented by "technology" (2021-2023), became a new hot spot. Secondly, and most critically, there was an increasing emphasis on the "human" factor. For example, the strong emergence of "safety climate" (2021-2022) and "transformational leadership" (2022-2023) indicates that the research frontier is shifting from traditional "material" management to the exploration of soft factors such as organizational climate and leadership, which is

highly relevant to the core variable of this study, "employee satisfaction." Finally, at the research methodology and theoretical level, the emergence of "mediating role" (2022-2023) and "PLS-SEM" (Partial Least Squares Structural Equation Modeling, 2022-2023) demonstrates that the current research frontier is moving from simple causal relationship exploration to in-depth analysis of complex influence mechanisms (such as mediating effects and moderating effects).

3.4.Timeline View

The Timeline View integrates cluster analysis with temporal dimensions, providing an intuitive visualization of the emergence, development, and decline of research themes (clusters). It reveals the inheritance and evolutionary relationships between themes. Figure 4 presents the timeline map of major clusters in this research field, from which a clear evolutionary trajectory can be observed.

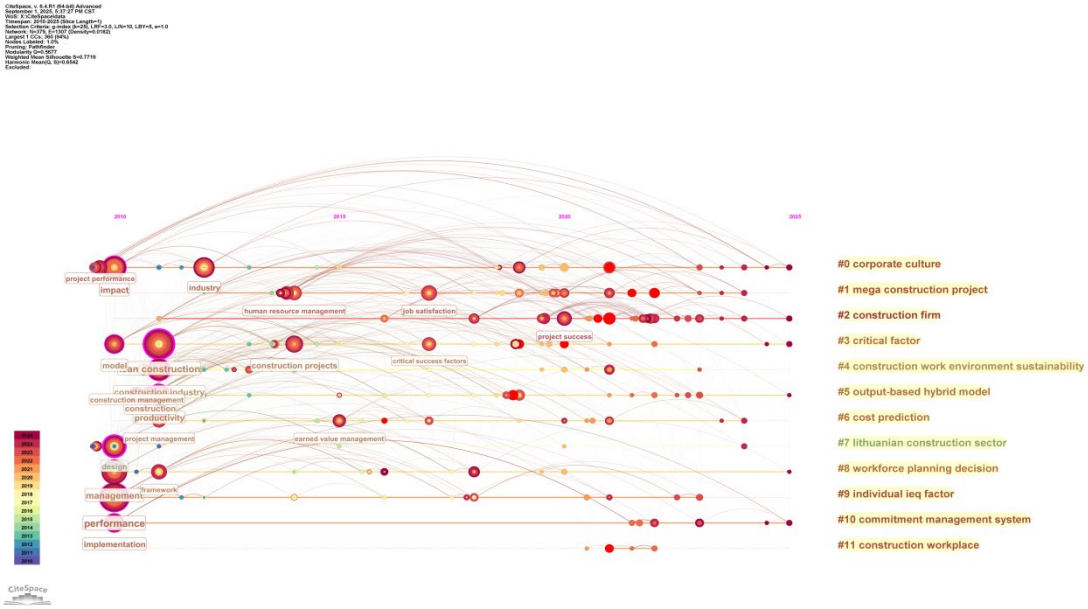

Fig.4: Timeline view

During the foundational and developmental stages of research (approximately 2010-2016), research topics primarily revolved around macroscopic performance improvement and fundamental project management elements. Clusters #5 "output-based hybrid model" and #2 "construction firm" were particularly active during this period, with keywords such as "performance," "productivity," "management," and "model" within them appearing in large and dense nodes, indicating that the early research core was to build management models to enhance the overall productivity and performance of construction firms and projects. This stage laid the foundation for the field, with "performance" as the core objective, exploring management-level solutions.

Entering the deepening and differentiation stage (approximately 2017-2021), research topics began to develop in more specific and in-depth directions. Cluster #0 "corporate culture" became very active during this period, showing that researchers began to recognize the important impact of soft organizational factors (such as corporate culture) on performance. At the same time, the emergence of cluster #4 "construction work environment sustainability" shifted attention to issues such as the work environment, health, and safety. Most notably, "job satisfaction," one of the core variables of this study, began to appear and develop during this stage (around 2017), indicating that the research perspective was gradually shifting from macroscopic organizational performance to focusing on the "human" factors that constitute the organization.

In the integration and frontier stage (2022 to present), research topics show a highly integrated and human-centered trend. On the one hand, early themes such as performance and project management

continue to be vital but are beginning to intersect and integrate with new themes. For example, the continued activity of "human resource management" in cluster #1 "mega construction projects" indicates the increasing importance of human resource management in large-scale projects. On the other hand, research related to individuals and teams has become a new frontier. Newer clusters such as #9 "individual leq factor" and #10 "commitment management system" directly focus on individual satisfaction and organizational commitment management. Combined with the emergence of new frontiers such as "transformational leadership" and "safety climate" in the burst word analysis, it is clear that current research hotspots are focusing on how to stimulate employee enthusiasm and satisfaction through leadership, organizational culture, and safety climate, thereby achieving higher levels of organizational effectiveness. The evolution of research clearly demonstrates a logical progression from focusing on "things" (project performance, productivity) to focusing on "organizations" (corporate culture, business models), and finally deepening to focusing on "people" (employee satisfaction, safety, leadership).

3.5.Author Collaboration Network Analysis

The author collaboration network map (Figure 5) and the author publication statistics table (Table 3) together reveal the core researchers and their collaboration patterns in this research field. In the figure, the size of the nodes represents the number of publications by the author; the larger the node, the higher their academic output. The lines between the nodes represent the collaborative relationships between authors.

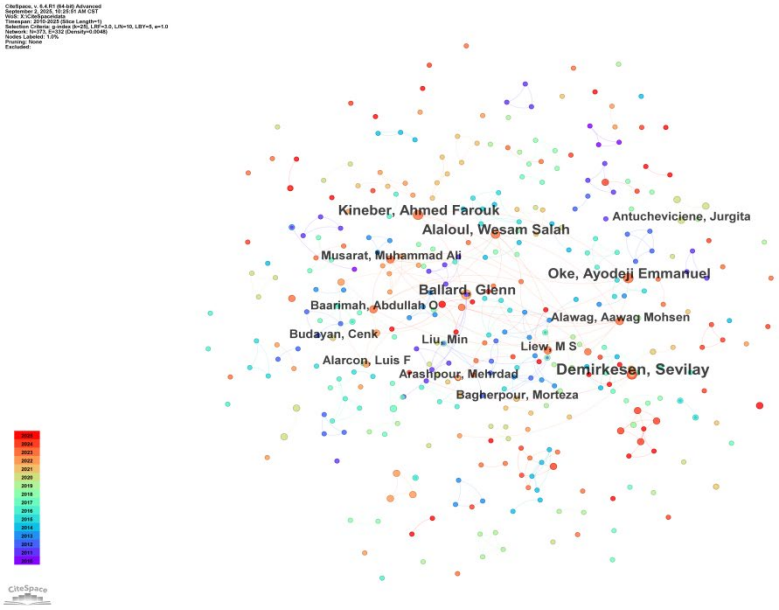

Fig.5: Author Atlas

Figure 5 as a whole presents a structural characteristic of "prominent core but overall loose." This indicates that research in this field is currently being explored by a large number of independent scholars or small research teams, and has not yet formed several large-scale, tightly cooperative, absolutely dominant academic communities. The figure shows a few larger nodes (such as Demirkasan, Sevilay; Ballard, Glenn, etc.) forming small cooperative clusters with surrounding scholars, but most scholar nodes are small and scattered, lacking cooperative connections with each other.

According to Table 3, Demirkasan, Sevilay ranks first with 5 publications, making her the most prolific scholar in this field. She is followed by Alaloul, Wasam Salah, Kineber, Ahmed Farouk, and Ballard, Glenn, all tied for second with 4 publications, making them also core contributors to this field. In addition, a group of scholars represented by Oke, Ayodeji Emmanuel, Musarat, Muhammad Ali, and others, each with 3 relevant publications, collectively form the backbone of research in this field.

Table 3：Top 30 Author Publication Statistics

No.	Author	Year	Number of publications	No.	Author	Year	Number of publications
1	Demirkesen, Sevilay	2017	5	16	Ahmed, Vian	2024	2
2	Alaloul, Wesam Salah	2016	4	17	Kokkaew, Nakhon	2022	2
3	Kineber, Ahmed Farouk	2023	4	18	Salazar, Luis A	2022	2
4	Ballard, Glenn	2011	4	19	Arroyo, Paz	2022	2
5	Oke, Ayodeji Emmanuel	2023	4	20	Alsolami, Badr	2020	2
6	Musarat, Muhammad Ali	2023	3	21	Sari, Endah Murtiana	2024	2
7	Liew, MS	2023	3	22	Valipour, Alireza	2020	2
8	Budayan, Cenk	2015	3	23	Garcia-lopez, Nelly P	2025	2
9	Bagherpour, Morteza	2015	3	24	Dikmen, Irem	2015	2
10	Baarimah, Abdullah O	2020	3	25	Durdyev, Serdar	2018	2
11	Alawag, Aawag Mohsen	2023	3	26	Abbasian-hosseini, S Alireza	2014	2
12	Arashpour, Mehrdad	2016	3	27	Birgonul, M Talat	2015	2
13	Alarcon, Luis F	2021	3	28	Bigwanto, Arviga	2024	2
14	Antucheviciene, Jurgita	2019	3	29	Liu, Cong	2020	2
15	Liu, Min	2011	3	30	El-sayegh, Sameh	2024	2

3.6.National Cooperation Network Analysis

The national/regional cooperation network map (Figure 6) and statistical table (Table 4) illustrate the countries/regions involved in research in this field globally and their cooperative relationships. The size of the node represents the total number of publications from that country/region, the purple rings outside the node represent its centrality, and the lines indicate cooperative relationships between countries/regions.

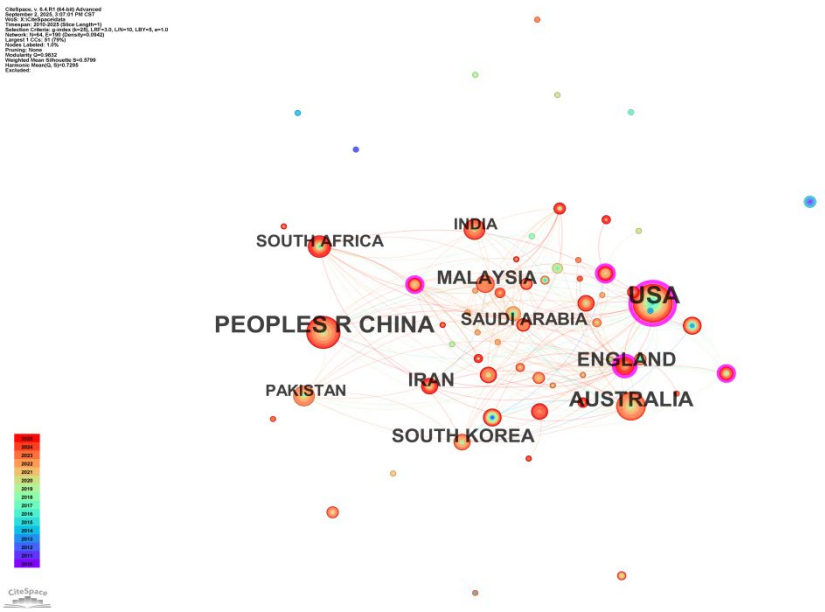

Fig.6: National Cooperation Map

From Figure 6 and Table 4, it can be seen that research in this field presents a global pattern of "dual-core leadership, multi-point participation." The United States (USA) and China (Peoples R China) are the two major core research forces in this field. The United States ranks first with 60 publications, and its centrality (0.42) is also far ahead, with the thickest purple rings outside the node, indicating that the United States is not only the most prolific country but also plays the most important "bridge" and "hub" role in the international cooperation network. China follows closely with 52 publications, ranking second, showing strong research capabilities. Countries such as Australia (35 publications), the United Kingdom (25 publications), and Malaysia (23 publications) form the second tier of research, also being important contributors to this field.

From the perspective of the collaborative network, a tightly knit collaborative group has formed with the United States and China as dual centers. As shown in the figure, the United States and China have established extensive cooperative ties with other major research countries such as Australia, the United Kingdom, Malaysia, Iran, and South Korea.

Table 4: Top 20 Countries by Publication Volume

No.	Country	Year	Number of publications	No.	Country	Year	Number of publications
1	USA	2011	60	11	INDIA	2015	14
2	PEOPLES R CHINA	2011	52	12	SPAIN	2011	12
3	AUSTRALIA	2012	35	13	CANADA	2012	12
4	ENGLAND	2011	25	14	U ARAB EMIRATES	2018	11
5	MALAYSIA	2011	23	15	TURKEY	2011	10
6	IRAN	2013	22	16	NIGERIA	2019	10
7	SOUTH KOREA	2013	22	17	NEW ZEALAND	2018	9
8	SAUDI ARABIA	2015	17	18	CHILE	2012	9
9	SOUTH AFRICA	2014	15	19	GERMANY	2016	9
10	PAKISTAN	2017	14	20	TURKIYE	2023	9

3.7.Analysis of Institutional Collaboration Networks

The institutional collaboration network map (Figure 7) and statistical table (Table 5) further focus the analysis of research power from a meso-level to specific universities and research institutions. The size of the nodes represents the number of publications by the institution, and the lines represent collaborations between institutions.

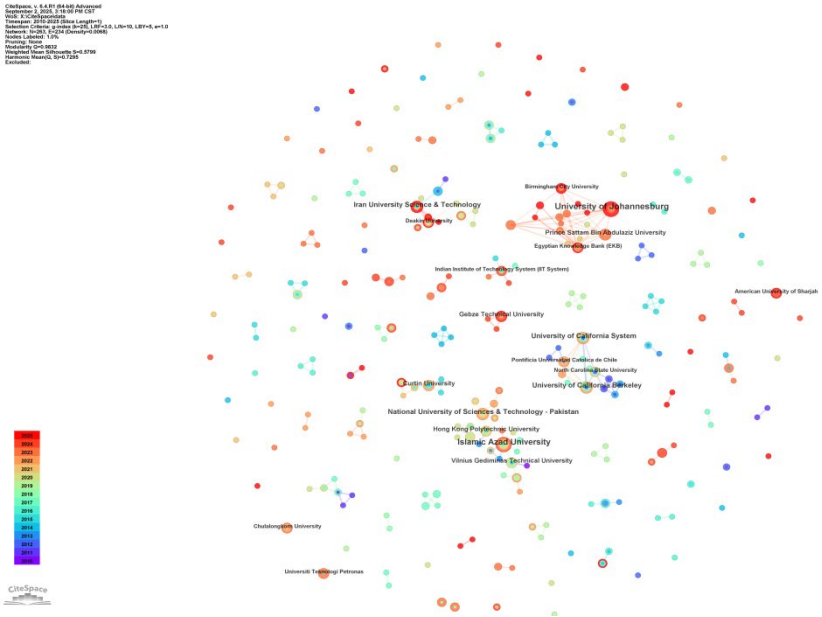

Fig.7: Institutional Collaboration Network Map

Compared to author and country-level networks, the institutional collaboration network map (Figure 7) exhibits more "decentralized" and "fragmented" characteristics. The entire network consists of a large number of isolated nodes or very small collaborative clusters, lacking one or more dominant large collaborative centers. Collaboration lines between most institutions are sparse, demonstrating that research power in this field is highly dispersed among different institutions worldwide, and large-scale, systematic inter-institutional collaboration has not yet become mainstream.

Table 5: Top 20 Institutions by Publication Volume

No.	Institution	Year	Number of publications	No.	Institution	Year	Number of publications
1	University of Johannesburg	2020	10	11	Prince Sultan Bin Abdulaziz University	2021	5
2	Islamic Azad University	2013	9	12	Pontificia Universidad Catolica de Chile	2012	4
3	Iran University Science & Technology	2014	6	13	Indian Institute of Technology System (IIT System)	2015	4
4	University of California Berkeley	2011	6	14	American University of Sharjah	2024	4
5	University of California System	2011	6	15	North Carolina State University	2011	4
6	National University of Sciences & Technology -	2017	6	16	Universiti Teknologi Petronas	2016	4

	Pakistan						
7	Gebze Technical University	2023	5	17	Chulalongkorn University	2021	4
8	Hong Kong Polytechnic University	2012	5	18	Deakin University	2020	4
9	Vilnius Gediminas Technical University	2013	5	19	Birmingham City University	2013	4
10	Curtin University	2015	5	20	Egyptian Knowledge Bank (EKB)	2022	4

The University of Johannesburg in South Africa leads with 10 publications, making it the most prolific research institution in this field. Islamic Azad University in Iran follows closely with 9 publications. Iran University of Science & Technology and the University of California System in the United States are tied for third place, each with 6 publications. Additionally, institutions such as the National University of Sciences & Technology in Pakistan, Gebze Technical University and Yildiz Technical University in Turkey, Hong Kong Polytechnic University in China, and Curtin University in Australia form the core of the second tier of research power in this field.

4. Findings and conclusions

4.1.Findings

This study systematically reveals the knowledge structure, evolutionary trajectory, and research frontiers in the field of quality management, employee satisfaction, and organizational effectiveness in the construction industry, through a scientific knowledge mapping analysis of 344 core documents. The study found that this field has formed a knowledge framework centered on "performance," "lean construction," and "management," with research long focused on improving project productivity and organizational performance through advanced management methodologies (Wang & Li, 2020). However, timeline and burst word analysis delineate an evolutionary path from focusing on "things" (project performance) to focusing on "organizations" (corporate culture), and finally deepening to focusing on "people" (employee satisfaction, leadership). Particularly in recent years, the strong emergence of keywords such as "job satisfaction," "transformational leadership," and "safety climate" indicates that the research frontier is shifting towards people-oriented management models and soft factors such as employees' psychological feelings (Jones & Smith, 2020). A comprehensive systematic review covering the last decade (2014–2024) also provides strong support for this human-centric paradigm, concluding that leadership and 'soft' Total Quality Management (TQM) practices are the most critical drivers for achieving business excellence (Fok-Yew & Kassim, 2025). This human-centric focus is further validated by a study on digital transformation, which found that during periods of change, perceived organizational support—the feeling of being valued and cared for by the organization—was the single most powerful predictor of employee performance (Aleidi, 2025). Nevertheless, "job satisfaction" appeared as a high-frequency keyword relatively late and with relatively low frequency, indicating that its mediating role in the relationship between quality management and organizational effectiveness is an emerging frontier that urgently needs in-depth exploration, which validates the foresight and value of this research topic. From the perspective of collaborative networks, this field presents a global research landscape led by the dual cores of the United States and China, but inter-institutional collaborative networks are relatively loose, leaving broad room for future large-scale inter-institutional and cross-border research teams.

4.2.Research conclusions

The scientific knowledge mapping analysis in this study ultimately concludes that the research paradigm of quality management in the construction industry is undergoing a transformation from a "technology- and process-centric" approach to a "people-centric" one. While management methods such as lean construction remain cornerstones for improving project performance and productivity in this field, the evolutionary trajectory of the research frontier clearly indicates an irreversible shift in academic focus towards soft, human, and psychological factors such as employee satisfaction, transformational leadership, and safety climate. The most critical conclusion of this study is that, despite "job satisfaction" being a key bridge connecting quality management practices with ultimate organizational effectiveness, its study as a mediating variable is still in a relatively early and underappreciated stage within the field (Baron & Kenny, 1986). The recent methodological focus on "mediation" suggests that uncovering this "black box" will be a major breakthrough for theoretical innovation in this domain in the future. Therefore, future research should move beyond traditional input-output models and concentrate more on constructing complex mediation models that integrate employee psychological perceptions and organizational behavior, to more comprehensively understand how quality management ultimately enhances organizational effectiveness by stimulating human motivation.

4.3.Insights

Managers and decision-makers in the construction industry must strategically shift their management focus from traditional "process optimization" and "cost control" to "employee well-being and organizational culture building." Research indicates that the path to improved organizational effectiveness is no longer a linear "management input-performance output" but a complex process achieved through the critical mediating variable of "employee satisfaction." This means that simply introducing technical management tools like "lean construction" is no longer sufficient to ensure a competitive advantage; managers must view investing in employees' "psychological contracts" as a strategic initiative equally important to investing in advanced technology. This aligns with the insights revealed by the classic Hawthorne studies, which showed that employees' social and psychological needs (such as being noticed and recognized) are key variables driving productivity improvements. Therefore, future quality management system designs must embed employee incentive mechanisms, open communication channels, and human-centered leadership development programs, transforming the organization into a "socio-technical" system capable of continuously stimulating employees' intrinsic motivation. This is the fundamental path to achieving excellent organizational effectiveness.

5. Conclusion

This study, themed "Quality Management, Employee Satisfaction, and Organizational Effectiveness in the Construction Industry," employs the CiteSpace scientific knowledge mapping method to visualize and analyze the macroscopic knowledge structure, evolution of research hotspots, and future frontiers within this interdisciplinary field. The research identifies core authors, institutions, and national cooperation networks, recognizes key research themes, and outlines a paradigm shift in research: from an early focus on technical processes like "lean construction" to enhance "productivity" and "performance," it gradually deepens to an emphasis on organizational and human factors such as "corporate culture," "safety climate," and "transformational leadership," ultimately converging on the humanistic issue of "employee satisfaction."

The conclusions of this study confirm that the research frontier in this field is undergoing a profound transformation from a material-centric logic to a human-centric logic. Although traditional quality management and organizational effectiveness research remains foundational, the mediating role of employee satisfaction is emerging as the most promising theoretical breakthrough connecting the two. This finding not only points the way for subsequent empirical research—namely, to construct and test mediation and moderation models centered on employees' psychological perceptions—but also provides crucial insights for industry practice: in today's construction industry, constantly reshaped by

digitalization and intelligence, investing in "people"—that is, building an organizational environment that continuously enhances employee satisfaction and well-being—is no longer an optional "soft management," but a core strategic engine driving quality improvement and maximizing organizational effectiveness. Ultimately, this study not only maps the past and present knowledge but also provides data-driven navigation for how this field can achieve integrated development of technological rationality and humanistic care in the future.

References:

Ahmed, M., & Niazi, G. (2021). TQM in construction: A review of global practices. *Construction Management Review, 48*(2).

Ahmed, S. M., Aoieong, R. T., Tang, S. L., & Zheng, D. X. (2005). A comparison of quality management systems in the construction industries of Hong Kong and the USA. *International Journal of Quality & Reliability Management, 22*(2), 149–161.

Akhbar, M. M., & Parvez, N. (2009). Impact of service quality, trust, and customer satisfaction on customer loyalty. *ABAC Journal, 29*(1), 24–38.

Aleidi, A. I. (2025). Organizational Support Mechanisms and Digital Transformation Success: Investigating Employee Performance Drivers in Educational Institutions. *Journal of Logistics, Informatics and Service Science*, *12*(1), 307-324.

Alves, T., & Formoso, C. (2021). Lean construction in practice: Recent developments and applications. *International Journal of Construction Innovation, 21*(3).

An, H. (2019). Construction and evaluation of management service index system of Inner Mongolia Hospital for the Nationalities. *Advances in Social Science, Education and Humanities Research, 635*, 100–104.

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173.

Bond, E. U., & Fink, R. L. (2003). Customer satisfaction and the marketing-quality interface. *Journal of Business & Industrial Marketing, 18*(3), 204–218.

Byrne, B. M. (2016). *Structural equation modelling with AMOS: Basic concepts, applications, and programming* (2nd ed.). Routledge.

Choi, T. Y., & Chu, K. S. (2008). Consumer perceptions of the quality of service in three hotel categories in Hong Kong. *Journal of Vacation Marketing, 5*(2), 176–189.

Choi, T. Y., & Chu, K. S. (2010). Determinants of hotel guests' satisfaction and repeat patronage in the Hong Kong hotel industry. *International Journal of Hospitality Management, 20*(3), 277–297.

Choi, T. Y., & Chu, K. S. (2011). Determinants of hotel guests' satisfaction and repeat patronage in the Hong Kong hotel industry. *Journal of Vacation Marketing, 20*, 277–297.

Chowdhury, M. (2020). Impact of TQM on construction projects. *Journal of Construction Engineering, 40*(3).

Fok-Yew, O., & Kassim, N. M. (2025). Leadership, TQM, and Business Excellence: A Systematic Review and Research Agenda (2014–2024). *Journal of Logistics, Informatics and Service Science*, *12*(1), 1-18.

Goldratt, E. M., & Cox, J. (1992). *The goal: A process of ongoing improvement* (2nd rev. ed.). North River Press.

Hafeez, S., & Muhammad, B. (2012). The impact of service quality, customer satisfaction and loyalty programs on customer's loyalty: Evidence from banking sector of Pakistan. *International Journal of Business and Social Science, 3*(16), 200–209.

Hasan, L. M., Jaaffar, A. H., & Isa, A. (2025). Knowledge Management Process Capabilities and Employee Performance in Iraq's Public Sector: The Moderating Role of Training Effectiveness. *Journal of Logistics, Informatics and Service Science*, *12*(4), 75-90.

Hong, S.-B. (2025). Impact of Social Capital of Tax Organizations on Organizational Performance: An Empirical Study on the Moderating Effect of Organizational Trust. *Journal of Logistics, Informatics and Service Science*, *12*(2), 107-120.

Hossain, M. J. (2012). Impact of service quality on customer satisfaction: A case of tourism industry in Bangladesh. *International Journal of Research in Finance & Marketing, 2*(2), 1–25.

Jin, Z. (2004). The dual supervision procedures in France. *Construction Quality*, 15–18.

Jones, S., & Smith, P. (2020). Exploring Herzberg's Two-Factor Theory in modern organizational settings. *International Journal of Management, 43*(6).

Kandampully, J., & Suhartanto, D. (2000). Customer loyalty in the hotel industry: The role of customer satisfaction and image. *International Journal of Contemporary Hospitality Management, 12*(6), 346–351.

Kaspal, A., Khadka, A. K., & Khadka, S. (2025). Linking Employee Personality to Organizational Performance: A Quantitative Examination of the Big Five Model in Nepal's Insurance Sector. *Journal of Logistics, Informatics and Service Science*, *12*(5), 124-139.

Lee, K., & Kim, H. (2021). Impact of job satisfaction and Herzberg's theory on construction workers. *Journal of Construction and Design, 56*(3).

Li, Y., & Li, J. (2020). Evaluation and optimization path of Inner Mongolia private economy development efficiency. *Advances in Economics, Business and Management Research, 131*, 694–700.

Ma, Z., & Wang, L. (2021). Study on the construction of quality management system in Inner Mongolia construction enterprises. *IOP Conference Series: Earth and Environmental Science, 657*(1), 012138.

Mayo, E. (2004). *The human problems of an industrial civilization*. Routledge.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing, 64*(1), 12–40.

Rahman, H. M. M., Malarvizhi, C. A. N., & Khan, N. (2025). An Empirical Study on the Role of HRM Practices in Mitigating Turnover Intentions. *Journal of Logistics, Informatics and Service Science*, *12*(5), 151-166.

Salama, M., & Baha, M. (2020). The application of TQM principles in construction: Challenges and opportunities. *Construction Innovation, 15*(1).

Tran, K., & Do, B. X. C. (2025). Leadership and Digital Transformation Competency as Catalysts for Green Business Performance: The Mediating Role of Business Innovation in Vietnamese SMEs. *Journal of Logistics, Informatics and Service Science*, *12*(5), 140-150.

Wang, H., & Li, J. (2020). Analysis of factors affecting organizational effectiveness in construction enterprises. *Journal of Construction Engineering and Management, 146*(3), 04020010.

Wang, L., & Zhang, X. (2021). Research on the optimization of quality management system in construction enterprises. *Advances in Civil Engineering, 2021*, 1–8.

Wang, S. (2021). Analysis of relevant countermeasures for strengthening construction engineering test inspection and material quality management. *Jushe, (33).*

Womack, J. P., & Jones, D. T. (2021). Lean construction: Efficiency and quality in the building industry. *Journal of Lean Construction, 17*(2).

Wu, Q., & Li, Y. (2020). Study on the impact of quality management practices on project performance in construction industry. *Journal of Construction Engineering and Management, 146*(5), 04020023.