Asia Pacific Science Press

A Review on Construction Quality Management of Prefabricated Housing in Xi'an

Li Maomao[1,2]*, Mohd Nizam Shakimon[1]

1. Faculty of Engineering, Science and Technology, Kuala Lumpur University of Science and Technology, Selangor 43000, Malaysia

2. Department of Artificial Intelligence, Xi'an Siyuan University, Xi'an, 710038, China

*Corresponding author: Li Maomao, 394888101@qq.com

Abstract: China's construction industry, despite over 30 years of development since the reform and opening-up period, remains largely traditional, characterized by outdated construction methods and labor-intensive practices. However, with the gradual disappearance of the "demographic dividend," the industry is facing a growing labor shortage. To adapt to the demands of new urbanization, industrialization, and informatization, as well as to align with the "dual carbon" development strategy and promote construction industrialization, China has been vigorously developing prefabricated residential projects. While significant progress has been achieved under supportive policies, the industry is still in a transitional phase from traditional to industrialized construction methods, with construction quality requiring further improvement. Considering the potential of contractor's perspectives to enhance construction quality management, this study explores the evaluation of construction quality management in prefabricated residential projects through the lens of contractors.

This study systematically reviews the fundamental theories of construction quality management evaluation for prefabricated residential projects and identifies initial evaluation indicators based on the characteristics of these projects through a literature analysis method. Subsequently, expert surveys are employed to finalize the evaluation indicators, establishing a contractor-based evaluation indicator system for construction quality management. The study then applies the Analytic Hierarchy Process (AHP) to calculate the weights of indicators at both the criterion and indicator levels and develops a construction quality management evaluation model using the fuzzy matter-element analysis method.

The research results of this article provide an important basis for contractors to conduct quality management evaluations.

Keywords: Prefabricated Residential Buildings; Construction Quality Management Evaluation; Evaluation Indicators; Evaluation Model

1. Introduction

1.1 Research Background and Importance

Prefabricated construction has been recognized as a transformative approach to address inefficiencies, environmental pollution, and labor shortages in China's traditional construction industry. Since the release of "The Action Plan for Promoting Prefabricated Building Development (2021–2023)", Xi'an—capital of Shaanxi Province and a key node in the

"Belt and Road Initiative"—has set a target of 30% prefabricated housing in new urban residential projects by 2025 [1]. Unlike cast-in-situ construction, prefabricated housing relies on off-site production of standardized components and on-site assembly, which places higher demands on quality coordination across the supply chain [2].

Contractors act as the "integrator" of prefabricated projects: they coordinate component suppliers, manage on-site assembly teams, and ensure compliance with quality standards [3]. However, existing studies on prefabricated quality management have mostly focused on technical aspects or owner/consultant perspectives, with limited attention to contractors' practical challenges [4]. This gap hinders the formulation of targeted quality management optimization strategies that align with industry practice.

1.2 Research Objectives

To improve the overall construction quality of prefabricated housing projects and promote the sustainable development of prefabricated housing, it is essential to have a clear understanding of the on-site quality management level and identify weaknesses in on-site quality management. The study aims to answer the following questions:

(1) What are the critical factors influencing the reliability and performance of prefabricated residential projects in Xi'an?

(2) How can a comprehensive evaluation framework for construction quality management in prefabricated housing projects be developed for Xi'an?

2. Literature Review

2.1 Framework and Research Logic

This study focuses on three core dimensions: prefabricated housing construction quality management, the contractor-centric perspective, and the regional specificity of Xi'an. The review follows a logical structure of theoretical foundation → thematic focus → regional contextualization → gap identification, systematically organizing domestic and international literature to lay a solid basis for constructing a contractor-oriented evaluation system for prefabricated housing construction quality management and conducting empirical research in Xi'an. Specifically, it first clarifies the theoretical connotation and global development context of prefabricated housing quality management; then narrows the focus to the contractor's role and management practices; further anchors the analysis to Xi'an's unique regional characteristics; and finally identifies the research gaps to define the innovation points of this dissertation.

2.2 Connotation, Characteristics, and Global Development of Prefabricated Housing

Prefabricated housing (off-site/modular construction) entails factory prefabrication of components (precast concrete, steel, wood) for on-site assembly [5], with core metrics of prefabrication and assembly rates. It features standardized design and factory production, aligning with green and industrialized construction trends, differing from traditional cast-in-place methods.

Globally, it has evolved through three phases: initial exploration (1950s–1980s), mature development (1990s–2010s), and intelligent upgrading (2010s–present). Europe's Germany leads in precast concrete; the UK uses MMC for housing and carbon goals (2021). East Asia's Japan pioneered housing industrialization [6], while South Korea excels in steel prefabrication.

Southeast Asia's Singapore targets 80% public housing prefabrication (2022), but Malaysia faces industrial chain/talent gaps [7].

In China, prefabricated buildings hit 30% of new starts by 2023. Xi'an mandates 25% prefabrication in key areas (2022), with projects in emerging zones but lags eastern cities in industrial chain maturity and talent [8].

Construction quality management spans design, construction and acceptance to meet standards, rooted in TQM, PDCA, Six Sigma, Lean Construction and 5M1E [9].

Prefabricated housing quality management has an extended chain and diverse risks covering component production, transportation, on-site assembly and strict acceptance. Core pain points include component deviation, poor hoisting accuracy, node leakage and incomplete traceability, requiring full-chain control [10].

2.3 Construction Quality Management from the Contractor's Perspective

Contractors' quality management roles have evolved with construction modes. In traditional cast-in-place projects, they served as "construction executors" focused on on-site process control. For prefabricated housing, they have become "full-chain

coordinators" linking component factories, teams, and stakeholders, overseeing component production, transportation, and on-site assembly.

Their lifecycle responsibilities include: pre-construction design review and quality plan formulation; strict component incoming inspections; on-site control of hoisting, grouting, and waterproofing; rapid defect response and rectification tracking [11]; and acceptance coordination with owners and supervisors. Cross-stakeholder collaboration is also critical: resolving design interface issues, joint factory supervision, and closed-loop reporting.

Existing studies have identified three primary quality management modes for contractors undertaking prefabricated housing projects, each with distinct advantages and limitations. The EPC integrated management mode enables the unification of quality control across design, procurement, and construction processes, as demonstrated by the successful full-cycle quality oversight in Shanghai's Lingang prefabricated housing project, which earned national demonstration project recognition; however, this mode imposes stringent requirements on contractors' comprehensive capabilities, thereby restricting its adoption among small and medium-sized enterprises (SMEs). The specialized quality management team mode delivers targeted quality control, with one Beijing-based contractor's dedicated team cutting component rejection rates from 5.2% to 1.8% by developing customized acceptance manuals and assembly checklists, though this approach incurs substantial labor costs that can strain project budgets. Meanwhile, the supply chain collaboration mode leverages information platforms to enhance the efficiency of quality defect resolution—for instance, a Guangzhou contractor improved defect handling efficiency by 30% through a joint quality information platform with local component factories —yet its widespread promotion is impeded by low levels of supply chain informatization and insufficient willingness to collaborate among participating enterprises.

Contractors deploying digital tools for prefabricated housing quality management face a trade-off between technological benefits and practical constraints across three primary solutions. Building Information Modeling (BIM) supports critical workflows including component detailing, hoisting simulation, and full-cycle quality traceability [12], yet its widespread adoption is hampered by high implementation costs and a shortage of skilled professionals, with penetration rates below 20% among contractors in Xi'an specifically. Radio Frequency Identification (RFID) technology enables real-time tracking of prefabricated component logistics, but its effectiveness is undermined by electromagnetic interference at construction sites and elevated equipment maintenance expenses. Meanwhile, smart construction site systems provide real-time monitoring of key construction parameters such as hoisting precision and grouting density; however, most contractors using these systems only achieve basic data collection, failing to translate the gathered information into actionable, data-driven quality management decisions [13].

2.4 Influencing Factors and Evaluation Systems for Contractors' Quality Management

Internal factors include technical capability, management level, personnel quality, and financial strength. In Xi'an, only 35% of contractors' technical teams hold prefabricated construction qualifications [14], and many small contractors lack standardized quality manuals, relying on experience-based construction.

External factors include policies, market environment, supply chain collaboration, and technical standards. Xi'an has only 12 component manufacturers, mostly in suburban areas, causing communication delays and quality standard inconsistencies. Additionally, outdated local standards increase management difficulties.

Existing evaluation systems mostly adopt regulator or owner perspectives. For example, China's Prefabricated Building Evaluation Standard (GB/T 51129-2017) focuses on assembly rate and green performance, ignoring contractors' construction control effectiveness. Some academic systems include indicators like "component acceptance rate" and "one-time hoisting success rate" but exclude Xi'an's regional characteristics and contractors' cost considerations.

2.5 Regional Specificity of Prefabricated Housing Quality Management in Xi'an

Against the backdrop of robust prefabricated housing industrial bases in eastern hubs like Shanghai (annual component capacity >5 million m³) and Shenzhen (prefabricated project ratio >40%), Xi'an lags significantly with a 2023 component output of just 800,000 m³, concentrated on small components. Large panels and slabs must be imported from other regions, driving up costs and causing delivery delays.

Xi'an's prefabricated housing policies have two distinct local traits: first, climate adaptation measures mandate integrated external wall insulation and -10℃ node crack resistance for the cold Guanzhong climate, stricter than southern standards; second, 32% of 2021–2023 urban village redevelopment projects adopted prefabrication, though tight schedules and limited space added quality hurdles.

For local contractors, two key pain points persist: winter low temperatures slow grout solidification, leading to strength deficits and cracking, with contractors lacking specialized plans facing a 15% node rework rate; meanwhile, only 20% of contractors master the "precast pile + raft foundation" technique needed for Xi'an's collapsible loess, with most relying on incompatible traditional methods.

Current Xi'an-focused research prioritizes policy and macro-technology but overlooks contractors' micro-quality management challenges. Local practices yield mixed results: a state-owned contractor cut component rejection from 8% to 2% via dual factory-site inspections (2023), but the high-cost model is unfeasible for SMEs, while a private firm's three component collisions exposed SME storage management flaws.

Despite the progress made in prefabricated construction, several gaps remain in the current literature that warrant further investigation. One of the most significant gaps is the lack of region-specific studies that address the unique challenges faced by different cities in China, such as Xi'an, where infrastructure and skill levels may not be as advanced as in coastal cities like Shanghai and Beijing. Existing research does not pay enough attention to the main actors in the construction execution process and does not consider the contractor's dual role as "executor-coordinator". Another gap identified is the insufficient focus on the human factors in quality management, particularly the role of training and skill development in ensuring consistent quality across all stages of the prefabrication process. Additionally, while the integration of digital technologies such as BIM and AI into quality management has been widely discussed, there is a "lack of research" focused on the practical integration of these technologies into quality management systems. Addressing these gaps is crucial for developing more tailored and effective strategies for enhancing the quality and performance of prefabricated residential projects in diverse urban settings.

3. Methodology

Based on the theories of construction quality management and evaluation, combined with the characteristics of prefabricated residential projects, the initial evaluation indicators are identified through literature analysis. The initial indicators are screened and optimized using the expert survey method, and the weight of each indicator is determined by AHP to form a complete evaluation index system.The fuzzy matter-element analysis method is used to construct the construction quality management evaluation model of prefabricated residential projects based on the index weights obtained from AHP.

The overall research design of this study is shown in Figure1:

Figure1 research design
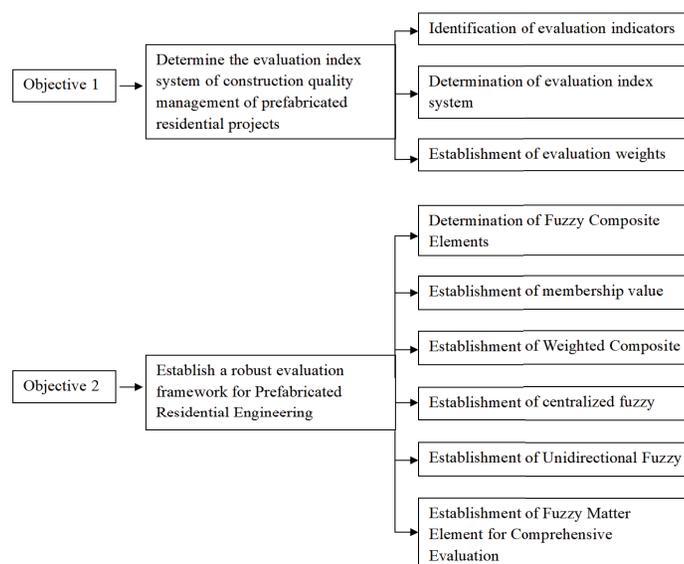
3.1 Research Methods

The main purpose of adopting the literature analysis method is to systematically sort out the basic theories of construction quality management evaluation of prefabricated residential projects, and initially identify and summarize the evaluation indicators. This method lays a theoretical foundation for the follow-up establishment of the evaluation index system and ensures the academic rigor and theoretical basis of the research indicators.

Retrieval channels include Chinese and foreign academic databases (such as CNKI, Web of Science), university libraries, and industry monographs. The retrieval keywords are "prefabricated building", "residential engineering", "construction quality management", "construction quality management evaluation", etc. According to the research theme, 23 high-relevance literatures are screened out from the retrieved documents, focusing on the research results related to construction quality management evaluation of prefabricated buildings. The evaluation indicators mentioned in the literature are sorted out, and indicators with the same or similar meanings are merged and optimized. Finally, 27 initial evaluation indicators covering six dimensions (personnel management, material management, mechanical equipment management, technical management, on-site management, and information management) are initially determined. The frequency of evaluation indicators for construction quality management of prefabricated residential project is shown in Figure2.

Figure2 Frequency Analysis of Terms in Construction Management
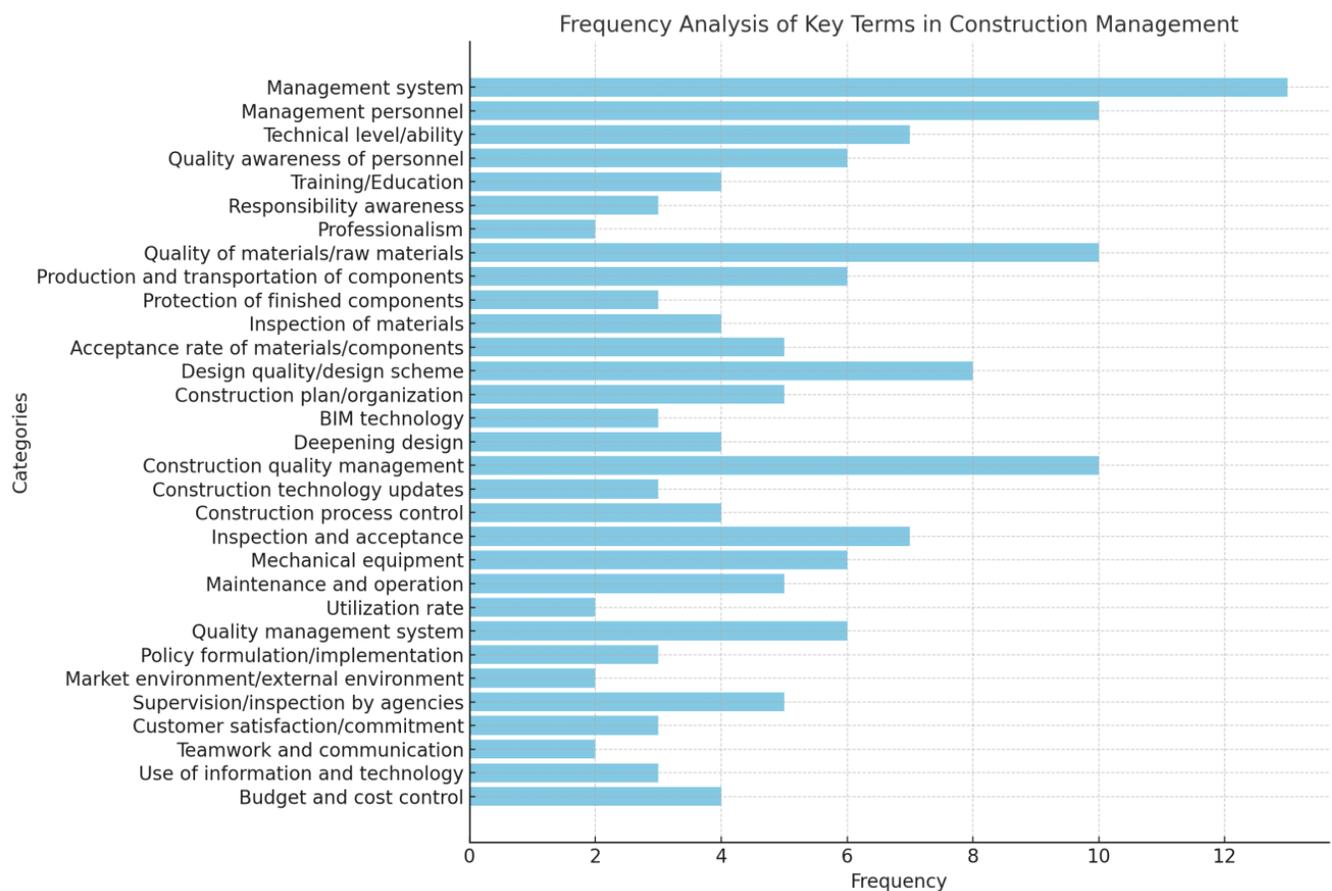
The expert survey method is used to further screen and confirm the initially identified evaluation indicators, determine the index weight scoring data and the section domain and grade division standards of evaluation indicators. This method combines the practical experience of industry experts to make up for the limitations of the literature analysis method and ensures the practical applicability of the evaluation index system.

A total of 10 experts are invited, including professionals from construction units, all of whom have more than 9 years of work experience in the construction industry and have professional titles or qualification certificates such as first-class constructor and registered supervision engineer. The survey is divided into two parts: indicator screening questionnaire and index weight scoring questionnaire. The questionnaires are distributed in the form of Questionnaire Star.

3.2 Data Collation and Analysis

The expert opinions are collected and sorted out. For the initial indicators, the final 27 evaluation indicators are determined according to the experts' suggestions of "adding, deleting and merging"; for the index weight scoring data, the average value of the experts' scores is taken to form the judgment matrix of AHP; for the index section domain and grade division, the final standard is determined by combining the experts' opinions and the actual engineering situation.

3.2.1 Implementation of AHP

AHP is used to calculate the weights of the evaluation indicators at all levels of the index system. This method can quantitatively handle the qualitative problems of multi-level and multi-index, and clarify the relative importance of each indicator, providing a basis for the subsequent construction of the evaluation model.

The model is divided into three levels: the target layer (construction quality management evaluation of prefabricated residential projects), the criterion layer (6 indicators including personnel management, material management, etc.), and the index layer (27 specific evaluation indicators).

Level 1 (Goal): Evaluating the quality management of prefabricated construction.

Level2 (Criteria): Key factors influencing quality, such as consistency of components, effectiveness of regulations, and reliability of supply chains.

Level3 (Sub-Criteria): Specific aspects under each criterion, such as curing methods, dimensional accuracy, and compliance monitoring.

The 1-9 scale method is used to construct the judgment matrix of the criterion layer and each index layer (see Tables 3-4 to 3-10 for the judgment matrix). The scale 1 means that the two indicators are equally important, and the scale 9 means that one indicator is absolutely more important than the other, as shown in Table 1.

Tables1 Meaning of scale 1-9

No.	Scale meaning	Ratio
1	When comparing the former element i to the latter element j, both i and j are equally important.	$A_{ij}=1$
2	When comparing the former element i to the latter element j, element i is slightly more important than element j.	$A_{ij}=3$
3	When comparing the former element i to the latter element j, element i is obviously more important than element j.	$A_{ij}=5$
4	When comparing the former element i to the latter element j, element i is much more important than element j.	$A_{ij}=7$
5	When comparing the former element i to the latter element j, element i is absolutely more important than element j.	$A_{ij}=9$
6	The importance of element i and element j falls between the above judgments.	$A_{ij}=2n$, (n=1,2,3,4)
7	The comparison of the importance of element j and element i results in the reciprocal of element i and element j.	$A_{ji}=1/n$, (n=1,2,3,...9)

Each element A_{ij} represents the relative importance of factor *i* compared to *j*.

3.2.2 Construct a judgment matrix

By judging each two elements in the matrix one by one according to the scale in Table 1, an n-order comparison judgment matrix table can be obtained, as shown in Table 2.

Tables2 N-order judgment matrix table

A	A_1	A_2	...	A_n
A_1	A_{11}	A_{12}	...	A_{1n}
A_2	A_{21}	A_{22}	...	A_{2n}
...	...	...	...	...
A_n	A_{n1}	A_{n2}	...	A_{nn}

The matrix A has the following properties, $A_{ij} > 0$, $A_{ij}=1/A_{ji}$（i≠j）, $A_{ii}=1$（i, j=1, 2, …, n）。

3.2.3 Calculating Relative Weights

As can be seen from the previous text,

judgment matrix
$$A = \begin{bmatrix} A_{11} & A_{12} & ... & A_{1n} \\ A_{21} & A_{22} & ... & A_{2n} \\ ... & ... & ... & ... \\ A_{n1} & A_{n2} & ... & A_{nn} \end{bmatrix}$$

(1) After normalizing each column vector in matrix A=(Aij) n × n, a new matrix B=(Bij) n × n is obtained.

$$B = \begin{bmatrix} B_{11} & B_{12} & ... & B_{1n} \\ B_{21} & B_{22} & ... & B_{2n} \\ ... & ... & ... & ... \\ B_{n1} & B_{n2} & ... & B_{nn} \end{bmatrix}$$

Where:

$$B_{ij} = \frac{A_{ij}}{\sum_{i=1}^{n} A_{ij}} \ (i=1,\ 2,\ 3,\ ...,\ n,\ j=1,\ 2,\ 3,\ ...,\ n)$$

(2) Add the row vectors of the normalized matrix B to obtain a new vector T.

$$T = \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ ... \\ T_n \end{bmatrix} = (T_1, T_2, ..., T_n)^T$$

Where:

$$T_i = \sum_{j=1}^{n} B_{ij} \ (i=1,\ 2,\ 3,\ ...,\ n,\ j=1,\ 2,\ 3,\ ...,\ n)$$

(3) Normalize the vector $T = \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ ... \\ T_n \end{bmatrix}$ to obtain the feature vector w.

$$W = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ ... \\ w_n \end{bmatrix}$$

Where:

$$w_i = \frac{T_i}{\sum_{i=1}^{n} B_{ij}} \ (i=1,\ 2,\ 3,\ ...,\ n).$$

This feature vector is the weight vector of each indicator, and w_i (i=1, 2, 3,..., n) is the weight of each corresponding indicator.

3.2.4 Consistency check of judgment matrix

A critical aspect of AHP is ensuring the consistency of stakeholder judgments through the Consistency Ratio (CR). The CR measures the reliability of pair wise comparisons and ensures that judgments are logically consistent.

1) Find the maximum characteristic value λmax.

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^{n} \frac{(Aw)_i}{w_i} = \frac{1}{n} \sum_{i=1}^{n} \frac{\sum_{j=1}^{n} A_{ij}.w_j}{w_i}$$

In the above equation, (Aw)i is the i-th component of (Aw).

2) Calculating the Consistency Index (CI):

The Consistency Index (CI) is computed using:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

Where:

λmax: Principal eigenvalue of the matrix.

n: Number of criteria.

3) Determining the Consistency Ratio (CR):

The CR is derived by comparing the CI to a Random Index (RI), which represents the average consistency of randomly generated matrices of the same size:

$$CR = \frac{CI}{RI}$$

The RI values, as introduced by Saaty (1980), are introduced randomness index, and its value is only related to the order of the judgment matrix. The specific values are shown in Table 3.

Tables3 The Random Index (RI) values

(Source: Saaty, 1980)

n	RI
1	0.00
2	0.00
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

Interpretation of CR:

The judgment matrices with n<3, the judgments always have complete consistency.

The judgment matrix with n ≥ 3,

If CR<0.10, the judgments are considered consistent and reliable.

If CR≥0.10, the judgments are inconsistent and require revision.

Mitigating Inconsistencies:

If the CR exceeds the acceptable threshold, stakeholders are asked to revisit their pairwise comparisons. This iterative process ensures that the final judgments are both logical and defensible.

3.2.5 Significance of CR in This Study

The CR is essential to maintaining the credibility of the AHP results. Ensuring consistent judgments enhances the reliability of the derived weights, which are crucial for evaluating and prioritising quality management factors. Inconsistent judgments could compromise the framework's validity, leading to flawed conclusions and recommendations.

The calculations involved in AHP, particularly the computation of λmax and CR, can be complex. To streamline the process, software such as Microsoft Excel (with AHP templates), is employed. This tool automates matrix operations, eigenvalue calculations, and consistency checks, reducing the likelihood of errors.

4. Fuzzy Matter-element Analysis Method

The fuzzy matter-element analysis method is used to construct the construction quality management evaluation model of prefabricated residential projects. This method can handle the fuzziness and multi-index characteristics of construction quality management evaluation, and realize the quantitative evaluation of the quality management level of prefabricated residential projects.

Determine the evaluation grade (divided into 5 grades: poor, relatively poor, general, good, excellent) and the classical domain and section domain of each indicator, and establish the evaluation object's index value matter-element according to the actual data of the project. The ascending and descending semi-trapezoidal distribution functions are used as the

membership degree functions to calculate the membership degree of each indicator to different evaluation grades, and the membership degree matter-element is formed. The weight matter-element of each indicator is established according to the index weight obtained by AHP. Multiply the weight matter-element and the membership degree matter-element to obtain the centralized fuzzy composite matter-element; then calculate the single fuzzy composite matter-element and the comprehensive evaluation fuzzy composite matter-element, and determine the final evaluation grade of the project according to the maximum value of the comprehensive evaluation value.

Conclusion

This study focuses on the construction quality management evaluation of prefabricated residential projects in Xi'an from the contractor's perspective, aiming to address the gaps in existing research that overlook contractors' practical challenges and regional characteristics. Through a systematic literature review, expert surveys, analytic hierarchy process (AHP), and fuzzy matter-element analysis, the research establishes a comprehensive evaluation framework and achieves three key outcomes. First, based on the 5M1E theory and characteristics of prefabricated construction, an initial set of 27 evaluation indicators across six dimensions (personnel management, material management, mechanical equipment management, technical management, on-site management, and information management) was identified and validated by industry experts, ensuring both theoretical rigor and practical applicability. Second, AHP was employed to calculate the relative weights of indicators at all levels, with consistency checks confirming the rationality of the weight distribution, which clarifies the priority of quality management focus for contractors. Third, a fuzzy matter-element evaluation model was constructed to quantify the fuzziness and multi-index nature of quality management evaluation, providing a operable tool for contractors to assess their quality management performance.

Empirically, the study highlights the unique challenges faced by Xi'an's prefabricated construction industry, such as insufficient local component production capacity, harsh winter construction conditions, and collapsible loess foundation constraints. The contractor-centric evaluation system addresses these regional specifics and contractors' roles as "full-chain coordinators," filling the gap between existing policy/owner-oriented evaluation standards and on-site practice. The research findings not only offer a scientific basis for contractors to identify quality management weaknesses and optimize strategies but also provide reference for local governments to refine prefabricated construction policies and promote the sustainable development of the industry in Xi'an and similar inland cities.

Limitations of this study include the small sample size of expert surveys and the lack of long-term tracking of case projects. Future research could expand the scope of expert consultations, incorporate more empirical data from different regions, and explore the integration of digital technologies (e.g., BIM, RFID) into the evaluation model to enhance its dynamic adaptability. Additionally, comparative studies between Xi'an and coastal cities with mature prefabricated construction industries could further enrich the understanding of regional differences in quality management.

Funding

Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

Reference

[1] Tan, Z. W. (2024). Application and evaluation of green construction technology for prefabricated buildings in general contracting projects. China Housing Facilities, (S1), 102-104.

[2] Yang, Y. F. (2024). Research on innovation of construction quality management strategies for prefabricated buildings under general contracting mode. China Construction Metal Structure, 23(10), 163-165. https://doi.org/10.20080/j.cnki.ISSN1671-3362.2024.10.056

[3] Cheng, Y. (2024). Research on evaluation of construction quality management level of prefabricated buildings from the lean perspective [Master's thesis, Anhui University of Science and Technology]. https://doi.org/10.26918/d.cnki.

ghngc.2024.001163

[4] Tian, S. S. (2024). Research on construction quality management of prefabricated buildings based on blockchain [Master's thesis, Guangzhou University]. https://doi.org/10.27040/d.cnki.ggzdu.2024.000190

[5] Cheng, Z. (2024). Research on influencing factors and comprehensive evaluation of construction quality of prefabricated buildings [Master's thesis, Wuhan University of Science and Technology]. https://doi.org/10.27380/d.cnki.gwkju.2024.000233

[6] Mao, Y. T., Sun, Y. H., & Ling, J. (2024). Research on construction technology management for sustainable lean construction. Journal of Guiyang University (Natural Science Edition), 19(1), 90-94. https://doi.org/10.16856/j.cnki.52-1142/n.2024.01.010

[7] Shi, L. F. (2024). AHP-fuzzy comprehensive evaluation for construction quality management of prefabricated buildings. Construction Science and Technology, (1), 74-77. https://doi.org/10.16116/j.cnki.jskj.2024.01.018

[8] Li, X. J. (2020). Research on construction quality risk evaluation of prefabricated buildings. Journal of Engineering Management, 34(6), 107-112. https://doi.org/10.13991/j.cnki.jem.2020.06.019

[9] Xiao, S. L. (2019). Research on correlation and evaluation of factors influencing the quality of prefabricated buildings [Master's thesis, Huazhong University of Science and Technology]. https://doi.org/10.27157/d.cnki.ghzku.2019.003381

[10] Zhang, F. F., Fang, Y., & Wen, G. F. (2018). Maturity evaluation of project quality management for prefabricated buildings in construction enterprises. Journal of Shandong Technology and Business University, 32(6), 63-73.

[11] Wen, D. F. (2018). Research on quality management evaluation of production and construction of prefabricated buildings [Master's thesis, Shenyang Jianzhu University]. https://kns.cnki.net/kcms2/article/abstract?v=8witAuWEzbO4n3DRkFYGp5BVvyfcWsqeRpjMM_vwYsLeOih8yS73R_KAslkJzPkfqNpehswE6i0IqJmH72FVDpNLmd0qBmNmTGEYahtWgvLi_e5IHzKTVXnEZmZwWJMMC9O9sYvVzmNdUBVwJTUKXEQ6oy2EikIKjvZVb5QU6kBZ313_uAO6FA==&uniplatform=NZKPT&language=CHS

[12] Zhang, Z. H. (2017). Research on performance evaluation of construction quality management for monolithic prefabricated buildings [Master's thesis, Shenyang Jianzhu University].

[13] Wang, J. Y. (2017). Research on construction stage quality management of prefabricated building project in Nanjing Vanke Shangfang affordable housing [Master's thesis, Shenyang Jianzhu University]. https://kns.cnki.net/kcms2/article/abstract?v=8witAuWEzbO-DWlAd5iPpNU2o3mTbgIh8O5YUD0c9vazVCM2IIQTLWqlOFD2CgQWM_TsnWNTHaJgpurSZh7kskgi17RVcQofO1EXC6ceRzBU6KLh6IhLBqfk51x51O-VWR_6qHalmp8wDoDnr96SFIb9HMwOpXe36cAewrhQvMsiJyHBziIYlg==&uniplatform=NZKPT&language=CHS

[14] Guo, B. R. (2016). Research on construction quality management of prefabricated buildings based on system dynamics [Master's thesis, Shenyang Jianzhu University]. https://kns.cnki.net/kcms2/article/abstract?v=8witAuWEzbP90UUL7J_76RNDlMAWKWZkEWSa3h3rrlTv-4sMIp-FAE1R-zaiMVpfQP6hqWG9Bokcox9juZSwMMSb_kQAaFqURfe5M9DSNWk7-V3dIJHkJDq0pdpuQT78uu4yCxfy0_2WhAFzB30NCbxcTxlQcTTWuYhFRG9n7ORbQ0ZgZws4ig==&uniplatform=NZKPT&language=CHS