Original Research Article

Research on the development and future development needs of prefabricated building management in China

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Abstract: This paper reviews 239 studies from the CNKI database, summarizing the overall research status, key themes, and future needs. It reveals that research began in 2016, saw a decline due to the pandemic, but the trend is now stabilizing. Key focuses include development trends, life cycle management, and sustainable construction.

Keywords: Prefabricated building management; Progress; Development needs; Life cycle management; Sustainable construction

Prefabricated buildings offer advantages such as industrialized production, efficient construction, and energy savings, making them key to China's green construction efforts. However, due to cost and technical limitations, they haven't been fully adopted. Chinese scholars are exploring their potential in diverse research areas. Wang Lihua et al. [1]analyzed the theoretical framework of prefabricated buildings from 2016 to 2021, focusing on the development environment and sustainability. Liu Kangning et al.[2] examined domestic and international research trends, offering development suggestions.

1. Research Situation

1.1. Literature sources

Based on the journal literature collected in CNKI database, the subject "prefabricated building * Management" was entered for advanced search. The search time range was from 2013 to 2023, and the journals from Peking University core, CSSCI and CSCN were selected. The system retrieved a total of 252 journals, combined with manual screening method to eliminate the meeting minutes, notices and other documents, and the selected 239 documents meeting the requirements as the final analysis data.

1.2. Release trend and key events

The number of journal publications often reflects the development trends of prefabricated buildings. In 2016, China's push to promote prefabricated construction led to a surge in related research. However, the COVID-19 pandemic in 2019 caused economic challenges and a decline in construction activity, which resulted in a reduction in publications. By 2022, China re-emphasized the importance of developing prefabricated buildings, and although the publication rate didn't see a significant short-term rise, the previous decline had noticeably slowed.

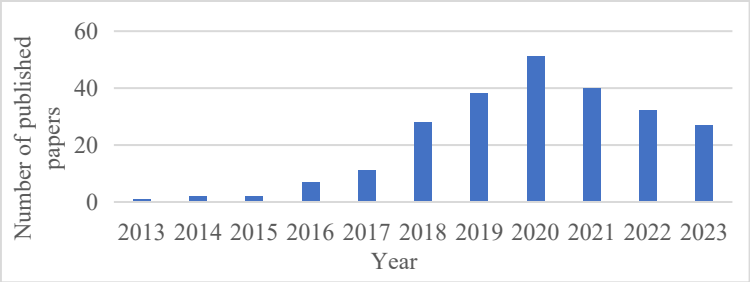

Figure 1. Annual publication volume.

1.3. Journal ownership

239 journal articles covering architectural science and engineering, industrial economics, environmental science and resource utilization, computer software and computer application and other disciplines, involving engineering research, technology research, technology development, engineering and project management and other research levels, were collected and published by 71 journals. This paper reviews the top 5 types of journals in terms of publication volume, as shown in Table 1.

Table 1. Popular journals (Top 5).

Journal title	Number of published papers	percentage
Construction economy	91	38.08%
Journal of Civil Engineering and Management	24	10.88%
Building structure	20	7.11%
Construction technique	8	3.35%
concrete	7	2.93%

2. Analysis of research content

2.1. Keyword clustering

Using VOSviewer, 546 keywords from the literature were clustered to create a visual map, highlighting the relationships between key terms. To better illustrate the connections, 100 keywords were selected, with top terms including “prefabricated buildings,” “BIM technology,” and “prefabricated components,” showcasing their strong contribution and interconnectedness.

2.2. Topic analysis

By summarizing the topic content of each journal and combining the keyword clustering results, the research Angle of all journal literatures is clarified. The specific topics included are shown in Table 2.

Based on the perspective of life cycle management of prefabricated buildings, Chinese scholars mainly study traditional project management objectives, and the breadth and depth of the research are increasing. Song Yuxuan et al.[3] made a comparative analysis of the factors affecting the incremental cost at each stage of the whole life cycle of a building under the general contract mode, providing guidance for further controlling project costs. At the same time, some scholars are also committed to the development and application of innovative technologies and risk assessment. Rong Bowen et al.[4] analyzed the potential problems and causes at each stage, used LSS theory and BIM 5D technology to manage the whole life cycle of prefabricated buildings, reduce resource waste and environmental pollution, and realized dynamic integrated control of the whole process of prefabricated buildings. For prefabricated building risk assessment, relevant research covers a wide range, such

as cost risk[5], construction risk assessment[6]and so on.

Table 2. List of research topics.

Research Angle	Thematic content	Quantity	percentage
Development background	Current situation and countermeasures	20	8.37%
	Related policy research	11	4.60%
	Driving and hindering factors	9	3.77%
	Connotation and evaluation	5	2.09%
Life cycle management	Cost, quality, schedule management	50	20.92%
	Information management	8	3.35%
	Construction safety management	10	4.18%
	Risk assessment	25	10.46%
	Application of innovative technology	38	15.90%
	Supply chain management	14	5.86%
	Industrial chain management	5	2.09%
	Precomponent management	12	5.02%
	Design standardization	7	2.93%
	Partner selection	5	2.09%
	New construction technology	6	2.51%
Sustainable construction	Comprehensive benefit evaluation	5	2.09%
	Lean construction	5	2.09%
	Green construction	4	1.67%

In addition, some scholars based on the development background of prefabricated buildings, focusing on the current situation and countermeasures, policy support, constraints and driving factors to analyze the current environment of prefabricated construction development. Xue Ru et al. [7]discussed the application status of BIM technology in the construction management of prefabricated buildings, and put forward countermeasures to improve the integration of BIM technology and construction management. Some scholars have identified the driving factors and hindrance factors for the development of prefabricated buildings. Li Dezhi et al. [8]obtained the basic data of binary Logistic regression through questionnaire survey, and then concluded that the key driving factor for construction units to actively adopt prefabricated buildings is the supply capacity of component factories, and the key hindrance factor is the construction and installation cost.

The comprehensive benefit involves multiple dimensions such as society, economy, environment and time, which can reflect the actual value of the research object more comprehensively and objectively. Jiao Aiying et al.[9] established a comprehensive benefit evaluation system for the whole life cycle of a building, considering the social benefits, economic benefits and environmental benefits of prefabricated houses. Lean construction has brought new development opportunities for the promotion of prefabricated buildings in China. Yang Hongxiong et al. [10]pointed out the reliability and effectiveness of lean construction technology applied to prefabricated buildings, and took production efficiency, economic benefits, implementation methods, management methods and enterprise environment as the focus of optimization, thus promoting the sustainable development of prefabricated buildings in China.

3. Conclusions

This paper reviews 239 core journals on prefabricated building management from the CNKI database, analyzing publication trends. It organizes key research topics around development background, life cycle

management, and sustainable construction through keyword clustering and topic analysis.

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