



# Investigating Solutions to the Shortage of Construction Site Managers in Japan: A Research Study on the Introduction of Young BIM Engineers from China

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## Abstract

Japanese construction industry is facing a critical labor shortage due to its aging population. To address this issue, utilizing Building Information Modeling (BIM)/Construction Information Modeling (CIM) to enhance productivity and employing foreign workers are considered effective solutions. However, research on the integration of foreign technical talents in Japanese construction sector remains limited. This paper aims to explore the potential of introducing young Chinese technicians trained in BIM to alleviate the shortage of site management personnel in Japan. First, a comparative study of BIM education in universities in China and Japan is conducted to assess the current state of BIM training in both countries. Following this, the willingness of 187 young Chinese technicians to take on management roles in Japan is investigated and analyzed, along with the satisfaction levels of 10 Chinese individuals currently managing sites in Japan. Finally, by synthesizing the survey results, the paper identifies the challenges in practical implementation and confirms the feasibility of employing BIM-educated young Chinese technicians to address Japanese labor shortage in site management.

# 1 Introduction

Japan is currently facing a labor shortage, which is particularly acute in the construction industry. According to a survey by the Japan Federation of Construction Contractors (MEXT, Basic School Survey, 2024), while construction investment has gradually increased since 2010, the number of construction workers has continued to decline from its peak in 1997 of 6.85 million, falling to 4.83 million in 2023, which is only 70.5% of the peak figure. In the same year, approximately 36% of the workforce was aged 55 and above, and about 12% were under the age of 29, indicating a significant aging trend compared to other industries. Data published by the Ministry of Health, Labour and Welfare show that while the effective job openings-to-applicants ratio for general occupations is 1.31, it is 5.57 for construction and civil engineering management-related occupations, highlighting the severe shortage of site management personnel in Japan. Universities are a crucial source of young engineers, and according to the Basic Survey of Schools by the Ministry of Education, Culture, Sports, Science and Technology, the number of students in university programs directly related to construction, such as civil and architectural engineering, has decreased by about 2,900, and technical school students by about 1,700 over the decade from 2011 to 2020. This decline is particularly notable in engineering-related departments.

Global literature has detailed the advantages of Building Information Modeling (BIM) technology, which offers comprehensive lifecycle solutions from design to construction and maintenance, allowing for efficient labor savings and enhanced productivity (Meng et al., 2020; Jin et al., 2019). This could effectively address the issues facing Japanese construction industry. Consequently, the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) has intensified its promotion of BIM/Construction Information Modeling (referred to as BIM hereafter) in both architecture and civil engineering. The introduction of foreign talent is also seen as an effective way to quickly alleviate the shortage of construction engineers (Conrad & Meyer-Ohle, 2019). Japan has entered the global competition for talent, and the government is designing attractive policies and plans to recruit and retain foreign engineers and professionals with advanced education and skills (Oishi, 2014).

China has the world's largest Architecture, Engineering, and Construction (AEC) industry, reaching approximately \$4.5 trillion in 2023, with about 100,000 civil engineering and architecture university students graduating annually. The advantages of BIM technology are of great importance to Chinese AEC industry, and since 2014, The National Master Specification has been tracking the status of BIM higher education worldwide (Banh, 2023). According to the latest reports, China provides BIM higher education to students and professionals in the AEC field, with many universities and professional schools offering BIM and smart construction-related courses by 2022, indicating that China will produce many BIM professionals in the future. With the transformation of Chinese construction industry and the expansion of international exchanges, young engineers with architectural expertise are increasingly seeking employment overseas. According to a 2022 survey conducted by MLIT, Chinese individuals engaged in construction management in Japan account for 45% of foreign employees, significantly surpassing those from other countries, demonstrating the pivotal role Chinese engineers play in Japanese construction sector (MLIT, Results of the Construction Industry Activity Survey, 2022).

Currently, there is scant research on the introduction of site management personnel in the construction industry, particularly concerning the introduction of foreign talent trained in BIM technology. This study focuses on the introduction of young Chinese talent trained in BIM education to address the shortage of site management personnel in Japan. The objective is to elucidate these challenges through survey analysis. Figure 1 illustrates the flow of the research. The remainder of this paper is structured as follows: Chapter 2 investigates the content and awareness of BIM education in universities in China and Japan. Chapter 3 explores the intentions of young Chinese engineers to engage in management roles in Japan. Chapter 4 surveys the satisfaction of Chinese individuals working in

construction management in Japan. Each chapter describes the purpose, method, and results of each survey. Chapter 5 explains and discusses the research findings, and Chapter 6 concludes the paper.

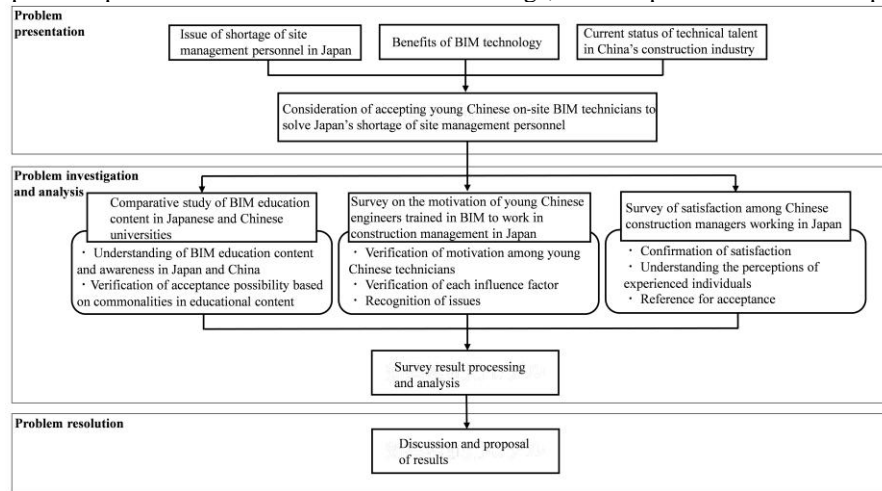


Figure 1: Research flowchart

## 2 Comparative study of BIM education content in universities of Japan and China

To determine whether Chinese universities BIM education content is applicable to Japanese construction industry, it is necessary to compare the educational content and awareness in both countries. University students are the future bearers and leaders of the construction industry. As an exemplary case of BIM education in Japan, Shibaura Institute of Technology has been offering BIM education since 2008. At this university, undergraduate students receive training in the operation of BIM software, and exercises using BIM for cost estimation are conducted. Similarly, in China, comparable education and exercises are carried out in relevant majors (Xu et al., 2018; Wang et al., 2020). According to a survey targeting universities in Shanghai, Fujian, and Shandong, like in Japan, BIM education in Chinese universities primarily focuses on the generation of 3D models, with applications in construction management such as site layout, scaffolding design, and material cost estimation also being developed (Figure 2).

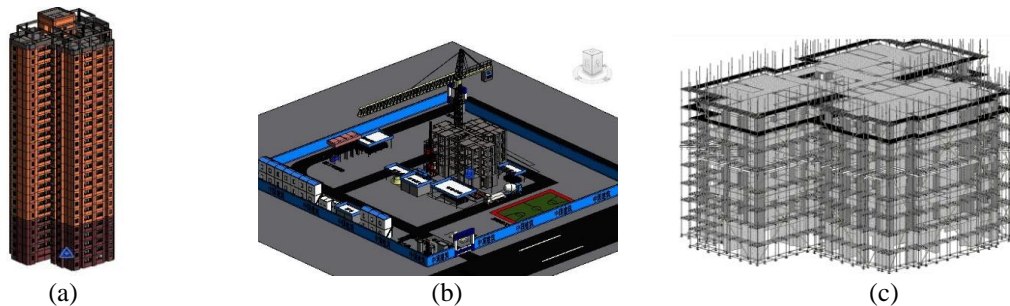


Figure 2: example (a)Example of 3D model (b)Example of site layout drawing (c)Example of temporary construction model

Through a survey of four educators from Japan and China who are involved in BIM education (Table 1), the comparison of BIM education conditions in both countries is shown in Table 2. It was found that universities in both Japan and China provide education related to design and 3D modeling. However, Chinese universities place greater emphasis on applications in construction management, aligning with practical on-site construction work. This indicates that BIM education in Chinese universities is comprehensive, sharing commonalities with Japanese educational content. This provides a basis for the technical feasibility of introducing site management personnel. Both Japan and China recognize the importance of BIM education, and Chinese universities, in particular, receive strong government support, which is expected to further enhance the quality of their education.

country	Position	Years of teaching experience	BIM teaching experience years
Japan	Professor	40years	26years
	Professor	24years	5years
	Professor	21years	6years
	Associate Professor	10years	Unknown
China	Professor	18years	8years
	Professor	16years	10years
	Associate Professor	8years	8years
	Associate Professor	5years	5years

**Table 1:** Respondent characteristics in BIM education survey

Item	Selected content	Japan	China
BIM-related course content	Design and 3D Modeling	4	4
	Structural Analysis		1
	Construction Management Related	1	4
	Cost Estimation		3
	Sustainable Design	1	1
	Others	1	
The importance of BIM education in university education	Very important	4	1
	Important		3
The university provides sufficient resources and support for BIM education	Think so		2
	Ordinary		2
	Don't think so	2	
	Don't think so at all	2	
How will the role of BIM education in university education change over the next five years	Unchanged from the current situation	1	
	A slight change has no overall impact	3	1
	Changes have an overall impact		3

**Table 2:** Survey results on BIM education

### 3 A survey on the willingness of young Chinese engineers who studied BIM to engage in construction management in Japan

#### 3.1 Purpose and Method of the Survey

In the context of rapid global environmental changes, the intention of young Chinese technicians, who have learned BIM-related technologies, to utilize their expertise in construction site management jobs in Japan constitutes a significant topic of discussion. For this purpose, a survey was conducted

targeting young students and graduates from universities and vocational schools in Shanghai, Fujian, and Shandong that offer BIM courses. The survey aimed to investigate these young technicians' intentions to engage in site management in Japan and the primary factors influencing such intentions. The objectives of this survey include providing insights into how the Japanese construction industry should approach Chinese technicians, what kind of work environment and benefits they should offer to attract them.

The questionnaire was designed with 12 related questions, four of which concerned basic attributes (gender, educational background, major, and on-site experience). The remaining eight items covered the following areas: motivation to work in site management in Japan, interest in construction site management, current professional skills, understanding of Japanese culture and work environments, expected salary for site management roles in Japan, tolerance for overtime, and concerns about working in construction site management in Japan. The survey was conducted from March to July 2024.

The data collected were statistically analyzed using SPSS and Excel. Correlation and regression analyses were specifically performed to clarify the relationship between respondents' attributes and their motivations. Furthermore, factor analysis was employed to identify key factors that could influence their intentions to work in Japan.

### 3.2 Survey Results

The basic attributes of this survey are shown in Table 3.

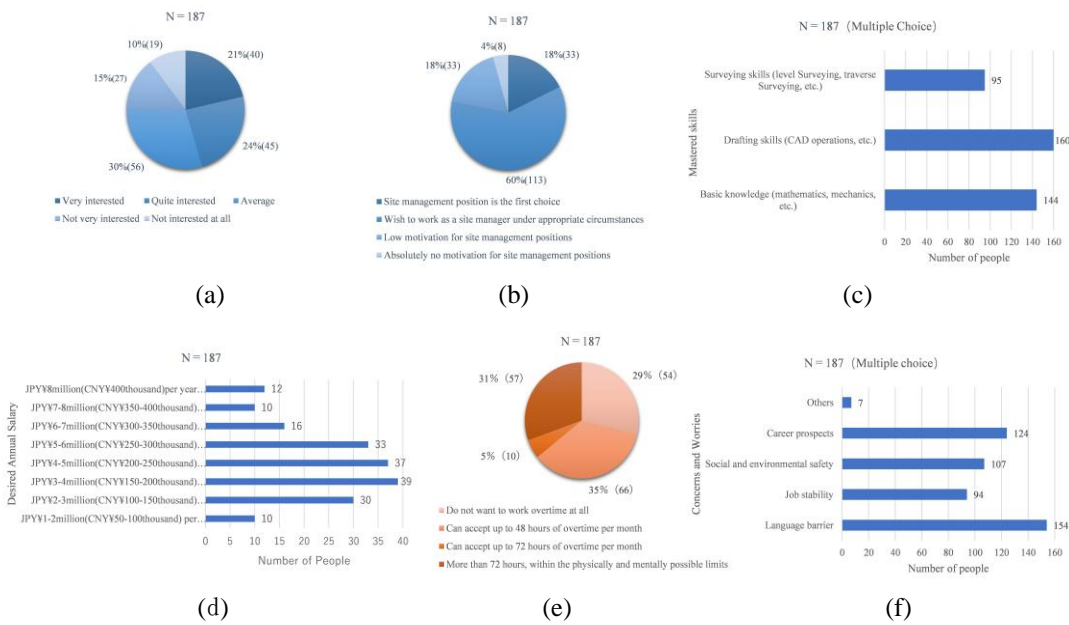
Item		Headcount	Proportion
Gender	Male	140	74.87%
	Female	47	25.13%
Educational background	Technical College	92	49.20%
	Undergraduate	85	45.45%
	Graduate student	10	5.35%
Major field	Architecture	97	43.32%
	Civil Engineering	81	51.87%
	Others	9	5.81%
On-site experience status	Inexperienced	98	52.41%
	0 to 2 months	55	29.41%
	2 months to 1 year	24	12.83%
	More than 1 year	10	5.35%

**Table 3:** Basic attributes (N=187)

There were 187 valid responses, with 140 men (74.87%) and 47 women (25.13%), reflecting the gender ratio typically seen in the construction industry. Regarding educational background, there were 92 graduates from technical colleges (49.20%), 85 university graduates (45.45%), and 10 graduate students (5.35%). In terms of majors, 97 were in architecture (43.32%), 81 in civil engineering (51.87%), and 9 in other related fields such as facilities and cost engineering. Among engineers under 30, those without any site experience accounted for half of the responses, with many having only short-term site experience.

According to the survey results (Figure 3a), 45% of respondents showed interest in construction management work in Japan. Considering the number of young Chinese engineers, the market for those wishing to try working in Japan is substantial. In contrast to the decreasing number of young people under 29 in Japan, results from Figure 3b indicate that 78% of young Chinese engineers are interested in site management roles. Results from Figure 3c show that, in addition to BIM technology, respondents

have acquired skills directly related to site management, such as drawing and surveying capabilities. Graduates from universities and professional schools possess expertise in mathematics and mechanics, providing a solid foundation for future certification and career advancement. According to the Ministry of Health, Labour and Welfare's Basic Survey of Wage Structure, the average annual salary for construction engineers, including site supervisors, is over 5 million yen. As shown in Figure 3d, the most desired minimum annual salary for construction site management positions in Japan ranges from 3 to 4 million yen, with a median of 4 to 5 million yen, which is within a feasible range for such positions in Japan. Regarding overtime, results from Figure 3e indicate that over 70% of young engineers are willing to accept some level of overtime. Considering Japanese labor reforms and the 45-hour monthly overtime cap, many engineers find this amount of overtime acceptable. Concerns (Figure 3f) show that the biggest worry among young engineers is language issues, with 154 out of 187 concerned about this, which is a significantly high proportion. Additionally, some are also concerned about the future prospects of their professions and the safety of society, which are issues worthy of discussion.



**Figure 3: Survey results**  
 (a) Enthusiasm for field management in Japan (b) Enthusiasm for a position in field management  
 (c) Skills acquired (aside from BIM technology) (d) Desired annual salary  
 (e) Tolerance for Overtime (f) Points of concern

In this study, regression analysis was performed using SPSS, examining multiple factors such as gender, educational background, site management experience, understanding of Japanese culture and workplace environments, tolerance for overtime, and interest in construction site management roles in Japan. The analysis specifically investigated the impact of these factors on the intentions of young technicians to work in Japan.

The results (Table 4) revealed that an understanding of Japanese culture and workplace environments significantly positively influences the ability to accept employment in Japan (regression coefficient 0.84, greater than 0.5). This outcome suggests that a deep comprehension of Japanese culture and workplace environments is directly linked to the motivation of young technicians to engage actively in construction site management roles in Japan. Other independent variables (gender, educational background, site experience, and tolerance for overtime) did not show a statistically significant impact on the acceptance of jobs in Japan (regression coefficients less than 0.5). This indicates that these factors

have minimal direct influence on the motivation of young technicians toward site management positions in Japan. The goodness of fit for the regression model was satisfactory ( $R^2 = 0.289$ ), explaining 29% of the variance in the dependent variable. The F-value ( $F(5,181) = 14.716$ ,  $p < 0.001$ ) confirmed that the regression equation overall was statistically significant.

From this analysis, it is understood that the understanding of Japanese culture and workplace environments plays a crucial role in shaping the willingness of young technicians to undertake site management work in Japan. This finding underscores the importance of measures to promote cultural adaptation and understanding in educational programs and workplace design. It has been found that age, educational background, and site management experience in China have minimal impact on the motivation to engage in site management work. Additionally, the fact that tolerance for overtime does not influence their motivation suggests that providing more flexible working conditions could also attract their interest. This provides valuable insights for the Japanese construction industry in devising strategies to attract and retain international talent.

Item	regression coefficient	t value	p value	VIF value
Gender	0.20	1.08	0.28	1.18
Educational background	-0.12	-0.89	0.38	1.07
On-site experience status	-0.13	-2.06	0.04	1.19
Understanding of Japanese culture and work environment	0.84	7.03	0.00	1.06
Tolerance for overtime	-0.05	-0.81	0.417	1.06
Number of observations	187			
R <sup>2</sup> -value	0.289			
F-value	F (5,181) = 14.716, P=0.000			

**Table 4:** Results of regression analysis (N=187)

## 4 A survey on the satisfaction of Chinese individuals engaged in construction management in Japan

### 4.1 Purpose and Method of the Survey

Following the investigation into the intentions of young Chinese engineers, a survey was conducted among 10 Chinese individuals who have worked (or are working) in construction management roles in Japan to understand their satisfaction levels and explore the challenges related to the integration of Chinese talent. The survey included 11 tailored questions: five collected basic personal information (gender, age, educational background, field of study, and on-site experience), while three assessed satisfaction with the work environment in Japanese site management, salary, and overall satisfaction with construction management duties. Additionally, three questions addressed personal views on language barriers, intention to reside in Japan, and whether the professional environment in construction management in Japan is better than in their home country. The survey was conducted entirely within the month of April 2024. Through this survey, the aim was to gain significant insights into the actual satisfaction levels, linguistic challenges, and the willingness to work in Japan from diverse perspectives, thereby evaluating the potential for integrating Chinese talent in Japanese construction management roles.

## 4.2 Survey Results

Item		Headcount
Gender	Male	7(70%)
	Female	3(30%)
Age	20s	5(50%)
	30s	4(40%)
	40s	1(10%)
Educational background	Technical College	1(10%)
	Undergraduate	3(30%)
	Graduate student	6(60%)
Major field	Architecture	6(60%)
	Civil Engineering	4(40%)
Experience	0 to 2 years	3(30%)
	More than 2 years	5(50%)
	More than 5 year	2(20%)

**Table 5: Basic attributes (N=10)**

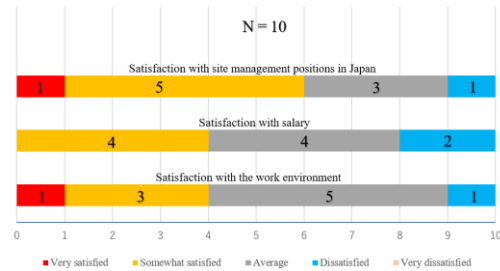
In consideration of the scope and representativeness of the survey, the basic attributes of the selected respondents are shown in Table 5. Among the 10 participants, there are 7 men and 3 women, roughly reflecting the gender ratio typical in the industry. Educational backgrounds include 1 technical college graduate, 3 university graduates, and 6 graduate degree holders, all of whom are engineers trained in architecture or civil engineering. Regarding fields of study, there are 6 in architecture and 4 in civil engineering. Experience on-site ranges from 0-2 years for 3 individuals, 2-5 years for 5, and over 5 years for 2 individuals.

Figure 4 displays the satisfaction levels of Chinese nationals engaged in construction management in Japan. Six respondents are somewhat satisfied with their site management work in Japan, three expressed neutral opinions, and one indicated some dissatisfaction. Breaking it down by specific areas, four people are satisfied with their salaries, four are neutral, and two are somewhat dissatisfied. Regarding the working environment, including labor conditions and workplace atmosphere, four are satisfied, five are neutral, and one is somewhat dissatisfied. This indicates a relatively high level of satisfaction among Chinese engaged in site management.

Survey results concerning unavoidable language barriers for foreign employees are shown in Figure 5a. No one feels that language is a very significant barrier or no barrier at all; one person feels it is a relatively significant barrier, four feel it is normal, and five, the majority, feel it is a minor barrier that does not impact their work. This suggests that Chinese nationals have a sufficient grasp of Japanese to prevent language from becoming a major obstacle.

The results concerning intentions to reside in Japan (Figure 5b) show that one individual has a very high intention to reside, five have relatively high intentions, and four maintain a neutral stance, with none expressing low or no intention. This implies that the favorable living conditions in Japan contribute to a high willingness among Chinese nationals to reside and work there, which in turn supports job sustainability.

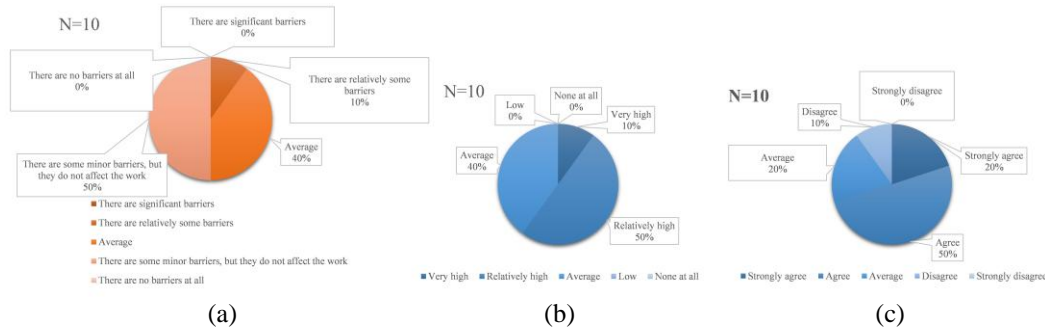
Regarding whether construction management positions in Japan offer a better career than those in China (Figure 5c), seven people believe to varying degrees that they do, two are neutral, and one does



**Figure 4: Customer satisfaction survey results**



not think so. Considering salary, job content, employment pressure, and work environment collectively, the majority rate Japanese site management roles more highly.



**Figure 5:** Survey results (a) Language barrier issue (b) Intention to reside in Japan (c) Provision of a better career

## 5 Discussion

The survey research has highlighted the commonalities between Chinese and Japanese BIM-related education, notably in the generation and visualization of three-dimensional models. Amidst the transformation of the architectural industry and propelled by national initiatives, Chinese universities are at the forefront of research in BIM-related education and smart construction. The rapid construction growth nationally underscores the necessity of integrating BIM technology and site management applications into university curriculums. This strategic integration aims to prepare engineers capable of managing construction sites in Japan and solving complex problems with BIM technology.

Furthermore, surveys conducted among young engineers in Shanghai, Fujian, and Shandong reveal a robust eagerness to engage in site management roles in Japan, influenced minimally by gender, educational background, or local experience. Instead, familiarity with Japanese culture and workplace norms emerges as a crucial component. This insight stresses the need for tailored promotional efforts and training programs to facilitate the smooth transition of talent into the Japanese market. Japan's ongoing labor reforms, such as reducing overtime and enhancing work conditions for female employees, anticipate the integration of skilled Chinese professionals, which is vital for addressing Japan's labor shortages.

The satisfaction expressed by Chinese engineers working in Japan regarding their work conditions, salaries, and career opportunities, despite language and cultural differences, underscores the minimal barriers these differences pose. The structural similarities between the Chinese and Japanese languages offer unique advantages for Chinese engineers, who are expected to excel in roles requiring both technical skills and communication prowess. Many engineers also show a long-term commitment to working in Japan, attracted by superior career development opportunities, signaling positive prospects for sustained talent recruitment.

To further enhance the integration of Chinese technical talent into the Japanese workforce, three recommendations are proposed:

**Strengthen Sino-Japanese Educational Cooperation:** Boost exchanges and collaborations between universities in both nations in the realms of BIM technology and construction management. Regular updates to educational content are essential to align with ongoing industry developments.

**Provide Language and Professional Training Through Third Parties:** Implement language training and specialized professional development programs through third-party organizations to ensure these professionals can swiftly adapt to the Japanese societal and workplace environments.

Enhance On-the-Job Training and Career Development: Urge Japanese construction firms to offer continuous on-the-job training and career development opportunities, aiming to enhance job satisfaction and workforce integration for foreign technical talent.

## 6 Conclusions

This study confirmed the potential contribution of young Chinese BIM technicians to addressing the shortage of construction site managers in Japan, based on comparative surveys of BIM education content at universities in China and Japan, surveys on the willingness of young Chinese technicians trained in BIM to engage in construction management in Japan, and satisfaction surveys of Chinese individuals working in construction management in Japan. It identified key factors influencing the applicability of young Chinese BIM talent, their expected salaries, and their work attitudes, demonstrating the feasibility of addressing these challenges.

However, this study has not yet surveyed the perceptions of companies in Japan that actually employ site managers, which is a direction for future research. Furthermore, by conducting and comparing surveys on BIM education and the employment intentions of young technicians in universities across Southeast Asian countries, differences in integrating technicians from different countries can be clarified. This approach will explore better ways to resolve Japanese construction industry labor shortage.

## Acknowledgments

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## References

- Ministry of Education, Culture, Sports, Science and Technology. (2024). Basic School Survey. Available at: [https://www.mext.go.jp/b\\_menu/toukei/chousa01/kihon/1267995.htm](https://www.mext.go.jp/b_menu/toukei/chousa01/kihon/1267995.htm) (Accessed: Sept. 1, 2024).
- Meng, Q., Zhang, Y., Li, Z., Shi, W., Wang, J., Sun, Y., Xu, L., Wang, X. (2020). A Review of Integrated Applications of BIM and Related Technologies in Whole Building Life Cycle. *Engineering Construction and Architectural Management*, 27, 1647–1677.
- Jin, R., Zhong, B., Ma Hashemi, A., Ding, L. (2019). Integrating BIM with Building Performance Analysis in Project Life-Cycle. *Automation in Construction*, 106, 102861.
- Conrad, H., Meyer-Ohle, H. (2019). Overcoming the Ethnocentric Firm? Foreign Fresh University Graduate Employment in Japan as a New International Human Resource Development Method. *The International Journal of Human Resource Management*, 30(17), 2525–2543.
- Oishi, N. (2014). Redefining the ‘Highly Skilled’: The Points-Based System for Highly Skilled Foreign Professionals in Japan. *Asian and Pacific Migration Journal*, 23(4), 421–450.
- Banh, T. (2023). BIM Education-Global–2023 Update Report.
- Ministry of Land, Infrastructure, Transport and Tourism. (2022). Results of the Construction Industry Activity Survey. Available at: [https://www.mlit.go.jp/report/press/joho04\\_hh\\_001185.html](https://www.mlit.go.jp/report/press/joho04_hh_001185.html) (Accessed: Sept. 1, 2024).
- Xu, J., Li, B. K., Luo, S. M. (2018). Practice and Exploration on Teaching Reform of Engineering Project Management Course in Universities Based on BIM Simulation Technology. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(5), 1827-1835.

Wang, L., Yan, X., Fan, B., Jin, R., Yang, T., Kapogiannis, G. (2020). Incorporating BIM in the Final Semester Undergraduate Project of Construction Management—A Case Study in Fuzhou University. *KSCE Journal of Civil Engineering*, 24(8), 2403-2418.