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An Integration Framework of Building Information Modeling Adaptation for Industrialized Building System Projects

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KEYWORDS

Building Information Modeling
Industrialized Building System
Technological Adaptation
Technology Readiness Index

ABSTRACT

In this paper, the investigation of An Integration Framework of Building Information Modeling Adaptation for Industrialized Building System Projects is discussed to know about cost implications, lack of government support, lack of technology alignment and people acceptance Then, To explore the criteria of technological adaptation for BIM-IBS implementation, To evaluate the level of technological adaptation and technology readiness index for BIM-IBS implementation, To discover the relationship between technological adaptation and technology readiness index of contractors in Central Region of Malaysia toward BIM technology for IBS projects need to be achieve. To achieve this quantitative research is conducted through online interview session. From the experimental works Key criteria that an organization needs to consider in adapting the integration of BIM technologies for IBS construction projects were understood. From these results, it can be conclude that cost are the main key criteria.

1. INTRODUCTION

The construction industry is a crucial component of a nation's economy, providing essential infrastructure and driving economic growth. This is due to constraints in implementing new technologies and practices related to information and communications technology (ICT).According to Nawi et al. (2015), designers and contractors are the main players in the construction industry.

Malaysia's government has shown support for the implementation of Industrialized Building System (IBS) and Building Information Modelling (BIM), as outlined in the Construction Strategic Plan 4.0 and Kementerian Kerja Raya Malaysia's 2021-2025 Strategic Plan.

The CIDB-IBS was established by the Malaysian government as a subsidiary of CIDB Malaysia with the aim of conducting research and investing in IBS techniques, upon the theoretical recognition of the benefits of IBS in construction (Kamar et al., 2010). However, in practice, the adoption of IBS in the private building sector appears to be a little slow when considering the delivery of one million construction units by 2028 (Saad et al., 2022).

2. EXPERIMENTAL PROCEDURE

2.1 BIM-IBS Adaptation Technology

According to Ern et al. (2022), in the case of the IBS project, BIM has the ability to improve the design process. In this research the discussion were more on issues about framework that could help BIM Adaptation for Industrialized Building Construction Projects. There are some key points to know about BIM adaptation in IBS projects.

BIM adaptation in IBS projects brings several benefits, including improved coordination, clash detection, prefabrication, and facility management. It enhances the overall project efficiency, reduces costs, minimizes errors, and fosters collaboration among project stakeholders. By embracing BIM technology, the IBS industry can optimize its practices, overcome challenges, and unlock new opportunities for innovation and growth.

2.2 Research Conceptual Framework

This study's research conceptual framework explores the complex dynamics of technology adaption in firms, with a particular emphasis on the interactions between organizational, technical, and financial aspects. This study attempts to investigate how a complex interplay of financial resources, technical capabilities, organizational structures, and individual technology ready attributes affects the adaptation and implementation of technology by merging these two theories.

3. RESULTS AND DISCUSSION

The interview method was used to collect data with a qualitative approach. Online interviews were conducted using the GOOGLE MEET software. Before conducting an online interview using the GOOGLE MEET software, a semi-structured interview was created to ensure that all information related to the obstacles in construction projects could be obtained. A sample size of five for this qualitative analysis was considered appropriate. As

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participants in this qualitative analysis, 5 BIM experts with work experience in academia, industry and construction projects were selected. The selection criteria for participants depended on: a) Registered with any construction-related organization (e.g., CIDB, BEM); b) Involved in IBS (precast concrete) construction projects; c) Acquire knowledge on BIM; d) Involved in the construction industry for more than 5 years; and e) Willing to participate in semi-structured interview.

Table 1 Participant demographics (n = 5)

Item	Description	Number of Participants	Percentage (%)
Gender	Male	4	75
	Female	1	25
Educational Qualification	Bachelors	-	-
	Masters	-	-
	PhD	-	-
	Professional	-	-
	Engineers	-	-
		5	100
Working Experience	5–7 years	1	25
	8–9 years	-	-
	More than 10 years	4	75

It was found that 100% of the participants were male, while none were female. Similarly,100% of the participants had a Highest Education level of qualification which are Engineers. Furthermore, 25% of the participants had 5 -7 years years of work experience while other 75 % were more than 10 years of working experience. Demographic analysis shows that they had extensive professional experience, qualifications and skills. Thus, they were considered suitable individuals to be interviewed for this research study.

3.1 Qualitative Research

1. Crucial factors for successful adaptation of integrating BIM technologies for IBS construction projects

P1 freq - Finance & software
P2 freq - Training to staff, BIM experts and Technology
P3 freq - Finance, Training to staff, BIM experts & Technology
P4 freq - Finance, Time & BIM experts
P5 freq - Finance & Software

The highest crucial factors that impact the successful integration of Building Information Modeling (BIM) in Industrialized Building System (IBS) construction projects is finance and followed by BIM experts. Training to staf, Technology, software stated by 2 panels each. While the least only stated by only one panel is time factor.

2. Way to measure the readiness of an organization towards adapting the integration of BIM technologies for IBS construction projects

P1 freq - Software & Course
P2 freq - Staff ability & Course
P3 freq - Course
P4 freq - Course & Upgrade tech
P5 freq - Software

The best way to measure the readiness of an organization towards adapting the integration of BIM technologies for IBS construction projects is preparing course which stated by 4 panels.Others ways are only stated one time staff ability, Software count, Upgrade tech.

3. Main challenges or barriers faced in adapting the integration of BIM technologies in IBS construction project

P1 freq - Resistant to change & Cost
P2 freq - Resistant to change & Cost
P3 freq - Resistant to change, Cost, Compatibility & Team work
P4 freq - Resistant to change, Cost, software & Lack of Experts
P5 freq - Cost & Design

The main challenges or barriers faced in adapting the integration of BIM technologies in IBS construction project is cost and resistant to change while other barriers stated only one time which is Lack of Expert, Design, Team Work, Compatibility.

4. Key criteria that an organization needs to consider in adapting the integration of BIM technologies for IBS construction projects

P1 freq - Cost, Technical, Individual
P2 freq - Cost, Organization
P3 freq - Cost, Technical
P4 freq - Cost, Technical, Individual & Sustainability
P5 freq - Cost, Technical

The highest frequency for Key criteria that an organization needs to consider in adapting the integration of BIM technologies for IBS construction projects is cost which is stated by all panels. Followed by Technical, Individual. The least was stated by each panel was organization and sustainability.

4. CONCLUSION

The construction sector in Malaysia is lagging behind in terms of technology. This results in a problem of productivity, quality and value (Zahrizan et al., 2013). The construction industry is a very complex industry involving many parties. A large volume of exchange of documents and drawings between parties can lead to defects in the final product. Applying BIM to an IBS project can help streamline processes and improve data exchange.

In conclusion from Qualitative Research data it shows that Cost play an important role for this research because The main Key criteria that an organization needs to consider in adapting the integration of BIM technologies for IBS construction projects and main challenges or barriers faced in adapting the integration of BIM technologies in IBS construction project is cost. The reason because BIM is a expensive software that needed to be learn by many construction industry players.

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