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Perception BIM Expert Towards Transition Risk to Implement BIM in IBS Projects

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KEYWORDS

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ABSTRACT

This paper examines the transition risks in implementing BIM and IBS technologies to improve their integration in construction. While ICT is essential for IBS, its potential is underutilized. Combining BIM and IBS gives significant benefits, but technical, financial, managerial and legal risks need to be addressed for better adoption. The study investigates transition risk factors for BIM-IBS adaptation among contractors, evaluates the Technology Readiness Index (TRI) for integration, and explores the relationship between risks and TRI. Semi-structured interviews were conducted with contractors in Malaysia's Central Region (Selangor and Kuala Lumpur) registered with CIDB, with grades G4 to G7 and at least five years of experience. Findings indicate that financial risk is the main concern for the first and third question, and managerial risk for the fourth. Overall, the transition risk for BIM in IBS projects is moderate and the dominant readiness TRI indicator of an organization is Optimism, with financial risks being the most significant.

1. INTRODUCTION

The construction industry has evolved with technological advancements like Industrialized Building System (IBS) and Building Information Modelling (BIM). IBS improves productivity by reducing waste, labour, and costs through prefabrication, while BIM enhances project quality, scheduling, and cost control by creating digital building models [8]; [1]. Both are promoted by governments, especially in Malaysia and the UK, to modernize the industry. The global BIM market is expected to grow due to these initiatives and the demand for efficient construction methods [3].

2. LITERATURE REVIEW

BIM, a digital construction tool, enhances decision-making, safety, and efficiency through virtual planning and lifecycle data integration, advancing from 3D modelling to 7D sustainability [4]. While Malaysia lags countries like the UK, initiatives like the CITP and a 2024 mandate for large projects, along with the Malaysia BIM Association, are boosting adoption [5];[6]. Introduced in the 1960s, Malaysia's IBS uses off-site production and standardization to improve construction quality and efficiency. Common systems include precast concrete, formwork, and steel framing, with precast concrete being the most widely used. Despite adoption in 84% of government projects, challenges like high costs and a skilled labour shortage persist [7]. The government continues promoting IBS to reduce foreign labour reliance and improve efficiency [2]. For this study, precast concrete framed buildings will be the chosen, as they are the most widely used IBS in Malaysia.

3. RESULTS AND DISCUSSION

This study employed semi-structured interviews, conducted in-person and virtually, with five BIM specialists from academia, business, and construction projects. Participants, selected for their IBS project experience, BIM knowledge, and at least five years in construction, were informed of the study's purpose and assured data confidentiality. The Table 1 below shows the demographic of BIM expert:

Table 1 Demographic of BIM Expert

Type	Description	Number of Panels	Percentage (%)
Gender	Female	1	25
	Male	4	75
Position	Professional Engineers	2	40
	Senior Engineer	1	20
	Assistant Engineer	2	40
Working Experience	5-10 years	1	20
	11-15 years	-	-
	16-20 years	3	60
	More than 20 years	1	20

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Table 3 summarizes the demographics of 5 BIM expert panellists: 75% male and 25% female. The position is 40% professional engineers, 20% senior engineer and 40% assistant engineer. In terms of experience, 20% have 5- 10 years, 60% have 16-20 years, and 20% have over 20 years, with none in the 11–15-year range, reflecting a predominantly male and highly experienced group.

Table 2 Important factors before successful BIM integration in an IBS project

Legend: P1-P5: Panel

Panel / Factors	P1	P2	P3	P4	P5
Managerial Risk		√	√		
Financial Risk	√		√	√	√
Technology Risk				√	√
Legal Risk					
Time Risk					

Table 2 highlights key risk factors for successful BIM integration in IBS projects, assessed by five panels (P1-P5). Financial risk is the most critical (score 4), followed by managerial and technology risk (2), while time and legal risk (score 0). Addressing financial risks is crucial for BIM adoption in IBS projects.

Table 3 The readiness of an organization to transit from current practices to BIM in an IBS project

Legend: P1-P5: Panel

Panel / Technology Readiness Index (TRI)	P1	P2	P3	P4	P5
Optimism	√	√	√		√
Innovativeness					
Discomfort				√	
Insecurity					

Table 3 highlights that Optimism scored the highest (4), indicating that organizations hold a positive attitude toward BIM adoption in IBS projects and believe it can enhance coordination and productivity. Discomfort scored lower (1), reflecting some unease due to the shift from conventional practices. Innovativeness and Insecurity scored zero. Overall, Optimism stands out as the key TRI indicator for successful BIM implementation, provided learning challenges are well managed.

Table 4 The most common risks preventing the transition from current practices to BIM for IBS projects

Legend: P1-P5: Panel

Panel / Factors	P1	P2	P3	P4	P5
Managerial Risk	√		√	√	
Financial Risk		√	√	√	√
Technology Risk				√	
Legal Risk					
Time Risk	√				√

Table 4 highlights key risks hindering BIM adoption in IBS projects, with financial risk being the most significant (score 4), followed by managerial risk (3) and time risks (2). Technology risk scores 1, while legal risks are not considered issues (score 0). Addressing financial risk is crucial for successful BIM adoption.

Table 5 Examples of possible risks encountered in moving towards BIM-IBS technology

Legend: P1-P5: Panel

Panel / Factors	P1	P2	P3	P4	P5
Managerial Risk	√	√	√	√	
Financial Risk	√	√			
Technology Risk			√	√	√
Legal Risk					
Time Risk	√			√	√

The Table 5 highlights risk in transitioning to BIM in IBS projects, with managerial risk being the most critical (score 4). Time and technology risks score 3, while financial risks are scoring 2 and legal risks are scoring 0. The data emphasizes the importance of focusing on managerial risk for successful BIM adoption.

Table 6 The level of risk for planning to transit from current practice to BIM for IBS projects

Legend: P1-P5: Panel

Panel / Level of Risk	P1	P2	P3	P4	P5
High					
Moderate	√	√	√	√	
Low					√

Table 6 shows that major risks for transitioning to BIM in IBS projects are moderate, with 4 panels indicating this level, while 1 panel indicates low risk.

Table 7 Summary the major factor of transition risks by the questions

Legend: P1-P5: Panel
Q1-Q5: Question

Factors / Question	Major Factor of Transition Risk
Q1	Financial risk
Q3	Financial risk
Q4	Managerial risk

From Table 7, the key transition risks are financial risk for question 1 and question 3. The managerial risk is for question 4.

4. CONCLUSION

From the findings indicate that the major transition risks in adopting BIM for IBS projects are financial factors for question 1 and 3, managerial factors with the overall level of transition risk assessed as moderate. Furthermore, the evaluation of organizational readiness shows that Optimism is the dominant indicator for TRI influencing the transition from conventional practices to BIM implementation.

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