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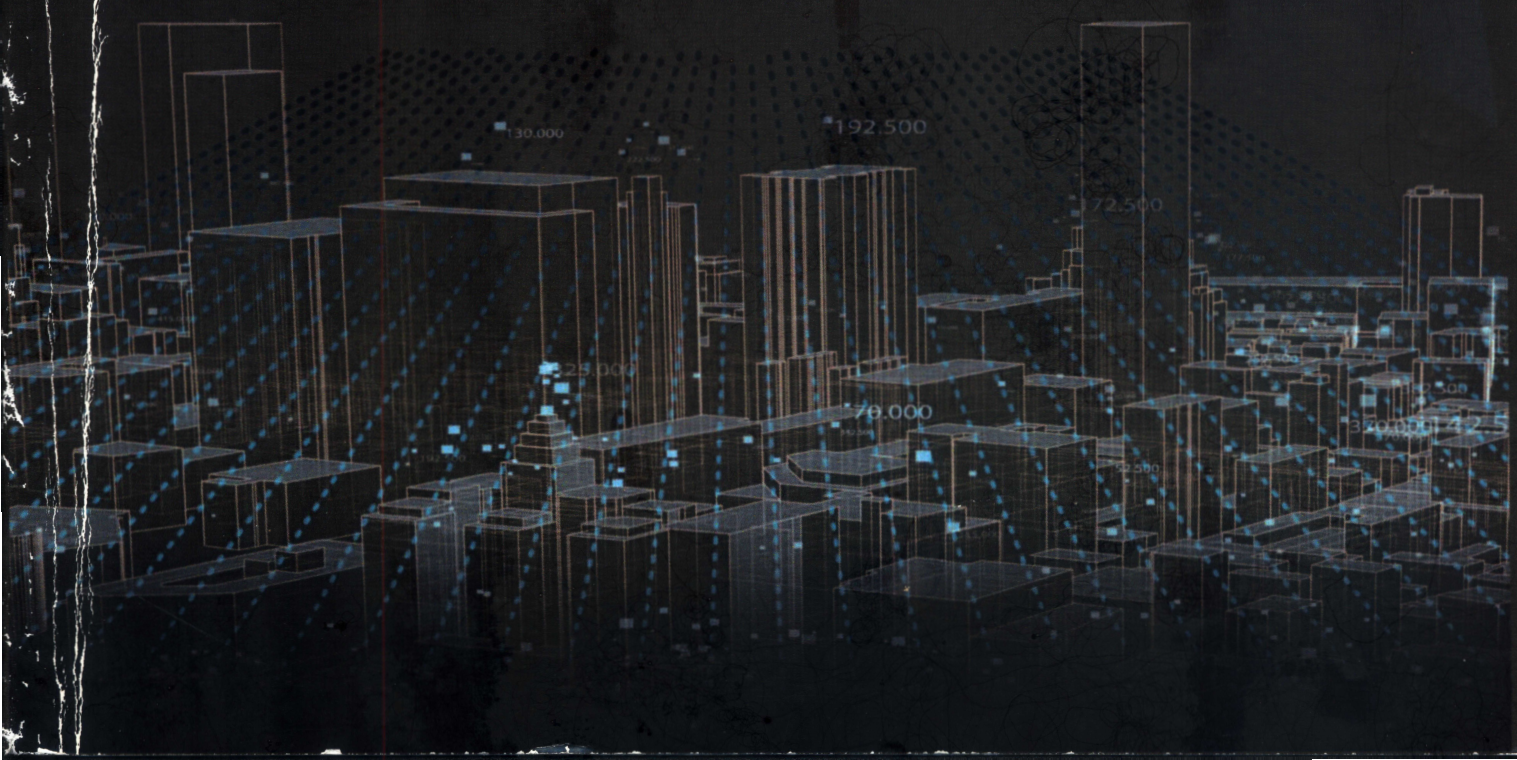
INDUSTRIAL REVOLUTION 4.0 IN MALAYSIAN PROPERTY



PROPERTY TALK 2021: INDUSTRIAL REVOLUTION 4.0 IN MALAYSIA PROPERTY

HOUSING AND LOCAL GOVERNMENT TRAINING INSTITUTE
UNIVERSITI TEKNOLOGI MARA, PERAK BRANCH
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IMPLEMENTATION OF INDUSTRIAL REVOLUTION 4.0 IN CONSTRUCTION PROJECTS

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Abstract

The world is moving toward digitalization era. In view of this, government from different regions are endeavour to embark on this shift by integrating digitalization strategies in the policy making. However, the implication of implementing Industrial Revolution 4.0 (IR 4.0) in construction projects is not fully explored. As such, the objectives of this study were to identify the critical barriers and impacts of the implementation of IR 4.0 in construction projects. In view of time and funding constraints, this study was limited in the Malaysia region. Questionnaire was designed to gauge the opinions of construction stakeholders on the implementation of IR 4.0 in construction projects. It was found that the most critical barriers were 'additional time is required', 'lack of technical and knowledgeable staff', 'lack of financial resources' and 'lack of manpower'. The critical positive impact of IR 4.0 implementation in construction projects were 'safety', 'project success' and 'time performance'. This study provides information to the relevant stakeholders to propose more practical strategies to assist construction stakeholders to embark on IR 4.0 in construction projects.

Keywords: Barriers, construction projects, impacts, Industrial Revolution 4.0

1.0 INTRODUCTION

The construction industry is one of the contributors to the country's Gross Domestic Product (GDP). However, this sector has been encountering delays and cost overruns for long and the issues have not been improved significantly for the past 50 years. These issues will affect the economy of the country in which it was reported that approximately 17.3% of construction projects being delayed for about three months and some were even disclaimed (Tahir et al., 2018). In 2011, the German government came up with the Fourth Industrial Revolution (Industrial Revolution 4.0), intended to connect technology and humans together for better performance and productivity. Many industries such as the manufacturing industry and retailing industries have reaped the benefits of this employment of information technology while the construction industry was still considered neophyte in this adoption (Osunsanmi et al., 2018a). The stakeholders in the construction industry are still unmindful of the essentiality and advantages of the implementation of this concept. In this respect, this study aims to investigate the significance of IR 4.0 in construction industry by adopting the following objectives:

- to identify the main barriers of the implementation of IR 4.0; and
- to examine the impact of IR 4.0 on project performances in construction sector.

2.0 LITERATURE REVIEW

Majority of the past studies were mainly conducted in other developed countries and other sectors especially manufacturing sectors (Castelo-Branco et al., 2019; Hamzeh et al., 2018; Raj et al., 2020). Very few studies have been conducted in Malaysia (e.g. Alaloul et al., 2020;

Aripin et al., 2019) and most of the past research conducted in construction industry were desktop study (Dallasega et al., 2018; Wu et al., 2016) instead of research-based study. Other past studies were focused on a particular IR 4.0-related technology such as Augmented reality (AR) and Building Information Modelling (BIM) rather than a big picture of IR 4.0 concept. Hence, it is crucial to conduct more surveys in Malaysian construction industry to obtain reliable data for the stakeholders to have a better understanding and idea on the implementation of IR 4.0.

3.0 RESEARCH METHODOLOGY

Research method of this study was a questionnaire survey which has been designed into three major sections and was adopted from Wee (2020). The questionnaire consisted of 3 sections, namely, personal information of the respondents, the importance of each barrier and the importance of IR 4.0 implementation on project performance. The questionnaire adopted a 5-point Likert scale (5 = extremely important, 4 = very important, 3 = moderately important, 2 = slightly important, and 1 = not important) (Marosi & Bauer, 2017) to interpret the data statistically. This study aimed to collect information from all types of construction organizations including consultants, contractors and developers in the Malaysian construction industry. This study adopted random and convenience sampling.

4.0 RESULTS AND DISCUSSION

A total of 200 questionnaires were distributed via mail and drop and pick approaches, 30 responses have been obtained. This was mainly due to the Covid-19 pandemic in Malaysia. Twenty-six (26) out of the 30 responses in this study were considered valid where 22 of the responses. The findings of this study were considered reliable as the responses were based on stakeholders with more than 10 years of working experience in the construction sector. Table 1 presents the background information of the respondents.

Table 1: Background of Respondents

Category	Percentage (%)
Types of Organization	
Consultants	70.0
Contractors	23.3
Developers	6.7
Working Experience	
10 - 20 years	73.1
21 and above	26.9

4.1 Main Barriers Hindering Implementation of IR 4.0

Table 2 presents the mean score and RII of the top six most critical barriers hindering the adoption of IR 4.0. 'Additional time/task' and 'staff lack of technical skill and knowledge' have the highest RII of 0.80. It is undeniable that a successfully implemented IR 4.0 system could save time for construction works but adapting to the new system requires additional time or task for the employees and it creates ever higher difficulty with the existing complex nature of construction projects. The findings of this study shown that the professionals seem hesitant of their competencies in IR 4.0-related knowledge and skills in comparison with other developed countries as Malaysia is still lagging behind in the development of these new technologies. In this case, it is important to improve the amount of skilful and competent employees by providing more workshops or enrichment programs which will also help in promoting information exchange between companies and employees and hence, fostering development of IR 4.0.

Table 2: Mean, RII and Ranking of the Barriers

Barriers	References	Mean	RII	Ranking
Additional time/task	[1], [2]	4.00	0.80	1
Staff are lack of technical skill and knowledge	[1], [2], [3], [4], [5]	4.00	0.80	1
Lack of financial resources	[3]	3.89	0.78	2
Lack of manpower	[6]	3.89	0.78	2
Compatibility issues of the current software with new technology	[2], [5]	3.85	0.77	3
Difficulty in authorizing and monitoring the quality and progress of construction	[2]	3.85	0.77	3

Note:
[1]=Delgado et al. (2019); [2]=Mehran (2016); [3]=Ametepey et al.; [4]=Aripin et al. (2019); [5]=Kamble et al. (2018); [6]=Mogos et al. (2019)

'Lack of financial resources' and 'lack of manpower' were the second highest barriers. Based on studies by Aripin et al. (2019) and Ametepey et al. (2015), keeping up with the latest technologies requires a certain amount of financial. On the other hand, adoption of IR 4.0 technologies requires specialist professionals to manage the technologies. This could cause companies encounter manpower issues.

'Compatibility issues' and 'difficulty in authorizing and monitoring the quality and progress of construction' were at the third order. The findings of this study showed that the stakeholders are concerned the adoption of IR 4.0 technology would complicate the existing systems and they may not well-established and affect the product's functional safety. This may lead to interoperability and compatibility issue of the systems (Kamble et al., 2018). IR 4.0-related technologies demand close supervision and specific skills in monitoring the operation as well as unpreventable adoption processes. The complicated and unfavourable nature of construction projects creates higher difficulties in authorizing the progress.

4.2 Main Impact of Implementation of IR 4.0 in Performances of Construction Projects

Table 3 presents the top three most critical performance factors of the implementation of IR 4.0. The findings of this study showed that implementation of IR 4.0 can improve the safety performance in construction projects which is deemed as the top priority in construction works. The second highest rank was project success. This showed that stakeholders believed the adoption of IR 4.0 is able to improve project success in construction projects. Time performance was at the third rank. For example, BIM can solve issues in the delay of information exchange as it enables the professionals from different disciplines including architects and engineers to gather, illustrate, transform, organize and share the data at one single platform (De Gaetani et al., 2020).

Table 3: Mean, RII and Ranking of All Performances

Performances	Mean	RII	Ranking
Safety	4.50	0.90	1
Project success	4.42	0.89	2
Time performance	4.39	0.88	3

5.0 CONCLUSIONS AND LIMITATIONS

The findings of this study showed that the critical barriers affecting the implementation of IR 4.0 in construction projects are mostly related with technology deficiency and financial issues. The stakeholders also believe that the implementation of IR 4.0 will mainly impact three

performance aspects in construction projects, namely, safety, project success and time performance. Malaysian government and all construction companies shall work together to ensure sufficient financial resources in adopting new technologies. Referring to the critical barriers of this study, further study could focus on identifying potential strategic initiatives in policy making to assist construction stakeholders to embark on IR 4.0.

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