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Awareness Level and Challenges of Building Information Modelling (BIM) Implementation among Quantity Surveying Profession

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Abstract

Building Information Modelling (BIM) technology has been acknowledged to offer many benefits to construction players. Many countries especially developed countries have adopted BIM massively in the construction industry, whereas in a developing nation like Malaysia, BIM adoption remains low. Compared to other professionals, quantity surveyors appear to lag in BIM application. The low adoption rate among quantity surveyors is due to a lack of awareness and is still uncertain about the benefits of BIM for their profession. The objectives of this study are (1) to identify the awareness level among the quantity surveying profession on the implementation of BIM, (2) to investigate the perception of the QS profession on the benefits of BIM implementation, and (3) to determine the challenges of BIM implementation. The quantitative research method was used in this study in which questionnaire surveys were distributed to the quantity surveying profession working in Melaka. Data collected from the questionnaire were then analysed by using Statistical Package for Social Sciences (SPSS) software. At the end of the study, the awareness level, perception of BIM benefits, and critical barriers to BIM implementation were discussed and identified in this study. The majority of respondents were aware of BIM implementation and had knowledge of it, but they had not implemented it in their practice due to certain obstacles. Results suggested that the Malaysian construction industry requires BIM implementation strategies to ensure government and industry players collaborate to adopt BIM successfully.

Keywords: Building Information Modelling (BIM), Awareness, Quantity Surveying, Challenges

Introduction

BIM is a computer programme that the project team and stakeholders can utilise for designing, planning, monitoring, and managing the project to ensure its success (Haron et al., 2017). The implementation of Building Information Modelling (BIM) in a building construction project has the potential to yield various benefits, the most important of which are time savings, cost reductions, and improved quality. Although BIM is currently earning worldwide

attention, it appears that its general comprehension is still quite low (Thurairajah and Goucher, 2013). The change from traditional building methods to a BIM-based plan has become one of the most frequently discussed topics, and the Architecture, Engineering, and Construction (AEC) industry has been gradually adopting it. However, the implementation of BIM is extremely challenging and must overcome several obstacles before it can be effectively implemented in the Malaysian construction industry.

According to Othman et al (2020), the majority of construction companies have reported that they do not use BIM for a variety of reasons, including inadequate knowledge, high costs, a lack of awareness, difficulties associated with transitioning from conventional practices, and other obstacles that prevent them from adopting BIM. In comparison to other professionals in the construction sector, quantity surveyors seem to lag behind in BIM application. Besides, the low adoption rate among quantity surveyors is due to a lack of awareness and is still uncertain about the benefits of BIM for their profession (Fung et al., 2014). In short, BIM significantly impacts the Quantity Surveying (QS) profession. Therefore, this study aims to determine the awareness level and challenges of BIM implementation among the quantity surveying profession in the construction industry.

Literature Review

Awareness Level and Perception of Building Information Modelling (BIM)

According to a survey conducted by Ismail et al (2019) involving respondents from quantity surveying backgrounds, most respondents were aware of BIM usage but had not implemented it in their work. Besides, Zhou et al (2017) indicated that Quantity Surveyors are fearful of BIM and are hesitant to embrace it because they are worried, that they will become redundant as BIM can do many traditional QS activities and hence replace their work. In addition, Zainon et al (2016) stated that as BIM eliminates more of the conventional job of quantity surveyors, there is growing concern that this would endanger the survival of the QS professions, particularly for small firms that still rely on the production of bills of quantities. It is essential for those involved in the construction industry to be aware of the significance of BIM application in construction projects (Latiffi et al., 2013). Moreover, a study by Zhou et al (2017) revealed that although most quantity surveyors are aware of the benefits of BIM, these benefits are ambiguous and the obstacles are heavy. It can be perceived that most construction professionals are aware of BIM technology but reluctant to take the risk of adopting it due to the uncertainty of BIM capabilities in construction projects.

Benefits of Using Building Information Modelling (BIM)

Implementing BIM into a construction project can provide numerous benefits, with time, cost, and quality is the most prominent. Using BIM in the construction industry will help find any potential conflicts during the design process, improve the efficiency of project scheduling, reduce costs, ensure high project quality, and encourage cooperation among construction players (Latiffi et al., 2016).

For quantity surveying practice, Ismail et al (2016) stated that the application of BIM can improve the accuracy of cost estimates by providing early schedule data, rapid forecasts of the cost impact of design changes, enhanced comprehension through visualisation, and information for documentation. In addition, Perera et al (2012) stated that Building Information Modelling (BIM) automates many tedious aspects of traditional quantity surveying, such as measurement, take-offs, the production of Bills of Quantities (BQ), reducing human error, enhancing efficiency, and encouraging collaboration. Furthermore, if

the design is modified, the QSs can quickly recognise the alterations in the drawings and automatically update the quantities (Fung et al., 2014).

Challenges of BIM Implementation in Malaysia

High Initial Cost

BIM implementation necessitates a large initial investment of money to acquire the technology and additional costs such as training and development. BIM also has a huge operational cost, including the expenditure of money on software, hardware, equipment, and training, all of which significantly impact the overall cost (Jamal et al., 2019). Besides, Latiffi et al (2015) stated that because of the high initial cost involved in adopting BIM technology, only large corporations have the financial resources necessary to purchase ownership of the software.

Lack of expertise, exposure, and awareness about BIM

A significant barrier that has emerged in the way of widespread implementation of Building Information Modelling (BIM) technology within the construction industry is a shortage of knowledgeable and competent BIM manpower within construction organisations. Moreover, Fung et al. (2014) stated that quantity surveyors have a low adoption rate because they are unaware of the benefits of BIM for their profession. Quantity surveyors are still unsure about BIM's potential usefulness in their work.

Insufficient Support and Participation from the Government

Othman et al (2020) expressed that many construction stakeholders have argued that the Malaysian government should provide detailed guidelines to gain a better comprehension of the BIM execution framework. The guideline is intended to assist those involved in the construction industry in implementing BIM in construction projects at the appropriate phase (Latiffi et al., 2016). According to Jamal et al (2019), the enforcement of BIM regulations by local authorities is very important and should be prioritised to increase BIM adoption.

Resistance to Changing Current Construction Industry Practice

The majority of construction stakeholders resisted implementing BIM because they are accustomed to the traditional or conventional method of managing construction projects and are reluctant to change (Latiffi et al., 2016). According to the interview conducted by Fung et al (2014), they pointed out that quantity surveyors (QS) are reluctant to incorporate BIM in their practices because they are unfamiliar with BIM and they are more likely to revert to traditional working methods, which will impede their job performance.

Methodology

This study used a quantitative method approach and questionnaire surveys as the data collection method. The target population for this research consisted of all quantity surveying profession working at *Jabatan Kerja Raya (JKR)*, QS consultant firms, and contractor companies in Melaka. For this research, the sampling frame requiring the complete list of population elements was unavailable. Therefore, the non-probability sampling method was selected for this research sampling to collect the data. The sample size was calculated by using the “Small sample technique” (Krejcie & Morgan, 1970). Hence, the minimum sample size is 49 respondents. The questionnaire survey was designed based literature review and data were collected by using a close-ended questionnaire distributed through online platform. In

this research, the questionnaire's format consisted of four (4) sections designed to explore the respondent's demographic background, the awareness level of BIM, perception of BIM benefits and challenges of BIM implementation. For the first two sections, the questionnaire is designed to be multiple-choice questions while the other two sections are based on a Likert scale of five (5) ordinal measures from 1 to 5 with choices ranging from "strongly agree" to "strongly disagree". Data obtained from the questionnaire were analysed by using Statistical Package for Social Science (SPSS) and represented in an organised form.

Analysis and Findings

Out of 80 questionnaires distributed, only 52 questionnaires were returned which represented 65% of the total distributed questionnaires. Based on the small sample technique by using Krejcie and Morgan (1970) formula, the minimum sample size required is 49 respondents. Hence, the desired size of the sample was attained, and all of the information obtained from the questionnaires was analysed.

Awareness Level Among QS Profession on Implementation of BIM

The result of this section was to achieve the objective of this research study which was to identify the awareness level among the quantity surveying profession on the implementation of Building Information Modelling (BIM).

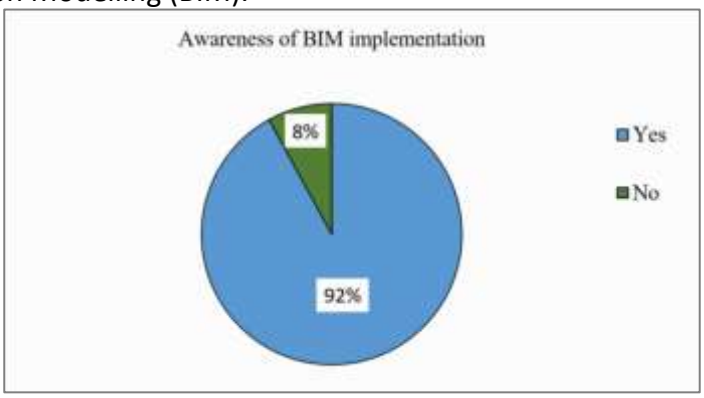

Figure 1: Awareness of BIM implementation

Figure 1 demonstrated that the majority of the respondents which is 92% had knowledge and were aware of BIM meanwhile only 8% of the respondents were unknowledgeable and unaware of BIM. This revealed that most of the respondents involved in this survey were knowledgeable and aware of BIM implementation.

Based on the result of the analysis, it can be concluded that the majority of the respondents were aware of BIM implementation but almost half of them did not implement it in their work. This was supported by a study by Ismail et al. (2019) who found that most quantity surveyors were aware of BIM and had a moderate understanding of it but did not use it in their practices. In addition, to comply with the BIM drive, the QS must acquire IT skills and knowledge of BIM software (Tee and Kamal, 2021).

Perception of QS Profession on Benefits of BIM Implementation

The question in this section was used to investigate the perception of the quantity surveying profession on the benefits of BIM implementation.

Table 1
Perception of QS profession on benefits of BIM implementation.

Perception of BIM benefits	Mean	Std. Deviation	Rank
BIM is very beneficial to be applied to the construction industry.	4.31	0.781	1
BIM can increase productivity and efficiency of work.	4.23	0.757	2
BIM can assess the time and cost associated with a design change.	4.23	0.783	3
Aware of the main benefits of BIM technology.	4.19	0.687	4
BIM can integrate construction scheduling & planning.	4.19	0.742	5
BIM automatically quantification for BQ preparation.	4.17	0.734	6
BIM can eliminate clashes in design.	4.15	0.872	7
BIM can monitor and track progress during construction.	4.10	0.799	8
BIM can improve multi-party communication and maintain synchronise communication.	4.02	0.918	9

Table 1 shows the list of perceptions of the QS profession on the benefits of BIM implementation with their mean score and standard deviation. The result shows all variables had a mean value of above 4.0 which is between 4.31 to 4.02 and a standard deviation between
0.781 to 0.918. indicating a high agreement of the respondent's perception with significant deviation. The analysis shows that the variable 'BIM is very beneficial to be applied to construction industry' received the highest mean which is (M = 4.31, SD = 0.781). The second and third rank goes to 'BIM can increase productivity and efficiency of work' and 'BIM can assess time and cost associated with design change' with the mean of (M = 4.23, SD = 0.757) and (M = 4.23, SD = 0.783) respectively. This was followed by 'Aware of the main benefits of BIM technology' with a mean score of (M = 4.19, SD = 0.687) as rank number 4 and 'BIM can integrate construction scheduling & planning' with a mean score of (M =4.19, SD = 0.742) as rank number 5. Other remaining benefits of BIM implementation are highlighted in this section accordingly. The Cronbach's alpha for the perception of the QS profession on benefits of BIM implementation was 0.956 which classified as excellent.
Based on the result from the analysis, it can infer that the majority of respondents agreed and gave a positive perception regarding the benefits of BIM implementation. The benefits of BIM have encouraged the construction industry to implement BIM in construction projects. Furthermore, BIM has been properly defined and demonstrated as a useful tool in the modern construction industry. This is supported by Latiffi et al. (2013) who mentioned that implementing BIM in the construction industry can increase project quality and enhance the industry's reputation. Besides, quantity surveyors can extract the quantities from the modified model automatically and avoid tedious human measurement by utilising BIM (Zainon et al., 2016). Hence, it is proven that BIM can improve QS performance, consequently, enhancing the performance of the project.

The Challenges of BIM Implementation

The question in this section was used in this research study to determine the challenges of Building Information Modelling (BIM) implementation.

Table 2
The Challenges of BIM implementation

Challenges to implement BIM	Mean	Std. Deviation	Rank
BIM's software is expensive and requires a high initial cost.	4.35	0.738	1
Lack of competent staff to operate the software.	4.19	0.793	2
Lack of training on BIM software.	4.13	0.817	3
Lack of knowledge about BIM.	4.13	0.841	4
Willingness to change from conventional method to BIM if given the chance and support.	4.13	0.841	4
Reluctance from Clients, Contractors or Consultants to implement BIM.	3.94	0.802	5
Insufficient support and participation from the Government.	3.85	0.958	6
BIM's software is very difficult to learn.	3.73	1.031	7
Resistance to change current construction industry culture.	3.67	1.133	8
The application of BIM will affect the current process practice.	3.44	1.195	9

Table 2 shows the list of challenges of Building Information Modelling (BIM) implementation with their mean score and standard deviation. The result shows a mean value between 4.35 to 3.44 and a standard deviation between 0.738 to 1.195. The analysis shows that the variable 'BIM's software is expensive and requires a high initial cost' received the highest mean which is (M = 4.35, SD = 0.738). The second and third rank goes to 'Lack of competent staff to operate the software' and 'Lack of training on BIM software' with the mean of (M = 4.19, SD = 0.793) and (M = 4.13, SD = 0.817) respectively. Next, the challenges of 'Lack of knowledge about BIM' with a mean score of (M = 4.13, SD = 0.841) and 'Willingness to change from conventional method to BIM' with a mean score of (M = 4.13, SD = 0.841) shared the same ranking at number four. This was followed by the challenges of 'Reluctance from Client, Contractors or Consultant to implement BIM' came in fifth place where the mean score is (M = 3.94, SD = 0.802). Other remaining challenges of BIM implementation are highlighted in this section accordingly. The Cronbach's alpha for the challenges of BIM implementation was 0.856 which categorised as good.

According to the findings of the analysis, it can be concluded that most of the respondents agreed with the challenges of BIM implementation stated in this section. The agreement on 'BIM's software is expensive and requires a high initial cost' reached the highest rank responses by respondents. This can be demonstrated by a study from Zainon et al (2016) who infer that adopting BIM requires a huge financial investment, as only large companies can afford the expensive technology. Besides, Jamal et al (2019) also mentioned that the most significant obstacle is the lack of skilled and experienced BIM workforce within the industry. Thus, it appears that the most effective method for overcoming obstacles to BIM

implementation is for government agencies and private developers to play larger roles to strengthen the position of BIM technology in Malaysia.

Conclusion

To conclude, frequent studies have shown that BIM is an useful technology, emphasising its potential resources that should be grab by the all players in the construction industry. However, implementation of BIM in the Malaysian construction industry remains slow. Based on the data analysis obtained from the questionnaire, the study found that majority of respondents were aware of BIM but had not applied BIM in their practice. Furthermore, the majority of respondents gave a good perception and strongly agree with the benefits of BIM implementation. Finally, the significant challenges of BIM implementation have been identified. Therefore, the Malaysian construction industry requires a BIM implementation strategy and guide to ensure government and industry players collaborate to implement BIM successfully.

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