Building Information Modelling (BIM) Adoption by Quantity Surveyors: A Preliminary Survey from Malaysia

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Abstract. Inefficiencies and ineffectiveness of delivering construction projects have negatively impacted the construction industry for decades. However, the emergence of BIM technology has influenced the construction process with its many benefits towards project success. Among the benefits offered by BIM are reduced project time and cost; and enhanced team collaboration and communication through the improvement of project quality and its performance. Consequently, BIM applications are claimed to provide more reliable working practice for Quantity Surveyors especially in establishing their cost estimates. Despite its well-known advantages that drive BIM employment worldwide, its usage in Malaysia is still at infancy level, with the lack of implementation by the Quantity Surveyors. Thus, this paper aims to explore BIM usage amongst Quantity Surveyors in Malaysia. A preliminary survey was undertaken to capture their views on BIM awareness, the application of BIM software, BIM usage by project stages, prospects of BIM and its importance. The findings from the survey show that BIM implementation amongst the professionals was still low. The application of BIM tools was used mostly for cost estimating and preparing Bills of Quantities (BQ) for tender documentation purpose only. Although BIM was mostly rated as important, most of the respondents were only aware of BIM but were not using it in their practice. However, they showed their interest in knowing more on how BIM would benefit their practice. The significance of this preliminary study is in terms of getting input on BIM adoption level amongst the construction players focusing on the quantity surveying field, which could be used as a reference point and benchmark towards BIM development in Malaysia.

1. Introduction
Throughout the years, the construction industry has been affected by many construction problems such as project delays, reworks, inaccuracies, less team-coordination, limited information-integration, and many more, leading to an abundance of project failures. Nevertheless, BIM has sparked a new revolution in the construction industry globally. The implementation of this technology has proved to have several merits towards gaining more effective and efficient practice for construction projects. Among the advantages of the BIM applications are cost and time saving; reduced human resource; quality and performance improvement; clash detection; improved accuracy; increased profitability; enhanced collaboration and communication; better presentation and documentation process; improved planning and design; better visualisation; and improved information.
BIM that has been actively employed by many developed countries such as the UK, US, Europe, Australia and New Zealand [1][2], has not been widely implemented in most of developing countries [3]. For example, the BIM development in the Malaysian construction industry is claimed to be still at an early stage of BIM with implementation level at the scale of 0 to 1 [4]. Although the Malaysian Government has aimed 2016 as the year of BIM mandate for most of the government projects [5], the implementation is still fragmented and mostly dominated by the private sectors since 2009 [5][6]. Additionally, Quek (2012) suggested that the quantity surveying sector in Malaysia should take an appropriate action to initiate an evaluation of BIM influence towards its practice [6]. With the limited studies on the Quantity Surveyors’ usage of BIM technology, it is worthwhile to primarily explore the extent to which BIM diffusion has possibly spread into this field.

Hence, the objective of this paper is to investigate the penetration of BIM technology amongst the construction players in Malaysia by focusing its usage by the Quantity Surveyors. The subsequent sections of this paper review previous literature on BIM diffusion in the Malaysian Construction Industry and BIM significance by referring to the practice of the Quantity Surveyors. The sections further discuss the methodology, results of the survey and the conclusions based on the findings.

2. Literature review

In Malaysia, having been given mandate by the Government, the BIM uptake is led by the Construction Industry Development Board (CIDB) [7]. Even though the implementation of BIM in Malaysia has been monopolized by the private sectors since 2009, it was literally started by Malaysian Public Works Department (PWD) in 2007 with the limitation of BIM applications only for PWD internal projects [8]. Having the first BIM Conference in Malaysia in 2009, CIDB introduced BIM as a platform to potentially establish more effective construction projects and encouraged for more industry players to start using BIM in their practice [5]. Shortly thereafter, in 2010, the National Cancer Institute Putrajaya was announced as the first national BIM project. Consequently, in 2011, BIM was actively promoted by the CIDB with some initiatives to expand the usage of BIM amongst the construction players in Malaysia [7]. The BIM Committee was set up in 2013 by CIDB in collaboration with the PWD, in which they launched BIM Roadmap 2015 in 2014, to be used by the industry as a guideline along with BIM practice [8]. With the total more than 20 construction projects utilising BIM recorded in 2014, they are currently moving forward in developing more guides to achieve the Malaysian Government implementation of BIM by 2016.

A survey was conducted by the PWD in 2013 and showed the increase of BIM usage in Malaysia as compared to only 2% of adoption rates in 2010 [8]. A survey of BIM usage in architecture firms in Malaysia exposed that 80% of respondents are alert of BIM benefits offered to them, but unfortunately, only 20% of them are currently using the BIM [9]. While Rogers et al. (2015) described that the Malaysian engineering consulting services firms recognized the BIM concept, however lacking personnel training, guidance, and support by the government deterred the firms from adopting BIM [10]. Additionally, Ali et al. (2014) also highlighted that the enforcement by the Malaysian Government could accelerate the BIM implementation amongst the construction players, to cope with their inadequate knowledge and reluctance towards adopting BIM [11].

The development of this technology further impacts the quantity surveying practice notably in contributing to establishing more accurate and reliable construction cost estimates. Despite challenging the traditional roles of the QSs [12] BIM benefits presents the opportunity to improve their flawed practice and add some more values to their existing services [13]. Wong et al. (2014) recognized BIM capabilities for QSs in relation to time, cost and quality in improving project performance [14]. In exploring BIM influence towards QSs practice, Kulasekara et al. (2013) concluded that apart from providing more accurate cost estimates, BIM potentially automates measurement, hence leading to reducing time and costs to estimate a project [15]. BIM is claimed to overcome weaknesses in the traditional method by providing more reliable sources for quantity take-off and cost estimating processes [16]. Thus, it is significant to further explore the BIM implementation amongst the Quantity Surveyors
in Malaysia. In which, it would later lead to more studies investigating on how BIM assists their practice in many ways, towards successful construction projects.

3. Methodology

Data were collected by using close-ended questionnaire administered by online survey. The questionnaire was pre-tested prior distributing to respondents as to ensure the clarity of its content to facilitate the study purpose. This survey was considered as a cross-sectional study, conducted at a particular time to prospect the current implementation of BIM by the Quantity Surveyors in the Malaysian construction industry. The questionnaire survey was distributed to Malaysian Quantity Surveyors registered with the Royal Institution of Surveyors Malaysia (RISM). There are about 1140 Quantity Surveyors that registered with RISM on the list, yet only 295 were randomly chosen for the research samples, calculated based on Krejcie & Morgan (1970) [17]. This study obtained 202 responses from the survey conducted; hence the overall response rate becomes 68.47%. Apart from questioning on the respondents’ background information, the questionnaire of the study was mainly designed to analyse the BIM usage amongst the respondents including their awareness, BIM software application, BIM knowledge, BIM importance in current roles, and planning of using BIM in the future.

4. Analysis and findings

The first part of the questionnaire briefly explores the respondents’ background information including years of experience in construction cost estimating, their professional background, current roles in their organisations, and the nature of business of their current organisations. Majority of respondents (37.1%) have more than 10 years in estimating construction costs. Almost all of respondents were from a quantity surveying background, taking 94.6% from the overall percentage. Most of respondents are Quantity Surveyors (83.7%). About half of the respondents were occupied by quantity surveying firms (52.0%). With the Quantity Surveyors being the majority of respondents in the survey, it met the research requirements in acquiring feedback from the appropriate respondents to generalise the findings.

In terms of awareness of the BIM usage in the construction industry (see Figure 1), 68.3% of overall respondents in this survey were aware of BIM usage but have not used it in their practice. It can be concluded that BIM awareness amongst the respondents is high regardless of whether they are applying any BIM technology in their practice or not. Even though the revolution of BIM has been globally diffused in the construction industry in recent years, BIM low implementation and slow development in Malaysia might be the cause of unawareness amongst those respondents.

| Awareness                                      | Frequency | Percentage (%) |
|------------------------------------------------|-----------|----------------|
| Aware & currently using BIM in cost estimating | 26        | 12.9           |
| Aware and have used BIM (but not in cost estimating) | 19        | 9.4            |
| Aware of BIM but have not used it               | 138       | 68.3           |
| Not aware of BIM                                | 19        | 9.4            |
| Total                                          | 202       | 100.0          |

In terms of BIM software usage (see Figure 2), the Glodon software is the most commonly adopted (27.1%). Apparently, Glodon software is specially designed for a quick modelling and BIM-supported
quantity take-off (www.glodon.com), to suit the practice of Quantity Surveyors to perform building cost estimating accurately and efficiently. For the application based on construction project stages (see Figure 3), the majority of respondents used the BIM software for the project estimating phase (28.7%). This phase typically consists of taking off quantities and estimating the construction costs for the desired projects. It could be seen that the respondents used the BIM software in this phase, for it is the most important stage in their practice. Estimating is one of the most crucial tasks in the quantity surveying field.

![Figure 2. Percentage of BIM software types used by respondents](image1)

![Figure 3. Percentage of respondents’ BIM usage by project stages](image2)
In terms of BIM knowledge, its importance and future planning to use it, the patterns can be seen in Figure 4, Figure 5 and Figure 6. Amongst the respondents that were at least aware of BIM development, they also had to rate their knowledge in BIM technology from 1 to 10 of the scale (from not at all knowledgeable to very knowledgeable rating). It can be interpreted that most of the respondents tend to weight their knowledge in BIM as moderate (see Figure 4). This result is aligned with the rate of awareness on BIM usage amongst those surveyed. They are, in the majority, aware of BIM regardless of using it. The survey outcome also reveals that respondents have rated BIM to be of a high level of importance in their current roles (see Figure 5). To perceive the BIM prospective, the respondents were examined regarding their future planning in using BIM. It illustrates that the respondents were most likely planning to adopt BIM in their future practice (see Figure 6). Given the previous high rating on BIM importance in their current roles, it potentially affects the respondents’ future BIM planning. Indeed, it implies that the respondents were highly expected to use BIM in the future. They might potentially believe that BIM would continuously bring improvement in their existing practice; therefore, its usage should be extended for future projects.

5. Conclusion
It resulted that the majority of respondents were aware but had not used BIM in their practice. Glodon software is commonly used; and mostly employed the software in cost-estimating practice. The respondents have mostly rated themselves as having moderate knowledge in BIM. For them, BIM plays a major role in their practice. Thus they predicted that they would be using BIM for their future planning. Overall, it showed the high BIM awareness with average knowledge amongst the respondents but employing the technology in their practice at present was still unsatisfactory. Thus, it can be interpreted that the implementation status of BIM amongst the Quantity Surveyors in Malaysia is still low. It indirectly indicates that the adoption of BIM in the respondents’ practice is bounded by the moderate
knowledge they have, specifically in project costing incorporating a BIM mechanism. Ultimately, this scenario might further explain the low level of BIM employment amongst the Malaysian Quantity Surveyors. Nevertheless, it is possible that the number of BIM users amongst the QS professionals in Malaysia will be increased in the future, due to the statistics that signify the importance and interests of frequent non-users using BIM in their forthcoming projects. This will shed some light on the greater expansion of BIM growth within the quantity surveying practice in Malaysia, hence, bringing technology usage in the practice to the higher level.

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