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Assessing the BIM Software Application in Quantity Surveying Practice

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Abstract

Building Information Modeling (BIM) is a technology and a new buzzword which being used and is gaining a momentum within the construction industry in Malaysia. For the past few years the wave of BIM had been hitting the shores of construction industry in Malaysia. It has the potential to revolutionize the quantity surveying practice. However, it appears that quantity surveyors (QS) are still lagging behind in BIM application compared to other professionals. It is still generally underexplored the application and usage of BIM software in their practice. This research attempts to examine the usage of BIM software in quantity surveying practice. The scope of this research limited in pre-construction phase. The list of BIM software that related to enhance the quantity surveying performance are found through literatures and verify through pilot study. The findings indicate that through 9 different types of BIM software, Autodesk Quantity Takeoff is the most popular among quantity surveying practice. These findings provide an evidence that QS had been integrated their practice into BIM technology.

Keywords

Building Information Modeling (BIM), capability, quantity surveying, construction industry

Introduction

Finalizing a project in a construction sector within three important parameters such as time, cost and quality are benchmarks of accomplishment for a project. Matipa, Cunningham, & Naik (2010) states that it is critical to confirm that the construction cost is within the client's budget because cost is mid the major parameter throughout the project life cycle. Quantity Surveyor typically report to project manager and give cost guidance in the decision-making process all through the administration of a project from conception stage to the implementation phase of the project. The QS handles cost control and estimating, the tendering procedure and, after contract grant, the business interface. QSs ought to have the capacity to do assessing and estimation of construction works preceding tender, generating the bill of quantities; produce bidding documentation and deal with the bidding procedure; elucidate and evaluate tenders; and deal with the resultant contract through month to month valuations, varieties control, contract organization and evaluation of

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cases. However, these tedious and time consuming tasks can be eliminated by automating the process through implementing building information modeling (BIM) (Ismail, Adnan, & Bakhary, 2019). Wong, Salleh, & Rahim, (2014) pointed out that BIM is evacuating a greater volume of the conventional work of QS by automating the all tedious Qs task.

In order to implement their BIM capabilities needs, several of software available in markets. Each of the software have their own capabilities which suits in each stage of construction phase (Ismail et al., 2019; Wijayakumar & Jayasena, 2013). There is very limited research on investigation on the usage of BIM software that suits QS requirements (P. F. Wong et al., 2014). Lack of information regarding BIM application along with uncertain capability from new technology has resulted in reluctance to implement new technology among QSs (S. Y. Wong & Gray, 2019). Therefore, this paper pointed out the software that been used by QSs in pre-construction phase. This will later helped the QSs in understanding the suitable software that suits to the QS requirements.

QS play a crucial role in the construction industry. They are accountable for the cost management throughout the entire project life cycle from the feasibility and design stages until building completion. Their task can be separated into two phase, which are pre-construction and post-construction phase of the projects. At the pre-construction phase, quantity surveying services include the preparation of preliminary estimates and feasibility studies, cost plans and schedules, bills of quantities preparation, procurement and tendering procedures, and evaluation of tenders (Stanley & Thurnell, 2014). On the other hand, at the post-construction stage, quantity surveying services include providing general contractual advice, assessing interim payments, evaluating variation, preparing finance statements, settling final account, and giving alternative dispute resolution (ADR).

Quantity take-off (QTO) is the most critical task provided by quantity surveyor. QTO is a pre-requisite for carrying out several other tasks such as estimating and bills of quantities preparation. However, it is very time-consuming and prone to error. Latiffi, Mohd, Kasim, & Fathi, (2013), Azhar, Khalfan, & Maqsood, (2015), Ali, Mustaffa, Keat, & Enegbuma, (2015) and Waterhouse & Philp, (2016) (Suhaida, Nurul Aini, Nadeera, & Shazwan, 2019) claims that the advent of BIM technology are the potential solution for all the QTO conventional problems. It removes the need for deadly manual take-off, human error on estimation and it provides a quicker way to analyze data and prepare cost estimates. BIM can offer significant assistances over traditional drawing-based manual taking-off process. When changes happen, it requires manually editing and updating for all drawing views which is tedious and error-prone.

Methodology

The research was divided into three phases. Firstly, the list of software associated with BIM in quantity surveying practice were identified through literature review. Many resources were used to gather information with regard to software's capabilities associated with BIM such as books, academic journals, articles, electronic journal databases and conference proceedings that focused on BIM technology in cost aspect. Apart from that, the reviewed literature also includes white papers and technical reports from various software vendors, guidelines and reports generated by

regulatory and government institutions and newsletters and articles on the practice in the construction industry. RIBA Plan of Work 2013 (Figure 1) is used as template for classifying the tasks by QSs in the construction process. This in turn helped to identify BIM capabilities in quantity surveying practice. The scope of this study covered pre-construction stage; hence stage 1 to 4 is applicable. Pre-construction is chosen as many designs and cost decisions are made at this early stage. Poor design and cost advice at the early stage will impact the later construction stage which often caused redesign, change order, rework, and leading to cost and time overrun.

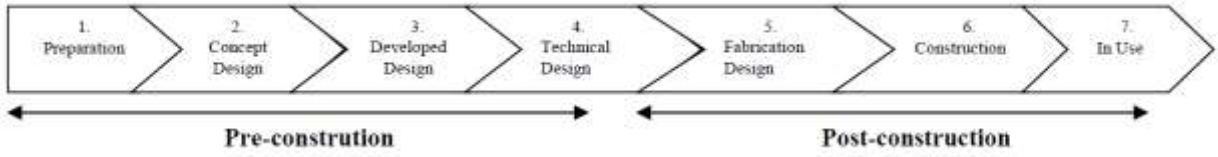

Figure 1. RIBA Plan of Work (Harris, Ani, Haron, Preece, & Husain, 2014)

The second phase was the pilot study. This is where all the list of software gather, listed and sent for verification to several BIM expert for analyzing the suitability in QS practice. The BIM expert define as QSs who have more than 10 years of experience in the construction industry and had adopted BIM in their practice.

The last phase was a quantitative survey. Data were collected by using close-ended questionnaire administered by online survey. 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 100 Malaysian Quantity Surveyors registered with the Royal Institution of Surveyors Malaysia (RISM). The minimum sample of 100 was used as the population are too large (Ghofar & Islam, 2015). This study obtained a total of 63 completed online questionnaires and the results are analysed in the discussion below.

Results and Discussion

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. The demographic data collected from the participants is shown below in Table 1. Most of the respondents were having more than 10 years' experience in construction industry with at least experienced one project involving BIM technology. 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%). 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.

Table 1. Demographic of characteristic of sample (n=63)

Respond Rate	63%
Education Background	
i- Quantity Surveying	83.7%
ii- Engineering	9.5%
iii- Construction Management	3.5%
iv- Others	3.3%
Years of experience	
v- Below 5 years	27%
vi- 5 years – 10 years	32%
vii-Above 10 years	41%
Number of BIM project involved	
i- 0-1	72%
ii- 2-3	25%
iii-4-5	3%
iv-Above 5	0%

In terms of involvement in construction project with BIM associated, the table showed that at least 72% of the QS had the experienced in using BIM in project. There also even 3% of respondents had experienced more than 4 project associated with BIM. This proved that QS had start to evolve from manual task to the automated by using BIM technology.

All the software listed had been identified and verified. The list is only limited for usage in pre-construction phase which used during Preparation, Concept Design, Developed Design and Technical Design. The list (Table 2), is to provide the measurement of awareness and understanding and application by quantity surveyor in that phase.

Table 2. List of BIM software used by QS during pre-construction phase

Software	YES	NO
Vico 3D BIM Quantity Takeoff	47.2%	52.8%
Autodesk Quantity Takeoff	80.6%	19.4%
CostX Take-off	52.8%	47.2%
Buildsoft Takeoff	72.2%	27.8%
Glodon Cubicost	55.6%	44.4%
Innovaya Visual Take-off	25%	75%
CostOs BIM Estimating	36.1%	63.9%
Revit	55.3%	41.7%
Smart BIM QTO	44.4%	55.6%

The content analysis outline the usage of BIM software in quantity surveying practice. Each software have their own capabilities to link with BIM technology. Autodesk Quantity Takeoff listed as the highest usage by quantity surveyor during pre-construction phase. This is due to 2 reasons; (1) the longest period of the availability in market (2) it is able to do taking off in 2D

file. These reasons supported by Wijayakumar & Jayasena, (2013) and Stanley & Thurnell, (2013) by stating that this software had been used by university in providing the course in BIM.

The next in the list are Buildsoft Takeoff with 72.2% of usage and Glodon Cubicost with 55.6%. This two software had quite similar capabilities which it allows the user to import, scale and rotate the plans. However, the Buildsoft Takeoff is more well-known in construction industry and been operated over the years compare to the Glodon Cubicost. This Glodon Cubicost software still new but the enhancement of the operation in providing the database for cost information and allow the users covert files into 3D quantity models that can generate reports and linked to cost will may take over the rank of Buildsoft in near time. This results indicated a different views from study done by Ismail et al., (2019) which Glodon software is most commonly adopted by quantity surveyor. However, the study did not focus into pre-construction phase and it calculated based for overall project life-cycle.

The lowest usage of software is Innovaya Visual Take-off. This software capable to performs object quantity takeoff accurately, quickly, and intelligently from Autodesk Revit, AutoCAD Architecture/MEP. Consequently, it can increase the efficiency of the project estimating process by more than 300%. Innovaya Visual Quantity Takeoff (QTO)'s robust and interactive 3D virtual reality environment also effectively improves communication and coordination between designers, builders, and clients. However, due to the reason that it is infamous in Malaysia and most of the construction company are not adopt and use this software in their project.

Conclusions

Most of the researcher stated that quantity surveyor still practicing the conventional method and insisted to implement the BIM technology. Autodesk Quantity Takeoff software is commonly used; and mostly employed the software in pre-construction phase. This study also provides a clear identification that most of QS had used the software that associated in BIM. It also helps other QS in the future to choose the suitable assistance provided by each of the software related to cost information. As currently practiced, this only limited to the pre-construction phase. However, some participants noted that in the future, there will be more cross-disciplinary collaboration on BIM modelling, allowing 5D BIM use to become more prominent. It is thought that as the use of BIM increases, a cultural change will take place, and 5D BIM will increasingly be more widely used by quantity surveyors for cost modelling. It is recommend that future research can cross sectional study into each of the stage in construction phase with the capabilities of BIM software.

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