Australian Journal of Basic and Applied Sciences, 9(7) April 2015, Pages: 207-210

ISSN:1991-8178

Australian Journal of Basic and Applied Sciences

Journal home page: www.ajbasweb.com

Building Information Modeling: Acceptance Gaps Within Malaysian Construction Industry Player

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ARTICLE INFO

Article history:
Received 12 October 2014
Received in revised form 26 December 2014
Accepted 17 January 2015
Available online 28 February 2015

Keywords:
Building Information Modeling (BIM), Influencing Model, Construction, Technology

ABSTRACT

The recognition of Building Information Modeling (BIM) constitutes a paradigm shift in the architectural, engineering and construction (AEC) industry around the world. Broader BIM acceptance will be able to transform the construction processes in order to perk up productivity, accomplish greater competence and make sure largely the sustainability of the AEC industry. This paper seeks to discover the acceptance gaps of implementing BIM in Malaysia AEC industry. A workshop was conducted by CIDB among five stakeholders: Public Private Partnership (PPP) Unit (UKAS), JARING, eMOST/ UMP, Greenwave Synergy (GWS) and CIDB eConstruct (EC) of the AEC industry in Malaysia. The findings suggest various acceptance factors and gaps existed for the wider acceptance of BIM. At the end of the workshop, the participants suggested a *'term-licenses'* approach which requires participation and cooperation from global BIM software companies. This will ultimately contribute to the development of *Long-Term Planning* of BIM implementation in Malaysia.

To Cite This Article: Mohd Harris Mohd Ismail, Elias Ismail, Adi Irfan Che Ani, Abdul Halim Samah and Afifuddin Husairi Hussain., Building Information Modeling: Acceptance Gaps Within Malaysian Construction Industry Player. ***Aust. J. Basic & Appl. Sci.,*** *9(7): 207-210, 2015*

INTRODUCTION

Building Information Modeling (BIM) is one of the new emerging technologies to be deployed in the design, construction, and facility management in which a digital representation of the building is being created to facilitate the exchange and interoperability of information in digital format. Structured approaches have been utilized in most advanced countries to ensure that their industry players systematically adopt the use of BIM (CIDB). 2012. In Malaysia, BIM's adoption is progressing, driven primarily by the private sectors since 2009 (CIDB). 2012 and government since 2010. Following this, CIDB currently complementing the efforts of BIM implementation by providing sustaining environments where BIM will survive and thrive in Malaysia (CIDB). 2013. Hence, this paper seeks to identify BIM acceptance gaps for implementation in Malaysia AEC industry. A Technology Acceptance Model (TAM) developed by Davis (1989) posits that human feelings, behaviour and attitude are the trigger to begin accepting new technology. The study accesses the impact of *perceive usefulness* and *ease-of-use* to the broader adoption of BIM.

Determinant Factors of Technology Acceptance:

Construction organisation are yet to utilise BIM aggressively, even the UK construction sector is still facing slow progressive changes in the BIM implementation (Khosrowshahi, F. and F. Arayici, 2012). The probable reasons could be the difficulty to implement BIM, adoption could incur higher additional project cost, require a comprehensive training, and majority of the designers are still familiar in using AutoCAD. Therefore, the determinant factors of technology acceptance could be divided into three parts; categories of technology adoption; factors influencing the choice to adopt; and factors mediating technology implementation. These factors are discussed in turn as follows.

Categories of Technology Adoption:

In Malaysia, the AEC industry decides to regulate the technology implementation based on economic demand, advantages and global

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competitiveness (Parente, S.L. and E.C. Prescott, 1994; Hasan, H., 2012). In order for the technology to be adopted conversantly, training and support in the use of the technology is inevitable due to the complexity of its processes (Suebsin, C. and N. Gerdsri, 2009). Meanwhile, most local organisations decide to adopt technology based on the benefits or competitive advantage that they will gain through the push factors such as regulations, policy and industry standards (Abukhzam, M. and A. Lee, 2010). In this regard, technology adoption could be categorised into two levels: national and organisational/individual levels. At the national level, the adoption means the decision at the ministry to mandate or regulate the use of technology throughout the whole nation. At the meantime, the organisational level is referring to the decision made by the top management of the organisations based on the push factors or the competitive needs to be *champion* in the respective area (Teng, J.T.C. and A. Nelson, 1996). Individual's acceptance also required to ensure that the organisation will obtain benefits from investing on new technology (Suebsin, C. and N. Gerdsri, 2009).

Factors Influencing the Choice to Accept:

The use and adoption of new technology is a process that begins with awareness of the technology and progresses through a series of stages that end in appropriate and effective usages. When people are presented with new technology, a number of factors influence their decisions on how and when to use the technology (Majid, T.A., *et al*., 2011). These decisions are related to their perceptions of the new technology through social communication but with fearful of changes (Suebsin, C. and N. Gerdsri, 2009). Figure 1 shows TAM theory which employs the perception towards *technology usefulness* and *ease-of-use* as determinant factors to technology adoption (Davis, F.D., 1989). While, regression analysis of TAM suggest that perceived ease of use may actually be a causal antecedent to perceived usefulness as opposed to a parallel, direct determinant of system usage (Davis, F.D., 1989).

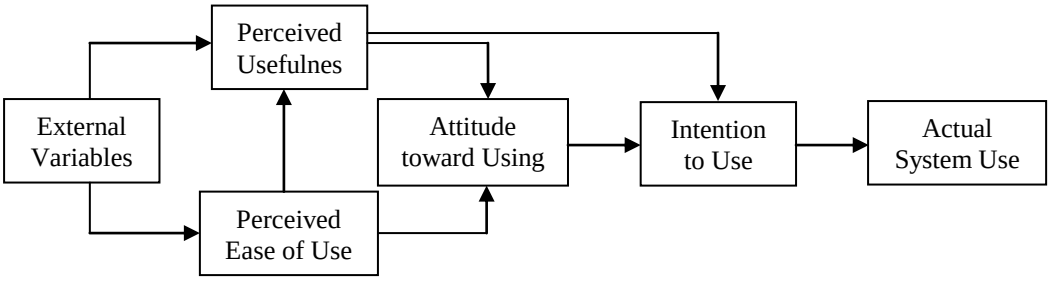

Fig. 1: Technology Acceptance Model (TAM) (Davis, F.D., 1989)

In general, TAM theory starts with the stimulus from regulation, political mandate, and implementation process as the *external variables*. While, the combination of perceived ease-of-use and perceived usefulness will form the *attitude and intention to use* prior to full acceptance and *actual use* of any new system or technology in the industry. *Perceived ease-of-use* is define as the users perception of the effort required for the use of new technology, meanwhile *Perceived usefulness* is refers to the degree to which an adopter believes the new technology is beneficial and would improve job performance. The extended model of TAM, namely TAM2, then is being developed by Venkatesh and Davis (2000) which includes *social influence* and *cognitive instrumental processes* into the equation. Later in 2012, TAM3 is being established by Venkatesh (2012) as an extended version of TAM2. However, the models are consistent with the basic TAM theory which defines *perceived usefulness* and *perceived ease-of-use* as key predictors of technology acceptance.

The *usefulness* and *ease-of-use* (usability) in implementing new technology would influence the adoption decisions at both parts (private and public organisations). In the event there is no *usefulness* or *usability* found by the private organisations, a negative influence will be induced to the public organisations which ultimately impact the activities and awareness program, policy making and enforcement of the new technology, will not take place.

Mediating Factors to Technology Execution:

Upon the incursion of technology into the industry, the industry players will evaluate the technology benefits, the competitive-advantages and the ease of transition of accepting the technology. In the event of no benefit or advantage is found there will be a no intend to adopt the technology neither at the industry level nor by the Nation. Meanwhile, the regulation, policy, enforcement and awareness programs will subsequently emanated when the entire process of developing and managing could be beneficial to the nations. However, even after the

acceptance of the technology, further analysis will need to be sought in term of the organisation's readiness in respect to the process, people and product (Gu, N. and K. London, 2010). *Process* means the necessity to revisit current work processes that require changes or otherwise; *people* refers to users and top management awareness, involvement, sufficient training and sufficient support; while. *Product* means the capability and complexity of the selected system to fulfil the users' requirements; these demonstrate as the mediating factors to technology implementation within the industry (Khosrowshahi, F. and F. Arayici, 2012).

Case Study:

A case study was conducted through a preliminary workshop organized by CIDB in January 2013. It brought together five potential stakeholders as listed in Table 1. Public Private Partnership (PPP) Unit (UKAS) acts as the main stakeholder who will enforce the usage of BIM by contractors; JARING as the infrastructure-as-a-service (IAAS) provider; eMOST/UMP represents BIMs process adviser; while the GWS and EC represent the BIM product vendors to advice on limitations of the proposed BIM platform.

Table 1: CIDB's Workshop Attendees

Organisation	CIDB	UKAS	JARING	eMOST/UMP	GWS	EC	Total
Number of Participants	5	5	3	2	3	4	22

The purpose of this workshop is to discover the influencing factors of the choice to accept BIM in AEC industry. According to CIDB, there is a need to focus on the areas of usability of the application and facilitate the whole AEC industries in order to effectively implement BIM. Despite the comprehensive understanding on the *usefulness* of BIM, the AEC industries need to have easy access and *usability* on the use of BIM for their projects. Hence the concept of *term-license or periodical license* was suggested that need to be explored further. This is based on UKAS description that BIM could incur higher project cost since the software is expensive to purchase and training time will take too long. For that matter, cost is the biggest obstacles to effectively implement BIM to projects in particular among small and medium (SMEs) companies including the Architects, Engineers and Quantity Surveyor firms.

Besides, eMOST /UMP suggest conducting a specialized and hand-on training of BIM among the contractors. Through a comprehensive training, the *usefulness* and *usability* of BIM could be discovered. Despite BIM training could incur a substantial cost for the project at the early stage, the overall cost saving could be realized in the long run. The eMOST/UMP has asserted that, the cost saving throughout the project life-cycle will outweighed the up-front additional cost of implementing BIM in the construction projects. To BIM product vendors, the GWS and EC; further discussion will be needed with the global BIM software companies to suggest the term license proposal, hence require further exploration. However, for the global software companies to consider the proposal of the *term license* in Malaysia, a nation-wide BIM implementation plan needs to be in place.

Conclusion:

The deployment of BIM in construction can make the industry more efficient, effective, flexible, and innovative. Based on the literature search and data from the preliminary workshop, it can be deduced those three (3) vital determining factors for BIM acceptance: National initiatives and plans such as regulation, policy & industry standards; competitive advantage & championship; and economic demand in the AEC industry within the perceptions of *usefulness* and *usability* of the application. To ensure the acceptance of BIM, five (5) vital determining factors are captured, which are: the project's BIM objective; fidelity and continuity of information across project lifecycle; sustainability; training and support; and business value of implementation within the perceptions of *perceived usefulness* and *ease-of-use (usability).* Expensive cost of implementing BIM could also give a negative impact on the *usability* of BIM in the AEC industry. Hence, during the workshop held by CIDB, the term-license or periodical license approaches had been proposed. However, to materialised this proposal, a National long-term planning for BIM need to be established. This will require further discussion and brainstorming in the future workshops.

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