IMPLEMENTATION OF BIM SOFTWARE: POSSIBILITIES WITHIN THE PRIVATE UNIVERSITIES IN MALAYSIA

Myzatul Aishah Hj Kamarazaly
School of Architecture, Building & Design
Faculty of Built Environment, Engineering, Technology & Design
Taylor's University, Malaysia
Email: MyzatulAishah.Kamarazaly@taylors.edu.my

Sr Azrina Md Yaakob
School of Architecture, Building & Design
Faculty of Built Environment, Engineering, Technology & Design
Taylor's University, Malaysia
Email: Azrina.MdYaakob@taylors.edu.my;

Sr Loo Seong King
School of Architecture, Building & Design
Faculty of Built Environment, Engineering, Technology & Design
Taylor's University, Malaysia
Email: SeongKing.Loo@taylors.edu.my;

Lee Kim Thiam
School of Architecture, Building & Design
Faculty of Built Environment, Engineering, Technology & Design
Taylor's University, Malaysia
Email: darrenlee9808@gmail.com;

ABSTRACT

Building Information Modelling (BIM) is the advancement in technology that is commonly seen in most construction sectors and is rapidly growing into a modernization of an era. The application of it sees its usefulness amongst the employees within these construction sectors. Despite the rapid growth of BIM, the adaptation of BIM remains questionable. In this era of 4th Industrial Revolution, where students' adaptability are quicker and faster to technology, there exists the possibility where the need to adapt can be fully achieved before entering into the working life. The situation however is dim as most higher education institutions do not possess the necessary BIM software or related training to catalyst this process. Through the understanding of this problem, this research is set out in hopes to produce a solution to the growth of the industry in Malaysia while taking into consideration of the Employer's perspectives of a well-educated and skilled Quantity Surveying graduate. Methodology of achieving the objective including understanding the overall situation through literature review, understanding the effectiveness of students by means of survey and question the non-existence BIM software in private universities as well as the capabilities of the students to adapt new software training and the professional availability if provided with any. The findings concluded with students being able to cope while understanding the full application of BIM with the exceptions of students that have no access to such software.

Keywords: BIM Software, Students' adaptability, Employer perspectives, Quantity surveying graduates, Professional availability.

1.0 INTRODUCTION

Building Information Modelling (BIM) applications are by and large quickly grasped by the development business to decrease cost, time, and improve quality and also ecological manageability. Accordingly numerous development firms are picking up involvement with these new instruments and forms and changing their desires from college graduates. The same number of development programs endeavor to convey educational modules and research that is important to the business; it is basic to precisely comprehend the effect of BIM on the operations and routine with regards to development organizations. These applications persistently introduce change openings while reinforcing coordinated effort inside the development business.

Harris et al (2014) all recall back to where that the Director of Public Works Department (PWD) officially introduced the use of BIM within Malaysia in the recent year of 2009 the opening of Infrastructure & Construction Asia's Building Information Modeling and Sustainable Architecture Conference. The Malaysian government all alone prosperity deals with to urge development players to apply BIM to development ventures since it can conquer run of the mill development venture issues, for example, postponement and conflicts in a plan by various experts and development cost overwhelm. Autodesk devices have been proposed by the administration as a BIM instrument stage. Latiffi et al (2013) express that it is critical for development players to know about the significance of BIM application in development ventures in light of the fact that BIM can be one of the conditions expected of an organization to fit the bill for government and private tasks, like what is polished in some different nations.

BIM can be broken down into numerous applications; most which have been deemed as outdated while a minority of them have claimed a more superior entitlement. Examples of the more renowned applications include Autodesk, Revit and AutoCAD, while the more trending ones include AtlesPro and Glodon. NBS (2016) shows an updated statistical analysis of the cost reduction tendency generated from the use of BIM, proving that through all these applications, all of them have identical characteristics, which is to improve overall productivity and cost reductions. In fact, this is actually the leading reason why most companies embed the use of BIM software. A case study has shown that 63% believes BIM will help bring about a 33% reduction in the initial cost of construction and whole life cost of built assets, while 57% believes BIM will help bring about a 50% reduction in the time from inception to completion for new-build and refurbished assets (NBS, 2016).

1.1 RESEARCH PROBLEM STATEMENT

Over the past years, there have been reports of the low adaptations of BIM software among employees despite the numerous advantages these BIM software have to offer. Olatunji, Sher and Gu (2009) trust that the industry has remained one of the slowest adopters of innovative technologies in spite of solid evidence of the relationship between investment in Information Technology (IT) and improved performance.

This basically indicates that the employees have built up a shared fear among each other, and that fear is the over implementation of these software. They fear that humans will become far inferior in the future and have decided to not adjust to these applications, in the sore trust that BIM will not assume control over these employments if there is no adjustment in any case. In spite of the expectation that the take-up of BIM in the AEC/FM will be moderately slow but inevitable (Goldberg, 2005), there are some genuine hindrances which should be tended to all together for this adoption to occur.

Perspectives of knowledge - that is, regardless of whether students see their capabilities as settled or pliant - influence student performance in the classroom (Dweck, 1986). Any student, who considers knowledge to be fixed, is normally demoralized by mistakes and experience barriers while learning. A view some hold is that sciences are saved for the savvy students (Barmby and Defty, 2006); science is an ability that most typical individuals are unequipped for accomplishing normally. This is illustrative of a settled mentality, which can keep individuals down. Learning is never completed; difficulties and disappointments need to in the end be grasped. This investigation was a path for understudies to build up a development mentality, a view that has been appealed to enhance scholastic execution from a settled view (Blackwell et al., 2007; Mangels et al., 2006; Birgit, 2001). A development mentality individual trusts that his or her insight can change, either decidedly or contrarily, contingent upon the exertion and training (Blazer, 2011). Students are not all the same, which implies their mentalities, are not all the same. Jones, Byrd, and Lusk (2009) examined secondary school students' convictions about insight and found that "students have a scope of convictions about the meaning of knowledge" (p. 3).

Therefore, it is essential to enable understudies to get a handle on the enthusiasm for new learning aptitudes within the area of implementation of BIM. In the end, if the students can depict a typical enthusiasm for utilizing BIM, at that point they will be comfortable in securing their employment as graduates later on. Hence, this paper aims to study the implementation of BIM and its impact on the prospects of graduates.

1.2 RESEARCH OBJECTIVES

The objectives of this research are:-

1. To study the implementation of various types of BIM Applications and the primary BIM software, Glodon within several private universities and its impact on the educational industry.
2. To determine and analyse the effects of implementing BIM within the students' daily learnings.
3. To identify the students' skill cap levels in the application of BIM and how do they intend to use these applications in the future
4. To determine why BIM has not been fully utilized within private universities.

1.3 IMPORTANCE OF RESEARCH FINDINGS

It is denoted that the world will eventually encounter the need to implement BIM into the construction process which permits growth in effectiveness in each part of the construction industry. The implementation of BIM inside the prime era of undergraduates, postgraduates and graduates, preceding the employment phase can help build up the graduates' capabilities of using BIM effectively. Therefore, there is a need to consider the conceivable advantages from the implementation of BIM in the education industry.

2.0 LITERATURE REVIEW

2.1 Factors affecting the implementation of BIM in general

BIM can streamline and helps clear correspondence between client, consultant and contractor in construction projects by giving a solitary respiratory framework for trading digital information in at least one concurred design. Khanzode and Fisher (2000) and

Azhar et al. (2008) trust that, this approach can diminish blunders related with conflicting and uncoordinated project documents in light of the fact that BIM is capable of conveying data which are identified with the building either its physical or functional attributes. In spite of the various advantages from the use of BIM, factors impeded the pace in executing BIM in the construction industry is distinguished.

Over cost, similarity and complexity of the technology are likewise the variables that impact the selection of new technology. Cost is a more subjective issue since it requires external factors, for example, regulations imposed by the government or clients. Lederer, Maupin, Sena and Zhuang (2000) trust that to build the pace of reception of new IT, higher similarity and more user-friendly technology are the attributes that the technology must have in light of the fact that, it is simple for individuals to acknowledge and utilize new technology in the event that they are familiar with it.

2.1.1 Technical and Social interference

Griffith et al. (1999), O'Brien (2000) and Whyte & Bouchlaghem (2002) believe that, the failure to implement new information technology (IT) in construction industry happens because of technical issues rather than social issues such as lack of technical expertise, the complexity of the system and lack of support system. According to Griffith, Raymond and Aiman-Smith, the relative invisibility of the implementation of process for new technologies is a major problem which leads to "The Invisibility Problem" theory. Implementation includes any process undertaken to institutionalize a new technology as a stable part of an organisation and follows the adoption decision and is bounded by institutionalization, in which technology becomes a part of the status quo (Griffith, Raymond & Aiman Smith, 1999, p 30).

The invisibility of implementation results in the tendency for decision makers to acquire major new technologies, to overestimate the value of a new technology and the likelihood of successful implementation. Griffith, Raymond and Aiman-Smith (1999) quote that from a superficial perspective, the estimated value of a successful implemented technology may seem easy to establish, and it is almost always not the case. M. Lynne Markus and Robert Benjamin (2015) make an even stronger statement based on their experiences with information technology specialists and consultants involved in information. Markus and Benjamin (2015) note that managers often possess a certain theory suggested as, the "Magic-Bullet Theory", when it comes to information technology-enabled transformation. They have built a gun and the magic-bullet of information associated to this gun, when fired, cannot do anything but hit its mark. Since the bullet is programmed to always hit its mark, there is almost no reason to worry about who is going to aim this gun and fire it. However, Ruikar et al. and Rojas & Locsin have a more contradicting view where they believe that people actually play a part as the major barrier to implementing new IT in the construction industry. Martinko et al. added that, the failure in changing people behaviour to handle new tools is the most prominent factor of why people are reluctant to adopt new technology.

Some of the surveys conducted recently (Khemlani 2007b, Howard and Bjork 2008) suggest that collaboration is still based on exchange of 2D drawings, even though individual disciplines are working in a 3D environment and the demand for object libraries is growing. These surveys reveal that a tool preference varies with film size, and there is a greater demand for technologies supporting distributed collaborative works across all firm sizes.

2.1.2 Organizational interference

Love et al (2001) trust that the variables of the failure in executing new technology arises from hierarchical issues. Most associations are hesitant to change their business procedure since they are anxious about the possibility that by changing their business procedure, it includes costs and endangers their set up process since they cannot acknowledge the fundamental proportion vulnerability of loss. Most employees of these associations build up the instinct that technology will assume control over their parts and feel anxiety towards changes, particularly when the new technology is included and this happens in light of the fact that relatively few managers see how to oversee mechanical change. As Taylor and Levitt (2007) comprehend, numerous organizations trust that executing BIM will influence their built up business forms in light of the fact that actualizing new technology will reshape their business forms and amid this procedure, profitability will experience the ill effects of division to collaborative in nature will put the project outcomes and clients' expectations at risk. Love et al (2001) has concluded up from a rundown of interviews what the organizational boundaries that were distinguished incorporated the following: indirect or hidden costs; inability to quantify (financially) the impact of e-commerce; inappropriate investment appraisal techniques; myopic strategic planning, lack of employee knowledge; lack of an IT infrastructure; a reluctance to form collaborative partnerships; and a general reluctance to change way business was undertaken.

It was generally seen that organizations did not have any desire to change as they were not ready to predict the advantages that e-commerce advertised. As a matter of fact, none of the 20 organizations met had started to grasp business-to business e-commerce, regardless of the approaching introduction of electronic tendering for Government projects and the goods and services Tax (GST). Seventeen firms viewed e-commerce as basically an interactive website page. In fact, when tested about sharing data and knowledge utilizing the web it was observed that this would risk their upper hand in competitiveness.

In a different perspective, education industries have a similar behavior to the construction industry. The employees represent the lecturers and the decision makers would represent the higher order in the programme of the school to decide whether it is worth investing into these BIM software. There exist these similar barriers that most educational institutions may encounter, thus allowing only a small fraction of the fulfilment for study of BIM among their students.

2.1.3 Lack of Knowledge and Skill

The lack of knowledge and ignorance of the potential benefits of IT applications was found to extend to contractor's existing systems, with more than 50% of contractors unaware of the capabilities of their existing highly specialized software. Often, tasks that could be handled by existing systems were externally contracted, as the organization was unaware that their system was capable of the task. The lack of knowledge was also identified as one of the main reasons why management had little interest in a commitment to the Internet, e-mail and advanced applications such as knowledge-based expert systems and simulation.

Lack of knowledge about BIM could contribute to the resistance in implementing BIM because in the construction industry it involves various parties. Without significant knowledge about BIM, each party is reluctant to use BIM because they believe that new technology such as BIM technology is difficult to learn and could increase the operating cost. Laage-Hellman and Gadde (1996) examined the barriers to the implementation of Electronic Data Interchange (EDI) in the Swedish construction industry. They undertook a case study with Swedish materials suppliers and discovered two (2) relevant barriers included:

i) *Technical boundaries within the business industry*: Small and medium-sized contractors do not have reasonable applications to permit standardized transmission solutions to become commonplace. On the suppliers' side, most organizations lack proper request, inventory and invoicing frameworks.

ii) *Technical boundaries at the organization level:* The absence of IT skill, particularly among the personnel on construction sites, has ended up being a critical issue, which backs off the spread of EDI inside the organization.

In relation to the education industry, teaching subordinates need to acquire this knowledge in order to teach the use of BIM to students. Students with the lack of proper training and guidance can prove a severe hold back on their ability to fully understand BIM. Due to the existence of a probability of belittling knowledge about BIM, most schools or higher education institutions see the solution of implementation as a hassle instead.

The following illustrates the relative importance indices and the rank for factors that hinder the implementation of BIM in the Malaysian construction industry by all respondents. According to Zahrizan et al (2013), the top five most important factors that hinder the implementation of BIM are (1) Lack of knowledge about BIM (RII = 0.950), (2) Clients do not request/enforce BIM (RII = 0.950), (3) Reluctance from clients, contractors or consultants to implement BIM (RII = 0.875), (4) BIM is not required by other team members (RII = 0.838) and (5) Lack of data of Return on Investment of BIM (RII = 0.833).

2.2 Driving factors in implementing BIM

A summary of the relative importance indices and the rank of the variables that could increase the pace of implementing BIM identified by the respondents are shown as follows. From here, it can be found that the top ten most important factors that could increase the pace of implementing BIM are:

1) Support and enforcement in the implementation of BIM by the government (RII = 0.950)
2) BIM training program (RII = 0.950)
3) Leadership of senior management (RII = 0.925)
4) Provide a grant scheme for training BIM (RII = 0.905)
5) Promotion and awareness road show about BIM (RII = 0.892)
6) Collaboration with universities (Research collaboration and curriculum design for students) (RII = 0.879)
7) Incentive given by client such as tax reduction (RII = 0.842)
8) Outsourcing BIM specialist (RII = 0.842)
9) Technical support (RII = 0.800)
10) Clients demand the application of BIM in their project (RII = 0.792)

Zahrizan et al (2013) conclude that, from the different categories of the factors that could increase the pace of implementation of BIM in the Malaysian construction industry, the respondents generally agreed that External Push (RII = 0.805) has a more significant role to speed up the pace of implementation of BIM compared to the Internal Push (RII = 0.755). The most important factors that could be the driving factors in implementing BIM in the Malaysian construction industry are the support and enforcement in the implementation of BIM by the Government and BIM training program where both scored RII of 0.950.

The respondents also possess a mutual belief that local universities could play a major role in promoting BIM by providing curriculums or courses related to BIM, for example. This is why collaboration with universities (Research collaboration and curriculum designed for students) is one of the important factors that could increase the pace of implementing BIM with an RII score of 0.879. As we know, BIM technology in Malaysia is really new, therefore there are many opportunities for university researchers to conduct research related to BIM and they could collaborate with the industry to identifying the needs and the area for exploration.

Conclusively speaking, there are many hindering factors that slow the pace of implementation of the BIM platform within the construction industry, let alone applying the concept within the educational industry. However, to complement these hindrances, the driving factors of implementation far exceed them and can allow for a smooth implementation of BIM within the boundaries of the education industry.

2.3 Remedies to Address the Hindering Factors of BIM Implementation

As referred to an article by Neeley (2008) BIM may very well be the most important event that has ever occurred in AEC/FM (architectural, engineering, construction, and facility management) and BPM (building project manufacturing) professions. He, similarly as Egan, insists that these professions has been lagging significantly in automation and increasing efficiency. Sir Egan (1998, p. 18) lays special emphasis on the improvement of the process through which industry delivers the product to its clients. He argues that commonly known assumption that every project in construction is unique is not true. He also emphasised (1998, p. 18) that the process of construction is in many cases repeated in its basis from one project to another Egan often holds manufacturing up as an example of successful performance enhancement. Neeley (2008) reveals that AEC/FM and BPM represent the world's largest industry, comparably larger than automotive, aerospace and oil. Hence every saving in respect to time and resources make a substantial difference. Therefore, concept of BIM soon started to be perceived as a possible panacea for all the bottlenecks earlier recognized by Egan.

2.3.1 Idea of Change

The idea of change has always been and will remain as difficult. As can be expected, organisations will change only if individuals themselves are willing to change, because people are "instinctively programmed" to resist any change that goes against their natural belief. Black and Gregersen (2002) argue that to fundamentally adapt within any organisation, one must first attempt to change the individual beliefs, attitudes and values within the organisation before the organisation as a whole can benefit from the change. By taking away the "Magic Bullet theory", users will start to realize that no matter how efficient the gun or the bullet is programmed, it requires personal skill to actually implement an idea of realization that nothing is self-automated without the human capability of manipulating that idea. Abolishing this idea entirely may not solve the problem, but it will prove as a step closer to understanding the method of grasping the concept of BIM.

2.3.2 Process Change

The primary impact of implementing BIM is the shift in which the work effort occurs in the process. In her recent book, Epstein (2012) provides an example of architects demonstrating the redistribution of the work and billing in project phases. Traditionally, schematic designs (SD) accounted for 15% of the work, design development (DD) being 30%, and construction documentations (CD), which comprised specifications, 50%, and bidding 5%. With the introduction of BIM, these statistics are now revolving around an entirely different scale of ratios. The SD phase now accounts for 30% of work time which reflects the creation of the 3D virtual model. DD stage is approaching 40% and CD is reduced to some 25% of the work. Contrary to belief, the increased accuracy of information derived from the model enable more accurate bids with tighter margins, hence being more competitive.

2.3.3 Culture and Environment

Arto Kiviniemi (2013) emphasized some factors inhibiting the change in implementation of BIM, indicating that there are several reasons including "siloed approach" and firm hierarchical relationships. In brief, Investopedia defines the silo mentality as an attitude found in some organizations when individuals or groups are not willing to share information or knowledge with other individuals. Equally it is the factor of reducing efficiency and contribution to the failing culture. This goes the same to the educational industry on its own, where if the students are not willing to share their ability to cope or understand the BIM platform, the efficiency rate of implementation slowly hinders away.

Vickers (1999) reveals that there are negative effects associated with transition to new technology such as BIM, comprising of stress and fear in both young and old employees having to learn demanding automated processes as well as loss of confidence associated with their ability or incapability to succeed. In general, it needs to be pointed out that construction is not exactly the sector attracting the brightest minds and the majority of on-site operatives are not or low-qualified personnel. As such, the construction industry is unattractive to trained and talented employees, because its learning environment is not competitive.

The intended industry of BIM implementation must become a learning environment, providing knowledge and lifelong learning. Investing in changing the mind scope of believing that this sort of knowledge can be acquired in a later stage of the working phase can allow the growth of a new ideal, where students are allowed to freely understand what BIM and its functions are entirely about without being subjected to mannerism of a cultural norm that hinders the growth of any development.

2.3.4 Barriers of Change

In an ideal world a successful industry would embrace new technology which facilitates efficiency and simplicity of work as soon as it emerges. In reality however, an industry remains reluctant due to the number of reasons. Firstly, executives or directors believe that investing in new technology is more of a cost factor rather than a value provider. There lies the "Invisible Problem" theory, where the initial value of the technology is either underestimated or overestimated. At the end of the day, the one that so rightfully profits is entitled to the director or the executive on their own. However, failing to see that the efficiency factor that BIM brings for students can have major consequences, as this limits the ability for the educational institution to develop into a much more efficient entity.

Managers and operatives usually do not care about the potential of new technology since they are satisfied with the way they work. These boundless possibilities become stored and undeveloped due to initial satisfaction of the new technology acquired.

There is no visionary upkeep from the managers, to see that this sort of technology can be upgraded further, mainly for the students' initiative in adopting BIM. Stakeholders may not drive the change eagerly enough. The ability to make a decision can be a powerful thing, but being subjected to a certain point of view where change is not needed, devastates the whole point of making a decision. To resolve this, these barriers must be abolished to allow for a change in mind set and norm.

3.0 RESEARCH METHODOLOGY

For research methodology, data and information was processed and gathered altogether. To accomplish the objectives of study, primary data was obtained through questionnaire surveys. Qualitative analysis and quantitative analysis are the two types of research approach for data collection. For this research study, quantitative analysis is applied to identify the implementation of BIM in the Malaysian education industry with the use of questionnaire surveys. The scope of the study is limited to the views by students studying in the Quantity Surveying degree provided by a number of university institutions within the Kuala Lumpur district. In this research paper, questionnaires are distributed through email by creating the survey form from an online source to achieve the targeted number of respondent. Other than that, this method can collect numerous data and be interpreted to accomplish the objective and aim of this research paper.

The questionnaire was divided into five (5) sections; Section A: Demographic, Section B: Factors affecting implementation of BIM within the education industry, Section C (I): Level of Frequency of Factors, Section C (II): Level of Impact of Factors and Section D: Practical Solutions to readdress the lack of implementation of BIM within the education industry.

Section A plans to recognize the demographic foundation of the target respondents in view of sexual orientation, which stages they are as of now within Taylor's University, working experiences and additionally, adaptation and comfort in utilizing BIM in their respective stages. Section B requires the respondents to rate on their concession to the variables influencing the usage of BIM inside the education business in light of the Likert scale of ordinal measures. Section C (I) expects to get the impression of the respondents on the event of each factor as expressed in Section B. It is necessary for respondents to rate the level of recurrence of each factor utilizing the Five-point Likert scale. Meanwhile, section C (II) means to assemble the perspectives from respondents on the level of effect on the comparative factors by utilizing the Likert scale. This segment likewise empowers respondents to express their proposal on various conceivable variables that severely affect the usage of BIM inside the education industry. Section D shows a few practical answers to readdress this issue for respondents to rate on their level of concurrence on the arrangements gave. Thus, respondents will have the chance to give different arrangements which are seen to be fitting to address downsides that might block the usage of BIM inside the education industry.

In the questionnaire, respondents are required to rate their level of agreement with a statement by way of ordinal scale. A 5 point Likert scale is represented by 1: Strongly Disagree; 2: Disagree; 3: Slightly Agree; 4: Agree; 5: Strongly Agree. Following this scale, the neutral point is eliminated and the accuracy provided by the 5-point Likert Scale can represent the respondent's preferences.

3.1 Conceptual Framework

Figure 1 outlines the research framework for this study. This model shows a thorough point of view of the 'External' and 'Internal' push factors that influence the execution of BIM in the education industry and the solutions to this issue which is labelled as the autonomous factors. Besides, the risk level related to the 'External' and 'Internal' push factors is the reliant variable for this study, getting from the 'External' and 'Internal' push factors influencing the usage of BIM in the education industry. The factors provided are assumptions made by the subjects of the study where a pre-determination of the factors is carried out and narrowed down to the relevant factors. The solutions to the hindrance of the said issues are determined with the same method as well.

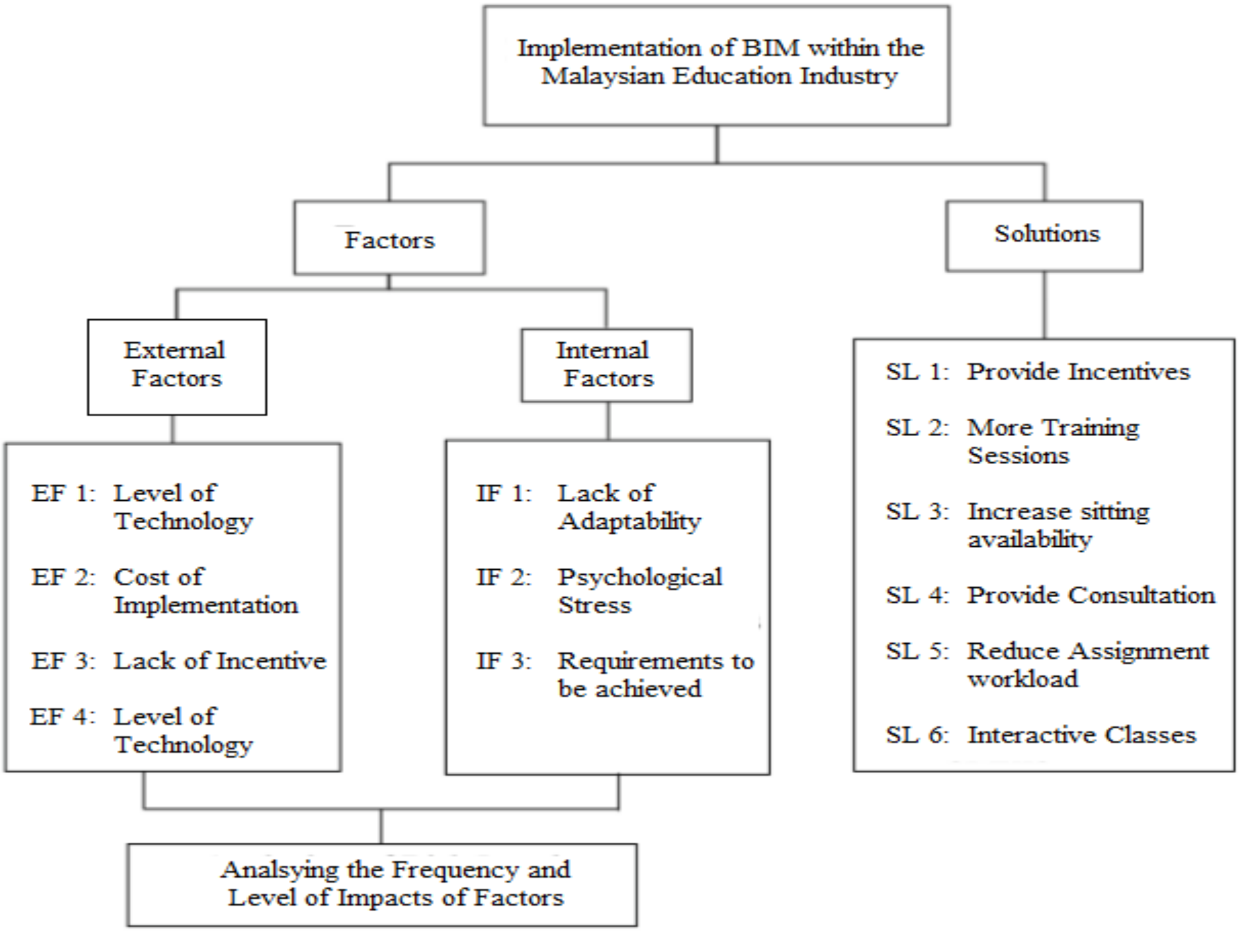

Figure 1: Conceptual framework

3.2 Data Analysis

The questionnaire surveys were delivered to the targeted respondents which are students and graduates studying in university institutions that offer the Quantity Surveying course within Kuala Lumpur. A confirmed sum of 600 questionnaires surveys was appropriated by means of social platform and email. Among the 600 sets disseminated, a sum of 428 sets was finished inside the stipulated time span.

4.0 KEY RESULTS

4.1 Frequency Of Hindering Factors

Table 1: Level of Frequency

[** Frequency Rating: 5 (VH) = Very High, 81% - 100%; 4 (H) = High, 61% - 80%; 3 (MH) = Moderately High, 41% - 60%; 2 (L) = Low, 21% - 40%; 1 (VL) = Very Low,1% - 20%]

	Level of Frequency of Factors	VH 5	H 4	MH 3	L 2	VL 1	TR	FI	Remark	RFI
B1.1	The level of technology advancement	24%	55%	7%	7%	7%	428	3.836	Frequent	0.109
B1.2	The lack of ability to adapt to newer software	28%	35%	24%	10%	3%	428	3.729	Frequent	0.106
B1.3	Cost of implementation in BIM	41%	41%	3%	7%	7%	428	4.026	Frequent	0.115
B1.4	Lack of incentives given from using BIM	24%	35%	14%	24%	3%	428	3.533	Frequent	0.101
B1.5	The demand of BIM in the market	7%	45%	24%	14%	10%	428	3.234	Occasional	0.092
B1.6	The availability of experts in the area of BIM	14%	45%	28%	10%	3%	428	3.561	Frequent	0.102
B1.7	Requirements to be deemed as BIM competent	14%	48%	24%	7%	7%	428	3.572	Frequent	0.102
B1.8	Lack of expected data return from BIM	7%	35%	31%	17%	11%	428	3.093	Occasional	0.088
B1.9	Psychological stress	10%	35%	28%	21%	7%	428	3.210	Occasional	0.092
B1.10	Overwhelming assignments	25%	14%	35%	14%	13%	428	3.243	Occasional	0.093
								35.037		*1.000*

Table 2: Level of Impact

[** Impact Rating: 5 (VH) = Very high; 4 (H) = High; 3 (MH) = Moderately High; 2 (SL) = Slightly High; 1 (L) = Low]

	Level of Impact of Factors	VH 5	H 4	MH 3	L 2	VL 1	TR	MR	RAI	Rank
B1.1	The level of technology advancement	28%	45%	24%	0%	3%	428	3.935	0.110	2
B1.2	The lack of ability to adapt to newer software	10%	35%	35%	21%	0%	428	3.346	0.094	8
B1.3	Cost of implementation in BIM	35%	35%	28%	3%	0%	428	4.005	0.112	1
B1.4	Lack of incentives given from using BIM	14%	41%	35%	3%	7%	428	3.526	0.099	6
B1.5	The demand of BIM in the market	24%	48%	14%	10%	3%	428	3.804	0.106	5
B1.6	The availability of experts in the area of BIM	21%	48%	24%	7%	0%	428	3.834	0.107	4
B1.7	Requirements to be deemed as BIM competent	3%	45%	41%	7%	4%	428	3.371	0.094	7
B1.8	Lack of expected data return from BIM	14%	21%	45%	14%	6%	428	3.222	0.090	9
B1.9	Psychological stress	25%	48%	14%	13%	0%	428	3.850	0.108	3
B1.10	Overwhelming assignments	7%	21%	45%	7%	21%	426	2.857	0.080	10
								35.749	*1.000*	

Table 1 and 2 indicates the level of frequency and level of impact of the factors affecting the implementation of BIM. According to Table 1, with the highest frequency of 0.115, the cost of implementation of BIM has led to many disputes between students and their learning capabilities towards BIM. With the high costs of implementation of BIM, it is clear that affordability to cater for many students in one seating is very low. This then provides a huge impact as shown in Table 2, where cost of implementation of BIM stays at the top. As the primary cause that relates itself to many other factors, existence of BIM within the education industry can vary from the high contradicting loads of assignments or the increase in psychological stress to cope with the training.

The second highest and most frequent factor lies under level of technological advancement at 0.110 RAI. Despite the age of students who are deemed to be more advanced at adapting technology, there still exists some who cannot cope with the level of technological advancements for BIM. This may be due to the lack of personal attention shown in class or the lecturers' skill in teaching the students. The third and most relevant impacting factor is psychological stress. Psychological stress is common and inevitable in the lives of every individual, regardless of race or cultural background (Newth, 2011). Especially in the tertiary education stage, university students tend to face and undergo more stress through heavier loads of assignments and classes.

Hall (2005) deems that university students have shown to possess a unique set of stressors which can affect every day experiences. These stress levels can impact the students' capabilities in learning efficiently, which ultimately becomes a factor of implementation of BIM within university institutions. If the students' stress level exceeds their limit, they view almost anything as a negative interpretation to existence. Nathan (2002) quotes that "prolonged and severe stress may be psychologically damaging in that it may hinder a person's ability to engage in effective behaviour and instead the person might end up distancing and worst case scenario- not engage or be present at all". This can be challenging and contradicting to resolve as this can lead into different directions; where if students who are already stressed with the need to study a new subject or BIM in this matter, then there is a high chance that BIM implementation will not accelerate within the education industry.

The demographic profile of respondents is intended to interpret data using a descriptive statistical method in percentage form. In general, the cost of implementing BIM software is initially high and deemed to be unaffordable in ratio to the number of students present within the institutions. Most institutions see almost no need to implement a certain facility or specific software if it only favors only a few courses, in this case only benefitting the Quantity Surveying course. Thereafter, Quantity Surveying students have also perceived that the other internal and external factors, level of technological advancement stipulated for new learners, psychological stress and the availability of experts within that field of knowledge play a significant role as factors affecting the implementation of BIM software in the education industry.

4.2 Solution to Hindering Factors

Table 3 depicts the outcome of the solutions available to address the issues of the lack in implementing BIM. The most prioritized solution, in allowing for more consultancies on how to cope with BIM training courses shows the most outstanding RAI value of 0.176. This is due to the surprising outcome from the number of students who have not grasped the use of BIM and its application. The next prioritized solution, allowing more opportunities to partake in training sessions, ranked second in the list at an RAI value of 0.172. This solution is prioritized right after the first one due to the fact that most of the students who strive to improve themselves in using BIM software are lacking the amount of proper training they need within a proper environment. The third most possible initiative solution which can be implemented is to increase the seating availability of the said BIM software. With the third highest standing RAI value of 0.170, respondents prefer to see the increase in seating availability in classrooms or other classrooms. The cost of implementation of BIM forms an indirect relation with this solution, as seating increment will result only in higher initial cost. This study further reveals that there are possible and plausible practical solutions to overcome these hindering factors which are greatly affected by the quality of training and attention the students are able to gain through training courses for the said BIM software.

Table 3: Solutions to Readdress Hindering Factors

*[** Agreement Rating: 5 (SA) = Strongly agree; 4 (A) = Agree; 3 (MA) = Moderately Agree; 2 (SOA) = Somehow Agree; 1 (D) = Disagree]*

Practical solutions to readdress hindering factors	SA 5	A 4	MA 3	SOA 2	D 1	TR	MR	RAI	Rank
Provide a certified incentive to prove competency	28%	52%	17%	3%	0%	428	4.037	0.168	4
Allow more opportunities to partake in more training sessions	42%	41%	7%	10%	0%	428	4.147	0.172	2
Increase the seating availability of BIM	31%	52%	14%	3%	0%	428	4.105	0.170	3
Allow for consultancy on how to cope with BIM training course	41%	45%	10%	4%	0%	428	4.241	0.176	1
Reduce the amount of reuqired assignment material	17%	52%	21%	4%	7%	428	3.694	0.153	6
Provide a more interactive session between lecturer and students	24%	59%	7%	0%	10%	428	3.869	0.161	5
							24.093	*1.000*	

5.0 CONCLUSION

BIM is a highly advanced piece of technology that is implemented in the construction industry to better aid the process of building construction. With the rise of competitive job scopes and economic down fall, students need to be able to prepare any skill set in order to thrive in a generation as such. In order to ensure that they are competent before entering the competitive world, application of BIM software during their education stage can boost this perk and allow them to have a head start in the working industry. However, the lack of implementation of BIM software within the Malaysian education industry has taken its toll onto the development of BIM application throughout Malaysia. Thus, this study has carried the important weight to identify Malaysian Quantity Surveying students and graduates' perception on their agreement on the factors affecting the implementation of BIM software as associated with the level of impact these may have on and from the implementation of these software, which is then followed by practical solutions to overcome this hindering phenomenon. With this, it has achieved all the objectives set out for the study.

The findings of this study would empower the Malaysia education industry to be concerned of this problem involving not only the Quantity Surveying students and graduates, but also to prospective construction employers which will expand their need to hire more valuable professional graduates. This is because the availability of sufficient human resources along with a set of skills that is valuable to use within the construction industry and is especially crucial for a developing nation such as Malaysia in this digital era.

Therefore, the objective of this study can ensure a full greater impact whereby the governing bodies of the construction industry such as the Construction Industry Development Board (CIDB), BQSM and RISM can carry out relevant research to obtain key findings and revamp the education industry in order to knock off into developing the construction industry into an era of BIM software application. Ultimately, this would attract and retain the Quantity Surveying graduates to contribute their known skills and knowledge towards refining the Malaysian construction industry at a much faster pace in order for our nation to achieve the standard of a developed nation by the year 2020.

6.0 RECOMMENDATION FOR FUTURE RESEARCH

This research mainly focuses on the factors affecting the implementation of BIM software within the Malaysian education industry. Future research can be conducted by using more than one approach, such as interviews and survey questionnaires, in order to ensure the reliability of the data collected. Future research can also be carried out by seeking perspectives of those who have been involved in the implementation of any BIM software within university institutions. This further research might be able to provide an insight for Malaysia to see the benefits of implementing BIM software within the education industry in order to possibly achieve the status of a developed country by the year 2020. Further recommendations on this particular study are to obtain insight from Quantity Surveying students in Malaysia regarding their demands and expectations on the benefits of implementing BIM software and its application at an early stage of education.

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