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BIM Knowledge: An Avenue for Construction Industry Development in Malaysia

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ABSTRACT

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BIM KNOWLEDGE: AN AVENUE FOR CONSTRUCTION INDUSTRY DEVELOPMENT IN MALAYSIA

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Abstract

The global development trend in construction industry is the adoption of Building Information Modeling (BIM) for project delivery process. Malaysia is identified as a fast growing nation with potentials to be in the league of developed nationals; to achieve this, BIM is inevitable. The adoption of BIM for project delivery is majorly a function of awareness, technical skills, collaboration and education among all professionals specialization in the industry. However, the moves to embrace and adopt this technology by the industry have been slow and this is largely due to low or complete lack of knowledge. This study therefore provokes the opinions of the practitioners in the industry by interview and data therefrom was analyzed using qualitative analysis software. Thirteen respondents include; architects, quantity surveyors, engineers, contractors and project/facility managers in practices were interviewed. This study therefore, identified the importance knowledge to the development of construction industry in Malaysia..

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1. Introduction

Construction industry have been found to play crucial roles in the provision of necessary infrastructure such as housing, roads, hospitals, schools, and other basic facilities, for good quality and to improve the socio-economic growth of most developed nations around the globe [1]. Though, construction industry is of importance to any economic worldwide, but it still remains one of the most challenging industries in this present age, with low reliable rate of profitability, little investment in research, education and development. Also, the problem of training of beginners for replacement of aging workforce and the present market needs of experts with adequate modern technological training are among the major problems that needed urgent attention [2].

The adoption of Building Information Modelling (BIM) technology has come as a relief to ease the pressure on the industry in order to provide value for money, creating opportunities sustainable design and construction, and to find solution to other problems bedeviling the industry. However, BIM is transforming the paradigm of the industry from 2D lines based drawing systems to nD object based information systems [3]. Yusuf, Ali [4] also maintained, that BIM is a modern delivery tool that is widely in use in the construction industry which is becoming international benchmark for efficiency in Architectural, Engineering, and Construction (AEC) and its influences and benefits are still unfolding.

Macdonald [5], noted that despite the enormous BIM benefits, its benefits cannot be fully achieved due to limited knowledgeable workforce in the sector. This made her to maintain that education

remains the only option for balancing the inadequacy in the industrial market needs of competent workforce. In Malaysia's construction industry, adoption of BIM by industry players is having challenges of implementation because of lack of knowledge and execution guideline for them to follow. In order to overcome these impediments effort are geared towards development of training and education program that will enables changing management style and developing new roles and responsibility [6].

2. BIM Knowledge

From series of study it is apparent that BIM pursues the aptitudes to change and revamp the performance of AEC industry, with the hope that inefficiencies will reduce, productivity enhanced and collaboration, communication and free flow of information will be upsurge [7]. Furthermore, with BIM there is the potential to achieve decreased project costs, increased productivity and quality, and reduced project delivery time [8]. In spite of the success factor perceived of the BIM and the envisage potential, the embracement, Becerik-Gerber, Gerber [9] noted that the adoption of these opportunities has remain low. Knowledge as human resources in any capital development has be found to be an important factor that determines awareness of the society. The overall level of education of the society is essential for productive use of new technology [10, 11]. Castells [11] advised that the only avenue for this to be achieved is by starting with the creation of knowledge and awareness among the society in question. Besides, the ability to adopt and practice BIM technology depends on knowledge of the complex process information manipulation

and assimilation. Furthermore, Bernstein, P.G. (2010), suggested that BIM knowledge should be made available to professionals in the construction industry, but also warning that failure to this will create a fundament setback in the industry. Enegbuma and Ali [12], noted that the Malaysia government through its agencies such as Jabatan Kerja Raya (JKR) and the Construction Industry Development Board (CIDB) were aware of the importance of BIM as an emerging technology that is revolutionizing the entire construction industry.

3. Theoretical Basis For BIM Knowledge

Theoretical basis is the structure that can hold or support a theory of a research study. The Project-based Learning (PBL) model is important in the learning process. It is touted to be the approach and means to achieve the 21st century skills. Moving away from traditional learning style, Project-based Learning (PBL) builds on individual strengths, and allows individuals to explore their interests, it also incorporates the principles of providing challenging and complex work, interdisciplinary and encourages cooperative learning. Project-based Learning also lends authenticity to learning. While in practice, practitioners plan, implement and evaluate projects in real-world situations beyond the classrooms. Project-based-learning experiences are often designed to address real-world problems and issues, which is complex, interconnecting, and ambiguous, sometime project-based learning may be called *inquiry-based learning* or *learning by doing*, since the learning process is integral to the knowledge and skills students acquire. [13]

Computing and networking technologies offers new opportunities to support inquiry-based learning. This was identified by Blumenfeld, Soloway [14], who spelt out the six contributions that technology can make to the learning process, that is

- i. Enhancing interest and motivation.
- ii. Providing access to information.
- iii. Allowing active, manipulable representations.
- iv. Structuring the process with tactical and strategic support.
- v. Diagnosing and correcting errors.
- vi. Managing complexity and aiding production.

In the knowledge transfer of BIM in any academic setting, interest and motivation are of great importance, this is to provide access to information which will enable students to be active through a process of tactical and strategic support. The aspect of conflict detection and resolution is made handy to manage complex models from all project team members to deliver the project to the best practise. Edelson, Gordin [15] explained that computer technology offers benefits for inquiry-based learning for large data storage and manipulate of information both in visual and audio formats; it also supports complex computations for communication and expression with the ability to respond rapidly among project team members. These qualities of PBL in the knowledge transfer and integration of BIM to education made it a promising technologies developed for learner and adopted for BIM to enhance ability of virtual appreciation of digital project before real life reproduction [14, 15]

4. Research Methods

The appropriateness of the data collection method adopted was due to the explorative nature of the study, BIM as a new paradigm that is still finding its feet in the construction industry, requires more and adequate information that will give an unbiased conclusions. The target populations for the study are the stakeholder in the construction industry in Malaysia; with particular reference to those that have already adopted BIM for their practice and those with BIM technical knowledge. Deciding on the number of sample size that will adequately represent the population comes in when the point of saturation is reached; when an additional respondent give no additional new information to the data set already secured. This allowed the researcher to determine and decide on the sample size. Thirteen respondents were interviewed to reach information saturation level; these comprises of architects, engineers, quantity surveyors, project managers and contractors that have adopted BIM and are active in the BIM awareness campaign. To source audience for these categories of respondents a modified snow ball technic was adopted in order to locate those stakeholders that have already adopted BIM, as they are few in number. For the analysis of the study, MAXQDA 12, which is a CAQDAS software was adopted. The choice this analytical approach was based on its suitability for easy coding, data display, data mapping, importation and exportation of data and interrelation of various data for analysis purpose [16].

5. Discussion and Findings

In order to appreciate the need for BIM knowledge and way of realising it, the impediments that are standing on the way of

adequate BIM knowledge must also be identified and highlighted for better appreciation of reasons for research solution outcomes. This section discusses the challenges facing acquisition of BIM knowledge and the needs for the establishment of adequate BIM knowledge in order to pave an avenue for the

construction industry in Malaysia to realise its potentials at full adoption of BIM. From the code matrix browser of the interviews as illustrated in figure 1, which shows the distribution of respondents' comments as regards BIM education challenges and the needs.

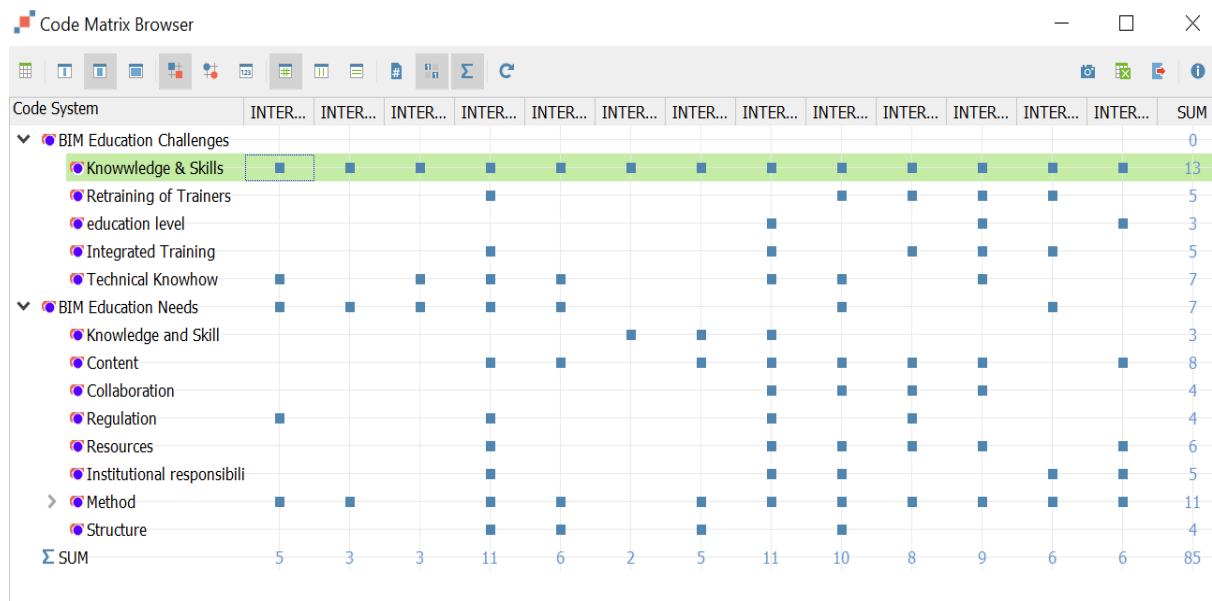


Figure 1: Distribution of Interview Respondents

From the distribution of interviewees' comments as presented in figure 2, 100% of respondents agreed that BIM adoption in the industry is majorly impeded by lack of knowledge and skills. Next to it is the lack of technical knowhow in teams of software(s) and hardware(s) technology. While the least problem of adoption is the education level with 23.1%, this means that the industry needs more of technical knowledge to forge ahead.

5.1 BIM Challenges

These are challenges that are facing BIM adoption as a result of non-adequacy of

knowledge and training in construction industry in Malaysia. Deducing from the interview, many of the respondents expressed that poor BIM adoption was as a result of non-establishment of education system to cater for the industrial workforce needs. Some of these challenges include the absence of knowledge and skills; absence of retraining of trainers, in adequate level of education; non-integrated training and poor software technical knowhow. Inferring from the comments made by the respondents indicated that BIM knowledge and skills constitutes a major setback for BIM adoption.

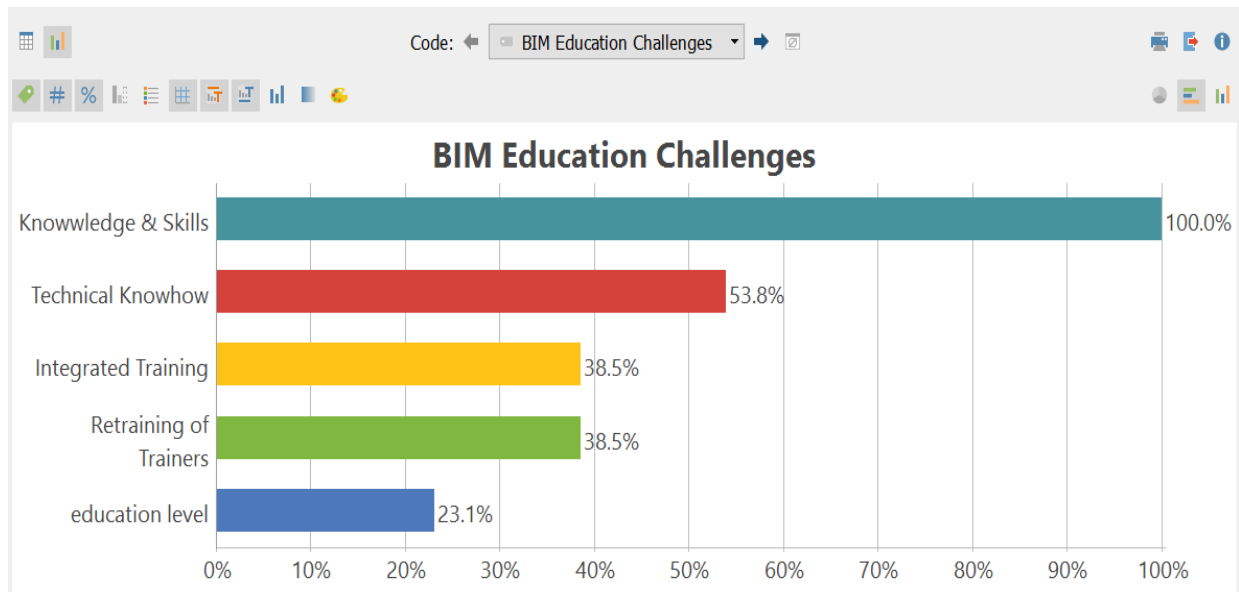


Figure 2: BIM challenges in the construction industry

5.1.1 Knowledge and Skills

All the respondents acknowledge the importance knowledge and skill to the adoption of BIM and the lack of it have been the main impediment to wide spread of BIM adoption. Many of the interviewees argued that because of lack of BIM knowledge many consultants firm only procure both the software and the hardware for BIM and keep without using them for their projects, as taken from the interviewee accounts as:

“The level of BIM in Malaysia have not reach that level, because it knowledge spread is still very limited among practitioners...limitation of knowledge and awareness among professionals and there is low level of BIM developer / industry”

The study also found out that many stakeholders are willing to adopt BIM in their respective specializations, but lack knowledge stands on their ways and they decide to stay with the traditional methods of project delivery even when they can afford the cost of setting up a BIM office. For instance one of the respondent opt that:

“I believe that there are large opportunities for design innovation and creativity but in Malaysia not all the consultancy firms are willing to use BIM because of lack knowledge and awareness...Lack of complete information by the design team as to the proper usage of BIM and this is largely due to limited BIM knowledge”

5.1.2 Retraining of Trainer

The retraining of trainer is a process where educators go for further training so as to keep abreast with the latest technology. Most of the educators are still to be acquainted with the latest technology; this is a challenge. Taking cognizance of comments from the respondents retraining of educator is paramount to BIM adoption, examples of such comments are:

“Okay, about education, I think, first of all, the lecturers have to get trained first, they have to go through school, perhaps retraining, probably be it at the industry, be it at CIDB, be it IDB, then they get at the understanding”

5.1.3 Non-integrated training

Formal education occurs in a structured environment whose explicit purpose is teaching students, an educator must therefore possess the required explicit knowledge to qualify to education students. Thus, the BIM education qualification needed for the production of competent workforce is still in lacking as can be deduce from comments from respondents. Another area of impotence is the integrated training among relevant departments and faculties. This tradition encourages collaborative education among various construction industry specialties starting from higher education.

“Now how can we make our BIM knowledge to grow from secondary school level for BIM appreciation in form of BIM definition, then in technical education, diploma and high diploma level to be exposed to the technical aspect of BIM. And for the higher institution (B.Sc., M.Sc., and PhD) this are exposed to the basic principles and the management technicalities of BIM”

5.1.4 Poor Software Technical Knowhow

Technical knowhow is also identified by the respondents as lacking in the training of students at higher education institutions. In addition, apart from the inadequate manpower without adequate technical knowhow needed, the software and machines need to be made available. As pointed out by one of the interviewee that:

“I have BIM, I have Revit in my office but I’m not using it due to lack of BIM operators. So this problem will be solved for there will be more BIM graduate to be absorbed by the market.”

5.2 BIM Knowledge Needs

Education have been found to be the spine of BIM adoption, in this case a number of needs have been identified by interviewees, these are to reposition the BIM education of the industry in order to adequately combat some of these challenges. Deducing from the interviews, as presented in figure 3, some of the needs are: improve knowledge and skills; education contents; collaboration; regulation; resource in teams of capital and machines; institutional responsibility; method and structure of BIM education deliverables.

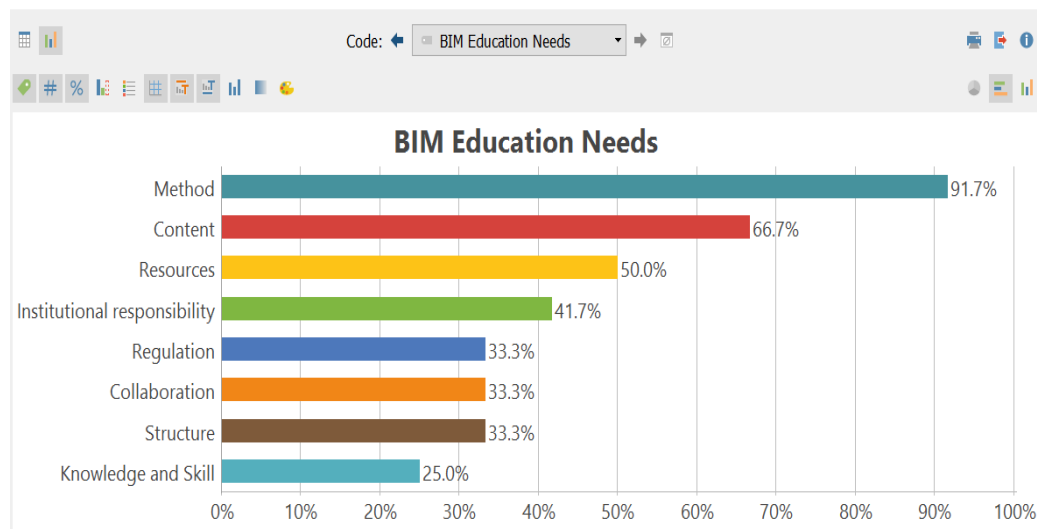


Figure 2: BIM education needs for construction industry

5.2.1 Improve Knowledge and Skills

Adoption of BIM can only be consolidated with good BIM education which is built upon the knowledge and skill of the technology. About 75% of the respondents acknowledged that BIM education across all educational stages (secondary, technical and university education levels) are important to the construction industry and therefore must be included in BIM educational plans of the construction industry in Malaysia.

“What knowledge do we need to give all these category of people, because secondary school knowledge is very important, technical education is very important, and university education is also very important, and they work hand-in-hand”

5.2.2 Collaboration among the Industry and Academia

Collaboration is the working together of the industrial practitioners and the academic for the overall development of the construction industry, and it is of importance to the production of BIM competent workforce. Collaboration is one of the breakthroughs of building information modeling because it affords the industry an obstructed free flow of information sharing. However, respondents recognized that BIM adoption needs collaboration among the industrial player especially the industrial practitioners and the academies. They also argued that the roles play by each party is complimentary and none can be dispense with.

“That is why I think the discussion between academia and the practitioners should be intertwined, and the other thing that they should be done is perhaps, the university

could use these mean, that is, they have this understanding of this concept of, okay, only if you are qualified, you can go and teach”

5.2.3 Resource (Software and Hardware)

The resource needed for setting up BIM education in higher education is enormous. This fact is agreed upon by all the respondents, but some are of the opinions that resources are not of problem to the institutions, because they are being supported by the government with grants that is needed for both software and hardware for BIM setup.

“In Malaysia the universities have more grant than the private practices, the university should be able to buy the needed software and hardware and to be able to conduct training for their students”

5.2.4 BIM Education Deliverables

For the education institution to be up to task of producing BIM workforce for the construction industry, the study identify that there is need for curriculum that addresses the basic principles of BIM. Though, the respondents identify two type of BIM education that is: business BIM education and the academic BIM education, but more emphases is place on the later. Among the deliverables needed by the academic institution from the opinions of the interviewees is that various BIM software(s) should be taught in addition to the main specializations.

“there must be a (BIM) curriculum to your being encouraged, alright, to seek the proper understanding of the principles of BIM; the basic thing about what you are doing, the little thing, and then you go away with the correct curriculum”

5.2.5 Institutional Responsibility

Academic institutions are the custodians of knowledge and skills, it is on this note that many of the respondents believed that academic institution roles and responsibilities are important in the development of BIM education in the construction industry. From the interviews it is identified that higher education should be specialized in the educating and training of upcoming professionals, also the interviewees are of the notion that institution should focus on the supply of needed workforce for the industry.

“So this is where we need to explore to make sure our institutions of higher learning are specialized in certain area of the industry.....But for the time being, we need to look for the education, then focus on the education demand and supply, and the usage of these tools that you want to implement to operate, manage the human resources”

6. Result and Conclusion

In order to keep with the BIM global developmental reality, BIM knowledge is key and the utmost need of the construction industry in Malaysia. The moves to embrace and adopt this technology by the industry practitioners have been slow and this is largely due to lack of knowledge and awareness, due to some impediments as highlighted in section 4.1. The industry BIM knowledge needs as discussed in last section indicated that, adoption of BIM with adequate knowledge is the only sure way to guarantee the development of the industry in Malaysia. In summary, the author believes that BIM integration to education institution will be the antidotes for lack of BIM

knowledge and the only way to develop the industry to an international standards.

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