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Study on Level of Awareness and Readiness of UTHM Students in Building Information Modeling (BIM)

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Abstract Building Information Modeling (BIM) is a new software technology that helps the building industry to revolutionise into a digitised, informative model. In the construction industry, the use of BIM required higher budgets, skills and expertise for practitioners. Previous research had found an inferior of BIM adoption in the construction industry in Malaysia. The aim of this study is to identify the level of awareness of UTHM students in BIM and to evaluate the readiness of UTHM students in learning BIM courses. Data was collected using a self-completion online survey based on the structured questionnaire survey and data were obtained from 207 students. Descriptive statistics have been used to deduce total data and provide insights into variety of collected data. The findings of the data analysis were carried out with the help of IBM SPSS software Statistics 26.0. The results indicated that students have heard of BIM but do not understand its concepts. Also, the respondents were not prepared to work in a BIM-enabled environment because their courses did not adequately prepare them. However, the majority of respondents would like to learn more about BIM as part of their course. Training will be required for all affected staff in order to prepare students for successful careers in the built environment industry.

Keywords: Awareness, Readiness, Building Information Modeling, UTHM Students

1. Introduction

Building Information Modelling (BIM) is new software for handling the life-cycle operations of the construction project starting from project planning, design, construction, facilities management, and maintenance. In building technology and innovation, this becomes an important understanding. BIM is digital documentation of physical and functional attributes facility's that is used for assessment, design collaboration, and operating visualization [1]. In the construction project, BIM can enhance communication, collaborate with construction workers, and reduce costs and security problems in construction projects [2].

To acknowledge the ability of BIM to stimulate the growth and development of the country the Malaysian government agreed to empower the related construction industry including Jabatan Kerja Raya (JKR), the Construction Industry Development Board (CIDB), and other qualified bodies through the Construction Industry Transformation Program (CITP) to implement the technology. One of the most effective strategies to increase BIM usage is through training and incorporation of BIM in the university curriculum [3]. However, such a technique has yet to be widely introduced in higher learning institutions. The teaching and practice of BIM in higher learning institutions are still far from adequate. On the industrial side, the number of skilled workforces from BIM training is still weak [4]. Education and learning preparation for BIM is very important to implementation in the Malaysia construction industry. BIM should play a major role in higher education institutions [5]. This trend is expected to continue as the industry develops standards, software tools are improved, and more clients make BIM mandatory. However, BIM is at an initial stage of development in Malaysia.

Some educators have seen BIM as a different type of CAD that students should study alone rather than as an increasingly necessary industrial practice [6]. One of the main barriers to collaborative teaching in universities is not surprisingly the opposition to the use of emerging technology in teaching and learning by educators [7]. BIM represents a good opportunity to improve efficiency and problems arise from a lack of knowledge of the skills and information required in the different work disciplines when implementing BIM [8]. The question arises whether students are familiar with BIM's existence in Malaysia and how far the BIM level in higher education institutions is known. This study seeks to identify the awareness and readiness of UTHM students towards the application of BIM in teaching and learning to highlight proactive action by making BIM a part of the Malaysia construction industry. The results obtained will assist the university to take action in future planning of BIM implementation in UTHM.

2. The role of Higher Education Institutions (HEIs) in promoting BIM adoption

Core sources of potential built-in environmental professionals for the building industry are higher education programmes. In a collaborative environment, managers will provide the future architecture and building professionals with the know-how and skills needed by industry [9]. It states that higher education institutions are increasingly and urgently needed to adapt to changing societal and economic needs by creating advanced education for students. For a smooth transition to BIM, higher education institutions are designed to develop and transfer technology to industry. The graduates should stay in line with the industry's new development, job seekers anticipate university graduates to be ready for BIM [10]. BIM adoption in higher education would meet the high demand for BIM professional staff and offer new opportunities for students with high productivity in the BIM application to face emerging challenges [5].

Several universities worldwide have started to integrate BIM into their curricula through lectures, seminars, workshops and specific BIM courses at degree levels, to train students for the industry because of the lack of BIM knowledge and skills at graduate levels. Nevertheless, in Malaysia BIM is in an initial development stage and still fails to introduce BIM into universities, one or more of the following factors can be concepts which is lack of understanding BIM, technical problems which is incapacity to use the necessary tools and problems related to circumstances. Resources and university liberalism are the main obstacles to developing engineering education to meet the needs of industry. [11].

2.1 BIM Awareness

Based on awareness of something or understanding of a situation or subject based on information or experience [12]. The survey questionnaire examines whether students who had heard about BIM, how they had heard about BIM, the underlying interpreting of BIM and the current development of the Malaysian construction industry as regards the adoption of BIM, to determine the awareness of BIM among UTHM students.

University academic, training involves integration BIM awareness and skills to enable the education and BIM training capable of increasing the construction industry's market requirements [4]. The

awareness of BIM has provided an incomplete list of obstacles such as the development of BIM skills and trusting new technologies [13]. Human resources have been regarded as important factors in national development and depend on social awareness of the quality of education and formation [14].

Mane researchers highlighted that the awareness of the phase of BIM implementation, its advantages and challenges as important aspects that allow the industry to promote it as a new technology for the delivery of projects. Their inability to understand the situation leads to slow adoption and implementation in Malaysia's construction industry [3]. Awareness of the challenges facing the adoption and implementation of BIM, for instance, developing BIM capabilities and relying on new technologies was not comprehensive. Increasing awareness will therefore also help to address the barriers which influence and therefore benefit from BIM adoption and implementation [13].

2.2 BIM Readiness

Readiness definition cannot be specified, but it is environmentally, contextually and individually relevant [15]. The willingness and the ability of study for entrepreneurial education is readiness [16]. The following meaning of awareness is the readiness to be ready for something [12]. The readiness and ability (skill) therefore, two elements used by the survey to notify students of readiness for BIM can be deduced from every significance. The aim of this study is to evaluate student readiness for BIM as the willingness to BIM exposure and its ability to work in a BIM. It developed students' readiness to study BIM in their courses and their capacity to work in a BIM with integrating BIM in curricula through lectures, seminars, workshops and a specific BIM courses at degree levels. The goal is train students for the industry due to a lack of BIM knowledge and skills at graduate levels.

3. Methodology

By identifying the goals and objectives of this report and reviewing previous related research, this observational and descriptive study was carried out to identify the level of awareness and the evaluate the readiness in learning of BIM course among UTHM students Positive (quantitative) research methods were used in this study. An online survey questionnaire consisting of sixteen items divided into three sections was used to collect data. The first section had five items to ascertain respondents' demography, followed by six (6) items on BIM awareness (Section B). Section C consists of five (5) items on the BIM readiness. Closed ended questions were used to make it easier and faster for the respondents to answer. It also made it easier to compare the answers of different respondents, which was a great benefit. The questions ranked their opinions on the topic using 5-point Likert-scale, with a scale from "strongly agree" to "strongly disagree."

The subjects of this survey were the engineering students in UTHM and in mainly focus on 3rd year students and 4th year students with faculty engineering in UTHM such as Faculty of Civil Engineering and Built Environment (FKAAB), Faculty of Electrical and Electronic Engineering (FKEE), and Faculty of Mechanical and Manufacturing Engineering (FKMP). In order to derive the total data and provide a summary of a range of collected data, descriptive statistics have been applied. The findings of the data analysis were carried out with the help of IBM SPSS software Statistics 26.0. Results for awareness of BIM and the readiness in learning of BIM course among UTHM students will be presented as percentages.

4. Results and Discussion

4.1 BIM Awareness

The paper critically examines the awareness of BIM among UTHM students based on the questionnaire on Section B. Figure 1 shows the bar chart that illustrates the percentages for the awareness of students as regards the BIM in UTHM.
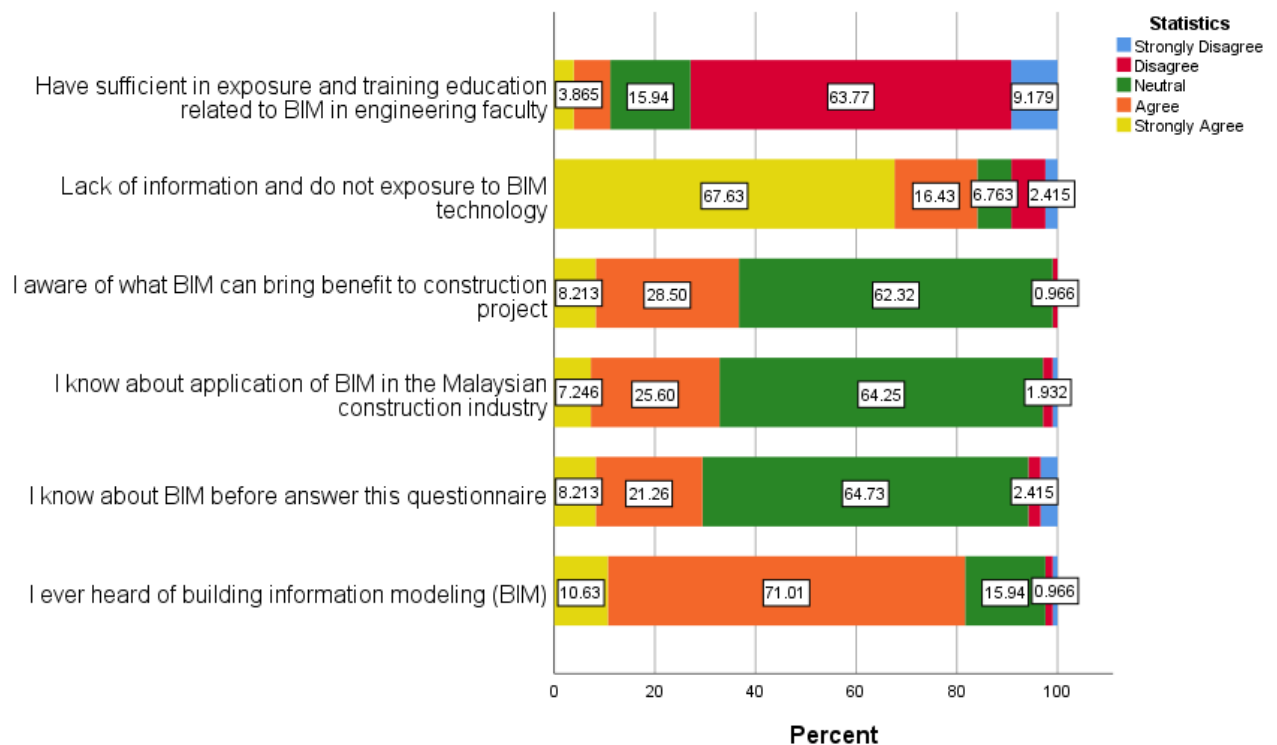
Figure 1: BIM Awareness

As indicated in Figure 1, the majority of respondents answered strongly agree and agree that they had heard about BIM consists 82%. However, 8% of respondents answered fell to neutral which they not sure that they ever heard about BIM. The results suggest that the majority of students may have heard were about BIM before it was introduced in their courses. It's could be attributed to the high level of BIM-related reports and journal papers published in the last five years [17]. Within the last five years, BIM has become one of the most talked-about and written about topics in the construction industry.

To ensure the existence of BIM among UTHM students, Figure 1 asked about the application of BIM in the Malaysia construction industry. More than half (64%) answered that 'Neutral' or 'Not sure' for the question. The results suggest to UTHM to make a program to introduce BIM in more depth to students so students can know the nowadays demands of BIM in the world of construction industry. Hence, in construction industry used BIM has many advantages for building construction such as trying to strengthen structural links and allowing for faster design decisions [18]. Furthermore, application of BIM was the ease of use related to its tools that it can reduce time in design framework as well can cut cost and project schedule of construction.

Following the above question in Figure 1, respondents were asked to be aware about BIM can bring benefits to construction projects. More than half (64%) answered that 'Neutral' or 'Not sure' for the question because of lack of knowledge about BIM which UTHM students only respondents had heard about BIM, however, they do not know what BIM the actual can bring many benefits to construction project. The results suggest to UTHM to make a program to introduce BIM in more depth to students that implemented BIM in construction projects can help to solve construction issues such as delays, design clashes and disputes between construction players. BIM technology can bring benefits and BIM used through the project life-cycle assists simultaneous construction [19].

Based on results survey in Figure 1 show that more than three quarters (84%) of respondents strongly agree were they lack information and were not exposed to BIM technologies in UTHM. However, only one quarter (9%) answered they disagree about this perception which was they have enough knowledge about BIM through journals, seminars and other sources. To results suggest to UTHM to introduce a new course on the introduction and implementation of BIM in more depth to

students. Due to a lack of resources, awareness, and even BIM knowledge among academicians, universities have been slow to incorporate tertiary BIM knowledge into their training [20].

Lastly, from Figure 1 more than half (64%) of respondents answered that they disagree about the perception that has sufficient in exposure and training education related to BIM in faculty engineering. This is because of a lack of curriculum focused on BIM training in UTHM. Besides, UTHM don't have professionally trained about BIM, are unfamiliar with BIM, lack the materials and educational resources necessary to teach BIM among lecturers. This situation necessitates the training of affected lecturers for them to be more capable also ready to delivering BIM topics. The previous study highlight that several lecturers are unable to teach new skills in new topic such as BIM [21].

4.2 BIM Readiness

The paper critically examines the readiness among UTHM students in learning BIM courses based on the questionnaire on Section C. Figure 2 shows the bar chart that illustrates the percentages for the awareness of students as regards the BIM in UTHM.
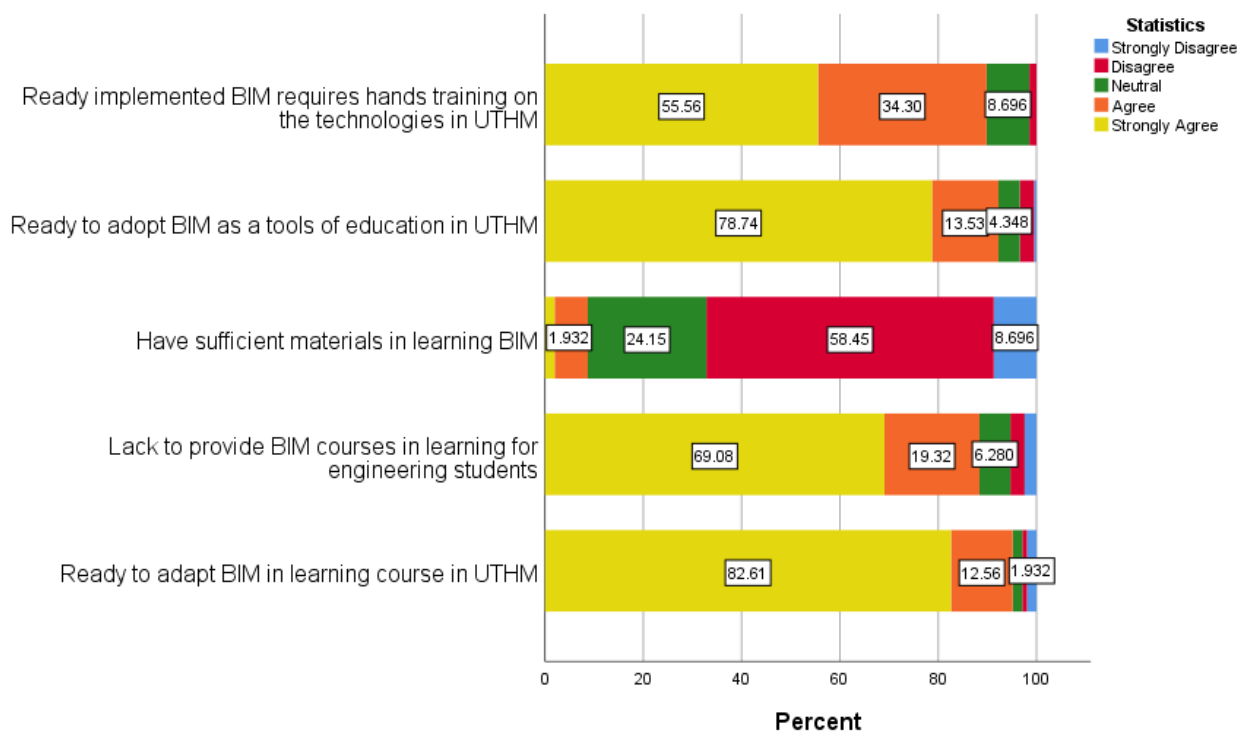

Figure 2: BIM Readiness

Figure 2 shows, the questions asked the respondents that ready to adapt BIM in learning course in UTHM. The majority of respondents (95%) answered strongly agree about this perception. The results of students being ready to learn BIM in UTHM because students are aware of BIM demands in the world of the construction industry. The results suggest introducing a new course on the introduction and implementation of BIM to engineering students in UTHM. BIM education is one of the primary elements that focus on university area and hence to produce BIM skill engineers that the industry needed [22]. In addition, providing graduates with the skills they need to succeed in increasingly dynamic market, with knowledge and the skills to work within the BIM working environment being one of those skills.

Based results survey in Figure 2 show that more than three-quarters of the respondents which were (84%) strongly agree about UTHM lack to provide BIM courses in learning for engineering students.

The rest of respondents (5.3%) disagree about this perception which they don't willing to explore to a new technology of BIM. BIM education is one of the primary elements that focuses in university area and hence to produce BIM skill engineers that the industry needed. However, universities still lack resources are the main barriers to develop engineering education to meet the demands [22]. Demand and supply between the constructions industry is a demand for BIM to be implemented to promote knowledge between lectures, rising awareness and improve the readiness to implemented BIM in teaching at university. Government main important as plays in promoting the BIM implementation [23].

Following the above question in Figure 2, respondents were asked that lack of materials and education resources of BIM in UTHM. More than half (59%) of respondents disagree about this perception that UTHM does not provide enough materials about BIM for students to learn. For example, in Faculty FKAAB only one subject and small subtopic to introduced BIM to students. A much more theoretical understanding of how BIM assisted teaching and learning and also exploring what needs to be found in the wide implementation of the program [5]. BIM education is one of the primary elements that focuses in university area and hence to produce BIM skill engineers that the industry needed [22].

Next question in Figure 2, ninety-two percent (92%) of the survey respondents answered strongly agree that they are ready to adopt BIM as a tool of education in UTHM. The results suggest that UTHM can develop collaboration with the construction industry that established BIM to provide BIM knowledge and training as a workshop platform for the building industry. BIM is based on collaboration to create a single integrated model [24]. Collaboration by all teams is a key principle of BIM for an efficient industry [25]. As a result, BIM thrives in a collaborative specialised area for project inception. BIM would ensure that several companies collaborate in a completely collaborative graphic dimension, allowing the project teams to work on a common platform to lower transaction and error costs [25].

Lastly, Figure 2 shown that more than three quarters of the respondents which were (90%) strongly agree about ready to implemented BIM requires hands training on the technologies in UTHM. The results suggest to introduce a new course on the introduction and implemented of BIM to engineering students in UTHM. The implementation of BIM has provided substantial advantages to the construction field while also having a major impact on its existing practices and corporate prototype [13]. The various benefits of BIM in construction including the reduced cost, carbon burden, time, and capital costs [26].

5. Conclusion

In conclusion, a survey was performed to identify the level of awareness of BIM and to evaluate the readiness in learning BIM course among UTHM students, and statistical analyses were performed as the results of the survey.

In the final analysis, it has been observed that nearly all UTHM students had ever heard what BIM it was but were unaware of BIM in the Malaysia construction industry. More respondents were familiar with BIM however not know its technical aspects in particular concerning construction applications and a lacking of curricula focus on BIM in UTHM. Due to a lack of resources, awareness, and even BIM knowledge among academicians, universities have been slow to integrate tertiary BIM knowledge into their training [20]. Finally, it is needed for a university to increase of student awareness will therefore also help to address the barriers which influence and therefore benefit from BIM adoption and implementation.

Next, the readiness of UTHM students in learning BIM course is very high. However, the research suggests that UTHM is still far behind in preparing their students to be enable them work in BIM enabled environment. Hence, university must address this issue to guarantee that their students are equipped with the necessary BIM knowledge to flourish in a BIM-enabled world. Institutions which incorporate BIM early in their curricula will gain a competitive edge to attract students. Finally, to improve this current situation requires all the engineering lecturers concerned at the university to be trained and enable them to deliver BIM subjects.

Overall, the results appear to suggest the need for any upcoming plans and adequate training for students to develop relevant skills. Based on the study, the research proposed to the faculty engineering in UTHM to introduce a new course on the introduction and implemented of BIM to students of Bachelor of Civil Engineering with Honours, Bachelor of Science in Architecture, Bachelor of Electrical Engineering with Honours, Bachelor of Electronic Engineering with Honours, and Bachelor of Mechanical Engineering with Honours. For future research could expand more time by selecting more respondents to answer the survey, which will get more evidence why this course should implement in faculty. In addition, Universiti Tun Hussein Onn Malaysia (UTHM) can develop collaboration with the construction industry that established BIM to provide BIM knowledge and training as a workshop platform for the building industry.

Acknowledgement

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