Enhancing the Knowledge and Proficiency for Interior Designers in Malaysia through the Implementation Building Information Modelling

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Abstract. Building Information Modelling (BIM) is the process to develop and enhance the process of work to ensure the accuracy in the scope of work and efficiency in the documentation are less error during the construction project. Having the knowledge and proficiency for interior designers on the required tasks and scope of work for interior designers are critical as a tools to manage interior project. This study is to emphasize the significance of knowledge and skill among interior designers in Malaysia while implement BIM in the interior projects. This research was conducted through preliminary study by choosing interior design firms in Klang Valley. Sixteen (16) interior design firms were choose randomly in this survey. The survey were conduct through questionnaire survey and discussion with the interior design expertise. The data was analysed the elements of barrier and key factors the enhancement of knowledge and proficiency for interior designers in Malaysia.

1. Introduction

Nowadays, in the construction industry, it is more challenging in term of technology, process, budgets, documentations and management. The construction players in the building process are facing this challenging to delivere flourishing project, despite tight budgets, and accelerated schedules which transpire to the Architecture, Engineering and Construction (AEC) industry [1, 2]. This phases, AEC industry has required to adopt another system to reduce project cost, diminish project delivery time, increase productivity and quality, and abolish waste as well as for AEC industry to improve in construction process [3]. The progress development can be become proper if the right approaches implement in construction and Building Information Modelling (BIM) has potential and purpose for construction players adopt in building process [4].

In the universal construction industry, the most significance innovation tool is Building Information Modelling (BIM) technology. According to Chen and Qu [5], BIM is a momentous approach technology to apply and maintain the integrated digital for all building development in different phases of the complexity construction building and abstract of data repository [6]. The integrated among design process and BIM were more organize include all the progress working in term of design, planning and documentation.
Today, many countries in the world using innovation tools and new technologies in the construction industry for enhanced the skills and knowledge in their expertise. For example, in construction it has been proven by using existence tool such as two-dimensional AutoCAD has been raising the efficiency and accuracy of project in the design phases. For that purpose, construction players have been created a building information modelling (BIM) as a latest tool to be present innovative and constructive by improvement several tools and techniques to increase the performance in the construction industry [7]. The effectiveness of building information modelling implementation in the projects is one of the paradigm for architect, engineering and construction (AEC), project managers, facility managers and contractors-subcontractors to develop from a traditional approach to modern and innovative approach in the process of design project. More integration technology can enhance by implementation BIM in the construction approach. Lately, BIM have growing rapidly in several countries such as Australia, United State, Finland, Denmark, Middle East, and India – industry players required submit the project document in BIM format [8]. However, the adoption BIM in Malaysian construction industry are still fresh [9, 10].

2. Literature review

Interior design is a multi-faceted profession with creative and technical solutions are applied within a structure to achieve a built interior environment. With the complying the solutions of element are functional, enhance the quality of life and culture of the occupants, and are aesthetically attractive [11]. Interior design task is including a scope of services performed by a professional design practitioner, qualified by means of education, experience, and examination, to protect and enhance the life, health, safety and welfare of the public. Professional interior design encompasses programming, space planning, construction, detailing, and finish selection as well as considerations of interior decor. As in building design, the process of interior design defines client and user requirements, develops conceptual approaches, and creates and documents solutions.

In the construction industry, interior design also has a role in construction industry development. For that, knowledge and performance skill should be considered to ensure the development progress in the construction were smooth in progress. The consideration for interior design industry to implement Building Information Modelling (BIM) should be consider to avoid from some element of risk such as cost overruns, project delays and building not performing as expected. According to Pryke [12], by using BIM can have provided greater certainty to ensures the key project milestone are encountered and delivered as expected while the deliver the building at the right time, cost and quality. Quality performance can have defined as the long term the effectiveness permanent [13] to improve the productivity and profitability of contractors for client’s satisfaction.

2.1. Introduction of BIM

There are many definitions of BIM that defines from designers, contractors and operators. BIM is known as a digital about the physical and function of characteristic the building by sharing the knowledge resource and forming about the building [14]. BIM is defined as a modelling technology and associated set of processes to produce, communicate and analyse digital information for construction life-cycle in the construction projects [15]. BIM is not any single act or process and it is not creating a 3 dimensional (3D) model but it is design for isolate and utilised computer-based fabrication to aware the needs in the process. it is contained the information and data of design, construction, logistics, operation, maintenance, budgets, schedule and more.

In figure 1, is shows the life-cycle in BIM principles there are process, people, policy and technology. This is as a guide for construction industry to implement BIM in their projects as paradigm in construction technology.
In table 1, shows the characteristics of BIM implementation among the stakeholders in the construction industry. Each stakeholder was identified the role and function to enhance the quality of works and documentation.

Table 1. Major stakeholders and characteristics of BIM implementation [15].

| Stakeholders                     | Characteristics of BIM Implementation                                      |
|----------------------------------|-----------------------------------------------------------------------------|
| Developer                        | • To improve the time, deliver and quality of project.                      |
|                                  | • To enhance the project information and design interest in industry.      |
|                                  | • To reduce the cost of project implementation                             |
| Academic                         | • To assist teaching and advance knowledge by using technology.            |
|                                  | • To provide the graduate with BIM knowledge related research.             |
| Design consultant                | • To improve the collaborative design process and productivity.            |
|                                  | • To optimize the analysis implementation and potential use of information in BIM model. |
| Facilities Management            | • To acquire accurate data and information.                                 |
|                                  | • To reduce the cost of operation during facilities management and time.   |
| Contractor & Quantity Surveyor   | • To produce accurate automated Bill of Quantities (BQ).                   |
|                                  | • To better understand the information to construct the building.          |
|                                  | • To have better administer the contract and project documentation.        |
| Vendor & BIM Consultant          | • To provide platform and technical advice about collaboration.            |
|                                  | • Train the industry and user.                                            |

2.2. Interior design

Interior designers need to practice to educate itself by following the process in scope of work to ensure the design phases and construction process will be coordinate accordingly the task and stage process as a professional practice. As mentioned [16], interior designers must satisfy a certain level of skills and
knowledge with familiar with scope of work as a tool to ensure the projects delivery successful. To produce knowledgeable interior designers, the improvement in several issues must be rise to ensure interior designers capable using BIM technology in the design stage. Starting from highest education level it can be enhance the knowledge and potential talent to grab the opportunity of learning in BIM technology. Interior design industry can be competing with others construction industry such as architecture, engineering, construction, and facilities management in term of knowledge, skill and reliable to using BIM.

Todays, interior design has improvised the technology and the understanding of digital technology in the design process and divided at the following phases: Programming, Conceptual Design, Design Development, Contract Document and Evaluation [17]. The design process has improved [18] by adding several phases: Analysis, Development, Implementation and Evaluation as the different step of the interior design process.

3. Research methodology
This study involved questionnaire survey to extract the relevant data and information from the respondents. The issues about implementation BIM among interior design industry were justify through literature review and previous research in construction industry. This research was done by preliminary study by interior design firms are as respondents in Klang Valley. In this study, the interior design firms registered with Lembaga Akitek Malaysia (LAM) were chosen. This survey was distributed by face to face (appointment) and email (by request) of firms. This survey was discovery the engagement interior design industry implement BIM technology in term of knowledge and skill.

This research was conduct with the literature study to review the challenge factors, barriers element, solution and benefits of BIM implementation for interior design industry in Malaysia context. Beginning with the preliminary study and following with the questionnaire, discussion, analysis and finding to find out the problems and issues as shown in figure 2.

![Figure 2. Research Methodology Process.](image)

This methodology has two (2) stages which is Stage I and Stage II. It is started with identify the research topic through literature review and previous study. Then all the variables and key determine the factors were conduct via preliminary study by questionnaire survey which is sixteen (16) interior design firms were chosen randomly in Stage II. From the collecting data, analyse data and finding were justify in discussion and conclusion.

4. Results and analysis
This study was conduct through preliminary study to find out the engagement of interior design firms implement BIM technology as a tools in the design process. The survey is gather from sixteen (16) interior design firms that randomly selected in Klang Valley. The survey was conduct through face to face by appointment with respondents to collect data and discussion regarding the research topic. This survey is to find out the current situation for interior design industry implement BIM in their profession as a tool to develop on the design process and documentation.
4.1. Demographic of respondents
This study, it is sixteen (16) respondents was chosen to justify the current situation about implementation BIM technology for interior design industry through the questionnaire survey. In table 2 shows the frequency of demographic of interior design firms in the data collection. Through the data the responses of year of firm established for interior design which is the data analysed six (6) respondents represented 38% of the total respondents were established in year 2006 to 2010 while five (5) respondents represented 31% were established in year 2011 to 2015. It sis following with three (3) respondents represented 19% established in year 2001 to 2005. However, in year 1990 to1995 and year 1996 to 2000 each representing one (1) respondent represented 6% only.

In the categories of firm, the respondents mostly are interior design consultant with represented fifty-six percent (56%) followed design and build with represented twenty-five percent (25%) and contractor with represented nineteen percent (19%). Most of the interior design industry are from interior design consultant because they comfort to this type of business and can generate more return of investment (ROI).

| Characteristic       | Frequency | Statistics (%) |
|----------------------|-----------|----------------|
| Year of Established  |           |                |
| 1990-1995            | 1         | 6%             |
| 1996-2000            | 1         | 6%             |
| 2001-2005            | 3         | 19%            |
| 2006-2010            | 6         | 38%            |
| 2011 - 2015          | 5         | 31%            |
| Categories of Firm   |           |                |
| ID Consultant        | 9         | 56%            |
| Design and Build     | 4         | 25%            |
| Contractor           | 3         | 19%            |
| Others               | 0         | 0%             |
| BIM Usage            |           |                |
| Less than 1 Year     | 3         | 19%            |
| 2 to 5 Years         | 7         | 44%            |
| 6 to 9 Years         | 4         | 25%            |
| More than 10 Years   | 2         | 12%            |

4.2. Knowledge level and experienced implement BIM
In figure 3 shows the responses of level of knowledge instead of experience of BIM, justify that four (4) respondents know about BIM while twelve (12) respondents do not know or have never heard of BIM. Most of the interior design industry they are not aware about BIM benefit in their design process and documentation. From the graph in figure 3, the knowledge is very crucial which is among of the interior design firms are not implement BIM.
4.3. Significant of BIM in the interior design
In table 3 shows the significance of BIM in interior design firms which is thirteen (13) respondents represented eighty-one percent (81%) agreed that BIM is very importance but three (3) respondents represented nineteen percent (19%) not agreed the significance to implement BIM in the interior design industry. The reason why they are not agreed to used BIM are they are more comfortable to used traditional method such as sketches and 2D drawing like AutoCAD. The high cost also take consideration to implement BIM in the interior design firms and in term of knowledge among interior designs are very low and the level of awareness also very poor.

Table 3. The significant of BIM implementation in interior design.

| Response | Frequency | Percentage |
|----------|-----------|------------|
| Yes      | 13        | 81%        |
| No       | 3         | 19%        |
| Total    | 16        | 100%       |

4.4. Software usage
Table 4 shows the responses of software usage for interior design. Accordingly, table 4, 1 respondent representing 50% of the total respondents were using Revit while 1 respondent representing 50% were using ArchiCAD as their tool. From the data, the numbers of interior design firms using BIM software is very crucial with only two (2) respondents answered they are using BIM technology. In the BIM technology, software knowledge and skill are the things very important for construction industry to expose more about BIM especially the beneficial and advantages while using BIM.

Table 4. BIM software for designers.

| Software Usage | Frequency | Percentage |
|----------------|-----------|------------|
| Revit          | 1         | 50%        |
| ArchiCAD       | 1         | 50%        |
| AutoCAD        | 0         | 0%         |
| Others         | 0         | 0%         |
| Total          | 2         | 100%       |
5. Conclusion
Interior design is still struggle in their skill and abilities in term of public and perceptions [19]. The associated of knowledge and current industry technology are very critical for interior design industry to perceived in the professionalism to value the project especially interior design project. The three-dimensional design based are very effective while implement BIM technology in the design process. BIM technology produced and provided the integration between environment and technology for the designers from the conceptual to construction drawing, visualization and documentation in the construction projects. Through the development of information of BIM technology, it is can achieve to the high level of perfection in pursuit in the design process.

With BIM technology, interior design industry can improve the quality of work and can reduce the cost on the project construction. The ability to using BIM would be developing the professionalism of interior design industry with others construction industry in the same level. The capability to using BIM software can help interior design industry lacking on the knowledge and it is secure in term of cost, time and design development in the project. Thus, they are still lacking on the skill and knowledge. The process to ensure interior design to used BIM are need to has initiative and enforcement to ensure they will have used BIM in the future.

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