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Engagement of Interior Design in the Design Process Phases through BIM Technology Implementation

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Abstract

Building Information Modelling (BIM) is one of the advanced technology in currently method used by architecture, engineering and construction (AEC) industry to enhance their performance and knowledge. The accuracy of BIM technology usage enables for construction industry to coordinate, to manage and to document everything with rapid time without delaying and obstacle problem while implement BIM technology in the construction industry. The engagement of interior design in the construction industry also should be considered to implement BIM technology as others construction industry. However, the lacking of knowledge and cost constrain has caused the implementation of BIM in interior design industry stunted because several problems. Therefore, this research will identify the key factors of BIM implementation in the interior design industry from the previous study and literature review. The data were conduct through questionnaire survey and interview with interior design expertise which is registered with Board of Architecture Malaysia (LAM) to highlight the involvement interior design industry in detail. This study was focused for interior design industry in Malaysia context. The research explores how crucial implementation BIM in the interior design industry to overcome the issues on design process context. Results obtained from this survey will contribute highly to BIM technology in developing for interior design industry enhance the scope of work and design process.

Keywords: Interior Design, Building Information Modelling, Design Process, Technology, Knowledge

Introduction

Nowadays, 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 (Baiden et al., 2006, p. 18). The effectiveness of building information modelling implementation in the projects is a 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 (Won & Lee, 2010). However, the adoption BIM in Malaysian construction industry are still freshly (Zakaria et al., 2013, p. 390 & Ahmad et al., 2014, p. 945).

The time is now for industry to implement greater technologies such as BIM as a key changer to ensure the construction industry is competitiveness in Malaysia context and international in generally. The technology in BIM is to facilitate the coordination, communication, analysis, project management and asset management to ensure the accuracy method, fewer errors, less waste, better safety and improved the efficiency in the construction industry. BIM implementation in Malaysia are still low and the awareness of BIM usage among construction industry need to justify the causes of BIM implementation especially in the interior design industry. Thus, interior design industry should have to take this advantage to implement BIM for enhance the scope of work and design process.

BIM Awareness in Malaysia

In any capital development, it is believing that human resource is the most import element and the quality of the level of awareness is a catalyst factor to enhanced adoption BIM in Malaysia can improvise with the education level and technical education by used new ICT technology. According to Enegbuma and Ali (2011, p. 402) stated that Malaysia government has realized the important of BIM as a paradigm technology the revolution in the building industry, on that the government start to establish and idea development with Construction Industry Master Plan (CIMP) 2006-2015 by collaboration between Jabatan Kerja Raya (JKR) and the Construction Industry Development Board (CIDB). Thus, CIDB has encourage organized awareness talk among construction industry and this effort were realized with establish a BIM unit by JKR which is responsible to guide and ensure every project using BIM technology (Deamer & Berstein, 2011). Currently, the level of BIM adoption in Malaysia stand at 17 per cent (17%) as compared with 71 per cent (71%) in the United States, United Kingdom (39 per cent) and Singapore (65 per cent) and government hopefully the level of awareness of the technology to be increase the adoption level to 30 per cent by year-end. According to Ministry of Work,

Malaysia will be implement submission by year 2021 for project submission but it is only for local authorities with city status (Bernama, 2019).

BIM Help Interior Design in the Design Process

Building Information Modelling (BIM) is a new process in the planning and design profession through software application based on the function itself in the construction industry. BIM is known as a 3D model or a software tool for architect, engineer and construction (AEC) to create construction document more accurate and efficient. The multi-purpose software in any disciplines for construction industry can ensure the sharing of information in the early design concepts till the facilitate in the construction phases. With BIM software, it is more easy to communicate the ideas, analyze and evaluate the space to show the performance in the finishing building. A designer is able to develop the designs with accurate drawings and detail (Clemons & Waxman, 2007; Yatin, Hamid, Shah, & Hassan, 2018; Shbeilat, Al Harasees, 2018).

BIM technology in interior design is able to become the key factor to integrated traditional design with BIM technology to find possible problems by coordinate, modify and communicate the design data and information to be effectively improvised the design and implementation BIM technology. The comparison between 2D and BIM 3D in Table 1.0 shows the purpose and accuracy the comprehensive while BIM is implement project design. There is has different in the design process in term of the effectiveness performance and the advantages to reduce the design errors.

Table 1.0 Comparison between 2D design and BIM 3D CAD design (Wang & Li, 2017, p. 261)

Item	Dimensional CAD design	BIM three-dimensional design
CAD, CAE, CAM Integration	Unable to be implemented CAD, CAE, CAM integration	Facilitate the achievement of CAD, CAE, CAM integration
Design efficiency	Design cycle cannot be guaranteed	Quickly capture design intent, relatively quick solution to accelerate Interior Design
Design process	Unable to effectively perform error checking	Reduce the possibility that the design errors; Wrong, drain, reducing collisions
Design changes	Design changes difficult, is not conducive to modify	Easy design changes, improve design quality
Design flow (Synergistic effect)	Plane, indirect; With the plane view, projection and other relations to reflect the design of the structure and effect	Three-dimensional, direct setting with a true three-dimensional modelling and design structure to reflect the effect
Blueprint	Don't get 3D axonometric drawing, excavation figure, etc	Better 3D visibility, can directly get 2D drawings from 3D model
Added	Limited	To deep level development for 3D entity model and provide digital handover and extension services for the project construction, management, maintenance and so on.
Professional and technical capacity	Overall sense of poor project The combination between the professional theory and practice poor	Overall sense of good, Theory and practice level can be further enhanced by the three-dimensional simulation

Research Methodology

This study involved questionnaire survey to extract the relevant data and information from the respondents. According to this research, the crucial issues about implementation BIM among interior design industry were identified through literature review and previous research in construction industry. This research was done by preliminary study by interior design firms as respondents in Klang Valley. The selection interior design firms were selected and the chosen of interior design firms were select by for whose firms registered with Lembaga Akitek Malaysia (LAM). 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 the design process.

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 shows in Figure 1.0.

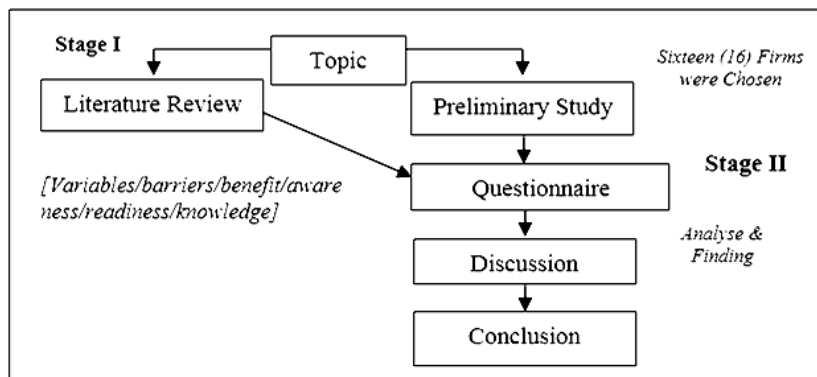


Figure 1.0 Research methodology flow

This methodology has two (2) stage 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, analyze data and finding were justify in discussion and conclusion.

Result and Discussion

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.

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 2.0 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 analyzed 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 is following with three (3) respondents represented 19% established in year 2001 to 2005. However, in year 1990 to 1995 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).

Table 2.0 The frequency of demographic of respondents

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%

Based on the Figure 2.0, the graph shows the BIM usage among interior design industry in Malaysia. The data shows more forty-four percent (44%) they already implement BIM within 2 to 5 years. However, BIM implementation from year 6 to 9 years represented twenty-five percent (25%). Thus, BIM implementation for less than 1 year represented nineteen percent (19%) and BIM implementation for more than 10 years represented twelve percent (12%).

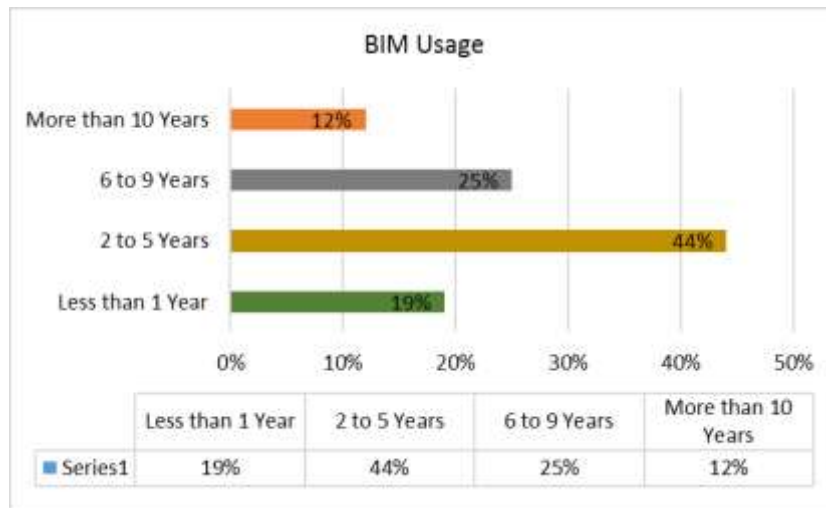


Figure 2.0 Percentage of BIM usage for interior design firms

Knowledge Level and Experience Implement BIM

In Figure 3.0 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.

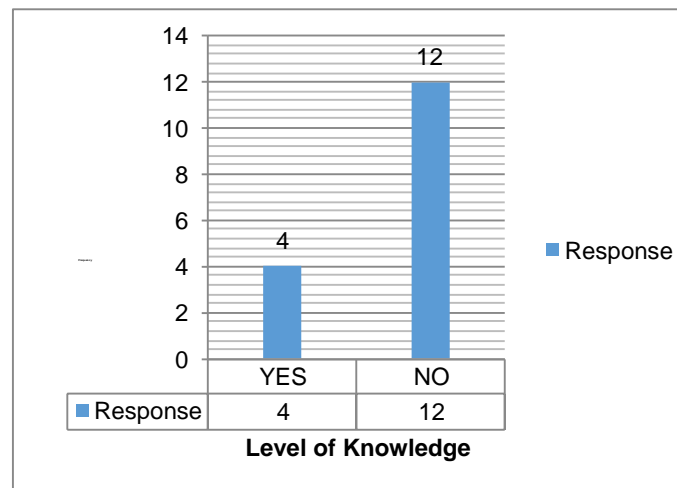


Figure 3.0 Percentage of Knowledge Level among Interior Design Firms

Significance of BIM in the Interior Design

In Table 3.0 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 3.0 The frequency of significance implement BIM in the interior design

RESPONSE	FREQUENCY	PERCENTAGE
YES	13	81%
NO	3	19%
TOTAL	16	100%

Conclusion

Interior design is still struggle in their skill and abilities in term of public and perceptions [9]. 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 to pursuit in the design process.

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