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The Barriers and Causes of Building Information Modelling Usage for Interior Design Industry

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Abstract. Building Information Modeling (BIM) has since developed alongside the improvement in the construction industry, purposely to simulate the design, management, construction and documentation. It facilitates and monitors the construction through visualization and emphasizes on various inputs to virtually design and construct a building using specific software. This study aims to identify and elaborate barriers of BIM usage in interior design industry in Malaysia. This study is initiated with a pilot survey utilising sixteen respondents that has been randomly chosen. Respondents are attached with interior design firms that are registered by Lembaga Arkitek Malaysia (LAM). The research findings are expected to provide significant information to encourage BIM adoption among interior design firms.

1. Introduction

At present, the use of technology in the construction industry continues to thrive and develop. Various fields including architecture, engineering, construction, quantity survey, facility management including interior design are shifting to benefit the vast development in technology. Building Information Modelling (BIM) is an example of the technology that is being adopted in these fields and interior design, among others are moving towards utilizing it as an effective tool to fulfil the interior design industry. A recognizable design field across the globe, interior designers are specialized in interior space's detailed and specification design obligations closely related to the selection on material and finishes, lighting setting, colour, texture, ventilation, furniture, ergonomic, anthropometric and all related with the human factor and purpose [1, 2]. Therefore, interior design industry are moving forward and ready to implement Building Information Modelling (BIM) as a tool or process to balance the demands of industry at present.

Interior design is a recognize able design field which is specialized in interior space's detailed and specification design obligations which is related to the selection on material and finishes, lighting setting, colour, texture, ventilation, furniture, ergonomic, anthropometric and all related with the human factor and purpose [1, 2]. These details put the special characteristic for interior design with others profession. This study will focus on the importance of using BIM in the interior design industry



will be evaluated the effectiveness and implementation of the design and documentation process. Besides, the direction of interior design industry will be determined and the barriers that inhibit the using of BIM in the design industry cannot be implemented. Interior design is still struggles to using the technology interior design is loose a grip in design field instead of having the upper hand [3].

This study will focus on the significance of BIM in the interior design industry that will be evaluated based on its implementation in the design and documentation process. Besides, future direction of interior design industry and the barriers that inhibit the use of BIM shall be determined. Interior designers are lagging in the technology race and gradually slipping behind in the design field where, they could have the upper hand advantage [3]. BIM can be described as a tool and process that functions as a building information modelling and management that characterizes represent; document and manages information; inbuilt intelligence, analyze and simulates, and collaborates and integrates [4]. Most of industry fields such as architecture, engineering, construction (AEC); facility management, quantity surveying and etc have already implemented BIM as main tool and process to assist and expedite tasks and various activities.

2. Literature Review

2.1. Interior Design and BIM

Interior design is multi-faceted profession in which creative and technical solution is applied within its own domain to achieve a better built environment. These solutions enhance the quality of life and culture of the occupants, and are aesthetically attractive. According to [5] depicted that, interior designers are required to have a good understanding on construction detailing to ensure effective use BIM. Since the modelling is holistic, interior designers must understand the core and shell of building details in order to design effectively in BIM.

Interior design profession describes a building's internal space with accurate scale to manipulate design elements such as wall, ceiling and floor. Interior designer's concern is the human ergonomic that ensures working and functional space. According to [6], interior design is a professional body that focuses on creative and technical to solve design problems.

2.2. A Theory and Practice of BIM

Building Information Modelling (BIM) is a revolution in design practice and standards of building design, delivery and operation. The purpose of BIM doesn't only focus on Computer Aided Design (CAD), but it is an innovative and landmark technology that is spectacularly attractive to allow for a better performance in design [7]. BIM improves the management of human skills and organisation by diminishing delays and inaccuracy between a project's stakeholders. In practice, it is an improvement in the design and monitoring of projects by taking into consideration the lowered cost, improved accuracy, speed and safety elements.

BIM provide opportunities for different and multiple fields to collaborate and engage data exchange in relevant areas, values, and commercial aspect in construction disciplines [8, 9]. Furthermore, this technology is able to grant the competitive advantage by creating opportunities and lowering the costs [10] than is showing as function of Technology, Process and People [11]. An interior design process is initiated with several design options, elaborated and developed driven by varieties of factor; space utilization, area requirements, aesthetics, material cost, finishes and material – which is applied in decision-making process. With the use of such technology, the documentation of each phase will ease up the process that will enable faster progress of the project

Table 1. Understanding the Anatomy of BIM

No.	Technology	No.	Process
1.	Project simulation consists using of 3D models integrated with project planning, design, construction and operation [12].	1.	Refining and adjusting according to project specifications and design changes to ensure model accuracy [14].
2.	Introduced the object-oriented parametric modeling [13].		
3.	The process where the element is modified or assembly automatically [15].	2.	To produce a design with optimized for quality, aesthetics, constructability, affordability, timeliness and seamless flow into lifecycle management [18].
4.	Defined BIM as a supplier, operation and maintenance producers, and clearance [16, 17].		

Table 2. BIM for Interior Design

BIM for Interior Design	
Interior Advantages	<ol style="list-style-type: none"> 1. Speed and ease of interior design creation and its ability to visualize the design 2. Ability to capture and manage the design via multiple options – from space layout to material selections. 3. The richness and reliability of data - early fundamental task.
Interior Design Options	<ol style="list-style-type: none"> 1. To keep multiple design alternative until enough information decision making. 2. Enabling designers to develop and study multiple design alternatives simultaneously within a single model.
Interior Design Information	a. Schematic design <ul style="list-style-type: none"> - Able to create a master schedule for interior spaces. - A working database view of a project. - Able to input table-based schedules for many interior design components. - Produce accurate preliminary estimates.
	b. Calculating Quantities <ul style="list-style-type: none"> - Storage, manage and coordinates design - Calculate area and quantify material and reliably – reducing overall project cost - Accurate area measurement – carpet, wall coverings, ceiling tile, or finishes. - Ability to track occupancy, space allocation and assets.
	c. Interior Documentation <ul style="list-style-type: none"> - All the construction documents relating to the interior design are direct presentation.

3. Research Aim and Methodology

This study aims to identify and elaborate barriers of BIM usage in interior design industry in Malaysia. The preliminary study is to obtain the initial data concerning barriers adopting BIM in interior design industry. This study focuses on ID firms registered with Lembaga Arkitek Malaysia (LAM) which sixteen ID firms in Klang Valley were randomly chosen. Beginning with find the research topic based on the literature review and preliminary study following with the questionnaire, discussion, analysis and finding to find out the problems and issues.

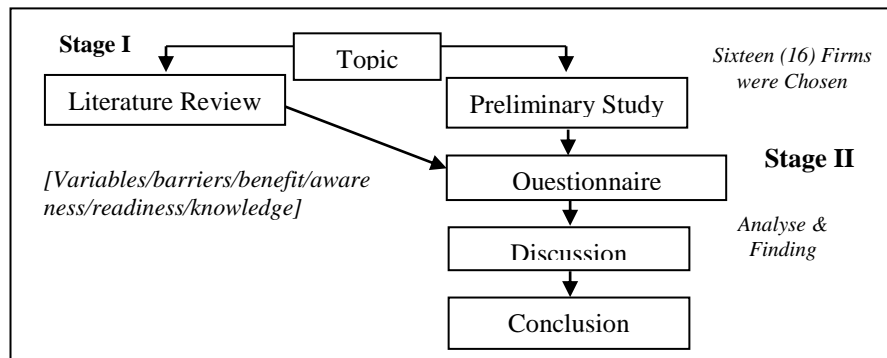


Figure 1. Research Method Flow

4. Result Analysis

Based on the analysis, this research will highlight the barriers and causes of interior design industry still behind in BIM adoption. From the analysis, this study will identify the awareness, readiness, problems and barriers of BIM appropriate usage in the interior design firms.

Table 3 shows the responses of year of firm established for interior design. Accordingly in Table 3, 6 respondents representing 38% of the total firms established between the year 2006 and 2010 while 5 respondents representing 31% of the total firms established between 2011 and 2015. It is followed by 3 respondents representing 19% of firms established between 2001 and 2005. However, between the year 1990 and 1995 and 1996 and 2000 each represented 1 respondent (6%) only.

Table 3. Year of Firm Established

Year	Frequency	Percentage
1990-1995	1	6%
1996-2000	1	6%
2001-2005	3	19%
2006-2010	6	38%
2011-2015	5	31%
Total	16	100%

Table 4 is shows the awareness level of interior design using BIM. It revealed 7 respondents representing 44% having poor knowledge about BIM while 5 respondents representing 31% have fair knowledge about BIM. However, only 4 respondents representing 25% have very poor awareness about BIM awareness

Table 4. Level of Awareness and Readiness BIM for Interior Design

Level	(VP)	(P)	(F)	(G)	(VG)	Total
	1	2	3	4	5	
Awareness Level	4	7	5	0	0	16
Readiness Level	4	0	10	2	0	16

Note: VP=Very Poor, P=Poor, F=Fair, G=Good, VG=Very Good

Table 5 shows the level of knowledge instead of experience of BIM. From the table 5, four (4) respondents representing 25% of the total respondents know about BIM while twelve (12) respondents representing 75% of the total respondents do not know or never heard of BIM.

Table 5. Level of Knowledge

Response	Frequency	Percentage
Yes	4	25%
No	12	75%
Total	16	100%

Figure 2 shows the ranking of barriers to the application of BIM in interior design industry in Malaysia. The most critical part is technology with 18 responses with each 17 responses in IT and knowledge elements as a barriers for using BIM. The others with 16 responses each are awareness, readiness, time and financial.

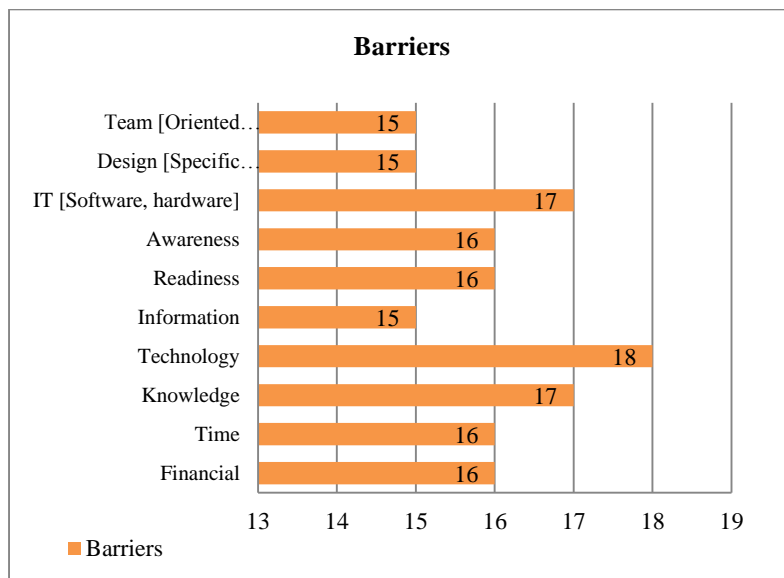


Figure 2. Ranking of the Barriers to the application or use of BIM in ID

Figure 3 shows the reasoning a few firms using BIM. Only 2 respondents using BIM where is 1 respondent representing 6% for each respondent and 14 respondents representing 88% did not apply the BIM.

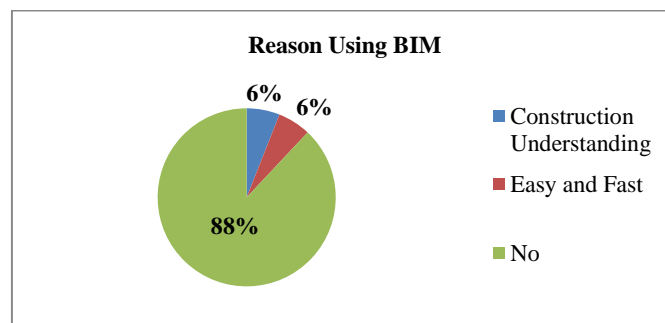


Figure 3. Reason Using BIM

Figure 4 shows the respondents the reasoning not using BIM in interior design firm. According to figure 4, 30% is representing less exposure about BIM and 21% are no information about BIM and

paid to consultant. Otherwise, 21% respondents are said they are preferred using software 3D and 7% said no useful for company and lack of staff.

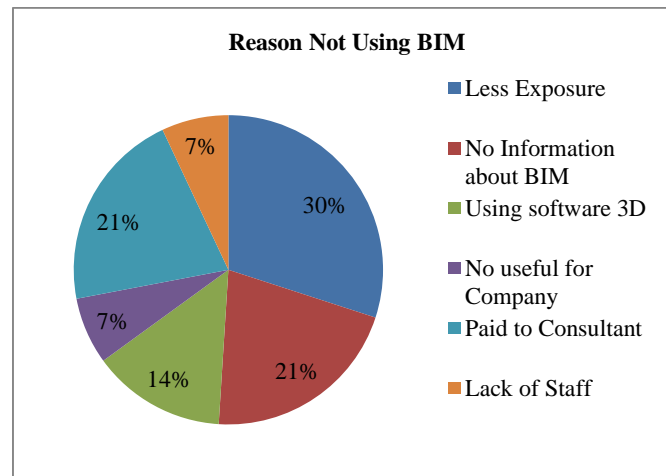


Figure 4. Reason Not Using BIM

5. Discussion and Conclusion

BIM is very important in the construction industry to enhance the quality of work, time, cost and documentation. Therefore, interior design industry must look forward to using BIM even there are barriers to facing. The crucial challenges to adopt BIM faced by the interior design industry in Malaysia context have been focused in this study and several influent factors have been identified. The most critical are caused due to the factors which are determined by technology, knowledge, cost, awareness and readiness.

BIM application in interior design projects can reduce cost and time in the design progress to sustain the quality of projects. BIM benefits for interior design industry by improving design phases and progression, decreasing the cost and maintenance, and also improving the skill and knowledge between human resource and employee. Implementation BIM in the interior design industry can enhance the overall quality of skill and improve the interior design profession as part of construction players. Moreover, with BIM technology will be expected to implement widely in the interior design industry in Malaysia

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