Building Information Modelling: Challenges and Barriers in Implement of BIM for Interior Design Industry in Malaysia

A B Abd Hamid¹, M Z Mohd Taib², A H N Abdul Razak³ and M R Embi⁴

¹²Centre of Interior Architecture Studies, Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Puncak Alam Campus, Selangor Malaysia;
³Department of Interior Design, Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA, Seri Iskandar Campus, Perak, Malaysia
⁴Department of Architecture, Faculty of Built Environment, Universiti Teknologi Malaysia, Johor Malaysia

E-mail: abah7591@salam.uitm.edu.my

Abstract. Building Information Modelling (BIM) is an innovative approach that has developed crossways the global in architecture, engineering and construction (AEC) industry. The construction industry of Malaysia has undergone a rapid development and dynamic technology adoption in advance and methods between the players industry and stakeholders. Consequently, limited technologies and devices have not been successful as it should have been. This study will be emphasizing scenarios of challenges and barriers in adopting BIM in interior design industry in Malaysia. The study was emphasizing the challenges and barriers in BIM usage from the designer’s perspective. The data are collected through the questionnaire as to identifying the barriers, knowledge, readiness and awareness and distributed to interior design firms were selected randomly. The finding of this research is to examine the barriers and causes of variables BIM usage for interior design industry in Malaysia. The outcome of this study is to identify the constraint of adoption BIM in interior design industry compare to others players in same industry.

1. Introduction

Technology is an asset to change and increase the development in the construction industry for improved lifecycle. Building Information Modeling (BIM) is a part of innovative technology used by architectural, engineering and construction (AEC) industries based on particular software [1]. BIM is an instrument and technology to manage construction projects [2] and to transform the approach of development and processes infrastructure hence the designed, analysed, constructed and managed [3]. BIM concept is already introduced since 1970 by Professor Charles M Eastman [4][5], however in year 2000 BIM has been started broadly in AEC industries and the United States of America is the first country to implement BIM in construction projects [6]. But today BIM usage has been adopted to all the world such as Hong Kong, Australia [4] [7], Singapore [8] [9], and Malaysia [9][10][11]. Malaysia is still fresh in implementation of BIM in the construction industry [10].

For a few decades, most of the major dilemmas facing by construction players are effectiveness and efficiency to deliver the projects are parts of main challenges in implementation of BIM [12][13][14]
which is lacking of the cost and time in delivery process, quality of finished product and unmanaged the risk and rewards.

2. Literature Review

2.1. A Scenario of BIM Implementation in the Construction Industry in Malaysia

In Malaysia, BIM usage is still new in construction industry [10] but the effort to implement BIM has been introduced by the Malaysian government to ensure the construction players such as architects, engineers and contractors concern to implement BIM in construction industry [15][16]. Apart from that, Public Works Department (PWD) and Construction Industry Development Board (CIDB) have collaborated to promote the implementation of BIM in construction project [16][17][18] through organizing seminar and workshop relating to BIM. Furthermore, CIDB and PWD has established a group of committee as to formulate construction projects process by preparing BIM roadmap and guideline as a reference for the construction player to implement BIM in their construction projects [16]. The committee has prepared the BIM standard manual documentation as a guideline for construction players. Meanwhile there are lots of efforts have done by the Malaysian Government to enhance BIM usage in construction industry [17] but the implementation of BIM is still sluggish and less fascinated by construction players to implement in construction projects [10]. The Government urged to the construction industry to using BIM in development project phases because BIM is seen more appropriate in solving problems for complexity projects and high risk projects [16] [19].

2.2. Interior Design and BIM

Purposely in Malaysia, the built environment industry including interior design uses CAD software such as AutoCAD to draw and design during the drawing development process [20]. In interior design industry, the interior environment elements for example visualization and conceptualization of the activities and designs [21] such as the production of sketches, drawing, 3D visualizations and multimedia programming are used to show the ideas and concept. BIM is beneficial for interior design projects because of several reasons such as the efficiency in production of visualizations, errors detection during drawing development process and prevention from clashes during construction progress.

Conventionally, the design processes in interior design requires different software to complete the drawing scheme 3-dimensional drawing; selection of finishes and material, and construction drawing. At present, Building Information Modelling technology based on the specifics software to put computer technology as a new structure of BIM interior design system. In term of performance with BIM, designers can use information to design new projects and also can emphasize the data project more accurately; the data analysis and materials selection. BIM technology provides the superb solution to solve problems for the interior design. Interior designers can incorporate the technology benefit from BIM in the design processes and drawing development in the scope of work for interior design industry. In the perspective of BIM usage, interior design can enhance the skill and knowledge for improvised their technical and expert. Interior design defines a building’s internal space with accurate data to manipulate design elements such as wall, ceiling and floor to ensure is working and functional space. According to [22], interior design is a professional body that focuses on creativity and technical to solve design problems.

| Interior Advantages | BIM for Interior Design |
|---------------------|------------------------|
| 1. Fast and easy for interior designer to create and ability to visualize the design. |
| 2. Capability to detain and manage the design via multiple options |

| Interior Design Options | BIM for Interior Design |
|-------------------------|------------------------|
| 1. To keep multiple design alternatives until there is enough information for decision making. |
| 2. Designer’s ability to construct and study several design within a single model. |
2.3. **BIM Benefits and Challenges**

The benefits of implementing BIM technology is impressive for construction projects in terms of early coordinate decision making, improved design conceptual and visualizations, a good incorporation between design and cost, reducing the waste and costs, avoid from the data errors in drawing and documents [23][24][25]. Therefore, the benefits of BIM technology for interior design industry are more helpful to implement this technology for conceptual design, detailing drawing and material selection. BIM can help interior designers to solve problem in term of specifications drawing and client’s decision in material and finishes selection. Perhaps with this technology it will be more efficient, quality performance and systematic to deliver the requirements and needs from the stakeholders and other construction players.

Before BIM is implemented, there are challenges that cause failure in its adoption. According to [26], was mentioned that lack of understanding about BIM, education and training costs, and the way of firms do business are the most challenges and barriers facilitate the industry players to implement BIM. The others challenging aspects influence the adoption BIM are authority and control over information [27] due the lack of interoperability of standardised approach in term of software and information system [4][28]. The lacking of awareness and encouragement to implement BIM by using standardised guidelines take a part of the challenges in BIM adoption [29]. Apart from that, other challenges to implement BIM are lacking of readiness, human resource factors, less of knowledge, high costs and technology equipments, legal issue and coordination between stakeholders and industry players in term of documentation and data information.

### 3. Research Aim and Methodology

This study aims of exploring the challenges and barriers to BIM implementation in interior design industry in Malaysia through survey collections at interior design firms registered with Lembaga Arkitek Malaysia (LAM). To justify the challenges and barriers on the research, the survey involved by sixteen (16) interior design firms focusing in Klang Valley which were randomly chosen. 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.

| Interior Design Information | a. Schematic design | - Able to create a master schedule for interior spaces.  
- Able to input table-based schedules for many interior design components. |
|----------------------------|--------------------|---------------------------------------------------------------|
| b. Calculating Quantities   | - Storage, manage and coordinates design                      
- Calculate area and quantify material and reliability.  
- Capability to track occupancy, and space allocation |
| c. Interior Documentation   | - Presentations method for all the construction documents relating to the interior design. |

---

**Figure 1.** Research method flow
4. Result Analysis

Starting with preliminary study, sixteen (16) interior design firms were chosen randomly to get the perspective from the industrial expertise about the implementation of building information modelling for interior design industry in Malaysia. Recently, studies employing quantitative method with questionnaire survey from the respondent’s feedback from the interior designers. The factors of the selection firms for this study are including the year of establishment of firms, size of firms and BIM implementation. The analysis result shows the responses for year of firm establishment for interior design. According to Figure 2, 38% of the total firms were established in year 2006 to 2010 while 31% were established in year 2011 to 2015. It is followed by 19% established in year 2001 to 2005. However, only 6% of firms were established in year 1990 to 1995 and 1996 to 2000.

![Figure 2. Year of firms’ establishment](image)

BIM can enhance the quality of progress working and more efficient on time and cost estimating. BIM also can do more organize in term of drawing composition and documentation specification. Through the results, Table 2 shown the BIM usage based on sixteen (16) respondents. From the sixteen (16) respondents, fourteen (14) respondents representing 87.5% did not use BIM in their firm. Otherwise, only two (2) respondents representing 12.5% are using BIM in their firm. Based on the data, it is shown that there is a very poor practice in interior design industry in term of BIM implementation.

| Response | Frequency | Percentage |
|----------|-----------|------------|
| Yes      | 2         | 12.5%      |
| No       | 14        | 87.5%      |
| Total    | 16        | 100%       |

Table 2. BIM usage

BIM technology is more valuable for construction industry, efficiency and accurate data are the instrument that can improvise in construction especially in interior design contexts. BIM also can approximate the specification and detailing documentation more efficient and fasting. Based on Table 3 is shows the reason why a few firms using BIM. Only two (2) respondents using BIM where is one (1) respondent representing 6% for each respondents. The reasoning using BIM is more easy and fast to finish the work and also understanding on construction drawing. With BIM everything can end up faster rather then not using BIM. Unfortunately, fourteen (14) respondents representing 88% did not apply the BIM. There is a poor usage for professional industry if they are not using BIM.
According to Table 4, 30% is representing less exposure about BIM and 21% are no information about BIM and paid to consultant. Otherwise, 14% respondents are said they preferred to use 3D softwares and 7% said no useful for company and lack of staff. According to the results, most of the problem is less information and knowledge about BIM technology. Some of the firms preferred to pay the BIM consultant as outsource for their projects. Mostly the knowledge are very crucial in interior design industry and human resource are the others factor.

BIM is very important to construction industry especially for architecture, engineering and construction (AEC) as to enhance the quality and efficient work on site and documentation formatting. Based on the Figure 3, is shown seven (7) respondents agreed that using BIM makes their work faster and organise. And the others which are three (3) respondents said BIM helps designers to understand the construction and updated technology. Technology application can influence the design method and speedy work to more systematic and efficient.

**Table 3. Reasoning BIM usage**

| Reason Using BIM | Frequency | Percentage |
|------------------|-----------|------------|
| Construction Understanding | 1 | 6% |
| Easy and Fast | 1 | 6% |
| No | 14 | 88% |
| **Total** | **16** | **100%** |

**Table 4. Reasoning not using BIM**

| Reason Not Using BIM | Frequency | Percentage |
|----------------------|-----------|------------|
| Less Exposure | 4 | 30% |
| No Information about BIM | 3 | 21% |
| Using software 3D | 2 | 14% |
| No useful for Company | 1 | 7% |
| Paid to Consultant | 3 | 21% |
| Lack of Staff | 1 | 7% |
| **Total** | **14** | **100%** |

**Figure 3.** Significance of BIM adoption for interior design firms.
According to Figure 4 shows the barriers to the implement BIM in interior design industry in Malaysia. The most critical part is technology with eighteen (18) responses and followed by IT and knowledge elements with each received seventeen (17) responses as barriers while using BIM. Furthermore, sixteen (16) responses say that awareness, readiness, time and financial as barriers for them to implement BIM.

![Barriers](image)

**Figure 4.** The barriers in implementing of BIM for interior design firms.

5. Findings and Discussion

The analysis resulted organising by categorisation of barriers and challenges was summarised briefly. Majority of respondents with 14 of 16 (85%) was realised that they are not well aware of BIM and not ready to get BIM involve in their firm. A total sixteen (16) interior design firms were selected to participate in the survey to investigate the implementation BIM in interior design firms. Most of the firms are new in interior design industry. Only 2 of 16 (12%) was established in the year 1990-2000. Based on result from Table 5, it can be concluded that implementation of BIM for interior design industry in Malaysia is very poor and in critical situation in construction industry. Table 5 demonstrate the summarization of barriers and challenges BIM in interior design industry.

**Table 5.** The barriers and challenges BIM in interior design industry.

| No | Barriers          | Challenges                  | Description                                                                 |
|----|-------------------|-----------------------------|-----------------------------------------------------------------------------|
| 1  | Technology        | Lacking of technology      | Some of organisations still using old version software, equipments and not   |
|    |                   | knowledge                  | updated with current technologies need.                                    |
| 2  | Knowledge         | Less knowledge             | Level of knowledge is poor and do not have any capacity to enhance the skill |
|    |                   |                             | and technology.                                                             |
| 3  | IT (software; hardware) | Costing to improvise equipment | Need to update the software and hardware to make sure the process of projects |
| 4  | Awareness         | Not aware                  | The organisation do not realised the importance of BIM in projects and      |
5. Readiness  Not ready  Easy and pay to outsource consultant. 
6. Financial  High cost  Very crucial and high cost when to implement BIM in organisation.

6. Conclusion

This study is to investigate the current situation implementation BIM technology in interior design industry in Malaysia. The finding of the study can concluded that BIM implementation for interior design industry is very low. They are still not aware and ready to use BIM technology as their tools for projects and documentations. Major barriers to implementing BIM are financial and knowledge with high rating to make it realised using BIM in interior design. Furthermore, to seeking improvised using BIM in interior design industry should be carried out accordingly the case study and survey with assessing the benefits of interior design industry. For enhancing the level of implementing BIM technology for interior design is should be develop a training program of BIM for all disciplines especially for interior design industry.

7. Acknowledgments

The authors would like to acknowledge the Universiti Teknologi MARA (UiTM) and Ministry of High Education (MOHE) for supporting the financial under the awarded Bestari Grant (600-IRMI/MyRA 5/3/BESTARI (003/2017). The authors also would like to thankful to interior design firms and to who assist along the research progress for providing comprehensive and important information for contributing part of this research.

8. References

[1] Robinson C 2007 Structural BIM: Discussion, case studies and latest development The struct. design tall spec. Build 16 517-533
[2] Azhar S, Behringer A, Sattineni A and Maqsood T 2012 BIM for facilitating construction safety planning and management at Jobsite The Proceeding of the CIB-W099 International Conference Modelling and Building Safety.
[3] Cho H, Lee K H, Lee S H, Lee T, Cho H J, Kim S H and Nam S H 2011 Introduction of construction management integrated system using BIM in the Honam high-speed railway Lot No 4-2 Proceeding of the 28th ISARC Seoul Korea.
[4] Eastman C, Teicholz P, Sacks R and Liston K 2011 BIM Handbook: A guide to building information modeling (BIM) for owners, managers, designers, engineers and construction (New Jersey: John Wiley and Son Inc)
[5] Forbes L H and Ahmed S M 2011 Modern construction lean projects delivery and integrated practices (United States of America: Taylor and Francis Group LLC) 214.
[6] National Institute of Building Science (NIBS) 2007 United States National Building Information Model Standard V1 1-2
[7] Monteiro A and Martins J P 2013 A survey on modelling guidelines for quantity takeoff-oriented BIM-based design Automation in Construction 35 238-253
[8] Wong A K D, Wong F K W and Nadeem A 2009 Government roles in implementing building information modelling system Construction Innovation 1(1) 61-67
[9] Ahmad Latiffi A, Mohd S, Kasim N and Farthi M S 2013 Building Information Modelling (BIM) application in Malaysia construction industry International Journal of Construction Engineering and Management 2(A) 1-6
[10] Zakaria Z, Mohamed Ali N Tarmizi Haron A, Marshall-Ponting A J and Abd Hamid Z 2013 Exploring the adoption of building information modelling (BIM) in the Malaysian construction industry: A qualitative approach International Journal of Research In Engineering and Technology 2(8) 384-395
[11] Construction Research Institute of Malaysia (CREAM) 2014 *Issues and challenges in implementing BIM for SME’s in the construction industry Malaysia*

[12] Latham M 1994 *Constructing the team* (London: HMSO)

[13] Egan J 1998 *Rethinking construction the report of the construction task force* (London: HMSO)

[14] Cabinet Office 2011 *Government construction strategy* (London: BIS Report)

[15] Furneaux C and Kivit R 2008 BIM: Implications for government CRC for construction innovation *Brisbane Australia Net Pty Ltd* 10-31

[16] Jabatan Kerja Raya (JKR) 2013 *Pengenalan BIM* retrieved April 23 2013

[17] Ahmad Latiffi A, Mohd S and Brahim J 2014 Application of building information modeling (BIM) in the Malaysian construction a story of the first government project *Applied Mechanics and Materials* ISSN 1660-9336

[18] Ahmad Latiffi A, Brahim J, Mohd S and Fathi M S 2014 Building information modeling (BIM): exploring level of development (LOD) in construction projects *Applied Mechanics and Materials* ISSN 1660-9336

[19] Jabatan Kerja Raya (JKR) 2011 *Laporan Tahunan JKR 2011* 28-29

[20] Dawoud H M, Haron S H and Abdullah A 2013 CAD application patterns among architecture and interior design students in Malaysia *Proceeding of the International Conference Social Science Research* e-ISBN 978-967-11768-1-8

[21] Dohr J and Portillo M 2011 *Design thinking for interiors: inquiry, experience, impact* (United States of America: John Wiley and Sons)

[22] National Council for Interior Design Qualification 2000 *NCIDQ Examination study guide* (Washington, DC: NCIDQ) pp. 22–23

[23] Suermann P C 2009 *Utilising building information modelling for facilities management* Master Dissertation (United Kingdom: University College London)

[24] Azhar S 2011 Building Information Modeling (BIM): Trends, benefits, risk and challenges for the AEC industry *Leadership and Management in Engineering* 11(3) 241-252

[25] Bryde D, Broquetas M and Volm J M 2013 The projects benefits of building information modeling in the building industry *International Journal of Project Management* 31 (7) 971-980

[26] Newton K L and Chileshe N 2012 Awareness, usage and benefits of BIM adoption-the case of South Australian construction organisations in Smith S D (ed.) *Proceeding of 28th Annual ARCOM Conference Edinburgh UK* 3-12.

[27] Davies R and Harty C 2013 Measurement and exploration of individual beliefs about the consequences of building information modelling use *Construction Management and Economics* 31(11) 1110-1127.

[28] Gu N and London K 2010 Understanding and facilitating BIM adoption in the AEC *Automation in Construction* 19(8) 988-999.

[29] Fischer M and Kunz J 2006 *The scope and role of information technology in construction* http://cife.stanford.edu/online.publications/TR156.pdf.