

Awareness of Building Information Modelling (BIM) Among Construction Practitioners in Johor

Faris Aiman Roseli¹, Nor Haslinda Abas^{2*}, Nur Qamarina Ibrahim³

¹Faculty of Civil Engineering and Build Environment,
Universiti Tun Hussein Onn Malaysia, 86400, Batu Pahat Johor, MALAYSIA

²Jamilus Research Centre, Faculty of Civil Engineering and Built Environment,
Universiti Tun Hussein Onn Malaysia, 86400, Batu Pahat Johor, MALAYSIA

³RAF Consult, 2E, Jalan Pulai Perdana 11/1, Taman Sri Pulai Perdana, 81110 Johor Bahru, MALAYSIA

*Corresponding Author Designation

DOI: <https://doi.org/10.30880/rtcebe.2023.04.01.036>

Received 06 January 2022; Accepted 15 January 2023; Available online 01 May 2023

Abstract: Building information modelling (BIM) is an innovative technique in the architectural, engineering and construction (AEC) sector that has spread worldwide. However, the acceptance of BIM is deemed as low in Malaysian construction industry. This study explores the awareness of BIM among the construction stakeholders in Johor such as client, architect, consultant and contractor. The results show that the overall cost and investment required to implement BIM are among the lowest and the major barriers of BIM implement are the lack of well-trained people which was the highest average mean.

Keywords: BIM, Awareness

1. Introduction

Malaysia is one of the countries who aspires to adopt Building Information Modelling (BIM) in construction industry. According to [1], when opposed to other countries around the world, Malaysian construction practitioners seemed to be reluctant to accept BIM since it was introduced in 2009. The majority of Malaysian construction firms are aware of the BIM principle but have yet to incorporate it into their project management. In 2007, the Director of the Public Works Department (PWD) proposed implementing BIM in Malaysia and in 2010, the first government initiative using BIM technique was announced [2].

BIM is a method of working that entails the automation of the entire project team using a 3D model that can perform all the conventional tasks associated with building projects, such as architectural, engineering, electrical, quantity surveying, and even safety awareness. By using the BIM, the

*Corresponding author: nhaslin@uthm.edu.my

2023 UTHM Publisher. All rights reserved.

publisher.uthm.edu.my/periodicals/index.php/rtcebe

construction industry will have more time to schedule, organize and design their projects firmly compare to conventional method. This is only one of the many advantages that the industry can gain as resulting in improve efficiency.

It is believed that one of the hindrances of implementing BIM in Malaysian construction industry is due to the low awareness of BIM among construction practitioners. Therefore, this study seeks to investigate the awareness of BIM implementation in construction industry, focusing on construction stakeholders in Johor area.

2. Literature Review

2.1 Overview of BIM in Malaysia

The Public Works Department (PWD) in Malaysia has been using BIM since early 2007, [3]. According to [3], PWD's research of BIM was aided by the development of a BIM Committee inside the organization. The goal was to find a BIM platform that would be suitable for PWD to adopt. Autodesk was suggested as one of the BIM tools by the Committee. The usage of the tool was suggested by the Department of Information Technology. Following that, by the end of 2010, PWD had begun installing the BIM tool, which was followed by training in how to use the programme in early 2011, [3].

Furthermore, in May 2012, the BIM Unit Project was formed, which includes of architects, structural engineers, mechanical and electrical (M&E) engineers, and quantity surveyors. The goal is to create a component for families, which will be Revit Families, for two pilot projects, [3]. Based on article [3], Type 5 Clinic (KK5) in Sri Jaya Maran, Pahang, and the Administration Complex of Suruhanjaya Pencegah Rasuah Malaysia (SPRM) in Shah Alam, Selangor, are the two experimental projects.

The Malaysian government has supported the use of BIM in the construction sector in order to help accomplish the CIDB Master Plan's goal as well as the country's 2020 vision by increasing key performance indicators (KPIs) and productivity, [4], [5], [6]. The Malaysian construction sector is now facing significant difficulties in meeting community expectations for increased efficiency, quality, and value based on article [7]. As a result, the Malaysian construction industry's best construction methods programme model includes information technology (IT) programmes and tools, [8], [9], [6].

2.2 Awareness of using BIM

The awareness of BIM implementation and processing in building projects has a big influence on top management's choice to switch to BIM-based technology. Implementation of BIM is a difficult task that requires various of information from many parties, but the awareness of the process would aid in overcoming the challenges. According to [10], researched on the awareness of BIM process implementation between public, private and all sectors in Malaysia. The result from the articles shows most of the respondents were not aware of the BIM process. This disparity might be attributable to differences in the number of participants from each sector. The percentage of professionals in both industries who scored a strong grasp of technology application and procedure is still lower than it should be. All respondents had a 55 % overall awareness level.

The awareness of using BIM among the construction industries are also depending on the working experiences of the workers. Some workers who already have experiences of work for 3 to 10 years usually know the basic things of BIM compared to the fresh graduate student who trying to adept and learn new things on site. Based on the research from the article [11], imply that having more years of BIM experience leads to a better knowledge of the benefits of BIM, which might lead to a more enthusiastic of the construction companies and workers toward BIM adoption.

Thus, it shows that only minor may know the awareness of using BIM in the construction industry but most of them are lack of knowledge on how to implement the BIM in construction field. This is because the lack of applications and training on BIM were not focused on most of the workers as most of the companies especially small company are not afford the pay the fund of the training and the software of BIM.

According to [12], understanding the study of BIM implementation awareness takes priority over determining if the technology application is importance to construction companies. The initial to determine the achievement for objective 1 of this study which to determine the level of BIM technology and idea understanding across construction industry teams. There are a few questions that can be question to the construction industry team to determine to level of awareness towards using BIM and can be summary such as table below.

Table 1 Summary of Determine the level of Awareness on BIM within construction industry teams

1.	Do you know about BIM
2.	Do you have any idea of using BIM
3.	Do you aware the benefits of BIM
4.	Do you aware the total cost of BIM software
5.	Do you think BIM are more complex compare to conventional method (AutoCad)
6.	Do you think that BIM can be the future for project information management

2.3 Motivation of implementing BIM

Design, procurement, construction, and integration in BIM will allow cooperation in design, procurement, and construction, reducing construction time, improving management performance, and achieving integration and construction project knowledge management.

In design aspect, various aspects of the BIM model can be evaluated and simulated and enhanced output of various design schemes of each level (such as sunlight, wind, thermal atmosphere, landscape visibility, noise, energy usage, emergency care expense, and so on), allowing the planner to make large scale, time, and complicated design material and function easier where the final project is fundamentally strengthened as a result of the highest value determination of building architecture requirements.

Multi-person team architecture is also one of the highlights of BIM design as opposed to conventional design methods. There are various of advantages of BIM on design side such as improving the design efficiency and quality, facilitate the work's operation and maintenance phase, improve of communication in each team members, plan and cost management must be integrated.

Regards to construction side, the motivation of BIM implementation is include BIM will cut building costs, shorten construction time, improve efficiency, and even reserve full information for all team members including the client in the construction operation and maintenance, laying a stable basis, radically changing the conventional management information loss caused by bad condition information.

According to [13], construction is an extremely complicated and complex operation, and modern construction project management is often used to reflect the progress of the network plan. But, due to technical, poor degree of visualization, it is difficult to visualize the progress of construction and a variety of complex relationships. Integration of spatial data, time, and cost information into digital 5D (3D + Time + Cost) model can be intuitively and reliably represented

in the development process and virtual Image advancement. 5D construction modelling technologies can be used in the project's construction process to establish rational plans, an accurate grasp of the project's progress, and maximize the use of construction materials and scientific site architecture, as well as the whole project's construction timeline, resources, and efficiency of centralized management and control to shorten the construction duration. Reduce the expenses.

3. Methodology

A literature review of published through online journals, proceedings and books published between the years 2000 and 2021 was used to determine the variables of awareness and barriers to BIM implementation. Following that, relevant data was selected and compiled based on the identification of BIM implementation barriers at construction sites. The questionnaire was created by including the four parties that influence the building site, which is contractor, consultant, architect, and client.

3.1 Questionnaire Development

Questionnaires were used to collect data on the perspectives of numerous construction groups at construction sites, allowing for an objective and cost-effective analysis. To begin, a complete list of barriers and awareness was screened in pilot research to confirm that all the questionnaire's items were valid, reliable, and meaningful. There were two parts to the survey. The first part investigated the respondents' background which shown in figure 1 below and the second part looked into their level of BIM awareness which shown in figure 2 below. The respondents were required to answer “Yes” or “No” for each factor of awareness that being asked.

3.2 Population and Sampling

The participants were construction stakeholders who were actively involved in construction sites around Johor area. Due to the unclear precise number of respondents working in Johor area, the respondents were labeled as a "unknown population sample." The questionnaire was filled out voluntarily and anonymously, with the project owners' significant cooperation and coordination. In all, 384 minimum samples were distributed, with 65 valid samples (16.93% response rate) being recovered. Due to time restrictions, 83.07% of the samples were invalid. In addition, the pandemic situation had made the data collection become difficult due to Movement Control Order (MCO) enforced by the government.

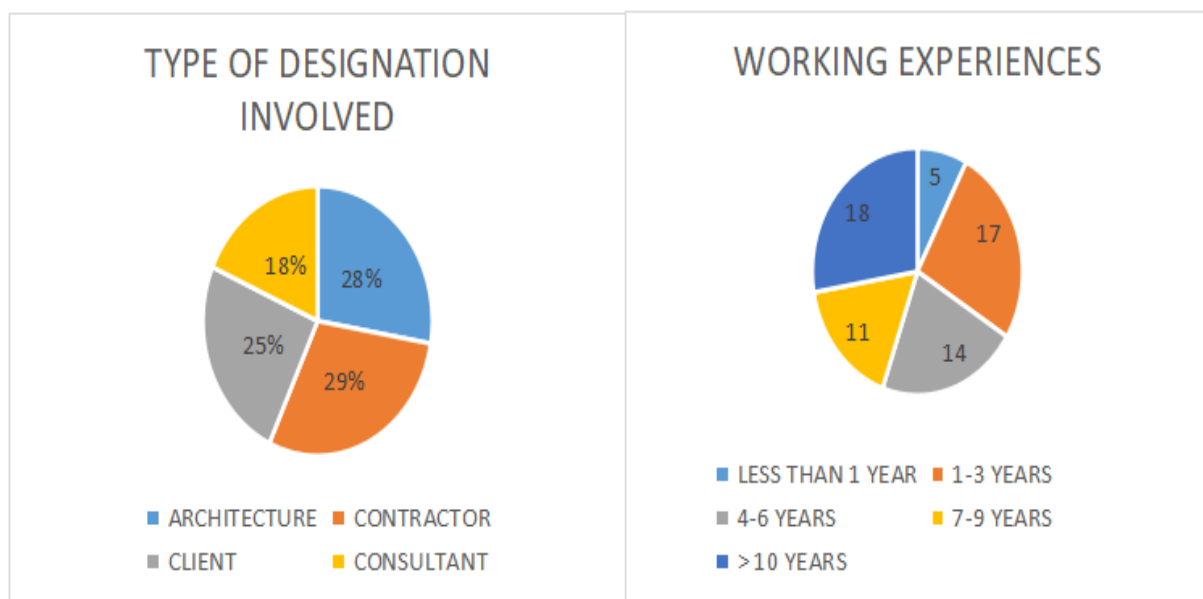


Figure 1 Demographic of Respondents

3.3 Measure for Data Analysis

After data collection, the questionnaire that received were tabulated in Microsoft Excel and analyzed based on the percentage, whether “Yes” or “No” to determine the level or awareness among the respondents of construction industry.

4. Results and Discussion

Using Microsoft Excel, the data was analysed. The software generated results for the awareness of BIM among the respondents who were in construction industry, which are shown in tables.

4.1 Understanding the Awareness of BIM among the construction team

Figure 2 displays the results of respondents who completed Part B of the questionnaire. According to the graph, most respondents had at least a basic understanding of BIM in the construction industry. On the first question, 46 respondents had heard of BIM previously, compared to 19 who had never heard of it. This is due to the fact that some of them have never worked with BIM before.

The following question is about how BIM is used on a construction site. In this question, 40 respondents know how BIM is utilized on a construction site, compared to 25 respondents who had no concept what BIM is. This is due to the fact that some of the respondents had never seen BIM at a construction site. On the third point, we inquired as to how BIM works. In this question, 42 respondents know how BIM works on a construction site, compared to 23 respondents who don't. This demonstrates that the majority of respondents have a basic understanding of BIM's role in the construction industries.

The fourth and fifth question enquire about the advantages of BIM. In this question, 44 and 49 respondents respectively know what the benefits of BIM are on a building site, compared to 21 and 16 respectively respondents who don't. Next are the sixth question which inquiries about the knowledge of BIM's role in construction projects. In this question, 44 respondents were aware of BIM's contribution to construction projects, compared to 21 who were unaware. This is likely due to the fact that some of the respondents have never worked on a BIM project before. In the seventh and eighth inquiry, they inquire about the cost of integrating BIM into a construction project. This revealed that only 27 and 20 respectively respondents were aware of the cost of BIM implementation, compared to 38 and 45 respectively respondents who were unaware of the cost. This is due to the fact that the BIM has several levels of comprehension, each with its own set of costs. This statement supported by [14], based on the findings, high cost of application is one of the barriers of BIM implementation in global architecture, engineering and construction (AEC) industry. On the ninth question, it is demonstrated that using BIM in a construction firm would be beneficial. This survey reveals that 41 people agree with the benefits provided by BIM in construction firms, while 24 disagree. This is due to the fact that some of the respondents may be unfamiliar with BIM.

Furthermore, on tenth question asks whether there are any obstacles to BIM implementation that perhaps the respondents are aware of. In response to this, respondents believe that there are obstacles and barriers to BIM implementation, whereas 25 disagree. The eleventh question reveals whether the BIM software is more difficult than AutoCad. This demonstrates that 46 people agree that BIM is more difficult than AutoCad, compared to 19 respondents who disagree. This is because certain construction teams who have worked in the field have been attached to using AutoCad and switching to a new technology such as BIM will be difficult for them to adjust to and comprehend. But on twelfth question, it shows that 54 respondents are willing to take the opportunity to change from conventional method to BIM if given them a chance compared to 11 respondents who maybe for them it is getting old to learn new tricks.

Lastly, on thirteenth and fourteenth question, the question was whether BIM is the "future of project information management" and whether it is necessary for construction professionals. In response to both questions, 57 and 55 respondents respectively believe that BIM is the future of next-generation projects and that it is critical for construction professionals to know and understand how to use BIM, whereas 8 and 10 respondents respectively disagree. This demonstrates that the majority of respondents see the necessity of BIM in the future, which can provide greater benefits to the building team.

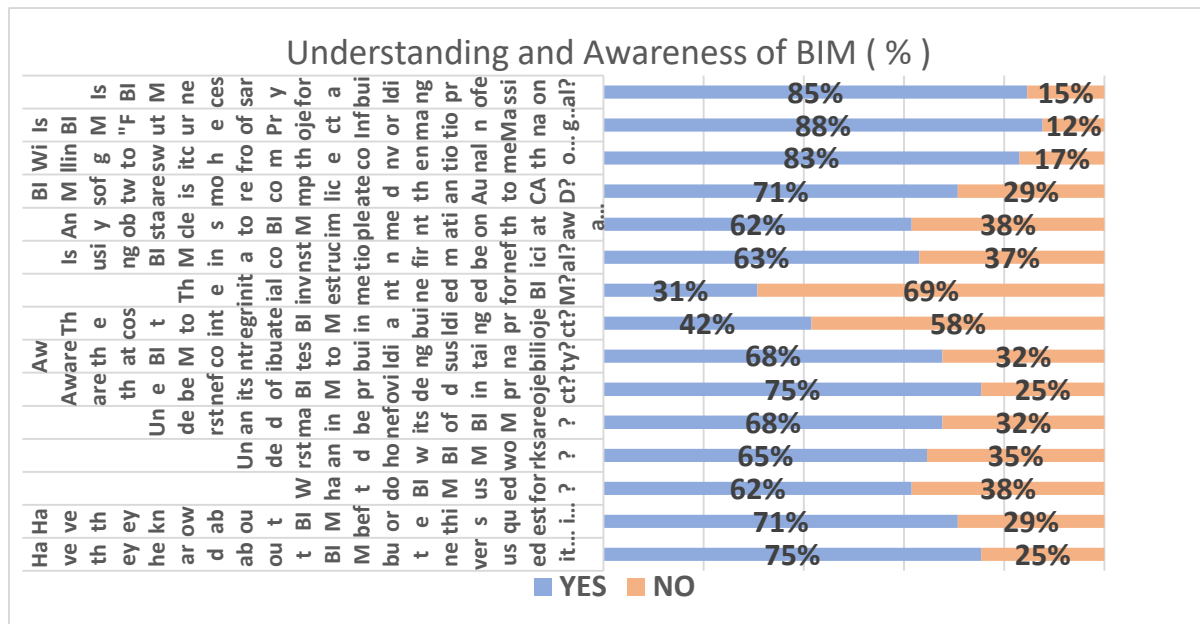


Figure 2. The Awareness of BIM among construction team results

5. Conclusion

The results towards the awareness of BIM in this study shows that majority of the construction industry are aware on using BIM in construction project. However, among the respondents, the overall cost and investment required to implement BIM are among the lowest. This is since the majority of construction employees are unfamiliar with BIM and the associated expenses. This statement supported by [15], where they conducted this research at another country.

This study limits in that it only focused on Johor region only and time constraint which impede receiving much larger responses from the respondents. Future study is sought to extend the research to other states in Malaysia to generalize the findings for Malaysian construction practitioners.

Acknowledgement

The authors would like to thank the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia for its support.

References

- [1] Tahir, M. M., Haron, N. A., Alias, A. H., Al-Jumaa, A. T., Muhammad, I. B., & Harun, A. N. (2017, December). Applications of building information model (BIM) in Malaysian construction industry. In *IOP Conference Series: Materials Science and Engineering* (Vol. 291, No. 1, p. 012009). IOP Publishing.
- [2] Haron, N. A., Raja Soh, R. P. Z. A., & Harun, A. N. (2017). Implementation of Building Information Modelling (BIM) in Malaysia: A Review. *Pertanika Journal of Science & Technology*, 25(3).
- [3] Latiffi, A. A., Mohd, S., Kasim, N., & Fathi, M. S. (2013). Building information modeling (BIM) application in Malaysian construction industry. *International Journal of Construction Engineering and Management*.
- [4] Ibrahim, Abdul Razak Bin, Matthew H. Roy, Zafar Ahmed, and Ghaffar Imtiaz. "An investigation of the status of the Malaysian construction industry." *Benchmarking: An International Journal* 17, no. 2 (2010): 294-308.

- [5] Nguyen, A. T., Guerra, T. M., Rath, J., Zhang, H., & Palhares, R. (2020, July). Set-Invariance Based Fuzzy Output Tracking Control for Vehicle Autonomous Driving under Uncertain Lateral Forces and Steering Constraints. In 2020 IEEE International Conference on Fuzzy Systems(FUZZ-IEEE) (pp. 1-7). IEEE.
- [6] Enegbuma, W. I., & Ali, K. N. (2013, May). Hypothesis analysis of building information modelling penetration in Malaysian construction industry. In Proceedings of CIB World Building Congress (pp. 5-9).
- [7] Zahrizan, Z., Ali, N. M., Haron, A. T., Marshall-Ponting, A., & Hamid, Z. A. (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.
- [8] Kamar, K. A. M., & Hamid, Z. A. (2011). Supply chain strategy for contractor in adopting industrialized building system (IBS). *Australian Journal of Basic and Applied Sciences*, 5(12), 2552-2557.
- [9] Sebastian, R. (2011). Changing roles of the clients, architects and contractors through BIM. *Engineering, construction and architectural management*
- [10] Othman, I., Al-Ashmori, Y. Y., Rahmawati, Y., Amran, Y. M., & Al-Bared, M. A. M. (2021). The level of building information modelling (BIM) implementation in Malaysia. *Ain Shams Engineering Journal*, 12(1), 455- 463.
- [11] Ahankoob, A., Manley, K., & Abbasnejad, B. (2019). The role of contractors' building information modelling (BIM) experience in realising the potential values of BIM. *International Journal of Construction Management*, 1-12.
- [12] Gamil, Y., & Rahman, I. A. R. (2019). Awareness and challenges of building information modelling (BIM) implementation in the Yemen construction industry. *Journal of Engineering, Design and Technology*.
- [13] Qin, H. (2017). The advantages of BIM application in EPC mode. In MATEC Web of Conferences (Vol. 100, p. 05058). EDP Sciences.
- [14] Liu, S., Xie, B., Tivendal, L., & Liu, C. (2015). Critical barriers to BIM implementation in the AEC industry. *International Journal of Marketing Studies*, 7(6), 162
- [15] Criminale, Andrew, and Sandeep Langar. "Challenges with BIM implementation: a review of literature." Proceedings of 53rd Associated School of Construction International Conference, Seattle, WA, April. 2017