

# **A Study on Benefits and Barriers of Implementing Building Information Modelling (BIM) in Malaysian Construction Industry**

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## **Abstract**

Building Information Modelling (BIM) is an advanced technology which is currently being used in the construction industries especially in other countries. However, there are still some barriers to implement BIM in Malaysia. This paper aims to determine the benefits of investing in BIM, explore the barriers to implement BIM and to persuade the implementation of BIM. The data was collected through interview targeting the construction player, and the data was analyzed. The result shows that the construction player agreed to the benefits and the implementation of BIM. However, there are still existing barriers to implement BIM in the Malaysian construction industry.

## **Keywords**

Building Information Modelling (BIM), benefits, barriers, implementation, construction industry

## **1. Introduction**

Technologies are advancing day by day. With the constant developing, changing, and improvement of technologies, human's life is getting easier, and works are completed faster. In order for the Malaysian government to achieve the status of developed country by 2020, they have been promoting and pushing the industries to adopt and utilise information technology (Zahrizan, Ali, Haron, Marshall-Ponting, & Hamid, 2013). Even in the construction industry, many new technologies are starting to be implemented to help change and improve the construction industry. According to Brandon et al. (2008) cited in Hosseini, Chileshe, Zou, & Baroudi (2013), construction industry was left behind by other industries in term of adopting new technologies. However, according to Thatcher Associates - an online blog, drones, Augmented Reality (AR), and Building Information Modelling (BIM) have already started to be use in the construction industry (Chaffe, 2016).

Most construction industry acknowledges the adoption of technology, but they still resist investing time and money to see a better result (Gallagher, 2017). On the other hand, some construction industries around the world have started implementing BIM in their company. Therefore, this research is carried out to study the benefits and barriers of implementing BIM in Malaysian construction industry, especially in Kedah.

### **1.1 Problem Statement and Objective**

BIM do provide many advantages to the construction players such as save cost and time of reworking, earlier detection of error, and detect clashing. However, there are barriers in implementing BIM in Malaysian construction industry. However, there are always problems that will arise in carrying out a project. For example, a project will run smoothly with good communication and understanding, but without proper visualization, a person will make mistakes. A client has a hard time understanding the building while some conceptual rendering was shown (AECMagazine, 2017). Besides that, communication difficulties between different parties will arise in the design and planning process. Thus, there is a need for Malaysian construction industry to know well the function and benefits of using BIM. Therefore, the objective of this study is to explore the benefits and barriers of investing in BIM in Malaysian construction industry.

## **2. Literature Review**

The conceptual idea of BIM was introduced way back before. In 1962, Douglas C. Engelbart explained about his vision on the future of architecture in his paper “Augmenting Human Intellect: A Conceptual Framework” (Cadbim, 2015). Then Building Description System was first documented in 1975. It is a working prototype that is a closest concept of BIM. In 1986, the term “Building Modelling” was written in Robert Aish’s paper which is a case study on illustrating arguments and concepts of BIM (Cadbim, 2015). After that, Autodesk released a white paper entitled “Building Information Modelling” which explains history to BIM, the characteristics, and the benefits (Autodesk, 2002).

### **2.1 Definition of BIM**

BIM definition may vary from different experts or authors. According to Arayici and Aouad (2010), BIM seeks to integrate processes throughout the entire lifecycle with Construction Lifecycle Management. Aside from that, BIM involves the use of technologies for documentation management, and improve collaboration and communication of construction players (Aryani, Brahim, & Fathi, 2014). Meanwhile, National Building Information Modelling Standard defines BIM as a representation of physical and functional characteristics of a facility in digital form which serve to share knowledge resource and form a decision during its lifecycle (NIBS, 2015). BIM is defined as a virtual building which extracts different views from a computerized construction building (Corke, 2016). Lastly, BIM is a combination of traditional computer aided design (CAD) with 3D modelling (Rouse, 2017).

While a variety of definitions of the term BIM have been suggested, the definition put forward by the ‘father of BIM’ as a benchmark when defining the philosophy of BIM. “BIM is a digital representation of the building process to facilitate exchange and interoperability of information in digital format” (Eastman, 2011). Overall, in this study, BIM can be defined as computing reality that simulates real life visualization in a construction building.

### **2.2 BIM and n“D” Function**

Different types of BIM model serve different purposes and has its own benefits (Woon, 2015). 3D BIM model is use to detect clashes at early design stage. The benefit is it reduces Request for Information (RFIs). 4D BIM model is to calculate progress in the physical development and schedule the timeline. The benefit is it optimizes planning. For 5D BIM model, it serves as a real-time cost control and estimate the accurate cost. It is efficient and cost effective for construction. While 6D BIM model is use for detailed energy analysis and LEED tracking. It reduces the overall energy consumption in construction project. Lastly, 7D BIM model function as facilities and asset management to extract component status specifications, maintenance, operation manuals and warranty data. It is good for optimizing asset management from design to demolish.

### **2.3 Benefits of BIM**

Complex projects are getting harder to manage by using traditional way. There are many benefits in implementing BIM in the construction process. BIM changes the traditional way of how companies work. BIM helps Architecture, Engineering, and Construction (AEC) service providers to improve time management and save cost. The benefits of BIM are faster project approvals, more predictable outcomes, sustainable design and analysis services, and improve collaboration and information sharing (Autodesk, 2011). BIM also make faster and effective processes, improve design, control lifecycle cost, automated assembly, and better customer service (Azhar, Nadeem, Mok, & Leung, 2008). According to Fischer & Kunz (2004), BIM helps to speed up analysis cycle time and reduce data input and transfer errors. BIM helps in reduction in building assets of the initial and whole life costs, and reduce time of completion (NBS, 2017). BIM not only reduces cost and time, but also reveals clashes, gaining client confidence and post completion operations and maintenance (M. Mandhar & M. Mandhar, 2013).

### **2.4 Barriers of BIM**

BIM certainly have shown a lot of benefits but there are barriers in implementing it. The barriers are differentiate into six parts as shown Table 1 below which are cost, training, client demand, ownership, culture issues or resistance to change, and interoperability (Hameed Memon, Abdul Rahman, Memon, & Iffah Aqilah Azman, 2014).

**Table 1. Barriers of Implementing BIM**

Cost	<ul style="list-style-type: none"> <li>• Large investment to update software, hardware.</li> <li>• Costly to train staff (Yan and Damian, 2008).</li> <li>• High cost in changing work flow and work process.</li> <li>• Service providers will only invest if perceive long term benefits and subsidizes training cost (Baba, 2010).</li> </ul>
Training	<ul style="list-style-type: none"> <li>• Affect decision making in BIM adoption (McGraw-Hill, 2009).</li> </ul>
Client demand	<ul style="list-style-type: none"> <li>• Hard to implement BIM without client demand.</li> <li>• Stake holders scared of change.</li> </ul>
Ownership	<ul style="list-style-type: none"> <li>• Hard to protect ownership of BIM data (Azhar, 2008).</li> </ul>
Culture issues or resistance to change	<ul style="list-style-type: none"> <li>• Refuse for better changes.</li> <li>• Different team culture (Brewel et al., 2010).</li> </ul>
Interoperability	<ul style="list-style-type: none"> <li>• Lack of interoperability (Steel et al., 2012).</li> </ul>

## **2.5 BIM in Malaysian Construction Industry**

Just like any other countries, Malaysia has also started adopting BIM in the construction industry in 2010, where the National Cancer Institute, Sepang was the first infrastructure construction project that uses BIM (buildingSmartMalaysia, 2015). However, the implementation of BIM is growing at a slow pace. According to CIDB (2014) cited by Woon (2015), it is hard to prove the advantages of adopting BIM in Malaysia because of not enough studies are done. Public Work Department (JKR) have implemented BIM in their construction projects (Ashar, 2017). Other than that, Sunway Construction have embarked on using BIM (Sunway®, 2017).

## **3. Research Methodology**

The research design of this paper is to develop the understanding of the benefits and barriers of BIM in Malaysian construction industry. This research also examines the similarity of the benefits and barriers with different studies conducted in the past. In this research, a qualitative method is being use to do collection and analysis of data because it is more suitable as it focuses on a Malaysian construction company. Overall, this research is a study on the benefits and barriers of implementing BIM in a construction company at Northern Malaysia.

An interview method was adopted for this research study. First, questions are construct to be ask during the interview session. Total of 13 questions was proposed for the interview session. The questions are group into three categories, which are benefits, barriers and implementations. The interviewee will be asked on the benefits of BIM in construction industry, the barriers to implement BIM in construction industry, and how to implement BIM in Malaysian construction industry.

## **4. Analysis and Findings**

During the interview, the interviewee directly state what the company knows about BIM as the questions were sent earlier before conducting the interview. From the interviewee perspective, BIM is still new to the company. The company just started to study on BIM and look at the pros and cons of BIM.

### **4.1 Benefits of BIM**

The benefits of BIM are listed below:

#### **i. Better visualization**

By using BIM, the user can visualize the building before construction. They can easily make changes without the work of reworking. Thus, it will save the cost and time from the reworking process.

*Respondent: “You will be confused by look at the drawings. For example, we make the University college, we are confused with some part of the building. We have to do it first, when doing it only realize the*

*mistake, the consultant says have to change, then do changes. That is the most problem. But if BIM is done first, we can make changes.”*

ii. Save time

BIM implementation in projects will prevent construction players from doing reworking. For example, when visualize using BIM is firstly done, any errors detected can be changed then only do the real constructing process. Thus, the completion time of the project is cut short.

iii. Reduce cost

Before the existence of BIM, construction players normally use Auto-CAD or blueprint to look at the construction structure, and then they will construct the building by looking at the 2-Dimensional (2D) design. When problems arise, the construction players have to do reworking. Reworking will consume a lot of time and cost. By using BIM, they can see the building in 3-Dimensional (3D) view. Changes are first made in the system until everything is settled then only the construction work begins.

Respondent: *“BIM has more 3D and we can make animation, do overlapping. That is the benefits of BIM.”*

#### **4.2 Barriers of BIM**

The barriers of BIM are listed below:

i. Cost

The main barrier is the cost of the software and hardware. The price of BIM software per user is expensive, even changing the hardware to compatible with high rendering software will also cost a lot.

Respondent: *“The barriers of BIM are the costing because, for one year the range is RM7,000 to RM8,000 per user. The following year need to pay RM 7,000 to RM 8,000 too for yearly renewal. The price of next year is not necessary the same, it might increase 5% to 7%. We also do not know how much. The problem is more to cost.”*

ii. Training

Giving training to staff will take up time and cost. The company needs to invest more in the software in order to give training to the staff. With the staffs that are trained to be skill, their wages or their salary will be high.

Respondent: *“We need to train skill people, need to have training. The training of BIM is the wages or salary is expensive.”*

iii. Resistant to change

Some construction players are always resistant to changes. They are comfortable by using what they already know. They are not willing to try and adapt to changes as they think it will be hard to implement new things.

Respondent: *“One more is our mindset, skeptical. Especially the construction players, construction players are always slow in changing. The barrier is that people are too skeptic towards BIM. Like people are sceptic towards Auto-CAD before.”*

The result from this research have strengthened and added some findings from the previous studies in terms of the benefits and barriers of implementing BIM in construction industry.

## **5. Discussion and Conclusion**

This research found that currently the industry is good enough with using AutoCAD and have not implement BIM as BIM will only be beneficial if it involves big and complicated projects. However, the industry will start to implement BIM as they saw the benefits that BIM will offer in construction projects. Furthermore, this research found out that the barriers of implementation of BIM at the moment is cost, training, and resistant to change.

Based on this research, BIM need to be expose more to Malaysian construction industry. More future research should be done and focus on Malaysian construction to help benefit the industry. Furthermore, maybe the industry can evaluate the differences of using BIM and traditional method in construction project. The researchers can help to develop a framework for the implementation of BIM that will be suitable for the local construction industry by referring to the successful implementation in other countries.

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