

ADOPTION OF BUILDING INFORMATION MODELING IN GOVERNMENT  
PROCUREMENT SYSTEM

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## **DEDICATION**

To my beloved wife ; Juhaida Nasarah,  
my children; Ibrahim Adham, Fatimatuzzahrah, Muhammad Adib Adham, Nur  
Syafia Azzahra, Nur Zafira Azzahra, Nur Nafisa Azzahra & Muhammad Adib  
Adham.

Thank you for your patience and endless support.

and families for their continuous encouragement and supports. Who taught me that  
even the largest task can be accomplished if it is done one step at a time.

To all my friends and classmate, thank you for the great and  
endless supports along the way.

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## ABSTRACT

Current construction contract procurement systems are often problematic which will address to the increased project costs and losses. By adopting Building Information Modeling (BIM) process which will minimize the common mistakes made during the pre-construction. However, BIM adoption level is still low in Malaysia. From the early benchmark, it's shows there are five categories that is the main barriers of the implementation which include task, team, context, actor and process. Therefore, the aim of this study is to evaluate the performance of BIM usage in procurement system and improving the existing BIM procurement. Hence, several objectives have been in line including: (1) to study the level of adoption of BIM work process in the government procurement system; (2) to determine the challenges and barriers, and (3) to determine the best strategies to improve the government procurement system. 100 questionnaires have been distributed and 64 feedbacks has been giving feedback which includes Architects, Engineers and Quantity Surveyors from the Government Technical Department. Data collected has analysed using the Social Science Statistics System (SPSS) software. The result shows the mean average index for the questionnaire items is valued at 3.553. This value of level of adoption in positive perspective falls under the "moderate" category. However, the analysis of negative perspective (weakness) shows the mean score was in the range of high value. The highest barriers have been identified as task barrier, which is valued at 3.765. It is follow by second ranking actor-skills barrier, with the mean value of 3.718. Additional to this, the highest ranking for best strategies to improve BIM adoption is from Practitioners which had the highest mean score of 4.406. This proves that actors play very important role in improving the level of BIM adoption. As a conclusion the human practice is important in developing the knowledge of BIM implementation in procurement system. In order to drive the successful on bringing the BIM, adopting the knowledge and enhance the human intellectual and capability is very important to drive the whole successful of procurement system.

## ABSTRAK

Sistem perolehan kontrak pembinaan semasa sering menjadi masalah yang menyumbang kepada peningkatan kos projek dan kerugian. Dengan menggunakan pakai proses *Building Information Modeling* (BIM) yang akan mengurangkan kesilapan biasa yang dibuat semasa pra-pembinaan. Walau bagaimanapun, tahap penerimaan BIM masih rendah di Malaysia. Dari penanda aras awal, ia menunjukkan terdapat lima kategori yang merupakan halangan utama pelaksanaan yang merangkumi tugas, pasukan, konteks, aktor (pengguna) dan proses. Oleh itu, matlamat kajian ini adalah untuk menilai prestasi penggunaan BIM dalam sistem perolehan dan meningkatkan perolehan BIM sedia ada. Oleh itu, beberapa objektif telah disertakan termasuk: (1) untuk mengkaji tahap penerimaan proses kerja BIM dalam sistem perolehan kerajaan; (2) menentukan cabaran dan halangan, dan (3) menentukan strategi terbaik untuk memperbaiki sistem perolehan kerajaan. 100 soal selidik telah diedarkan dan 64 responden telah memberikan maklum balas iaitu Arkitek, Jurutera dan Juruukur Bahan dari Jabatan Teknikal Kerajaan. Data yang dikumpulkan telah dianalisis dengan menggunakan perisian Sistem Perangkaan Sains Sosial (SPSS). Hasilnya menunjukkan indeks purata min untuk item soal selidik bernilai 3.553. Nilai tahap pelaksanaan dalam perspektif positif berada di bawah kategori "sederhana". Walau bagaimanapun, analisis perspektif negatif (kelemahan) menunjukkan skor min berada dalam julat nilai tinggi. Halangan tertinggi telah dikenalpasti sebagai penghalang tugas, yang bernilai 3,765. Ia disusuli oleh penghalang aktor pada kedudukan kedua, dengan nilai min 3.718. Tambahan untuk ini, ranking tertinggi untuk strategi terbaik untuk meningkatkan penggunaan BIM adalah dari aktor yang mempunyai skor min tertinggi 4.406. Ini membuktikan bahawa aktor memainkan peranan penting dalam meningkatkan tahap penerimaan BIM. Sebagai kesimpulan amalan manusia adalah penting dalam membangunkan pengetahuan pelaksanaan BIM dalam sistem perolehan. Untuk memacu kejayaan pelaksanaan BIM, mengamalkan pengetahuan dalam meningkatkan intelektual dan keupayaan manusia adalah sangat penting untuk memacu kejayaan keseluruhan sistem perolehan.

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## **LIST OF ABBREVIATIONS**

BIM	-	Building Information Modeling
PWD	-	Public Work Departmennt
JKR	-	Jabatan Kerja Raya
CIDB	-	Construction Industry Development Board
AEC	-	Architect, Engineer & Construction
DB	-	Design & Build
USFA	-	United States' Federal Authority
ADCO	-	Architecture, Design, Construction and Operations
UTM	-	Universiti Teknologi Malaysia
CAM	-	Computer Aided Manufacturing
BbCN	-	BIM-Base Collaboration Networks

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# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Study

The construction industry faces difficulties in balancing efficiency, time and cost with community partnerships. According to Zahrizan et al., (2012) , due to rising costs, low quality production, delays, labour intensive use and the use of old technology, the construction industry in Malaysia is considered to be the most complex industry. This is because the construction sector is very complex and coupled with the involvement of many different parties in the construction industry from the design stage to the process of completion of work.

It is axiomatic in construction management that a project can be considered successful if it is completed as scheduled, under budget and quality standards, as well as maintaining a high level of client satisfaction. The problem of the recruitment process for construction has gradually been related to the fulfilment of these requirements. In essence, the success of the project can be influenced by selecting the appropriate method (Naoum & Egbu, 2015).

Nowadays, there are several types of contract procurement used in construction industry. These types of procurement include traditional / conventional procurement systems, construction management and design & built (DB) procurement systems. Broadly speaking, problems facing the construction process are viewed with respect: (1) Separation from construction; (2) inability to integrate; (3) lack of effective communication; (4) uncertainty; (5) change in the environment, (6) change in clients ' preferences and expectations and (7) increasing project complexity (Shamil Naouma & Charles Egbua, 2015).

In comparison, a thousand drawings and documents were created manually before BIM joined the business and the rest were given as complex tasks. The traditional procurement system also uses 2D data in academic practice, which can cause miscommunication and is not produce exactly the right decision for complex tasks. The research was ineffective due to misunderstandings in miscommunication (BIM Standard, 2016). Despite similar capabilities and processes, communication and information outputs are still poorly used.

Thus, BIM is a platform for sharing information to stakeholders to minimize disputes between stakeholders (Benjaoran & Bhokha, 2009). In the building information model, by Liu *et al.*, (2015) all information relating to the design, such as location, climate, and building materials, can be uploaded in the database. In addition, during the process of design, Building Information Modeling will give an advantage to designers and design work time scale will be reduced.

Therefore, BIM is the current best medium for information sharing between stakeholders while differences in stakeholders can be avoided (Benjaoran & Bhokha, 2009). In a model of building details, by Liu *et al.*, (2015) database can upload all design details such as site location, environment and building materials. In addition, during the design process, modeling of building information has the advantage of producing a variety of designs while minimizing work time.

Therefore, the Public Works Department (PWD) responsible for the construction and maintenance of public infrastructure in Malaysia has adopted the latest strategies to improve the current situation. One of these strategies is the use of Building Information Modeling (BIM) in managing of government project construction especially in project procurement, which forces all involved in the automation process to adopt collaborative approaches that reduce inefficiencies.

Hence, this study will identify the benefits and novelty of the BIM process that will be applied in the procurement process, evaluate problems and challenges and ultimately develop strategies to increase the use of BIM procurement.

## 1.2 Problem Statement

Procurement methods are designed to achieve project goals, with resources based on money, time, equipment, technology development, labour and equipment. Establishing a system that defines the boundaries of the tasks, obligations and relationships between the parties in the construction project is essential to all procurement methods by tailoring best practices to the success of the construction project. Position of operations in project execution in the operational phase, involving real construction, tender, site management and contract administration (Masterman, 2002).

However, the strategy for the procurement system for construction projects has not changed significantly in recent decades, though the time and cost involved continue to be felt throughout the industry. Conventional procurement commonly used today in construction projects has faced many disputes, shortcomings and caused many problems that had to be faced by parties, especially during design, design, construction, and post construction concepts.

In response to reduce time and cost overruns, frequent disagreements, and possible project success, alternative procurement methods have been proposed. Due to the increasing popularity of these alternatives, procurement methods show customers are trying to increase time and cost performance and reduce disputes over their projects. The procurement strategy in building a project undergoes a change from traditional methods to a point project delivery system (Masterman, 2002). Factors such as reactions to changes in regional, state and local laws and policies contribute to this trend.

In order to solve the problems that arise and facilitate the various parties involved in the construction work, it has encouraged existing experts to develop a technology or system application called Building Information Modeling (BIM). BIM enables planning and design work to be carried out at the same time as building structure modeling methods to be viewed and exhibited.

### **1.3 Aim and Objectives**

The aim of this study is to evaluate the performance BIM adoption in government project procurement. To achieve the aim, following objective are formulated, and objectives are:

- (i) To study the level of adoption of BIM work process in the government procurement system
- (ii) To determine the challenges and barriers in adopting BIM work process
- (iii) To determine the best strategies to improve the government procurement system

### **1.4 Scope of Study**

This research focuses on the public procurement policy in PWD that currently uses BIM. All BIM implementation information on procurement projects was obtained from project planning involving an architect, structural engineer, mechanical and electrical engineer and quantity monitor. In fact, all respondents participating in this analysis must have been interested in both traditional procurement and are currently involved in initiatives using BIM. This is important in assessing their level of BIM acceptance in the procurement system.

The analysis is also important for understanding the problems and threats facing BIM and for determining the best strategies for achieving the goals of this report. The study of literature and systematic survey in Malaysia and data are primarily from the building industry in Malaysia. Consequently, the results of the research are expected to apply to Malaysia and to other regions as a comparative study. The sample of this study includes practitioners with BIM knowledge and experience in the implementation of the government procurement system.



## **1.5 Significant of The Study**

Based on the research done on the implementation of BIM in the construction industry, it is proving that BIM has solved the problems faced by the construction industry players and can enhance the overall process of project development, even spreading it further and further in the post-contract phase. Due to the architecture, engineering and construction (AEC) market, BIM's popularity has improved productivity through the use of different data forms.

For fact, the clash appearance of the building may be reduced, which reduces time and costs related to the upkeep of the building. The planning process can be improved by the clear way of identifying risks before development starts. BIM can also be used environmentally friendly and competitive with the environmental effects of energy efficiency and carbon emissions.

Although BIM has been adopted in the construction industry, its implementation is still in its infancy and has not been widely disseminated, especially in developing countries such as Malaysia. Therefore, the aim of this study is to evaluate the performance of BIM adoption in government procurement system.

Results of the study will be the benchmark for improving work performance in the quality control of research, the completion period of the project is optimal and cost-effective, based on government-developed criteria.

## **1.6 Summary**

From the above discussion, it can be concluded that the implementation of BIM can solve many of the problems that often arise in construction contract construction. However, due to the slowness of the BIM process, its implementation is still lagging behind.

Hence, it is necessary to bridge this gap by continuing to implement it in the future to align with current BIM technology developments as well as to broaden the benefits and adoption of BIM in more detail.

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