BUILDING INFORMATION MODELING IN LOCAL CONSTRUCTION INDUSTRY

HAMMAD DABO BABA
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Dedicated to

My beloved children, Farouq, Amatullahi, Amaturrahman, Mahmood and Hafsah for your endurance and care.

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ABSTRACT

Building Information Modeling (BIM) is a new emerging approach to design, construction, and facility management in which a digital representation of the building process is being created to facilitate the exchange and interoperability of information in digital format. Despite the advantages derived from this paradigm, local construction industry is reluctant to deploy the technology in its service delivery. The objectives of the study include identifying the level of BIM tools utilization, identifying the barriers and strategies for the implementation of Building information modeling (BIM) in the local construction industry. Structured questionnaires were administered to 100 key players in the field of Architecture and Engineering randomly selected from within Kuala Lumpur region. Twenty Nine (29) respondents have appropriately answered and duly retuned the questionnaire. Data collected was analyzed using Analysis of Variance (ANOVA) and the hypotheses ware tested using t-test at 0.5% level of confidence. The study found that, BIM is been accepted by a substantial number of construction professional (Architects and Engineers). However, majority are still using AutoCAD in their design services. Moreover there is high correlation in terms of BIM Usage among Architects and Engineers but there is no correlation in the means responses of Architects and Engineers on the barriers to BIM implementation. In conclusion, the study has identified several strategies for Building Information modeling to be implemented and utilized in construction service delivery.

ABSTRAK

Building Information Modeling (BIM) adalah suatu pendekatan muncul baru untuk desain, pembinaan, dan pengurusan kemudahan di mana perwakilan digital dari proses pembangunan sedang dibuat untuk memudahkan pertukaran dan Interoperabilitas maklumat dalam format digital. Walaupun keuntungan yang diperolehi daripada paradigma ini, industri pembinaan tempatan enggan untuk menggunakan teknologi dalam penyediaan perkhidmatan tersebut. Tujuan kajian ini termasuk mengenalpasti tahap penggunaan alat BIM, mengenalpasti halangan dan strategi untuk pelaksanaan pemodelan maklumat Bangunan (BIM) dalam industri pembinaan tempatan. kuesioner terstruktur yang diberikan kepada 100 pemain kunci di bidang Teknik Arsitektur dan dipilih secara rawak dari dalam kawasan Kuala Lumpur. Dua puluh Sembilan (29) responden yang menjawab tepat dan telah kembali lagi kuesioner. Data yang dikumpul dianalisis menggunakan Analisis Varians (ANOVA) dan ware hipotesis diuji dengan menggunakan t-test pada tahap 0,5% dari kepercayaan. Kajian ini mendapati bahawa, BIM ini telah diterima oleh sejumlah besar pembinaan profesional (Arkitek dan Jurutera). Namun, majoriti masih menggunakan AutoCAD jasa desain mereka. Apalagi ada korelasi yang tinggi dalam hal BIM Global antara Arkitek dan Jurutera tetapi tidak ada korelasi dalam bererti tanggapan dari Arkitek dan Jurutera pada hambatan pelaksanaan BIM.Sebagai kesimpulan, kajian telah mengenalpasti beberapa strategi untuk pemodelan Maklumat Gedung untuk dilaksanakan dan digunakan dalam penyediaan perkhidmatan pembinaan.

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3D	-	Three Dimensional
ADT	-	Architectural Desktop
AEC	-	Architecture, Engineering and Construction
AECON	-	Architecture, Engineering, Construction and Operation
AIA	-	American Institute of Architects
AGC	-	America General Contractors
BEM	-	Building Element Model
BIM	-	Building Information Modeling
BMP	-	Bitmap formatted image
CAD	-	Computer Aided Design
CAM	-	Computer Aided Manufacturing
CIM	-	Computer Information Manufacturing
DGN	-	Microstation Design File
DWF	-	Autodesk Web Design Format
DWG	-	AutoCAD and Open Design Format
DXF	-	Drawing Interchange File Format
GDL	-	Geometric Description Language
gbXML	-	Green Building Extensible Language
IFC	-	Industry Foundation Classes
JPG	-	Joint Photographic Experts Group
MEP	-	Mechanical Electrical and Plumbing
NBIMS	-	National Building Information Modeling Standards
RVT	-	Revit File Format
STEP	-	Standard for the Exchange of Product model data

CHAPTER 1

INTRODUCTION

1.0 Introduction

The study focuses on Building Information Modeling in local construction industries in addition; the study seeks to identify the reasons behind slow implementation of this solution in construction industry. In this chapter, a brief overview of the study is presented. The chapter covers background, statement of the problem, aims and objective, research question, hypothesis, scope, significance and finally summarized the summary of the chapters.

1.1 Background

There was an eminent research effort on enabling and advancing information technology to enhance work efficiency and collaboration among Architecture, Construction and Engineering (ACE) stakeholders by providing mechanism infrastructure to deliver pertinent information required for decision making in a timely manner. According to Estaman et al 2005, Halfawy and Froese 2001, such an

technologies, and should facilitate information interchange between members of the project team and across stages in the project lifecycle from construction to inspection to maintenance. Khoury and Kamar 2009 suggested that the central kernel of this communications infrastructure should be inhabited by a shared construction project model in the form of integrated product models and project database, these resulted to Building Information Modeling (BIM).

Building information modeling (BIM), is a modeling technology and associated set of processes to produce, communicate and analyze building models (Estamsn et al 2008), is seen as an enabler that may help the building industry to improve its productivity. Yet, although BIM has been on the market for a number of years, it has not been adopted industry – wide to its full capacity. As of 2009 approximately half of industry representatives do not use any BIM software on projects in the U.S (McGrawHill 2009).

1.2 Statement of the Problems

The slow adoption of the BIM in the industry has been caused by several technical and human barriers, these barriers can be categorized as internal or external. In internal use of BIM, the main barriers are cost and human issues, mainly the learning of new tools and processes. The learning process is significantly more expensive than the actual costs of hardware and software. In the same vein, Kivineimi et al (2008) posited that, high investment cost and the constant need to upgrade hardware and software are seen as two major obstacles for firms. Moreover, the unclear balance between the benefits and the costs and the fear that the actual benefit go to another participants in the projects. Another internal barrier is fear of lacking of features and flexibility of the modeling tools. Meanwhile, the external barriers as described by Williams (2007) include legal aspect of implementing BIM which have been an area of concern to many owners, A&Es (Architects and Engineers), general contractors and sub-contractors. Issues related to model

ownership and responsibility for model accuracy as well as concerns about the responsibility of cost of producing and managing the model, top the list of perceived legal obstacle to embracing the BIM process.

Meanwhile, technical Issues related mainly to lack of sufficient and reliable interoperability between software applications – are significant obstacles, although perhaps not fully recognized by the industry yet, since most companies have no experience of the use of shared BIM in the saying of Kiviniemi et al (2008).

In general the industry lacks agreement and common practice concerning how to use integrated BIM, although in Nordic Countries the willingness to share BIM data seems to be higher than elsewhere as advanced by Newton et al (2009). There are claims that, the slow adoption of BIM in construction industry is attributed to lack of awareness, technical complexity, and absence of interoperability between various software that are been used in generating the Model. However, the degree and variance of this factors has not been identified. Therefore there is need for research to identify degree

1.3 Aims and Objective of the study

The aim of the study is to identify barriers to strategic implementation of Building Information Modeling (BIM) within industry in Malaysia while the objectives are:

1. To identify the level of BIM tools utilization and implementation at the design phase in local construction industry.
2. To identify the barriers to utilization and implementation of Building Information Modeling (BIM) in Architectural and Engineering design.
3. To identify strategies that will enhance effective BIM implementation in local construction industry.

1.4 Research Questions

1. What is the utilization level of BIM Tools in local construction industry?

2. What is the relation between Engineers and Architect in in terms of utilization of BIM tools in local construction industry?

3. What are the possible strategies that will enhance effective implementation of BIM tools in local Construction Industry?

1.5 Research Hypothesis

The study will be guided with the following hypotheses;

Ho There is no significant correlation between Architects and Engineers in terms utilization and adoption of building Information Modeling (BIM) in local construction industry

H_1 There is a significant correlation between Architects and Engineers in terms utilization and adoption of building Information Modeling (BIM) in local construction industry

1.6 Scope of the Study

The study is limited to implementation of building information modeling (BIM) at design phase, data collection is from Architectural Engineering and Construction firms in Malaysia only. Moreover, the study is limited to a sample of 100 respondents from selected AEC firms located within Kuala Lumpur region. Kuala Lumpur region was selected due to its high level of technology awareness and high concentration of construction firms.

1.7 Significance of the Study

The study will contribute to the pool of knowledge in various facet of academic and professional perspective. Academically, the study will generate a statistical data that will show the current status of Building Information Modeling (BIM) and the significance of competence in the implementation of BIM in Malaysia as well as the perception of this new technology among practitioners in Architecture, Engineering and Construction industry. Meanwhile, to professional's circle, the study propose strategies for the implementation of BIM to harness the numerous benefits of technology.

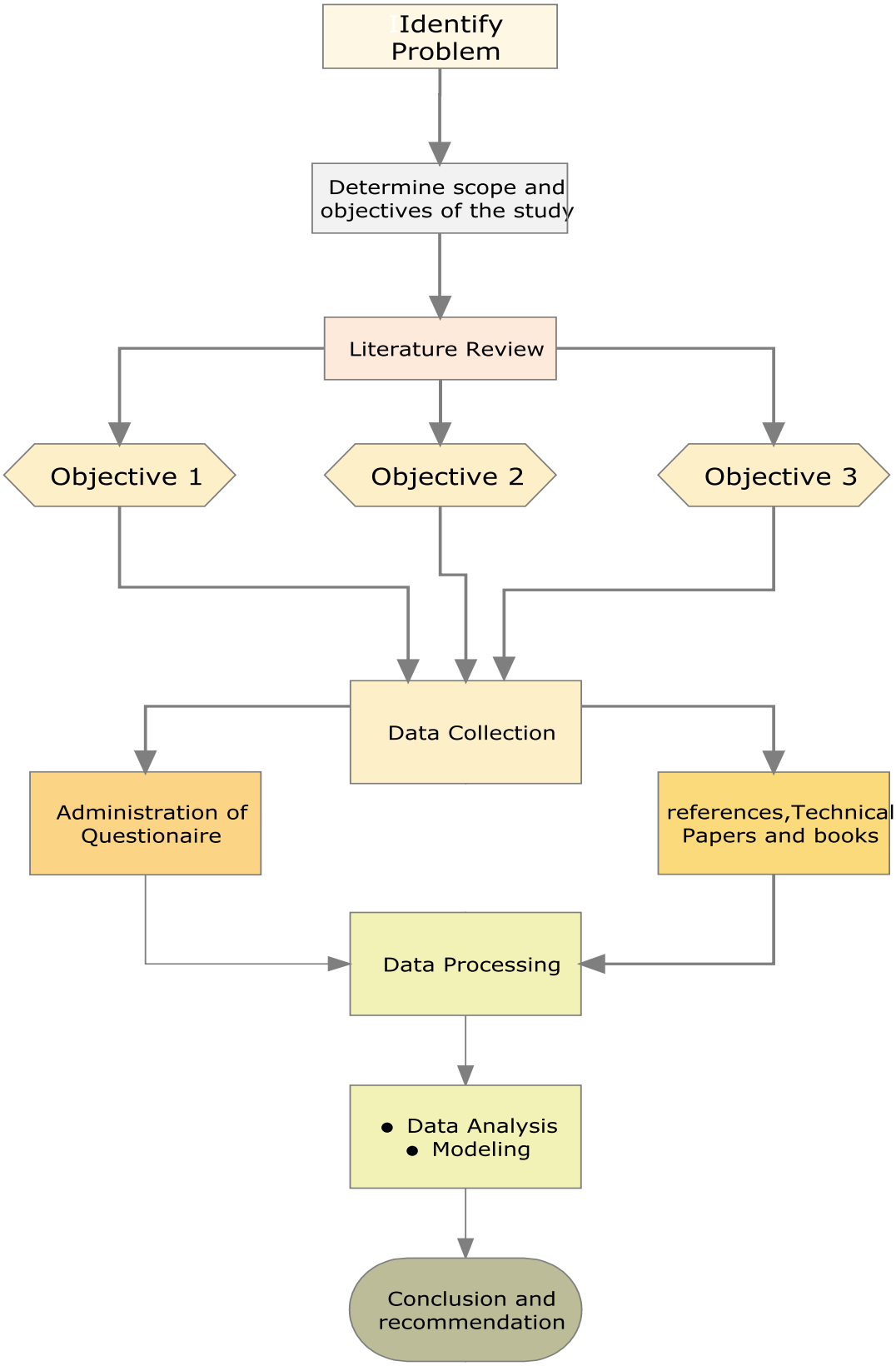

Figure 1.1 Flowchart diagram of the research process

1.8 Summary of the chapters

This works has been logically structured to five (5) chapters and below is the summary of each chapter in the study as follows:

1. **Chapter 1: Introduction**

   The first chapter of the study is a background of the study and it comprise of introduction, background, statement of the problems, aims and objectives, research questions, research hypothesis, scope of the study, significance of the study, research methodology and the chapters organization.

2. **Chapter 2 Literature Review**

   This chapter is based on literature reviews on the related topics related to the study. The literature reviews are from books, journals articles, conference papers and periodicals. The topics in this chapter include the concept of Building Information Modeling (BIM), the phases to integrate in construction life cycle and Barriers to BIM implementation.

3. **Chapter 3 : Research Methodology**

   This chapter covers the main topics on how the study was conducted; the subheadings are introduction, methodology, literature review, instruments for data collection, study samples, method of data analysis and the summery of the chapter.

4. **Chapter 4: Data Presentation and Analysis**

   This chapter present results of the study and discusses the finding in a logical manner. It treated each question individually and later present the summary of the result. Moreover, finding on each objective has been clearly outlined. Finally the hypothesis was also tested at 0.05 level of significance using correlation coefficient.

5. **Chapter 5: Summary and Conclusion.**

   This is the last chapter of this project report; it covers the conclusion of the entire project report based on the answers to the research questions, it also advance recommendations for further studies.