

THE DEVELOPMENT OF 3D
MODEL BUILDING INFORMATION
MODELLING (BIM) FOR
COMMERCIAL OFFICE BUILDING

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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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ABSTRAK

Tesis ini menyiasat pengaruh Pemodelan Maklumat Bangunan dalam tafsiran projek bangunan dan bagaimana teknologi ini dapat meningkatkan proses pembinaan dengan berkesan. Terdapat 5 model 3D yang berbeza yang boleh dibangunkan menggunakan perisian BIM (s). Autodesk Revit adalah perisian BIM yang digunakan untuk membangunkan lima model yang mereka ada; Model seni bina, Model struktur, model Mekanikal, model elektrik dan model Paip tetapi untuk kajian ini hanya akan meliputi model Senibina dan model Struktur. Model-model ini telah diselaraskan dan digabungkan bersama untuk menguji pelaksanaan BIM. Tiga aktiviti penggunaan BIM: visualisasi, proses kecekapan dan pengurusan data. Penggunaan aplikasi dalam pembinaan menunjukkan bahawa: (1) Kekurangan untuk membangunkan proses projek pembinaan ke dalam bangunan yang lengkap. Ia membantu semua pihak boleh bekerjasama untuk membangunkan proses dengan lebih cekap kerana semua pihak menggunakan perisian yang sama. (2) Visualisasi umumnya merupakan penggunaan paling mudah dari Model Maklumat Bangunan seperti pandangan ketinggian dan keratan rentas dalam model 3D. Oleh kerana visualisasi adalah paling mudah ia juga merupakan aplikasi yang hebat kerana ia meningkatkan hasil keseluruhan dari mana-mana projek. (3) Meningkatkan Pengurusan Data dalam Industri Pembinaan. Ini membantu dalam meningkatkan pengurusan data dalam pembinaan untuk akses lebih cepat. Kesimpulannya, teknologi BIM membantu meningkatkan koordinasi antara pihak, visualisasi, dan pengurusan data.

ABSTRACT

This thesis investigate the influence of Building Information Modelling in the building project interpretation and how this technology may enhances construction process effectively. There are 5 different 3D models that can be developed using BIM software(s). Autodesk Revit is a BIM software used to develop the five models which they are; Architectural model, Structural model, Mechanical model, Electrical model and Plumbing model but for this study will only cover Architectural model and Structural model. These models were coordinated and appended together to test BIM implementation. Three BIM utilization activities: visualization, efficiency process and data management. The utilization of these applications in construction showed that: (1) Deficiency on develop the process of construction project into complete building. It helps all parties can work together on develop the process be more efficiently as all parties are using the same software. (2) The visualization is generally the simplest use of a Building Information Model such as elevation and cross-section view in 3D model. As visualization is simplest it is also a great application because it enhances the overall outcome of any project. (3) Improve Data Management in Construction Industry. This helps to in improving the data management in construction to be access faster. In conclusion, BIM technology helps to improve coordination among parties, visualization, and data management.

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LIST OF ABBREVIATIONS

CAD	Computer-Aided Design
BIM	Building Information Modelling
IBS	Industrial Building System
2D	2 Dimensional
3D	3 Dimensional
MEP	Mechanical, Electrical and Plumbing
WBS	Work Breakdown Structure
PBS	Product Breakdown Structure
ABS	Assembly Breakdown Structure

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this developing world, Malaysia have been constructing building, roads and more in ensuring the project success rate by used construction management as a method to deliver the project. A project delivery method whereby the client retains a construction manager to provide certain preconstruction competence including cost estimating, value engineering, and scheduling and, during the construction phase of the project, coordination of all construction activities. Satiating information is one of the crucial part in starting a project. Many projects fail on this constraint because the coordination and communication system of the project is either not fully defined or understood from the start. However, some stumbling block remain, among which one stands out clearly: the lack of digital information for existing buildings and, especially, of computable data, which prevents any demanding in use of ICT tools (CAD tools, numerical simulation) that are so beneficial to building design practices. Most existing buildings have been designed and built following paper-based, 2D approaches, which result in few, if any, digital data.

Coordination can be seen as a process of managing resources in an organized manner so that a higher degree of operational efficiency can be achieved for a given project. Social network matrices are constructed using different centrality measures. These measurements are used to explore the association between network centrality and coordination for a construction project. (*Liaquat Hossain,2009*). By used the proper coordination and better communication between team, you will either have to reliable its cost or time. In ensuring the success of the project the management must be clear and adequate properly. The scope of work is the part of project planning that involves

determining and documenting a list of specific project goals, deliverables, features, functions, tasks, deadlines, and ultimately costs. In other words, it is what needs to be achieved and the work that must be done to deliver a project. In term of coordination, construction management can be easily coordinate using Work Breakdown Structure. A work breakdown structure (WBS) is a key project deliverable that organizes the team's work into manageable sections. The Project Management Body of Knowledge (PMBOK) defines the work breakdown structure as a "deliverable oriented hierarchical decomposition of the work to be executed by the project team." The work breakdown structure visually defines the scope into manageable chunks that a project team can understand, as each level of the work breakdown structure provides further definition and detail.

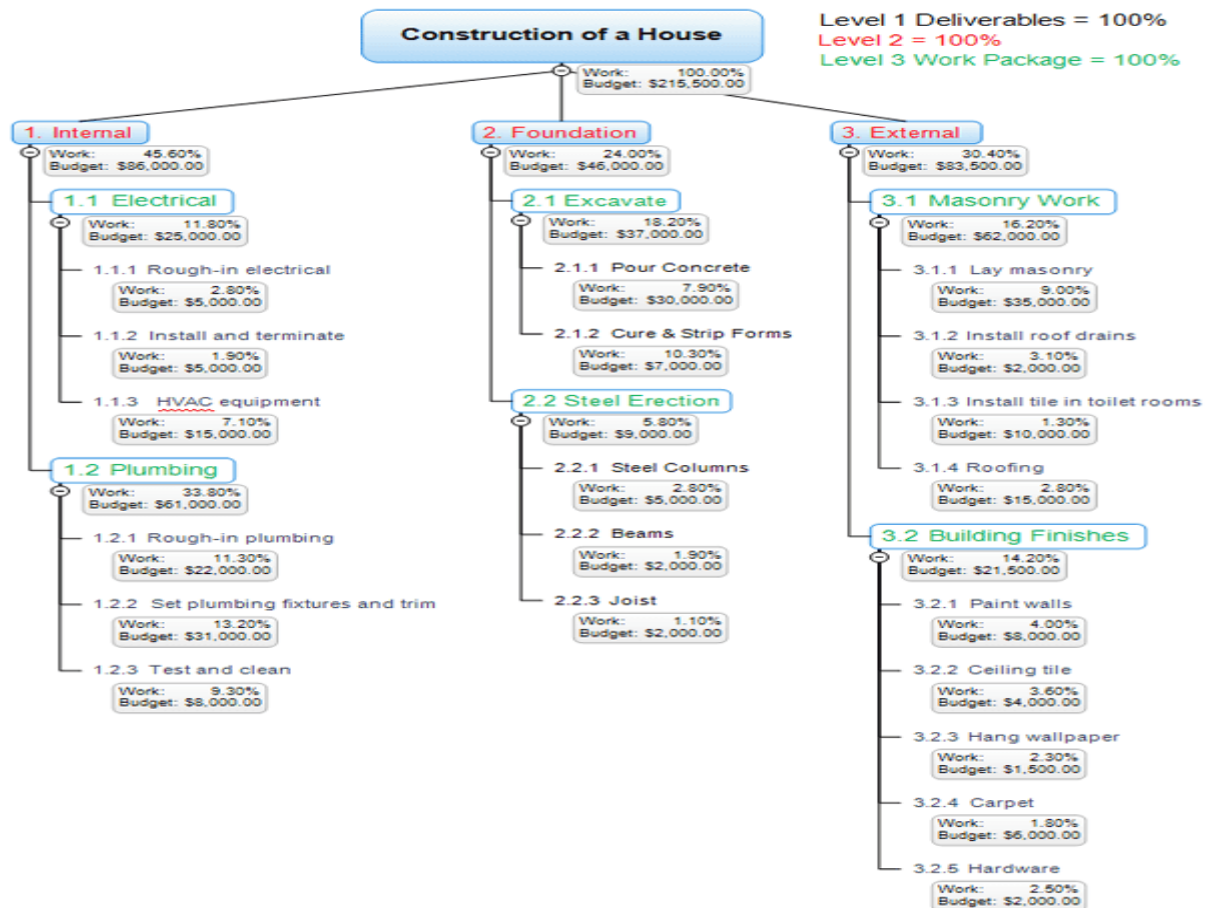


Figure 1.1: Work Breakdown Structure

Building Information Modelling (BIM) is a digital representation of physical and functional characteristics of a facility. A BIM is a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle; defined as existing from earliest conception to demolition (NBIMS-US, 2016). BIM also is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models (BIMs) are files (often but not always in proprietary formats and containing proprietary data) which can be extracted, exchanged or networked to support decision-making regarding a building or other built asset.

Before technology became known, in construction projects, the project team only associated CAD 2D construction for phase construction. This process involves many documentation, drawings and tables for use in interpretation drawings that will affect the scope of the project which will eventually take time and cost. Using 3D BIM Modelling, researchers can coordinate the scope project by helping the team in elucidate the project in more detail that will allow them to understand further before posting on sites that will save cost and time. In addition, using BIM can assist in managing data where all data can be stored in a database. Additionally, BIM helps in enhancing the alignment among parties that will save you a lot of time as it makes them understand and collaborate more methodically by using the same software. By using 3D Model, the process of work will be more organize by using some tools in BIM, which is it can be known as Model Breakdown Structure.

1.2 Background of Study

The created object is called a 3D model and these 3-dimensional models are used in a variety of industries. The film, television, video games, architecture, construction, product development, science and medical industries all use 3D models to visualize, simulate, and render graphic designs (Autodesk, 2018). 3D BIM Modelling are used by architect, civil engineer, mechanical engineer and electrical engineer to design building in 3D which make the scope of the project more clear to be establish before constructing on site compare to the old 2D CAD construction drawing. 3D modelling is the process of using software to create a mathematical representation of a 3-dimensional object or shape. BIM Modelling consist five main discipline which are architecture, structural,

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