



STRATEGIC PLANNING FOR BIM IMPLEMENTATION IN EGYPT

By

Nada Wael Arafat Elmansy

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
Structural Engineering

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Summary:

Building Information Modeling (BIM) is a growing technology in the construction industry. The adoption of Building Information modeling is facing challenges in the global construction market. The research focuses on studying BIM implementation in Egypt. The research is performed in three main steps; the assessment of BIM in Egypt, the alignment of the requirements of the industry with its maturity level, and finally the advancement of the level of BIM implementation. Maturity Models are tested on the Egyptian construction market. An implementation model is created using IDEF0 to be used in strategic planning for implementation of the technology in the Egyptian construction market.

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Abstract

Building information modeling (BIM) has been an emerging technology in the past years. Globally, construction industry is directed to more automation in project delivery and special care is given to Building information modeling. In Egypt, construction industry is now directed to the adoption of BIM to benefit from its uses among construction practitioners within projects as well as entities. Thus, there is a need to create a plan for implementation to help organizations assess their BIM maturity, establish their target implementation level, and have a plan for its adoption.

This research presents a framework for the implementation of BIM in organizations on a strategic level. To reach a strategic plan to implement BIM in Egypt, four steps are considered in the proposed framework. First, a comprehensive literature review was conducted to study Building information modeling in the global construction market. The study focused on the plans of implementation in other countries and highlighted the United Kingdom and Australian models of implementation. Special attention was given to analyze the models designated to measure the BIM maturity of organizations. Second, the assessment of the current situation in the Egyptian construction market is performed based on step one. The assessment is required to study where does the market stand when it comes to BIM as a prior step to create an implementation plan. This was done using the existing BIM Maturity models and studying their applicability in the Egyptian market. Third, a survey is developed to study the target of the Egyptian market from the adoption of BIM. This is done through studying the goals of the construction organizations in Egypt to align them with their assessed BIM maturity level. To develop a plan of implementation it is essential to study the requirements and views of all involved parties. Thus, the survey targeted all the employees within the organizations on the top, middle, and technical workforce levels. The output of the survey is used in the fourth and final step to create a roadmap. After aligning BIM goals with the current BIM status, recommendations are highlighted in order to create a roadmap for BIM implementation in organizations. To facilitate the implementation of the roadmap in the Egyptian construction industry; a model of implementation is created. The model is created and tested using Integrated Definition (IDEF0) diagrams as a functional modeling tool. The model is made easy to be accessible for industry practitioners to use it for BIM implementation planning.

Chapter 1 Introduction

1.1 General

The use of Building Information Modeling (BIM) is evolving in the architecture, engineering, and construction industry (AEC). A lot of research efforts were dedicated to the identification of BIM along with studying its uses and benefits. Some extensive research is directed to the implementation of BIM and some countries have already taken major steps towards mandating BIM in the industry. One of the major problems that limit construction companies in Egypt from using BIM is the implementation and integration of the technology within the company's culture. Moreover, most construction companies in Egypt are facing a problem defining their current BIM maturity level as a start. Defining the maturity level of an organization is an important step towards the implementation of the technology. Thus, developing a roadmap for implementation would require study to where we stand in Egypt regarding BIM technology.

1.2 Problem Statement

The implementation of Building Information Modeling within an organization, like any other new process, would follow a growth curve. Some organizations are known to have relatively low or no experience with BIM. In Egypt the use of BIM was limited to the use of some software for 3D modeling and clash detection. Moreover, construction companies in Egypt are facing a challenge finding a roadmap to help in BIM implementation on a strategic level. Although some researches were conducted to develop a framework for implementation, the need for applying this in Egypt remains of great importance. A first step towards BIM implementation would be conducting an assessment of BIM adoption within an organization. The assessment should evaluate the maturity level of the organization as in the current status and its performance within the market when it comes to using the technology.

Various attempts were carried towards the development of BIM maturity models for the usage of organizations. However, up till now, a nationwide maturity model to be used does not exist. This creates the need for a comparison between the adoption of various maturity models and their applicability in the Egyptian market. The goal of this process is to identify possible areas of adoption of BIM as well as implementation of new processes and technologies.

1.3 Research Objectives

The main objective of this research is to develop a framework for BIM implementation in Egypt. The research aims at focusing on an implementation plan and organizational BIM assessment. This promotes adopting BIM in Egypt. The results would then be used to understand the market and to develop a roadmap for BIM implementation. To achieve this main objective, the following sub-objectives are considered:

- Studying a framework for BIM implementation, as well as BIM goals and objectives.
- Studying various attempts to develop maturity models and their applicability.
- Using the developed BIM maturity models to assess the current implementation of BIM within the construction Egyptian market through case studies.
- Conducting a comparison between the results reached from using various maturity models.
- Assessing the target of construction professionals from BIM implementation in Egypt.
- Using a modeling tool to develop a model for BIM implementation.

1.4 Research Methodology

To achieve the objectives stated above, the following research methodology is followed:

- Conduct a research on the available BIM maturity models to investigate the application of them in the Egyptian market.
- Assess the current condition of the construction influencers in the Egyptian market through case studies. Various Capability Maturity Models (CMM) are used as an evaluation tool, which are originally provided for organizations and users to utilize for analysis of maturity levels.
- Compare between the results obtained by different maturity models for the same organization and develop the current maturity level.
- Conduct a market survey for a sample from the construction industry to assess the understanding of the industry stakeholders about BIM, their willingness to implement it, as well as their target from implementation.
- Assess the survey results reaching the target level of implementation.
- Develop a framework with the implementation steps of BIM as a simulation model.

1.5 Organization of Thesis

Following the introductory chapter, the research is organized as follows:

- Chapter 2 represents a literature review of Building Information Modeling, its uses, and application. The chapter also reviews the work of other researchers on BIM Capability Maturity models. It studies the models created by countries to implement BIM and focus on United Kingdom and Australian model in implementation.
- Chapter 3 explains the proposed framework to reach a strategic plan for BIM implementation. The proposed framework is illustrated in steps that are further elaborated in succeeding chapters.
- Chapter 4 focuses on the assessment of BIM maturity in the Egyptian market. In this chapter, different models are investigated different and their application. The chapter investigates the applicability of these models to measure the maturity of Egyptian construction organizations.
- Chapter 5 focuses on a systematic assessment of BIM in Egypt. In order to establish a consistent framework for BIM implementation, interviews and questionnaires with Industry stakeholders is conducted to gather and analyze data relating to BIM implementation in Egypt.
- In Chapter 6 the input from the studies conducted in chapter 5 is used to develop a roadmap for BIM implementation in Egypt.
- Chapter 7 represents a summary as well as recommendations for future research.