



AIN SHAMS UNIVERSITY  
FACULTY OF ENGINEERING  
STRUCTURAL DEPARTMENT

## **THE IMPACT OF APPLYING BUILDING INFORMATION MODELING ON DESIGN AND CONSTRUCTION STAGES**

A THESIS SUBMITTED TO  
THE FACULTY OF ENGINEERING  
AIN SHAMS UNIVERSITY  
IN FULFILLMENT OF THE REQUIREMENTS FOR  
THE DEGREE OF MASTER OF SCIENCE IN  
STRUCTURAL ENGINEERING

BY

**ALAA MASOUD ABD EL-RAHMAN AHMED**

BSc. 2011 STRUCTURAL DIVISION  
CIVIL ENGINEERING DEPARTMENT  
AIN SHAMS UNIVERSITY

SUPERVISED BY:

**PROF. AYMAN HUSSEIN HOSNI KHALIL**

PROFESSOR OF CONCRETE STRUCTURES  
STRUCTURAL ENGINEERING DEPARTMENT  
AIN SHAMS UNIVERSITY

**DR. MAHMOUD MOHAMED EL-KATEB**

ASSISTANT PROFESSOR  
STRUCTURAL ENGINEERING DEPARTMENT  
AIN SHAMS UNIVERSITY



AIN SHAMS UNIVERSITY  
FACULTY OF ENGINEERING  
STRUCTURAL DEPARTMENT

## APPROVAL SHEET

**THESIS** : MASTER OF SCIENCE IN CIVIL ENGINEERING (STRUCTURAL)  
**STUDENT NAME** : ALAA MASOUD ABD EL-RAHMAN AHMED  
**THESIS TITLE** : THE IMPACT OF APPLYING BUILDING INFORMATION  
MODELING ON DESIGN AND CONSTRUCTION STAGES

## EXAMINERS COMMITTEE

Signature

**Prof. Mohamed El-Saeid Eisa**

Professor of Concrete Structures  
Structural Engineering Department  
Faculty of Engineering – Cairo University

.....

**Prof. Ashraf M. Samy Biddah**

Professor of Concrete Structures  
Structural Engineering Department  
Faculty of Engineering – Ain Shams University

.....

**Prof. Ayman Hussein Hosni Khalil**

Professor of Concrete Structures  
Structural Engineering Department  
Faculty of Engineering – Ain Shams University

.....

Date: / / 2017

## **STATEMENT**

This thesis is submitted to faculty of engineering Ain Shams University for the degree of Master of Science in civil engineering structural department.

The work included in this thesis was carried out by the author for the department of civil engineering (structural division), Ain shams university.

No part of this thesis has been submitted for a degree or a qualification at any other university or institution.

Date: 02/07/ 2017

Name: Alaa Masoud Abd EL-Rahman Ahmed

Signature:

## **AUTHOR**

Name : Alaa Masoud Abd EL-Rahman Ahmed  
Date of birth : 20 December 1989  
Place of birth : Cairo  
Academic Degree : B.Sc. of Civil Engineering (Structural)  
University : Ain Shams University  
Date : June 2011

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## ACKNOWLEDGEMENTS

*First of all, I thank GOD who guided and helped me to finish this work in the proper shape.*

*I would like to thank everyone that has helped and contributed to present my thesis. I would like to especially thank and appreciate Prof. Ayman Hussein and Dr. Mahmoud El-Kateb for their help. They have highly supported me throughout the duration of preparation my thesis. This thesis would not have been possible without the kind help and support of these people.*

*I would like to thank my father, my mother for all their caring efforts at all times. They have been great and very supportive of me all throughout my education, especially when researching and preparing my thesis.*

*Alaa Masoud Abd EL-Rahman Ahmed*

## **ABSTRACT**

### **THE IMPACT OF APPLYING BUILDING INFORMATION MODELING ON DESIGN AND CONSTRUCTION STAGES**

The main aim for any construction projects is to make balance between time, cost and quality. All members in construction projects (managers, engineers, workers, builders...etc.) try to find the ideal methods to achieve less time with less cost and best quality. Over the years all people belong to design and construction services tried to improve methods and instruments to achieve project management triangle; time, cost and quality.

With the development of civilization, the projects become more complicated and need more scientific and development methods to satisfy the new development. Many methods and theories began to appear to make full control on project management and to face the new types of construction projects. Building Information Modeling (BIM) is one of the new methods which appeared to satisfy the development of construction projects.

This research studies the impact of applying BIM in design and construction stages, and how it increases the quality of co-ordinations between all disciplines in projects, which reflects directly on the productivity of construction projects.

Construction always faces low productivity with other industries due to poor planning and co-ordination problems. BIM is a process which is used to overcome these problems by controlling co-ordinations between project team members, making design more clear, presenting full information about design process and showing most conflicts between disciplines before performing construction process so that conflicts will be solved before starting construction process.

Most case studies of construction projects find that apply BIM process will make project productivity increases with various ratios, these ratios depend on how BIM process is circulated and organized from project members.

This research tries to find the ideal usage of BIM in design and construction stages and finds out how applying BIM affects directly in project management triangle; Time, cost and quality.

The thesis outline is divided into the following chapters:

- **Chapter (1)**

An introduction to the research. This chapter discusses the importance of the research, types of construction project stages, and the scope of the research program.

- **Chapter (2)**

Presents a brief review of the available literature on the history of applying BIM with definitions, managing design, and construction process. Construction productivity are also documented in the same chapter.

- **Chapter (3)**

Presents the BIM process. This chapter describes project management in design and construction stages and present case study to ensure process steps.

- **Chapter (4)**

Presents BIM questionnaire. The analysis and results of questionnaire will show how BIM affects in construction projects.

- **Chapter (5)**

Presents research summary and conclusions with suggestions for future studies.



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## **LIST OF ABBREVIATIONS**

AEC	: <b>A</b> rchitectural, <b>E</b> ngineering, and <b>C</b> onstruction
AIA	: <b>A</b> merican <b>I</b> nstitute of <b>A</b> rchitects
BIM	: <b>B</b> uilding <b>I</b> nformation <b>M</b> odeling
BOQ	: <b>B</b> ill <b>O</b> f <b>Q</b> uantities
CAD	: <b>C</b> omputer- <b>A</b> ided <b>D</b> esign
DWG	: <b>D</b> ra <b>W</b> in <b>G</b>
IFC	: <b>I</b> ndustry <b>F</b> oundation <b>C</b> lasses
LOD	: <b>L</b> evel <b>O</b> f <b>D</b> etail
MEP	: <b>M</b> echanical, <b>E</b> lectrical and <b>P</b> lumbing
NWC	: <b>N</b> avis <b>W</b> orks <b>C</b> ache File
O&M	: <b>O</b> perations and <b>M</b> aintenance
QA	: <b>Q</b> uality <b>A</b> ssurance
QC	: <b>Q</b> uality <b>C</b> ontrol
QTO	: <b>Q</b> uantity <b>T</b> ake- <b>O</b> ff
RFI	: <b>R</b> equest <b>F</b> or <b>I</b> nformation
RVT	: <b>R</b> e <b>V</b> i <b>T</b> project file
RTE	: <b>R</b> evit <b>T</b> emplate
TXT	: <b>T</b> e <b>X</b> <b>T</b>
TQM	: <b>T</b> otal <b>Q</b> uality <b>M</b> anagement
VDC	: <b>V</b> irtual <b>D</b> esign and <b>C</b> onstruction
2D	: Two-Dimensional
3D	: Three-Dimensional
4D	: Four-Dimensional (3D + time)
5D	: Five-Dimensional (4D + cost)