



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



**MONA MAGHRABY**



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكروفيلم

# جامعة عين شمس التوثيق الإلكتروني والميكروفيلم

## قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأقراص المدمجة قد أعدت دون أية تغييرات



## يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار



**MONA MAGHRABY**



AIN SHAMS UNIVERSITY  
FACULTY OF ENGINEERING  
Structural Engineering

# **A 5D BIM-based Integrated Analysis of Design Impact on Project Constructability and Cost**

A Thesis submitted in partial fulfilment of the requirements of the degree of  
Master of Science in Civil Engineering  
(Structural Engineering)

by

**Sarah Waleed Mahmoud**

Bachelor of Science in Civil Engineering  
(Structural Engineering)

Faculty of Engineering, Ain Shams University, 2014

Supervised By

**Prof. Dr. Ibrahim Abdel Rasheed**

**Dr. Mohamed A. El-mikawi**

Cairo - (2020)





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# A 5D BIM-based Integrated Analysis of Design Impact on Project Constructability and Cost

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**Sarah Waleed Mahmoud Ali Barakat**

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# Statement

This thesis is submitted as a partial fulfilment of Master of Science in Civil Engineering Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

**Sarah Waleed Mahmoud Ali Barakat**

Signature

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Date:03 December 2020



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# Abstract

The construction industry is rapidly growing all over the world. Construction managers are always on the quest for finding tools and methods to facilitate the construction process and improve the time and cost of construction projects. The consideration of constructability issues as early as the design phase can significantly improve the construction process leading to smooth project delivery and savings in time and cost.

This research aims to develop an assessment model that can be used to evaluate the constructability of a design based on the most common constructability principles. The assessment model requires the use of BIM technology as an automated tool for collecting all the project data. The study was conducted in three phases which are literature review, questionnaire survey, and model development. Through extensive literature review and because of the use of BIM as a data collecting tool, 10 factors were identified as the most relevant in studying the constructability. A questionnaire survey was then used to calculate the relative importance of each factor based on the opinions of construction experts.

A case study of a reinforced concrete commercial project was used to apply the workflow, construct a BIM model and perform constructability assessment. Building systems included in the study are structural and architectural systems. Furthermore, an analysis is carried out to analyze the effect of the current design choices on the cost of the project.

The assessment model can be used iteratively several times to achieve the project maximum required constructability. It can also be used throughout the project phases to continuously update the project data. Results show that the assessment model is easy to use and that can produce a sufficiently good evaluation of the constructability of the project.

**Keywords:** Constructability Assessment, Design Impact, BIM, Construction Management, Project Management



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