بسم الله الرحمن الرحيم

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بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

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Ain Shams University

Faculty Of Engineering

Department Of Architecture

Achieving Sustainability Through Reducing Risks During The Architectural Design Process: A Lean Management Perspective

A Thesis submitted in partial fulfilment of the requirements of the degree of Master of Science in Architectural Engineering

By

Sherouk Mohamed Abdelrehim

Bachelor of Science In Architectural Engineering

Department of Architecture, Faculty of Engineering, The British University in Egypt, 2018

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Cairo - (2022)

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Statement

This thesis is submitted to Ain Shams University for the M.Sc. degree in Architecture Engineering, Faculty of Engineering, Ain Shams University.

The work included in this thesis was carried out by the researcher during the period from December 2020 to February 2022, and no part of this thesis has been submitted for a degree of qualification at any other university or institute.

The candidate confirms that the work submitted is his own and that appropriate credit has been given where reference has been made to the work of others.

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Sherouk Mohamed Abelrehim

Abstract

The construction industry, which is one of the largest in the world, is critical to achieving national and international social and economic sustainable development goals. Socially, it is involved in long-term projects that transform client and end-user needs into designs which describe technical attributes, functional performance goals, and quality standards. Furthermore, it strives to complete these projects on time, as specified, and in the most cost-effective manner possible. Economically, the construction industry contributes to a country's GDP (gross domestic product) by creating jobs and providing the majority of the country's fixed capital assets and infrastructure, as well as, allowing other supporting industries to thrive.

On the other hand, the construction industry's practises affect the project sustainability considering its environmental, social, and economic impacts. The construction industry is riskier than other industries due to its nature, complexity and dynamism, as well as the involvement of a large number of people and organisations with varying goals and capabilities.

The architectural design process is a critical stage in the life cycle of a construction project. This is because decisions made during this phase affect the project's performance throughout its life cycle. Failure to evaluate risk factors during this phase will have an impact on the project's long-term viability. Lean management is a method of designing a process to reduce waste. Despite the fact that Lean Management tools are widely used in the construction industry to enhance sustainability of projects, its application in the design process has received little attention in construction literature.

Therefore, this thesis aims to investigate the role of lean management in achieving sustainability by reducing risks during the architectural design process. In order to achieve this aim, identification of different risks that take place during the design phase is presented. In addition, the thesis also explores lean management principles and tools and its application in different construction projects. A survey questionnaire is conducted to investigate the perception of architecture design firms toward lean management usage during the design process. A framework was suggested for applying lean tools within the architecture design process to achieve

sustainability. Finally, highlighting the research recommendations for lean management tools usage within the design process to achieve sustainability.

Key words: Sustainability, risks, design process, Lean construction management

Abbreviations

GDP: Gross domestic product

ADFs: Architecture design firms

RIBA: Royal Institute of British Architects

VOC: Voice of customer

QFD: Quality function development

LPS: Last planner system

JIT: Just in time

CSM: Current state map

FSM: Future state map

PHSA: Provincial Health Service Authority

Table Of Contents

List of Figures

Introduction

Chapter 1: **The Perception of Lean Management Towards Architecture Design Risks to Achieve Sustainability**

Chapter 2: Lean Management Application in Developed Countries Construction Projects

Chapter 3: Survey Questionnaire Methodology and Analysis