

UNIVERSITI TEKNOLOGI MARA

**INDUSTRY 4.0 FRAMEWORK FOR
CONSTRUCTION ENGINEERING
INDUSTRY-ACADEMIA
ADOPTIONS IN MALAYSIA**

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ABSTRACT

Industry 4.0 embraces digitisation of smart products or processes by integrating various technological advancements to control the entire systems' value chain. The construction sector is also captivated by the idea of the Industry 4.0, which transforms the conventional method into a digital and cyber-physical system that creates connection across the construction project lifecycle. However, considering that the construction industry is known as a low-technology adopting sector as compared to the other industries such as manufacturing, agriculture and computer science, studies on Industry 4.0 in this industry remains scarce. The complexity of the emerging technologies of Industry 4.0 is also affecting the educational sector in complying with future job requirements. The current pedagogy does not meet the Industry 4.0 needs due to the lack of experience-based knowledge and expertise among the academics. Hence, this study aims to enhance the construction industry sector through holistic strategies of adoption or adaption of the Industry 4.0 elements in the current and future construction industry. The knowledge, attitude and practice (KAP) study were performed among industry and academics on Industry 4.0 in construction engineering. The descriptive analysis showed the KAP results, and the exploratory factor data analysis further showcases readiness criteria in developing the preliminary framework. The study involved the mix-method approach within the ongoing Public Works Department (PWD) projects and nine public universities in peninsular Malaysia as the primary data collection. The significant initiatives of Industry 4.0 implementation were obtained through Focus Group Discussion method among technical experts from industry and academia respondents. The final validated framework could then be used to influence the industry-academics of Industry 4.0 adoption and adaption, further bridging the disparities between both parties. This study focuses on developing an integrative framework is to ensure both industry players and academics are able to understand and evaluate their readiness towards the implementation of the Industry 4.0 concept.

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CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the background and overview of this thesis. The section in this chapter consists of the research theme, problem, questions, aim and objectives, scope and significance of study. A summary of research phases and methodology were also presented at the end of this chapter. The intention of this chapter is to describe the research topics and the rationale of this research. Firstly, this research emphasises the current state of development in the construction industry and the importance of technological transformation adoption to enhance development in this sector. The research problems, questions and hypothesis that contribute to the research aims and objective are provided in the second part of this chapter. This is followed by the research boundaries and implication of this research.

1.1 Research Background

The construction industry has unique features, intricate nature and challenging processes that involves multi-organisational team from civil, mechanical, electrical and more at different phases of project development (Behm, 2008). Construction projects include socio-economics infrastructures and basic amenities, such as buildings, roads, bridges and many more, to develop the necessary physical structure, improve the society lifestyles and contribute to the economy growth (Khan *et al.*, 2014). Subsequently, the construction process consists of various amounts of data information from multiple sources to facilitate a better decision-making that impacts project time, cost and quality. However, the construction industry is facing with inconsistencies and inaccuracies of data information processes due to the lacking of smart technological innovation adoptions in the current processes and production (Son *et al.*, 2012a). Hence, in order to enhance the construction industry's performance in Malaysia, the government is currently riding along the wave of Industrial Revolution 4.0 with the Industry 4.0 elements.

The Industry 4.0 have been introduced at the Hannover Fair by the German