DEVELOPMENT OF PREFABRICATED BUILDING IMPLEMENTATION FRAMEWORK FOR ADDRESSING HOUSING NEEDS IN LIBYA

by

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بِسْمِكَ اللّٰهُمَّ

In the name of Allah, we start

DEDICATION

To the soul of my father, who had dreamt to witness these moments …

To my kind-hearted mother, for her unlimited love, inspirations, supports, protections, sacrifices, and prayers …

To my wife, and my daughter, for their sacrifices in this academic pursuit…

Khaled M. Amtered El-Abidi

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LIST OF ABBREVIATIONS

ACA	Acceleration Capital Allowance
BSRIA	Building Services Research and Information Association
BURA	British Urban Regeneration Association (United Kingdom)
CIA	Central Intelligence Agency
CIB	International Council for Research and Innovation in Building and Construction
CII	Construction Industry Institute (United States)
CIDB	Construction Industry Development Board
CIMP	Construction Industry Master Plan 2006-2015
CIRC	Construction Industry Review Committee
CREAM	Construction Research Institute of Malaysia
COMET	Committee for Middle East Trade
CSFs	Critical Success Factors
ETF	European Training Foundation
£L	Libyan Pounds (Previous currency of Libya)
GAE	General Authority for Environmental
GAI	General Authority for Information
GDP	Gross Domestic Product
GOH	General Organization for Housing
IBS	Industrialized Building System
IMF	International Monetary Fund
LYD	Libyan Dinar
MIDA	Malaysian Investment Development Authority
NAO	National Audit Office
NCID	National Corporation for Information and Documentation
R&D	Research and Development

SMEs	Small and Medium-size companies
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
US$	United States Dollars

PEMBANGUNAN RANGKA KERJA UNTUK IMPLEMENTASI PRA-FABRIKASI BANGUNAN BAGI MENANGANI KEPERLUAN PERUMAHAN DI LIBYA

ABSTRAK

Memenuhi keperluan perumahan amat dititikberatkan dikebanyakkan negara di dunia dengan lebih banyak tuntutan keperluan di negara membangun dan Libya tidak terkecuali. Kajian-kajian yang berkaitan telah membuktikan bangunan pra-fabrikasi dapat membantu meningkatkan usaha penyediaan perumahan dari segi kecepatan, kuantiti, dan kualiti serta pembinaan semula pasca-konflik. Kajian ini adalah tentang pra-fabrikasi bangunan di Libya, yang masih belum dikaji sebelum ini. Kaedah-kaedah campuran telah dibangunkan untuk tujuan ini, dengan penekanan diberikan kepada teknik penyelidikan kualitatif. Kaedah-kaedah yang digunakan terdiri daripada: data sekunder, temubual separa berstruktur, tinjauan kuantitatif, tinjauan AHP, dan perbincangan kumpulan fokus. Kaedah penyelidikan kualitatif menawarkan penerokaan pada peringkat pertama. Manakala kaedah penyelidikan kuantitatif menyumbang kepada proses pentafsiran yang lebih jelas di peringkat kedua, kaedah penyelidikan kualitatif menawarkan penerangan yang kukuh kepada peringkat sebelumnya. Dapatan awal kajian ini berdasarkan temubual separa struktur bersama pekerja yang terlibat mendapati pra-fabrikasi memberi faedah kepada keperluan perumahan walaupun kaedahnya masih belum dikenal pasti. Oleh itu, kajian ini memberi tumpuan untuk membangunkan satu kerangka konseptual berkenaan Faktor Kejayaan Kritikal (CSF) berdasarkan garis panduan untuk meningkatkan peluang kejayaan transformasi ke prafabrikasi bangunan, yang boleh berkembang untuk disesuaikan dengan keadaan perumahan di Libya. Bagi mewujudkan kefahaman tentang CSF untuk pelaksanaan bangunan pra-fabrikasi, kajian di negara yang mempunyai industri yang kukuh seperti Malaysia adalah perlu. Berdasarkan dapatan CSF, kajian ini mencadangkan rangka kerja yang dibangunkan sesuai dengan amalan industri pembinaan di Libya melalui kumpulan tumpuan. Sepuluh faktor kejayaan kritikal telah dikenal pasti di bawah tiga elemen utama: strategi, proses, dan pekerja, diikuti oleh tiga sumber dana yang penting dan tiga faktor pemangkin utama. Keputusan daripada kajian ini bersesuaian dengan kajian-kajian terdahulu mengenai kepentingan kestabilan politik sesebuah negara dan dasar negara tersebut terhadap pelaburan dan infrastruktur baru.

DEVELOPMENT OF PREFABRICATED BUILDING IMPLEMENTATION FRAMEWORK FOR ADDRESSING HOUSING NEEDS IN LIBYA

ABSTRACT

Addressing housing needs is of great concern in many countries of the world with more predominance in developing countries and Libya is not an exception. Related literature has proven that prefabricated building can help improve housing delivery efforts in terms of speed, quantity, and quality as well as post-conflict reconstruction. This research is concerned with prefabricated building in Libya, which has not been investigated before. A mixed methods approach was developed for this purpose, with emphasis given to qualitative research techniques. Methods used comprised: secondary data, semi-structured interviews, quantitative survey, AHP survey, and focus group discussions. Qualitative research methods offered an exploration in the first stage. Whereas quantitative research methods contributed to a more rigorous interpretation process in the second stage, qualitative research methods offered a solid description of the former. The findings of the early stages of this study have shown that the participants of semi-structured interviews' have recognized prefabricated building benefits on addressing housing needs, eventhough they are not entirely sure about the method of implementation. In order to establish a comprehensive understanding on CSFs for prefabricated building implementation, exploring another country with an established industry, such as Malaysia, is necessary. From the identified CSFs, a conceptual framework that is able to comply with the construction industry needs in Libya is developed via focus group. Ten CSFs were identified under three main elements: strategy, process, and people, followed by three important sources of funding factors and three major enabling factors. Results from this study concur with previous studies regarding the importance of the country's political stability and its policies towards new investment and infrastructure.

CHAPTER ONE
INTRODUCTION

1.1 Background

"The term prefabricated brings to mind a building system in which the essential pieces of structure are sent to the site on which the finished edifice will be constructed partially or completely assembled" (Bahamón, 2002). Although a crude form of prefabricated building began before the iron age, there had been no substantial prefabrication in housing construction until the time of two World Wars (Pan, 2006). Meanwhile, many former colonies of Europe in Africa and Asia became independent during postwar years; these countries must immediately acquire and apply technology to expedite their development (Akubue, 2002). In the early 1960s, prefabricated building was transferred to many independent countries, including Libya, by developed countries. However, many countries demonstrated limited success in using this technology due to tarnishing its reputation by previous design as well as construction mistakes. Consequently, conventional construction methods still prevailed in housing construction.

In the late twentieth century, prefabricated building processes were enhanced by advances in design, information technology, and machinery as well as the current emphasis within the industry to reduce waste materials, energy consumption, labor requirements, project duration, and costs. These situations have validated that using prefabricated building is now more practical than ever (CII, 2002 and Song et al., 2005).

During the late 1990s and 2000s, governments of many countries and regions, such as the United Kingdom (UK), South Africa, Singapore, Hong Kong, Malaysia, Province of Quebec in Canada, Australia, and Germany, rethought adopting

prefabricated building, they introduced policies to enhance mechanization in their industries through long-term visions or strategies (CIDB, 2003; CIRC, 2001; Construction 21 Steering Committee, 1999; DPW, 1998; Egan, 1998; Hampson and Brandon, 2004; Venables and Courtney, 2004; and Leabue and Vinâls, 2003). Significant differences in local emphasis were noted despite several similarities among these initiatives (Green et al., 2011). Since the intensity of influence of these aspects may differ from country to country, as may the nature of the construction industry, targeting any attempt to develop a policy or strategy to enhance prefabricated building adoption or integration is needed (Zakaria et al., 2017). Efficient processes and step-by-step advances can direct prefabricated building to achieve its optimal extent in countries that have not yet developed enhanced mechanization.

However, the Libyan government has the additional burden of dealing with domestic conditions, which place it in a serious situation and perhaps insurmountable disadvantage. The construction industry needs to learn from the experiences and good policy that support transformation and knowledge acquisition, which can be realized in improvements on a continuous basis. Thus, countries can learn from each other's experience (Ofori, 2006), by analyzing their experiences. The focus on the factors that are really critical to the success of prefabricated building implementation in another country is useful for the Libyan construction industry to formulate future strategies to transform from conventional practice into prefabricated building. It can be used as a complementary, alternative building method that can incrementally offer advantages to the overall housing industry.

1.2 Research Context

With a focus on the increasing demand for housing, this section presents the policy context of the previous housing supply. This context suggests a need to address the use of prefabricated building for housing construction. The current stakeholders' low familiarity with the concept of its processes indicates the need for Malaysia's experience in prefabricated building application as a case study.

1.2.1 Housing Supply Context

After its adoption of the socialist philosophy in 1977, the Libyan government assumed full responsibility and control over the provision and allocation of housing. According to The Secretariat of Utilities (1985) 750,000 dwelling units should have been developed during the planning period 1980 to 2000 in consideration of the housing requirements and the elimination of the present deficit. However, this number was not achieved due to a general decline in government spending as a result of successive shocks to the Libyan economy, which lasted until 2004 (see section 3.4.3). On the other hand, the growing housing demand is a product of change in the country's demographic structure from having 24.2% of its population in cities and towns in 1954 to over 88% in 2006.

In the early 2000s, to correct its previous policies, the Libyan government implemented a large-scale privatization program, it allocated US dollars (US$) 123.4 billion for infrastructure projects, including the construction of 530,000 dwelling units throughout the country. Despite the strong demand for housing, most new estates remained unfinished because of significant delays in construction, which were aggravated by the onset of political turmoil in February 17, 2011 that escalated into a civil war. Many housing contracts were suspended or canceled as a result. On the other

hand, 70,000 people were internally displaced after the civil war, and they urgently required new permanent accommodation (UNHCR, 2013). In addition, the damaged areas due to political violence escalation by 2014 require rebuilding. Despite the upgrading, the total capacity of the Libyan housing market could not immediately meet the new short-term demands for buildings, and could not respond to the totality of new needs. It is estimated that 50,000 dwelling units should be constructed annually during the period (2014-2033).

1.2.2 The Need to Address the Use of Prefabricated Building in Housing Industry

Many developing countries prefer conventional construction methods over adopting innovative construction methods. It is very comfortable for them to use labor intensive and low technology methods of construction, believing that they are an efficient means of producing a house. However, "*the construction industry in most developing countries operates with low productivity and relatively high overall costs, despite low labor costs*" (Ofori, 1994a: p.44). This statement is also valid for the Libyan case, which is currently characterized by traditional procurement systems, paper-based and verbal communication systems, and cement- and intensive-labor process (Grifa, 2006).

Although Libya is facing acute shortage of water supply, the construction industry operations are currently cement based and designed around mixing methods on site in which water is an important issue in terms of quantity, quality, and management (Grifa, 2006). In addition, the output quality in the conventional construction methods is highly dependent on the professional skill of workers. However, the required quality cannot be achieved, because of poor quality control at the site (Badir et al., 2002). The poor image of the industry is caused by high incidence of accidents, absence of job

security, poor management, and low wages for high-risk jobs and lack of opportunity for career development (Abdul Razak et al., 2010). These methods require lengthy construction periods (Thomas and Sakarcan, 1994), which are even unable to cope with the huge demand for houses.

Libya is a large country in terms of area but small in population, thus human resource is the main obstacle for development. Consequently, expatriate workforce is indispensable in the Libyan domestic market. In the late 1980s and 1990s, the Libyan foreign policy encouraged the entry of irregular workers from African and Arab countries into the country and allowed their presence (Abuhadra and Ajaali, 2014). This step has dire consequences on the construction industry since foreign workers have little or no skills. Grifa (2006) argued that labor is one of the biggest issues and key challenges of the Libyan construction industry. Ile Housing Forum (2004) skills report claims that the housebuilding sector experiences a more acute skills supply problem than construction in general. In fact, recent labor shortage in the industry mainly in the troubled areas have resulted in insufficient workers being available to undertake conventional construction projects.

Pressured by the skills shortage, the declining number of new workforce entrants and the need for faster housing completion, the construction industry is seeking innovative technology based on prefabricated building to maximize productivity. Also the water usage in construction can be reduced via reducing wet trades through using prefabricated building. With the government incentives and encouragement, there is a high possibility that prefabricated building could flourish. Any increased activity of the private sector in the housing building for the purpose of sale or lease is likely to create significant new market opportunities for prefabricated building.