CONSTRUCTION BID MODEL FOR RESIDENTIAL BUILDING PROJECTS IN DUBAI

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Dedicated to

My Parents, Husband and my Children

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ABSTRACT

Many construction firms face hardships during the economic crisis due to inaccurate bidding and difficulty in obtaining new projects because of cost fluctuation. The best option for construction firms during an economic crisis is to control their construction bid costs that fit the situation. The bidding cost during the economic crisis has led to losses in the execution of projects. The study investigated how the construction sector of Dubai, United Arab Emirate, experienced poor bidding performance during the economic crisis. This is evident when material cost was fluctuating and the construction companies had a tough time getting new projects due to inaccurate bidding. This research looked into the details of construction bidding management during the bidding stage by developing a construction bid mathematical model to assist construction firms avoid bidding problems during the economic crisis. Using the data gathered from the year 2009 and 2010 economic crash, a construction bid mathematical model and bidding plan methodology were developed to better prepare construction companies during economic crisis. The chronology of this study was divided into two phases. Phase one involved conducting an extensive literature review and collecting secondary data. Phase two focused on primary data gathering and analysis of the data collected. Documentary analysis and questionnaire surveys were engaged as a source and tool to gather the data. Data were analyzed using coefficient of variation and severity index. From the available data, the bid mathematical model for bidding was successfully developed. Then, ten experts validated this model and the data were analyzed whereby the results showed that the model has successfully reduced the estimation inaccuracy as well as predicted the problem faced especially bidding during the economic crisis. The findings have shown that it is very important to have a crisis-response plan in place to eradicate risks, secure the market and provide solutions to problems faced during the crisis. In conclusion, the model can be used to minimize the adverse effects on the construction companies, including the projects and stakeholders in the construction industry.

ABSTRAK

Kebanyakan firma pembinaan mengalami kesusahan semasa krisis ekonomi disebabkan oleh bidaan yang tidak tepat dan kesukaran untuk mendapatkan projek baharu kerana kos yang tidak stabil. Pilihan terbaik untuk firma pembinaan semasa krisis ekonomi adalah untuk mengawal kos bida pembinaan yang sesuai dengan keadaan. Kos bidaan semasa krisis ekonomi menyebabkan kerugian dalam pelaksanaan projek. Kajian ini mengkaji bagaimana sektor pembinaan di Dubai, United Arab Emirate, mengalami prestasi bidaan yang lemah semasa krisis ekonomi. Ini terbukti apabila kos bahan turun naik dan syarikat-syarikat pembinaan mengalami kesukaran untuk mendapatkan projek baharu disebabkan oleh bidaan yang kurang tepat. Kajian ini meneliti butiran pengurusan bidaan pembinaan semasa peringkat pembidaan dengan membangunkan model matematik bida pembinaan untuk membantu firma pembinaan mengelakkan masalah pembidaan semasa krisis ekonomi. Dengan menggunakan data yang dikumpulkan daripada kemerosotan ekonomi pada tahun 2009 dan 2010, model matematik bida pembinaan dan metodologi pelan bidaan telah dibangunkan sebagai persediaan kepada syarikat-syarikat pembinaan semasa krisis ekonomi. Kronologi kajian ini dibahagikan kepada dua fasa. Fasa pertama melibatkan kajian literatur yang luas dan mengumpulkan data sekunder. Fasa kedua memberi tumpuan kepada pengumpulan data primer dan analisis data yang telah dikumpul. Kajian dokumentari dan tinjauan soal selidik digunakan sebagai sumber dan alat untuk mengumpulkan data. Data dianalisis menggunakan pekali variasi dan *severity index*. Daripada data yang ada, model matematik bida untuk bidaan berjaya dibangunkan. Sepuluh orang pakar mengesahkan model ini dan data yang dianalisis menunjukkan bahawa model tersebut berjaya mengurangkan ketidaktepatan anggaran serta meramalkan masalah yang dihadapi terutamanya dalam pembidaan semasa krisis ekonomi. Dapatan kajian menunjukkan bahawa pelan krisis-tindakan sangat penting untuk membasmi risiko, mendapatkan pasaran dan menyediakan penyelesaian kepada masalah yang dihadapi semasa krisis. Kesimpulannya, model ini boleh digunakan untuk meminimumkan kesan buruk ke atas syarikat-syarikat pembinaan, termasuk projek-projek dan pemegang taruh dalam industri pembinaan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AACE	-	American Association of Cost Engineers
AED	-	United Arab Emirate Dirham
AASE	-	Airborne Arctic Stratospheric Expeditions
BCR	-	Beyond Contractual Reward
BIM	-	Building Information Modelling
BQ	-	Bill of Quantities
CIOB	-	Chartered Institute of Buildings
COV	-	Coefficient of Variation
DCAM	-	Division of Capital Asset Management
GCC	-	Gulf Corporation Council
GFA	-	Gross Floor Area
GSA	-	General Service Administration
ICE	-	Institute of Civil Engineers
IBS	-	Industrialized Building System
MEED	-	Middle East Economic Digest
MEP	-	Mechanical Electrical and Plumbing
MTD	-	Maintenance Training Device
PC	-	Prime Cost
PRI	-	Profitability Requirement Index
PRIR	-	Profitability Responsiveness Item Ranking
RD	-	Repair and Alteration
RICS	-	Royal Institute of Chartered Surveyors
SF	-	Square Foot
SMM	-	Standard Method of Measurement
WSDOT	-	Washington Department of Transportation
UAE	-	United Arab Emirate

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background of the Research

Construction bidding cost for residential building projects in Dubai during economic crisis will be analyzed to determine the construction bid mathematical model for the year 2009 and 2010. This period was chosen to reflect the latest economic crisis of Dubai and show the difficulties of bid winning of residential building projects (MEED, Middle East Economic Digest Cost Indices Report, 2012). The bases of developing the bidding mathematical model which is a unique contribution for this study and will be a reference for the construction companies during the economic crisis (Jung *et al,* 2016).

Instead of preparing precise basic reasons for fluctuations in price, forecasting bid levels was given more emphasis. And the achievement or disappointment of a project can be judged based upon various factors yet the most well-known factor is the cost. The most vital component to a client is ordinarily to finish the project within budget (Wood, 2010).

Many unsuccessful businesses were the result of more and more inexperienced people forming construction firms and venturing into the construction sector each year, as free exit naturally follows free entry. The construction sector's unpredictability including high risks further added to this situation. According to Kaka (1990), the high risks include elements of weather, site problems as well as the

need to price building materials before they were manufactured in the old way of tender bidding.

It is obvious that difficulties of winning new bid of residential building existed in Dubai during the economic crisis in 2009 and 2010. According to Gugler *et al*, (2015), these difficulties were due to the wrong cost estimation. Likewise, Mansfield *et al*. (1994) asserted that wrong cost estimation was due to construction market fluctuation (The tender stage for Dubai's residential buildings during the economic crisis is very crucial and important and the estimations done in these stages must be accurate and precise).

The wrong cost estimation and the difficulties of getting new residential building projects were faced by the United Arab Emirates (UAE) construction firms in 2009. In addition, the construction market was suffering the effects of an economic liquidity crunch and that was evident in the impact on tender prices (MEED, 2012).

Therefore, competing among contractors in the construction industry, increased which resulted high rate of residential building projects bid failure and the construction market instability. Many attempts to identify and solve the problem of construction bidding failure in residential building projects in the construction industry during the economic crisis were in conflict. The construction bidding cost has attracted a lot of attention in the recent years. However, more efforts are required to achieve a successful bidding especially during the economic crisis.

To obtain an exact estimate for residential building projects in Dubai during economic crisis is very critical. While it is not easy to prepare the budget forecast as it involves predicting the nature of residential building project, on the other hand, lack of cost forecasting for residential building projects was the main cause for the failure of construction firms in Dubai during economic crisis (Challal and Tkiouat, 2012). To be able to conduct cost forecasts on a frequent basis, the method used has to be simple, fast and reliable. Current construction bid models for residential

building projects have not considered bid evaluation stage during economic crisis. Consequently, cannot be used for residential building during economic crisis (Apeldoorn, 2013; Pucker *et al.,* 2006).

Moreover, all residential building projects are known to have some form of risk due to market fluctuation especially during economic crisis. Most Dubai contractors did not adopt construction bid model for residential building projects during economic crisis. According to Latham (1994), risk of market fluctuation in the construction sector must be anticipated and handled well, reduced as much as possible, either solved together or relocated. In this regard, construction bid must be managed according in Dubai peculiarity taking into account construction market fluctuation during this economic crisis 2009 and 2010 (Myers, 2017). This research effort is made to introduce approaches for predicting construction bid model associated with residential building projects.

1.2 Problem Statements

It is obvious that the residential building project during economic crisis can never be considered successful if the cost, upper and lower limits are applied to it are not satisfied (Elchaig *et al*, 2005). And most common causes of residential buildings failure in construction industry during economic crisis were low profits and inadequate market risk (Kanggari, 1988). Large construction companies in Dubai failed to dominate a respectable share of the market. To this effect, accurate market price fluctuation information, feedback of building materials, equipment and technologies during residential building projects necessary to allocate the required risk factor for this residential building bid during economic crisis is questionable. Consequently, these companies are always characterized by fluctuations and crisis effect.

Also due to global economic crisis, the impact on tender prices after the real estate crash was reflected on the commodities, costs for thirty two (32) key items.

These include cost of materials, labor, plant and fuel. Likewise, it involves the price movements for major items, such as concrete in foundations, reinforcement steel and formwork to slabs and soffits. Tender prices is not just the material cost, but also the cost of transporting and placing the materials, it has tracked commodity items using this compounded rate as used in tender information (MEED Cost Indices Report, 2012).

Most construction companies faced bidding cost issues due to the wrong estimation of cost especially during the economic crises period. The wrong estimation of cost is commonly found in the tender and bidding stages (www.dubaided.gov.ae). The tender stage is very crucial and the estimations done on these stages must be accurate in Dubai especially during economic crisis. If the contract sum was wrongly estimated, then the construction company will lose this job. This is not good for the company in terms of its image, reputation, loyalty and good market rating (Sriprasert, 2000).

Currently, conventional bidding cost model could not adequately fulfill the needs of construction sector needs, since most of the conventional models did not incorporate the market fluctuation uncertainties in such a challenging environment, residential building projects must integrate market fluctuations (Abdallah, 2007).

In Dubai, the shift towards construction bid cost was driven by two major reasons. Firstly, the need to estimate bid projects and secondly, the need for construction companies' innovation in the bidding cost model of residential building projects. In developing countries like UAE, the high demand for residential buildings pressures on global market situation and competition compelled construction companies to innovate alternative bidding models to improve estimation for residential building projects (Al Sharif, 2007).

Construction markets are complex and require careful segmental bid models. The construction industry has undergone considerable model change in the last decade. Clients that are ever demanding and fierce competitions have resulted in

many construction companies having to look for ways of: beating their competitors. They focused on new bidding models, getting to know market situation of residential building projects, doing their marketing before trying to participating in their bids (Christopher *et al.,* 2003). Hence, this study focused on the Dubai's economic crisis in 2009-2010 to answer several questions arised

1.3 Research Questions

1. Do construction firms face bidding problems in residential building projects in Dubai during economic crisis (2009-2010)?
2. Do construction bid factors of residential building projects arise during market fluctuation?
3. Has there been any construction bid model to achieve appropriate estimation for residential building projects during the economic crisis?
4. Is there any construction bid risks that arise for residential building projects during economic crisis?

1.4 Aim and Objective

The aim of this study is to develop a construction bid cost mathematical model during economic crisis for residential buildings in Dubai, United Arab Emirates. To achieve this aim, the following objectives are identified:

i. To identify and establish the factors that influence bidding cost for residential buildings during economic crisis.
ii. To establish the components of bid model necessary to be considered in bidding cost model during economic crisis.
iii. To develop the construction bid mathematical model of a residential building project in Dubai during economic crisis.
iv. To validate the bid model statistically through expert opinions.

1.5 Scope of the Research

This research focused on build construction bid model for residential building projects in Dubai during economic crisis. The research made used of typical bidding documents for Dubai's residential building projects for the year 2009 and 2010. The first questionnaire was developed to establish the required cost mathematical model and construction bidding cost components. The second questionnaire on the other hand focused on establishing the main components affecting residential building projects bidding. It also deals with the main variables in developing the bid mathematical model. Furthermore, the type of the projects considered are residential buildings. To this effect, the bidding stage for project executed duration for economic crisis was the main focus. On the other hand, the documentary analysis was performed to get an insight on the real market fluctuation and to explore the factors and components affecting bidding cost during economic crisis to establish the construction bid mathematical model and contractors' bid plan

1.6 Research Methodology

The research is divided into four phase 1, 2, 3 and four respectively, as illustrated in the Figure 1.1. Phase 1 deal with the identification of research problems and establishing the aims and the objectives of the research.

Phase 2 covers a review on the information regarding the problem, construction-bidding cost during economic crisis in Dubai; factors influencing residential building bidding cost during economic crisis, construction bidding cost components during economic crisis and existing construction bidding cost models.

Phase 3 deals with the , documentary analysis to investigate the bidding cost of construction for residential buildings during the economic crisis from 2009 to 2010. Likewise, Phase 3 involved questionnaire surveys to support the documentary

analysis in order to determine the construction bidding cost problems for residential buildings during the economic crisis in Dubai,

Phase 4 covers development of construction cost bid mathmatical model, bidding paln and validation of the model.

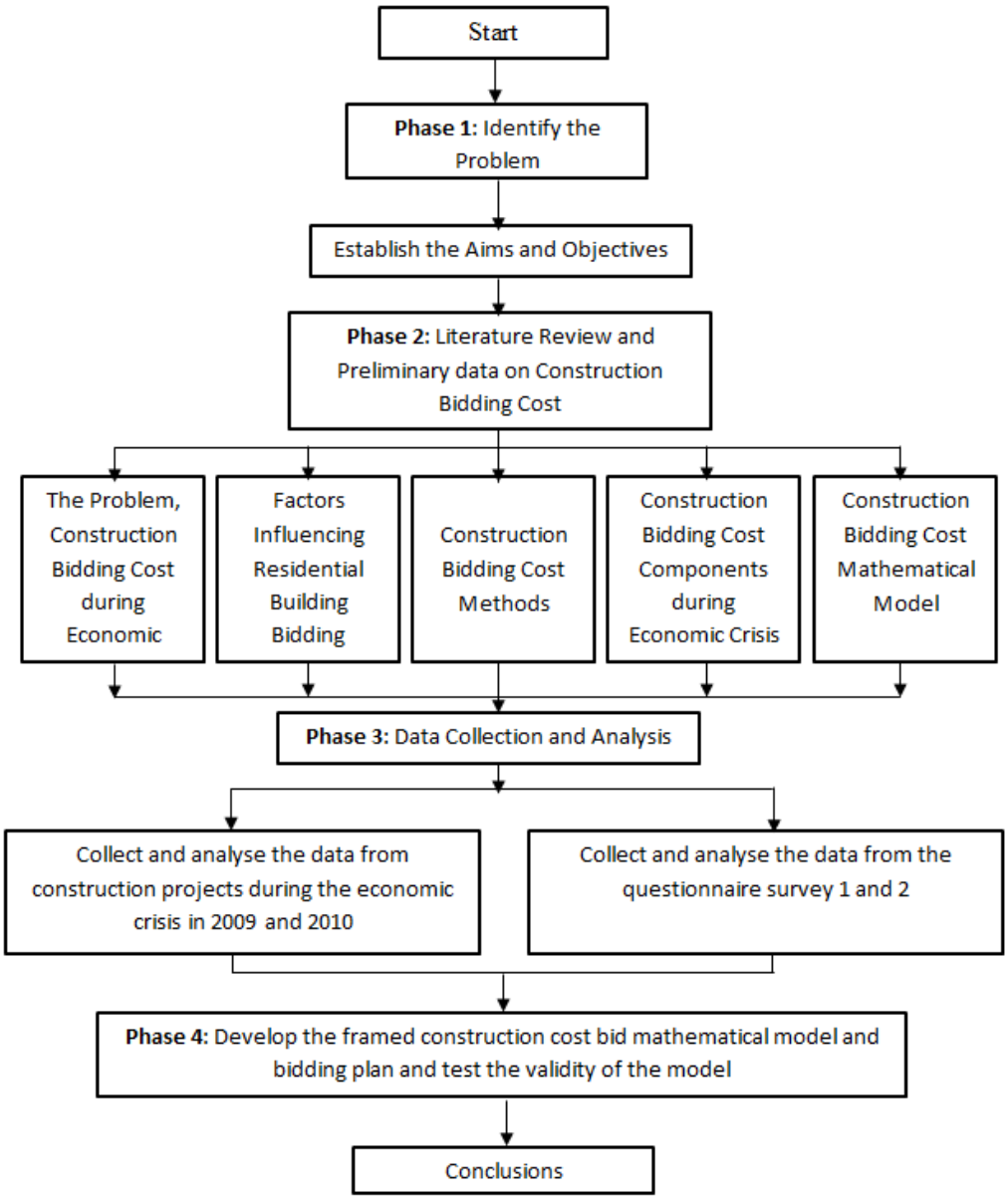

Figure 1.1: Research Methodology

1.7 Significance of the Research

The reaearch identifies and established those factors influencing bidding cost for residential buildings during the economic crises. Likewise, construction bid mathematical model for residential building projects that incorporate construction market fluctuations and accurately predicts the biddig cost during the economic crises is developed. The model can be used by relevant firms for predicting the demand of ideal cost estimate of residential building projects for biding stage during economic crisis. Consequently, this will assist construction firms to survive the most competative environment during the economic crises with increased level of satisfaction.

1.8 Thesis Organization

This thesis is divide into six chapters. **Chapter 1** which consists of background of the research, problem statement, objectives of the research, scopes of the research, and significant of the research aimed to highlight the introduction aspect of this research work.

Chapter 2 consists of comprehensive literature review based on the research topic. The literature reviewed covers the general overviews on factors affecting construction bidding cost. The chapter further reviews the available construction biiding cost methods It also describes the overview of construction bid cost mathemamtical models.

Chapter 3 explained the methodology, data collection and analysis conducted to achieve the research objectives. The chapter discussed the research approach and overall research flow chart.

Chapter 4 describes the results for the data collected from documentary analysis, questionnaire phase 1 and questionnaire phase 2. It also discusses the

results of projects' prices during the economic crisis, construction bidding cost item components for data collected from the documentary analysis, the results for the residential building projects bidding cost in the form of graphs and tables, the construction bidding methodologies of bidding cost and the construction bidding cost components during the economic crisis.

Chapter 5 presents the final results of the study, the construction bid cost mathematical model for residential buildings including validation tests for the model and then establish the contractors' construction bidding plan as well as cost components.

Chapter 6. Finally, overall conclusions were made based on the objectives. Recommendations for further investigation based on the research outcome acknowledge during this study were mentioned and highlighted

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