INDUSTRIALIZED BUILDING SYSTEM VALUE MANAGEMENT BY USING BUILDING INFORMATION MODELING

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To my beloved family and specially my dears father and mother

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ABSTRACT

Value management (VM) is a structured and logical practice meant to pursue a value of money in every necessary purpose levels of quality and performance. These important elements (time, cost and quality) will be optimally balance as VM application is focusing on value rather than cost. Therefore adopting VM approach in industrialized building system (IBS) will ensure value for money projects delivered to the client.

This research has established the VM framework for implementation in IBS project by investigating the perception and understanding of VM, studies the critical elements and Using BIM tools to show the factors that affecting the Value Management. At the present time, construction industry is lacking information concerning predefined value management which can be used by building information system (BIM). Thirteen factors which have a main influence on the performance from VM studies in construction are recognized through the literature review. In addition the study also indicated that the project viability issues must be addressed accordingly at the strategic level before being implemented and also should be carry out as early as possible to maximize the benefits VM. To support the successful of VM implementation in IBS projects, focus need to be given on the relationship with the clients. Founded on these aspects, is to prioritize the IBS value management with reference to BIM principals as much as possible to ensure the success of IBS for the construction.

ABSTRAK

Pengurusan nilai (VM) adalah amalan berstruktur dan logik bertujuan untuk mendapatkan nilai wang dalam setiap peringkat untuk kualiti dan prestasi . Elemen-elemen penting (masa, kos dan kualiti) ini mengimbangi secara optimum kerana aplikasi VM memberi tumpuan kepada nilai dan bukan kos. Oleh itu menggunakan pendekatan VM dalam sistem binaan berindustri (IBS) akan memastikan projek yang berbaloi dengan kos diberikan kepada pelanggan .

Kajian ini telah membina rangka kerja VM untuk pelaksanaan dalam projek IBS dengan menyiasat persepsi dan pemahaman VM, mengkaji elemen-elemen kritikal dan menggunakan alat BIM untuk menunjukkan faktor-faktor yang memberi kesan kepada Pengurusan Nilai. Pada masa ini, industri pembinaan kurang maklumat mengenai pengurusan nilai yang telah ditetapkan yang boleh digunakan dengan sistem maklumat bangunan (BIM) . Tiga belas faktor yang mempunyai pengaruh utama terhadap prestasi daripada kajian VM dalam pembinaan dikenalpasti melalui kajian literasi. Di samping itu, kajian ini juga menunjukkan bahawa isu-isu kelangsungan projek perlu ditangani dengan sewajarnya di peringkat strategik sebelum dilaksanakan dan juga perlu dijalankan seawal mungkin untuk memaksimakan manfaat VM. Bagi menyokong kejayaan pelaksanaan VM dalam projek-projek IBS, tumpuan perlu diberi kepada hubungan dengan pelanggan. Berdasarkan kepada aspek-aspek ini, keutamaan pengurusan nilai IBS adalah dengan dengan merujuk kepada prinsip-prinsip BIM bagi memastikan kejayaan IBS untuk pembinaan.

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LIST OF ABREVIATIONS

VM	-	Value Management
POE	-	Post Occupancy Evaluation
PPE	-	Post Projection Evaluation
CSF	-	Critical success factors
KPI	-	Key Performance Indicators
BIM	-	Building Information Modeling
IBS	-	Industrialized Building System

CHAPTER 1

INTRODUCTION

1.1 Introduction

Value management (VM) is a structured and analytical process that seeks to achieve value for money by providing all necessary functions at the lowest cost and consistent with required levels of quality and performance (AS/NZS, 1994). VM, which has been widely used in many developed countries for several decades, is a useful tool that can help the industry to meet these challenges.

On one hand, the major reasons for choosing VM, according to Shen and Chung (2002), are to achieve cost saving, establish a clear project objective and provide creative thinking for design improvement. This target cannot be met unless there is a clear cut picture on the virtual realization of actual situation of the projects in terms of time; cost and quality which are crucial cause of concern in VM process, also so that in order to assess the process of value management, it is necessary to implement the feedback system during execution of the project.

As a matter of fact, construction projects are subjected to changes so that there is a requirement of this issue to have the updated feedback throughout the whole process of construction project. Timely and targeted feedback will able the project management to identify problems early and make adjustment that can keep the project on time and within budget. Building information modeling (BIM) is one of the effective virtual systems of performance measurement tools and feedback tools for managing projects value. The research writer aims to develop the usage of BIM in order to assess the value management in construction projects.

1.2 Background from the Study

Value management is a planned and systematic procedure that search for reach value for money by offering all from the essential functions at the lowermost rate steadily with required ranks from excellence and presentation. A VM study is usually prearranged in the mode from a workshop that takes the collected of multidisciplinary group of stakeholders to evaluation, making definite group know as client as a necessities and grows a cost-effective explanation in the way from an expert organizer who monitors an established set from actions. If appropriately executed, it allows administrations to adopt a steady mode towards decision-making, taking into account the needs from the business, the environment within which it is operating, and the people involved (BS EN12973, 2000). As an effective tool for meeting the increasing demands for value enhancement by clients (DellTsola, 1982; Kirk et al., 1988; Barton, 2000), VM has been widely utilized in lots from countries for at least for five decades. The US government requires all of its executive branches and federal agencies to establish and preserve cost-effective VM procedures and procedures in all programmes and projections (SAVE International, 2001).

In recent years, the "Rethinking Construction" (Egan, 1998) and "Accelerating Change" (Construction Task Force, 2002) reportages have a set of demanding progress goals for the construction industry. These include a 10% decrease in capital cost and construction time, a 20% decrease in defects and accidents, a 10% increase in productivity and turnover and profits, and a 20% increase in predictability. To accomplish these goals, a key recommendation from the Task Force was to accelerate supply-side integration and the integration of the teams. In response to these challenges, the production industry is undergoing a series of changes. Teamwork and information sharing, for example, are preferred than the old adversarial culture. The VM methodology is ideally placed to bring multidisciplinary teams and stakeholders together and to work towards the similar direction of value creation for customers.

The help that VM provides organizations to compete more efficiently in local, national and international markets is often cited. VM does this by decreasing costs, increasing profits, progressing quality, expanding market share, saving time, solving problems, and using resources more efficiently (SAVE International, 2008). In construction, frequently referred advantages from using VM also include: decreasing construction costs, decreasing operational and maintenance costs, simplifying procedures, progressing projection schedules, decreasing waste, increasing procurement productivity, using resources more efficiently, and growing innovative solutions. The realization from these advantages depends very much on the performance from the VM studies.

Measuring performance is crucial towards the progressing the performance. This is widely accepted and practiced in the manufacturing and service sectors. In the last decade, several performance measurement models have been created, e.g. the SMART model by Cross and Lynch (1988), the performance measurement questionnaires by Dixon et al. (1990), the balanced scorecards by Kaplan and Norton (1996), and the European Business Excellence Model (EFQM, 2003). Foremost barriers to using these tools have also been known (Bititci and Came, 1998; Bourne and Neely, 2000). For example, lots from available performance measurement tools

utilize historical data. As a result from this, they actually measure past performance, leaving a deficiency from immediacy between measurement and progress. These tools often require cumbersome, laborious and time-consuming procedures of data collection, sorting, maintenance, and reporting. Lots from companies do not see the justification for the resources required to measure this past projects. This seriously undermines the perception from the value and beneficialness from these tools. There is also a deficiency from appropriate models to efficiently take into consideration non-financial and less tangible aspects. The combination from these problems often results in a vicious circle of negative perceptions, which leads to insufficient resources being made available, which in turn lead to poor measurements and, eventually, a loss of support and commitment of senior management.

BIM from past and current projects is a tool to expedite this situation. VM in the Malaysian production industry is the main thrust and focus from this research. As Malaysia progresses towards a develop nation status, the contribution from the production industry in Malaysia towards the expansion procedure is of paramount importance. It is in this context that VM can be considered valuable as its application can lead to significant saving leading to better value and better functional completed construction projections. Though VM was first presented to the Malaysian production industry in 1986 (Jaapar & Torrance 2005) it has not yet become widely practiced in the Malaysian construction industry.

1.3 Research aims

The research aimed to provide the readers with the basic understanding of the relation between Value Management Methodology and Building Information Modeling. The aim from this study is to provide a method for measuring the performance for VM in IBS projects and through Building Information Modeling (BIM).

1.4 Research objectives

The objectives of this research are as follow:

1) To obtain the perception and understanding of value management in construction industry.

2) To act the critical elements of value management in IBS construction.

3) To show the factors affecting the Value Management in IBS in order to be integrated to BIM application.

1.5 Problem Statement

Even though there are numerous studies have been undertaken towards value management, only few are used successful in measuring a Value Management VM by using Building Information Modeling (BIM). To make the concept of value management in line with the objectives sets by the executing and functional project managers, there is need of using BIM as a tool which can satisfy the objectives of both value management optimization in construction industry. In order to do so, the research aims at objectives which are mentioned herewith and fortunately after deploying the project all of these objectives have been met through the case study of IBS method of construction.

1.6 Scope of Study

The scope of this study is targeting the construction projects which are dealing with several difficulties regarding controlling the time and cost that leading to performance of the project. The research aims is to use BIM to check the costs of the items for managing the value of the (IBS) projects.

1.7 Brief Research Methodology

In order to meet the above mentioned objectives, the Auther proposes to carry out the following methodology as in Figure 1.1 it outlines the processes involved in to the completion of this project. It is divided into two distinct phases: phase 1 encompasses of scope and objectives determination, and literature review which considered as the information gathering and investigation process. Phase 2 is the phase where data collection and analysis has been made base on finding on analysis.

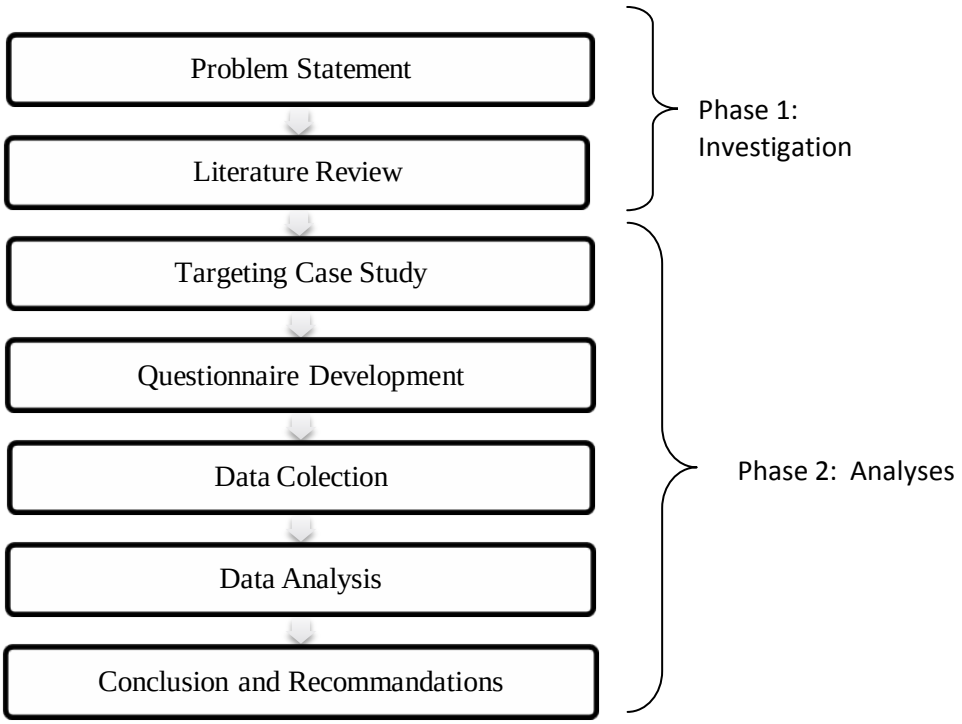

Figure 1.1 The Research design

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