Application of Value Engineering at Design Stage in Indonesia Construction Industry

by Herawati Zetha Rahman

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Mohammed Ali Berawi [a], Herry Priyatno [b], Yusuf Latief [c]
Sesmiwati [d], Herawati Zetha Rahman [e]

[a]*Civil Department, Faculty of Engineering, University of Indonesia, Depok*
E-mail : maberawi@eng.ui.ac.id

[b]*Civil Department, Faculty of Engineering, University of Indonesia, Depok*
E-mail : hp_p2b@yahoo.co.id

[c]*Civil Department, Faculty of Engineering, University of Indonesia, Depok*
E-mail : latief73@eng.ui.ac.id

[d]*Civil Department, Faculty of Engineering, University of Indonesia, Depok*
E-mail : sesmiwati@gmail.com

[e]*Civil Department, Faculty of Engineering, University of Indonesia, Depok*
E-mail : herazetha@gmail.com

ABSTRACT

Value Engineering is a systematic method that using function analysis to improve value of a project. The proper application of VW method is expected to deliver best value of a project in terms of quality, technology, efficiency and innovation. This research is designed to evaluate the application of VE method in design stage of construction building in Indonesia. Based on the result of questionnaire survey and interviews, it was found that the application of VE in the design stage has not been optimized applied due to the lack of VE understanding and incomplete VE process. Therefore a recommendation on a proper VE method based on International standard is proposed to solve problems encountered in Indonesia.

Keywords

Value Engineering, Building Construction, Design Stage, Optimizing

1. INTRODUCTION

Construction of buildings has the sequence of stages that starts from formulation stage, planning and design stage, construction and controlling stage and closing stage (Kohli, 2007). Planning decisions are made by the stakeholders at design stage in order to maximize the use of resources during the construction stage. Unfortunatelly, the execution of construction building in Indonesia is still relatively inefficient (Rochmanhadi, 1992; Latief and Untoro, 2009). Inefficiencies in the management of construction projects can be found from the high wastage that leading to cost overrun and delays (Soemardi, Wirahadikusumah and Abduh, 2007, Latif and Untoro, 2009).

The challenges of building construction has been recognized by the government and in order to improve efficiency, Regulation of the Minister of Public Works No. 45/PRT/M/2007 is published. Based on the regulation the application of Value Engineering (VE) at the design and construction stage of buildings need to be performed, especially for public buildings with an area of more than 12.00m^2 or over eight (8) floors.

Unfortunatelly, construction practitioners in Southeast Asian countries generally not mastered the concepts and methods of VE (Cheah and Ting, 2005). It is supported by research from Latief and Untoro (2009) that a series of problems are still occurred in the implementation of VE in Indonesian construction industry include lack of knowledge and understanding on the VE study.

The main objectives of this research are thus to determine the benefits and key success factors of VE application in the design phase in Indonesia, to evaluate the gaps on the application of VE that occur in the design phase of buildings in Indonesia and international standard and finally to suggest a recommendation to optimize the application of VE.

2. VALUE ENGINEERING IN CONSTRUCTION INDUSTRY

2.1. The Development of Value Engineering

Based on the standard SAVE (2007), the concept of value began in the late 1940s by Lawrence D. Miles who worked at General Electric (GE), a defense contractor who faced a crisis of materials to produce products during World War II. The situation then be realized that if the value and innovation improvement could be systematically managed, it would have increase the competitive advantage of company through the concept design of the integrated function analysis with innovative process known as value analysis (VA).

Application of VA was expand and also change in context from review existing parts to improving conceptual design, the term marked the emergence of Value Engineering(VE) used by U.S Navy in 1954. In the early 1960s, VE started to be applied in the construction industry (Shen and Guiwen, 2003). At that time the contractors were required to reduce project costs without compromising quality and function of construction works. To overcome this, the contractors and the clients begin to apply the VE method at design stage. Next decade, many organizations or institutions applied VE method in the early stages of planning a product or service.

According to Djoko Ramiadji (1986) VE study in Indonesia has been recognized and applied in road construction, for example re-design of Cawang Fly Over Road Project during its construction. Implementation of VE in the project was used to produce several billion dollars cost savings. Since then, applications VE have been defined as a need and then be applied to road and building construction projects. But its applications have not yet describe the optimum results, understood as a costs optimization process through substitution method which did not refer to the VE process that has been best practiced in the international context.

2.2. Value Engineering Study

Implementation of VE study theoretically can be implemented during the project life cycle starting from the concept stage with a large potential for cost savings than if carried out during the construction phase. This is caused by a high flexibility in making changes without the expense and additional time to redesign if implemented at an early stage of the project (ASTM, 2010). According to Dell'Isola (1997) the implementation of VE study is better conducted at the beginning of the project and if applied later will increase the investment and change resistance will exist. A proper VE method as a systematic and multi-disciplined team approach to analyze the function (Berawi & Woodhead, 2005a; Berawi & Woodhead, 2005b) is expected to produce an optimum outcome for a project in terms of quality (Berawi, 2004), technology (Berawi & Woodhead, 2005c; Berawi, et.all, 2008), efficiency (Abdul-Rahman, Berawi, et.al, 2006; Woodhead & Berawi, 2008) and innovation (Berawi & Woodhead, 2008; Berawi, 2009) .

According to SAVE Standard (2007), the requirements of VE study are a) the team follows an organized job plan b) multidisciplinary group of experienced professionals and project stakeholders, and c) value team leader is trained in value methodology techniques. The VE study generally encompasses three stages include pre-workshop (preparation), workshop (execution of job plan) and post-workshop (documentation and implementation). The purpose of the job plan is to guide the team through a process to identify and focus on the main functions of the project to create new ideas that generate enhanced value. The job plan consists of the following sequential phase.

1. Information phase – The information phase aims to understand current conditions and their limitations.
2. Function Analysis Phase – This phase is an important in the VE study that aims to understand the project from the point of view function and identify the system or group function that have a high potential for improvement. This phase involves all members of the VE team together.
3. Creative Phase – The creativity phase aims to generate ideas of how other alternatives run the functions of the building/system or functions that have been identified as having high potential to be able to do improvements. In this phase, the VE study team utilize of creativity techniques to develop ideas in carrying out the functions of the building/system.
4. Evaluation Phase – The evaluation phase aims to reduce the number of ideas that have been identified to a list of of ideas that most potential to improve project outcomes.
5. Development Phase - The development phase aims to analyze and further develop the list of alternative ideas/ the most potential to improve project outcomes.
6. Presentation Phase - The presentation phase aims to explain the alternative value (value) to the management team and other stakeholders or decision makers.

3. RESEARCH METHODOLOGY

Quantitative and qualitative researches are both used to achieve the objectives of this research. The quantitative methodology is conducted through a questionnaire survey both online and offline while the qualitative method is applied using in-depth

interview. The offline questionnaire survey were conducted to reach wider respondents which distributed to the Indonesian construction industry stakeholders that are incorporated in 9 mailing list of construction industry and Indonesian VE association (HAVEI). Interview was conducted by Indonesian practitioners and experts. The following criteria of expert are having education at least bachelor degree with working expert on construction projects at least 13 years and have been involved in the VE study.

The data was analyzed using the descriptive procedure in SPSS to describe the application of VE in the design stage. The data was analyzed using Cronbach's Alpha as a method to ensure data's reliability. Reliability is the ability of the questionnaires to consistently measure the topic of research at different rimes and across different population (Hinton, 2004). The data was later analyzed using One-Sample T test in order to check whether the data obtained from the questionnaires are significant by comparing the mean of the data with the hypothesized population mean (Morgan, 2004).

The in-depth interview was conducted when the trend of the answer from respondents were determined after analyzing the data obtained from the questionnaire. The semi structured interview was conducted to explore the underlying reasons of the respondents that contributed to the answer in the questionnaires.

4. RESEARCH RESULTS

4.1. Questionnaire Survey Result

This section presents the results of questionnaire survey regarding to application of VE at design stage of building construction. Data collection of questionnaire were gained from distributing questionnaires among construction stakeholders in Indonesia.

The total number of return questionnaire are 51 in which the profession respondents as a contractor (33.33%), consultants (31.37%), government staff (17.65%), developers (7.84%). The majority education of respondents have bachelor degree (76.47%) followed master degree (17.65%). Only a few respondents who have national certification (23:53%) whereas the international certification (9.8%).While the position of the respondents was dominated by civil engineers (27.45%) and project managers (21:57%) and architects (5.77%). Respondents' experience according to their profession, majority of the questionnaire answered by the respondents have 1-4 years experience (35.29%), more than 13 years experience (33.33%) and 5-8 years experience (13.73%).

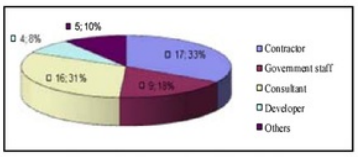

Figure 1 : Respondents Description

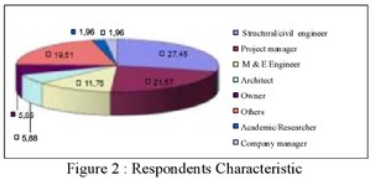

Figure 2 : Respondents Characteristic

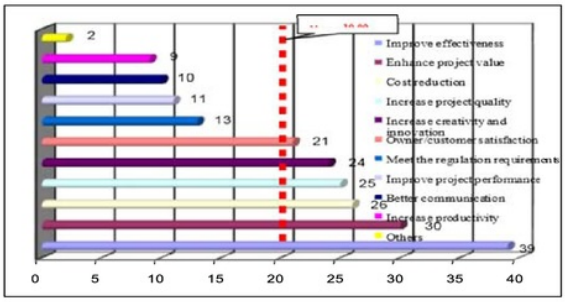

Figure 3 : The Benefits of Value Engineering/Value Management

As shown in Figure 3, respondents are asked to define the benefits of VE application. From the 10 benefits VE as cited in questionnaire, the majority of Indonesian construction stakeholders only aware the two benefits from application of VE in the design phase, namely improve effectiveness and enhance project value.

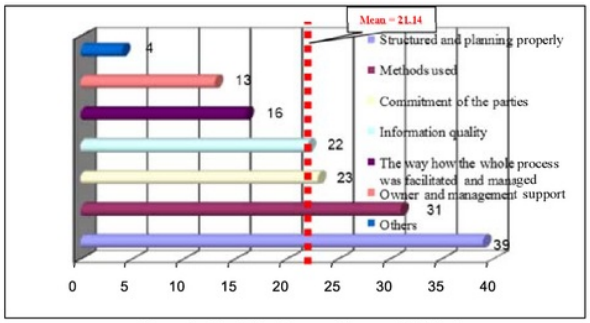

Figure 4 : The Critical Success Factors of VE Study

Figure 4 illustrated majority of the respondents response on the critical success factor application of VE. From six key success factors in the questionnaire, the majority of Indonesian construction industry stakeholders only select the structured and planning properly.

Based on the result of questionnaire, the suitability of VE application with international standards have many gaps. This can be found from the answer given in questionnaire about the activities, materials and tools at pre-workshop, workshop stage and post workshop stage.

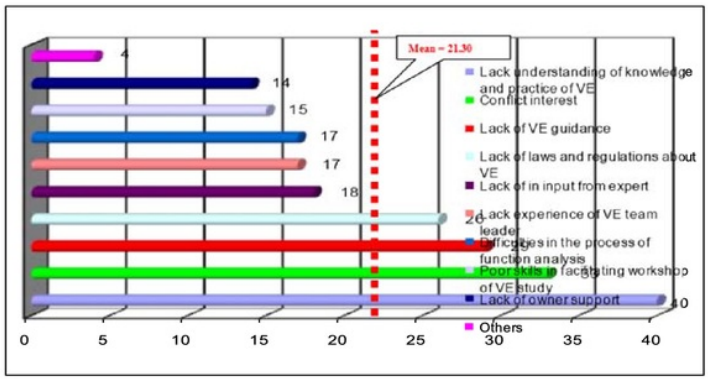

Figure5 : The Problems of VE Application

Incompatibility/gaps of VE application at design stage of buildings and the problems of VE application are determined as a lack of knowledge and practice of VE, conflict interests and lack of VE guidance that has been shown in Figure 5.

4.2. Interview Result

The interview result are summarized in the following table.

Question		Interview with Experts
Q1-Application of VE in Indonesia	Causal Factors	- The absence of law or others regulation to force the stakeholder to understand VE correctly - Lack of socialization or delivery of VE materials that are less proper in the socialization - There is an understanding that the benefits of VE just for cost effectiveness, quality control, and quality assurance. - Lack of knowledge about the VE, methods and requirements of VE - Often found failures in the use of VE method in practice
	Improvement Efforts	- Arrange a law of VE - Socialization - Provide and publicize the results of VE studies - Improve or straighten the understanding of VE
Q3- Constraints to fulfill the requirements of the VE Team Leader	Constraint	Lack the expertise of VE
	Improvement Efforts	- Socialization and publication of certificate of VE program - Require a certificate of VE expert consultants - VE become the university curriculum
Q3 –VE workshop	Improvement Efforts	- Strengthening the presence of association VE in Indonesia - Provides practical guidance of VE - Workshops and seminars of VE - Increasing attention and interest of construction industry stakeholders about VE application
Q4 – The problems that often occurs in the application VE	Causal Factors	- Lack of socialization of VE - Lack of knowing the VE international standard - Lack of experience of VE studies - Less concerned about professional responsibility
	The causes of conflicts of interest	- The interests of efficiency (contractors) are faced with the interests of aesthetics (architects) - The procurement system - The results difficult to implement associated with attitude of resistance to change - The results of less adequate planning
	The causes of lack VE guidance	- Lack capabilities of writing VE guidance - less understanding about VE by construction stake holder

5. CONCLUSION

There is a highly need to optimizing the application of VE in the design phase of buildings in order to produce the best value outcome. Currently, the gaps between the execution of VE in Indonesia with international standards still prevalent and followed by lack of experience on the implementation of VE in Indonesia. The application VE in building construction projects more toward cost optimization through substitution method and carried out informally in public buildings. The problems in the application of VE in Indonesia are caused by a lack of knowledge and practice of VE, especially the use of function analysis (FAST Diagram) the existence of conflicts of interest and there is no guidance of VE.

The proposed recommendation to optimize the application of VE are to arrange enforcement of VE with the state law as practiced in the USA, to provide VE guidance and hand book, socialization on VE through regular training or workshop, VE to be incorporated in the university curriculum, and strengthen the presence of VE association in Indonesia.

ACKNOWLEDGMENT

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Key Performance Indicators for Public Infrastructure Project in Malaysia

Syuhaida Ismail[a], Aminah Md Yusof[b]

[a]*Department of Civil Engineering*
UTM RAZAK School of Engineering and Advanced Technology
Universiti Teknologi Malaysia International Campus
54100 Kuala Lumpur
Malaysia
Tel : (+603) 26154654. Fax : (+603) 26934844
E-mail : syuhaida@ic.utm.my

[b]*Faculty of Civil Engineering*
Universiti Teknologi Malaysia
81310 Skudai Johor Malaysia
Tel : (+6012) 7102340. Fax : (+603) 26934844
E-mail : aminahyusof@utm.my

ABSTRACT

Public infrastructure projects interest the member of public at large. Nevertheless, with the belt-tightening budget, public infrastructure projects in Malaysia are procured by the private concessionaire on behalf of the government. These 'privatised' public infrastructure projects however resulted in high-profile problems due to poor public accountability, reduction in competition and development of monopolies embedded in these procurement approaches. Therefore, this paper explores the necessity of the key performance indicators (KPIs), a monitoring tool which ensures that private concessionaires perform their responsibilities effectively. Thus, with the aim of formulating the definition and variables of the KPIs for the assessment of public infrastructure projects performance in Malaysia, this paper establishes the KPIs of public infrastructure. Questionnaire survey is undertaken in prioritising the KPIs where the Statistical Packages of Social Science (SPSS) results demonstrate that 63 from 78 variables from the KPIs variables from literature review are included as KPIs for public infrastructure projects in Malaysia. Thus, this KPIs establishment urges the need for KPIs in monitoring the performance of private concessionaire and rising private concessionaire's responsibility and accountability in undertaking public infrastructure projects in Malaysia for the betterment of public infrastructure provision and finally encouraging the KPIs implementation in Malaysia's construction industry.

Keywords

Key performance indicator, public infrastructure facility and service, project performance, monitoring and benchmarking tool

1. INTRODUCTION

Various tools have been used in enhancing the performance of an organization or a company especially when money is a key matter in one's business. This includes the most established tool of performance monitoring known as Key Performance Indicators (KPIs) where the practice in Business Intelligence (BI) has proven that these KPIs are able to improve the performance in a systematic and logical way by quantifying the performance and then comparing this performance against others [1] [2]. Thus, with the same agenda, the Malaysian government has an inspiration of improving the performance of the public infrastructure projects which are claimed as synonymous with delays and shoddy workmanship [3], which inherently cause problems and heavy expenditure to the government. These public infrastructure projects are previously procured by the government yet now is delivered by the private concessionaire due to government's intention in reducing its budget deficit and balance sheet constraints [4].

However, the current trend of public infrastructure projects delivered by the private concessionaire is also notorious with the monopoly of PFI projects by certain private concession entities who have relative connection or company affiliation with those who have authority in relation with public infrastructure provision. This monopoly exercise has consequently demotivated the private concessionaires particularly Bumiputera in participating in the provision of public infrastructure projects in Malaysia. Therefore, it is essential for this paper to explore the necessity of the key performance indicators (KPIs) in monitoring the performance of private concessionaires. Via the KPIs, the private concessionaire is accountable to perform their responsibilities effectively as their performance is linked to the reward and penalty system of performance-based payment mechanism.

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