KEY PERFORMANCE INDICATORS FOR VALUE MANAGEMENT
IMPLEMENTATION IN CONSTRUCTION INDUSTRY

MUHAMMAD ADAM BIN ABD KADIR

A dissertation submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Science (Construction Management)

Faculty of Civil Engineering
Universiti Teknologi Malaysia

MAY 2013

To all my family members, especially to my beloved mother and father who always gives me supports and encouragements to me, not only in financial terms but also in providing the motivations and encouragements to achieve success.

ACKNOWLEDGEMENTS

Grateful to Allah S.W.T. His mercy and His consent could be me take this opportunity to thank all those involved directly or indirectly in providing guidance and guidance and inspiration and support in conducting this study. Appreciation addressed to Prof. Prof Dr Aminah Md Yusof on her willingness to spend time in guiding and supporting me in doing this research, especially during the discussion and review.

Not forgetting to thank the Institute of Value Management Malaysia (IVMM) in providing useful information. Also to the Value Management Division of Economic Planning Unit (EPU), consultant, contractors and other parties for their cooperation in this research either directly or indirectly.

Thanks are also given to all the members of my family and friends that much patience in giving encouragement and support in completing this dissertation.

ABSTRACT

Today, Value Management (VM) is an approach that has been widely used by various industries in managing their projects or programs to get the best value. In reaping the advantages of the VM implementation, Malaysia is no exception to implement the VM in construction projects, especially for projects carried out by the government. Therefore, the implementation should be implemented properly so that the implementation objectives can be achieved. To ensure the implementation of the VM is implemented well, the performance of its implementation should be measured. Various methods have been introduced to measure the performance of the work and one of them is the implementation of the Key Performance Indicators (KPIs). KPIs implementation has been widely used in measuring the performance of a project or work processes. Due to this reason, research is conducted to identify the trends of VM implementation in the construction industry in Malaysia, and then formulate the KPIs to measure the performance of its implementation. To achieve that purpose, a set of 187 questionnaires were distributed to the selected respondents to get their opinion on the VM and the implementation of KPIs to measure the performance of the VM in the Malaysian construction industry. The frequency analysis and average index showed that all 47 of the proposed have been agreed by the respondents. However, the obtained results are merely meant as a guide to identify KPIs for the implementation of VM in the Malaysian construction industry. The selection and screening of these KPIs should be conducted again to see the interest of each KPI in the projects undertaken.

ABSTRAK

Hari ini, Pengurusan Nilai (VM) adalah suatu pendekatan yang telah banyak digunakan oleh pelbagai industri dalam menguruskan projek atau program mereka bagi mendapatkan nilai yang terbaik. Berdasarkan kelebihannya, Malaysia juga tidak terkecuali melaksanakannya dalam projek-projek pembinaan, khususnya bagi projek-projek yang dijalankan oleh pihak kerajaan. Namun begitu, VM haruslah dilaksanakan dengan sempurna agar tercapai objektif yang ditetapkan. Prestasi pelaksanaannya haruslah diukur untuk menentukan samada ia dilaksanakan dengan baik atau tidak. Pelbagai kaedah telah diperkenalkan untuk mengukur prestasi sesuatu kerja, diantaranya ialah pelaksanaan Petunjuk Prestasi Utama (KPI). Pelaksanaan KPI telah banyak digunakan dalam mengukur prestasi sesuatu projek atau proses kerja. Kajian ini dijalankan untuk mengenal pasti arah aliran pelaksanaan VM dalam industri pembinaan di Malaysia, seterusnya merangka KPI untuk mengukur prestasi pelaksanaannya. Bagi mencapai maksud itu, maka 187 set borang soal selidik telah diedarkan kepada responden yang terpilih untuk mendapatkan pendapat mereka tentang VM dan pelaksanaan KPI untuk mengukur prestasi pelaksanaannya didalam industri pembinaan di Malaysia. Kaedah asas seperti analisis kekerapan dan indek purata menunjukkan bahawa kesemua 47 senarai KPI yang dicadangkan telah dipersetujui oleh responden. Walaubagaimanapun, keputusan yang perolehi ini hanyalah sekadar panduan untuk mengenalpasti KPIs untuk pelaksanaan VM dalam industri pembinaan di Malaysia. Pemilihan dan penyaringan semula KPI ini perlulah dijalankan semula dengan melihat kepentingannya dalam projek-projek yang dijalankan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVATIONS

AI	–	Average Index
ANOVA	–	One-Way Analysis of Variance
BQ	–	Bill of Quantity
BRE	–	Building Research Establishment
BS	–	British Standard
BSC	–	Balanced Scorecard
C & S	–	Civil and Structure
CEO	–	Chief Executive Officer
CIB	–	International Council For Research And Innovation In Building and Construction
CIRIA	–	Construction Industry Research and Information Association
CSC	–	Committee of Standards and Cost
CSFs	–	Critical Success Factors
EPU	–	Economic Planning Unit
FIDIC	–	International Federation of Consulting Engineers
IBS	–	Industrialize Building System
ICE	–	Institution of Civil Engineers
ICU	–	Implementation Coordination Unit of the Prime Minister
IIU	–	International Islamic University
IT	–	Information Technology
IVMM	–	Institute of Value Management Malaysia
JKR	–	Jabatan Kerja Raya
KPIs	–	Key Performance Indicators
M & E	–	Mechanical and Electrical

MANOVA	–	Multifactorial Analysis of Variance
MOF	–	Ministry of Finance
NAD	–	National Audit Department
NKRAs	–	National Key Result Areas
PAM	–	Pertubuhan Akitek Malaysia
PMD	–	Prime Minister's Department
PWD	–	Public Works Department
ROI	–	Return On Investment
SMT	–	Senior Management Team
SPSS	–	Statistic Package Science Social
UITM	–	Universiti Teknologi MARA
UK	–	United Kingdom
UM	–	Universiti Malaya
US	–	United State
USM	–	Universiti Sains Malaysia
UTM	–	Universiti Teknologi Malaysia
VA	–	Value Analysis
VE	–	Value Engineering
VM	–	Value Management
VMCP	–	Value Management Change Proposal
VMIC	–	Value Management Incentive Clause
VR	–	Value Review

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1   Introduction

Construction industry is one of the sectors that contributed to a country development by providing necessary facilities such as infrastructure, residential areas, industrial areas and others. In general, the construction industry consists of three types, namely building construction, civil construction and heavy construction or industrial construction. Each type of construction industry is different in design, level of professionalism, planning, construction method, construction experts, and others. The construction industry is a field that has a very broad scope, which is related to the cost, time, quality, environmental impact, safety and health. Therefore, the good management is necessary in managing construction projects, to ensure that it is successfully implemented thus improving the quality of the construction industry sector.

Nowadays, the construction industry has been a process of more complex and unique in its implementation. This occurs due to the demand from customers who have different backgrounds to meet their lifestyle needs. Therefore, some of the issues that exist must be resolved with the right approach, especially in managing the

demands and the needs of customers. The parties in the construction industry recognise that the approaches used in the managing the construction projects are constantly changing and becoming more challenging. Because of this, it makes them compete with each other to offer the best products and provide excellent services to customers. Thus, the parties in the construction industry must become more productive, creative and innovative in their products or services so that they can survive in this business. Because of various processes involved in the construction project, managing a project properly before, during and after the construction is very important to be scrutinised carefully. Failure to manage properly and not adopting the best practices in construction projects can affect the successful of the project. Further, this leads to issues such as cost overrun, low quality of work, lack of work coordination, delays of work and others.

Studies on the factors that lead to cost overruns in a project found that both internal and external factors in the business are contributing to the cost overruns. These factors are fluctuations in raw material prices, the cost of materials that are not stable, high cost of mechanisation, the lowest bid method of procurement, poor site management, a long period between the design stage and time to biding or tendering, the method of cost estimation is not correct, the occurrence of additional work, improper planning and the use of government policies that do not fit (Azhar et al., 2008).

Lack of communication skills will also lead to many problems, especially in relation to work coordination. The occurrence of misunderstanding and inaccurate instructions given to employees for the job execution is some of the communication problems. In the end, these resulted the job done is not in accordance to specifications. For these reasons, then corrective work should be done to ensure it is in accordance with the specification provided. Thus, the correction of the work done can cause the project cost to increase from the original cost. Moreover, it is also causing interference on the original schedule due to some changes in the working period.

Other issue in construction industry is on low quality of its final product (Kubal, 1994; Kanji & Wong, 1998; Wong & Fung, 1999; Wan Mahmood et al., 2006). The construction industry has been criticised and compared with other sectors like manufacturing and services due to low quality product. Other than that, criticism is also focusing on its process, people or employees involved and materials as well as equipment used (Wan Mahmood et al., 2006). Because of that, construction practitioners have to put their efforts to introduce a variety of techniques and tools, particularly in managing projects to achieve a better quality of work.

It is important to generate best solution for the issue, which has significantly affected the construction industry reputation. The construction industry needs knowledge development so that new techniques can be produced to solve problems pertaining to the issue. A good knowledge in management is a key point for the construction industry in ensuring the construction projects delivered very well. With that reason, today the knowledge of management has grown tremendously in line with the changes of technology and demand from industry's requirement.

As clients, they always want to know how the advancement of money invested by them for projects. Therefore, the concept of value for money is used where it relates to the costs involved in producing the product, whether it is relevant or irrelevant to the cost and product satisfaction to be achieved. This approach often called as the Value Management (VM).

VM is a structured program to maintain and enhance an appropriate balance between the wants and needs of stakeholders with the resources available to ensure that they satisfy their needs (The Institute of Value Management). In another definition, VM also referred to as a rigorous and systematic system that enhances and optimises the value of the project cost and facilities without sacrificing the level of performance required (Che Mat, 2004; Che Mat & Mohd Shah, 2006). In other words, VM is a creative program to perform working together in achieving the requirements of clients and stakeholders (Che Mat, 2010).

Identifying and adding value to a measurement by focusing on the objectives and its functions before solution is making, it is the principle of VM implementation where it can increase the innovation in VM progress (The Institute of Value Management). VM is a unique framework in which it combines several management styles such as using positive methods to motivate individuals and teams in the VM team, emphasising the environment in the organisation and use of effective methods and tools (The Institute of Value Management).

Referring to practitioners from various countries, there are few reasons why VM is necessary in construction. As European and Australian practitioners, they have applied VM to support "hard" project problems and "soft" management issues (Leung, 2009). Here, the "hard" project problems are such as reduce cost, reduce waste of resources, time saving, problem solving and decision making, while the "soft" management issues are such as communication improvement, share understanding, team work enhancement and conflict reduction (Leung, 2009). For American practitioners, they use VM to satisfy the government requirements as well as to solve the project problems in terms of risks, costs and wastage (Leung, 2009). Practitioners from Hong Kong use VM based on their experience to support decision, objective setting, idea creation, communication improvement and information sharing (Leung, 2009).

With VM implementation, it creates opportunities and benefits to the construction project. Due to these positive results, it has become a popular and necessary approach that recommended to be used in managing a construction project especially in developed countries. Furthermore, the implementation of VM also encourages the creative solutions and innovative approaches which indirectly resulting the improvement on the construction management and enhancing the construction project value in the future.

By looking at the implementation of the VM which is providing a positive impact, it is very important to ensure that the VM is implemented properly and

carefully. Because of that, an approach to evaluate its success that can be achieved should be conducted. Various methods can be used to evaluate. Among the methods used were as the Balance Scores Card, Benchmarking, Key Performance Indicators (KPI) and others. However, KPI is seen as a common method used by organisations to evaluate its success or the performance of a particular activity in which it is engaged.

Looking at the implementation of the KPIs for the VM, it has already been implemented and there are studies that have been done about it. This can be proved by a study conducted by Lin et al. (2008) entitled "Identification of Key performance Indicators for Measuring the Performance of Value Management Studies in Construction".

1.2   Problem Statement

Pickles (2000) stated that VM is a structured, systematic and analytical process, in which it seeks to achieve Value for Money by providing all necessary functions at the lowest total cost consistent with the required level of quality and performance. This approach distinguishes the needs from the clients, establishing the function of purpose of a project with the lowest cost and satisfying clients' needs in the most economical manner.

Internationally, construction industry is more complex and challenging. Due to the need in improving the knowledge of construction management purposely to become a versatile in the industry, VM is a fundamental knowledge that should be studied and understood by practitioners. This is for, continuously, increasing the value provided to the client and as an important tool in construction project (Ellis, Wood et al., 2005; Jaapar, 2008). It can be also considered as critical to a success in a

project due to its ability in providing a basis for an improvement of value for money in construction (Ashworth & Hogg 2000; Jaapar & Torrance 2006).

The Prime Minister of Malaysia, Datuk Seri Najib Tun Razak said that the research done by researchers in Malaysia in the year 2009 on the impact of VM implementation in Malaysia found that the construction projects in the country that have implemented VM has been recorded saving on initial project cost by between 10% and 30% (Bernama, 2011). Due to the concern from the Malaysians government about these issues, on 29 December 2009, a circular has been issued by the Economic Planning Unit (EPU), which is known as Guideline of VM Implementation in Malaysia.

In construction management, it may involve planning and scheduling, coordination, resources management and monitoring. Therefore, it should be properly managed in ensuring the project is running smoothly according to plan and avoid from the occurrence of the wastage of construction material. Improper controlling the construction material will cause waste in construction and it can attribute to environmental problems (Wahab & Lawal, 2011). The National Development Planning Committee of Malaysia has identified several issues. These issues include the weaknesses of planning and conducting the project in early stage, such as failure to determine the scope of a project which it is the common concept should be used in facilities and financial allocation, in construction of a building (Unit Perancang Ekonomi Jabatan Perdana Menteri, 2009). Other issues are such as failure to take into account the needs of the whole project and lack of integration in the planned project between the ministry and other agencies (Unit Perancang Ekonomi Jabatan Perdana Menteri, 2009).

By taking the advantages of using VM in the construction industry into consideration, the implementation of VM in Malaysia constructions industry has actively disseminated. Many studies have been conducted in improving the implementation of VM in construction project such as Che Mat (1999), Jaapar

(2008), Jaapar & Torrance (2006), Jaapar et al. (2008), and Jaapar et al. (2009). Despite these efforts have been implemented, the implementation of VM has not yet widely practiced in Malaysia (Jaapar & Torrance, 2005) and it still in infancy or early stage even though it is to provide a robust platform for consultants and the stakeholder to achieve value for money on proposed construction project (Jaapar & Torrance, 2006). Additionally, a survey that has conducted to investigate the awareness of VM in the construction industry, has reported that 78% of the respondents knew about VM, but only 16% of them are well understood about the VM, which knowledge is gained from the training and exposure they had received (Jaapar et al., 2009).

Besides that, a study about the factors that hinder the successful implementation of VM that conducted by Idrus et al. (2010) found that the factors are lack of local guidelines and info about VM, interruption to normal work schedule, too expensive to carry out the VM, conflicting of objective by different parties and not suitable for low-cost project. These obstacles seem to reflect that VM implementation in Malaysia is relatively not well received among the members in the construction industry. Even, some of the projects that implement the VM in construction projects, it is reported that the VM has been successfully implemented. Most of the project has been reported the project successful to the cost saving in the range at 10% to 30% in relation to the overall project.

It is sufficient to assume that the successfully implemented VM is entirely depending on project cost saving? How do they measure the performance of VM implementation so that we could regard VM as successful implemented? What are the parameters or indicators that they have used to conclude its success? Is it the cost saving is called as an indicator of successful implementation of VM? Whereas the value in VM related to a good value for the function of a project, good quality and optimal overall project cost. Therefore, this indicator plays very important role in evaluating the success in the implementation of the VM and the development of KPIs for VM should be conducted. Even though KPI have been brought to bear in Malaysian construction industry since incorporated policy 1983 (Ismail, 2009), KPI

for VM studies in Malaysia have not yet seen. A study need to be carried out to explore the development of KPIs to evaluate the successful implementation of VM in Malaysia.

1.3   Aim and Objectives of Study

The aim of this study is to develop a framework for Key Performance Indicators (KPIs) for Value Management (VM) implementation in Malaysia construction industry, so that VM can be successfully implemented in construction industry. The following objectives are formulated in achieving this aim.

1. To review the current trend of VM implementation in Malaysian construction industry.
2. To analyse factors hinder the implementation of VM in Malaysian construction industry.
3. To develop a framework for Key Performance Indicators (KPIs) for VM in Malaysian construction project.

1.4   Scopes of Study

Previous research that has been carried out by Jaapar and Torrence (2006) reported the implementation of the VM in Malaysia construction industry and the embedded it within the university sector is still in early stage. After that, research studies about the implementation of VM in Malaysia construction industry provided prototype of the VM guideline to implement it in Malaysia construction industry

(Jaapar et al., 2008). Lastly, in the end of the year 2009, the circular about the guideline of implementation of VM in Malaysia had provided by country's Economic Planning Unit (EPU) of Malaysia. Although these guidelines are provided for the implementation of government projects, it is hoped that this study will help certain parties in implementing the VM for non-government projects. Therefore, this is accomplished as this study identifies current patterns of VM implementation, as well as the obstacles encountered in implementing the VM in the construction industry in Malaysia.

After many improvements have been made to the performance of the VM in the Malaysian construction industry, this study is undertaken to develop a framework for the KPI to the VM, so the VM implementation will continue its success to gain the advantages and benefits of its application in the construction industry. Therefore, it is not an intention of this study to come up with new KPIs, but tested the KPI for VM that that have been prepared by Lin et al (2008) in Malaysian construction industry. In addition, there are also some additional guidelines proposed in the implementation of these KPIs.

1.5   Research Methodology

Some research methodology was used to carry out this research, including a literature review, interviews, conducting a survey and data analysis. The Figure 1.1 shows the research flow to achieve the objective of this study.

```
┌─────────────────────────────┐
│     Exploration of Issues   │
└─────────────────────────────┘
              ↓
┌─────────────────────────────┐
│     Problems Formulation    │
└─────────────────────────────┘
              ↓
┌─────────────────────────────┐
│      Theoretical Review     │
└─────────────────────────────┘
              ↓
┌─────────────────────────────┐
│       Data Collections      │
└─────────────────────────────┘
```

Primary Data
Interview
Questionaires

Secondary Data
Book
Journal
News
Article

Data Analysis and Discussion

Conclusions and Recommendations
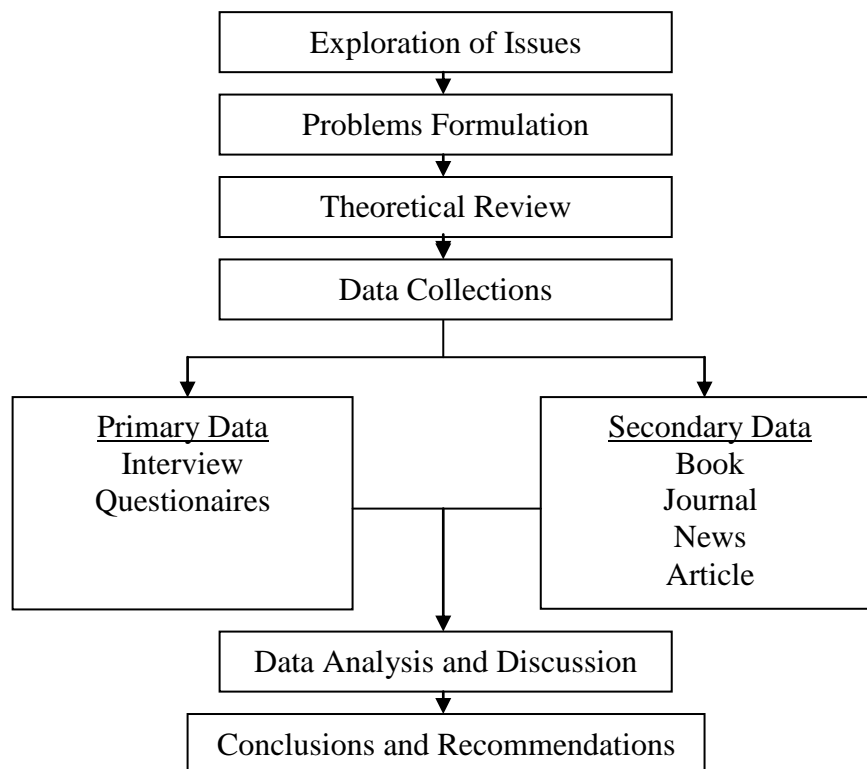
Figure 1.1 Research methodology flowcharts

(i)   Exploration of issues

Exploration of the issue of executed VM is to find out the problems that occur in the implementation of the VM. Exploration is done through reading literature such as articles and studies that have been conducted so far. Exploration is made to ensure that all possible recommendations can be made so that the VM can be implemented in the construction industry sector in Malaysia with better and more effective as well as to identify methods that can help in improving the implementation of this VM.

(ii)   Problem formulation

Problems identified in the exploratory phase of the issue are about the problems that arise in the implementation of the VM and so is the application of KPIs for VM execution. This is intended to ensure that the implementation of VM is subject to certain issues that attempted to be resolved in this study. Before the formulation of the problem is made, it has to take into account the scope of the study and research to be done in order to ensure that this study is not the equal of any studies that have been conducted. After that, it is also considered with reference and information can be obtained.

(iii)   Theoretical review

Study of VM is made to ensure that the objectives, concepts and the methods of VM implementation can be understood as a whole. In addition, the implementation of KPIs also examined for use in the implementation of the VM. With the aim of the study to ensure the successful implementation of the VM, the obstacles he faced were also identified. Further, with the availability of important information about the implementation of the KPIs for this VM, so it can serve as a basis in preparing to collect data for these study goals.

(iv)   Data collections

The data collected consist of two types of data, namely primary data and secondary data. The primary data is obtained by stating the question on the implementation of VM and the application of KPIs for VM in the current context. While the secondary data are obtained from the literature review

made by reading books, articles, journals, previous studies and so on. With the availability of secondary data, it can help in preparing questions in the questionnaire in order to obtain primary data.

Questionnaires were distributed to the targeted respondents, namely respondents who considered directly involved with VM. The respondents are comprised of members of the Institute of Value Management Malaysia and members of the Value Management Unit division of Malaysian Economic Planning Unit and several individuals known involved in Value Management.

This questionnaire is divided into three parts. The first section is about the information the respondent and the respondent's involvement in the implementation of the VM and KPIs for projects that they run. The second part is to identify trends in the current VM implementation and the third part is about the development of KPIs for VM execution.

(v)   **Analysis and Discussion**

Primary data were analysed by using basic analysis such as frequency analysis. Next, the results obtained are presented in the form of demographic data. In addition, the Average Index (AI) analysis is also performed to examine the level of agreement of respondents on the questions that follows the importance of the answers given by the respondents. In addition, the analysis using the Statistical Package for Social Sciences (SPSS) is also used for multi-criteria decision-making by making demographic data as independent variables.

(vi)   **Conclusion and Recommendation**

The results obtained from data analysis are used to establish the conclusions and recommendations for this dissertation. This part is considered as an important part in this dissertation. Conclusions are made for each issue that arises in the problem statement and a summary is made for each of the objectives to be achieved. Lastly, suggestions are made for improvisation in the future.

REFERENCES

Azhar, N., Farooqui, R. U., & Ahmed, S. M. (2008). Cost Overrun Factors In Construction Industry of Pakistan. *First International Conference on Construction In Developing Countries (ICCIDC–I) "Advancing and Integrating Construction Education, Research & Practice".* August 4-5, 2008. Karachi, Pakistan

Barton, R. T. (2000). Soft value management methodology for use in project initiation: a learning journey. *Journal of Construction Research*, 1(2), 109-123.

Bernama (2011, March 13). Office of Prime Minister of Malaysia: Application of Value Management is Important, Says PM. *Bernama*. Retrieved from: http://www.pmo.gov.my/?menu=newslist&news_id=6505&news_cat=13&cl =1&page=1731&sort_year=2011&sort_month=

BRE (1997). *Value From Construction; Getting Started in Value Management*. Building Research Establishment.

British Standard Institution (2000). *BS EN 12973*. London: British Standard Institution.

Chan, A., Scott, D., & Chan, A. (2004). Factors Affecting the Success of a Construction Project. *Journal of Construction Engineering and Management*, 130(1), 153–155.

Che Mat, M. M. (1998). The Challenges and Potentials of Value Management in Local Construction Industry. A Paper Presented at the Value Engineering in Construction Industry Seminar organised by Faculty of Civil Engineering, Universiti Teknologi Malaysia, CIDB and IEM.

Che Mat, M. M. (1999) The challenges and potential of value management in local construction industry. *Jurnal Alam Bina*, 2 (1), 41-47.

Che Mat, M. M. (2010). Value Management – The Way Forward. *Seminar Achieving Better Value in Construction Industry Through Value Management & Life Cycle Costing - Enhancing Assets and Cost Optimization*. 20 April 2010. Dewan A, Putrajaya International Convention Centre (PICC)

Che Mat, M.M., & Mohd Shah, Z. (2006). Value Management as an effective and efficient tool for Space Management. *In Value Management National Seminar.* University of Malaya, Kuala Lumpur.

CIB (1997). *Briefing The Team.* London: Thomas Telford.

CIRIA (1995). *A Client's Guide to Value Management in Construction.* Construction Industry Research and Information Association

Clifton, C. (2011). The Advantages of Key Performance Indicators. Retrieved October 10, 2011 from: http://www.ehow.com/list_7239706_advantages-key-performance-indicators.html

Cooper, L. (2010). CSF's, KPI's, Metrics, Outcomes and Benefits. *Do IT Yourself – itSM Solutions.* Retrieved October 10, 2011 from: http://www.itsmsolutions.com/newsletters/DITYvol6iss5.htm

Dali, M. Z. (2000). *Keberkesanan dan Penerimaan Pengurusan Nilai Di Dalam Industri Binaan Malaysia.* Bachelor of Quantity Surveying, Universiti Teknologi Malaysia, Skudai.

Dell'Isola, A. J. (1982). *Value engineering in the construction industry (3rd ed.).* New York: Van Nostrand Reinhold

Department of Statistics Malaysia (2010). National Product and Expenditure Account Third Quarter 2010. *Department of Statistics Malaysia.* Retrieved January 27, 2011 from: http://statistics.gov.my/portal/index.php?option=com_content&view=article&id=339%3Anational-product-and-expenditure-accounts-third-quarter-2010-updated-22112010&catid=45%3Aquarterly-gross-domestic-product-&lang=en

European Commission (1995). *Value Management Handbook.* European Commission

Fitz-Gibbon, C., T. (1990). *BERA Dialogues 2: Performance Indicator.* Bristol: WBC Print Ltd

George, D., & Mallery, P. (2010). *SPSS for Windows Step by Step: A simple Study Guide and Reference, 17.0 Update* (10th Ed.). Boston: Allyn & Bacon

Gilkey, C. (2012). The Difference Between Critical Success Factors and Key Performance Indicators. *Productive Flourishing*. Retrieved January 5, 2013 from: http://www.productiveflourishing.com/the-difference-between-critical-success-factors-and-key-performance-indicators/

Green, S. D. (1994). Beyond value engineering: smart value management for building projects. *International Journal of Project Management,* 12(1), 49-56.

Hammer, M. (2007). 7 Deadly Sins of Performance Measurement and How to Avoid Them. *MIT Sloan Management Review*. Retrieved from: sloanreview.mit.edu

HM Treasury. CUP Construction Guidance No. 2 Value for Money. Retrieved from: www.hm-treasury.gov.uk

ICE (1996*). Creating Value in Engineering*. UK: Thomas Telford

Idrus, A., Abdul Lateef, O., Khamidi, M. F., & Ab Rahim, M. S. (2010). The Implementation of Value Engineering Among the Malaysian Construction Consultants. *Management in Construction Researchers Association 9th Annual Conference and Meeting (MiCRA 2010).* December 1-2, 2010. UITM Shah Alam, 251-258.

Institute of Value Management Malaysia (2011). About us: Vision, Mission Statement & Objectives. *Institute of Value Management Malaysia.* Retrieved March 17, 2011 from: http://ivmm.org.my/v1

Ismail, S. (2009). *Key Performance Indicators for Private Finance Initiative in Malaysia*. Doctor of Philosophy (Civil Engineering) Thesis. University of Technology Malaysia, Skudai.

Jaapar, A. (2008), Value Management Study To The Malaysian Construction Industry. *Proceedings of the 3rd BEAN Conference.* May 2, 2008. James Parsons Building, Liverpool, pp 145.

Jaapar, A., & Torrance, J. V. (2005). Value management and its current status in Malaysia, *The Malaysian Surveyor,* 39(2): 14-25.

Jaapar, A., & Torrance, J. V. (2006). Contribution of Value Management to the Malaysian Construction Industry: A New Insight. *International on construction industry 2006.* Pedang, Indonesia, pp 101-109

Jaapar, A., Endut, I. R., Ahmad Bari, N. A., & Takim, R. (2009). The Impact of Value Management Implementation in Malaysia. *Journal of Sustainable Development,* 2(2). Canadian Center of Science and Education.

Jaapar, A., Takim, R., Endut, I. R., & Ahmad Bari, N. A. (2008). Value Management Guidelines for the Malaysian Construction Industry. *ALAM CIPTA International Journal on Sustainable Tropical Design Research & Practice*, 3(1).

Jaapar, A., Torrance, J. V. et al. (2004) Value Management? *Faculty of Architecture, Planning and Surveying*, Universiti Teknologi MARA

Kagioglou, M., Cooper, R., & Aouad, G. (2001). Performance management in construction: A conceptual framework. *Journal of Construction Management and Economics*. 19(1), 85–95.

Kaplan, R. S. (1983). Measuring manufacturing performance: A new challenge for managerial accounting research. *Accounting Review*, 58(4), 686–705.

Kaplan, R. S. (1986). Accounting lag—The obsolescence of cost accounting system. *California Management Review*, 28(2), 174–199.

Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard Measures that drive performance. *Harvard Business Review*, 70, 71–79.

Kaplan, R., S. & Norton, D., P. (1996). *The Balanced Scorecard: Translating Strategy into Action*. Boston: Harvard Business School Press.

Kelly, J., & Male, S. (1991). *The Practice of Value Management: Enhancing Value or Cutting Cost*. United Kingdom: The Royal Institution of Chartered Surveyor

Kelly, J., & Male, S. (1993). *Value management in design and construction: The economic management of projects*. London: Spon Press, Taylor and Francis Group.

Kelly, J., & Male, S. (2002). *Value management: Best Value in Construction*. Oxford, UK: Blackwell Publishing. pp 77-99

Kelly, J., Morledge, R., & Wilkinson, S. (2002). *Best Value in Construction*. Oxford: Blackwell Publishing.

KPI Working Group (2000). *KPI Report for The Minister for Construction*. London: Department of the Environment, Transport and the Regions.

Leung, M. Y. (2009). Reasons For Applying VM – An International Comparison. *SAVE International 2009 Conference*. June 29 – July 2, 2009. Detroit, Michigan USA

Lin, G.B. & Shen, Q.P. (2007). Measuring the Performance of Value Management Studies in Construction: A Critical Review. *Journal of Management in Engineering*, 23(1), 2-9.

Lin, G.B., Shen, G.Q., Sun, M. & Kelly, J. (2008). Identification of Key performance Indicators for Measuring the Performance of Value Management Studies in Construction. *Journal of Construction Engineering and Management.* 137(9), 698–706

Lin, G.B., Shen, Q.P. & Fan, S.C. (2004). A Framework for Performance Measurement of Value Management Studies in Construction. *Proceedings of 2004 International Conference on Construction & Real Estate Management.* Hong Kong. 307-311.

Lin, G.B., Shen, Q.P., Liu, G.W. & Fan, S.C. (2006). Linking KPIs to CSFs in the Performance Measurement of VM Studies. *Proceedings of 2006 International Conference on Construction & Real Estate Management*, Orlando, Florida, U.S.A., 1200-1204.

Male, S., Kelly, J., Fernie, S., Gronqvist, M., & Bowles, G. (1998).*Value management benchmark: A good practice framework for clients and practitioners*. London: Thomas Telford.

Marr, B. (2010). How to design Key Performance Indicators, Management Case Study. *The Advanced Performance Institute*. Retrieved from: http://www.ap-institute.com/white-papers.aspx

McNamee, R., Parker, M., & Philbrook, S. (2009). *Key Performance Indicators for the City of Melbourne's Building Team*. Bachelor of Science. Worcester Polytechnic Institute

Miles, L. D. (1989). *Techniques of value analysis and engineering.* Northbrook: Eleanor Miles Walker.

Miller, D. (1991). *Handbook of Research Design and Social Measurement*. California: SAGE Publication Ltd.

Miller, S. (2007). KPI or Key Performance Indicators - Learn How To Design, Fill With Data And Use. Retrieved October 7, 2011 from: http://ezinearticles.com/?KPI-or-Key-Performance-Indicators---Learn-How-To-Design,-Fill-With-Data-And-Use&id=512572

Mind Tools (2011). Critical Success Factors: Identifying the Things That Really Matter for Success. *Mind Tools*. Retrieved October 11, 2011 from: http://www.mindtools.com/pages/article/newLDR_80.htm

Mootanah, D. P. (2000). Theory meets practice: proposal for a dynamic value and risk methodology for project management. *Journal of Construction Research*. 1(2), 131–138.

Neely, A., Adams, C., & Kennerley, M. (2002). *The performance prism: The scorecard for measuring and managing business success*. London: Financial Times Prentice Hall.

New South Wales Treasury (2004). *Value Management Guideline: Total Asset Management*. Sydney: Treasury's Office of Financial Management

Norton, B. R., & McElligot, C. W. (1995). *Value management in construction: A practical guide*. Basingstoke, U.K.: Macmillan.

Parmenter, D. (2007). *Key Performance Indicators: Developing, Implementing, and Using Winning KPIs*. New Jersey: John Wiley & Sons, Inc.

Perera, S., Karunasena, G., & Selvadurai, K. (2003). Application of Value Management in Construction. *Built-Environment-Sri Lanka*. 4(1)

Pickles, L. (2000). Value Management – What is it and How is it Used. *The Hong Kong Institute of value management*. 6(4) and 7(1), 1-4

QFINANCE (2011). Understanding Key Performance Indicators. *QFINANCE*. Retrieved October 10,2011 from: http://www.qfinance.com/performance-management-checklists/understanding-key-performance-indicators

RAPIDBI (2007, July 29). Key Performance Indicators KPI's. *RAPIDBI*. Retrieved October 2, 2011 from: http://rapidbi.com/keyperformanceindicatorskpis/

SAVE International (2005). *Value Methodology Standard (Edition 2005)*. SAVE International.

Shen, Q.P., & Liu, G.W. (2003). Critical Success Factors for Value Management Studies in Construction. *Journal of Construction Engineering and Management*. 129(5), 485–491.

Skinner, W. (1986). The productivity paradox. *Harvard Business Review*. 64, 55–59.

The Institute of Value Management. What is Value Management. *The Institute of Value Management*. Retrieved Jun 11, 2012 from: http://www.ivm.org.uk/whatisivm.php

Thomson, D.S., & Austin, S.A. (2001) Construction Value Management Revisited: The Designer's Role. *Proceedings of Cobra 2001 Conference.* 3-5 September, Glasgow Caledonian University, Glasgow, UK, RICS Foundation, 1, 98-106.

Unit Perancang Ekonomi Jabatan Perdana Menteri (2009). *Pekeliling EPU: Garis Panduan Pelaksanaan Pengurusan Nilai (Value Management), Bilangan 3*. Putrajaya: Jabatan Perdana Menteri

Unit Perancang Ekonomi Jabatan Perdana Menteri (2011). *Panduan Pelaksanaan Pengurusan Nilai Dalam Program/ Projek Kerajaan*. Putrajaya: Jabatan Perdana Menteri

Upfold, D., & Turner, N. (2013). Data Collection. *Problem Gambling Institute of Oranto*. Retrieved February 28, 2013 from: http://www.problemgambling.ca/EN/ResourcesForProfessionals/Pages/DataCollection.aspx

Venkataraman, R. R., & Pinto, J. K. (2008). *Cost and Value Management in Projects*. New Jersey: John Wiley & Sons, Inc.

Vitez, O. (2011). The Advantages of Key Performance Indicators in Construction. Retrieved October 10, 2011 from: http://www.ehow.com/list_5985276_advantages-key-performance-indicators-construction.html

Wahab, A. B., & Lawal, A. F. (2011). An evaluation of waste control measures in construction industry in Nigeria. *African Journal of Environmental Science and Technology*. 5(3), 246-254

Walters, E. (2011). CSFs and KPIs. *12 Manage The Executive Fast Track.* Retrieved October 7, 2011 from: http://www.12manage.com/methods_rockart_csfs_kpis.html

Wan Mahmood, W. Y., Mohammed, A. H., Misnan, M. S., Mohd Yusof, Z., & Bakri, A. (2006). Development of Quality Culture in The Construction Industry. *International Conference on Construction Industry.* 2006, Pedang, Indonesia: 218-224.

Wandahl, S., & Bejder, E. (2006). Value Management in the Briefing Process. *Hong Kong Institute Value Management*. 2(2), 3-10.

Wikipedia (2011). Critical success factor. Retrieved October 11, 2011 from: http://en.wikipedia.org/wiki/Critical_success_factor