



VALUE ENGINEERING IN CONSTRUCTION BUSINESS IN SRI LANKA

BY

W.M.J. Wilegoda

Supervised By

Dr. L. L. Ekanayake

The Dissertation was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfillment of the requirement for the Degree of MBA in Project Management.

Department of Civil Engineering
University of Moratuwa

2009

92390



Abstract

Value Engineering concepts have been in the Sri Lankan construction industry for many years even though it has not been practiced effectively. The industry practitioners still rely on these concepts mainly in situations when their project cost exceeds the budget. Therefore, it has been more popular as a cost-cutting tool rather than a vital concept for value improvements.

Related literature however, reveals that Value Engineering (VE) concepts are very popular in other countries and are being used frequently in construction business to achieve improvements in value. Previous researchers have revealed that absence of a proper VE procedure is one of the main constraints for an effective VE practice in the Sri Lankan construction industry.

This study attempts to derive a procedure for establishing an effective VE practice for the Sri Lankan construction business. As a result, VE methodology and guideline / workbook were developed. Various VE manuals and guidelines that are being used in other countries were analyzed in order to determine a tailor-made VE methodology for the country.

The survey results revealed that people's awareness of VE methodology in these construction companies is not very satisfactory. However they are in favour of having a proper VE methodology and a guideline for a better practice in future. The ICTAD's latest move to include VE clauses into the 'Standard Bidding Document' were highlighted as clear indication of the future prospects for VE.

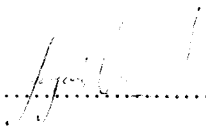
The methodology and the guideline / workbook developed has however, not been field tested. Therefore, another industrial survey consisting of presentations and discussions need to be carried out to find out, if any changes are needed for improvement. The ICTAD could be of help for further improvement of this



methodology and guideline in the aim of creating a standard VE methodology for the construction industry in the country.

DECLARATION

“I hereby declare that the work included in this dissertation as part or as whole, has not been submitted for any other academic qualification at any other university or institute. The material included in this document contains the findings of researcher and elsewhere abstracted of previous publications where references are provided accordingly.”

W.M.J. Wilegoda 

23rd January 2009

Approved By .. ***UOM Verified Signature***

Dr. L.L. Ekanayake

Department of Civil Engineering

University of Moratuwa

23rd January 2009

ACKNOWLEDGEMENT

I wish to express my sincere gratitude to my supervisor Dr. L.L. Ekanayake from the Department of Civil Engineering, University of Moratuwa for his continuous support and supervision during this dissertation.

Special thanks to Dr. Ahoka Perera and Dr. Chinth Jayasinghe of the Department of Civil Engineering, University of Moratuwa for their valuable suggestions and comments during the progress presentations. Further I would like to thank all the members of the Department of Civil Engineering for their support throughout the period.

My appreciation also goes to Heads of estimation department, construction mangers, senior quantity surveyors, engineers and project managers of the construction companies who shared information and made comments during the data collection. Also, valuable thoughts given by the senior quantity surveyors of various consultancy companies are gratefully acknowledged.

I express my thanks and appreciation to my family for their understanding, motivation and patience. Last but not least, I would like to thank to all my colleagues and friends who helped me on this dissertation.



University of Moratuwa, Sri Lanka
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

TABLE OF CONTENTS

Declaration	ii
Abstract	iii
Acknowledgement	iv
Table of content	v
List of figures	ix
List of tables	x
List of abbreviations	xii
CHAPTER – 1: INTRODUCTION	1
1.1 BACKGROUND	1
Evidence for use of Value Engineering (VE) in Business	3
Sri Lankan VE practice	4
Comparison of Global and Sri Lankan VE practice	5
1.2 THE RESEARCH PROBLEM	5
1.3 SIGNIFICANCE OF THE STUDY	5
1.4 RESEARCH OBJECTIVES	5
1.5 METHODOLOGY	6
1.6 LIMITATIONS OF THE RESEARCH	7
1.7 RESEARCH FINDINGS	7
1.8 ORGANIZATION OF THE REPORT	8
CHAPTER – 2: HISTORY, EXPANSION AND APPLICATIONS OF VE	10
2.1 WHAT IS VALUE ENGINEERING?	10
2.2 INVENTION OF VE CONCEPTS	10
2.3 IMPORTANCE OF VE CONCEPTS	10
2.4 VARIOUS VE APPLICATIONS IN BUSINESS	12
2.5 SUCCESS STORIES OF VE APPLICATION IN VARIOUS BUSINESS / PROCESSES	13

2.5.1	Examples of VE for Product Development	13
2.5.2	Examples of VE for Product Maintenance	14
2.5.3	Example of VE for Process Improvements	14
2.5.4	Example of VE for Procurement Improvements	14
2.5.5	VE for Internal System Improvements	15
2.6	VE IN CONSTRUCTION BUSINESS	15
2.7	POTENTIAL VE APPLICATION AREAS FOR CONSTRUCTION COMPANIES	17
2.7.1	VE Change Proposals	19
2.7.2	VE during Production	20
2.7.3	VE for Operation and Support	20
CHAPTER – 3:	RESEARCH METHODOLOGY & ANALYSIS OF RESEARCH RESULTS	22
3.1	RESEARCH METHODOLOGY	22
3.2	OVERVIEW OF DATA COLLECTION AND ANALYSIS	24
3.3	SELECTION OF DATA ANALYSIS TECHNIQUES	25
3.4	VE AWARENESS	25
3.5	ATTITUDE ON VE	26
3.6	AVAILABILITY OF VE METHODOLOGY / GUIDELINE	27
3.7	REQUIREMENT OF A VE METHODOLOGY / GUIDELINE FOR BETTER PRACTICE	27
3.8	INTEGRATION OF VE INTO EXISTING BUSINESS PRACTICE	28
3.9	ICTAD RECOGNITION OF VE	30
CHAPTER – 4:	ANALYSIS OF VE METHODOLOGIES / GUIDELINES	31
4.1	PROJECT SELECTION CRITERIA FOR VE	31
4.1.1	Analysis of SAVE International Project Selection Criteria	31
4.1.2	Analysis of UDOT Project Selection Criteria	31
4.1.3	Analysis of SOJVE Project Selection Criteria	32

4.1.4	Analysis of IDA Project Selection Criteria	33
4.1.5	Proposed Selection Criteria for Construction Companies	33
4.2	VE JOB PLAN	34
4.2.1	Analysis of SAVE VE Job Plan	35
4.2.2	Analysis of SOJVE VE Job Plan	38
4.2.3	Analysis of IDA VE Job Plan	40
4.2.4	Analysis of UDOT VE Job Plan	40
4.3	ANALYSIS OF PHASES OF VARIOUS VE METHODOLOGIES	42
4.3.1	Pre-Study Preparation Phase	42
4.3.2	Proposed Pre-Study Preparation Phase for Construction Companies	46
4.3.3	Information Phase	46
4.3.4	Proposed Information Phase for Construction Companies	47
4.3.5	Functional Analysis Phase	48
4.3.6	Proposed Functional Analysis Phase for Construction Companies	49
4.3.7	Creative Phase	49
4.3.8	Proposed Creative Phase for Construction Companies	51
4.3.9	Evaluation Phase	51
4.3.10	Proposed Evaluation Phase for Construction Companies	52
4.3.11	Development Phase	53
4.3.12	Proposed Development Phase for Construction Companies	54
4.3.13	Presentation Phase	54
4.3.14	Proposed Presentation Phase for Construction Companies	56
4.3.15	Post Study Stage - Implementation Phase	56
4.3.16	Proposed Implementation Phase for Construction Companies	57
4.3.17	Proposed VE Methodology / Job Plan for Construction Companies	57
CHAPTER – 5:	INTEGRATION OF VE INTO BUSINESS PROCESSES	61
5.1	VE AS AN ‘ENTERPRISE CHANGE MODEL’	61
5.1.1	What is a ‘Change Model’?	61
5.1.2	Examples for Change Models and comparison of their approaches	62

5.1.3	Comparison of VE approach with other Change Models	63
5.1.4	Comparison of VE with Business Process Re-engineering	64
5.2	HOW TO FACE CHALLENGES IN INTEGRATION OF VE INTO BUSINESS PROCESSES	64
5.2.1	Industry Awareness	64
5.2.2	Top Management Support	64
5.2.3	Peoples Resistance to Change	64
5.2.4	Cost of VE	64
5.2.5	Company Resources	71
5.2.5.1	People	71
5.2.5.2	Database	71
5.2.5.3	Technology	71
5.2.6	Availability of VE methodology	71
CHAPTER – 6: CONCLUSION AND RECOMMENDATION		
6.1	CONCLUSION	71
6.1.1	Significance of VE for business success	71
6.1.2	Findings	71
6.1.3	New VE methodology	71
6.1.4	Integration of VE into existing practice	71
6.2	RECOMMENDATION	71
6.2.1	Future Research	71
6.2.2	Promotion of VE practice	71
	References	71
	Bibliography	8
	Appendix - A: VE Guideline / Workbook	8
	Appendix - B: Analysis of Research Results	13
	Appendix - C: Engineering Economics Tables	15

LIST OF FIGURES

Figure – 4.1	-	SAVE International Generic VE Job Plan	35
Figure – 4.2	-	SAVE Value Management Job Plan with Details	36
Figure – 4.3	-	VE Job Plan Society of Japanese Value Engineering	37
Figure – 4.4	-	IDA VE Methodology	38
Figure – 4.5	-	VE Job Plan / Methodology	40
Figure – 4.6	-	Proposed VE Job Plan /Methodology	58
Figure – 5.1	-	Cook’s recommended persuaders	67



University of Moratuwa, Sri Lanka.
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

LIST OF TABLES

Table – 4.1	:	SOJVE –Project Selection Criteria	32
Table – 4.2	:	Proposed VE selection criteria for SL construction companies	33
Table – 4.3	:	SAVE pre –workshop stage	42
Table – 4.4	:	IDA orientation phase	42
Table – 4.5	:	UDOT –VE, Job plan –Detail 1	43
Table – 4.6	:	UDOT –Detail VE –job plan – Detail -2	44
Table – 4.7	:	SAVE Information phase	45
Table – 4.8	:	IDA Information phase	46
Table – 4.9	:	SAVE Function analysis phase	47
Table – 4.10	:	IDA Function analysis phase	48
Table – 4.11	:	SAVE Creative phase	49
Table – 4.12	:	IDA Creative phase	49
Table – 4.13	:	SAVE Evaluation phase	50
Table – 4.14	:	IDA Evaluation phase	51
Table – 4.15	:	SAVE Development phase	52
Table – 4.16	:	IDA Development phase	53
Table – 4.17	:	SAVE Presentation phase	54
Table – 4.18	:	IDA Presentation phase	54
Table – 4.19	:	SAVE Implementation phase	55
Table – 4.20	:	IDA Implementation phase	56
Table – 4.21	:	Proposed VE Job plan / Methodology –Details	59
Table – 5.1	:	Comparison of key elements of enterprise change models	61
Table – 5.2	:	An example for VE study cost calculation	69

TABLES IN APPENDIX - B

Table – 1A	:	Answer summary of question – 1a	136
Table – 1B	:	Answer summary of question – 1b	136
Table – 2A	:	Answer summary of question – 2a	138
Table – 2B	:	Answer summary of question – 2b	138
Table – 3A	:	Answer summary of question – 3a	140
Table – 3B	:	Answer summary of question – 3b	140
Table – 4A	:	Answer summary of question – 4a	142
Table – 4B	:	Answer summary of question – 4b	142
Table – 5	:	Answer summary of question – 5	144
Table – 6	:	Answer summary of question – 6	145
Table – 7	:	Answer summary of question – 7	146
Table – 8	:	Answer summary of question – 8	148
Table – 9	:	Answer summary of question – 9	149
Table – 10	:	Answer summary of question – 10	150

ABBREVIATIONS

BPR	-	Business Process Re –engineering
BPVE	-	Business process Value Engineering
CBA	-	Costing, Choosing by Advantages
DFAS	-	Defense Finance and Accounting Service
FAST	-	Functional Analysis System Technique
FMEA	-	Failure Measurement Error Analysis
GE	-	General Electric
ICTAD	-	Institute of Construction Training and Development
IDA	-	Institute of Defense Analysis
INVEST	-	Indian Value Engineering Society
IT	-	Information Technology
NCASL	-	National Contractors Association of Sri Lanka
O & S	-	Operation and Support
QA	-	Quality Assurance
SAVE	-	Society of American Value Engineering
SBD	-	Standard Bidding Document
SOJVE	-	Society of Japanese Value Engineering
SWOT	-	Strength, Weaknesses, Opportunities and Threats
UDOT	-	Utah Department of Transportation
US	-	United States
USA	-	United States of America
VA	-	Value Analysis
VE	-	Value Engineering
VECP	-	Value Engineering Change Proposal
VM	-	Value Management
VP	-	Value Planning