VALUE ENGINEERING APPLICATION GUIDELINES
For Public Projects

prokom
PROJECT MANAGEMENT EXCELLENCE
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Preface

The purpose of this document is to further clarify the policy, process and procedure on VE implementation in public projects in line with the Malaysian Government’s circulars; “Value Management Implementation Guideline No.3/2009” and “Value Management Implementation Guide in Government Programmes / Projects”, as published by the Economic Planning Unit of the Prime Minister’s Department, Malaysia.

The document outlines the policies on VE governance, framework and study interventions focusing on JKR work process, and as well as to set standards of VE practice in public projects. This document is useful and practical for individuals or groups intending to apply VE in their projects and to enhance knowledge in the subject matter.

Notwithstanding the purpose of this document, it is applicable for usage by private agencies and academic institutions as guidance and reference. The list of VE tools and techniques is not exhaustive and not limited to what have been suggested in this document.
Acknowledgement

Our heartfelt gratitude to those who have contributed knowledge, ideas, effort and time to develop this document:

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Acronyms & Abbreviations

A.C.I.D  Authorize-Consult-Inform-Do
CVS     Client Value Systems
D&B     Design and Build
EIA     Environmental Impact Assessment
EPU     Economic Planning Unit
FAST    Function Analysis System Technique
GFA     Gross Floor Area
HODT    Head of Design Team
HOPT    Head of Project Team
JAN     Jabatan Audit Negara
JKR     Jabatan Kerja Raya
JPS     Jabatan Pengairan dan Saliran
PDA     Preliminary Detailed Abstract
PFI     Private Finance Initiative
PM      Project Manager
PPP     Public-Private Partnership
PO      Programme Office
POE     Post Occupancy Evaluation
RFP     Request For Proposal
RM      Risk Management
SAVE    Society of American Value Engineers
S.M.A.R.T Specific-Measurable-Attainable-Realistic-Timely
SOA     Schedule of Accommodation
SPN     Seksyen Pengurusan Nilai
S.W.O.T  Strengths-Weaknesses-Opportunities-Threats
VA      Value Assessment
VE      Value Engineering
VECP    Value Engineering Change Proposal
VEMM    Value Engineering Methodology Matrix
VM      Value Management
VR      Value Review
VRM     Value Risk Management
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1. INTRODUCTION OF VALUE MANAGEMENT
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1. INTRODUCTION OF VALUE MANAGEMENT

Value Management (VM) has been recognized globally as an emerging paradigm that focuses on continuously increasing the value delivery to the client. It is widely accepted as an important tool in management of construction projects. A well-managed and effective implementation of VM will result in value enhancements aimed at achieving or even surpassing client’s expectation.

VM has seen growth in its development and implemented at various intervention points across a wide range of construction project types. It is highly effective when implemented early in the planning phase of a project. Its effectiveness reduces in subsequent project phases, i.e. design, construction and operation. It maximizes project value throughout the life cycle in a well-structured process and a comprehensive manner.

In today’s competitive environment, governments around the world are constantly challenged to deliver better value for less due to shrinking budgets and resources. Decision makers are forced to re-evaluate and enhance organizational processes to ensure robust prioritization of programmes or projects and better distribution of funds in delivering long term value for the public.

As a fast developing nation, Malaysia is faced with the demanding task of prioritizing the limited resources and funds to ensure a well-balanced spread to match the growing needs to support development programmes and projects within the public sector. In addition, the government’s growing concern of achieving best value for money in public sector investments, has led to the adoption of VM, a proven effective methodology to substantiate benefits to client, fulfilling their business needs, refining technical solutions and ensuring sound capital investment.
Definition Of Value Management

SAVE International (2007) defines VM as a systematic process that follows a Job Plan, involving a multidisciplinary team to improve value of a project through the analysis of functions.

Consistent with the above and other established definitions, VM in Malaysia is defined as a structured multidisciplinary team approach to seek functional requirements of programmes / projects / products / services to achieve optimisation in delivering the client’s perceived value. This is achieved by systematic analysis of relationship between function, cost and quality in order to make the right decisions about the optimised project value.

**PHILOSOPHY OF VM**

**MAXIMIZING PROJECT VALUE**

VM maximizes project value aligned to the strategic objectives determined by client; throughout its life cycle to achieve best value for money.

**NOT COST CUTTING**

A straight omission or adjustment (to scope, specification etc.) to meet any predetermined cost target is not VM.
Concept Of Value

The value definition by Dell ‘Isola (1982) is oftentimes quoted to describe the main variables of project value; which are ‘function’, ‘quality’ and ‘cost’. The relationship between these variables with value is demonstrated in a simple formula presented below.

\[
\text{Value} = \frac{\text{Function (F)} + \text{Quality (Q)}}{\text{Cost (C)}}
\]

Where:
- Function = the specific work that a design or item must perform
- Quality = the owner’s or user’s needs, desires and expectations
- Cost = the life cycle cost of the product

The above equation illustrates a reliable way to achieve the most economical required function which fulfils the expected level of quality. This value concept is adopted in the Malaysian EPUVM Guide (2011) to describe the dynamics of value variables towards value enhancement potentials.

As such, the project value is potentially enhanced by the following approaches which recapitulate that the best value in a project is achievable by enhancing the value through critical optimizations between its variables - function, quality and cost:

- **Cost Reduction Approach** - Reducing the cost but maintaining the function and quality
- **Function Increase Approach** - Increasing either the function or quality or both but maintaining the cost
- **Compound Approach** - Reducing the cost and at the same time increasing the function and quality
- **Expanded Growth Approach** - Increasing the cost but at the same time improving function and quality at a higher proportion
Table 1 below describes examples of the potential improvements and outcomes achievable from the four approaches of value enhancement through VM in public construction projects.

### Table 1 - Potential Improvements and Outcomes of Value Enhancement

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<th>VALUE ENHANCEMENT APPROACH</th>
<th>POTENTIAL IMPROVEMENTS</th>
<th>POTENTIAL OUTCOMES</th>
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| **Cost Reduction Approach** | • Sharing of facilities / spaces  
• Centralised functions  
• Opt for cheaper solutions with same function and quality | • Optimized solution / design  
• Elimination of redundancies  
• Unnecessary cost avoidance  
• Cost optimization |
| **Function Increase Approach** | • Add or improve functionality  
• Opt for better quality criteria or characteristic or technology, yet within cost | • Improved functionality  
• Improved quality / characteristic / technology  
• No cost implication |
| **Compound Approach** | • Eliminate unnecessary function / facility  
• Eliminate unnecessary quality criteria or technology  
• Refine functional and/or quality solutions at lower cost | • Unnecessary cost avoidance  
• Improved functionality  
• Improved quality / characteristic / technology  
• Elimination of redundancies  
• Cost optimization |
| **Expanded Growth Approach** | • Increase sustainable solutions in design  
• Increase operations ability in design  
• Increase maintenance solutions in design  
• Improve constructability  
• Opt for better technology | • Improved sustainability  
• Improved operations / maintainability  
• Improved constructability / technology  
• Cost optimization |
2. VALUE MANAGEMENT IN PUBLIC PROJECTS
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The Malaysian government has mandated the implementation of VM in public programmes and projects valued at MYR 50 million and above, through a directive issued by The Economic Planning Unit (EPU) of the Prime Minister’s Department in December 2009 (EPU Circular, 2009). This marked a new paradigm for VM and is expected to drive significant growth of VM application within the construction industry.

**Major VM Interventions**

Value opportunities may arise at points in the project life cycle when there is a need to make decisions on strategic / technical / capital commitment or to re-align diverging parties to common project objective. However, this does not limit the occurrence of the required VM intervention points. The intervention points should be scheduled at optimal points in the project lifecycle and structured to meet the objectives and scopes of value study relevant to any particular project phase or as required by the client. The interventions are targeted at critical stages of project life cycle to support strategic decision points by client or stakeholders.

Subsequent to the mandate by EPU as mentioned above, the government has set three major VM interventions to be implemented in public programmes or projects as follows:

- Value Assessment (VA) at Strategic Planning Stage
- Value Engineering (VE) at Design Stage
- Value Review (VR) at Use Stage
Value Assessment (VA)

VA is set at the Strategic Planning Stage of project implementation to primarily focus on decision to invest and to establish the requirements including scope of investment. From the government standpoint, it is about prioritizing programmes or projects to be implemented at the strategic level, in line with the government’s master plan and strategic objectives. At this stage, expected business outcomes and project objective(s) are clearly defined and planned to be delivered in the best possible manner from the outset.

VA will be implemented by the Seksyen Pengurusan Nilai (SPN), EPU, focusing on one or more of the following study objectives / scopes:

- To establish / validate business case
- To strategize asset creation
- To define project scope
- To cap project budget allocation
- To determine expected benefits or project outcomes
- To establish project objectives
- To determine client’s value criteria / value objectives
- To determine required project functions and deliverables
- To strategize project implementation
Value Engineering (VE)

VE is applied during design development at the Design Stage of project implementation. It aims to align or re-align the technical solutions appropriately to meet business needs and scope requirement as earlier defined at the Strategic Planning Stage. In a physical project, VE explores extensively the possible options or alternatives against the project objectives, client’s value criteria, required functions, needs and requirements to achieve an optimized design in terms of functionality, cost and quality.

VE will be implemented by Jabatan Kerja Raya (JKR) / Jabatan Pengairan dan Saliran (JPS) as the government’s technical agencies. The typical study objectives / scopes of VE are:

- To verify project objectives
- To establish / verify required functions and deliverables
- To optimize design to meet functional requirements
- To optimize project cost within the capped budget
- To establish / verify client’s value criteria / value objectives
- To establish design quality criteria
- To improve quality and efficiency of project performance
- To improve project implementation plan
Value Review (VR)

VR is set at the Use Stage of project implementation to assess the realization of intended outcomes of investment during its operation over the life span of the project. The assessment aims to ensure effective value improvements are continuously implemented over the project life span and any lessons learned will be escalated to the client to improve their planning of future projects.

VR will be implemented by Jabatan Audit Negara (JAN) focussing on one or more of the following study objectives / scopes:

- To measure achievement of project objectives
- To review fulfilment of functions and deliverables
- To measure realization of project benefits or outcomes
- To review / improve quality and operational performance
- To assess project implementation performance
- To strategize continuous improvement of the facility
- To identify and escalate lessons learned for future projects

Development of public projects in Malaysia integrates the above distinct VM interventions within the whole asset management life cycle; covering strategic, implementation and operational stages; spanning across the central government and various implementing agencies. As such, VM processes and practices across the VA, VE and VR studies need to be streamlined and effectively coordinated to ensure maximum value delivery throughout the project life cycle.
3. VALUE ENGINEERING APPLICATION IN PUBLIC PROJECTS
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VE is simply expressed as a systematic approach of achieving the required functions at minimum cost, focusing on improving value in design and construction of a physical project. It is the manner in which the business case is translated into the technical requirements for a built facility through design and construction. With the appropriate application of VE process, the potential of achieving any given function at the lowest cost consistent with the required performance increases tremendously.

The government’s directive on VM mandates all public projects that have undergone VA studies to progress into the relevant VE studies to ensure continuity and consistency of value transmission into design development. In order to ensure the transmission at Design Stage, JKR has customized VE process, tools and techniques for the organizational use, which aims to deliver tangible value enhancement in design. However, the potential of value enhancement at construction stage via Value Engineering Change Proposal (VECP) is still untapped as it requires considerable review of the existing contracting environment.

**VE Study “Must Have” Characteristics:**
- Structured and dynamic VE Study process
- Application of appropriate VE tools and techniques
- Multi-disciplinary teamwork orientation
- Emphasis on function analysis
- Clarity of value criteria (value objectives)
VE Framework In JKR

In mapping out the implementation strategy of VE in JKR, the following framework illustrates the interrelationship between key components and expected outcomes of VE in the organizational environment. This framework as in Figure 3.1 shall provide guidance on:

- Articulating strategic goals (or outcomes) of VE in delivering value for customers and stakeholders of public projects.
- Indicating key components of enablers and outcomes; and their cause-effect relationships between JKR major perspectives in achieving the strategic goals.
- Aligning and cascading strategies or actions at lower perspective level to produce outcomes at higher perspective level.

Figure 3.1 – VE Framework in JKR
The descriptions of the key components of VE Framework as illustrated in Figure 3.1 are as follows:

- **Improve value for money in public projects** - The ultimate goal or outcome of VE implementation is to strategically deliver best value for stakeholders in their public project investment.

- **Enhance customer satisfaction** - VE emphasizes on the expected value, needs and requirements of the customers which enhances their satisfaction towards project delivery performance.

- **Increase customer participation** - VE is a customer-oriented methodology that increases customer involvement or participation in project implementation.

- **Institutionalize VE in organization** - Clear policies, process and procedures of VE leads to effective, efficient and integrated implementation throughout the organization. VE institutionalization improves project delivery performance to the customers / stakeholders, inculcates and sustains value culture.

- **Application of VE best practices** - VE process and procedures are benchmarked to the established best practices and contextualised to JKR environment; ensuring effective and sustainable application of VE.

- **VE competency development** - VE competency is developed in compliance with the international standards for VE practitioners; with training syllabus and modules are contextualised to the organizational needs and practices.

- **Certified Value Manager (CVM) certification** - Development of a certification programme is to provide opportunity for VE practitioners / Value Managers to be certified to international standards, thus professionalising VM in the organisation.
VE Governance In JKR

The Figure 3.2 illustrates the governance structure of VE in public projects and streamlined to JKR practice.

Described in the figure are the governing parties and their assigned tasks in executing VE in public construction projects. The governance structure demonstrates the interorganizational relationships between the parties involved, highlighting their task and responsibilities in VE implementation.
VE Interventions In Conventional Procured Project

In most of VM literatures, potential value study interventions in projects are determined based on the conventional (or traditional) procurement route; where design and construction liabilities are held by two separate parties, the owner and contractor respectively. This popular procurement strategy for public construction projects offers more than one opportunity for VE interventions during the design development. During construction, VECP (Value Engineering Change Proposal) is an opportunity for contractor to propose modifications or changes to improve functional value of the project (See Section 7).

In Figure 3.3, JKR has outlined three intervention points for VE in public construction projects; termed as below:

- **VE on Concept Design** is set prior to the approval of the concept by client and transition to preliminary design. This VE intervention is concerned with optimizing functions and cost to the facilities design and expected performance as well as verifying the design to the earlier set client value criteria and strategic functions of the project.

- **VE on Detail Design** is set to be executed as required on project to project basis. This VE intervention is concerned with optimizing the design and cost to component / elements levels against the required functions, quality and performance. This is conducted prior to finalization of design in preparation for procurement.

- **VECP** is set at Construction Stage, focusing on further improvement of time, quality and build ability which may result in cost saving. Innovation in construction methodology and improvements to operation are encouraged. However, implementation of VECP is only feasible via a provision of an incentive based clause in the applicable contract.
Figure 3.3 – VE Interventions In Conventional Procured Project
VE Interventions D&B / PPP / PFI
Procured Project

In Design and Build (D&B) / Public-Private Partnership (PPP) / Private Finance Initiative (PFI) projects, the contractor or concessionaire has the sole responsibility to develop the design and carries the liabilities for the design and construction of the project. For such projects, there are possible VE interventions during the project lifecycle as described below:

• **VE on Request For Proposal (RFP) / Needs Statement** is set to review RFP / Needs Statement document, preferably upon completion of the draft document. This study will review and refine the client’s needs statement, including the technical and performance requirements. All accepted VE recommendations will be included in the RFP / Needs document as bidding basis for the contractor / concessionaire.

• **VE on Tender Evaluation** (Pre Award) aims to review and refine selected design proposal by contractor / concessionaire against the tender basis (RFP / Needs Statement). The VE study provides a forum for bidder to seek clarification or further enquire on the RFP / Needs Statement and / or provide alternatives to the government where possible.

• **VECP** intervention for D&B / PPP / PFI project is similar to VECP intervention for conventional procured projects. It is set at Design Finalization Stage and / or Construction Stage, focusing on further improvement of cost, time, quality and build ability. Its implementation is only feasible via a provision of an incentive based clause in the applicable contract.

The current government procurement procedures for D&B / PPP / PFI project for all types of tender (Open, Selective, Negotiated) permits VE intervention during development of RFP or Needs Statement for the project.

Implementation of subsequent VE interventions at later stages of the project, i.e. at the Evaluation of Tender (Pre Award) and Post Award Stage require specific provisions or amendment to the existing procurement procedure and / or contract conditions to permit the government to interact, examine and propose change to the design submitted by contractor / concessionaire.
Figure 3.4 – VE Interventions In D&B / PPP / PFI Project
4. VALUE ENGINEERING PROCESS AND PROCEDURE
4. VALUE ENGINEERING PROCESS AND PROCEDURE

Introduction

This section explains the VE Study process adopted for application in public projects and procedures of implementing VE Study in JKR Malaysia. There are three stages of the VE Study process:

- Pre lab Stage
- Lab Stage
- Post Lab Stage

Figure 4 illustrates the VE Study process, indicating the workflow of the three stages, the six lab phases, the duration for each stage and the key decision points within the process.

![Figure 4 - VE Study Process in Public Projects](image-url)
**Pre Lab Stage**

Pre Lab Stage is the planning phase of any VE study where the study context and objectives are established, project information is gathered and analysed, and lab agenda and logistics are organized. At this stage, VE facilitators will explore value mismatches and strategize methods, tools and techniques in achieving VE study objectives. The duration of Pre Lab Stage is normally between 2 to 3 weeks prior to lab. It is important to allocate sufficient time to carry out the activities of Pre Lab Stage to ensure efficient and effective implementation of VE study.

**Lab Stage**

This is the stage where lab members will further explore value mismatches and alternatives to accomplish or improve the existing situations. Through the workshop and team work, lab members will generate, evaluate, develop option and collectively recommend the best solutions. Typically, the duration of the Lab Stage is 3 – 5 days, depending on project complexity and scope of VE study. The following lab phases are conducted in sequence to provide efficient and robust decision making:

- Information Phase
- Function Analysis Phase
- Creative Phase
- Evaluation Phase
- Development Phase
- Presentation Phase

**Post Lab Stage**

The activities of Post Lab Stage include the followings:
- Documenting and reporting VE Study findings
- Implementing VE recommendations (design amendments)
- Assessing the study performance.

It is important to assess the study performance in terms of compliance to the agreed Action Plan and VE recommendations, and to identify lessons learned for continuous improvement in implementing VE study and managing project value.

Typically, the duration required to document, prepare and disseminate VE Study Report is between 2 to 3 weeks after the VE Lab. The assessment of VE Study performance (on Action Plan and VE recommendations status) is carried out upon completion of the VE Lab. The duration of the assessment is largely dependent on the actual implementation progress of VE recommendations by project team.
Pre Lab Stage

Purpose

- To check project readiness for VE Study.
- To gather and synthesize project information.
- To plan for VE Lab activities.

Activities to be conducted:

- Interface with client, project manager / HOPT (JKR) in understanding the strategic context of VE Study.

Subsequent to the notification of VE Study requirement, facilitators are required to interface with client / project team by holding meeting(s) and discussions to clarify, obtain agreement and commitment on the following pertinent matters:

- Status of project implementation – for readiness and VE Study timeline
- VE Study objectives and expected VE findings / deliverables
- Scope or level(s) of study
- Implications and constraints of VE Study
- Compliance to VA Study
- Requirement for further VE Studies (if necessary)
- VE Study logistics – tentative date, itinerary, venue and budget
- Composition of lab participants

- Collate relevant and sufficient project information for the VE study.

It is important for facilitators to collect and gather relevant and sufficient information as well as documents from project stakeholders such as client, project manager/ HOPT (JKR), designer etc. for commencing initial study. Key documents required for compilation are:

- VA Lab Report (where applicable)
- Client needs and requirement
- Project brief including Schedule of Accommodation (SOA) for building project
- Drawings
- Specifications
- Technical reports (e.g. traffic study, soil investigation, EIA etc.)
- Relevant statistical data
- Approved project budget
- Project cost estimate (e.g. Preliminary Detailed Abstract -PDA)
- Project work programme, Project risk management plan etc.
- Relevant authorities requirements

“The more time that is spent on the pre-study information gathering and preparing, the better the study will be”

Activities to be conducted (continued):

• Commence study to develop initial views on value problems.

Upon confirmation of VE Study context and availability of sufficient project information, the facilitation team will commence study on the project as follows:
• Study design proposal and quality requirements (drawings and specification)
• Visit project site (as required)
• Study project objectives and project outcomes
• Study project functions and propose Function Analysis System Technique (FAST) diagram
• Identify and prioritize Client Value System with client
• Propose space / Cost / Quality (or others) Study model(s)
• Check compliance of design proposal against VA

This initial study will provide clear project definition, identifies value mismatches and potential value improvement that will facilitate the lab execution.

• Develop lab programme and arrange logistic for VE Lab execution.

Proper planning and preparation of lab programme and logistics arrangement are essential in ensuring efficient and effective lab execution. The facilitation team will carry out the following tasks in the preparation:
• Develop lab agenda
• Identify and appoint facilitation team
• Determine lab tools and techniques
• Identify and propose list of lab participants
• Identify lab working groups and study scopes
• Prepare lab kit
• Advise on lab arrangement and requirement (room layout, equipment, etc.)
• Arrange logistics

• Organize orientation session(s) prior to VE Lab.

When necessary, orientation session(s) may be conducted by facilitators to ensure:
• The facilitation team is clear of the value study strategy and their responsibilities
• Other lab team members (client, project manager / HOPT (JKR), designers etc.) are familiar with the VE Study approach and methodology.

The focus of the orientation session(s) is to increase their understanding, participation and commitment towards the impending VE Lab Stage. The facilitators may conduct the session(s) separately or together in a single session for both teams.

Expected outcome

The team has clarity of stakeholders’ needs, requirement and expected value to be delivered. The VE Study objectives and expected deliverables are made explicit, and the execution of Lab Stage is well programmed and arranged accordingly.
Lab Stage

Lab Phase 1 – Information Phase

Purpose

- To develop understanding of the project and required details.
- To gather, synthesize and verify project information.

Activities to be conducted:

- Register lab participants.
- Hold lab opening session for introduction and team building among the lab participants.
- Brief and verify VE Study agenda to ensure participants understand the lab agenda and process.
- Brief and verify VE Study objectives. The verified objectives will be measured against the lab achievements at the end of the lab.
- Conduct briefing by relevant parties (client, HOPT, designers authorities, other stakeholders) covering the followings:
  - Project information:
    - Client needs and requirement
    - Project objectives and project outcomes
    - Project background (scope, status, location, timeline, team, etc)
    - Project status
    - Proposed design from all disciplines
    - Project cost estimate (e.g. PDA)
    - Project risks
    - Authorities’ requirements
  - Value Assessment (VA) Report and compliance of design proposal
  - Brief and verify project objectives to ensure clear business needs and strategic project goals using S.M.A.R.T (Specific-Measurable-Attainable-Realistic-Timely) approach.
  - Confirm proposed VE Study model(s) to be used as baseline for cost optimization. One or more study model(s) can be proposed - space / cost / quality model(s) or others.
  - Inform Client Value System to participants, as the value criteria to be incorporated into the design solutions and project deliverables.
  - Confirm Lab working groups and VE study scopes and followed by physical formation of respective groups.
  - Establish project parameters to be studied and present to lab participants for understanding.

Expected outcome

The team has a comprehensive and detail understanding of the project. It is crucial to obtain as much as possible accurate project information and data, as the basis for subsequent activities in the next phases.
Lab Phase 2 – Function Analysis Phase

Purpose

• To understand the functions of the project / spaces / elements / components / systems
• To identify mismatches and potential value improvement for the project.

Activities to be conducted:

• Conduct briefing on Function Analysis Phase to ensure the participants understand the purpose, activities and expected outputs of the phase.
• The lab team verifies project functions identified earlier by the facilitation team. Project functions are best illustrated by a FAST diagram and verified through Goal and System Technique. This will provide understanding of how the project must perform and highlight any function-related mismatch.
• Analyse functions of spaces / elements / components / systems by identifying and classifying function according to 3 categories (basic, secondary or required secondary function) and analysing cost and worth, space, capacity, flow and adjacency requirement.

Function Analysis highlights value mismatches of project / spaces / elements / components / systems usually arising from mismatches of function (e.g. Unnecessary function provided or necessary function not provided) and / or mismatches of cost (comparing worth against cost to perform the required function)

Expected outcome

This phase will ensure the functions of project / space / element / component / system fulfil the client’s needs and objectives. It clarifies expected project performance focusing on what things must do rather than what it is. The team identifies value mismatches to be resolved and / or to improve project performance.

Types of function

**Basic Function** – The primary purpose or most important action performed by a product or service. The basic function must always exist, although methods or designs to achieve it may vary. An item may possess more than one basic function.

**Secondary Function** – Secondary function results from specific design approach to achieve a basic function. If methods or design approaches to achieve the basic function are changed, secondary function may also change.

**Required Secondary Function** – A function that must be achieved to meet codes, standard or mandatory other requirements.

*Source: Dell ‘Isola, A (1997)*
Lab Phase 3 – Creative Phase

Purpose

• To generate broad list of creative and innovative ideas as alternative ways to perform functions and enhance value of the project.

Activities to be conducted:

• Conduct briefing on Creative Phase to ensure the participants understand the purpose, ground rules, activities and expected outputs of the phase. It is important to set the ground rules to create open, positive and receptive environment to stimulate and generate new ideas.

• Generate alternate ideas to the original design proposal that may improve value of the project. Creative and innovative tools and techniques need to be applied by the participants for this purpose.

Expected Outcome

The team generates a broad list of creative and innovative ideas/alternatives to resolve value mismatches and enhance value of project.

Creative and Innovative Thinking

• Improve existing ways
• Find new ways doing things
• Think “outside the box”
• Modify things
• Challenge the norms
• Move to radical change
Lab Phase 4 – Evaluation Phase

Purpose

• To shortlist the generated ideas into list of potential ideas for value improvement

Activities to be conducted:

• Conduct briefing on Evaluation Phase to participants to ensure the participants understand the purpose, ground rules, activities and expected outputs of the phase.
• Judge the generated ideas based on four criteria below. This technique will guide the lab team members to sort large quantity of ideas effectively:
  • Client Acceptability
  • Functionally Suitability
  • Technically Feasibility
  • Economically Feasibility

  Categorize the judged ideas according to the following categories for development and further evaluation of potential ideas:
  • Evaluate – Potential ideas
  • Information – Potential for future
  • Discard – Non potential ideas
• Present and obtain consensus from the lab team members on the judgement and categorization of ideas. A plenary session shall be held for all the working groups to present and agree collectively on the shortlisted ideas.

Expected Outcome

The team identifies an extensive list of the best ideas to be developed into implementable value based solutions for the project.
Lab Phase 5 – Development Phase

Purpose

• To further analyse the viability of ideas to be developed into workable solutions as best or preferred options.

Activities to be conducted:

• Conduct briefing on Development Phase to ensure the participants understand the purpose, ground rules, activities and expected outputs of the phase.
• Develop and further evaluate the shortlisted ideas into workable options and determine best solutions based on their advantages and disadvantages, cost implication, innovativeness, risks and constraints.
• Present and obtain consensus on the best solutions as VE Study recommendations through a plenary session.
• Summarize all recommended ideas and findings including reviewing study model(s) – space / cost / quality (or others)
• Develop action plan for post lab activities and obtain the identified responsible parties’ agreement.
• Review achievement of VE Study against the predetermined objectives and identify any lessons learned.

Expected Outcome

The team creates justified and robust recommendations, realization of value improvement in term of soft and hard benefits and gain commitment on actions and timelines.
Lab Phase 6 – Presentation Phase

Purpose

• To present and gain acceptance from stakeholder or decision maker to proceed with the implementation of VE recommendations

Activities to be conducted:

• Conduct briefing on Presentation Phase to ensure the participants understand the purpose, ground rules, activities and expected outputs of the phase
• Prepare presentation and present VE study findings focusing on recommended ideas, optimised project cost and action plan for implementation of recommended ideas. Presentation may include:
  • VE Study Objectives
  • Project Information
  • VE Study Model(s)
  • Client Value System
  • Project functions
  • VE Study Scope
  • Summary of recommended ideas
  • Reviewed VE Study Model(s)
  • Action plan
  • Achievement of VE Study Objectives
  • Lesson Learned
• Obtain consensus from lab team members / stakeholders on VE Study recommendations and findings.

Expected Outcomes

Key stakeholders agree with VE recommendations and support the implementation.
Post Lab Stage

Purpose

• To document, report and disseminate VE Study findings.
• To translate VE recommendations into actions or expected value improvements.
• To assess VE Study performance (on Action Plan and VE recommendations).

Activities to be conducted:

• Document and report VE Study findings.

Upon completion of VE Lab Stage, all VE lab outputs will be consolidated and a formal report will be documented by the facilitators. The report may be presented (if required) and signed off by stakeholders.

• Disseminate approved VE Report

The VE Report will be submitted to the client for dissemination to other stakeholders and relevant lab participants. The report will be the basis for incorporating VE Study recommendations into the project and for review during VR Study.

• Follow up on agreed Action Plan

The Project Manager / HOPT(JKR) is responsible for the execution of the agreed action plan and ensuring all required actions are completed by the relevant parties. VE facilitation team will track and update the actual status of the actions and may propose improvement where appropriate.

• Monitor and assess implementation of VE recommendations and findings

The implementation of VE recommendations and findings will be closely monitored by Project Manager / HOPT(JKR). The implementation will be updated and assessed by the facilitation team in order to measure the actual achievement of the VE Study.

• Assess performance of VE Study implementation

The performance of VE Study will be assessed by the facilitation team in terms of its effectiveness and efficiency in solving value problems. The assessment is essential as it provides feedbacks to the team for improvement of future VE Study execution. Outcomes of the assessment should be communicated to the management, client and relevant parties for lessons learned.

Expected Outcome

All VE Study findings are formally reported and communicated as implementation reference and basis of VR Study. The Action Plan and VE recommendations are monitored and assessed on the implementation performance. Continuous improvement on VE study performance and lessons learned are captured.
5. ROLES AND RESPONSIBILITIES IN VALUE ENGINEERING STUDY
5. ROLES AND RESPONSIBILITIES IN VE STUDY

VE Study involves multi-disciplinary group which comprise participants from all levels from various organisations. This is important to create completeness and obtain consensus in seeking alternatives and innovations in VE Lab sessions. VE Study promotes structured problem solving and robust decision making, stimulates creative thinking and improves communication among project stakeholders.

VE Study is highly dependent on good cooperation among lab team members. Therefore, it is important to define clear roles and responsibilities of each lab team member to ensure effective and efficient VE Study.

Roles and responsibilities of VE Lab Team Members

Client:
- Provide clear direction and relevant information especially on project strategic directions, needs, requirements and expectations
- Act as champion or sponsor to drive the implementation of VE Study
- Provide funding for organizing VE Lab and all related activities
- Participate actively throughout the VE study process
- Provide direction in decision making process

Project Manager / HOPT (JKR):
- Assist client in planning and implementing the VE Study
- Provide relevant information on project background, needs and requirements
- Provide clear direction on project implementation strategy
- Participate actively throughout the VE study process
- Advise client in decision making process

Designers:
- Provide technical expertise and relevant inputs for the areas being studied
- Participate actively throughout the VE study process
- Advise client in decision making process
- Responsible for implementing the VE Study recommendations

Authority / Utility companies:
- Highlight the relevant regulation and requirements for compliance by the project being studied.
- Participate in the VE Study process as required.

External Experts (if necessary):
- Provide subject matter expert inputs for the project being studied.
- Participate in the VE study process as required.
Roles and responsibilities of VE Facilitators

Facilitators are necessary in any VE Study as it is a workshop based and facilitated process. The importance of having VE Facilitator is to maintain momentum and keep small groups working on track according to the workshop agenda. The facilitator should be a neutral party to all members and have no vested interest in the decisions reached by the lab groups. Without this neutrality, the opportunity to develop trust and the open communication will be severely limited.

A facilitator is responsible for conducting the VE Study according to the complete process covering all study stages and responsibilities includes:

- Comprehend the study context, objectives and expected outputs
- Advise on the setting up of an effective and conductive lab environment
- Advise on forming effective lab team composition
- Synthesize and communicate information to lab team
- Facilitate lab through the structured process
- Encourage human dynamic during lab process

All VE Study labs will be led by a Lead Facilitator, who acts as the Value Manager for the study. The Lead Facilitators has added responsibilities as follows:

- Structure, plan and manage the study process
- Lead and manage facilitation team
- Ensure each lab group is on track
- Prepare report and present study findings
- Drive creativity and innovation in the study process
- Motivate lab team to achieve study objectives.

A facilitator is responsible for planning and structuring group(s) and the required activities, in a manner that supports and encourages participation, and stimulates the group(s) to achieve its goals and objectives.
Competency of VE facilitators

Competent facilitators are paramount for a successful VE Study. It is essential for VE Facilitators / Value Managers to possess the right sets of knowledge, skills and values. Key competencies for VE facilitators are:

- Sound knowledge on the application of VE process, methodology, tools and techniques
- High ability to acquire and comprehend information in specific areas being studied
- Highly developed facilitation skills or ability to perform the appropriate tasks
- Strong facilitation values

Facilitation Knowledge

Facilitators are required to have sound knowledge on facilitation methodology and process as well as appropriate usage of VE tools and techniques. They are required to gain technical skills to carry out the following activities:

- Set objective and purpose of study
  A facilitator must have a very clear understanding of what needs to be accomplished by the end of the session and guide the group to this end
- Collect information on subject of the study
- Gain experts’ views on subject matter
- Identify constrains and risk of study
- Understand hidden agenda impacting study
Facilitation Skills

It is important for facilitators to develop strong facilitation skills as follows:

- **Observing Skills**
  Understand and assess information to provide effective feedbacks and suggest appropriate adjustment accordingly.

- **Managing Skills**
  Facilitator must have an extensive set of managing skills - from planning and delegation to communication and motivation, such as:
  - Manage conflict with tactics
  - Maintain neutrality
  - Gather opinions from other parties
  - Develop towards a compromise
  - State areas of agreement

- **Attending Skills**
  Attending means being in the company of someone else and giving that person full attention; to what they are saying or doing. A facilitator must pay attention to everything a participant says and does. This includes observing body language and verbal communication; taking into consideration all the silences and pauses in the conversation. Actively listening not only conveys information, but also encourages the participants to continue talking.

- **Listening Skills**
  - Show interest
  - Be understanding
  - Express empathy
  - Be patient
  - Avoid arguing and interrupting
  - Avoid jumping to conclusions

- **Questioning Skills**
  - Asking right questions in the right way at the right time
  - Applying a variety of question types; general / direct / open-ended / factual / re-direct / leading
  - Handling answers by providing feedbacks and foster understanding
  - Encouraging discussion and moving forward
Values of Facilitator

Facilitation is effective when certain values are accepted and practiced by the facilitator and the lab team. The values provide an internal reference point (of what is good, important, beneficial and constructive) and the basis for appropriate actions and outcomes.

It is important for facilitators to demonstrate their commitment to the following:

- **Responsibility** - a facilitator is responsible for the plans he/she makes and how it affects the structure, process and participation at the study sessions. The facilitator must be sensitive to how much responsibility lab team members are prepared or able to take.

- **Listening** - a facilitator must have the ability to listen to what people are saying and tuning to what they are not saying, i.e. explicit meaning of word and also their tone for implicit meaning. He/she must be aware of the verbal and nonverbal means of communication.

- **Cooperation and participation** - the facilitator and lab team work together to achieve their mutual goals. Facilitation succeeds when participants respond collectively in group work. Everyone in the group must be encouraged to share ideas, concerns, suggestions and contribute to solutions/initiatives.

- **Respect** - facilitator must respect and acknowledge each individual in the group. They are given the opportunity to speak freely and their individual boundaries are honoured.

- **Equality** - each member is regarded as having the equal right to contribute to the group and is provided a fair opportunity to do so.

- **Neutrality** - a neutral facilitator facilitates teams to think creatively about issues where there are differences in opinion and agenda. He/she is able to assist team members to listen and understand one another and find cohesion from all points of view, thus developing a sense of trust and fairness within the group.

- **Trust and honesty** - a facilitator must honestly reflect their values, concerns and priorities in working with the group. The facilitator must ensure he/she sets the expectation of honesty from each member and encourage the development of trust within the group.