A GUIDE ON VALUE MANAGEMENT (VM)

INTEGRATION IN AFFORDABLE HOUSING PROGRAMMES AND PROJECTS

CIDB MALAYSIA

A GUIDE ON VALUE MANAGEMENT (VM)

INTEGRATION IN AFFORDABLE HOUSING PROGRAMMES AND PROJECTS

CIDB MALAYSIA

A Guide on Value Management (VM) Integration in Affordable Housing Programmes and Projects

CIDB MALAYSIA

All enquiries regarding this book should be forwarded to:

Construction Industry Development Board Malaysia
Level 10, Menara Dato' Onn,
Pusat Dagangan Dunia Putra,
No. 45, Jalan Tun Ismail,
50480 Kuala Lumpur,
Malaysia.

Tel: 603 4047 7000
Fax: 603 4047 7070
Email: standard@cidb.gov.my
Website: www.cidb.gov.my

Perpustakaan Negara Malaysia Catalogue-in-Publication Data
ISBN No: 978-967-2971-41-2

3.0

4.0

CONTENT

5.0

6.0

EDITORIAL

This research was funded by the Construction Industry Development Board (CIDB) Malaysia and executed by the Construction Research Institute of Malaysia (CREAM) and Subject Matter Expert (SME). We would like to thank the editorial team for their contribution and support.

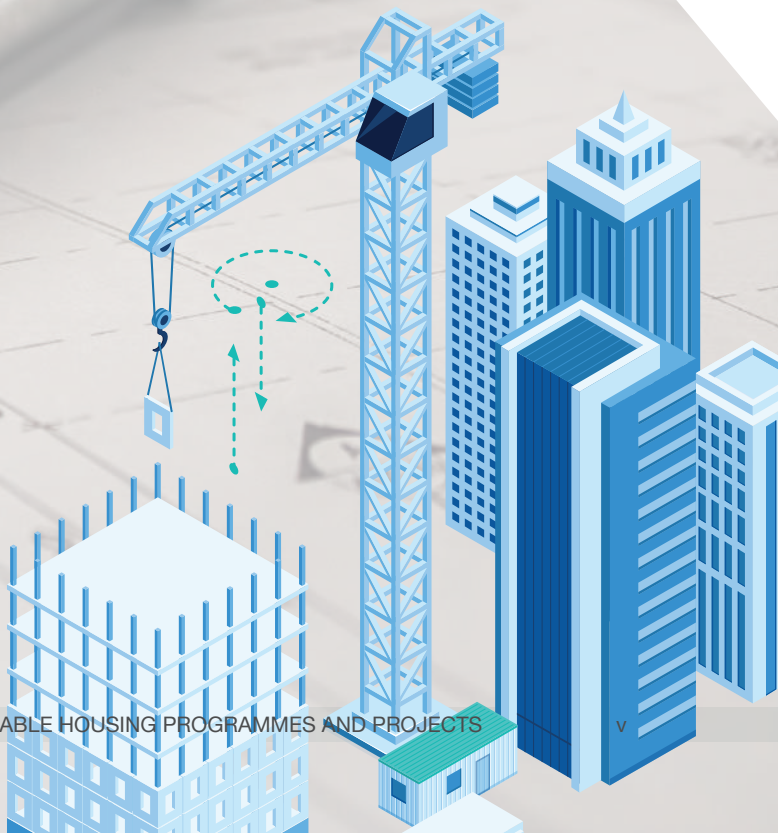
PREFACE

This guide introduces the conception of Value Management (VM) integration in relation with construction programmes and projects, focusing on Affordable Housing (also known as RMM, which stands for Rumah Mampu Milik). Over the years, CIDB has developed several Affordable Housing models, designs and associated technologies to support the Government's goals in fulfilling the capacity and enhancing the delivery performance of Affordable Housing/RMM for the country. Thus, CIDB has initiated VM integration for public and private affordable housing programmes and projects, aiming to create and deliver the best value in RMM programmes and projects.

This document provides conceptual guidance on potential interventions of VM Study within Affordable Housing/RMM programmes and projects life cycle. Along with the discussions on principles of VM integration, basic VM procedures and processes are provided to guide implementation of VM Study to be adoptable in RMM programmes and projects. This guide also provides some basic methods, tools, and techniques applicable in executing VM Study for RMM through lab engagement (or workshop-based).

This guide/publication can be used by both public and private agencies/entities as guidance and reference for those who intend to implement VM in their RMM programmes and projects, and to enhance knowledge in the subject matter. However, the suggested list of tools and techniques in this document is not as exhaustive as what are available in other VM guides/guidelines.

CIDB wish to express their gratitude and appreciation to all the experts, professionals and industry players involved in the development of this document. This publication is expected to be a useful reference for public and private clients and industrial players, and for those who wish to integrate VM in the implementation of Affordable Housing/RMM programmes and projects in Malaysia.



01

INTRODUCTION

1.0 INTRODUCTION

1.1 Overview

Value Management (VM) implementation in Malaysia was initiated in 2009 during the 10th Malaysia Plan (RMKe-10 /*Rancangan Malaysia Ke Sepuluh*). The Malaysia Government through the Economic Planning Unit (EPU) in the Prime Minister's Department had issued a directive (Circular No.3/2009) to embark on VM implementation in public programmes and projects worth MYR50 million and above. This directive has stimulated an evolution and drive a significant growth in VM application in Malaysia especially within the public construction (physical) projects. In 2015, the latest EPU circular on VM implementation (Circular No.1/2015) was released incorporating updates and continuous improvement for VM implementation in RMKe-11 (*Rancangan Malaysia Ke Sebelas)* and beyond.

VM is implemented to produce effective results through lab (or workshop) engagement and achieve best value throughout multiple stages of project life cycle. Though VM, the expected programme/project outcomes and objectives can be achieved and the determination of project scopes, functions, technical solutions and costs etc. can be further optimised. To abide to the EPU's mandate, VM integration in public programmes and projects is implemented for *Rumah Mampu Milik* or RMM by the Ministry of Housing and Local Government (*Kementerian Perumahan dan Kerajaan Tempatan* or KPKT), where Value Assessment (VA) Study and Value Engineering (VE) Study interventions are implemented at relevant project stages of RMM by KPKT.

In the 12th Malaysia Plan (RMKe-12, 2021-2025), the evolution of VM integration is manifested in public programmes and projects implementation (The 12th Malaysia Plan Guidelines, 2019). The introduction of VM integration within the Strategic Phase for public client agencies is known by the abbreviation of 'VMS' (VM at Strategic Phase). VMS is acknowledged as a breakthrough in VM integration, where at least one (1) VMS Study intervention is applied within the client's strategic planning activities. This newly added VM Study intervention fills the vacuum of VM integration at the inception of project; which it is set prior to the submission for project approval and the 'decision to construct' demarcation point is yet to be achieved by the clients.

This document provides conceptual guidance on potential interventions of VM Study within project life cycle of Affordable Housing/RMM programmes and projects. Concurrent to the principles of VM integration, basic procedures and processes are documented in implementing VM Study intervention in relation to Affordable Housing/RMM development. Such VM integration is initiated in RMM programme and project implementation adopting RMM CIDB Standard Design (simply known as RMM CIDB). Figure 1.1 shows examples of Affordable Housing/RMM designs by CIDB, which include apartment (high-rise and 'walk-up'), single-storey terrace, and townhouse. This guide also includes some basic methods, tools, and techniques applicable in executing VM Study for RMM through lab (workshop-based) engagement.

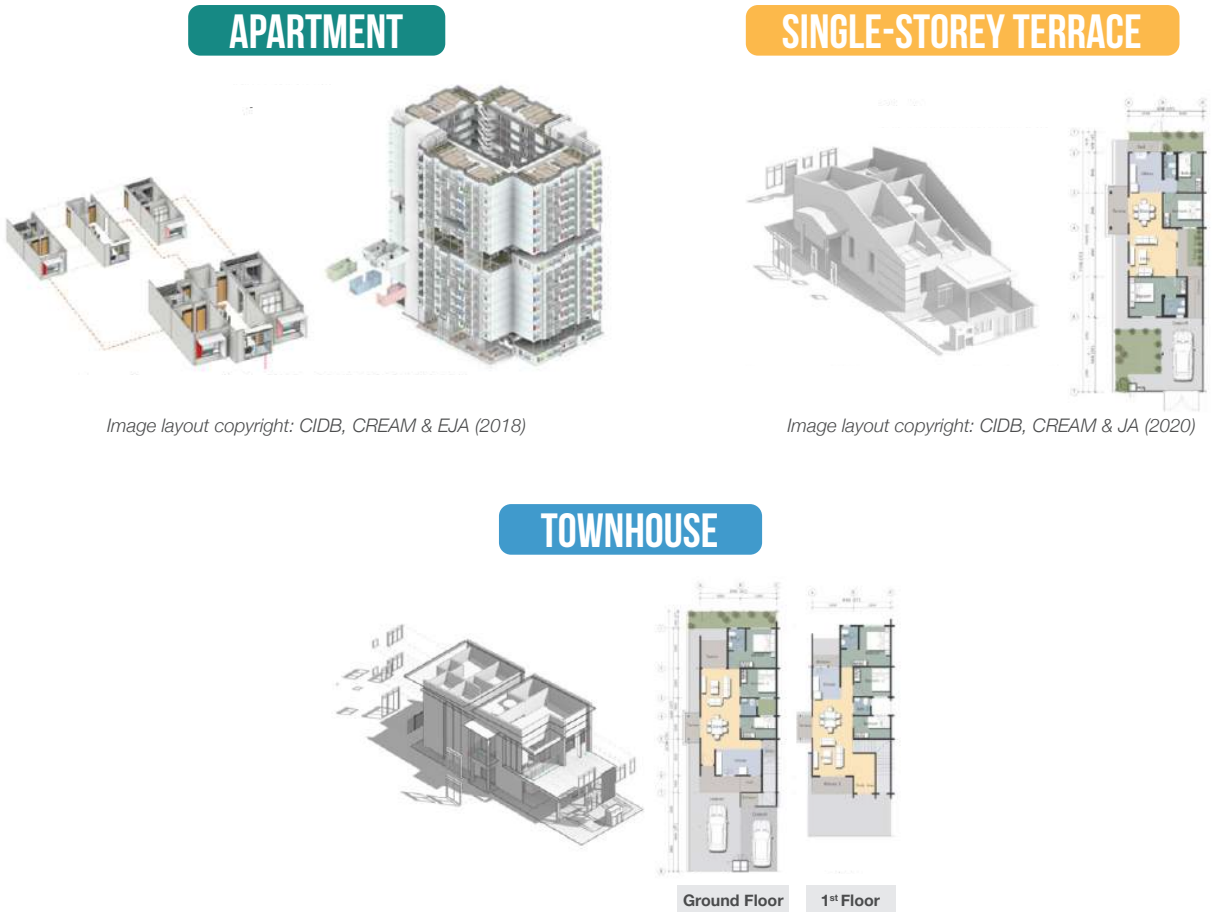


Figure 1.1 Examples of RMM CIDB Standard Designs

The RMM CIDB complies with the National Housing Standard (CIS 26, 2019) in providing sustainable and affordable housing to achieve the goals of the National Affordable Housing Policy (DRMM, 2019) set by KPKT. The RMM programmes and projects are in line with the direction of DRMM (2019) and have introduced transformation of new technologies and methods, such as Industrialised Building System (IBS), Building Information Modelling (BIM), and Big Data. In essence, the RMM CIDB aims to meet adequate requirements of quality, build-up, location, and financial affordability of RMM.

1.2 What is Value Management (VM)

Value Management (VM) has been globally recognised as an effective methodology, using structured and systematic process and with multidisciplinary team approach. VM emphasises on achieving best value, and continuously enhance value delivery to clients throughout project life cycle. VM is a rigorous and systematic effort in improving the value and optimise the cost of programmes, projects, facilities, systems, products and services (IVMM, 2018). This methodology is known as a management tool in achieving value for money (EPU Guide, 2011). This acknowledgement of VM as an effective methodology in delivering best value for money is supported by other scholars (Jaapar et al., 2012).

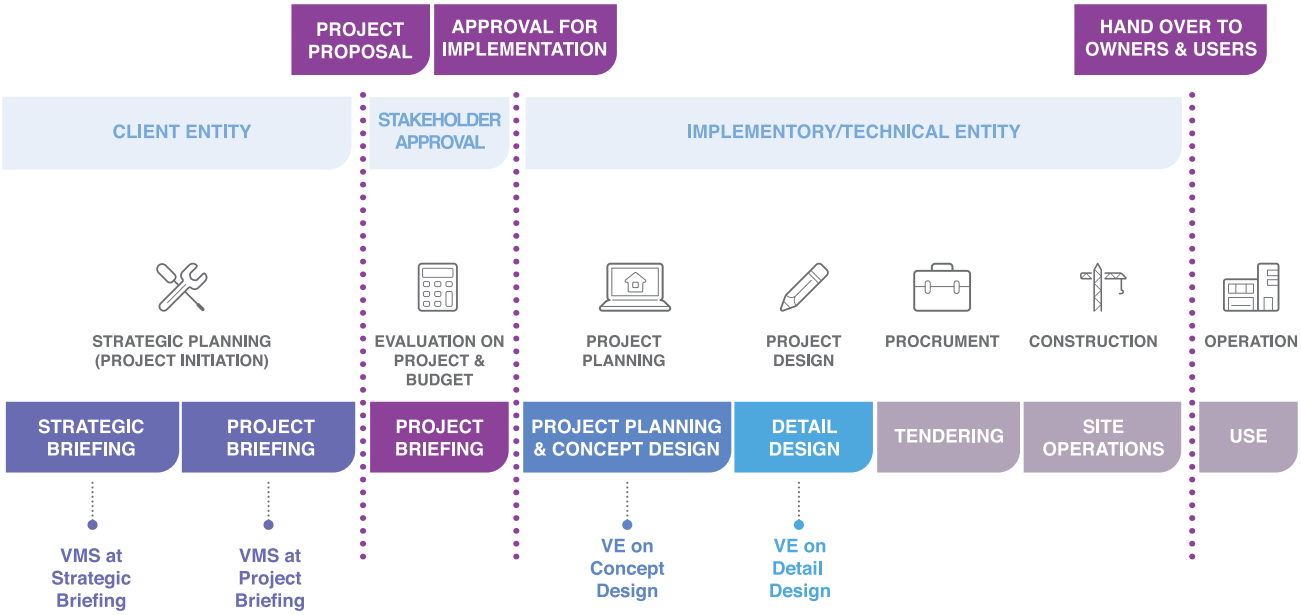
In managing construction project value, value optimisation is referred to multiple variables such as functionality, cost, quality, and other value variables e.g., satisfaction, benefits, time, resources etc. (Ab Ghani, 2020). Hence, VM is not only a measure of cost reduction, but are also for other achievements through VM integration. As such in RMM, VM is capable to optimise design quality criteria, improve Industrialised Building System (IBS) utilisation, and impose sustainability elements in RMM projects. Effectiveness of construction project delivery can also be improved through VM implementation.

1.3 VM Intervention in Affordable Housing Programmes and Projects

Multiple interventions of VM Studies at different project implementation stages are intended to keep the project value chain intact throughout project life cycle. Any intervention at the strategic phase is intended to strategise value from the outset, so that the perceived client's value can be implemented and used.

VMS Study aims to close strategic gaps and resolve issues pertaining to client's decision-makings on RMM, in relation with RMM programme and/or project inception strategy, feasibility, selection of house types and implementation strategy, and including project procurement system. The RMM 'programme' represents multiple projects and/or broad phases of housing development, which utilise various types of RMM (e.g., apartment, single-storey terrace, and townhouse). Whilst 'project' refers to any single selected site for RMM development utilising a single or mixed RMM types, models and designs.

Figure 1.2 represents opportunities of VM integration throughout project life cycle, indicating various VM Study interventions. As proposed, each VM intervention is not mandatory and rigid within implementation of RMM projects. Interventions can be suited according to the issues to be resolved, client's needs and requirements, intended VM Study objectives, study inputs and timing.



Adapted from PWD VAE Guide (JKR, 2021)

Figure 1.2 Opportunities of VM Study Interventions within Project Life Cycle

1.3.1 Value Management at Strategic Phase (VMS)

VMS Study is an intervention or more within the Strategic Phase of client entity, which is at the earliest stage in project life cycle. VMS intervention can be implemented either at Strategic Briefing or Project Briefing, or both if required by the client entity (public and private). 'VMS at Strategic Briefing' focuses on justifying viability of business needs and in deciding on the right business case or selection/priority of project(s). 'VMS at Project Briefing' emphasises on specifying (or briefing) the business case (project proposal), in terms of determining site/land utilisation; masterplan; project scopes and components; and cost estimation etc. for the proposed project.

The stakeholders of a client organisation may perform a strategic assessment at the transition between Strategic Briefing and Project Briefing in deciding on the appropriate selection of project(s) to fulfil the business needs. While the Strategic Assessment as shown in Figure 1.2 (at post Project Briefing) is intended to achieve the formal project approval or 'decision to construct' demarcation point of the proposed project.

In general, VMS aims to strategise value from the outset during the Strategic Phase prior to project and budget proposals submission by client to the approving stakeholders. This strategic VM integration is intended to set the right value alignment of RMM at programme or project levels, so that right value can be aligned and delivered throughout project implementation stages.

The proposed objectives of 'VMS at Strategic Briefing' and 'VMS at Project Briefing' studies (see **Table 1.1**) are as follows:

Table 1.1. Proposed Objectives of VMS Study Interventions

VMS at Strategic Briefing	VMS at Project Briefing
• Establish strategic fit or viability of business needs through justification of the programme and project outcomes;	• Establish project objectives to align with the programme and project outcomes (the business needs);
• Determine business case as the proposed project(s) (or what type of project(s) is/are viable in achieving the business needs);	• Determine scopes and components of project, aligning with the established project objectives;
• Establish broad scopes and cost budget estimation of the proposed programme/ project(s);	• Determine preliminary cost estimate for the proposed project based on determined scopes and components, and requirements etc.;
• Strategise the programme or project(s) implementation strategy (e.g., key timelines for the programme/multiple projects, strategic risk management etc.)	• Determine/improve project implementation strategy (e.g., procurement strategy; key timelines; risk management plan etc.).

1.3.2 Value Engineering (VE)

VE is applied during the design development stage of project implementation. It aims to align or re-align the technical solutions appropriately to meet project objectives, abide to project scopes and cost budget cappings made at Strategic Assessment Phase (project approval). In general, VE explores possible options or alternatives of conception in meeting project objectives, incorporation of client's value criteria, refinement of functions, quality, needs and requirements, and technical solutions to achieve optimised designs.

In VE application for RMM, the value studies can be strategised at two levels of design development phase, i.e., at Concept Design and Detail Design stages. The former VE Study focuses on best option of masterplan and concept design. Whilst the later VE Study focuses on refining technical solutions, construction methods and materials to be used in the design.

The proposed study objectives of VE at Concept Design and Detail Design (see **Table 1.2**) are as follows:

Table 1.2. Proposed Objectives of VE Study Interventions

VE on Concept Design	VE on Detail Design
• Verify that project objectives are align with Concept Designs in terms of the characteristics of required functions, client value systems, quality criteria etc.;	• Refine characteristics/technical solutions of the required functions, client value systems, quality design criteria etc. in Detail Design;
• (Whenever necessary) Assess available option(s)/ alternative(s) of Master Plan layout and Concept Designs to determine best option;	• (Whenever necessary) Assess available options/ alternatives, and/or refine technical solutions/material selections in Detail Design;
• Optimise project costs within the capped scopes and budget;	• Optimise project costs within capped scopes and budget approval;
• Review/improve project execution plan (e.g., procurement strategy; work programme; risk management plan etc.)	• Review/improve project execution plan (e.g., procurement strategy; work programme; risk management plan etc.)

1.3.3 Other VM Study Interventions

There are other potential VM Study interventions within construction project life cycle, depending on the selected procurement route (e.g., conventional procurement system, Design & Build procurement system, Concession Contract/PPP/PFI etc). Suggested in the following are other types of VM interventions as practiced by public and private clients which intended to achieve specific VM Study objectives for specific value issues.

1.3.3.1 Value Assessment (VA)

Value Assessment (VA) or Value Planning (VP) is implemented in public programmes/ projects for finalising scopes and cost budget as its study objectives. It is implemented during Strategic Assessment process (refer Figure 1.2) involving the EPU stakeholders, client ministries and agencies, prior to project execution. VA is used as one of the management strategies to achieve value for money through actual needs (scopes of the projects) verification and project cost capping determination. At this stage, expected project outcomes and project objectives are clearly defined and planned so that they can be possibly delivered.

1.3.3.2 VE on Request for Proposal (RFP)

This VE intervention is set to review, refine and finalise RFP/ Pre-bid / Needs Statement document of Design and Build (D&B) procured project. It takes place during Pre-Tender Stage of Design and Build (D&B) procured project preferably upon completion of the draft document prior to issuance of RFPs to D&B tenderers. It involves reviewing and refining the client's needs statement, including the technical and performance requirements stated in the document. All accepted VE recommendations will be inserted or updated in the RFP / Pre-bid/ Needs document as bidding basis document for the contractor / concessionaire.

1.3.3.3 VE Change Proposal (VECP)

VECP is applied at post award or construction stage, and adapts well to Conventional and D&B procurement system, Concession Contract/PPP/PFI. It focusses on further improvement of project value i.e., 'time', 'quality' etc/ which often results in cost saving. Innovation is encouraged in terms of construction methodology and operational improvements. However, VECP implementation in public/private projects is feasible via a provision of an incentive-based clause (for sharing any cost saving) that requires specific provision in tender and contract documents.

02

VALUE MANAGEMENT (VM) PROCESS AND PROCEDURE

2.0 VM PROCESS AND PROCEDURE

2.1 Introduction

The VM Study process comprises of three (3) study stages: Pre-Lab, Lab, and Post-Lab (EPU Guide, 2011); **Figure 2.1** illustrates the workflow's three stages.

In the diagram, the Lab Stage outlines six (6) value study process stages i.e. the Information Phase, Function Analysis Phase, Creative Phase, Evaluation Phase, Development Phase, and Presentation Phase. Pre-Lab and Lab Stages of this VM Study (excluding Post-Lab Stage) successfully underwent the standardised VM study process and procedures.

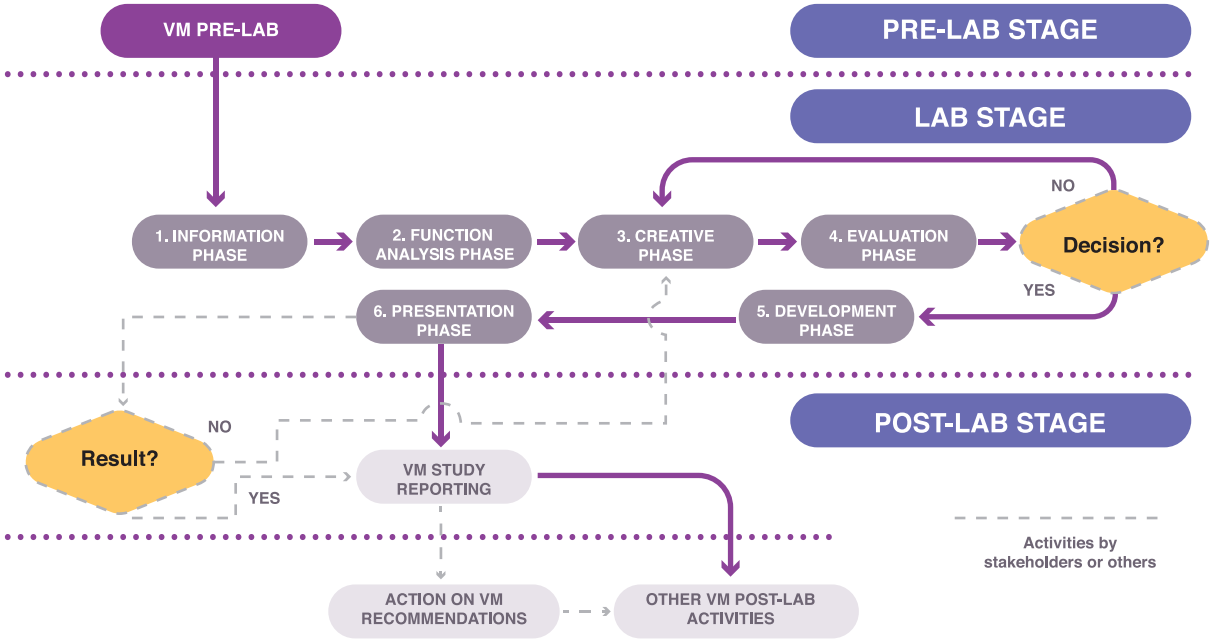


Figure 2.1 VM Study Process – In Compliance with VM Standards (EPU Guide, 2011; PWD VAE Guideline 2021)

2.2 Pre-lab Stage

Pre-Lab Stage is the precedent to the Lab Stage. It is a planning phase where the study context and objectives are established, information is gathered and analysed. During this stage, facilitator will explore value mismatch, identify strategising method, tools and techniques to achieve VM Study objectives. Recommended duration for Pre-Lab Stage is normally between 2-3 weeks prior to lab subject to the availability of study inputs and project team.

2.3 Lab Stage

This stage is where the lab members will further explore any mismatch in accomplishing or improving the existing situations. Through this lab, members will generate ideas, evaluate, develop and collectively recommend the best solutions. Ideally, the recommended duration for VM lab is 5 days or 40 hours as illustrated in **Table 2.1.** The suggested durations for VM Lab phases are not rigid and are modifiable to suit the project's contexts, scopes of VM Study, and allowable time given by client as lab organiser.

The following phases are conducted during VM Lab Stage:

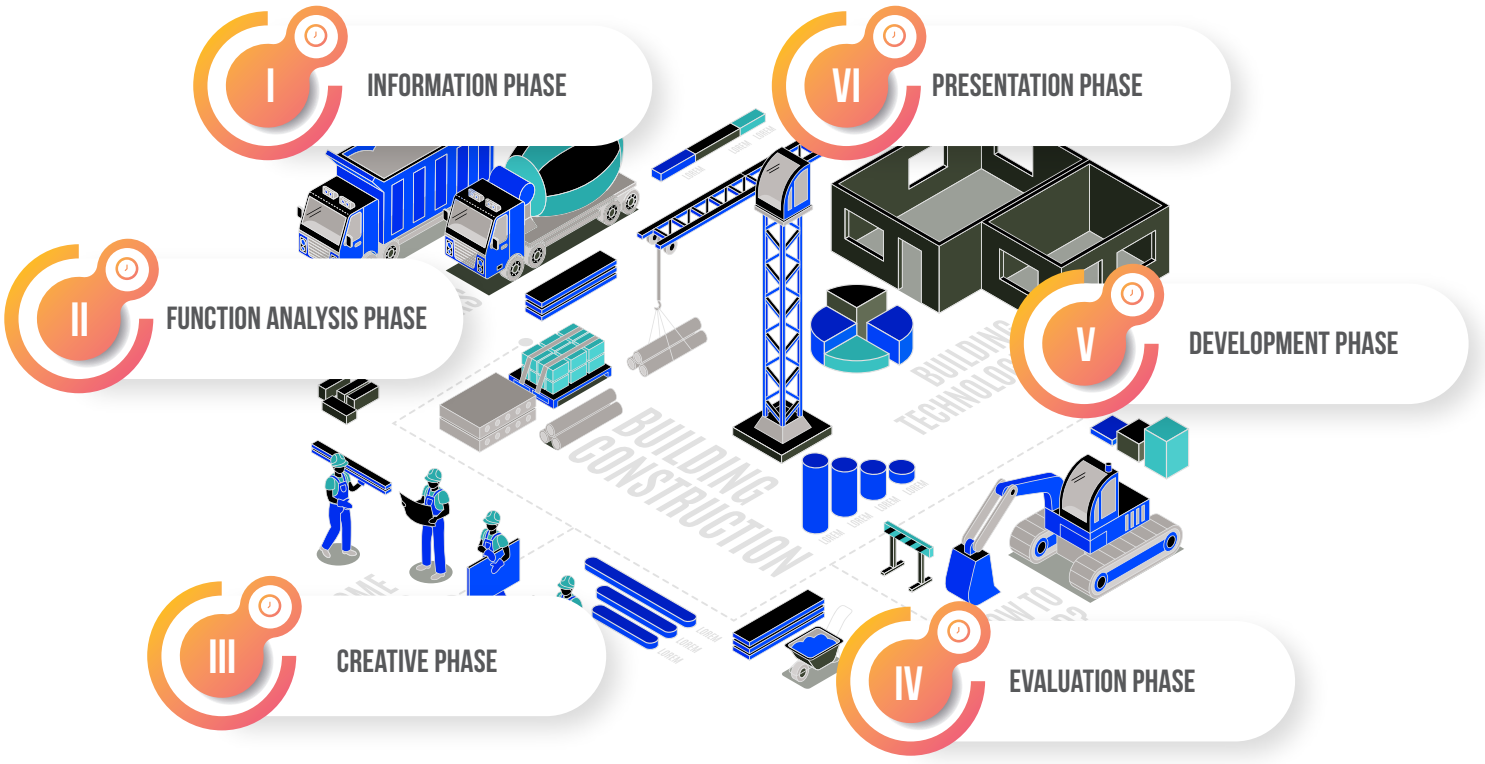


Table 2.1 proposes VM Lab phases execution within 40 hours duration to provide comprehensive study processes. However, **Table 2.2** can be opted whenever VM Lab phases durations are unnecessarily required or are not feasible to be conducted within 40 hours or 3 sessions each day. As proposed by Table 2.2, only 2 daytime sessions are conducted within less than 40 hours duration.

Table 2.1. VM Lab Sample Agenda (40 hours: 3 Sessions/Day)

LAB SCHEDULE	MORNING SESSION 8.30 AM - 1.00 PM (4 effective hours with 30 minutes break)	AFTERNOON SESSION 2.30 PM – 6.00 PM (3 effective hours with 30 minutes break)	EVENING SESSION 8.30 PM – 10.30 PM (1.5 effective hours with 30 minutes break)
DAY 1: MONDAY	(1) INFORMATION PHASE • OPENING • VM LAB BRIEFING • STUDY INPUTS BRIEFING/SHARING • GROUPING	(1) INFORMATION PHASE • GROUP WORKS	(1) INFORMATION PHASE • GROUP WORKS
DAY 2: TUESDAY	(1) INFORMATION PHASE • PRESENTATIONS (2) FUNCTION ANALYSIS PHASE • GROUP WORKS	(2) FUNCTION ANALYSIS PHASE • GROUP WORKS	(2) FUNCTION ANALYSIS PHASE • GROUP WORKS
DAY 3: WEDNESDAY	(2) FUNCTION ANALYSIS PHASE • PRESENTATIONS (3) CREATIVE PHASE • GROUP WORKS	(3) CREATIVE PHASE • GROUP WORKS	(3) CREATIVE PHASE & (4) EVALUATION PHASE • GROUP WORKS
DAY 4: THURSDAY	(4) EVALUATION PHASE • PRESENTATIONS (5) DEVELOPMENT PHASE • GROUP WORKS	(5) DEVELOPMENT PHASE • GROUP WORKS	(5) DEVELOPMENT PHASE • GROUP WORKS
DAY 5: FRIDAY	(5) DEVELOPMENT PHASE • GROUP WORKS (5) DEVELOPMENT PHASE • PRESENTATIONS	(6) PRESENTATION PHASE • VM FINDINGS PRESENTATION • CONCLUSION	

Table 2.2. VM Lab Sample Agenda (Less than 40 hours: 2 Sessions/Day)

LAB SCHEDULE	MORNING SESSION		AFTERNOON SESSION
	8.30 AM - 1.00 PM (4 effective hours with 30 minutes break)		2.30 PM – 6.00 PM (3 effective hours with 30 minutes break)
DAY 1: MONDAY	(1) INFORMATION PHASE • OPENING • VM LAB BRIEFING • STUDY INPUTS BRIEFING/SHARING • GROUPING		(1) INFORMATION PHASE • GROUP WORKS
DAY 2: TUESDAY	(1) INFORMATION PHASE • PRESENTATIONS	(2) FUNCTION ANALYSIS PHASE • GROUP WORKS	(2) FUNCTION ANALYSIS PHASE • GROUP WORKS
DAY 3: WEDNESDAY	(2) FUNCTION ANALYSIS PHASE • PRESENTATIONS	(3) CREATIVE PHASE • GROUP WORKS	(3) CREATIVE PHASE • GROUP WORKS
DAY 4: THURSDAY	(4) EVALUATION PHASE • PRESENTATIONS	(5) DEVELOPMENT PHASE • GROUP WORKS	(5) DEVELOPMENT PHASE • GROUP WORKS
DAY 5: FRIDAY	(5) DEVELOPMENT PHASE • GROUP WORKS	(5) DEVELOPMENT PHASE • PRESENTATIONS	(6) PRESENTATION PHASE • VM FINDINGS PRESENTATION • CONCLUSION

2.4 Post-Lab Stage

Post-lab is intended to document and formally report the findings of VM Study; and to implement VM Study findings or VM Ideas that have been achieved during Lab Stage. Actions at VM Post-Lab Stage should also consider feedbacks from client entity and stakeholders that require further clarifications or reviews on the VM Study findings.


03

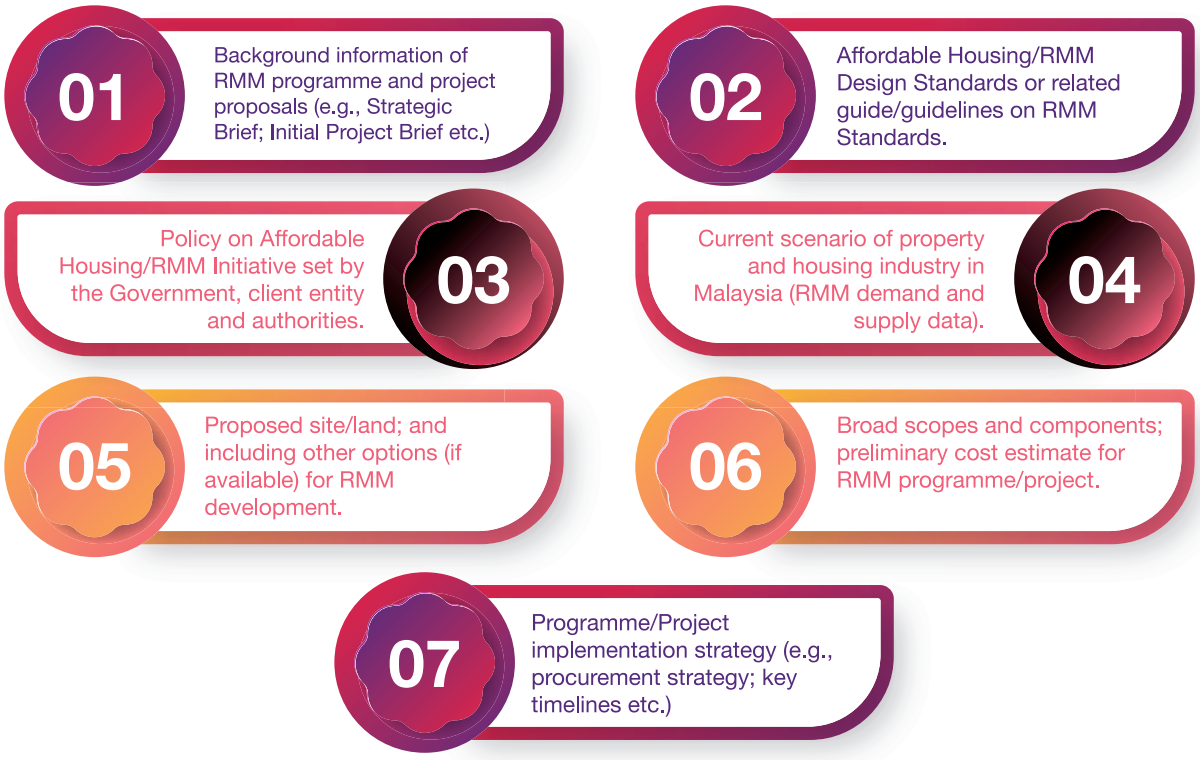
VALUE MANAGEMENT AT STRATEGIC (VMS) PHASE STUDY INTERVENTION

3.0 VMS STUDY INTERVENTION

3.1 Overview

VMS Study can be implemented in RMM programme and projects, where VMS at Strategic Briefing and / or VMS at Project Briefing can be adopted. Each VMS Study intervention should be appropriately planned according to its study context and objectives, study timing and inputs.

3.1.1 VMS Study Inputs

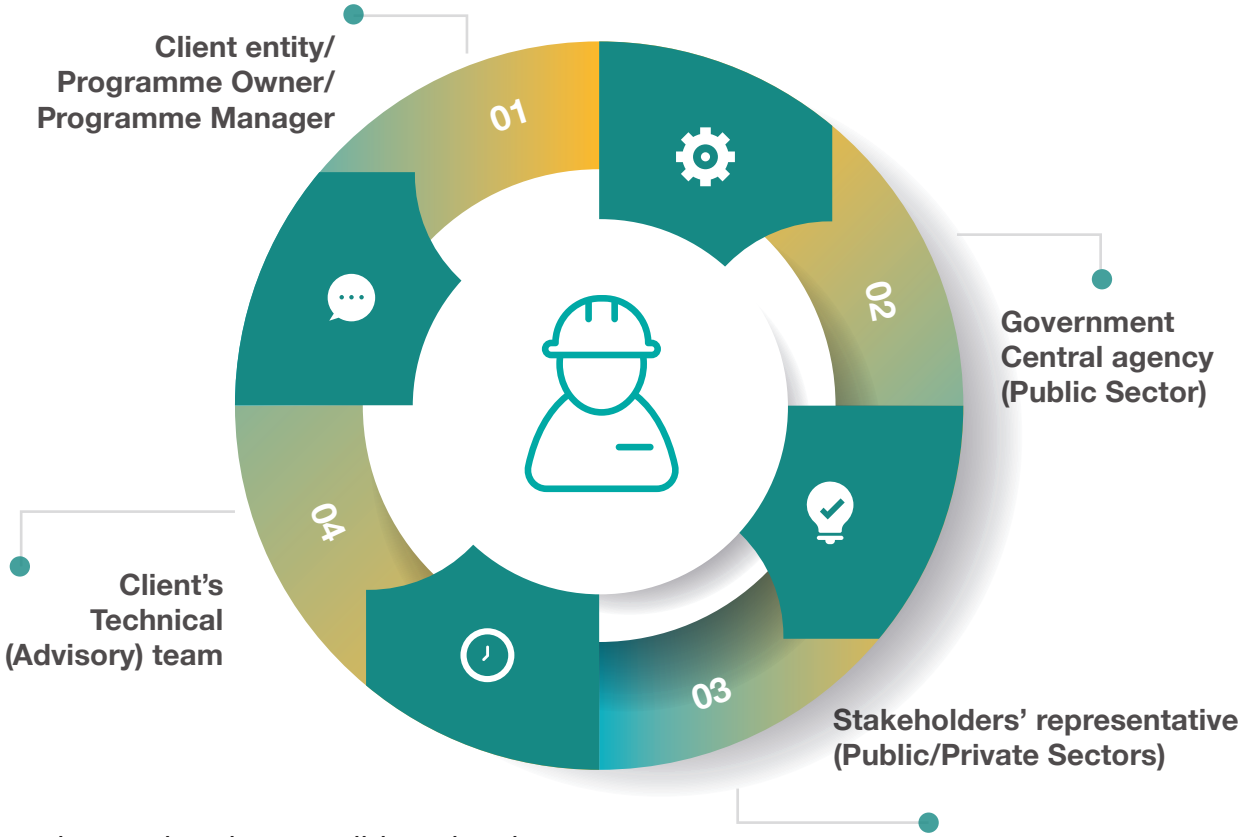


3.1.2 VMS Study Members

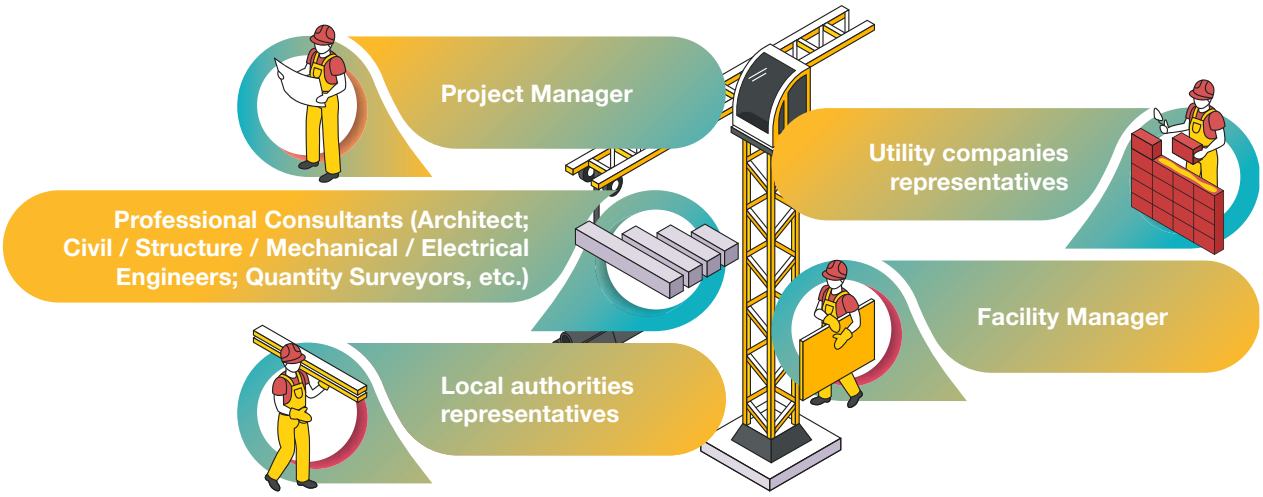
The key feature of the VMS Study is the formation of effective work groups, where the focused scopes of study and expected outputs for each group are determined. Typically, VMS Lab participants are grouped according to their roles in the study, but other factors are considered such as their professional backgrounds and expertise in the RMM programme

and project implementation. Throughout the study, which comprises of Pre-Lab Stage, Lab Stage and Post Lab Stage, VMS Facilitation Team is led by a Value Manager or a competent Lead Facilitator, and supported by Group Facilitators and Scribe(s).

Lab members (or participants) composition may comprise of:



If already appointed or possible to involve:



3.2 VMS Pre-Lab Stage

The recommended VMS Pre-Lab Stage activities and tasks are in reference to and adapted from the available VM guides/guidelines i.e., EPU Guide (2011), JKR VE Guidelines (2013), JKR VAE Guideline (2021), National Value Management Guide, and IVMM (2018). Although the recommended activities and tasks mostly emphasise on the actions to be performed by VMS Facilitation Team, the VMS Study process and procedure are generic and applicable to all entities involved in VMS Study execution.

KEY ACTIVITIES 01

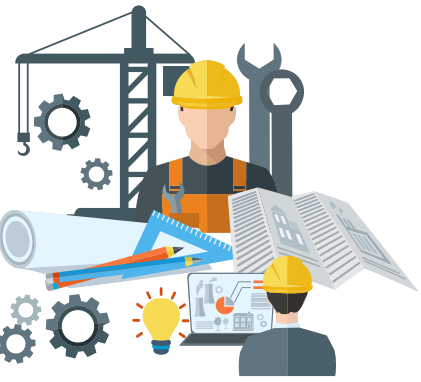
INTERFACE AND INTERACT WITH CLIENT ENTITY AND STAKEHOLDERS

RECOMMENDED TASKS

Interface and interact with client representatives, and stakeholders (programme/ project managers, experts, local authorities, utility companies, etc.).

KEY ACTIVITIES 02

GATHER PROJECT INFORMATION



RECOMMENDED TASKS

Inputs (information/data/documents) compilation for pre-study purposes is conducted by Facilitation Team and review on readiness for VMS Lab includes (but not limited to) the following:

- Strategic brief/information of the proposed programme and/or project
- Initial project brief/information
- Available site options (if any) and project site selection
- Land (site) ownership status and conditions
- Project development concept/type(s) or model(s); and available options (if any)
- Project scopes and components
- Project capacity/size and plot ratio
- Indicative Schedule of Accommodation (SOA) and Total Gross Floor Area (GFA)
- Preliminary cost estimates and cost plans (if any)
- Special requirements (by client/authorities etc.)
- VMS Lab logistics - date, itinerary, venue and budget
- Composition of VMS Lab participants

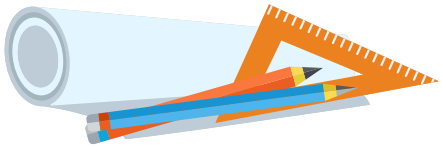
KEY ACTIVITIES

03

IMPLEMENT PRE-STUDY

RECOMMENDED TASKS

Implement Pre-Study (by VMS Facilitation team, client entity and related parties) to facilitate understanding, preliminary findings, determination of readiness and preparation for VMS Lab.



KEY ACTIVITIES

04

DEVELOP LAB PROGRAMME AND ARRANGE LAB REQUIREMENTS

RECOMMENDED TASKS

Plan and develop (by the VMS Facilitation team, client entity and related parties) VMS Lab Agenda, study game plan, tools and techniques, lab members composition, working groups, resources and logistics etc. for organising VMS Lab.

KEY ACTIVITIES

05

ORGANISE ORIENTATION SESSION

RECOMMENDED TASKS

Organise orientation session for VMS Facilitation Team members and other related parties/lab members (as required) for study preparation prior to VMS Lab.

3.3 VMS Lab Stage

3.3.1 VMS Lab Information Phase

The main purpose of this phase is to understand the background and current situation of the project under study. It includes sharing of current inputs i.e., information/data/ documents etc., including strategic information, project brief, preliminary cost estimation and project implementation strategy. Furthermore, VMS Information Phase will lead to the identification of gaps or issues/problems and risks, as contributed by the earlier pre-study activity (during pre-lab) and any up-to-date information shared during this phase.

The recommended activities and tasks for VMS Lab – 'Information Phase' are as follows:

KEY ACTIVITIES 01

REGISTER LAB PARTICIPANTS

RECOMMENDED TASKS

Ensure attendance of client/stakeholders/representatives/ / decision makers; and record attendance of participants

LAB OPENING SESSION

KEY ACTIVITIES 02

RECOMMENDED TASKS

Conduct opening session (i.e., opening remarks, direction, expectation etc.), followed by introduction activity (e.g., introduction of lab team members, clarify roles and responsibilities) or use appropriate team building technique.

KEY ACTIVITIES
03

BRIEFING ON VMS LAB AGENDA AND LAB PHASE PROCESS

RECOMMENDED TASKS

Run through the VMS Lab process and procedure, purposes and expected outputs of 'Information Phase'; and verify with lab team members on VMS Lab Agenda setting, game plan, lab grouping, group members etc.

KEY ACTIVITIES
04

VERIFY VMS STUDY OBJECTIVES

RECOMMENDED TASKS

Establish and brief main objectives of VMS at Project Briefing Study (modifiable for VMS at Strategic Briefing Study):

- Establish project objectives to align with programme/ project outcomes (business needs);
- Determine scopes and components of project, aligning with the project objectives;
- Determine preliminary cost estimate for the proposed project;
- Determine/improve project implementation strategy (e.g., Key project timelines, procurement strategy, risk management plan etc.).

KEY ACTIVITIES
05

BRIEFING ON PROGRAMME AND/OR PROJECT INFORMATION

RECOMMENDED TASKS

Present related information/data/document in justifying the viability and feasibility of the proposed project. Presentations (at project level) may include:

- Basis of justification on the viability of project proposal (strategic brief, programme/project outcomes, project objectives etc.)
- Inputs of Project Brief (not limited to the following lists)
  - Development concept of project to be developed.
  - Functional requirements, list of required services, project scopes and components, capacity/size, SOA Indicative Total GFA etc.
  - Site conditions, status of land ownership, suitability of the site etc.
  - Specific requirements such as BIM or local authorities/utility companies, etc.
- Preliminary Cost Estimate of project.
- Project implementation strategy (key timelines, procurement strategy, risk management plan etc.).

KEY ACTIVITIES
06

DETERMINE VMS STUDY MODEL(S)

RECOMMENDED TASKS

Determine appropriate VMS Study Model(s) to be used:

- Project Cost Model (Capital Cost) - coordinated with preliminary cost estimates
- Life Cycle Cost Model;
- Spatial Model - coordinated with SOA and GFA;
- Quality Model; etc.

KEY ACTIVITIES
07

VERIFY VMS STUDY SCOPES

RECOMMENDED TASKS

Verify appropriate study scopes of VMS in accordance with the determined VMS Study Objectives; and align with the formation of working groups, composition; etc

KEY ACTIVITIES
08

ANALYSE INFORMATION USING METHODS, TOOLS AND TECHNIQUES

RECOMMENDED TASKS

Analyse programme and/or project information in relative to the identification of gaps, issues, problems, constraints, risks, etc. through application of suitable and effective methods/ tools/techniques/templates etc. (e.g., P.E.S.T.E.L. for analysing on the 'Politics - Economics - Sociological - Technological - Environmental Legal'; Client Value System (CVS); S.W.O.T for analysing 'Strengths - Weakness - Opportunities Threats'; and 'Information Phase' Template).

KEY ACTIVITIES
09

PRESENT INFORMATION PHASE OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present 'Information Phase' study outputs/findings and obtain feedbacks from VMS Lab members for additional information/analysis.

3.3.2 VMS Lab: Function Analysis Phase

The Function Analysis Phase primarily aims to determine and provide understanding on the functional requirements according to the appropriate level(s) of analysis, at either one or more of these focuses, i.e., project/spaces/element/system levels. In this second lab phase, the functionality of the project is analysed and verified to ensure that the required functions can be created, improved, or removed (if not relevant). Through Function Analysis, any findings of mismatch, gap and functional related risk will become the basis for an improvement or remedy to ensure the intended functionality is achieved, for which the function is in line with the project outcomes and project objectives.

The findings from functional analysis will also be used as a basis for generating alternative ideas, options and decisions in relation with determining the project scopes and components, development concepts, key systems and elements, etc. Apart from providing basis for functionality requirements, the findings from Function Analysis Phase will implicate the utilisation and distribution of project resources such as the land/site usage, spaces, capacity, costs, time, etc.

The recommended activities and tasks for VMS Lab - Function Analysis Phase are as follows:

KEY ACTIVITIES

01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Function Analysis Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES

02

ANALYSE PROJECT FUNCTIONS

RECOMMENDED TASKS

Analyse Function Analysis at the holistic project level, and identify any mismatch, gap, risk or any potential function improvements. Apply suitable function tools/techniques (e.g., F.A.S.T Diagram, function analysis template, etc.) and record findings/outputs of the analysis.

KEY ACTIVITIES

03

ANALYSE FUNCTIONS OF SPACES/ ELEMENTS/ SYSTEMS/COMPONENT ETC.

RECOMMENDED TASKS

Further analyse the functional requirements, such as key operation flow/key user flow, key adjacency requirements, etc.; and record findings of any mismatch, gap, risk or potential improvements. Apply suitable methods/tools/ techniques etc. (e.g., key user/operation flows charting, adjacency matrix, F.A.S.T Diagram, function analysis template etc.) in performing functions analysis.

KEY ACTIVITIES

04

PRESENT 'FUNCTION ANALYSIS PHASE' OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present 'Function Analysis Phase' study outputs/findings and obtain feedbacks from VMS Lab members for additional information/analysis.

3.3.3 VMS Lab Creative Phase

'Creative Phase' aims to apply creative thinking techniques to challenge existing proposals or provide alternatives (or options) and determine solutions that have potentials to increase project value. It is implemented through idea generation which include alternatives to close or resolve the addressed gaps, issues, mismatch or risks, to propose improvement on functionality, quality, time cost, resources, satisfaction etc. and to achieve project objectives and outcomes.

In this phase, the earlier information gathered during the 'Information Phase' and 'Function Analysis Phase' are referred for the addressed gaps, issues, risks, mismatch, and will be the basis in proposing potentials of improvement. Any suitable creative and innovative method/tool/technique and/or template such as 'Brainstorming Technique' is applied to generate ideas during this phase. In some circumstances, an alternative(s) or option(s) is/ are required to 'challenge' or verify the existing proposal, and/or to select the best option in terms of asset solution strategy, site location/utilisation, development concept, master plan etc.

The recommended activities and tasks for VMS Lab - 'Creative Phase' are as follows:

KEY ACTIVITIES

01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Creative Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES
02

GENERATE ALTERNATE IDEAS

RECOMMENDED TASKS

Generate ideas through 'Brainstorming Technique' or other appropriate method/tool/technique etc. to generate as many ideas as possible, but avoid pre-judgement; and to record each generated idea. Among many examples of VMS ideas that can be generated are:

- Alternative(s) or option(s) to the existing proposal of asset solution (project proposal);
- Improved or additional justification on viability of the proposed asset solution (project proposal);
- Alternative(s) or option(s) or modification(s) to the existing site selection or site utilisation; development concept; project scopes and components, etc.
- Solutions or improvement measures to the identified gaps, issues, risks, mismatch etc.
- Improvement measures on functionality, quality, time schedule, costs, resources etc.

KEY ACTIVITIES
03

PRESENT 'CREATIVE PHASE' OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present the 'Creative Phase' outputs/findings and obtain feedbacks from VMS Lab members to exhaust or modify the generated ideas.

3.3.4 VMS Lab Evaluation Phase

The 'Evaluation Phase' involves a systematic process to evaluate ideas and alternative(s) or option(s) generated during 'Creative Phase'. Thus, during 'Evaluation Phase', the generated ideas/options will be screened and listed as potential ideas for further development (in the next 'Development Phase').

The evaluation process is implemented by setting evaluation criteria (whether specific/ generic); and by applying any appropriate and effective evaluation methods/tools/ techniques/templates etc. The evaluation criteria can be customised to a specific context (e.g., 'Function-based' criteria in evaluating options for development concept/master plan etc.); or to apply generic evaluation criteria in screening the list of generated ideas. During the screening process, collective judgement and discretion from lab team members are necessary in evaluating the ideas, as to list potential ideas (categorised as 'Evaluated' Ideas) for further evaluation in 'Development Phase'.

The recommended activities and tasks for VMS Lab - 'Evaluation Phase' are as follows:

KEY ACTIVITIES

01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Evaluation Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES

02

GENERATE ALTERNATE IDEAS

RECOMMENDED TASKS

Determine appropriate evaluation method/tool/technique/ template etc. and evaluation criteria for screening purpose or to shortlist the generated ideas (from 'Creative Phase').

Apply the specific or customised evaluation criteria in evaluating the alternative(s) or option(s) – if applied, such as options of development concept; master plan, etc.; and/or apply the generic evaluation criteria for evaluating the list of generated ideas, which are intended to resolve any identified gaps/issues/mismatches/risks etc.

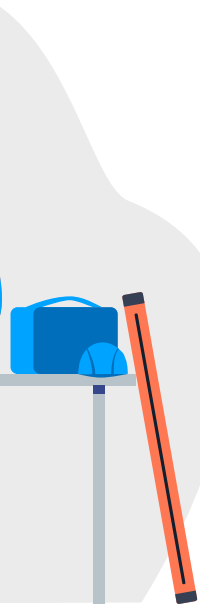
Among the adoptable generic evaluation criteria are:

- Client Acceptability
- Functional Suitability
- Technical and/or Time Feasibility
- Economic Feasibility

Other evaluation criteria that may be adopted are:

- Commercial viability
- Compliance to authority or policy
- Innovative factor
- Risk impact factor, etc.

Categorise the ideas and/or options into either; 'Evaluate' for potential ideas; 'Discard' for non-potential ideas; and 'Information' for potential ideas that will suit future or other projects. The 'Evaluate' category is for the listed ideas that require further evaluation under 'Development Phase'.



KEY ACTIVITIES

03

PRESENT 'EVALUATION PHASE' OUTPUTS/FINDINGS AND OBTAIN CONSENSUS AGREEMENT

RECOMMENDED TASKS

Present the 'Evaluation Phase' outputs/findings and obtain feedbacks from VMS Lab members towards reaching consensus from the lab members.

3.3.5 VMS Lab Development Phase

The purpose of 'Development Phase' is to develop ideas and incorporate alternative(s) or option(s) listed under 'Evaluate' category from the previous 'Evaluation Phase'. The development of ideas includes evaluating each potential idea in detail before it is finalised and recommended as a VMS Idea (or not). In developing each idea, detailed evaluation will be supported by additional information e.g., the advantages and disadvantages of idea, relevant calculations, cost implications, sketches, analysis results, etc., where appendices or additional documents may be provided.

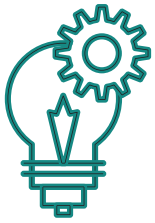
The recommended activities and tasks for VMS Lab - 'Development Phase' are as follows:

KEY ACTIVITIES 01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Development Phase' process and procedure, its purposes and expected outputs.



KEY ACTIVITIES 02

DEVELOP AND FURTHER EVALUATE IDEAS INTO WORKABLE OPTIONS/SOLUTION

RECOMMENDED TASKS

Develop details of each idea i.e., the advantages (e.g., innovation), disadvantages (e.g., risk), cost/time/quality implications etc. and may be supported by calculations, analysis, and relevant appendices/documents.

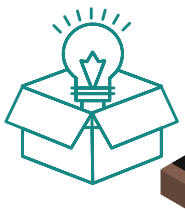
KEY ACTIVITIES 03

PRESENT AND OBTAIN CONSENSUS ON VMS IDEAS AND BEST SOLUTION/OPTION

RECOMMENDED TASKS

Present and discuss each idea, and obtain consensus on finalising and recommending it as a 'VMS Idea'. Whenever alternatives or options are evaluated, the final decision on the best solution or option must be achieved, that is based on the detailed evaluation.

Obtain consensus from VMS Lab members and stakeholders on the recommended VMS Ideas.



KEY ACTIVITIES
04

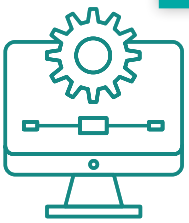
LIST AND RECORD RECOMMENDATION OF VMS IDEAS

RECOMMENDED TASKS

Establish a list of VMS Ideas and keep proper records of all study outputs (i.e., application of templates, methods, tools/techniques, supporting documents etc.). A record of the rejected idea(s) or option(s) should also be kept, stating the reasons for the rejection.

KEY ACTIVITIES
05

SUMMARISE IMPLICATIONS FROM VMS STUDY FINDINGS



RECOMMENDED TASKS

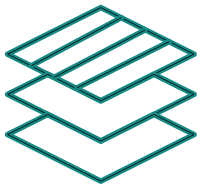
Summarise/Review VMS Study Model(s) based on the implications derived from VMS Ideas and/or the selected option (e.g., Cost Model, Spatial Model - SOA and GFA, etc.)

KEY ACTIVITIES
06

DEVELOP ACTION PLAN FOR POST VMS LAB ACTIVITIES

RECOMMENDED TASKS

Determine VMS Post Lab Action Plan, taking into account the action and time required to implement VMS Ideas. The Post Lab activities, time targets, responsible parties etc. need to be captured in the Action Plan, as agreed by VMS Lab members and stakeholders.

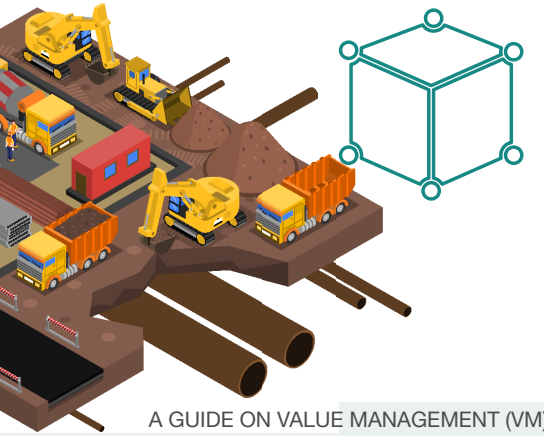


KEY ACTIVITIES
07

REVIEW ACHIEVEMENT OF VMS STUDY OBJECTIVES

RECOMMENDED TASKS

Assess and record the achievements of VMS Study Objectives.



3.3.6 VMS Lab Presentation Phase

This final phase requires the facilitation team to encapsulate and present the findings of VMS Lab to lab members and stakeholders in order to obtain consensus. Concurrently, VMS Lab outputs (the completed tools/templates/templates etc.) from VMS Lab activities must be gathered and complied for reporting and record purposes. Eventually, an initial version of VMS Report will be presented during this phase as to summarise the findings and achievements of VMS Study, prior to preparing a complete VMS Report for submission purpose (to be delivered during Post Lab Stage).

The Initial VMS Report captures the recommended VMS Ideas and revisions of VMS Study Models e.g., Project Cost Model (Preliminary Costs Estimate), Spatial Model (SOA and GFA), Quality Model (Design Quality Criteria) and etc. In the presentation, the summarised key findings from VMS Study will be highlighted e.g., the verification on project viability (whether the project is viable or not); the determined project scopes and components, the selected alternative or option (if applied – e.g., on development concept/master plan, etc.); revisions of SOA/GFA; revised project costs; determined project implementation strategies (procurement strategy, timelines, and risks identification), etc.

In addition, Post VMS Lab Action Plan and the assessment on VMS Study Objectives will also be presented in concluding the VMS Study. Upon presentation of initial VMS Report, feedbacks from the lab members/stakeholders are obtained for final reviews and/or improvement to the initial VMS Report, which is aimed at concensusly conclude the VMS Study. So, this becomes basis for preparing an official VMS Report for submission purpose (during Post Lab Stage).

The recommended activities and tasks for VMS Lab - Presentation Phase are as follows:

KEY ACTIVITIES 01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Presentation Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES 02

PRESENT VMS STUDY RECOMMENDATIONS AND FINDINGS

RECOMMENDED TASKS

Present the initial VMS Report, summarising the findings of VMS Study which includes (not limited to the following list):

- List of the recommended VMS Ideas;
- Completed applications of methods/tools/techniques and templates;
- Determined/Revised VMS Study Model(s) (e.g., Cost Model, Space Model; Quality Model, etc.);
- Summary on key findings of VMS Study, e.g., verification on project viability; determined project scopes and components, the selected alternative or option; revisions of SOA/GFA; revised project costs; determined project implementation strategies, etc.
- Relevant supporting data/documents/information;
- Agreed VMS Post Lab Action Plan;
- Assessment on VMS Study Objectives; etc.

KEY ACTIVITIES 03

OBTAIN ACCEPTANCE FROM VMS LAB MEMBERS AND STAKEHOLDERS

RECOMMENDED TASKS

Obtain feedbacks on reviews and improvements from VMS Lab team members and stakeholders; which is based on the Initial VMS Report presentation. Upon presentation and reviews, the acceptance and consensus on the Initial VMS Report should be achieved.

3.4 VMS Post Lab Stage

Post-Lab Stage is primarily intended to document, submit and disseminate an official report of VMS Study findings and outputs. At the same time, other activities need to be performed during this stage are to implement and/or adopt the recommended VMS Ideas in the related project documents i.e., Strategic Briefing/Business Needs/Business Case Justification; Project Briefing; Preliminary Cost Estimate; Project implementation Strategies and etc. Wherever possible, other activities at VMS Post-Lab Stage may include follow-up actions and assessments on the agreed activities of VMS Post-Lab Action Plan; and the implementation/adoption of VMS Ideas by the assigned parties.

The recommended activities and tasks for VMS Post-Lab Stage are as follows:

KEY ACTIVITIES 01

DOCUMENT VMS STUDY OUTPUTS

RECOMMENDED TASKS

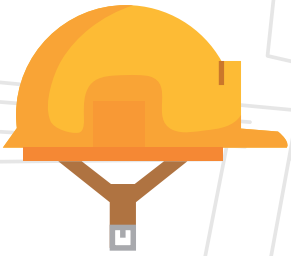
Consolidate all VMS outputs and produce final reporting (hardcopy report and signing off – if required)

KEY ACTIVITIES 02

DISSEMINATE VMS STUDY REPORT

RECOMMENDED TASKS

Submit VMS Study Report copies to client entity/project owner/ related stakeholders.

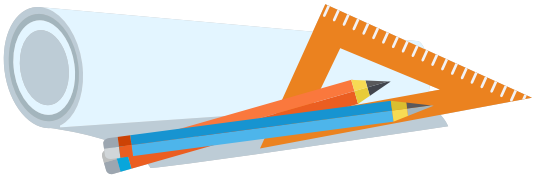


KEY ACTIVITIES
03

FOLLOW UP ON AGREED ACTION PLAN

RECOMMENDED TASKS

Monitor and assess implementation of activities in the agreed Post VMS Lab Action Plan



KEY ACTIVITIES
04

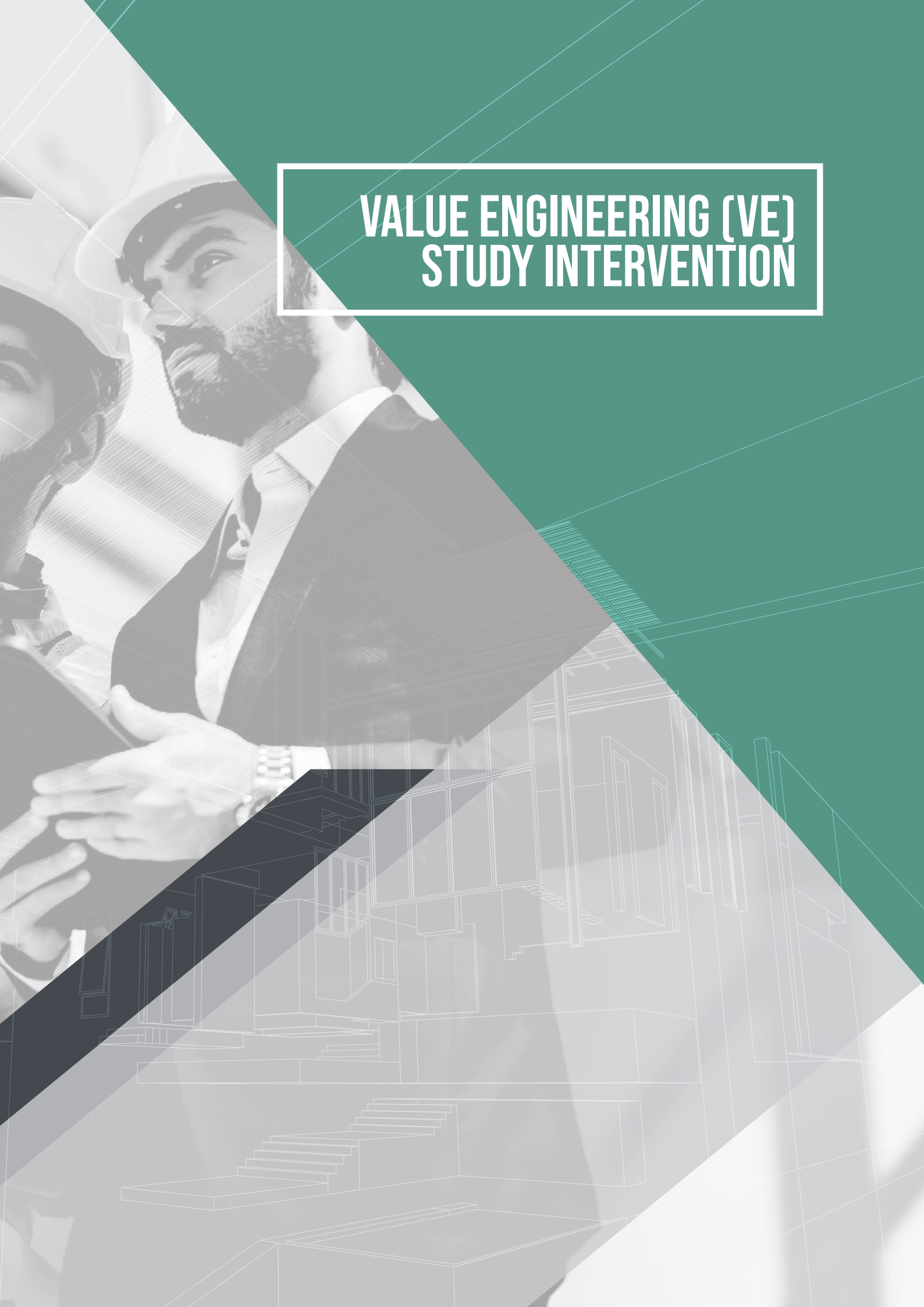
FOLLOW UP ON VMS IDEA IMPLEMENTATION

RECOMMENDED TASKS

Monitor and assess implementation/adoption of VMS Ideas in the related project documents.

04

VALUE ENGINEERING (VE) STUDY INTERVENTION



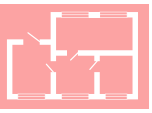
4.0 VE STUDY INTERVENTION

4.1 Overview

VE Study intervention(s) can be implemented at the design development stages of RMM projects, i.e., on Concept Design and/or Detail Design Stages. VE Study intervention(s) is/ are subsequent to VMS Study intervention(s) in ensuring continuous value enhancement in the Affordable Housing/RMM project implementation. The primary basis of VE Study can be among the readily available RMM CIDB designs, or any newly developed designs suitable for adoption in the Affordable Housing/RMM projects. The primary advantage of RMM CIDB designs is the availability of various workable model / design options for adoption in the Affordable Housing/RMM projects. Moreover, the RMM CIDB designs are developed using the IBS System and BIM integrations.

4.1.1 VE Study Inputs

a) Concept Designs and/or Detail Designs (as latest developed and reviewed prior to VE Study).



b) 'As progressed' bills of quantities (BQ) or other forms of project costs calculation/estimation.

c) Feasibility Study Report (if conducted/available).

d) Project Briefing of RMM project proposal; comprises of project scopes and components, initial master planning etc. and preliminary cost estimate.

e) Proposed site information for RMM development. i.e., location, boundary, conditions etc.

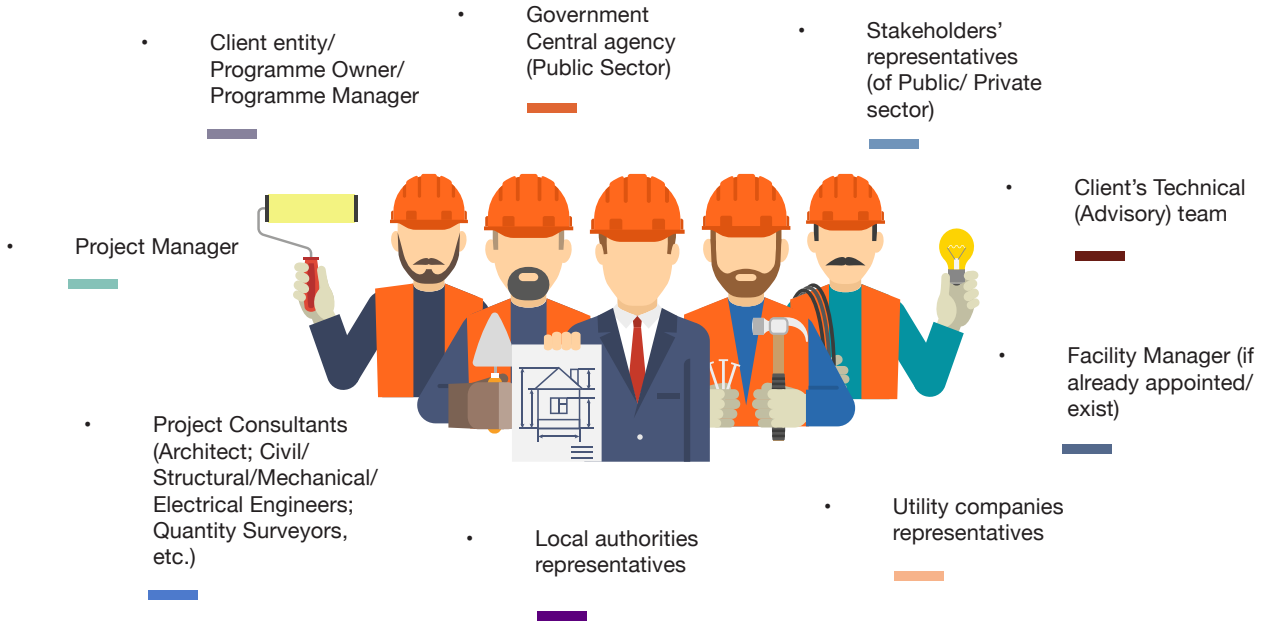
f) Project implementation strategy, e.g., procurement strategy; work programme; etc.

4.1.2 VE Study Members

VE Lab participants are typically grouped according to their consultancy service disciplines or professional roles and expertise in a specific RMM project implementation. Throughout the study, which comprises of Pre-Lab Stage, Lab Stage and Post Lab Stage, VE Facilitation Team is led by a Value Manager or a competent Lead Facilitator, and supported by Group

Facilitators and Scriber(s).

Lab members (or participants) composition may comprise of:



4.2 VE Pre-Lab Stage

The recommended VE Pre-Lab Stage activities and tasks which referred to and adapted from available guidelines i.e., EPU Guide (2011), JKR VE Guidelines (2013), JKR VAE Guideline (2021), National Value Management Guide, IVMM (2018) are as follows. The recommended activities and tasksemphasised more on the actions to be performed by VE Facilitation Team, but the following process and procedure are generic and applicable to all entities' involved in VE Study execution:

KEY ACTIVITIES

01

INTERFACE AND INTERACT WITH CLIENT ENTITY, STAKEHOLDERS AND PROJECT TEAM

RECOMMENDED TASKS

Interface and interact with client representatives, and stakeholders (project managers, experts, local authorities, utility companies, etc.)

KEY ACTIVITIES

02

GATHER PROJECT INFORMATION

RECOMMENDED TASKS

Inputs (information/data/documents) compilation for pre-study purposes is conducted by Facilitation Team and review on readiness for VE Lab includes (but not limited to) the following:

- VMS La b Report (if applicable) and compliances of project designs solutions to VMS Study
- Concept Designs and/or Detail Designs progress (project readiness and VE Study timelines etc.)
- Project Briefing and/or Design Briefing (updated/latest)
- Technical report (e.g., Feasibility Study; SI Report, Survey Plan etc. – if available)
- Relevant authorities' requirements
- VE Study Objectives and Study Scopes/Level of study
- Site conditions, boundary etc. and master planning
- Project scopes and components; capacity/size etc.
- Schedule of Accommodation (SOA) and Total Gross Floor Area (GFA) (updated/as designed)
- Preliminary cost estimates (updated/as designed)
- Special requirements (by client/authorities etc.)
- Implications and constraints of VE Study to project
- Requirement for further VE Study (if necessary)
- VE Lab logistics - date, itinerary, venue and budget
- Composition of VE Lab participants.

KEY ACTIVITIES

03

IMPLEMENT PRE-STUDY

RECOMMENDED TASKS

Implement pre-study (by VE Facilitation Team, client entity and relevant parties) to facilitate understanding, preliminary findings, determination of readiness and preparation for VE Lab; covering but not limited to the following:

- Current designs and quality requirements
- Site visit (where necessary)
- Project objectives and project outcomes
- Project functions or verify F.A.S.T Diagram
- Spaces/elements/systems functions etc.
- Appropriate study model(s)
- Compliances of VMS Ideas in design solutions

KEY ACTIVITIES

04

GENERATE ALTERNATE IDEAS

RECOMMENDED TASKS

Plan and develop (by the VE Facilitation team, client entity and related parties) VE Lab Agenda, game plan, tools and techniques, lab members composition, working groups, resources and logistics etc. for organising VE Lab.

PRESENT 'CREATIVE PHASE' OUTPUTS/FINDINGS

KEY ACTIVITIES

05

RECOMMENDED TASKS

Organise orientation sessions for VE Facilitation Team members and other related parties/lab members (as required) for study preparation prior to VE Lab.

4.3 VE Lab Stage

4.3.1 VE Lab Information Phase

The main purpose of this VE Study phase is to share and provide common understanding of the current project information/data/documents etc. i.e., Concept Design and/or Detail Designs, updated project/design briefing, preliminary cost estimation and project implementation strategy etc. Moreover, the Information Phase will lead to the identification of gaps or issues/problems and risks, as contributed by the earlier pre-study activity (during pre-lab) and any up-to-date information shared during this phase.

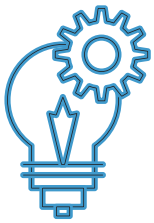
The recommended activities and tasks for VE Lab - Information Phase are as follows:

KEY ACTIVITIES 01

REGISTER LAB PARTICIPANTS

RECOMMENDED TASKS

Ensure attendance of client/stakeholders/representatives / decision makers; and record attendance of participants



KEY ACTIVITIES 02

LAB OPENING SESSION

RECOMMENDED TASKS

Conduct opening session (i.e., opening remarks, direction, expectation etc.), and followed by introduction activity (e.g., introduction of lab team members, clarify roles and responsibilities) or apply any team building technique.

KEY ACTIVITIES 03

BRIEF AND VERIFY VE LAB AGENDA AND LAB PHASE PROCESS

RECOMMENDED TASKS

Briefing on VE Lab process and procedure, purposes and expected outputs of 'Information Phase'; and verify with lab team members on VE Lab Agenda setting, game plan, lab grouping, group members etc.

KEY ACTIVITIES
04

BRIEF AND VERIFY VE STUDY OBJECTIVES

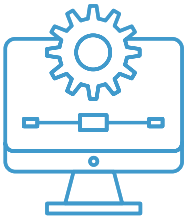
RECOMMENDED TASKS

Briefing and verify main objectives of VE on Concept Design Study (modifiable for VE on Detail Design Study):

- Verify project objective alignment on Concept Design in terms of characteristics of required functions, client value systems, quality criteria etc.;
- (Whenever necessary) Assess option(s)/alternative(s) of Master Plan and Concept Designs to determine best option;
- Optimise project costs within the capped scopes and budget;
- Review/improve project execution plan (e.g., procurement strategy; work programme, risk management plan etc.)

KEY ACTIVITIES
05

BRIEF ON PROJECT INFORMATION



RECOMMENDED TASKS

Present related information/data/document etc. about project/scopes under study as follows:

- VMS Report and compliance of designs proposals
- Concept Design and/or Detail Design
- Updated Project Briefing/Design Briefing (not limited to the following lists):
  - Functional/user flow/adjacency etc. requirements, project scopes and components, capacity/size, SOA, Total GFA etc.
  - Site conditions, constraints etc.
  - Any specific requirements, such as on BIM or by local authorities/ utility companies, etc.
- 'As-designed' project Costs Estimate.
- Project implementation strategy (e.g., key timelines, procurement strategy, risk management plan etc.).

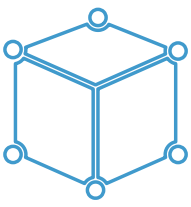
KEY ACTIVITIES
06

DETERMINE VE STUDY MODEL(S)

RECOMMENDED TASKS

Determine appropriate VE Study Model(s) to be used:

- Project Cost Model (Capital Cost) - coordinated with 'as-designved' cost estimates
- Life Cycle Cost (LCC) Model;
- Spatial Model - coordinated with SOA and GFA;
- Quality Model; etc.



KEY ACTIVITIES 07

VERIFY VE STUDY SCOPES

RECOMMENDED TASKS

Verify appropriate study scopes of VE in accordance with the determined VE Study Objectives; and to align with the formation of working groups, composition; etc.

KEY ACTIVITIES 08

ANALYSE INFORMATION USING METHODS, TOOLS AND TECHNIQUES

RECOMMENDED TASKS

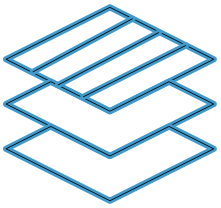
Analyse project information in relative with the identification of gaps, issues, problems, constraints, risks, etc. through application of suitable and effective methods/ tools/techniques/templates etc.

KEY ACTIVITIES 09

PRESENT INFORMATION PHASE OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present 'Information Phase' study outputs/findings and obtain feedbacks from VE Lab members for additional information/ analysis.



4.3.2 VE Lab Function Analysis Phase

This second phase VE aims to achieve determination and understanding on the functional requirements according to the focus function analysis at one or more levels i.e., whole project/space/element levels etc. In this phase, the functionality of the project is analysed against the existing functional information to ensure that functional requirements can be created, improved, or removed (if not relevant). Through Function Analysis, any findings of mismatch, gap and functional related risk will become the basis for any improvement or a remedy to ensure the achievement of the intended functionality, in which the function is in line with the project objectives.

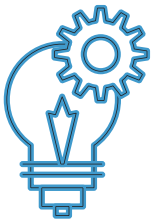
The recommended activities and tasks for VE Lab - Function Analysis Phase are as follows:

KEY ACTIVITIES 01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on Function Analysis Phase including purposes, activities and expected outputs



KEY ACTIVITIES 02

ANALYSE PROJECT FUNCTIONS

RECOMMENDED TASKS

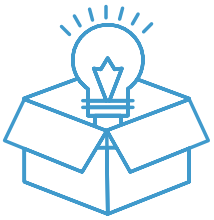
Functional analysis at the project level and record the findings of any potential improvements/mismatch/risks related to the function using tools/techniques (e.g., F.A.S.T Diagram, function analysis template)

KEY ACTIVITIES 03

ANALYSE FUNCTIONS OF SPACES/ELEMENTS/ SYSTEMS/COMPONENTS ETC.

RECOMMENDED TASKS

Further analyse functional requirements such as operation flow/ user flows, adjacency requirements, etc.; and record findings of any mismatch, gap, risk or potential improvements. Apply suitable methods/tools/ techniques (e.g., user/operation flows charting, adjacency matrix, F.A.S.T Diagram, function analysis template etc.) in performing functions analysis.



KEY ACTIVITIES 04

PRESENT 'FUNCTION ANALYSIS PHASE' OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present 'Function Analysis Phase' study outputs/findings and obtain feedbacks from VMS Lab members for additional information/analysis.

4.3.3 VE Lab Creative Phase

This phase aims to apply creative and innovative thinking techniques to challenge existing proposals or options by identifying other alternatives and solutions that are potentially able to increase the value of the project/space/system/element etc. Commonly, 'Brainstorming Technique' is applied for ideas generation including in finding alternative(s) or option(s) to increase functional and technical requirements, which is to close or resolve the identified gaps, issues, mismatch or risks; and propose improvement on functionality, quality, time cost, resources, satisfaction etc.

In this phase, the earlier information gathered during the 'Information Phase' and 'Function Analysis' Phase are referred for the addressed gaps, issues, risks, mismatch, and being the basis for proposing potentials of improvement.

The recommended activities and tasks for VE Lab - Creative Phase are as follows:

KEY ACTIVITIES 01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Creative Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES 02

GENERATE ALTERNATE IDEAS

RECOMMENDED TASKS

Generate ideas through 'Brainstorming Technique' or using other appropriate method/tool/technique etc. to generate as many ideas as possible, but to avoid pre-judgement; and to record each generated idea.

KEY ACTIVITIES 03

PRESENT 'CREATIVE PHASE' OUTPUTS/FINDINGS

RECOMMENDED TASKS

Present the 'Creative Phase' outputs/findings and obtain feedbacks from VE Lab members to exhaust or modify the generated ideas.

4.3.4 VE Lab Evaluation Phase

The 'Evaluation Phase' involves a systematic process to evaluate ideas and include alternative(s) or option(s) generated during 'Creative Phase'. So, the generated ideas/ options can be screened and listed as potential ideas for further development (in the next 'Development Phase').

The evaluation process is implemented by setting evaluation criteria (whether specific/ generic); and by applying any appropriate and effective evaluation methods/tools/ techniques/templates etc. The evaluation criteria can be customised to a specific context (e.g., 'Function-based' Criteria for evaluating options of development concept/master plan etc.); or to apply generic evaluation criteria for screening the list of generated ideas. Within the screening process, collective judgement and discretion from lab team members are necessary in evaluating the ideas, as to list potential ideas (categorised as 'Evaluated' Ideas) for further evaluation in 'Development Phase'.

The recommended activities and tasks for VE Lab - Evaluation Phase are as follows:

KEY ACTIVITIES

01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Evaluation Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES 02

EVALUATE THE GENERATED IDEAS

RECOMMENDED TASKS

Determine appropriate evaluation method/tool/technique/ template etc. and evaluation criteria for screening purpose or to shortlist the generated ideas (from 'Creative Phase').

Apply the specific or customised evaluation criteria in evaluating alternative(s) or option(s) – if applied, such as options of master plan layout; concept design, etc.; and/or apply generic evaluation criteria for evaluating the list of generated ideas, which are intended to resolve any identified gaps/issues/mismatches/risks etc. Among the adoptable generic evaluation criteria are:

- Client Acceptability
- Functional Suitability
- Technical and/or Time Feasibility
- Economic Feasibility

Categorise the ideas and/or options into either; 'Evaluate' for potential ideas; 'Discard' for non-potential ideas; and 'Information' for potential ideas that suit future or other projects. The 'Evaluate' category is for the listed ideas that require further evaluation under 'Development Phase'.

KEY ACTIVITIES 03

PRESENT 'EVALUATION PHASE' OUTPUTS/FINDINGS AND OBTAIN CONSENSUS AGREEMENT

RECOMMENDED TASKS

Present the 'Evaluation Phase' outputs/findings and obtain feedbacks from VE Lab members towards reaching consensus from the lab members.

4.3.5 VE Lab Development Phase

The purpose of 'Development Phase' is to develop ideas and include alternative(s) or option(s) listed under 'Evaluate' category from the previous 'Evaluation Phase'. The development of ideas includes evaluating in detail each potential idea before it is finalised and recommended as a VE Idea (or not). In developing each idea, the detailed evaluation will be supported by additional information e.g., the advantages and disadvantages of the idea, relevant calculations, cost implications, sketches, analysis results, etc., where appendices or additional documents may be provided.

The recommended activities and tasks for VE Lab - Development Phase are as follows:

KEY ACTIVITIES
01

BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on Development Phase including purposes, activities and expected outputs

KEY ACTIVITIES
02

DEVELOP AND FURTHER EVALUATE SHORTLISTED IDEAS INTO WORKABLE OPTIONS AND TO DETERMINE BEST SOLUTIONS

RECOMMENDED TASKS

Develop details of each idea i.e., the advantages (e.g., innovation), disadvantages (e.g., risk), cost/time/quality implications etc. and may be supported with calculations, analysis, and relevant appendices/documents.

KEY ACTIVITIES
03

PRESENT AND OBTAIN CONSENSUS ON VE IDEAS AND BEST OPTION/SOLUTION

RECOMMENDED TASKS

Present and discuss each idea, and obtain consensus on finalising and recommending it as a 'VE Idea'. Wherever there are alternatives or options evaluated, the final decision on the best solution or option must be achieved, that is based on the detailed evaluation.

Obtain consensus from VE Lab members and stakeholders on the recommended VE Ideas.

KEY ACTIVITIES 04

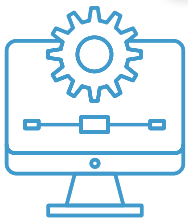
LIST AND RECORD RECOMMENDATION OF VE IDEAS

RECOMMENDED TASKS

Set a list of VE Ideas agreed by the members of the VE Lab. A list of rejected ideas should also be recorded stating the reasons for rejection.

KEY ACTIVITIES 05

SUMMARISE IMPLICATIONS FROM VE STUDY FINDINGS



RECOMMENDED TASKS

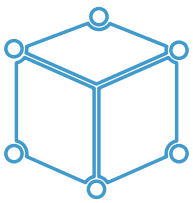
Summarise/Review VMS Study Model(s) based on the implications derived from VE Ideas and/or the selected option (e.g., Cost Model, Spatial Model - SOA and GFA, etc.)

KEY ACTIVITIES 06

DEVELOP ACTION PLAN FOR POST VE LAB ACTIVITIES

RECOMMENDED TASKS

Determine VE Post Lab Action Plan, taking into account the action and time required for implementing VE Ideas. The Post Lab activities, time targets, responsible parties etc. need to be captured in the Action Plan, as agreed by VE Lab members and stakeholders.



KEY ACTIVITIES 07

REVIEW ACHIEVEMENT OF VE STUDY OBJECTIVES

RECOMMENDED TASKS

Assess and record the achievements of VE Study Objectives.

4.3.6 VE Lab Presentation Phase

This final phase requires the facilitation team to encapsulate and present the findings of VE Lab to lab members and stakeholders in order to obtain consensus. Concurrently, VE Lab outputs (the completed tools/templates/templates etc.) from VE Lab activities must be gathered and complied for reporting and recording purposes. Eventually, an initial version of VE Report will be presented during this phase as to summarise the findings and achievements of VE Study, which is prior to preparing a complete VE Report for submission purpose (to be delivered during Post Lab Stage).

The initial VE Report captures the recommended VE Ideas and revisions of VE Study Models e.g., Project Cost Model (Preliminary Costs Estimate); Spatial Model (SOA and GFA); Quality Model (Design Quality Criteria) etc. In the presentation, the summarised key findings from VMS Study will be highlighted e.g., the optimization of designs through alternatives or options within the determined project scopes and components, the selected alternatives or options (if applied – e.g., on master plan layout, concept design etc.); revisions of SOA/ GFA; revised project costs; refinement of project implementation strategies (procurement strategy, timelines, and risks identification), etc.

In addition, the Post VE Lab Action Plan and the assessment on VE Study Objectives will also be presented to conclude VE Study. Upon presentation of the initial VE Report, feedbacks from the lab members/stakeholders are obtained for final reviews and/or improvement to the initial VE Report, which is aimed at reaching consensual conclusion of VE Study. So, this became the basis of preparing an official VE Report for submission purpose (during Post Lab Stage).

The recommended activities and tasks for VE Lab - Presentation Phase are as follows:

KEY ACTIVITIES 01

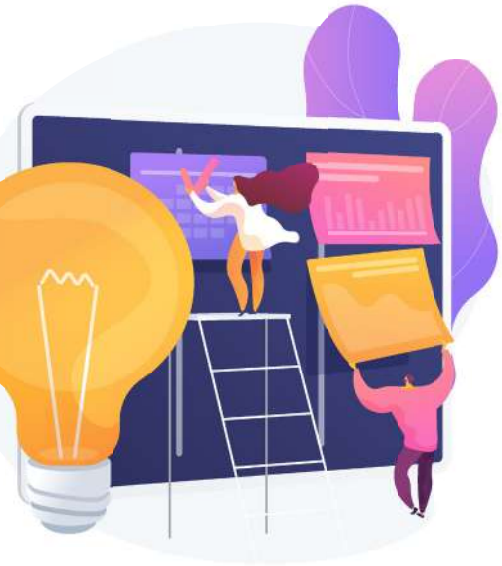
BRIEF ON PROCESS

RECOMMENDED TASKS

Briefing on 'Presentation Phase' process and procedure, its purposes and expected outputs.

KEY ACTIVITIES 02

PRESENT VE STUDY RECOMMENDATIONS AND FINDINGS



RECOMMENDED TASKS

Present the initial VE Report, summarising the findings of VE Study which includes (not limited to the following list):

- List of recommended VE Ideas;
- Completed applications of methods/tools/techniques and templates;
- Determined/Revised VE Study Model(s) (e.g., Cost Model, Space Model; Quality Model, etc.);
- Summary on key findings of VE Study, e.g., significant technical improvements; design optimisation within the capped project scopes and cost; selection of best option e.g., master plan layout or concept design; revisions of SOA/GFA; revised project costs; determined project implementation strategies, etc.
- Relevant supporting data/documents/information;
- Agreed VE Post Lab Action Plan
- Assessment on VE Study Objectives; etc.

KEY ACTIVITIES 03

OBTAIN ACCEPTANCE FROM VE LAB MEMBERS AND STAKEHOLDERS

RECOMMENDED TASKS

Obtain feedbacks on reviews and improvements from VE Lab team members and stakeholders; which is based on the initial VE Report presentation. Upon presentation and reviews, the acceptance and consensus on the initial VE Report should be achieved.

4.4 VE Post Lab Stage

Post-Lab Stage is primarily intended to document, submit and disseminate an official report of VE Study findings and outputs. At the same time, other activities need to be performed during this stage are to implement and/or adopt the recommended VE Ideas in the related project documents i.e., Concept Design and/or Detail Design; Project Cost Estimate; Project implementation strategies etc. Wherever possible, other activities at VE Post-Lab Stage may include follow-up actions and assessments on the agreed activities of VE Post-Lab Action Plan; and the implementation/adoption of VE Ideas by the assigned parties.

The recommended activities and tasks for VE Post-Lab Stage are as follows:

KEY ACTIVITIES 01

DOCUMENT VE STUDY OUTPUTS

RECOMMENDED TASKS

Consolidate VE outputs and produce final reporting (hardcopy report and signing off – if required)

KEY ACTIVITIES 02

DISSEMINATE VE STUDY REPORT

RECOMMENDED TASKS

Submit VE Study Report copies to client entity, project team and related stakeholders.

KEY ACTIVITIES 03

FOLLOW UP ON AGREED ACTION PLAN

RECOMMENDED TASKS

Monitor and assess implementation of activities in the agreed Post VE Lab Action Plan.

KEY ACTIVITIES 04

FOLLOW UP ON VE IDEA IMPLEMENTATION

RECOMMENDED TASKS

Monitor and assess implementation/adoption of VE Ideas in Concept Design and/or Detail Design, Bills of Quantities (BQ) and other related project documents.

05

VALUE MANAGEMENT (VM) TOOLS AND TECHNIQUES

5.0 VM TOOLS AND TECHNIQUES

Appropriate VM and other management tools and techniques are applicable in VMS and VE Studies in supporting facilitation processes, aiding group discussions, and assisting decision-makings throughout the structured value study processes. The initial applications or drafts preparation of the selected tools and techniques should take place at Pre-Lab Stage, where VMS/VE Facilitation Team can initiate the applications for some preliminary findings and obtain feedbacks for verification from key members/participants. The applied tools and techniques will produce preliminary study findings, which are intended to support and aid further investigation/exploration during VMS/VE Lab Stages, and to collectively verify those results with VMS/VE Lab members/participants.

Figure 5.1 shows the recommended tools and techniques applicable during Pre-Lab Stage and Lab Stage in executing VMS/VE Study for RMM programmes and projects.

Figure 5.1. Recommended Tools and Techniques Applicable in VM Study

5.1 P.E.S.T.E.L

P.E.S.T.E.L. is a strategic management tool adoptable for VMS Study in Affordable Housing/RMM programmes and projects, as adopted in the RMM CIDB initiative using CIDB Concept Designs.

P.E.S.T.E.L. involves studying and identifying issues and gaps that exist under the initiatives of RMM programmes and projects, based on key strategic aspects or topics namely; Political, Economic, Social, Technology, Environmental and Legal. The identification of issues and gaps starting from the Pre-Lab Stage has been the main inputs for VMS Lab Information Phase, which became the basis for further explorations during Creative Phase and beyond.

5.2 S.W.O.T

S.W.O.T. analysis examines and identifies the inherent strengths/strengths, weaknesses/ shortcomings, opportunities and threats (Strengths - Weaknesses - Opportunities - Threats) in each selected RMM concept. For this study, development concepts involved are high rise, town house and single storey terrace from the RMM CIDB initiative.

The results of the SWOT analysis for each development concept have identified issues and gaps and potentials relevant to the RMM CIDB. Results from the analysis were identified as specific parameters and recorded in the Information Phase template for the scope of the study of each group and referred to in further studies.

5.3 Client Value System (CVS)

Client Value System (CVS) is a tool used to determine the priority of criteria or factors that affect or influence the value desired by the client as the owner of the program/project. The priority of the value system is determined through the VM tool to make Paired Comparison which sets the order of priority based on the score for the value system that is compared with each other. The results of the CVS analysis will qualitatively describe the order of priority in value criteria by the client that need to be conveyed in the design, output, project benefits etc. CVS analysis will influence the use of key resources and decisions by the client on the determination in the project to be delivered.

At the Pre-Lab Stage and Lab Stage (Information Phase), CVS analysis for RMM programme/ projects can be performed on Public and Private Sector clients for the purpose of making comparison on the priority orders of both sectors' client value systems. The findings of the analysis are used as the basis to identify gaps and seek potential improvements in relation to client value system delivery for RMM programmes/projects. The findings on gaps/issues/risks etc. need to be recorded and discoursed during Lab Stage - Information Phase and referred to during Creative Phase for improvements.

This targeted value system can be used as the basis for the performance of value delivery that can be audited or qualitatively measured in appropriate interventions (example: during design development; during the Value Engineering Review - VE) in the project life cycle.

As a generic guide and definitions (not in order of priority), the following are descriptions of Client Value Systems, which are to be prioritised using additional VM Tool - Paired Comparison for CIDB RMM programs and projects.

- **CAPEX** - Capital Expenditure or Cost of Capital that needs to be provided in the early stages of development and is influenced by limited or restricted financial allocations under budget control.
- **OPEX** - Operational Expenditure or operating and maintenance costs that need to be planned from an early stage to be at a minimum when operating.
- **TIME** - The time period for project implementation that needs to be planned and/or the project can be completed according to schedule.
- **COMFORT** - The level of comfort that impacts the user's operational needs in carrying out activities or using the asset or facility.
- **SAFETY / SECURITY** - The level of security that impacts the performance of users to achieve a certain level of security in the project.
- **POLITIC / COMMUNITY** - The need to select popular decisions to meet the needs of the community or users or relevant stakeholders.
- **IMAGE / AESTHETIC** - The need to create an element or component that gives a particular appeal or image in the project.
- **EXCHANGE** - Exchange in the form of returns or financial income for an asset or facility sold.
- **ENVIRONMENTAL** - Sustainability factor or the need to preserve the environment for a certain level of protection in the project.

5.4 Design Quality Criteria

Design Quality Criteria Analysis aims to determine the targeted quality priorities in the design of the CIDB RMM project. It is different from CVS Analysis because the focus is on eight (8) aspects of design quality only, namely Architectural and Site Context; Sustainable Solution; Humanise Quality of Life; Adoption of Technology; Health, Safety and Security; Aesthetic, Image and Icon; Exchanging Values; Operation and Maintenance Cost.

The order of priority shown is unique for each development concept and it aims to verify that the quality criteria of the design is achieved and given priority as the findings through analysis. Lab members have analysed and prioritised quality criteria for each development concept studied. If necessary, the results of the analysis are used as the basis for selecting design options under the development concept using 'Weighted Design Criteria Matrix' as an additional tool.

5.5 Strategic F.A.S.T Diagram and Goals and Systems

Function Analysis System Technique or F.A.S.T Diagram is the main VM tool in analysing functions in VM Studies according to the suitability of the study level whether at the function level of 'program', 'project', 'space', 'element' and 'component'. Functional analysis is the basis for determining the functional requirements required in each project (including the level of other functions studied). Once the relevant functional requirements have been identified, compliance and/or mismatch of the functions can be ascertained through this analysis. Findings in the Functional Analysis Phase in the VMS Lab serve as the basis for the suggestions intended for improvement or functional compliance in the Creative Phase.

From the determination of the list of Technical Functions through F.A.S.T Diagram, an additional VM tool 'Goal and System' was used to identify any gaps and/or mismatch (mismatch) of CIDB RMM program and project functions.

Based on the verified F.A.S.T Diagram Strategic Analysis, the list of Technical Function requirements determined for the RMM project is as follows:

- Meet marketability (location, market price and appropriate development concept).
- In line with the requirements of the optimum number of units.
- Provide a healthy and comfortable environment.
- Prepare a safe environment.
- Resilience ready.
- Provide an environmentally friendly and sustainable environment.
- Friendly operation and maintenance.
- Apply the appropriate image / character.
- Provide basic facilities for housing.
- Conducive to ecosystems, technologies and related housing management systems.

5.6 Cost-Benefit Analysis (CBA)

CBA is an important tool in project planning and management that assist clients or project managers in making decisions based on the expenses and revenues that a project might generate. The consideration in CBA. on financial and other alternative benefits will examine the feasibility of the project before the clients/managers proceed with their decision making. The feasibility of project is based on the evaluation of the major costs (e.g., direct/procured costs, indirect/operating costs, opportunity costs, potential risks etc.) against the potential benefits that indicate the pros and cons on selecting the project. Based on the evaluation, it is expected that a feasible project will be justified if the major costs is found lower than the potential benefits once the project is completed.

5.7 Weighted Scoring Matrix

Weighted Scoring Matrix tool is applicable in evaluating a range of available options to a particular selection of decision making. Such evaluation provides more robust and objective judgement in selecting the most appropriate option, based on the weighted score of selection criteria and scoring on available options. This assessment tool adopts the weighted scores of selection criteria from the earlier application of Paired Comparison Tool or any other criteria prioritisation tool. In the matrix, the assigned value score for each option is judged on the performance of each option against the prioritised and weighted selection criteria. The outputs of the Weighted Scoring Matrix application are the total score of each option and the prioritised rank of the assessed options.

5.8 Logical Framework Matrix (L.F.M) & Creativity Index (C.I)

L.F.M. and C.I. are the combined tools applicable in the public clients' Strategic Phase, adopting the outcome-based approach in their strategic planning. Both are key tools of project appraisal by clients in considering the intended outcomes of programme and project (in the L.F.M.) for prioritising and selecting the most viable project prior to obtaining the government's approval. Appraising using both tools involves determining and evaluating on project impacts' scores (in the C.I.) set for achieving the intended project outcomes (from L.F.M.). The scores are evaluated against the total cost of capital expenditure (CAPEX) and operational expenditure (OPEX) for a determined life span of the project' impacts. Eventually, a C.I. Score for the appraised project is established.

06

ROLES AND RESPONSIBILITIES

6.0 ROLES AND RESPONSIBILITIES

6.1 Coordinator

VM Coordinator is responsible to directly and actively involved in conducting technical consultancy or advisory services throughout the VM study, which commonly works for client entities.

He/she coordinates and provides study inputs and requirements (i.e., relevant information/ data/documents etc.) and work closely with VM Facilitation Team to ensure the overall preparation and execution of VM study runs smoothly and effectively.

6.2 Lab Members

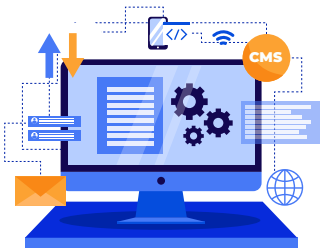
VM Lab members involve multidisciplinary participants or lab groups' members, comprising of personnel from multiple levels, various organisations and areas of expertise. They are important members to create completeness, contribute thinking, ideas and provide consensus during lab sessions. VM Study is highly dependent on effectiveness and cooperation from team members.

6.3 VM Facilitator

A VM Facilitator is responsible for conducting VM Study from Pre-lab Stage until Post lab Stage according to the complete process and responsibilities, which includes:

A VM Lab is led by a competent Lead Facilitator, who acts as a Value Manager within the public or private organisation. An appointed Consulting Value Manager must be certified by the National governing institution of VM i.e., the Institute of Value Management Malaysia (IVMM) as a Certified Value Manager (CVM); or alternatively certified by any equivalent International VM institution before delivering VM facilitation consultancy service.

The minimum, a Value Manager or a Lead Facilitator is responsible to:

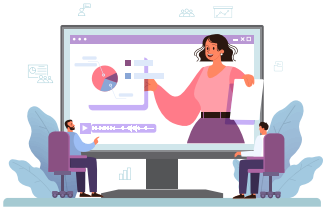


- Structure, plan and manage for whole VM Study process

- Plan for VM Study Objectives, Lab Agenda, game plan, tools and techniques etc.

- Lead, coordinate and manage VM Facilitation team

- Drive groups' dynamics and keep agenda on track during lab execution



- Motivate members to perform and achieve VM Study Objectives

- Drive creativity and innovative thinking during study process

- Lead preparation of VM Report and present study findings (whenever required)

6.4 Scriber/Recorder

A scriber responsibility is to provide assistance to facilitators and lab members that includes:

- **Fill up information from every group during lab executions**
- **Translate verbal information into Lab Templates for every lab phase**

BIBLIOGRAPHY

Unit Perancang Ekonomi, Jabatan Perdana Menteri, (2011). Panduan Pelaksanaan Pengurusan Nilai dalam Program/ Projek Kerajaan.

Jabatan Kerja Raya (JKR) Malaysia, (2013). Value Engineering Application Guidelines for Public Projects.

Jabatan Kerja Raya (JKR) Malaysia, (2021). Panduan Pemakaian Inisiatif 'Value at Entry' (ACAT, VMS, GN0) di Fasa Perancangan oleh Agensi Pelanggan.

Institute of Value Management Malaysia (IVMM), (2018). National Value Management Guide.

Royal Institution of Chartered Surveyor (RICS), (2017). Value Management and Value Engineering.

Kelly, John; Male, Steven; Graham, Drummond (2014). Value Management of Construction Projects (Second Edition). Wiley Blackwell.

Jaapar A. et al., (2012). Implementation of Value Management in Public Projects. Procedia – Social and Behavioural Science 68 (2012).

Ab Ghani R. (2020). Establishing Value Variables for Defining Construction Project Value. The Malaysian Construction Research Journal (MCRJ) Special Issue, CREAM, CIDB Malaysia.

ABBREVIATIONS

BQ	Bills of Quantity
BIM	Building Information Modelling
C.B.A	Cost-Benefit Analysis
CAPEX	Capital Expenditure
CI	Creativity Index
CIDB	Construction Industry Development Board
CREAM	Construction Research Institute of Malaysia
CVM	Certified Value Manager
CVS	Client Value System
D&B	Design and Build
DRMM	National Affordable Housing Policy (*Dasar Perumahan Mampu Milik*)
EPU	Economic Planning Unit of Prime Minister's Department
F.A.S.T	Function Analysis System Technique
GFA	Gross Floor Area
IBS	Industrialised Building System
IVMM	Institute of Value Management Malaysia
KPKT	Ministry of Housing and Local Government (*Kementerian Perumahan dan Kerajaan Tempatan*)
LCC	Life Cycle Cost
LFM	Logical Framework Matrix
OPEX	Operational Expenditure
P.E.S.T.E.L	Politics-Economics-Social-Technology-Environmental-Legal
PFI	Private Finance Initiative
PPP	Public-Private Partnership
PWD	Public Work Department (Jabatan Kerja Raya)
RMKe-10	10th Malaysia Plan (*Rancangan Malaysia ke Sepuluh*)

RMKe-11	11th Malaysia Plan (*Rancangan Malaysia ke Sebelas*)
RMKe-12	12th Malaysia Plan (*Rancangan Malaysia ke Dua belas*)
RFP	Request for Proposal
RMM	Affordable Housing (*Rumah Mampu Milik*)
SOA	Schedule of Accommodation
S.W.O.T	Strengths - Weakness - Opportunities - Threats
VA	Value Assessment
VE	Value Engineering
VECP	Value Engineering Change Proposal
VM	Value Management
VMS	Value Management at Strategic Phase

ACKNOWLEDGEMENT

The Construction Industry Development Board (CIDB) Malaysia would like to acknowledge the individuals and organisations for their valuable contributions and insights.

Validation Workshop Panellist

Sharifah Muna Syed Murtadza	Jabatan Kerja Raya Malaysia
Noorihan bt Abd Halim	Jabatan Perumahan Negara
Nur Amiza Mohd Amin	Kementerian Perumahan dan Kerajaan Tempatan
Ir Mohd Azizul Izni Mahyudin	Unit Perancang Ekonomi
Sr Muhammad Zuhry Mohd Mazlan	Institute of Value Management Malaysia
Nor Hisham Daud	REHDA Malaysia
Ir Ts. Zuraihi Abd Ghani	CIDB IBS Sdn Bhd
Anuar bin Hamzah	Syarikat Perumahan Negara Berhad

CIDB MALAYSIA

ISBN 978-967-2971-41-2

9 7 8 9 6 7 2 9 7 1 4 1 2