

Guideline

Framework for Value Engineering Reviews in Major Transport Infrastructure Projects

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1 Purpose and objectives

1.1 Purpose

This purpose of this framework is to embed a structured Value Engineering (VE) process in the project life cycle to ensure projects deliver optimal value. The VE process supports projects to:

- **Systematically evaluate** projects by applying a structured process that involves gathering information, developing plans, brainstorming alternatives, evaluating their costs and benefits, and implementing solutions for components.
- **Analyse the total cost of a project over its entire lifespan**, not just initial construction costs, to identify long-term operation and maintenance costs.
- **Enhance functionality** by identifying the essential functions of road design elements to ensure they are met effectively at the lowest possible cost and that they deliver optimum value for the Principal.
- **Challenge assumptions** by questioning established design practices to encourage creative problem-solving and identify innovative alternatives, and
- **Collaborate** to encourage cross-discipline communication and involvement of all stakeholders to foster a shared understanding and generate more effective solutions.

1.2 Definition

Value Engineering is a structured, systematic process used to improve a project's value by analysing its functions and finding ways to:

- reduce cost
- enhance performance, and
- simplify delivery,

without compromising quality, safety, or reliability.

1.3 Objectives

The objectives of Value Engineering are to:

- improve project functionality without compromising quality or safety, to deliver essential functions at the lowest total life cycle cost, without compromising quality or safety
- reduce whole of life cycle costs and risk (planning, design, construction, operation, and maintenance)

- encourage innovative thinking and cross-disciplinary collaboration to develop the right solution
- assess the viability of design products to achieve cost effective outcomes
- identify alternative materials, methods, and processes to achieve the same or improved outcomes
- ensure alignment with client objectives and stakeholder expectations, and
- ensure alignment with Department of Transport and Main Roads or Principal objectives and stakeholder expectations.

1.4 What is 'good value'?

In Value Engineering, 'good value' reflects how effectively a project balances cost, function, performance, and risk.

Value can be broadly expressed as:

$$\text{Value} = (\text{Function} + \text{Performance} + \text{Benefits}) \div (\text{Cost} + \text{Risk} + \text{Consequences})$$

A project achieves 'good value' when it delivers the required function and performance at the lowest practical total cost and risk.

Common metrics of good value include:

- costs avoided – reducing or eliminating unnecessary expenditure
- lifecycle cost reduction – savings over construction, operation, and maintenance
- consequences mitigated – avoiding safety, environmental, or service impacts
- performance gains – improved reliability, capacity, or service outcomes
- innovation outcomes – adoption of new methods or materials delivering measurable benefit
- time savings – reduced delivery time or disruption.
- sustainability value – lower emissions, resource efficiency, or community benefit.

Time savings could consider factors such as transportation, inventory, motion, waiting, overproduction, over processing and defects.

'Costs avoided' and 'consequences mitigated' are both key indicators, however 'good value' is about optimising total benefit versus total cost and risk.

2 Governance and oversight

2.1 Value Engineering review panel

The Value Engineering review panel provides governance and oversight of the VE process. The panel is:

- chaired by the Principal or their appointed representative
- includes senior functional component discipline representatives from engineering, construction, procurement, operations, maintenance, the VE facilitator and independent experts
- responsible for:
 - oversight of the VE process
 - endorsement of key recommendations, and
 - ensuring alignment with project goals.

2.2 Value Engineering facilitator

The Value Engineering facilitator is responsible for leading and coordinating the VE process.

The facilitator is:

- an independent, Value Engineering professional, and
- leads workshops, ensures methodology compliance, and collates documents and findings.

3 Timing and integration in the project life cycle

Value Engineering reviews can be staged and integrated into the following key project phases, with a mandated VE review and validation during the Planning, Concept and Development Phases, see Table 3 for details.

Table 3 – VE review focus area during project phases

Phase	VE review focus area
Planning Phase – Strategic (optional) and Detailed Planning	Strategic options and assess cost effective outcomes.
Concept Phase – Business Case and Concept Design	Project options generation and assessment , constructability review, and procurement strategies. Site investigations, work packaging, schedule optimisation, staging
Development Phase – Preliminary Design or Design Prototype for Tender documents	Design assumptions, materials, construction methods on recommended business case option, procurement method.
Development Phase – Detailed Design (optional)	Verify final design have met input requirements, construction methods, procurement methods.
Finalisation Phase – Post-construction (optional)	Lessons learned, life cycle cost feedback.

4 Value Engineering review process

The Value Engineering review process consists of a series of structured phases. Each phase builds on the previous to progressively define, analyse, and improve project value.

4.1 Problem addressing phase (or ‘what is the purpose?’)

This phase focuses on confirming the fundamental purpose of the project and ensuring alignment with intended outcomes.

Key activities:

- review the project objectives
- review and test the underlying purpose of the project
- address ‘needs versus wants’ by considering:
 - What are the non-negotiables (the ‘absolute musts’)?
 - What are the negotiables?
 - What is desirable?

4.2 Information phase

This phase involves gathering and reviewing all relevant project information to inform analysis and decision making.

Key activities:

- review the project scope, objectives, constraints, and cost estimates
- collect relevant data (design models, specifications, schedules)
- understand the Principal's requirements and performance expectations, including the confirmation of "design domain" (that is, Normal Design Domain (NDD), Extended Design Domain (EDD), or Design Exception)
- review risk assessments, including early results of site investigations
- review proposals elsewhere in the network
- review any third-party project and design requirements such as local government, rail or public utility plant, and
- confirm utilisation of new or existing Building Information Modelling (BIM) or digital models and data, including the level of detail relevant for project / design class type.

4.3 Function analysis phase

This phase focuses on identifying and prioritising the functions that the project must deliver.

Key activities:

- identify and define key project functions (basic versus secondary)
- use tools like FAST (Function Analysis System Technique) to map relationships, and
- prioritise functions based on importance and cost.

4.4 Creative phase

This phase encourages the development of alternative solutions to achieve required functions.

Key activities:

- brainstorm alternative ways to perform key functions
- encourage free thinking without judgement, and
- include perspectives from multiple disciplines.

4.5 Evaluation phase

This phase assesses the feasibility and value of proposed alternatives.

Key activities:

- assess the feasibility, cost implications, risk, and performance of each idea
- assess the relationship between an idea / option and proposals elsewhere in the network (independence, complementarity and substitutability are to be explicitly recognised when assessing an option)
- develop selected alternatives into workable solutions, and
- shortlist the most promising alternatives.

4.6 Development phase

This phase develops selected options into actionable strategies.

Key activities:

- provide sketches, cost benefit analyses, and implementation strategies.

4.7 Key project risks

This phase ensures that key risks are properly identified and challenged.

Key activities:

- list and challenge the top risks, and
- document and challenge the identified risk mitigations.

4.8 Broad spectrum of costs

This phase considers all relevant cost components to support comprehensive analysis.

Key activities:

- summarise costs into categories, including:
 - materials
 - overheads
 - professional services, and
 - traffic management, and
- consider displaying the summary as a pie chart of the broad cost spectrum elements.

4.9 Presentation and report phase

This phase consolidates findings and presents outcomes to decision-makers.

Key activities:

- present recommendations to the VE panel
- ensure recommendations are clearly explained and presented to decision-makers, and
- prepare a comprehensive VE report, including:
 - function analysis summary
 - list of alternatives considered
 - cost savings and value improvements, and
 - implementation roadmap.

5 Implementation and tracking

5.1 Transport and Main Roads or Principal approval

Selected proposals (including extended design domain exploration) are endorsed by the Principal.

5.2 Integration into design

Approved changes are formally adopted in the planning and design / delivery documentation.

5.3 Change control

VE-driven changes are subject to normal project change control processes.

5.4 Tracking

Maintain a VE register to track decisions, estimated versus actual savings, and lessons learned.

6 Key success factors

Successful implementation of Value Engineering depends on several critical factors, including:

- **early engagement** – start VE reviews early in the planning and concept design phases
- **multidisciplinary team** – include planners, designers, engineers, constructors, operators, and maintenance experts

- **data quality** – ensure accurate cost, schedule, and performance data
- **clear objectives** – define what ‘value’ means for the Principal up front, and
- **cultural buy-in** – foster a culture of continuous improvement, challenge mindset and innovation.

7 Tools and techniques (examples as optional)

A range of tools and techniques may be used to support VE analysis.

Examples:

- to enable comparative benchmarking, considerations of CAPEX, OPEX, NPV/ lifecycle costs and asset valuation data can be informative
- pie chart of the broad spectrum of costs (materials, overheads, professional services, and so on)
- Function Analysis System Technique (FAST)
- Life Cycle Cost Analysis (LCCA)
- risk assessment and Monte Carlo simulations
- Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis
- cost benefit analysis
- benchmarking and industry comparisons, and
- Safe Systems Assessment.

8 Documentation and knowledge sharing

Effective documentation and knowledge sharing are critical to maximising the value of the VE process.

Key activities:

- maintain a VE Report (see *Value Engineering Report Template*)
- the VE Report is not automatically subject to RPEQ certification
- contents of the VE Report may be considered the result of 'professional engineering services', and if appropriate, subject to RPEQ certification if requested by Transport and Main Roads or the Principal
- establish a 'VE lessons learned' database, and
- archive alternative solutions that were not implemented, for potential future use.

