National Economic and Development Authority

VALUE ANALYSIS Handbook

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Australian Government
AusAID

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Philippine-Australia
Partnership for Economic
Governance Reforms (PEGR)

Value Analysis Handbook

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National Economic and
Development Authority

Message

The Philippines has achieved modest economic growth in the past decade. Its potential to achieve high growth is limited largely by lack of infrastructure. Infrastructure is key to the Philippines attaining a high sustainable and inclusive growth. To ensure efficiency and effectiveness in infrastructure investments, the NEDA sought the support of the Australian Agency for International Development (AusAID)-assisted Partnership for Economic Governance Reforms (PEGR) to develop a set of guidelines and a toolkit on value analysis and structuring public-private partnerships (PPP).

Thus, under PEGR's Reform Agenda (RA) 006-07 entitled "Institution Strengthening of NEDA and Other Oversight Agencies on Value Engineering, Contract Preparation and Performance Monitoring of Infrastructure Projects," two handbooks have been produced: the Value Analysis Handbook and the Handbook for Structuring PPPs.

The Value Analysis Handbook presents the theory and techniques applied in conducting a value analysis to a project. Value Analysis or Value Engineering is one of the tools being explored by the government to achieve a value for money in major development projects, optimize infrastructure expenditures, and increase the efficiency and effectiveness of infrastructure projects.

The handbook for Structuring PPPs shall primarily serve as guide for the implementing agencies and LGUs on allocating its responsibilities vis-à-vis of the private proponent on a PPP project. Structuring a PPP entails allocating risks between the public and private proponent which is important in assessing contingent liabilities.

We hope that with these two handbooks the quality of project development will be improved and thus increasing the likelihood of achieving project objectives.

ROLANDO G. TUNGPALAN
NEDA Deputy Director-General

Message

The Australian Government is pleased to support the Philippine Government's Public Private Partnerships (PPP) program, the centerpiece of the Aquino Administration's development plan to foster more exclusive economic growth, accelerate poverty reduction, and boost private sector participation in the economy.

We hope that this handbook serves as a useful resource in assisting government agencies, local government units, and private proponents to rigorously assess quality and cost efficiencies infrastructure investments to deliver improved value-for-money outcomes.

This is an important initiative jointly undertaken by the National Economic and Development Authority and Australian Agency for International Development and will contribute to maximising the effective and efficient use of public funds and the preparation of High quality infrastructure projects.

TITON MITRA
Minister Counsellor
Australian Agency for International Development

Acknowledgement

The need for assessing and improving infrastructure development specifically the conceptualization, preparation, evaluation, and implementation of an infrastructure project through value for money (VfM) strategies was inspired by Ruben S. Reinoso, Jr., Assistant Director-General and concurrent Director of the Infrastructure Staff (IS) of the National Economic and Development Authority (NEDA). Through the direction of ADG Reinoso and IS Assistant Director Kenneth V. Tarnate, the Social Infrastructure Division (SID) of IS, headed by its Chief, Engr. Elmer H. Dorado, led the preparatory works for the conduct of a study on VfM strategies and strengthening the capacity of the government in handling projects particularly those under Official Development Assistance (ODA) and public-private partnerships (PPPs).

The Australian Agency for International Development (AusAID), through the facility of the Philippines-Australia Partnership for Economic Governance Reforms (PEGR), had been very supportive in making the study on "Institution Strengthening of the National Economic Development Authority (NEDA) and other Oversight Agencies on Value Engineering, Contract Preparation and Performance Monitoring of Infrastructure Projects" a reality and a success by providing the financial assistance and ensuring that study objectives, expected outputs and timelines are met by the engaged consultants. Special thanks are given to the PEGR counterparts for the study, Ian Porter (Facility Director) and Hector Florento (Governance Advisor), for being actively involved in this endeavour.

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The following groups/stakeholders, among others, were involved in the study through participation in trainings/workshops which helped in formulating and improving the study outputs and recommendations: NEDA Build-Operate-Transfer (BOT) Group, Office of the President (OP), Government Procurement Policy Board (GPPB), Department of Budget and Management (DBM), Department of Finance (DOF), Department of Public Works and Highways (DPWH), Department of Transportation and Communication (DOTC), BOT Center (renamed as PPC Center), Department of the Interior and Local Government (DILG), Light Rail Transit Authority (LRTA), Philippine Ports Authority (PPA), Toll Regulatory Board (TRB), National Power Corporation (NPC), National Transmission Corporation (TransCo), National Electrification Administration (NEA), Manila International Airport Authority (MIAA), Metropolitan Waterworks and Sewerage System (MWSS), and Metropolitan Manila Development Authority (MMDA). Our partners from the private sector had been enthusiastic in sharing their relevant experience and valuable insights which were crucial to the attainment of this activity's outputs.

The technical staff of other IS divisions: Communications Division, Power and Electrification Division, Transport Division, and Water Resources Division, had actively participated by sharing their sector-specific knowledge, skills, and experiences in every consultation meetings, roundtable discussions, trainings/workshops and case studies/pilot-testing, and by providing their valuable comments and recommendations to all documents and reports submitted to NEDA. The technical staff of SID composed of Arch. Geronimo S. Samoza, Engr. Dulce Agnes S. Marquez, Engr. Maria Genelin L. Licos, Ms. Ramakrishna J. Villanueva, Mr. Omercaliph M. Tiblani and Mr. Rocky E. Dejan, had collectively put their time and effort towards the completion of this undertaking.

The NEDA Staffs include the Administrative Staff (AdS), Agriculture Staff (AS), Information Technology Coordination Staff (ITCS), Legal Staff (LS), Project Management Staff (PMS), Public Investment Staff (PIS), Social Development Staff (SDS), and Trade, Industry and Utilities Staff (TIUS), had been supportive by participating in meetings and trainings and providing their inputs for the refinement of draft reports and other documents formulated under the study.

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IBRD	International Bank for Reconstruction and Development (World Bank Group)
ICB	International competitive bidding
ICC	Investment Coordination Committee (a NEDA Board inter-agency committee)
ICC-CC	ICC-Cabinet Committee
ICC-TB	ICC Technical Board
ICT	Information and Communication Technology
IDC	Interest During Construction
IFC	International Finance Corporation
IFI	International Financial Institution
INFRACOM	Infrastructure Committee (a NEDA Board inter-agency committee)
INVEST	Indian Value Engineering Society
IPO	Initial Public Offering
IRDS	Initial Requirements Definition Stage
IRR	(i) Implementing Rules and Regulations
IRR	(ii) Internal Rate of Return
IS	Infrastructure Staff of NEDA
ITCS	Information Technology Coordination Staff of NEDA
IVMM	Institute of Value Management Malaysia
IVM-UK	Institute of Value Management UK
JBIC	Japan Bank for International Cooperation
JEXIM	Export- Import Bank of Japan
JV	Joint Venture
KOCT	Korean Ministry of Construction and Transportation
KPI	Key performance indicator
kWh	Kilowatt-hours
LGU	Local Government Unit
MLIT	Ministry of Land, Infrastructure, and Transport (Japan)
NCHRP	National Cooperative Highways Research Program (United States)
NEDA	National Economic and Development Authority
NHS	National Highway System (United States)
NIA	National Irrigation Administration
NYSDOT	New York State Department of Transportation (United States)

ODA	Official Development Assistance
OGC	Office of Government Commerce (UK)
OMB	Office of Management and Budget (United States)
PAVE	Philippine Association of Value Engineers
PCCP	Portland cement concrete pavement
PE	Project Evaluation
PEGR	Philippines-Australia Partnership for Economic Governance Reforms
PFI	Private Finance Initiative (UK)
PPP	Public-Private Partnership
PSA	Public Service Agreement
RA	(i) Reform Agenda of the PEGR
RA	(ii) Republic Act (Philippines)
ROI	Return on Investment
ROW	Right-of-way
SAVE	Society of American Value Engineers
SHA	State Highway Agency (United States)
SHVE	Society of Hungarian Value Engineers
SIVE	Society of Iranian Value Engineers
SJVE	Society of Japanese Value Engineers
SKVE	Society of Korean Value Engineers
STA	State Transportation Authority (United States)
TQM	Total Quality Management
TRB	(i) Toll Regulatory Board
TRB	(ii) Transportation Research Board (United States)
U.S.	United States of America
UK	United Kingdom of Great Britain and Northern Ireland
VA	Value Analysis (synonym for value engineering)
VE	Value Engineering (synonym for value analysis)
VECP	Value Engineering Change Proposal
VfM	Value for Money defined as the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements
VM	Value Management
VMIT	Value Management Institute of Taiwan

Executive Summary

This handbook is a comprehensive reference for the technical staff of the Government of the Philippines (GOP) particularly the implementing agencies, local government units and oversight agencies on the principles of value analysis and its application to project development.

Value Analysis

Saving money and, at the same time, providing better value is a concept that everyone can support. The benefits of optimizing infrastructure expenditures, constructing more with less money, increasing efficiency and reducing the amount of resource use must be recognized today and pursued in the future.

In the constant battle to find a better way to fight inflation, validate cost estimates, and assure all stakeholders that the solutions being proposed are cost effective, the application of value analysis comes to the forefront, for both government and private decision-makers. Value analysis is a proven technique used to combat runaway costs and is a process proven by countless owners, manufacturers and government entities. More specifically, Value analysis is defined by a value analysis international certification body (SAVE International) as: *"the systematic application of recognized techniques by multi-disciplinary team(s) that identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost".*

Value Analysis Handbook

Many books have been written on the theory and technique of value analysis. This handbook is intended to be a reference for the GOP in generally, specifically the technical staff of the National Economic and Development Authority (NEDA) who will be charged with the review and validation of value analysis studies conducted by proponent agencies. The essential goal of conducting value analysis studies and of the evaluation to be done by the NEDA staff is assuring that the Government of the Philippines is getting the best value for money in major development projects that are eligible for evaluation under the Guidelines of the NEDA Investment Coordination Committee.

[1] In more recent value analysis literature, the "information" and "functional analysis" phases are now considered two distinct phases of the Job Plan, so there are now seven phases.

Sections 1 to 3 of this handbook focus on the definition of value analysis, the description of basic value analysis principles and the selection of value analysis studies. Sections 4 to 9 describe the six-phase 'Job Plan' in detail[1]. Each chapter provides specific guidance for analyzing value analysis studies to assure that the studies have been accomplished in accordance with internationally accepted standards and practices. Most importantly, the information included in these chapters provides basic guidance in certifying that the study was accomplished under the direction of a qualified expert, was accomplished by a multi-disciplinary and certified team of bona fide experts, and was performed following the six-phase 'Job Plan.' The Job Plan is an internationally defined and accepted analytical process for value analysis.

Finally, attached at the back of the Handbook are the following appendices:

- The revised evaluation procedures and guidelines and technical annexes of the NEDA-Investment Coordination Committee (ICC), which incorporate value analysis (Appendix G)
- International experience on value analysis, including the lessons learned from a review of the use of value analysis in the United States, United Kingdom, Asia and Latin America, the common elements for institutionalizing value analysis, the applicability of value analysis in the Philippines, details of the international cases that were studied, and additional reference materials in the international case studies. (Appendix E)
- A copy of the SAVE International Value Standard and Body of Knowledge. The SAVE Standard is the definitive reference for value analysis that was used by the Castalia Team in developing the value analysis enhancements in the ICC project development framework (Appendix H).

1 Introduction

Value analysis is the most effective technique known to improve value, and eliminate unnecessary costs in product design, testing, manufacturing, construction, operations, maintenance, data, and processes and practices. While its application to processes and practices is less well known, effectiveness in this area has been highly successful.

1.1 Definition of Value Analysis

Value analysis, as defined by the Society of American Value Engineers International (SAVE International), is "the systematic application of recognized techniques by multi-disciplined team(s) that identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost".

Value analysis may be defined in other ways, as long as the definition contains the following three basic precepts:

- An **organized review** to improve value by using multi-disciplined teams of specialists knowing various aspects of the problem under study
- A **function-oriented approach** to identify the essential functions of the system, product, process or service being studied and costs associated with those functions
- **Creative thinking**, which uses recognized techniques to explore alternate ways of performing the functions at a lower overall cost or otherwise improve the design, process, service, or product effectiveness.

Value analysis is predicated on the proposition that people spend their money on accomplishing functions rather than simply obtain ownership. Concern for our environment, energy and rising costs, requires that the functional needs of safe and efficient project implementation be carefully analyzed to obtain these functions in the most economical manner, with minimal disturbance to the environment.

1.2 Glossary of Value Analysis Terms

Value analysis practitioners have developed a lexicon of words and terms that they use with a specific meaning. This section contains a list of the most

commonly used words and terms and the meaning that they have in value analysis documents.

Basic Function: The performance characteristic(s) of a product or service that is required to make it perform.

Secondary Function: An additional performance characteristic of a product or service.

Cost of Function: All costs directly associated with the performance of a particular function.

Design-to-Cost: A discipline for holding a designer responsible for a specific cost ceiling for the production or construction cost of a product or facility. This approach is used to control manufacturing or construction costs during the design process. The values and relationships for designing to a cost become visible as the design proceeds. This visibility permits identification of high-cost areas suitable for value analysis study so that the resulting production/construction cost is at (or under) the pre-established ceiling.

Function: Any performance characteristic that a product or service accomplishes.

Function Analysis System Technique (FAST): A method for analyzing, organizing, and graphically displaying the interrelation of the basic and secondary functions of a system, product, design, process, procedure, or facility.

Life-Cycle Cost: Total cost of an item's ownership. This includes initial acquisition costs (right-of-way, planning, design, and construction), operation, maintenance, modification, replacement, demolition, financing, taxes and disposal as applicable.

Unnecessary Costs: The costs not required for the performance of necessary functions.

Value Analysis: Refers to the systematic application of recognized techniques by multidisciplinary team(s). It identifies the function of a product or service; establishes a worth for that function; and provides alternate ways to accomplish the necessary function, reliably, at the lowest overall cost, through use of creative techniques. Value analysis is a method for solving cost and technical problems. Listed below are several similar terms and their accepted uses. Each uses the methodology of the value analysis job plan.

Value Assurance: Often indicates the application of value analysis during design or procedure preparation. Its objective is to assure a high-value item when released for manufacture or construction, or when placed in service.

Value Improvement (Enhancement): Refers to efforts applied to existing items to create one of better value.

Value Management: Sometimes called value control, value management recognizes that value principles are a management tool applicable to a variety of problems only one of which is cost. Value management can also embrace all "cost awareness" programs. This "umbrella" term has been chosen by the United States Government General Services Administration for its internal value program, which covers its diverse activities, including building design and construction; the Federal Supply Service; The National Archives and Record Service; and most of the computers and telephone systems used by federal civilian agencies.

Value Analysis Job Plan: The formal problem-solving procedure used to carry out a value analysis study. Most often, the 6-step SAVE International Job Plan[2]. For additional information on this and other facets of international certification of the value analysis process and requirements please see the web-site: www.value-eng.org

Value of Function: Maximum value is achieved when a function is performed at lowest overall cost and still meets all the users' needs.

Value Analysis Team: Usually five or more professionals aware of various aspects of the item being studied. For a highway study the value analysis team could include engineers or others proficient in planning, design, environmental matters, rights-of-way, budget, and estimating.

Worth of Basic Function: An estimate of the least expensive way of performing a function, neglecting the actual application of that function.

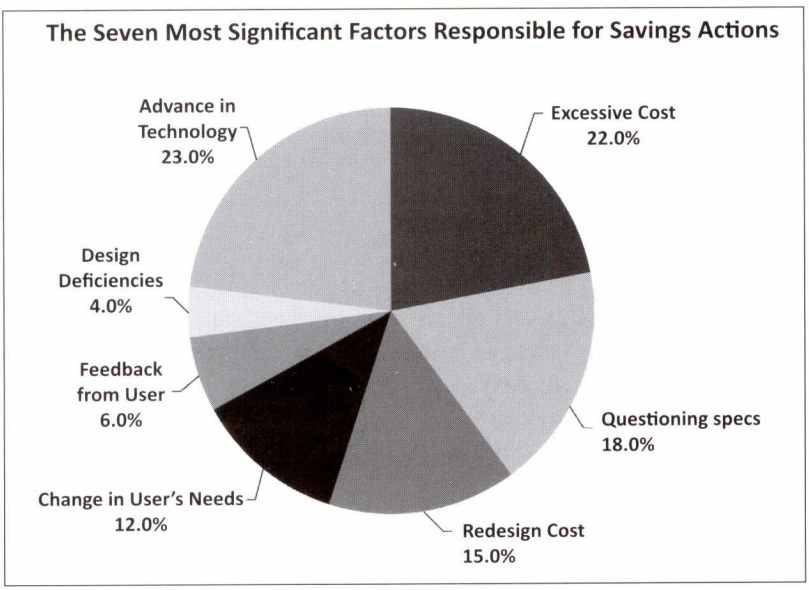
1.3 Effect of Value Analysis

Instead of cutting costs to make an item cheaper, as occurs in normal cost reduction, the organized, highly-effective value analysis approach determines the worth of the basic function, without regard to its applications. A target cost is set and the design alternative(s) meeting all function needs at a lower overall cost are identified.

[2] Now, the 7-phase Job Plan, since Information and Functional Analysis Phases are considered as distinct.

Typically, a value analysis study can generate recommendations to eliminate ten to thirty percent of the project's construction costs. The designer/user usually accepts about half of these recommendations, providing a cost avoidance of at least five percent. Historically, the cost of a value analysis study is usually less than ten percent of the implemented savings.

Figure 1.1: Saving Opportunities



Source: Dell'Isola, Value Engineering: Practical Applications

2 Fundamentals of Value Analysis

Value analysis is often considered a management tool for cost control. In practice, however, it really is a step-by-step process used in problem solving or in improving a product or process.

By definition, value analysis is a method for obtaining optimum value. The strength of value analysis lies in its ability to delineate clear design alternatives and suggest choices based on the necessity or desirability of a function, the availability of economic means of achieving that function, and cost-worth [3] relationships.

Value analysis is not only effective for identifying and eliminating unnecessary costs; it is also effective when directed at the conservation of all resources. Value analysis has also proven to be a valuable aid in improving the reliability, quality, safety, and performance or products and processes, and in ensuring compliance with an implementation schedule.

In order to effectively apply the principles of value analysis, the value analysis team members must be knowledgeable and trained in the use of the value analysis job plan. Value analysts can have varied backgrounds — a systems analyst, a shopkeeper, an engineer, an accountant, or a homemaker, but what is most important is that they are certified in the value analysis discipline.

A value analysis study done on a project is not likely to reveal anything startling to the value analysis team members. However, when applied at the proper time, that is, at the earliest stage of the project development cycle, the value analysis methodology will result in new and unique ideas that are value adding. This is what makes value analysis effective. Value analysis leads to higher creativity in problem solving by following a precise sequence of steps known as the value analysis job plan.

2.1 Value Analysis Job Plan

Among many techniques used to solve problems, only the value analysis approach calls for function analysis followed by the application of creative thinking techniques.

Each step of the value analysis job plan (called phases) includes several tasks. To apply the value analysis job plan, two important factors must be recognized:

- An effective value analysis effort must include all phases of the job plan. Omission of any phase will hamper the accomplishment of the

[3] Cost-worth is the ratio of cost to the value of a specific function. This is discussed further in Section 4.5.

objectives. The amount of attention given to each phase, however, may differ from one project to another.

- A successful value analysis study requires a team effort. The cooperation and active participation of several people produces synergy. This group dynamic plays a key role in developing new ideas, and illustrates that the results of a team of experts is greater than the sum of the effort of a number of individuals.

2.2 Value Analysis Principles

Value analysis principles consist of key questions, techniques, and procedural tasks used in pursuing the objective of the value analysis job plan. The objective is to achieve design excellence by completing each of the following phases:

1. **Information Phase**

   The value analysis team has reviewed the project design, objectives, and the preliminary cost information. They understand the limitations on the project as well as the expected benefits.

2. **Function Analysis Phase**

   The team has defined the project functions using a two-word active verb/measurable noun context. The team has reviewed and analyzed these functions to determine which need improvement, elimination, or creation to meet the project's goals.

3. **Creative Phase**

   The team has employed professional creative techniques to identify other ways to perform the project's function(s).

4. **Evaluation Phase**

   The team has followed a structured evaluation process to select those ideas that offer the potential for value improvement while delivering the project's function(s) and considering performance requirements and resource limits.

5. **Development Phase**

   The team has developed the selected ideas into alternatives (or proposals) with a sufficient level of documentation to allow decision-makers to determine if the alternative should be implemented.

6. **Presentation Phase**

   The team leader has developed a workshop report and/or presentation that documents and conveys the adequacy of the alternative(s) developed

by the value team to the decision-making body of the proponent agency (e.g. a Management Team or Executive Review Board).

Finally under the Implementation Phase, the Executive Management Team has selected the value alternative to be implemented and directs the proponent agency's project team to proceed with the next steps.

These principles are explained in greater detail in subsequent sections, where each phase of the job plan is further discussed.

3 Project Selection

The key to project selection is to identify candidate projects for a value analysis study. The projects should have the potential to achieve maximum cost avoidance, energy savings, or other benefits, such as a shorter construction schedule through a complete value analysis. It is also important that the right team members are chosen for the analysis.

Proper selection is vital to the success of the entire value analysis program. As value analysis resources are limited, a major criterion in project selection should be the potential benefit from the resources invested.

3.1 Reasons for Unsatisfactory Results in Value Analysis Studies

This section describes the numerous reasons why a value analysis study may lead to unsatisfactory results. These reasons are as follows:

- **Lack of Information** — The amount of accurate and up-to-date information limits the effectiveness of value analysis. Failure to get sufficient and relevant facts can be due to a misunderstanding of the full requirements of the original project or a lack of knowledge about available resources.
- **Wrong Beliefs** — Decisions that are based on erroneous beliefs, rather than facts, compromise the effectiveness of value analysis. For example, planners who make decisions on what a design should accomplish might not properly sense the public's needs. Another example is a designer that holds an inaccurate prejudice against a specific resource, might make an improper choice of the best technological alternative.
- **Habitual Thinking** — It is essential that the value analysis team keep up with the state-of-the-art technology and methodology because thinking and doing things in the same way is a frequent cause of poor value. Most people have a tendency to re-use what worked the last time, or to copy the standard set by others without considering the situation. Habitual thinking is also inadvertently promoted by management through rigid use of a given set of standard designs, procedures, and customs.
- **Risk of Personal Loss** —The tendency of risk averse decision-makers to stick with previously successful methods, as opposed to more relevant methods, reduces the effectiveness of value analysis. When decisions are based on past experience of "nearly-related" data rather than on something new or unfamiliar, it is difficult for best new ideas generated in a value analysis study to be chosen.

- **Reluctance to Seek Advice** — Designers and planners are often very reluctant to seek advice from others because they fear it may be seen as a sign of incompetence. Architects, planners and engineers should seek the advice of other competent experts, as they may be able to provide additional insight into the problem. By consulting others, they will be better able to achieve maximum design value.
- **Time Constraints** — When a project appears on a long-range or annual construction program, there is often a critical demand that the project stay on schedule. Frequently, the time pressure is so great that it is impossible to consider properly, if at all, the value of the design approach in development. In cases like these, the designers usually find it necessary to accept the first workable solution to a problem in order to complete the job on time. Seldom is there time to contemplate ideas, or to design for value by developing alternative approaches. When designs are developed under these conditions, they are normally good candidates for a value study.
- **Negative Attitudes** — Value analysis will not work when decision-makers are reluctant to make a change of any kind regardless of the merits of the proposal, especially if the change directly affects their plan or design. The same is true when value teams feel they always provide the best value in their approach, even when only a few of the value analysis techniques and procedures were used in their studies.
- **Changing Technology** — When a value team fails to recognize and consider rapid strides in the development of processes, products, and materials, it limits the potential for uncovering higher-value adding alternatives. The team must remain cognizant of the constantly changing, and many times more inexpensive, ways of performing necessary functions.
- **Strict Adherence to Requirements** — Requirements and published standards are often unrealistically specific regarding performance, materials, safety or procedures. Sometimes the planner or designer assumes requirements are specified when they are not. Traditionally, designers have concentrated on developing designs that exceed all known and assumed requirements. The net result is over-design, with attendant waste of taxpayer funds. The value analysis team must challenge the requirements to determine if they best meet a need of the project, or just satisfy the published standards.
- **Performance At Any Cost** — When a problem is identified, the natural reaction is to develop a design that will solve it completely. However,

this may lead to a solution with a cost that far exceeds its value. The cost of solving 95 percent of the problem may be within reason, but solving the remainder can unreasonably increase the cost. Solving 95 percent of the problem, and using the remaining funds to solve other critical problems may be a more prudent approach.

- **Poor Human Relations** — If the various specialists on complex projects do not work together, they are likely to work at cross-purposes, wasting a great deal of effort, with a final product that lacks value. Lack of good communications, misunderstanding, jealousy and normal friction between human beings is a frequent source of unnecessary costs. Highway projects require the talents of many people, and good human relations are especially critical.

3.2 Specific Value Analysis Project Plan Features

In preparing the value analysis plan, it is important that at the minimum, it must contain the following features:

- Detailed description of the objectives and scope of the project to assure direction of the study
- Description of the qualifications of the team members, who must possess a variety of relevant work skills and experience to conduct the project.

3.3 Team Structuring

Depending on the scope of the project and time constraints for completion, value analysis studies can vary from a small to large team effort, and may also have several people assigned to support the team if and when their particular skills are needed.

Although there is no set size for an efficient value analysis team, five persons, supported on a part-time basis by other elements' of the organization (e.g. the proponent agency), is usually a sufficient number. Information of members to perform the study should be based on the following criteria:

- Use only staff/employees who have had value analysis training to support the value analysis team. Team members should have attended an appropriate value analysis workshop training seminar, and should have familiarity with the value analysis process. If such experience is unavailable, include a suitable orientation during the conduct of the study.

- Identify work experience or background of the team members related to the project under study. A mix of talent is desired to achieve different points of view. Typical team members might include a soils engineer, right-of-way specialist, materials specialist, environmental specialist, structural engineer, design engineer, landscape architect, traffic operations specialist, maintenance engineer, or resident engineer. An experienced cost estimator can also be valuable to the team. Many studies suffer from overreaction to popular concerns for the environment, liability, and public opinion. If any of these conditions impact the study, the team leader should consider including representatives of these "adversary groups" as active team members.

3.4 Selection of Team Members

The selection of individual team members is of paramount importance. As a minimum, the team should be staffed with a higher level of experience and expertise than the team performing the project or technical design. Team members must have excellent communication skills and work easily within a team environment. It is very important that the team be interdisciplinary. The particular makeup of team members will vary depending on what point of project design or implementation the value analysis study is occurring. At the preliminary planning or "options" point more emphasis would be on staffing the team with planning expertise rather than heavy with technical expertise. When value analysis is done at the project design and implementation stages, the criteria for selecting the value analysis team members shift towards the technical qualifications. For example, a value analysis team performing a value analysis study at various stages of the project development cycle on a wastewater project might look like the following:

Table 3.1: Possible Value Analysis Teams for a Wastewater Treatment Project by Stage

Options Stage	Feasibility Stage	Variations Stage
1. Certified Value Specialist	1. Certified Value Specialist	1. Certified Value Specialist
2. Wastewater Engineer	2. Wastewater Engineer	2. Wastewater Engineer
3. Civil Engineer	3. Mechanical Engineer	3. Civil Engineer
4. Economist	4. General Engineer	4. Contracts Specialist
5 Urban Planner	5. Contracts Specialist	5. Claims Specialist
6. Financial Expert	6. Structural Designer	6. Financial Expert

3.5 Focus of a Value Analysis Study

There are certain qualities or aspects of a proposal that serves as indicator for possible value analysis. The following areas of high cost or causes of high cost, which may indicate poor value, should receive the majority of the value analysis effort:

- Great complexity in the design – Generally, the more complex the design, the more opportunity for improving value and performance.
- Advancement in the state-of-the-art – Those aspects of design that go beyond the state-of-the-art usually offer potential value analysis savings.
- High degree of time compression in the design cycle – A project having an accelerated design program usually contains elements of over design.
- A component or material that is critical, exotic, hard-to-get, or expensive
- Intricate shapes, deep excavations, high embankments, steep slopes, etc.
- Components that appear to be difficult to construct
- Overly long material haul – excessive borrow; excessive waste
- Expensive construction
- Long foundation piles
- Excessive reinforcement
- Cofferdam dewatering
- Architectural embellishment
- Record seeking designs (longest span, highest piers, deepest cut, etc.)
- Large safety factors
- Curb, gutter, and sidewalk (rural)
- Specially designed components that appear to be similar to low-cost off-the-shelf items
- Components that include non-standard fasteners, bearings, grades, and sizes
- Sole-source materials or equipment
- Processes or components that require highly skilled or time-consuming labor
- Items with poor service or cost history
- Items that have maintenance and field operation problems
- Project costs that exceed the amount budgeted
- Standard plans that are in use for more than three or four years

4 Information Phase

Objective: The objective of the information phase of the value analysis job plan is to acquire knowledge of the design to be studied and to assess its major functions, cost and relative worth.

Information Phase Outline:

- Understand the item, system, or operation under study
  - Gather all types of information from the best sources
  - Obtain complete, pertinent information
  - Get the facts
  - Get all available costs
- Determine, define, and classify the functions
  - Identify and define functions
  - Develop a Function Analysis System Technique (FAST) diagram
  - Classify functions
  - Determine function relationships
- Determine function cost, and function worth
  - Determine cost of each function and overall project
  - Identify high-cost functions
  - Determine the function worth and overall project worth
  - Determine function value
- Determine function value
  - Determine value opportunity index for each function
  - Determine overall value opportunity index
  - Identify areas of poor value

4.1 Discussion

This phase should provide a thorough understanding of the system, operation, or item under study by an in-depth review of all of the pertinent factual data. Complete information is essential to provide a solid foundation for the value analysis study. The complexity of the value analysis project, the amount of information available, and the study schedule will all influence the level of effort devoted to the information phase. The second intent of this phase is to determine the functions being performed and those that must be performed by the item or system under study. Value analysis identifies two classes of functions: the basic or secondary function and the esteem or aesthetic function.

The basic function of a design element satisfies the user's need for having an action performed. The secondary function may or may not support the basic function. An aesthetic or esteem function fulfills a desire for something more than what is needed.

These functions are not mutually exclusive and are frequently present in designs. Good value occurs when the user is provided with the essential functions, and the unessential ones he desires, at a reasonable cost.

4.2 Understand the Item, System, or Operation Under Study

There are three important actions to take in order to fully understand the value analysis study that must be done:

- Gather all types of information
- Get the facts
- Get all available costs.

Gather all types of information – The value analysis team should gather all relevant information, regardless of how disorganized or unrelated it may seem when gathered. The data should be supported by credible evidence, where possible. Where supported facts are not obtainable, the team should obtain the opinions of knowledgeable persons. The information sought is seldom found in comprehensive form in one place. The by-words for any value analysis study are "Record Everything."

Information gathering may be subdivided into separate tasks and assigned to individual team members. Various types of data which may be obtained are:

- Physical data such as shape, dimensions, material, skid resistance, color, weight, density, fire resistance, weather resistance, sound absorption capability, deflection resistance, and horizontal and vertical alignment.
- Methods data, i.e., about how it is operated, constructed, fabricated, developed, installed, maintained, and replaced.
- Performance data, concerning present performance requirements and actual performance needs in areas of design, operation, maintenance, safety, and utility.
- Restrictions (relating to detailed specifications) concerning methods, performance, procedures, operations, schedule, and cost.
- Cost data, including a detailed breakdown of costs of labor, material, and markups for both construction and other elements of life cycle cost.
- Quantity data relating to the anticipated volume or repetition of use for this project and future uses.

The team should obtain information from credible sources. There are two basic principles in this area. The first is to seek information from multiple sources, and the second is to seek the best source for the information desired. The following are typical sources from which the required information might be obtained:

- People Source – Project managers, designers, operators, maintenance, architects, contractors, fabricators, suppliers, and expert consultants.
- Data Source – Planning documents, drawings, computations, design analyses and calculations, specifications, material lists, cost estimates, schedules, A & E scope of work, handbooks, Analysis and maintenance manuals, commercial and government standards and codes, test and maintenance reports, user feedback, catalogs, technical publications, previous study data files, management information systems, conference and symposium proceedings, and universities.
- Complete, Pertinent Information – The type of data available will depend upon the status of the design in its overall life cycle, i.e., whether it is in preliminary or final design or under construction.

A set of design objectives and a statement of requirements may be all that is available early in a project cycle. For an older, standard design, such useful data as performance under use, maintenance characteristics, failure rates, and operational costs may be available. In addition to specific knowledge of the project, it is essential for the team to have all relevant available information concerning the technologies involved, and to be aware of the latest applicable technical developments. The more that factual information is brought to bear on the problem, the higher the possibility of a substantial cost reduction.

Get the Facts – Get specific information about the item. Avoid generalities, which serve only to protect the status quo. Work on each function individually before attempting to combine them into a single multi-functioning project. The danger in a generalized statement is that if one exception can be found, the statement is proven wrong. If the proposal depends upon a generalized statement, the validity of the entire study could be compromised.

Get all available costs – To make a complete analysis of any project, the total cost of the item, the cost of each component and a breakout of the cost of each design component are needed.

The team should obtain accurate and itemized cost estimates for each proposed design to determine the alternative offering the greatest cost reduction.

4.3 Identify, Define, and Classify Functions

4.3.1 Identify Functions

A user purchases an item or service because it will provide certain functions at an acceptable cost. If something does not perform as intended, the item is of no use to the user, and no amount of cost savings will improve its value.

Actions that sacrifice needed utility of an item reduce its value to the user. On the other hand, functions beyond those that are needed also are of little value to the user. Thus, anything less than required performance is unacceptable; anything more is unnecessary and wasteful. To achieve the best value, carefully define functions so their associated costs may be quantified.

Often there is a temptation to look at an item and say that the function it performs is the required function. But this is not always true. Defining the function shows one precisely which characteristics of the design are required.

Determine functions as soon as sufficient information is available for accuracy. All members of the value analysis study group should participate in function analysis because the determination of the required function(s) is basic and vital to the successful application of the subsequent phases of the job plan.

After the team has developed the functional description, estimate the worth of performing each required function. Compare the determined worth against the estimate of the item's cost. This comparison indicates whether the study will provide an opportunity for value improvements.

The objective of the value analysis study is to develop a design that closely approaches the established worth.

4.3.2 Define the Functions

Attempts to identify and define the function(s) of an item can often result in several long descriptions. While this method may describe the function(s) satisfactorily, it is neither concise nor workable enough for the value analysis approach to function. In value analysis, function is expressed using two words: an *"active verb"* and a *"measurable noun"*.

- The "active verb" defines the action required (it may generate, support, control, restrain, pump, protect, transmit, etc).

- The "measureable noun" describes what is acted upon (electricity, load, temperature, force, liquids, surfaces, sound, etc.). It must be measurable and understood because a specific value will be assigned to it in the evaluation process, when cost is related to function. For example, the function of a water service line to a roadside rest area could be defined as "provides service." This service, not being readily measurable, does not enable us to seek alternatives intelligently. On the other hand, if we define the function as "transports water," the noun in the definition is measurable, and accepted alternatives can be determined based on the quantity of water being transported.
- The system of defining a function in two words, a verb and a noun, is known as two-word abridgment. This abridgment represents a skeletal presentation of relative completeness. Advantages of this system are that it forces conciseness and avoids combining functions or attempting to define more than one simple function at a time.

4.3.3 Modified Definition of Function(s)

The definition of a function as a two-word abridgment is standard practice. However, there are cases when functions may be defined in more than two words, provided that a clear definition of the function is the end result. It is permissible to use a compound or a combination of adjectives, participles, or nouns if they result in better understanding of the function by the team members.

Examples of the uses of modifiers are shown below:

- Adjective: Generates electrical power
- Participle: Protects recording mechanism
- Noun: Measures hydraulic flow rate

4.4 Fast Diagram

In 1964, Mr. Charles W. Bytheway developed a system for function analysis that has become known as the Function Analysis System Technique (FAST). Mr. Bytheway developed the FAST diagram as a way to analyze the functions of the Walleye Missile System. FAST diagramming has been widely used since 1965 by value engineers throughout the world as a tool to correctly identify the interrelationship of the functions under study.

As in the case with most value analysis tasks, the development of a FAST diagram is best accomplished as a team effort. The interplay of different viewpoints leads to deeper thinking about the subject and, therefore, a more thorough conduct of the information phase in the 6-phase Job Plan.

The preparation of a FAST diagram of, at least, the first choice alternatives during the development phase, allows for a re-examination of the solution. Rethinking at this point can identify areas for additional savings that may have been overlooked. A comparison of the FAST diagram for the original design and that of the proposed alternative can be a valuable sales tool during the presentation phase. A FAST diagram has great value as a communication tool, because it is stated in functional terms that almost everyone can understand, no matter how technical or complex the item may be.

4.4.1 Function Analysis System Technique (FAST Diagram)

Because value analysis is function – not item, oriented and it is the heart of the methodology it deserves special emphasis as a deliberate step. The heart of the value analysis methodology is the focus on function. The function language is a two word abridgement – an active verb and a measurable noun.

Identifying the functions and creating the Function Analysis System Technique (FAST) Diagram must be a team effort. The objective is to answer the following three questions:

- What does it do?
- What must it do?
- What is it worth?

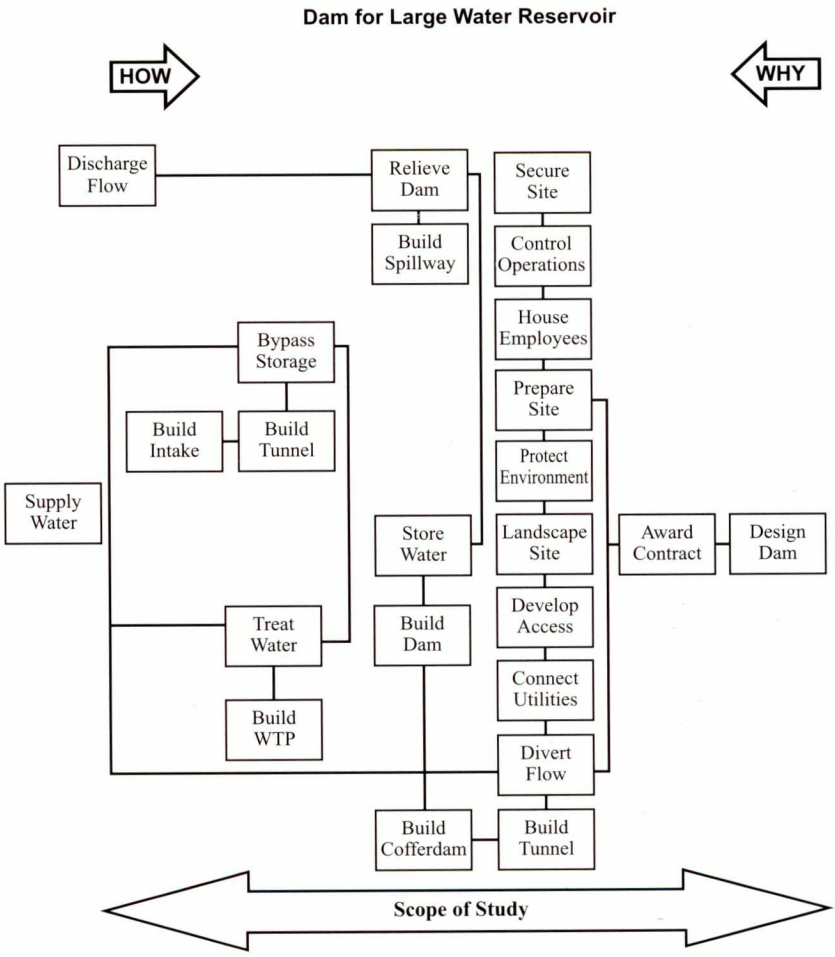
The activities required to perform this step are:

- Identify and classify the functions
- Consider how the function is being used,
- Prepare the FAST Diagram
- Determine the required functions, desired functions
- Determine function worth
- Select high cost/low value areas for study

Table 4.1: Some Examples of Function Language

Active Verb	Measurable Noun
Support	Weight
Transmit	Torque
Contain	Liquid
Increase	Light
Collect	Sewage
Conduct	Current
Insulate	Facility
Protect	Insulation
Amplify	Sound
Rectify	Voltage
Perform	LCC Analysis
Develop	Worth
Optimize	Decision

Figure 4.1: Example FAST Diagram



4.5 Determine Functional Cost And Worth

4.5.1 Functional Cost

Functional cost is the method chosen to perform the function under consideration. Where an item serves one function, the cost of the item is the cost of the function. However, where an item serves more than one function, the cost of the item should be pro-rated to match each function.

4.5.2 Functional Worth

Worth is the most inexpensive way to perform a function. Once all functions are identified as basic or secondary and unnecessary functions discarded, the team establishes the worth of a function, without considering where or how the function is used. Functional worth determination is perhaps the most difficult step in value analysis, but it is an indispensable step.

It is a highly creative endeavor because worth is a subjective rather than absolute or objective measure. Skill, knowledge, and judgment play a major role in determining the quantitative aspect of worth, in terms of pesos.

4.6 Life Cycle Cost Model

Throughout the value analysis job plan, the team should keep in mind that value is maximized when performance is reliably achieved for minimum total cost. Thus, satisfactory performance throughout the desired life cycle of the product is essential to good value. Value engineers look beyond initial cost. The costs of operation, maintenance, and disposal or replacement must also be considered.

A complete life cycle cost model should include an analysis of the following items calculated in terms of present value:

- Capital cost – initial cost of construction, design, land, legal fees, other related costs
- Maintenance cost – the cost of regular maintenance patrol, repair, salaries of maintenance personnel, and maintenance contracts
- Rehabilitation/replacement cost – the cost of replacing materials, equipment or other elements during the life cycle of the entire facility.

4.7 Information Phase Check List

In the information phase, the following questions must be answered:

4.7.1 General

- What is the objective of the project?
- Why is it needed?

- Are the functions listed?
- Are the redundant (secondary) functions listed?
- Does the team completely understand the functional requirements?
- Has the team reviewed the specifications and requirements?
- Are the specifications realistic? (That is, are all specified characteristics both necessary and sufficient?)
- Can the team recommend to modify or to eliminate specification requirements?
- Will a modification of the specification simplify design and construction?
- Are the specifications required, or are they guidelines only?
- Does the report state that all performance and environmental requirements are necessary and sufficient?
- Has the planner and the designer interpreted the specifications correctly?
- Does the report identify what special performance or operating characteristics are required?

4.7.2 Analysis and Design

- Does the report state the background history?
- Who designed the project? When?
- Who determined the requirements?
- Who must review a change?
- Who must approve a change?
- Who must approve implementation funding?
- Who must implement the change?
- Does the design do more than required?
- What alternates did the designer consider?
- Why were alternates rejected?
- Are any changes to the design planned?
- Do drawings reflect latest state-of-the art?
- How long is it designed to last with normal use (design life)?
- What is its normal use?
- What is the measure of life (time, traffic volume, and cycles)?
- What are the life cycle costs?

4.7.3 Methods and Processes

- Can we combine, simplify, or eliminate any functions?
- Are any nonfunctional or appearance-only items required?
- How is construction performed?
- Why is it performed that way?
- Are there high direct labor costs?
- Has the team identified high-cost areas or items?
- What is the schedule?

4.7.4 Materials and Procurement

- Has the team identified any special, hard-to-get, or costly materials specified by the designer?
- What alternate materials were considered?
- Why were they rejected?
- Are the materials used hazardous or difficult to handle?
- When was the material specified?
- Have new materials been developed that would perform the function for less cost?
- Has the team interviewed the present suppliers to ascertain any problems which contribute to high costs?
- Does the supplier or contractor have a value analysis clause in his contract?
- Has there been any price, delivery, or quality problems?
- Is this a single source item?

4.7.5 Maintenance

- Has the team observed the item in use?
- Has the team solicited the people who use or maintain it for ideas?
- What is normal maintenance?
- What is frequency of maintenance?
- What is level of maintenance?

4.7.6 Function And Worth

- Has the team assigned costs to each function?
- Has the team established a worth for each function?
- Has the team determined target costs for each function?

- Are designs requirements established which do not require any function to be performed?
- Are functional requirements exceeded?
- Are unnecessary features called for?
- Is there a better way to perform the function?
- Can any function be eliminated?
- Can we do without it entirely?
- Does it cost more than it is worth?
- Has the team identified all the high and unnecessary cost areas and high-cost/worth ratio areas?
- Do the potential cost savings appear sufficient to make further value analysis information and proposal development worthwhile?

5 Creativity Phase

Objective: The objective of the creativity phase of the value analysis job plan is to "brainstorm" the functions of design elements identified in the Information Phase, and develop a number of alternatives to each.

Creativity Phase Outline:

- Understand and control the positive and negative factors in creative thinking
- Plan for creative sessions
- Select the creative techniques to be used

5.1 Positive and Negative Factors

The results achieved through the use of creative thinking, especially brainstorming techniques, will vary with the creative ability of the individual. However, one can enhance one's creativeness through conscious effort toward the development of attributes such as those listed below:

- **Observation:** Alertness and awareness of conditions that exist.
- **Problem Sensitivity:** The ability to recognize when there is a problem.
- **Constructive Discontent:** An attitude of questioning the status quo.
- **Motivation:** Willingness to expend the time and energy to reach a given goal.
- **Flexibility:** Adaptability and openness to change.
- **Originality and Resourcefulness:** The ability to conceive a great number of new and unique ideas that reaches beyond everyday solutions.

There are also factors that inhibit the creative process. One should recognize such mental blocks and make an effort to eliminate them from one's thinking. These blocks to creativity are outlined here:

1. Habitual Blocks
   a. Continuing to use or approve "tried and true" procedures when new and better ones are available
   b. Lacking a positive outlook; lacking determined effort; conforming to custom, and relying on authority
2. Perceptual Blocks
   a. Failing to use all the senses of observation
   b. Failing to investigate the obvious

c. Having difficulty in visualizing remote relationships
d. Failing to distinguish between cause and effect

3. Cultural Blocks
   a. Needing to conform to "proper" patterns, customs or methods
   b. Placing overemphasis on competition or on cooperation
   c. Needing to be practical, above all things
   d. Having confidence and faith only in reason and logic
4. Emotional Blocks
   a. Fearing making a mistake or appearing foolish
   b. Fearing supervisors and distrusting colleagues and subordinates
   c. Being over-motivated to succeed quickly
   d. Refusing to take any detour in reaching a goal

Probably the single most important factor affecting one's creative accomplishments is the environment in which he or she must live and work. A creative atmosphere, characterized by mutual respect for one another's ability and the encouragement of individual thinking can spur a mind of even average expressiveness to great heights.

5.2 Plan for Creative Sessions

During the creativity phase of the job plan, direct the team's creative effort towards the development of alternative means to accomplish the needed functions. Do not begin consideration of alternative solutions until the team thoroughly understands the problem. All members of the value analysis task group should actively participate, for the greater the number of ideas conceived, the more likely that better quality, less costly alternatives will be among them.

- Challenge the present method of performing a function. Technology is changing so rapidly that the rules of a few years ago are probably obsolete. Create new ways (alternatives) for performing the necessary function(s) more efficiently (lower total cost) or effectively. Take advantage of new products, processes, and materials.
- Use Creative Techniques. Use as many creativity techniques as necessary to get a fresh point of view. Adopt a positive mental approach to any problem. In developing ideas, do not allow negative thoughts or judicial thinking. Concentrate on creating as many ideas as possible on how the function can be performed. After writing down all ideas, consider all possible combinations to determine the best method of performing the function.

- Make every attempt during this phase to depart from the ordinary patterns, typical solutions, and habitual methods. Experience indicates that it is often the new, fresh, and radically different approach that uncovers the best value solution(s).

5.3 Creative Thinking Techniques

Several techniques are available for use to the value engineer during the creativity phase. Use them singularly or in combination, depending on the project under study and the preferences of the team leader. Some of the more widely known and used techniques are outlined below:

- **Free Association Techniques.** Free association of ideas is the fruit of both the conscious and subconscious mind. In fact, the subconscious mind is the most creative portion of the brain, but the conscious portion forms the input.
- **Brainstorming.** This creative approach is an uninhibited, conference-type, group approach, based upon the stimulation of one person's mind by another's. A typical brainstorming session consists of a group of four to eight people spontaneously producing ideas designed to solve a specific problem. The objective is to produce the greatest possible number of alternative ideas for later exaltation and development.
  Observe these rules during brainstorming:
  - Critical critiquing must be withheld. This means controlling the natural tendency to evaluate ideas instantaneously.
  - Not criticize by word of mouth, tone of voice, shrug of shoulders, or other form of body language that indicates rejection is permitted.
  - Come and encourage "free-wheeling". The wilder the idea, the better; it is easier to tame down than to think up.
  - Apply the technique of "hitchhiking" or "piggybacking" to expand on the ideas of others by offering many variations (synergism).
  - Combine and improve ideas.
  - Set a goal in number of ideas, or time, to force hard thinking.

  The brainstorming process involves holding a free-wheeling group discussion, with the group leader questioning, guiding, and occasionally supplying problem-related information. All ideas are listed so that all members of the group can see as well as hear the ideas. The use of a flip chart and crayons, or felt tip pens, is preferable. The filled sheets can be taped to the walls so that they are constantly in view.

5.4 Creativity Phase Checklist

- Has the team used creative thinking techniques?
- Has the team provided an atmosphere that encourages and welcomes new ideas?
- Has there been cross-inspiration?
- Have all members of the team participated?
- Did you set an output goal?
- Has the team recorded all the ideas?
- Has the team discouraged negative responses?
- Has the team reached for a large quantity of ideas?
- Has the team generated ideas without all the constraints of specifications and system requirements?
- Has the team made a thorough search for other items that are similar in at least one significant characteristic to the study item?
- Has the team identified all basic functions for this project?
- Has the team made a separate creativity phase worksheet available to be filled out for each basic function description?
- Has the team dismissed from your thoughts the present way/method of accomplishing the basic function?
- Has the team explained the techniques, method of approach, and "ground rules" for group brainstorming before proceeding?
- Has the team provided for a sufficient incubation period to permit later addition of more ideas?
- Has the team made provisions for a follow-up session to evaluate and refine the ideas? Has the team submitted all of the basic functions of the project to the complete creativity phase?

6 Evaluation Phase

Objective: The objective of the evaluation phase of the value analysis job plan is to analyze the results of the creativity phase and, through review of the various alternatives, select the best ideas for further expansion.

Evaluation Phase Outline:

- Perform preliminary screening to separate the best ideas
- Evaluate the alternatives to aid development of solutions
- Determine criteria and objectives
- Weight the alternatives
- Weight the criteria and objectives of the project
- Compute the numerical rating
- Rank the alternatives
- Select the best alternates for development

6.1 Discussion and Key Questions

During creativity, the group makes a conscious effort to prohibit any judicial thinking so as not to inhibit the creative process. Now the ideas produced must be critically evaluated for acceptance.

Use the key questions listed below as the basis for a set of evaluation criteria to judge the ideas:

- How might the idea work?
- Can it be made to work?
- What is the cost?
- Will each idea perform the basic function?
- Which is the least expensive?
- Can it be modified or combined with another?
- What are the chances for implementation?
- Will it be relatively difficult or easy to make the change?
- Will the users' needs be satisfied?
- What is the savings potential, including life cycle costs?

6.2 Preliminary Screening Techniques

Several techniques are available to evaluate alternate ideas. Examples are as follows:

- **Comparison Technique.** This technique is a method of comparing the various features of all of the alternatives under consideration.

- **Advantages Versus Disadvantages Technique.** In this technique, list the advantages and disadvantages of each alternative. Then sort the ideas based on the number of advantages and disadvantages of each. Choose those ideas with the greatest total advantage for further evaluation.
- **Ranking Technique.** The ranking technique allows the evaluators to assign a numerical rating to the alternates. Start this process by judging an excellent idea to be worth 5 points; a good idea, 4 points; a fair idea, 3 points; a poor idea, 2 points; a very poor idea, 1 point. Group all 5-point ideas and evaluate further. Use the same method on all 4-point ideas, and, if necessary, on the 3-point ideas.
- **Probabilities Technique.** In this technique, assign subjective probabilities of success to the implementation of acceptable ideas. A probability close to one means that the idea has a good chance of being implemented. A probability close to zero means the idea has little, if any, chance of being adopted.
- **Estimating Alternatives.** Rank the remaining alternatives according to an estimate of their relative cost-avoidance potential. Base the ranking on relative estimates comparing each of the alternatives against the original design method for providing the function. Develop the surviving alternative further to obtain more detailed cost estimates. Proceed to more detailed cost estimates only if the preceding step indicates that the alternative is still a good candidate.

6.3 Weighting Criteria and Objectives

The method most commonly used for the evaluation process is that of comparing each criterion against the other and assigning a measure of importance. Figure 6.1 shows an example of a "weighting matrix" used in this method. Measures of importance may be as follows:

4 = Very Major Preference

3 = Major Preference

2 = Minor Preference

1 = Slight Preference.

In the case of ties, each criterion is assigned 1 point.

It is seldom that "objectives" or "criteria" will be of equal importance; some should have greater influence on the final decision than others. A weight factor can then be introduced. Weights from 1 to 10 are often used with the highest number given to the criteria with the most importance and the other raw scores are adjusted in proportion (rounded off).

Following the development of "Weights of Importance", each alternative being considered is initially judged on a 1 (Poor) to 5 (Excellent) basis and that score is recorded in the lower portion of the square. This number is then multiplied by the "Weight of Importance" number and recorded in the upper quartile of the square. Finally the sum of these numbers is recorded as a "Total".

Do not arbitrarily discard any idea; give a preliminary evaluation, as objectively as possible, of each idea to determine whether or not there is some way the idea can be made to work. These totals are then used as a tool to aid the team in arriving at the "Best" alternative but should not be considered as totally conclusive.

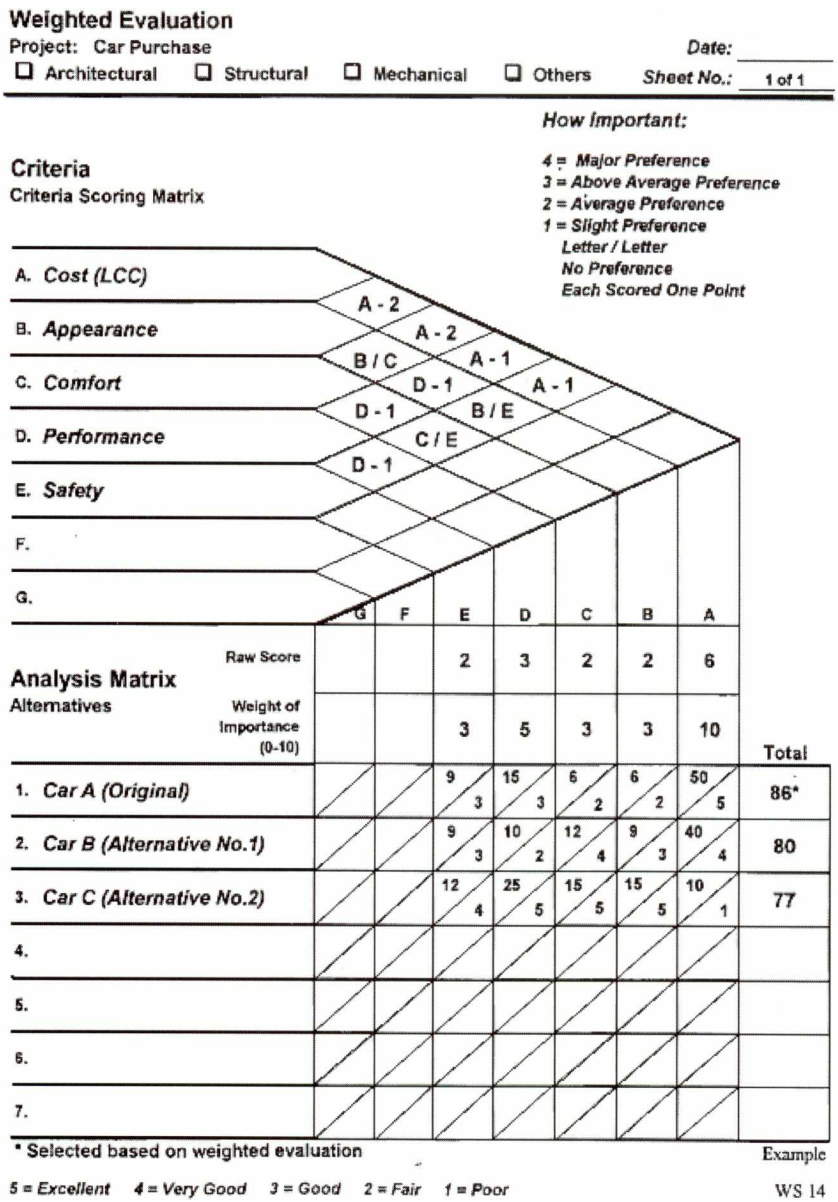
In this example an individual is considering the purchase of an automobile and wishes to utilize the "Matrix-Weighted Evaluation" process to objectively determine the best value of three automobiles being considered. In order to accomplish this, the individual identifies the criteria he/she wishes to consider and records them on the matrix sheet. For this example the criteria are: cost, appearance, comfort, performance, and safety.

Next, the individual weighs each criterion against the other. In this example the decision is that cost is better than appearance by a factor of "2"; same for cost versus comfort; and cost is better than performance by a number of "1". This process is continued until each criterion is compared to all other criteria.

Next, each of the Letter scores is added and the sum recorded below as a "Raw Score" and then weighted as described above. Finally it is shown that Automobile A is favored by a score of 86 over B (80) and C (77).

Example using a weighting matrix: Purchasing of an automobile (Figure 6.1)

Figure 6.1: Weighted Evaluation



Weighted Evaluation

Project: Car Purchase

Date: _____

☐ Architectural ☐ Structural ☐ Mechanical ☐ Others

Sheet No.: 1 of 1

How Important:

4 = Major Preference
3 = Above Average Preference
2 = Average Preference
1 = Slight Preference
Letter / Letter
No Preference
Each Scored One Point

Criteria

Criteria Scoring Matrix

	G	F	E	D	C	B	A
A. *Cost (LCC)*			A - 2	A - 2	B / C	A - 1	D - 1
B. *Appearance*				D - 1	B / E	A - 1	C / E
C. *Comfort*					D - 1		
D. *Performance*							
E. *Safety*							
F.							
G.							

Analysis Matrix

Alternatives

	Raw Score		2	3	2	2	6	
	Weight of Importance (0-10)		3	5	3	3	10	Total
1. *Car A (Original)*			9 / 3	15 / 3	6 / 2	6 / 2	50 / 5	86*
2. *Car B (Alternative No.1)*			9 / 3	10 / 2	12 / 4	9 / 3	40 / 4	80
3. *Car C (Alternative No.2)*			12 / 4	25 / 5	15 / 5	15 / 5	10 / 1	77
4.								
5.								
6.								
7.								

* Selected based on weighted evaluation

Example

5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor

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7 Development Phase

Objective: The objectives of the development phase of the value analysis job plan are to collect additional data, analyze thoroughly those best alternatives selected during the evaluation phase, and prepare cost estimates and initial designs that will ensure acceptability and ultimate project implementation.

Development Phase Outline:

- Determine sources for additional information
- Ascertain technical feasibility of the selected alternatives
- Determine economic feasibility of the selected alternatives
- Present findings in detailed change proposals
- Develop implementation plan

7.1 Discussion

This phase is an objective appraisal of the alternatives that provide the best value for reliably performing the required functions. During this phase the most promising alternatives selected during the evaluation phase will be further developed into detailed alternative designs. The intent is to obtain and present convincing data regarding design changes and costs for presentation to management.

The best alternatives are completely developed, with the assistance of experts and specialists, as required. Recommended design changes, materials, procedures, new forms, changes to standards and policy, all costs, and implementation requirements have to be documented. Develop each alternative until enough data has been accumulated to prove it is the best choice. If there are other similar alternatives that are also options to the existing situation, develop the next best idea enough to prove its potential. If management rejects the team's preferred alternative perhaps the second alternative may serve as a fallback recommendation that is still an improvement over the existing design.

7.2 Development Phase Techniques

- **Use Search Techniques.** Develop a list of the names of specialists and suppliers who have the knowledge needed in developing the proposals, using references and phone communications.
- **Consider Alternate Products and Materials.** In developing ideas one should give consideration to all possible design solutions, including different products, and materials, as applicable.

- **Consult Specialists.** To obtain better value in design, consult the most knowledgeable specialists available to answer questions on technical and construction problems. If the functions have been defined correctly, using precise verbs and measurable nouns, the area of knowledge needed for value can be identified. For example, "support weight" would indicate that a material specialist or structural engineer/designer could contribute. While consultation can be done by telephone or mail, having a personal meeting with the specialists is usually more desirable. Effective use of specialists can remove many potential roadblocks. The value analyst must be able to:
  - Define the required functions and the cost problem
  - Indicate the importance and priority of the problem
  - Make the specialist a part of the project
  - Direct the specialists efforts
  - Give credit for his/her contribution
  - Ask him/her to identify other specialist or sources of assistance.
- **Consult Suppliers.** Each industry employs a unique group of suppliers, particularly in the structural field, including personnel with the latest information on structural shapes, pipe culverts, cements, chemical additives, etc. Encourage your suppliers to suggest alternatives, other materials, design modifications, etc., to learn from their experience. In design, do not demand unnecessarily stringent requirements "just to be on the safe side." Over- specification may be safe and easy, but it is an expensive "shortcut." Solicit suggestions for improvement from the suppliers, and ask what there is about the design that causes high cost. In early planning, thoroughly describe the functional and technical requirements of the project, indicating those that are critical and those where some flexibility exists. Keep abreast of the services your suppliers have to offer, and maintain an up-to-date file of new services as a potential source of ideas leading to tangible dollar savings in future planning and design.

7.3 Procedures

- **General.** Subject each alternative to: (a) careful analysis to insure that the user's needs are satisfied; (b) a determination of technical adequacy; (c) the preparation of estimates of construction and life-cycle costs; and (d) a full consideration of the costs of implementation, including redesign and schedule changes.

- **Develop Specific Alternatives.** Follow those alternatives that stand up under close technical scrutiny to the development of specific designs and recommendations. Prepare sketches of alternatives to facilitate identifying problem areas remaining in the design. Perform a detailed cost analysis for proposed alternatives to be included in the final proposal.
- **Testing.** Perform any tests required to demonstrate technical feasibility before the alternative is recommended for implementation. Often the desired tests have already been conducted by another agency. Ask for a report on those tests. If not available, the value analysis team may arrange for the necessary testing and evaluation. Required testing should not delay approval of a proposal when: (a) Risk is low; (b) Consequences of less success would involve nothing more serious than less cost avoidance; (c) The element being tested involves an intangible or subjective factor; and (d) The test is normal confirmation procedure after an action is taken.

7.4 Develop Implementation Plans

Anticipate problems relating to implementation and propose specific solutions to each problem. Particularly helpful in solving such problems are conferences with specialists in areas such as: inspection, environmental, legal, procurement, materials, and planning. Develop a specific recommended course of action for each proposal that details the steps required to implement the idea, who is to do it, and the time required.

7.5 Life Cycle Costing

In considering the value of an item or process, the team should consider the overall life cycle cost of the item or process. In some cases, a higher initial cost of an item could result in reduced life cycle costs. Similarly a lower initial cost may result in more frequent maintenance and shorter life cycle than a higher initial cost item.

Consider the following major factors when determining the life cycle cost of an item:

- Expected life of item
- Construction (initial) cost
- Maintenance and operation cost
- Salvage value
- Discount rate

The expected life of any object is, simply put, how long the item is expected to last. Some items are used up at the end of their life cycle, but most can be maintained indefinitely. When the cost of maintenance becomes excessive; however, these items are replaced. Roads, bridges, drainage structures, etc., can be maintained indefinitely, but at some point the cost of repair becomes so high that replacement is more cost effective. This point of replacement, or major reconstruction, is the life cycle of that item.

Construction cost is simply the cost to construct the item. Identify this during the investigation phase of a value analysis study, usually from the construction estimate. If an item is purchased rather than constructed, use the purchase cost of the item.

Maintenance and Operation (M&O) costs are the costs associated with owning, maintaining, operating, and using an item, or system. There are two types of M&O costs, recurring and non-recurring. Recurring M&O costs are ordinary, routine, repetitive maintenance expenses. On a highway, they include mowing, replacing traffic markings, and the cost of electricity for lights, drainage maintenance, and guardrail maintenance. Consider these costs as a lump-sum, annual payment. Non-recurring M&O costs include replacement or irregular activities, such as resurfacing a highway, re-decking a bridge, and crack & joint sealing. Consider these costs individually.

Salvage Value is the value of selling or re-using items and material at the end of the life cycle. For example, some items with salvage value are guardrail, recycled pavement, bridge beams, rails, etc.

Another type of salvage value occurs when a highway's life cycle is completed, and a major reconstruction is undertaken. The salvage value of the old road would be the right of way, grading, sub-base, etc., that will not have to be purchased or performed for the reconstruction.

Perhaps the most difficult part of life cycle cost analysis to understand is the time value of money. Put simply, money in the future is not as valuable as money today. This has nothing to do with inflation, but with the flexibility of having the money now, and the opportunity costs of not having the money now. In economic terms, it is generally considered that the cost of money is 4% per year. That means that the value of a dollar decreases by 4% for every year in the future. For example, one dollar in 'one year is worth $0.96 today.

Over the life cycle of different items or systems, costs are incurred at different Times. Because of the time value of money, it is not fair or consistent to compare these costs at face value. For a fair comparison, refigure costs to today's dollars, by applying a discount rate to bring future costs back to their value today.

To find the Life Cycle Cost of an item or system, the following steps are generally followed:

1. Identify the expected life of the project element. This can be based on background information, experience, policy, or by arbitrarily selecting an expected life.
2. Identify construction costs of all alternatives. In most cases, this information will be provided. If not, find it during the investigation phase of the value analysis study.
3. Identify recurring maintenance costs by year. This information is available from maintenance staff, repair records, material usage, or accounting records.
4. Identify non-recurring maintenance costs by year. This information is also available from maintenance staff, repair records, material usage, or accounting records.
5. Identify salvage values, if any. For items such as right of way, grading, etc., the initial cost can be used for the salvage value. Other items may require an estimate on the part of the value analysis study team.
6. Using the discount rate chart, multiply recurring costs by the Uniform Series present worth factor for the appropriate final year. For an item with a 20-year life span, multiply the total annual recurring cost by the Uniform Series present worth factor for 20 years. This gives the total of all annual recurring costs for the 20-year period.
7. Using the discount rate chart, multiply non-recurring costs by the Single Payment present worth factor for the appropriate year. Multiply a cost occurring during the 5th year by the Single Payment present worth factor for year 5. This gives the present value of that payment in year 5 only. Multiply other non-recurring costs by the appropriate factor individually.
8. Using the discount rate chart multiply the total salvage value by the Single Payment present worth factor for the appropriate (last) year. Find the salvage value of an item in the last year of the life span which is a single event. The present value of the salvage is a NEGATIVE cost, since it returns money to the owner. Subtract the salvage value from the total Life Cycle Cost of ownership when finding the total cost.

9. Total the results of the computations this is the present worth of the life cycle cost of the item or system.

EXAMPLE: Estimating the Life Cycle cost of two alternatives for constructing "Pavement":

Table 7.1: Alternative #1
Flexible Pavement with Flexible Pavement Shoulders

Year	Action	Cost
0	Initial	₱383,835
6	Patch (5%, both lanes, 1.5")	₱2,000
8	Mill & Resurface (both lanes, 1.5")	₱32,000
12	Patch (5%, both lanes, 1.5")	₱2,000
16	Mill & replace 15% both lanes(3" base, 1.5" surface)	₱39,500
20	Patch (5% both lanes, 1.5")	₱2,000
24	Mill & replace 3" truck lane, overlay both lanes 1.5"	₱62,200
28	Patch (5% both lanes, 1.5")	₱2,000
	Estimated Salvage Value	₱191,917

Table 7.2: Alternative #2
Jointed Portland Cement Pavement with Rigid Shoulders

Year	Action	Cost
0	Initial	₱512,000
4	Seal defective joints	₱1,525
6	Patch	₱16,000
8	Seal all joints	₱6,100
12	Seal defective joints	₱1,525
16	Seal all joints, patch	₱28,600
20	CPR-3" or 3" overlay	₱150,000
24	Seal defective joints	₱1,525
28	Seal all joints, patch	₱28,600
	Estimated salvage value	₱256,000

Table 7.3: Life Cycle Calculation – Alternative 1

PROJECT ID		DEVELOPMENT PHASE		
Project ID		LCC ANALYSIS	Alternative #1	
4% Discount Rate				
30 Years Life Cycle		Flexible pavement with flexible shoulders		
Year	Description	Cost	PW Factor	Present worth
0	Initial	₱383,835	1.0000	₱383,835
1				
2				
3				
4				
5				
6	Patch (5% both lanes, 1.5")	₱2,000	0.7903	₱1,581
7				
8	Mill & Resurface (both lanes, 1.5")	₱32,000	0.7307	₱23,382
9				
10				
11				
12	Patch (5% both lanes, 1.5")	₱2,000	0.6246	₱1,249
13				
14				
15				
16	Mill & repl. 15% both lanes (3"base, 1.5" surface)	₱39,500	0.5339	₱21,089
17				
18				
19				
20	Patch (5% both lanes, 1.5")	₱2,000	0.4564	₱913
21				
22				
23				
24	Mill & repl. 3" truck lane, overlay both lanes 1.5"	₱62,200	0.3901	₱24,266
25				
26				
27				
28	Patch (5% both lanes, 1.5")	₱2,000	0.3335	₱667
29				
30				
	Total Non-Recurring Costs			₱456,982
	Annual Maintenance Costs:	₱5,600	17.292	₱96,835
	Estimated Salvage Value	₱191,917	0.3083	(₱59,172)
	Total Life Cycle Cost of Alternative No. 1			₱494,645

Table 7.4: Life Cycle Calculation – Alternative 2

Project ID		DEVELOPMENT PHASE		
Project ID		LCC ANALYSIS	Alternative #2	
4% Discount Rate				
30 Years Life Cycle		Jointed Portland Cement Pavement with rigid shoulders		
Year	Description	Cost	PW Factor	Present worth
0	Initial	₱512,000	1.0000	₱512,000
1				
2				
3				
4	Seal defective joints	₱1,525	0.8548	₱1,304
5				
6	Patch	₱16,000	0.7903	₱12,645
7				
8	Seal all joints	₱6,100	0.7307	₱4,457
9				
10				
11				
12	Seal defective joints	₱1,525	0.6246	₱953
13				
14				
15				
16	Seal all joints, patch	₱28,600	0.5339	₱15,270
17				
18				
19				
20	CPR-3" or 3" overlay	₱150,000	0.4564	₱68,458
21				
22				
23				
24	Seal defective joints	₱1,525	0.3901	₱595
25				
26				
27				
28	Seal all joints, patch	₱28,600	0.3335	₱9,537
29				
30				
	Total Non-Recurring Costs			**₱625,219**
	Annual Maintenance Costs:	**₱1,700**	**17.292**	**₱29,396**
	Estimated Salvage Value	**₱256,000**	**0.3083**	**(₱78,930)**
	Total Life Cycle Cost of Alternative No. 2			₱575,685

One can see that the two pavement alternatives experience different life cycle costs. It appears that Alternative #1, Flexible Pavement with Flexible Shoulders with a total cost of ₱383.8K, offers the lowest life cycle cost. The value analysis team would recommend alternative #1 as the best value in pavement for this project.

7.6 Development Phase Checklist

- Has the team planned the steps required to "sell" the ideas?
- Has the team determined the time required for analysis/drawing changes?
- Has the team determined when the change can reasonably be incorporated?
- Has the team satisfied the user's needs?
- Did the team have all supporting data available?
- Did the project meet the operational requirements?
- Did the project meet the safety requirements?
- Are the maintenance requirements met?
- Has the team estimated the Life-Cycle costs?
- Has the teams best ideas been thoroughly described?
- Has the team identified the type of people who can help support or develop the value analysis recommendation?
- Has the team solicited and recorded from specialists?
- Has the team considered all available solutions?
- Has the team considered locally available materials?
- Has the team double-checked the quantities and costs used in your calculations?
- Has the team developed the estimated net savings?
- Has the team examined the alternates for environmental impact?
- Has the team consulted appropriate organization and outside specialists?
- Has the team made all the other organizational functions a part of the team and consulted them?
- Does the re-design make use of available standards?
- Has the team reviewed the new method or design with all those concerned or responsible?
- Has the team made a strong attempt to overcome roadblocks?
- Did the team require any additional information?
- Has the team consulted all the best reference materials?

8 Presentation Phase

Objective: The objective of the presentation phase of the value analysis job plan is to put the recommendations before the decision-makers with sufficient information that the decision-makers will accept the proposals.

Presentation Phase Outline:

- Anticipate roadblocks to be overcame
- Prepare written proposal
  - Summarize study
  - Identify expected benefits/disadvantages
  - Make recommendation of specific action
  - Suggest an implementation plan of action

8.1 Discussion

A value analysis recommendation is a challenge to the "status quo "in any organization. It is a proposal for improving value and providing a beneficial change. The success of a value analysis Team is measured by the cost avoidance and value improvement achieved from implemented recommendations. Regardless of the merits of the recommendation, the net benefit is zero if they are not accepted and implemented. Presenting a recommendation, and subsequently guiding it to implementation, often requires a greater effort than the proposal's actual generation.

The initial presentation of a recommendation must be concise, factual, accurate, and conducted in such a manner that creates management's desire to accept and implement the change. Selling a recommendation depends to a large extent on the use of good human relations. Present the recommendation in such a way as to avoid any personal loss or embarrassment to those related to the study item. Give proper credit to those who contributed and to those responsible for implementation. The information contained in the value analysis recommendation will determine whether the proposal will be accepted or rejected. Although sufficient information may be available to the team, this information must be documented in the proposal.

Since management must base its judgment on the documentation submitted with a proposal, sufficient data must be provided to the reviewer to reach an informed decision.

8.2 Written Proposal

Always complete the value analysis study with a written report detailing the value analysis recommendations. Supplement the written report with an oral presentation of study results. The systematic approach of the value analysis job plan includes the careful preparation of a written report, from which a more concise oral presentation will evolve.

8.3 Gaining Value Analysis Acceptance

Several hints that appear to be most successful in improving the probability of acceptance are discussed in the following paragraphs:

- **Consider the reviewer's needs.** Use appropriate terminology to the organization and position of the reviewer. Each proposal is usually directed toward two audiences. The first audience, which is technical, requires sufficient detail to demonstrate the feasibility of the proposed change. The second audience, which is administrative, is one for whom the technical details can be summarized, while the financial implications are emphasized. Long-range effects on policies are usually more significant to the manager than to the engineer.
- **Prepare progress reports.** The manager who makes an investment in a value analysis study expects to receive periodic reports with estimates of potential outcomes. These reports assure top management awareness, support, and participation in the value analysis program. Managers are seldom motivated to act by a one-time exposure at the "final presentation," no matter how "just" the cause.
- **Warn the value analysis team of objections early on.** Early disclosure of potential changes can serve to warn the value analysis team of any objections to the proposal. This "early warning" will give them an opportunity to incorporate modifications to overcome objections. If management has been kept informed of progress, the value analysis presentation may be only a concise summary of final estimates, pro-and-con discussion, and perhaps formal management approval.
- **Relate benefits to organizational objectives.** Value analysis recommendations that represent advancement toward an objective are most likely to receive favorable consideration from management. Therefore, ensure that the presentation exploits all of the advantages that a value analysis recommendation may offer toward fulfilling organizational objectives and goals. The objective may not only include cost avoidance but also the attainment of some other mission-related goal of the manager.

- **Support the decision-maker.** The cost avoidance of the recommendations is likely to be improved if the proposal is promptly implemented. Prompt implementation, in turn, depends upon the expeditious approval by the individuals responsible for a decision in each organizational component affected by the proposal. Identify these individuals and conduct the entire value analysis effort under their sponsorship. Like any other well-prepared staff report, each value analysis report should:
  - satisfy questions the decision-maker is likely to ask;
  - permit him/her to preserve his professional integrity and authority;
  - imply assurance that approval would enhance management's image; and
  - include sufficient documentation to warrant a favorable decision with reasonable risk factors (both technical and economic).
- **Adequate Return.** To gain serious consideration of value analysis proposals by management, include adequate evidence of satisfactory return on the investment. Often, current contract savings alone will assure an adequate return. In other cases, life cycle or total program savings must be considered. Either way, evidence of substantial benefits will improve the acceptability of a proposal.
- **Show Collateral Benefits.** Value analysis proposals often offer greater value benefits than the immediate cost improvements specifically identified.

Some of the benefits are collateral in nature, and difficult to equate in monetary terms. To increase the likelihood of acceptance of value analysis recommendations clearly identify and completely describe all collateral benefits. Some typical collateral benefits are reduced maintenance, energy conservation, improved aesthetics, better environmental quality, lower replacement cost, etc.

8.4 The Value Analysis Workbook

The workbook documents all actions and efforts expended during the study. It should be a complete and ready document to facilitate preparation of the summary report and support the team's recommendations.

The value analysis team compiles a workbook throughout the life of a study, starting with the information phase. If properly maintained during the project, the workbook will require no additional preparation.

The following list indicates the type of information that should be recorded in the project workbook for each project:

- An explanation of why this project was selected for study
- List of team members and their specialty
- A functional evaluation of the process or procedure under study
- All information gathered by the group relative to the item under study
- A complete list of all the alternates considered
- An explanation of all logical alternates investigated, with reasons why they were not developed further
- Technical data supporting the idea(s) selected, with other factual information to assure selection of the most favorable alternate(s)
- Original costs cost of implementing the alternates being proposed and cost data supporting all savings being claimed
- Acknowledgment of contributions made by others to the study
- Steps to be taken and the timetable for implementing the proposed alternate(s)
- Before-and-after sketches of the items under study

8.5 Reasons for Rejection of Value Analysis Recommendation

Failure to provide adequate documentation is a major cause for proposal rejection. Some typical reasons for rejection are indicated below:

- Failure to Maintain Project Integrity. It is safe to assume that any approval authority will want positive assurance that the integrity of the project is maintained.
- Technical Supporting Information Incomplete or Inaccurate. Provide all salient technical information. Accompany it with proof of previous successful use or tests supporting the change proposal.
- Cost Analysis Incomplete or Inaccurate. Credibility of cost information is of major importance. Erring on the conservative side with cost estimates tends to gain more favorable consideration than presenting inflated claims of savings. Although approval authorities know that cost information must usually be estimated, reveal the basis and sources of the team's estimates.

8.6 Presentation Phase Check List

The following checklist will prepare the value analysis team for the presentation:

- Is the need for a change clearly shown?
- Is the problem defined?
- Is the proposal concise?
- Are all the pertinent facts included?
- Are dollar savings included?
- Is your value analysis workbook complete and accurate?
- Has the team double-checked your recommendations, costs, and savings?
- Is your information complete?
- Has the team prepared back-up material for questions that may be asked?
- Can use of vu-graph, opaque projector, flip charts or blackboard sell your ideas?
- Has the team established a plan of action that will assure implementation of a selected alternate?
- Is the change described?
- Are there pictures or sketches of before-and-after conditions?
- Has the best alternate been fully documented?
- Have all the constraints been considered?
- Has the recommendation been presented to the most appropriate responsible manager or decision maker?
- Has the implementation plan been developed?
- Have the recommendations been extended to all areas of possible application?
- Has the improved value design been considered for a standard or preferred practice?
- Has credit been given to all participants?
- If you were a decision maker, is there enough information for you to make a decision?

8.7 Written Reports

Clear communications should be the basic function of all writing. No matter what the purpose of the writing, the result should be the transfer of thought. The idea you have may be top-rate, but until you've explained it clearly to others, neither your organization nor you will gain from it.

One of the ways to improve upon your written reports is to observe these ten (10) rules of clear writing:

- Keep sentences short. Long sentences make reading difficult
- Present simple thoughts and expressions
- Use familiar words
- Avoid using unnecessary words
- Put action in your verbs
- Write the way you talk. The written word sometimes gets "stuffy"
- Use terms your reader can picture
- Write within your reader's experience
- Use variety in expressions
- Write to express; not impress

8.8 Visual Aids

Good graphic illustrations can translate a large number of figures into a simple understandable "management language." But the documentation on which a presentation is based, and the visuals that interpret that documentation, are measured by entirely different yardsticks.

Documentation is based on detailed findings. The facts, figures and statistics that make up the documentation should be as complete, up-to-date, detailed, authentic, fully organized, and thoroughly indexed as possible. The visuals summarize the situation at a glance. The charts, graphs or other visuals used in a presentation should be as few in number and as significant, simple and free of detail as it is possible to make them, pinpointing the high spots that the briefing seeks to identify, clarify and establish.

9 Implementation Phase

Objective: The objective of the Implementation Phase of the value analysis job plan is to ensure that approved proposals are rapidly and properly translated into action in order to achieve the savings or project improvements that were proposed.

Implementation Phase Outline

- Develop an implementation plan
- Execute the plan
- Monitor the plan to completion

9.1 Discussion

Even after formal presentation, the objectives of a value analysis study have not been fully attained. The recommendations must be converted into actions; hence, those who performed the study and the manager who requested the study must all maintain an active interest until the proposal is fully incorporated into the design or plans. A poorly implemented proposal reflects discredit on all concerned. Where unexplained delays are encountered, a polite follow-up note may serve as a reminder to the responsible authority, pointing out that those who made the study are available for assistance. An approved value analysis proposal should not be permitted to die because of inaction in the implementation process.

9.2 Implementation Investment

The team needs to emphasize the need to invest time or funds in order to save money when submitting value change proposals. Managers must provide funds or personnel time for implementation to achieve the benefits of value analysis.

Successful implementation depends on placement of the necessary actions into the normal routine of business. Progress should be reviewed periodically to insure that any roadblocks that arise are overcome promptly.

9.3 Expediting Implementation

The fastest way to achieve implementation of an idea is to effectively utilize the knowledge gained by those who originated it. Whenever possible, the value analysis team should be required to prepare initial drafts of documents necessary to revise handbooks, specifications, change orders, drawings and contract requirements. Such drafts will help to assure proper translation of the idea into action, and will serve as a baseline from which to monitor progress.

Appendix A
International Analysis Experience with Value Analysis

This appendix describes the study done by the Castalia Team on international experience with value analysis [4] among public and private sector organizations in selected countries.

Cases examined were in the following regions and countries:

- United States – federal and state transportation agencies
- United Kingdom
- Asia – Japan, South Korea, Hong Kong and Malaysia
- Latin America – Argentina, Costa Rica, Chile and Nicaragua

The aim of the Castalia study was to draw on the lessons from these international experiences in order to apply value analysis appropriately in the Philippines' NEDA ICC project evaluation framework.

We started by reviewing experience in the United States (U.S.) because of the country's significant history in originating value analysis. The value analysis technique that was originated by Lawrence Miles at the General Electric during the days of World War II became a staple technique for the U.S. Government in the early 1960s, at which time value analysis was generally known as value engineering. Value analysis was first introduced to projects by the U.S. Navy and the Army Corps of Engineers. In the 1970s, other public agencies started using VA, including the Departments of Transportation (DOT) or the state transportation authorities (STAs) in various states.

Outside of the U.S., value analysis also started to grow in countries such as Japan, Italy, Australia and Canada. Construction-oriented value engineers thrived in India, South Africa, England, France, Sweden and Germany.

For this study, we examined value analysis experience in detail for the United Kingdom (U.K.), South Korea, and Japan. We also reviewed experience in a few other Asian and Latin American countries in order to obtain additional

[4] Value analysis (VA) is the foundational approach for what is more popularly known as value engineering (VE) in the U.S., Latin America and Asian countries that were reviewed while the equivalent term in the United Kingdom, Malaysia and Hong Kong is value management (VM). We use value analysis as the general term in this section, referring to both value analysis and VM. In some cases, either value analysis or VM is used to emphasize its country of reference. The terms refer to the same fundamental concepts.

comparative information: Hong Kong, Malaysia, Chile, Argentina, Costa Rica and Nicaragua.

In the succeeding appendices we summarize the conclusions and recommendations from our review of international experience with value analysis by outlining the key lessons learned (Appendix B), the common elements of institutionalization (Appendix C), and in what ways value analysis practice may be established in the Philippines (Appendix D).

We reviewed in particular the following:

- The practice of value analysis in the U.S. in particular the documented experience of the Federal Agencies and State Agencies in Transportation Sector
- The practice of value management in the U.K, both in the public and private sectors
- The contrasting experiences of two Asian countries which are more advanced in the practice of value analysis – Japan and South Korea; and two other countries with relatively newer experience – Hong Kong and Malaysia
- The value analysis activities in a few Latin American countries – Argentina, Costa Rica, Chile and Nicaragua.

Appendix B
Key Lessons Learned

This appendix describes the key lessons learned in our study of international experience in value analysis across the United States, United Kingdom, Asia, and Latin America.

The use of value analysis as a decision-making tool lies at the core of investment strategies of both public and private sector organizations in many countries. Value analysis has progressively grown in practice, acceptance, and knowledge base since it was first introduced in the U.S. in the early 1940s.

Value analysis is commonly called value engineering in the U.S., Asia and Latin American countries and value management in the U.K.

Value engineering and value management studies, especially when undertaken at early stages of project development, have been shown to improve quality and cost efficiency, for both public and private sector organizations. From our review of international experience on value analysis we derived the following key lessons:

Value analysis reduces costs – In all the cases we examined, value analysis reduced projects construction costs by between 5 and 50 percent. Value analysis saves government agencies in the U.S. and U.K. billions of dollars a year. For example:

- Value analysis studies conducted for projects included in the U.S. Federal Highway Administration's Federal Aid Highway Program have saved the agency an average of US$1.8 billion dollars per year – or between 5.4 and 10.1 percent of projects' estimated construction costs – between 2003 and 2007
- Value engineering change proposals—value analysis completed during the construction phase – submitted to the U.S. State Departments of Transportation (DOTs) saved the DOTs US$61 million in 2002
- Value analysis studies conducted for the U.S. Department of Defense resulted in savings of over US$25 billion between 1983 and 2002
- In the UK, government departments saved an estimated £23 billion in 2004 as a result of applying value management
- The London Underground mass rapid transit system has saved "many millions of pounds" through value management studies

- In Japan, the Ministry of Land, Infrastructure and Transportation in 2003 found that a value engineering-type inspection of the designs of public work projects done prior to their construction could lead to a 10 percent cost savings. A localized 2005 value analysis study done on several road projects in the Oita Prefecture yielded an average savings of 31 percent
- In the South Korea tollway project, a value engineering study revealed that the cost of the project could be reduced by as much as 50 percent without decreasing the project's benefits and functionality.

Value analysis improves the quality of the project proposal – Because value analysis involves a functional analysis, the project is better defined after undergoing a value analysis study. The structured and rigorous review of the project leads to better project preparation – value analysis improves the quality of a project proposal. With the application of value analysis, it is likely that the NEDA-ICC evaluation and approval process may require less time than it currently does.

The successful administration of the value analysis program in the US transportation sector has resulted in quantifiable benefits "to the quality of the surface transportation improvement projects and to the effective delivery of the overall Federal-Aid Highway Program".[5] The application of value management in the London Underground has "dramatically improved project definition and subsequently refined implementation and reduced wasted cost"[6]

Conducting value analysis reduces the risk of delays in project implementation. This is because all project components are identified upfront, through functional analysis. The value analysis process induces a thorough review of the project design, identifying mistakes in details and coordination. This in-depth analysis of the project leads to better project design. It also leads to better construction documents, thereby reducing the risk of delays during construction.

- For example, value analysis of a twin span concrete segmental river over the Halifax River in Daytona Beach, Florida, shaved two months off the completion time of the US$24 million project. This project was completed in 1997.[7]

5 From "Value Engineering" at http://www.fhwa.dot.gov/VE/

6 From "Value Management in Transport and the UK Rail Industry," available at http://www.ivm.org.uk/vm_sector_transport.htm

7 "Value Engineering Speeds Span," Engineering News, ENR magazine June 1997, page 12

- Additionally, a value analysis study was conducted during the scoping stages of a road project for the New York State Department of Transportation (NYSDOT). The study examined several alternatives, not only from the construction/life-cycle cost perspective, but also from the perspective of user costs and delays to travelers. Although no direct cost savings can be attributed to this study, the NYSDOT staff found that the improvements achieved in the project's decision making process were significant. Value analysis facilitated good decision-making early on in the project which led to a smoother implementation.[8]

Conducting value analysis studies reduces the risk of changes in scope (variations in the project) during project implementation. This is because the functional analysis that is done as part of a value analysis study enables to identify what are the project functional components necessary to achieve the project's objective.

- The brainstorming process in value analysis serves as filtering mechanism; enabling the value analysis team to move systematically from a universal set of alternatives to the most desirable unique solution. In the South Korea toll way upgrade project, a value analysis study was undertaken to reduce the queuing time of highway users while maintaining toll revenues for government. The brainstorming process for the study generated 143 alternatives. These alternatives were then evaluated for effectiveness using a set of project performance criteria. The criteria included "project schedule", defined as the "time required to deliver the project (that is, improvement in delay to highway users) to the public". From the initial 143 options, 26 alternatives were selected. Eventually, the best alternative was adopted.

Conducting value analysis studies reduces the risk that a project will experience cost overruns due to changes in construction. This is because value analysis identifies the best and most cost-effective design in constructing the project. Cost overruns may still exist if the amount of time required for construction or the price of materials (items that are shown under the budget line "contingencies") change. However, it is important to note that value analysis does not evaluate contingencies. Value analysis identifies, through functional analysis, which components are needed, thereby reducing the risk of cost overruns.

8 From "Successful Practices in the Value Engineering Program," available at http://www.fhwa.dot.gov/ve/2007/04.cfm. The value analysis study was done on State Route 390 from Trolly Blvd to State Route 104.

- In the US case, value analysis applied during construction enables governments to mitigate cost overruns and prevent future cost overruns, by allowing the contractor to propose a Value Analysis Change Proposal (VECP). VECP are proposals by the contractor, identified through a value analysis study to reduce construction costs on a project already awarded.[9] At this stage, government agencies provide financial incentives to contractors to propose changes in the contract requirements which meet the project's financial requirements at a lower cost or improve value/service with no corresponding increase in cost (see details of U.S. case study in Appendix E.1).

[9] Definition from Federal-Aid Policy Guide, FAPG G011.9.

Appendix C
Common Elements of Value Analysis Institutionalization

Our review of international experience in value analysis revealed some common elements that allow us to draw some useful insights for establishing its practice in the Philippines. This section describes these elements of value analysis institutionalization from the countries reviewed and discusses how these may be transferred to the Philippine setting. Value analysis experience across the continents (the Americas, Europe, and Asia) was reviewed following the framework below, which examines various elements of institutionalizing value analysis:

- Rationale for adoption and practice of value analysis – Why was value analysis introduced? What prompted the public or private sector in the country to adopt value analysis principles in their decision-making processes?
- Mode of institutionalization of value analysis – How was value analysis initially introduced or what type of medium (e.g., government policy, training, industry standard) was utilized to establish or to facilitate the introduction and adoption of VA?
- Organizational Base – Which group or entity is responsible for enforcing or fostering value analysis practice? What is the scope of its mandate or authority?
- Framework for Implementation – What are the key principles and methodologies applied? How is value analysis currently being implemented or promoted? Which elements worked and which did not?
- Users and Practitioners – What sectors and industries are using VA? Are there communities of practice[10]? Are there educational institutions that support the growth and spread of value analysis knowledge?
- Costs and Benefits – What is the cost-threshold of projects that are subjected to VA? What are typical costs of a value analysis study? How much are the potential savings?

[10] Communities of Practice (COP) are professional groups or organizations that jointly pursue the growth of a body of knowledge and principles and their application in developmental concerns. Examples of COP are the institutes and societies of value engineers, whose mission is to promote the application of value analysis in public and private sectors.

- Applicability in the Philippines – What lessons are potentially transferable to the Philippines? What may be recommended as elements of establishing value analysis in the country?

Rationale for value analysis – The common motivation for the practice of value analysis is to improve quality and raise cost efficiency. For public sector procurement, the motive is reinforced by the need to have greater accountability for the use of government resources and the achievement of greater net economic benefit and value for money. For private sector, the added imperative is the need to maximize profits.

- In the U.S., value analysis was introduced to achieve a better balance between project objectives and the associated costs.
- In the U.K., value management was introduced to ensure the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements, called Value for Money (VfM).
- In Japan, value analysis was adopted to improve industry competitiveness by managing and to reduce construction costs in public works.
- In South Korea, value analysis was introduced to minimize cost overruns in poorly designed public works projects.
- In Malaysia, value analysis adoption was introduced to instill cost control and VfM in the auto industry.

Mode of Institutionalization

The presence of a government mandate facilitates immediate and comprehensive adoption of value analysis. In both the U.S. and U.K., a federal/central government policy was used as compliance mechanism. Practice of value analysis is pervasive, as it is being used extensively in a broad spectrum of public procurement actions. In both countries, private contractors participating in the provision of public services are also required to conduct value analysis studies on their proposals.

In Japan and South Korea as well, government policy was established to compel value analysis studies by government implementing agencies prior to their procurement actions. While not yet as comprehensive in scope as those in the U.S. and U.K., the Asian cases are following in the footsteps of the western countries, focusing on public works.

In contrast, value analysis in Latin America has not, to date, been mandated by the government. Although it has been introduced in several countries (Argentina, Costa Rica, Chile and Nicaragua) through workshops and value analysis studies on specific projects, it has not yet been institutionalized. This

further underscores the importance of a government-issued mandate in bringing about the institutionalization of value analysis.

Not surprisingly, the mandatory nature of value analysis practice in the case countries is associated with predictability in the realized cost savings. Because value analysis studies are required, it enables government managers to plan on cost savings that need to be accomplished, such as in the case of U.K. and the U.S., where targets are set and reviewed in specific performance periods.

Organizational Base – In countries where value analysis has been institutionalized, a specific government agency is responsible and accountable for ensuring its practice in the public sector. In the U.S. and U.K., a common organizational base is a government agency charged with oversight on utilization of government resources. In the U.S., it was the Office of Management and Budget (OMB) that required value analysis to be used in all federal departments and agencies. In the U.K., the directive is being enforced by the Government Budget Office and National Audit Office and is used all throughout the national and local authorities. In Japan and Hong Kong, the main organizational home is their respective ministries dealing with infrastructure. Attendant to their responsibility of enforcing value analysis/value management practice, the organizational bases in the countries studied naturally provided sources of information to guide (for example, industry and academe) in the conduct of value analysis/value management studies.

Framework for Implementation – Whether it is called value analysis or value management, the foundations of the practice are value analysis and cost-efficiency. In all countries that were reviewed, the framework for implementing value analysis was clearly set out in the form of well-defined policies and procedures and roles and responsibilities.

In terms of the timing, the proper application of value analysis is at the earliest stage of project development when it will yield the greatest benefit through cost savings. The conduct of value analysis at the earliest stage does not, however, preclude its re-introduction at a subsequent phase of project implementation, for example, during construction stage.

- In the U.S., among the State Transportation Authorities (STAs), value analysis is implemented in two project stages: first, at pre-construction (or project identification) stage and second, at construction stage. Both federal and state- level agencies practice value analysis. It is done either by well-trained in-house teams, external consultants or a combination of both.
- In the first stage – pre-construction – value analysis studies are done either by respective in-house teams in the government agencies, their

external consultants or a combination of both. The value analysis studies are then assessed by a reviewing body within the agency and approved for implementation. For private contractors of projects, value analysis studies are required in their proposals.

- In the second stage – construction (also referred to as "implementation") – current private project contractors submit a Value Engineering Change Proposal (VECP) when potential for further cost savings are foreseeable. This VECP is allowed to be submitted under the Value Engineering Incentive Clause (VEIC) of their contract. A VEIC induces a contractor to search for creative ways of cutting costs without sacrificing quality. Part of the cost savings are then given to the contractor. Under this 2-stage value analysis system, the likelihood of unnecessary costs and cost overruns are twice mitigated, resulting in greater net economic benefits for the government.
- In the U.K., value management is a rule of thumb in all national and local public procurement actions. Value analysis is undertaken at the project identification stage for infrastructure projects. Because of the universal applicability of value management tools, the U.K. Government has also mandated its adoption in other aspects of governance, including the determination of policies and standards. As in the U.S., value management studies are done either by well-trained in-house teams, external consultants or a combination of both. Public-private partnerships, in particular Privately Financed Investments (PFI), are also mandated to follow value management guidelines. Potential savings from value management are targeted per government unit and audited, as part of an overall budgeting system of Government.
- Among the countries reviewed, there are guideposts or triggers used by decision-makers to signal the need for value analysis studies to be undertaken. These value analysis red flags may include the following project characteristics:
  - High construction cost – Anywhere from US$10 Million (South Korea) to US$25 Million (U.S.) have been used as minimum project costs
  - Complex, multi-part or highly sophisticated design
  - Difficult construction or fabrication procedure
  - Use of critical or high-cost materials
  - Major structures or capital investment program, involving significant public impact
  - Technology used is susceptible to fast-paced change

- Planning horizon is long-term
- Proponent has unclear or undesirable track record

Value analysis and risk analysis are two sides of the same coin. In the U.K.'s value management framework, both types of analyses are considered integral in the appraisal and evaluation of government decisions to promote public interest. This approach is described in the U.K.'s decision-making guidebook, *The Green Book - Appraisal and Evaluation in Central Government* [11], which sets the techniques and issues that should be considered when carrying out assessments of all new policies, programs and projects, whether revenue, capital or regulatory. The book emphasizes the need to account for wider social costs and benefits of proposals and the need to ensure the proper use of public resources.

Value engineering is also an organizational development concern. Among the U.S. STAs, several functional elements have been identified as essential to a successful value analysis program (See Appendix E.1). These include policy and procedures, training, existence of value analysis champion and corporate or leadership commitment. The latter is considered as the key ingredient of a successful value analysis program. Unless the value analysis program is able to confirm its contribution toward corporate goals or the organizational mandate, then support of senior management may not be sustained.

In Japan and South Korea, our review also offered a glimpse into the organizational dimensions of value analysis institutionalization. In Japan, where value analysis was originated by industry, knowledge had to be built up and diffused first within the internal organizational units (like the planning, engineering and purchasing departments), so that a cohesive approach to cost reduction could be attained at the company level. The use of value analysis was also not confined to investment decisions but also on improvements of efficiency in company processes, procedures and organizational methods. In the South Korea value analysis study of the toll road project, it was concluded that the success of value analysis program in the public sector depends on factors like:

- Setting clear value analysis responsibilities within the organization
- Providing and maintaining clear documented guidelines and procedures for conducting value analysis
- Building organizational capability by providing training for staff
- Evaluating the value analysis program to track the actual benefits of value analysis and assess areas for improvement.

[11] The U.K. Green Book is similar in intention and content to the NEDA Project Development Manual. The key difference is that the NEDA manual is used largely for evaluating projects, whereas the U.K. book applies to all decision-making actions in government.

Users and Practitioners – Value analysis is practiced widely in both public and private sectors because of its clear benefits and generic nature, which renders it applicable to many types of projects. In the public sector, the users are both national and local government organizations. In the private sector, the construction industry is a common user of value analysis in the countries that were reviewed. Academe and Communities of Practice (COP) play an important role in the growth of the knowledge base and application of value analysis. Academic stimulus, through capacity building activities like trainings and workshops, was largely responsible for the early introduction of value analysis in Japan in the early 1960's, through the Sanno Institute of Business Administration, when the rest of Asia had yet to learn of value analysis. COPs, such as the various societies or institutes of value engineers all over the world (see Appendix F.6) are key in spreading the merits of value analysis because they facilitate the exchange of information between government and private sector through their publications and conferences.

Costs and Benefits of value analysis – It pays to do a value analysis study. Value analysis studies have proven quantifiable benefits in the form of cost savings, although these are not realized without costs. For example:

- Year 2002 statistics available from the U.S. state DOTs showed varying statistics but all point to the general conclusion that it pays to do a value analysis study, whether done at pre-construction or construction phase. For value analysis done at pre-construction, the return on investment (ROI) in value analysis studies of DOTs done in the year 2002 averaged US$116:US$1.[12] For value analysis done during construction, Value Engineering Change Proposals or VECPs approved by government also yield savings amounting to US$61 million or roughly US$1.6 million for each of the 38 states that implemented VECP.
- Year 2003-2007 statistics from the U.S. FHWA's Federal Aid Highway Program showed even higher ROIs, in the range of 132-219. The value analysis studies resulted in savings of between 5.4 and 10.1 percent of projects' estimated construction costs. The average cost of conducting value analysis studies over the same period was about US$31,000.
- Year 2005-2006 statistics from the U.S. Department of Energy (DOE) showed that the cost of doing a value analysis study was on average about US$60,000. For the 35 value analysis studies conducted that year

[12] The return on investment is defined as the cost savings resulting from the value analysis study divided by the cost of performing the value analysis study.

that yielded a total savings of US$277 million, this implied an ROI of about 31 percent.

- Year 1983-2000 statistics from the U.S. Department of Defense (DOD) showed that value analysis studies yield over US$25 billion in savings, coming from both value analysis in pre-construction and VECP, with an ROI of 6 percent. (See Appendix E.1)
- In the UK, savings from value management initiatives are pre-targeted and cast in performance contracts of government departments. In year 2004, a total of £23 billion in VM savings were generated. This emboldened the government in 2007 to set a higher goal of no less than 3 percent of all public service expenditures or an equivalent of £30 billion, to be created by year 2010-2011.
- In Japan, the Society of Japanese Value Engineers (SJVE) cited in its 1981 manual that cost reductions from industrial value analysis range from 30 percent to 70 percent, or a benefit/cost ratio of 32 times. In 2003, the Japanese Ministry of Land, Infrastructure and Transportation found that a value engineering-type inspection of the designs of public work projects done prior to their construction could lead to a 10 percent savings in costs. A localized 2005 value analysis study done on several Oita Prefecture road projects yield a 31 percent average savings.
- In the South Korea tollway project, a value analysis study revealed that the cost of the project could be reduced by as much as 50 percent, without decreasing the project's benefits and functionality.

Appendix D
Applicability of Value Analysis in the Philippines

Our review of international experience in value analysis indicates that the prospects for implementing value analysis in the Philippines are favorable. The country stands to gain significantly judging from the cost savings of other countries that have required value analysis studies on major infrastructure projects.

In Appendix C we identified several common elements of value analysis institutionalization in the countries reviewed. In this appendix, we used the same institutionalization elements in gauging the applicability of value analysis within the Philippine decision-making frameworks. Our evaluation is as follows:

Rationale – International experience shows that the common motivation for the practice of value analysis is to improve quality and raise cost efficiency. In the Philippines, it is no different. The government motivation is clear and urgent. There is a need for improving value and raising the bar on cost efficiency in public infrastructure investments. The Philippine government motivation is aptly stated in the present project's Terms of Reference:

> *"Given [their] direct impact on the country's capacity for growth and fiscal position, the [Philippine] infrastructure development program should be a major focal point for efficiency measures...The current situation underscores the need for the GoP to strengthen oversight of large-scale infrastructure projects...[given] that many of the existing projects are grossly over budget upon completion, very much delayed and/or pose substantial fiscal risks to the public sector."*

Mode of Institutionalization — International experience has shown that government mandate expedites the acceptance of value analysis adoption. Within the Philippine government sector, public infrastructure selection and financing is already systematically guided by a policy framework that is anchored on cost-benefit and cost effectiveness analyses. The NEDA ICC Evaluation Guidelines provides an enabling backdrop for requiring value analysis studies to be submitted by implementing agencies and for NEDA to verify the acceptability of the value analysis studies.

Organizational Base – In countries where value analysis has been institutionalized, a specific government agency is responsible and accountable for

ensuring its practice in the public sector. The Investment Coordinating Committee (ICC) of the National Economic and Development Authority (NEDA) is a suitable anchor for value analysis because of its role as oversight agency for the government's project development process. It is also an appropriate organizational starting point for instituting more permanent and systematic integration of value analysis in the country's infrastructure planning, evaluation and budgeting framework because it already possesses the mandate consistent with the rationale for value analysis. That is, ensuring the efficient and effective allocation of constrained public and ODA resources intended for development projects. The lack of knowledge and awareness about value analysis may be the strongest reason why value analysis could fail. It is therefore important that the NEDA's capacity be built to enable it to successfully perform its value analysis oversight mandate.

Implementing Framework – The greatest enabling condition for institutionalizing value analysis in the Philippines is that value analysis in other countries has grown rapidly in knowledge base and experience, so that there is no need to reinvent the wheel. In order to facilitate the introduction of value analysis in the current project development system, the Philippine government would need to think about addressing the following essential elements:

- **People** —Local capacity enhancement must be done both at the regulatory or oversight agencies, like the NEDA, and the implementing agencies (IA) especially those regularly undertaking major infrastructure projects or transacting with private sector proponents like the Department of Public Works and Highways (DPWH), Department of Transportation and Communications (DOTC) and Department of Energy (DOE). Like NEDA, however, many of the national and local government agencies are likely to already have fundamental project development skills, which augur well for the introduction of the value analysis methodology. It is also important that commitment from key leaders is obtained to make the transition work well. Having a value analysis champion and leadership commitment are the two most critical elements for successful establishment of a value analysis practice.
- **Policy**—Within the existing ICC Guidelines, NEDA has the opportunity to introduce the policy change that will compel implementing agencies to plan their projects better. NEDA can reformulate the current guidelines by incorporating the requirement of a value analysis study in the submission of proposals for ICC review. The requirement for value analysis studies can also be trickled down to private sector proponents under the BOT law.

- **Procedures** —The existing NEDA Project Development Manual may be revisited for possible incorporation of a chapter on "conduct of a value analysis study" at the project identification phase. Available value analysis or VM manuals like the UK Green and Orange Books, as well as the U.S. Department of Defense and the Japanese value analysis guides that are referenced in this report are suitable sources of value analysis techniques.

Costs and Benefits of Value Analysis — Introducing value analysis will add rigor and effectiveness to the existing project evaluation framework of the ICC. Two most important and direct benefits of introducing value analysis is that it will lessen the occurrence of poorly designed projects and mitigate cost overruns during construction.

Appendix E
Details of International Cases

This appendix presents the details of each international case study. Section E.1 discusses the practice of value engineering in the U.S., in particular, based on the documented experience of the Federal Agencies and State Agencies in Transportation Sector. Section E.2 describes the practice of value management in the U.K., both in the public and private sectors. Section E.3 is a detailed review of the contrasting experiences of two Asian countries—Japan and South Korea—and a cursory look at two other countries—Hong Kong and Malaysia. Section E.4 gives an overview of the value analysis activities in some Latin American countries—Argentina, Costa Rica, Chile and Nicaragua.

E.1 Value Engineering Experience in the United States of America

This section describes the practice of value engineering[13] among the federal and state agencies in the transportation sector of the U.S., using the institutional elements noted in Appendix C.

Value analysis had its origins in the U.S. Value analysis is now referred to as "value engineering" in the U.S., but the two terms refer to the same concepts and methodology.

Among the various organizations of the U.S. Government, the transportation authorities or departments collectively comprise the largest users. The institutionalization of value analysis in the U.S. is due largely to government mandate. Value analysis is practiced widely by public agencies in two stages:

- Value engineering in pre-construction
- Value engineering during construction via Value Engineering Change Proposals (VECPs)

Savings from value analysis studies have been reported as substantive, and as a result, this has served to reinforce the importance of value analysis in the public investment management framework of the government.

[13] Value analysis is the terminology that has become more widely used in the U.S. rather than value engineering. The terms are interchangeable. The Society of American Value Engineers (SAVE) defined value analysis as "the systematic application of recognized techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost".

To add some reference as to how other federal agencies are faring in terms of value analysis cost savings, examples from the Department of Defense (DOD) and the Department of Energy (DOE) are also cited under the section on value analysis savings (Table E.1).

E.1.1 Rationale for Value Engineering

Value engineering for transportation projects in the U.S. had been strongly encouraged and used by the Federal Highways Administration (FHWA) and US Department of Transportation (DOT) since the mid 1970s to achieve a better balance between project objectives and the associated costs. The Federal Highway Administration (FHWA) defines value engineering as "an organized application of common sense and technical knowledge directed at finding and eliminating unnecessary costs in project".[14]

"The application of the value methodology, however, can vary significantly from state to state, reflecting local practices and expectations"[15]. Whereas two decades ago, State Transportation Agencies (STAs) used value analysis to improve their standards, specifications, and processes; today, they have shifted attention to individual projects. The rationale for the U.S. adoption of value analysis in transportation projects is best described by the FHWA in its Regulation 23, which requires the application of value analysis "to improve project quality, reduce project costs, foster innovation, eliminate unnecessary and costly design elements, and ensure efficient investments."[16]

E.1.2 Mode of Institutionalization and Organizational Base[17]

The practice of value analysis in the US has become ingrained in the government decision-making culture over the last four decades due in large part, to numerous mandates set in place by the Federal Government, which were adopted by the state agencies. In the transportation sector, the following legislative and policy influences were significant in requiring the practice of value analysis and identifying the federal and state agencies that were vested with the responsibility of implementing value engineering- related laws and policies:

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[14] Jumas, Dwifitra, Martalius Peli, Wahyudi Putra, and Sukra Arnaldi. Value Engineering and Cost saving Issues on USA Department of Transportation (DOT). International Conference on Construction Industry, June 2006, Malaysia.

[15] Wilson, C. David. Value Analysis In Transportation. Achieving Value, Winter 2006.

[16] Same as footnote #7.

[17] Same as footnote #7.

- **1970: The Federal-Aid Highway Act** made the first reference to using value analysis for federal highways. It required that value analysis studies be conducted for highway projects funded with federal money. The Act stated that "in such cases that the Secretary determines advisable, plans, specifications, and estimates for proposed projects on any Federal-Aid system shall be accompanied by a value engineering or other cost reduction analysis"
- **1993: Office of Management and Budget (OMB) Circular A-131** required that value analysis be used in all federal departments and agencies as a cost management tool. The Circular also required each agency whose total budget or total procurement exceeded US$10 million in a given fiscal year to report every fiscal year to the OMB, the results of using value analysis annually. (See Appendix F.1)
- **1995: The National Highway Designation Act (NHDA)** was passed by the US Congress. This expanded the role of value analysis in federal projects. It instructed the Secretary of Transportation to establish a program requiring all State Transportation Authorities (STAs) to conduct value analysis on all projects costing US$25 million or more.
- **1997: FHWA issued Regulation 23 CFR part 627**, which required each State Transportation Authority (STA), to undertake value analysis analysis on any project segments on the National Highway System that cost US US$25 million or more. FHWA was influenced by NHDA's decision two years earlier. For a complete text of the Regulation, see Appendix F.2
- **1998: The Federal-Aid Policy Guide** was revised to include a chapter providing guidance on the application of value analysis in the federal-aid highway system
- **2002: FHWA regulations required value analysis on qualifying design- build projects**. This was an amendment to FHWA regulations and occurred after the FHWA published its final rule establishing regulations for design-build contracting.
- **2005: Under Public Law 109-59, Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy of Safety for Users (SAFETEA- LU)**, value analysis use was further strengthened, by introducing a new value analysis trigger to all state transportation authorities: "all bridges costing US$20 million require a value analysis study."

E.1.3 Implementation Framework

Conceptually, the goal of a value analysis study is "to achieve true value for the owner". This value may be attained by removing unnecessary costs to the project or providing a more workable product that would decrease the cost of owning and operating the facility (its life-cycle costs). Thus, value, in this context, is considered to be that amount of money that is received in return of a product or service. In the context of the U.S. transportation sector, value is measured in dollars of costs savings at the end of each fiscal year due to the conduct of the value analysis studies. Value analysis practice in the STAs or Departments of Transportation (DOTs) is generally conducted at two junctures of the project development process. These are:

- Value engineering in pre-construction – Value engineering study conducted at the concept stage of project design
- Value engineering in construction – Value engineering study conducted at post-project contract award

Value engineering at the pre-construction stage

The pre-construction or the concept stage of design is defined as that stage in a project's development when the planning process is complete but the contract for full design of the project has not yet been awarded to a consultant or the in-house project design team has not yet begun its work.

A value analysis study that is conducted in the pre-construction stage, either by in-house value analysis teams in the State Transportation Agencies (STAs) or by consultants or a combination of both, is premised on the principle that the earlier value analysis is applied, the greater the potential for savings because of greater leeway for managing the life-cycle costs. Considering that life-cycle costs are largely comprised of operation and maintenance costs, it is imperative that operation and maintenance costs be minimized by factoring them into the decision-making process as early as possible.

While the federal and national laws and policies noted above provide the overarching mandate for undertaking value analysis in the transportation agencies, the DOTs follow some basic implementing guidelines in the conduct of value analysis at the pre-construction stage. These guidelines, which were summarized by the American Association of State Highway Transportation Officials (AASHTO, 1987) and the National Cooperative Highway Research Program (NCHRP, 1981)[18], are as follows:

[18] Same as footnote #7.

- **Project selection** – Only projects that provide the maximum opportunity to improve the public investment by quality enhancement or life cycle cost saving must be implemented. Some typical characteristics for projects that require a value analysis study are:
  - Projects that substantially exceed initial cost estimates
  - Complex or multi-part items or processes that provide unique but costly functions
  - Items using critical or high-cost materials
  - Items requiring difficult construction or fabrication procedure
  - Items that perform a questionable function
  - Items that simply appear too costly to build, operate, or maintain
  - Project that have grown complex, possibly by development over a long period of time
  - Major structures
  - Projects with complicated or costly traffic control or detours
- **Timing** – In general, the earlier value analysis is applied the greater the potential for saving.
- **Participation –** When value analysis is applied in pre-construction, every effort should be made to involve construction, maintenance, and operations personnel in addition to design personnel. Decisions made in early stages of project development have considerably more influence on life-cycle costs than those made in the construction and maintenance phases, and operations and maintenance costs typically account for a high percentage of life-cycle costs.
- **Standard plans and specification and design criteria** – Serious consideration should be given to organizing and initiating a systematic team effort to review and analyze all standard plans and specifications currently in use to determine their applicability to proposed projects that will be subject to value analysis.
- **Value engineering teams** – The creative phase of the job plan requires forming a team with diverse backgrounds, skill sets and viewpoints.

Value Engineering at the Construction Stage

Value engineering during construction deals with value analysis studies that are conducted in the post contract award phase and focuses on the role of contractor.

During this phase, the state government allows a contractor to submit a proposal for changes in the contract requirements. According to the Federal-aid

Policy Guide, FAPG G011.9, a Value Engineering Change Proposal (VECP) is defined as: "a construction contract provision which encourages the contractor to propose changes in the contract requirements which will accomplish the project's functional requirements at a least cost or improve value or service at no increase in cost. The net savings of each proposal is usually shared with the contractor at a stated reasonable rate". [19]

The VECP program provides a reward system for contractors who propose contract modifications that reduce cost, without reducing product or process performance. In order to invite VECPs from the contractors, the state includes in the contract document a Value Engineering Incentive Clause (VEIC). A VEIC defines the basic requirements and evaluation criteria of the program. Before initiating a VECP program, a state generally secures an interpretation from the attorney general or other appropriate source as to the legality of their VEIC provision.

A contractor who participates in a VECP will show opportunity to demonstrate ingenuity and construction excellence. If a contractor's VECP is proven by the state government to result in net savings over the contract cost, then the contractor receives an extra payment. Not surprisingly, contractors use VECPs to increase their profits and to ensure continuing improvement on their projects. The AASHTO also notes that VECP leads to the following benefits to the state:

- Enhancing the project design at reduced cost to the state
- Advancing the project completion date

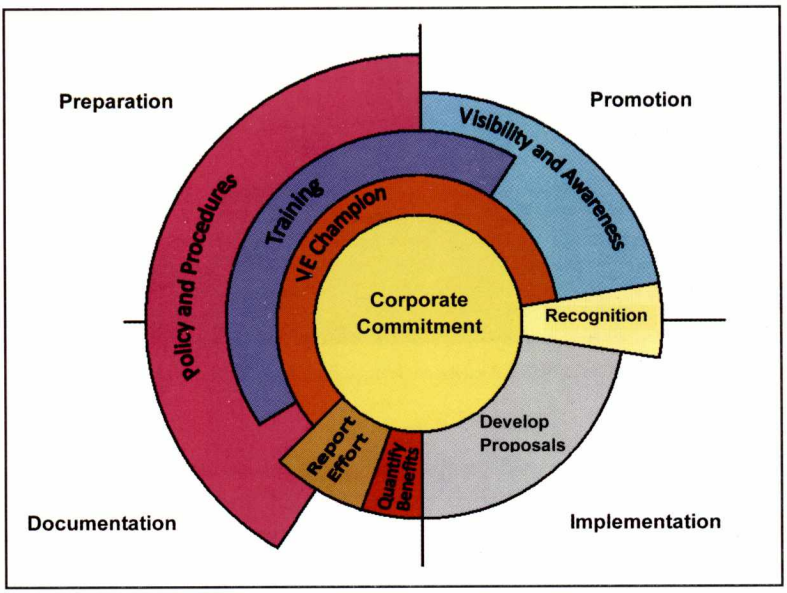
Sample of Value Analysis Best Practices from the State Departments of Transportation

A sampling of successful best practices from the DOTs is published in the website of the United States Federal Highway Administration. Value Engineering as an Organizational Development Concern – a study done in 2005 by the National Cooperative Highways Research Program (NCHRP) of the U.S. Transportation Research Board (TRB)–showed that a successful value analysis program must be capable of four activities – preparing for, promoting, implementing, and documenting – its value analysis studies to sustain corporate interest in the program.

[19] Definition from Federal-aid Policy Guide, FAPG G011.9. (http://www.fhwa.dot.gov/construction/cqit/vecp.cfm)

Figure E.1 shows some of the functional elements that are associated with each of the four activities. Among the elements, corporate commitment is considered as the key ingredient of a successful value analysis program. The bottom line is that the value analysis program must be capable of proving its contribution toward corporate goals and sustain the commitment of senior management in the implementation of the value analysis solutions.

Figure E.1: Functional Elements of a Value Analysis Program



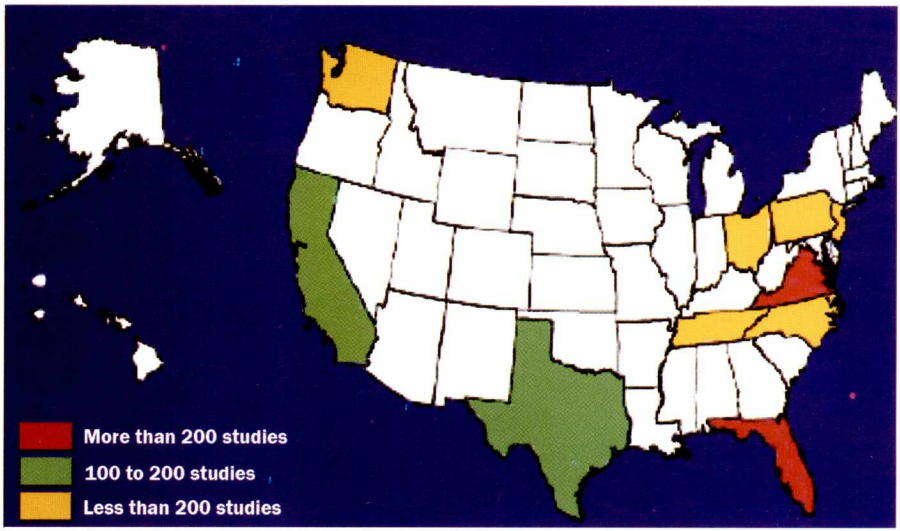
Source: Wilson, C. David. Value Analysis In Transportation. Achieving Value, Winter 2006.

E.1.4 Users and Practitioners

As earlier noted, the U.S. transportation sector was selected for this study because of wide ranging application of value analysis in both pre-construction and construction stages of road projects. Wilson (2006)[20] noted that "although an overall measure of value analysis activity does not exist, FHWA's value analysis website (www.fhwa.dot.gov/ve) presents an annual summary of value analysis activity on Federal-Aid National Highway System (NHS) projects and can be used to gauge the level of activity." Figure E.2 below illustrates the distribution of value analysis studies conducted by the top ten STAs from 1999 to 2003.

[20] Same as in footnote # 7.

Figure E.2: Ten Most Active State Transportation Authorities (STA) Performing Value Analysis Studies, 1999-2003 on National Highway System (NHS) Federal-Aid Projects



Source: Wilson, C. David. Value Analysis in Transportation. Achieving Value, Winter 2006.

The FHWA's value analysis program[21] applies to its Federal-Aid program. This program funds State projects that are developed and administered by State Departments of Transportation (DOTs)[22] with money authorized from the Federal Highway Act. This program is designed to:

- Encourage State DOTs to use value analysis
- Ensure that the projects requiring value analysis reviews by law and regulation receive them
- Encompass a variety of value analysis activities focused on education and training, technical assistance liaison with industry and States, promotional activities, and active participation in studies
- Focus on education and training of Federal, State, and local highway employees through the conduct of value analysis workshop by the National Highway Institute.

[21] From the FHWA website on value analysis <http://www.fhwa.dot.gov/ve/>

[22] DOT is also referred to alternatively as STA.

The FHWA also works with the American Association of State Highway and Transportation Officials' (AASHTO) Value Engineering Technical Committee to encourage and promote the use of value analysis by State DOTs. One such activity used by the FHWA is the presentation of State DOT awards for "Excellence in Value Engineering" presented at the biennial AASHTO value analysis Conference.

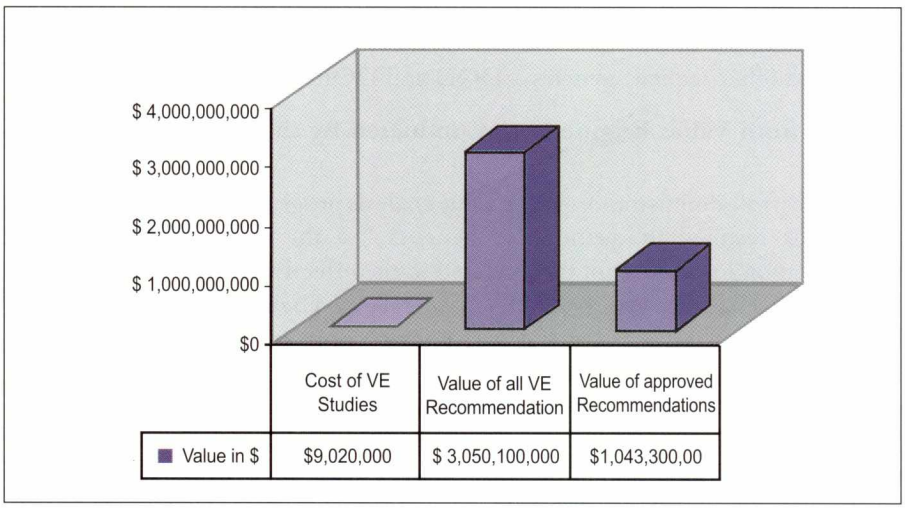
Value Engineering in Pre-construction

The FHWA reported that in Fiscal Year 2002, 377 value analysis studies costing US$9 million were conducted by STAs, through either in-house teams (59 percent) or consultants (41 percent). From these studies, a total of 2,344 value analysis recommendations were generated, of which 969 were approved for implementation.

Figure E.3 shows the value of all the value analysis recommendations and the value of those value analysis recommendations that were actually approved and implemented.

The estimated return on investment (ROI) – which is obtained by simply dividing the value of approved value analysis recommendations by the cost of the value analysis studies – on these value analysis studies is US$116:US$1.

Figure E.3: Pre-Construction Value Engineering Studies in U.S. State Departments of Transportation (DOT), FY 2002



Source: Jumas, Dwifitra, Martalius Peli, Wahyudi Putra, and Sukra Arnaldi. Value Engineering and Cost saving Issues on USA Department of Transportation (DOTS). International Conference on Construction Industry, June 2006, Malaysia.

Value Engineering in Construction

In the same fiscal year, the FHWA reported that 38 of the STAs conducted one or more VECPs. A total of 416 VECPs were submitted with 347 of these approved and their total cost savings potential amounting to US$ 61.101 million or roughly US$1.6 million for each of the 38 states that implemented VECP. The states with the highest number of VECPs submitted and VECPs approved were California, Florida, Michigan, North Carolina, Ohio, Oregon, Tennessee, and Washington. The majority of the states in this list were also the forerunners in value analysis in pre-construction.

A key insight in the conduct of "value engineering in construction" is that, even though the approval rate was high (about 83 percent), there were states that were active in "value engineering in pre-construction" that were not as active in VECPs, like Texas. Reasons cited for this incongruence were:

- Contractors perceived that the contracting officer (CO) is biased against them. The CO's bias stems from his suspicion that contractors withhold their value analysis idea in the pre-construction stage, so that they can get value analysis savings during the VECP
- Contractors feel that a change in the existing contact may not succeed since it will introduce an undesirable technical or programmatic risk.

E.1.5 Savings from Value Engineering

In this section we show the magnitude of cost savings that are generated from the implementation of value analysis studies in both the U.S. transportation sector and other federal agencies – DOD and DOE.

Savings from Value Engineering Conducted by the U.S. Transportation Sector

The successful administration of the value analysis program in U.S. transportation sector has resulted in quantifiable benefits "to the quality of the surface transportation improvement projects and to the effective delivery of the overall Federal-Aid Highway Program". The Federal-Aid Highway Program provides financial aid to the states for highway construction. It is administered by the FHWA, which "works closely with state highway departments in correcting dangerous stretches on existing roads and in promoting safe, well-planned, well-built highways through a vigorous inspection program. It also seeks to improve the efficiency of inter-and intra-urban road systems, as well as to preserve the natural beauty along the roadways."[23]

[23] Taken from http://www.answers.com/topic/federal-aid-highway-program

Value engineering studies done as part of the Federal-Aid Highway Program resulted in savings of between 5.4 and 10.1 percent of projects' estimated construction costs from 2003 to 2007. A summary of the savings realized through value analysis from 2003 to 2007 is shown in Table E.1.

Table E.1: Summary of Past Value Analysis Savings from Federal-Aid Highway Program

	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007
Number of value analysis studies	309	324	300	251	316
Cost of value analysis studies Plus					
Administrative Costs (In millions of US$)	8.4	7.7	9.8	8.2	12.5
Estimated construction cost of projects					
Studied (In millions of US$)	20,480	18,700	31,580	21,530	24,810
Total number of recommendations	1,909	1,794	2,427	1,924	2,861
Total value of recommendations (In millions of US$)	1,970	3,04 0	6,760	3,060	4,600
No. of approved recommendations	794	793	1,077	996	1,233
Value of approved recommendations (In millions of US$)	1,110	1,115	3,187	1,785	1,970
Cost savings (value of approved recommendations / estimated construction cost) (percent)	5.4%	6.0%	10.1%	8.3%	7.9%
Return on investment	132:1	145:1	325:1	219:1	157:1

Source: http://www.fhwa.dot.gov/ve/f

Value Engineering Savings and Practice in Other Federal Agencies

Other federal agencies such as the Department of Energy (DOE) and the Department of Defense (DOD) have also reported value analysis savings in their annual reports to the OMB. Consistent with the 1993 OMB Circular A-131, which required that value analysis be used in all federal departments and agencies as a cost management tool, both DOD and DOE have annually reported to the OMB on their value analysis practice. These value analysis cost savings are summarized in Table E.2.

Table E.2: Summary of Value Engineering Practice and Savings—DOE and DOD

Federal Agency	Motivation for value engineering	Year value analysis Studies Conducted & No. of value analysis studies implemented	Cost of value analysis Studies	Net Gov't Savings = Cost Savings + Cost Avoidance	ROI of value analysis Efforts
DOE	Value engineering efforts are primarily focused on improving existing concepts, designs, present practices, processes, safety, and risk management. Cost savings was a supplemental goal.	2005-06 totaled 35	Less than US$60,000 per study	US$277 million	Not available
DOD	Value engineering is used on any contractually specified item, function, process, or deliverable in order to reduce cost while retaining required performance capability. VECPs are used to produce savings in complex acquisition of defense systems for the country in light of curtailment of new acquisitions and heightened importance of maintaining the older existing defense systems	2000 1,696 value analysis projects implemented 61 VECPs awarded and implemented	US$188.5 million	US$1.12 billion	6%

Sources:

1. DOE, 2005-2006 Value Management/Value Engineering Report.
2. DOD, Annual Value Engineering Report, Fiscal Year 2000, USD/AT&L.

The DOD issued its first value analysis guide, the DOD 4245.8-H Handbook on value engineering, in March 1986 to provide an understanding of the DOD value analysis program.[24] The handbook was prepared by the U.S. Army Management Engineering Training Activity (AMETA). This document has been recently updated (in 2006) by the Institute of Defense Analyses to make it more informative to multiple audiences:

- For Government practitioners, it gives details on the basics of the value analysis methodology and discusses how to establish a value analysis program
- For Government program office personnel, it explains the impact value analysis can have on their success
- For Government contracting officers and industry, it describes best practices for applying value analysis on Government contracts
- For both Government and industry management, it provides an overview of the benefits of a strong value analysis program.

E.2 Value Analysis Experience in the United Kingdom

This section describes the practice of value analysis among the national and local governments in the United Kingdom, using the institutional elements noted in Appendix C. The equivalent concept of value analysis in the U.K. is called value management (VM).

Technique-wise, the practice of value management in the U.K, through its VfM programmes, is no different from the government-mandated use of value analysis in the U.S. Both value analysis and value management have historically evolved from value analysis, which is founded on the technique of functional analysis, the building block of Miles' pioneering value analysis work. Like value engineering, value management is also traditionally built around the job plan, which is considered by many authors to be a good and effective decision-making process. Value management uses the "whole-life cost" or life-cycle cost of a project when optimizing the quality or obtaining best value required from a project being developed.

[24] We were unable to find a similar guide from the U.S. DOE.

E.2.1 Rationale for Value Analysis

Value management, according to the UK Office of Government Commerce (OGC),[25] "aims to maximise project value within time, cost and quality constraints." It is essentially a value enhancement approach, although cost-cutting can also be a by-product. The excerpt below taken from the OGC's Construction Procurement Guide 4 emphasizes the importance of VM:

> *"A value management approach helps decision-making at all levels. The concept of value relies on the relationship between satisfying the differing needs and the resources used in doing so. The fewer the resources used and the greater the satisfaction of needs, the greater the value. Stakeholders (including internal and external customers) may all hold differing views of what represents value. The aim of value management is to reconcile these differences and enable an organization to achieve the greatest progress towards its stated goals with the use of minimum resources."*

E.2.2 Mode of Institutionalization & Organizational Base

Her Majesty's Treasury is the main national agency responsible for managing the implementation of government's value management strategy though Value for Money (VfM) programs. VfM means "the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements"[26].

The Her Majesty's Treasury website[27] notes the following mandate of the agency:

> *"Government will match investment in public services with reform and a constant effort to improve value for money."*

The adoption of value management in the U.K. public sector has been largely promoted through issuance of policies or "guidance" by Her Majesty's Treasury. The most important government guidance documents are as follows:

- U.K. Green Book – Appraisal and Evaluation in Central Government[28], issued in 2003 – This guidance sets the techniques and issues that should be considered when carrying out assessments of all new policies, programs and projects, whether revenue, capital or regulatory. The

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[25] Risk and Value Management, Achieving Excellence in Construction Procurement Guide 4, UK Office of Government Commerce, 2007

[26] Value for Money Assessment Guidance, November 2006, HM Treasury

[27] HM Treasury website on Value for Money: http://www.hm-treasury.gov.uk/documents/public_spending_reporting/vfm/valueformoney_index.cfm

[28] The U.K. Green Book is relatively similar in intention and content to the NEDA Project Development Manual. The key difference is that the NEDA manual is used largely for evaluating projects, whereas the U.K. book applies to all decision-making actions in government <http://www.hm-treasury.gov.uk/media/3/F/green_book_260907.pdf>

Green Book sets out the general approach for carrying out options' appraisal (combined with cost benefit analysis) of all government intervention. It emphasizes the need to account for wider social costs and benefits of proposals and the need to ensure the proper use of public resources. Its purpose is to ensure that all government decision-makers must have verified that there are no better ways to meet the objective and that the solution at hand is the best use of resources.

- Value for Money (VfM) Assessment Guidance issued in November 2006 – This guidance outlines a process for ensuring that privately financed investments (PFI) in public services is likely to be a suitable procurement route for securing VfM for government and the public. A PFI is a contractual arrangement where private sector supplies services to the public sector on a long-term basis, say 15 to 30 years.
- U.K. Orange Book – Management of Risk, Principles and Concepts[29] issued in October 2004 – This document supplements the Green Book and provides guidance for developing and assessing proposals that affect the risk of fatalities, injury and other harms to the public. This is a requirement for all expenditure and of all new policy actions which may have an impact on businesses, charities, the voluntary or rest of the public sector.

The formal mechanism for realizing VfM savings within the U.K. government system is through the use of Public Service Agreements (PSA). PSAs were introduced in 1998 as part of a performance management framework which was introduced when government conducted a comprehensive spending review. The Gershon report cited later in Section E.2.3 is an important and landmark case of comprehensive spending review done by government. "PSAs set out the key priority outcomes the Government wants to achieve in [a] spending period. PSAs have played a vital role in galvanizing public service delivery and driving major improvements in outcomes."[30] For 2008-2011, the UK Government came up with PSA Delivery Agreements on the following four general areas:

- Sustainable growth and prosperity (PSAs 1-7)
- Fairness and opportunity for all (PSAs 8-17)
- Stronger communities and a better quality of life (PSAs 18-26)
- A more secure, fair and environmentally sustainable world (PSAs 27-30).[31]

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[29] UK Orange Book, http://www.hm-treasury.gov.uk/media/3/5/FE66035B-BCDC-D4B3-11057A7707D2521F.pdf

[30] "What are PSAs?" <http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaindex.cfm

[31] These may be found online at the following websites, in the order listed in the text: http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_crs07_psagrowth.cfm; http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaopportunity.cfm; http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psacommunities.cfm; http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaenvironment.cfm.

Each PSA is underpinned by a single Delivery Agreement that is jointly shared by all contributing departments and developed in consultation with delivery partners and frontline workers. Examples of PSA Delivery Agreements like "PSA Delivery Agreement 5: Deliver reliable and efficient transport networks that support economic growth, October 2007" can be found at http://www.hm-treasury.gov.uk/pbr_csr/psa/pbr_csr07_psaindex.cfm. Among the U.K. national departments, the U.K Department for Transport (DfT) is an example of a government agency that has developed its own VfM framework, following the national guidance. The DfT is mandated, among others, to set the framework, produce and support software for assessing whether transport schemes are value for money. The DfT has issued a guide for local authorities for promoting well planned evaluation of local transport projects, which normally have a capital spending requirement of more than £5 million. (The executive summary of the guide is included as Appendix F.5.)

E.2.3 Implementation Framework

Value management is a component of the U.K government's value for money programs. Below we discuss some ongoing VfM programs and how Public Service Agreements commit government agencies to achieving target VfM savings through value management.

Government Value for Money Programmes

Her Majesty's Treasury manages the implementation of government's VfM policy. Following is a summary of VfM programmes that are either nearly completed or ongoing.[32]

- **Efficiency Programme (SR04)** – This is Government's approach to improving spending efficiency in its year 2004-2008 spending period. The efficiency programs implemented during this time came from recommendations made by Sir Peter Gershon[33] in 2003, in his

[32] Details on each program are found in the HM Treasury website, respectively at:
Efficiency Programme: efficiency_programme/eff_index.cfm http://www.hm-treasury.gov.uk/documents/public_spending_reporting/
VFM Programme: http://www.hm-treasury.gov.uk/media/2/D/pbr_csr07_chapter3_208.pdf
Operational Efficiency Programme:/vfm/vfm_operational_efficiency.cfm.
http://www.hm-treasury.gov.uk/documents/public_spending_reporting

[33] Sir Peter Gershon was Chief Executive of the Office of Government Commerce Reference from 2000-2004. he was tasked to lead a major change programme to reform the way UK Central Civil Government handles over £13 billion p.a. of public procurement. Against an initial target to deliver £1 billion of value for money gains by March 03, his leadership resulted in the actual achievement of £1.6 billion in government efficiency savings. References to Sir Peter Gershon may be found in: (1) <http://www.da.mod.uk/our-work/governance/advisory-board/peter-gershon> and in (2) "The Gershon Review: Public Service Efficiency and the Management of Change ",<http://www.spss.com/uk/efficiencysummit/gershon.htm>

report to the Prime Minister called "Public Service Efficiency and the Management of Change." Sir Gershon's efficiency recommendations targeted a total of £20 billion savings by year 2008. To date, U.K departments have now reported savings of over £23 billion for the SR04 period, indicating major success of the programme. Examples of the efficiency programmes that were implemented are shown in Appendix F.4.

- **VFM Programme (CSR07)** – This CSR07 value for money programme builds on the success of the SR04 Efficiency Programme, targeting an additional £30 billion of sustained, cash-releasing, net VfM savings by 2011. Departments commit their targets and implementation plans through VfM Delivery Agreements, which sets out how and where their savings will be achieved.
- **Public Value Programme** – This public value programme, launched at Budget 2008, looks at all major areas of public spending to identify where there is scope to improve VfM and VfM incentives. Initial areas identified for investigation include road-building, commissioning in the health sector and regeneration spending.
- **Operational Efficiency Programme** – This operational efficiency programme draws on private sector expertise to examine cross-cutting areas of government spending. Initial scope of work covers back office and IT; collaborative procurement; asset management and sales; property; and local incentives and empowerment. The programme will report at Budget 2009.

Use of Value for Money Public Service Agreements

The use of PSA as vehicle for committing each government department or agency to their VfM target savings, as pointed out in the preceding section (Section E.2.2), has been shown to be effective in actually achieving VfM. Accountability for actually delivering or creating the VfM cost savings is ensured through departmental reviews by the National Audit Office.[34] The "best practice" excerpt from the 2003 Gershon Report[35] below, describes how the PSA system works:

> *"VfM PSAs have had an important share in increasing departments' focus on efficiency in both the 2000 and 2002 Spending Reviews. All departments are currently required to have a value for money target, most within their PSAs, focusing on improving the*

[34] Page 78, Budget 2008, From http://www.hm-treasury.gov.uk/media/A/3/bud08_chapter5.pdf

[35] Sir Peter Gershon 2003 Report to the Prime Minister – "Releasing Resources into the Future", An Independent Review of Public Sector Efficiency http://www.spss.com/uk/efficiencysummit/Gershonefficiencyreview.pdf

efficiency or value for money of a key element of its work. For example, in Spending Review 2000, the Home Office was [targeted] annual efficiency gains by police forces [totaling] at least 2 percent of overall police spending that year". Also, in Spending Review 2000 the Treasury targeted to "by 2002-2003, deliver £1 billion of savings in government procurement through the Office of Government Commerce". Departments report progress on value for money targets, and all PSAs set in the 2002 Spending Review, through departmental reports... "

This contracting and auditing system through PSAs strongly binds government organizations to set VfM targets that they can realistically achieve and be accountable for. VfM is created by complying with the "VfM guidance" manuscripts issued by Her Majesty's Treasury.

Value for Money Guidance for Privately Financed Investments

Under the November 2006 *Value for Money (VfM) Assessment Guidance*, which is followed by government in managing its dealings with private sector, the following three-stage process is being implemented to assess the VfM of PFI schemes:

- Stage 1 – Programme 1 Level Assessment. This ensures that PFI is only considered for use in those programmes where it is appropriate and is likely to represent good VfM.
- Stage 2 – Project Level 1 Assessment. This requires that an upfront procurement appraisal be done at Outline Business Case.
- Stage 3 – Procurement Level Assessment. This is an ongoing assessment during the procurement phase of a project to ensure that the desired project can be delivered in view of certain quality goals.

In its more recent issuance of 2006, the VfM Assessment Guidance compels all procuring authorities in the departments and local authorities to ensure that PFI procurement is the best option for attaining VfM in public services. The 2006 Guidance uses the checklist below in evaluating whether a proposed PFI is potentially VfM for government.[36]

- A major capital investment program, requiring effective management of risks associated with construction and delivery
- The structure of the service is appropriate, allowing the public sector to define its needs as service outputs that can be adequately contracted for in a way that ensures effective, equitable, and accountable delivery of public services into the long-term, and where risk allocation between public and private sectors can be clearly made and enforced

[36] In the Philippine context, this checklist may be applicable for use in an evaluation framework that determines the suitability of public infrastructure projects to be financed under BOT schemes.

- The nature of the assets and services defined as part of the PFI scheme, as well as the associated risks, are capable of being costed on a whole-life, long-term basis
- The technology and other aspects of the sector are stable and are susceptible to fast-paced change
- The planning horizons are long term with confidence that the assets and services provided are intended to be used over long periods into the future
- The private sector has the expertise to deliver.

E.2.4 Savings from Value Engineering

The national VfM programmes earlier described in E.2.3 provide a big picture of the magnitude of efficiency savings from VfM. An example of a case where VfM was able to generate savings for the government is shown below in the Dudley Southern Bypass project.

Box E.1: Benefits of Value Engineering: UK/Dudley Southern Bypass

Considerable effort went into conducting a value engineering exercise and planning the Dudley Southern Bypass road. As a result, no works were carried out until the team was satisfied that it knew the site conditions, the likely risks to the project and had adequate plans in place. The project was completed five months ahead of schedule and within the target cost and the agreed budget. These results were achieved ahead of schedule and within the target cost and the agreed budget. These results were achieved despite a major enhancement to the scheme, with the decision taken after the start of the project to construct a new Metro line parallel to a section of the road. The team altered its plans to take account of this in constructing the road. This work is estimated to have saved over £3 million on the cost of the Metro line.

Value engineering achieved savings. For instance, the original specification required the removal of large amounts of waste to be replaced with quarry material. Much of the waste material was contaminated, but by working together and involving the Environment Agency in developing solutions, they were able to reuse most of the waste material within the project and prevented heavy traffic moments around Dudley.

Source: UK Office of Government Commerce, Risk and Value Management 4– "Achieving Excellence in Construction Procurement Guide" 2007

E.2.5 Value Management and Risk Management

Value analysis and risk analysis have become increasingly recognized as two sides of the same coin, with value opportunities and improvements being on one side of the coin and risk management on the other. Each analysis has and requires different mindsets. Value improvement is perceived as reflective of opportunity-seeking behavior to improve a project. It is therefore viewed in a positive light. Risk management, on the other hand, is the negative side because of its focus on the "threats". Because of these differences in perspective, a value opportunity analysis is generally conducted first, followed by a risk analysis of value opportunities and then a full risk analysis. In the UK Treasury's Green Book, "Appraisal and Evaluation in Central Government", options analysis and risk analysis are used as complementary tools to ensure that no policy or project is adopted without first having answered the questions on whether are there better ways to achieve the objective and whether there are better uses for government resources.

E.3 Value Engineering Experience in Asia

In this section, the experience of two Asian countries which have fairly advanced practice of value engineering – Japan and South Korea – relative to rest of Asia are examined. (Section E.3.1 and Section E.3.2, respectively). Two other Asian countries – Hong Kong and Malaysia – are also briefly described to provide added dimension in comparing value analysis experience across the region (Section E.3.3). The comparison among the four countries is shown in a comparative matrix, highlighting their relative similarities and differences. (See Table E.4)

E.3.1 Value Engineering Experience in Japan

Value engineering adoption in Japan is dominantly a private-sector led effort that started in the 1960s. It was not until the 1990s that government followed suit with its own value analysis policy pronouncement. In this section, the practice of value analysis by the private sector or industries and the Japanese Government is described.

Value Engineering in the Japanese Private Sector

Value engineering adoption in the Japanese private sector was set against the late 1960s backdrop when the country was moving toward a recession. At that time industries became acutely aware of the need to manage their costs in order to become competitive both locally and abroad. Because of the clear cost-cutting benefits of value engineering, adoption of value analysis spread quickly among the industries from the 1960s to 1980s.

In due time, because of improvements in value analysis theory and practice, it became an organic part not only of the industry's materials procurement and purchase departments, but also of their planning and engineering departments. By the 1980s, value analysis had become more broadly accepted as a system for value assurance of products and services. Value Analysis was enabling companies to yield remarkable results as a method of cost reduction. In addition, it has been reported to be effective at the research and development and design stages as well.

Rationale for Value Engineering – The main motivation for the introduction of value analysis among industries is the need to reduce costs. In order for an organization to survive in a climate of intense competition, it is necessary to lower the cost of products or services (or improve their value). As a rule therefore, the extent to which there is a need for product cost reduction is an important factor in deciding whether to introduce value engineering. With expectations of intensified competition between companies in both the local and global markets, the push for managing costs is pulling the demand for more value analysis efforts.

Mode of Institutionalization – Industries form their own value analysis teams to undertake studies as part of their in-house processes. In current times, companies with a well-established value analysis system have trained value engineers that are assigned in various departments of their businesses, (for example, manufacturing/production, sales operations, quality control/testing, and industrial engineering) as a way of fully integrating value analysis techniques in the company. When necessary, these trained value analysis personnel are assembled as a task force to undertake corporate-level value analysis work.

Implementation Framework – The general principle being followed by industries in the timing of value analysis implementation is that value analysis studies must be done early in the lifecycle of products to keep up with technological innovations and competition. Product lifecycles start with research and development and then goes through growth, maturation, aging, and eventually obsolescence. Value Analysis is most critical at the growth stage when competition is most intense, and it is at this stage that cost-cutting is most needed. However, if value analysis is applied as early in the cycle as possible, the product will be even more competitive.

Users and Practitioners – The Society of Japanese Value Engineers (SJVE) notes that value analysis had its beginnings in the fields of materials procurement and purchasing and that the first industrial establishments to introduce value analysis were the automobile and heavy electrical industries. Today, value analysis industrial use in Japan is pervasive. The

seminal growth of value analysis practice was strongly complemented by early initiatives of academe to customize the body of knowledge to industry requirements. In-company seminars that were offered by Sanno Institute of Business Administration in the 1960s were regarded as the origin of value analysis adoption in Japan. Currently, the SJVE, which has issued a value analysis Manual (Japanese 1971; English 1981) as a guide for industrial value analysis practitioners and would-be adopters, continues to promote the use of value analysis among industries and disseminating information within the country and abroad. The Sanno Institute remains as key provider of programs in management training and consulting services to thousands of corporations.

Value Engineering Costs and Savings – The SJVE notes that "cost reductions on a scale never previously seen have been achieved in companies where value analysis has been actively implemented. The effectiveness of value engineering, measured in terms of savings per case per year, ranges from several tens of thousands to several hundreds of millions of yen." Experience suggests the following values, which are now being used as industry benchmarks, for possible cost reductions through value engineering:[37]

- Percentage cost reduction of 30-70 percent over the initial project cost
- Benefit-cost ratio (that is, annual savings from value analysis /cost of value analysis operations) of 10-20 times.
- An evidentiary example cited by the SJVE is the result of value analysis studies done in trainings at the Sanno Institute, which attested to the benefits of value analysis in private sector practice. The benefits of value analysis in terms of cost reductions in industry activities ran up to more than one-third of the original project costs. Key statistics are shown in Table E.3.

Table E.3: Value Engineering Benefits in the Japanese Private Sector

VE Effectiveness Indicators	Amount
Annual Net Savings By One Team (Average Membership, 8.8 People)	19.8 million Yen
% Cost Reduction Achieved in the Component Selected for value analysis	34.9%
Benefit/Cost Ratio	32 times

Source: Society of Japanese Value Engineers Guidebook for Value Analysis Activities - A Basic value analysis Manual, 1981

[37] Society of Japanese Value Engineering Guidebook for Value Analysis Activities - A Basic value analysis Manual, 1981

Value Engineering in the Japanese Public Sector

After the private sector's success with value engineering, the public sector began to introduce it in government programs and procurement in the 1990s.

Rationale for Value Engineering – The collapse of the Japanese economy in the early 1990s triggered a government desire to reduce costs of public works projects. By the late 1990s, the Japanese government caught on with industry in the desire to practice value engineering. This motivation led the Ministry of Land, Infrastructure, and Transport (MLIT) in 2003 to conduct complete design inspections of all public works projects that had not begun construction at that time. The goal of the inspections was to facilitate the introduction of improvements in design of the projects. The inspection revealed that on average 10 percent of costs could be potentially reduced.

Mode of Institutionalization and Organizational Base – There appears to be no hard and fast national rule on value analysis adoption per se. The closest there is to a value analysis public mandate is the 1997 announcement of Government's "Action Guidelines for Public Works Cost Reduction."[38] This government guideline facilitated a change in the way public construction services were delivered and regulated, rendering the system friendlier to the introduction of formal value analysis practice. With additional impetus from a Japanese public that was now more acutely aware of the roles of infrastructure in their lives, the following transformations, which made government's public works funding more directly accountable and transparent to the citizens, were observed:

- Government's infrastructure designs changed to conform with public demand and the need to stay competitive – from "Standardized Mass Production" to "Distinctive Custom Made" models – which were now thoroughly assessed for cost efficiency.
- Government's construction policies evolved from being centrist – governed by large central ministries – to localized, with smaller local governments now being allowed to directly contract with private organizations – that are likely to be value analysis practitioners – in the provision of public infrastructure.
- Local regulations are now allowed to supersede central government regulations provided the local government is responsible for the provision of public infrastructure, and private sector participation is encouraged.

[38] Hisaya Yokota, VES, PE, A New Evaluation Method of Value For Public Works, 2005

Implementation Framework – There are two specific cases which can be cited as value analysis frameworks used in the national and local governments:

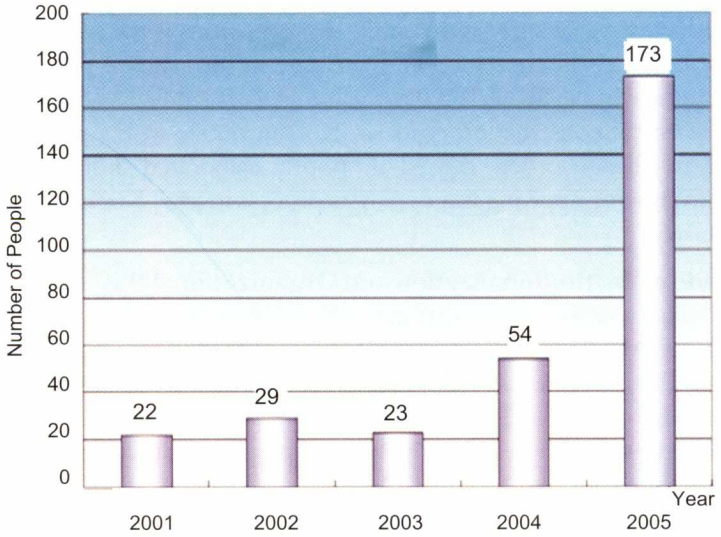
- From the Ministry of Land, Infrastructure, and Transport (MLIT) – A key feature of the 2003 inspections done by the MLIT (as cited in the "Rationale"), which later on became accepted as a rule of practice, was the use of an "inspection checklist". Though not exactly a national value analysis framework, the method proved effective when assessing a large number of designs and for government projects that had obvious improvable factors. The downside was that the checklist was ineffectual when the improvable factors are unknown and/or hidden. In 2004, upon finishing the design check, MLIT concluded that the design check and inspections were valuable. The inspection checklist approach was made mandatory by the MLIT and it further recommended the use of design value analysis to reduce construction cost. This statement codified the recognition of Design value analysis and its role in improving design and cost efficiency in public works.
- From local government – In terms of local regulations, an example is the Value Analysis Guidelines issued by the Oita Prefecture[39] in April 2005, entitled "Oita Design Value Analysis Guidelines", which set a standard for applying and executing value analysis for priority large projects and/or projects that require high-level engineering. These guidelines were developed after a value analysis training-workshop was conducted, using three road projects as test cases that showed potential cost savings.[40]

Users and Practitioners – The transformations brought about by 1997 announcement of Government's "Action Guidelines for Public Works Cost Reduction" have paved the way for increasing application of value analysis by public organizations in Japan. Statistics on the number of Value Engineering Leader (VEL) licensures from 2001 to 2005 show a significant increase in the number of new VEL licensed in-house engineers in public organizations. (See Figure E.4) Year 2005 shows an eight-fold increase in the number of value analysis professionals. Of the total 301 VELs, 37 percent of them are prefecture level government engineers, 32 percent are federal government engineers, and the rest are from other government organizations, foundations, or corporations.

[39] Prefecture - the Philippine equivalent of a province. The Oita Prefecture is located in Kyushu Island. It has 18 municipalities and the capital city is Oita. <http://www.pref.oita.jp/english/>

[40] The results of these value analysis test cases are discussed in the following bullet point on "VE Benefits".

Figure E.4: Number of Licensed Value Engineering Leaders (VEL) in Japanese Public Organizations



Source: Society of Japanese Value Engineering Guidebook for value analysis Activities - A Basic value analysis Manual, 1981

Value Engineering Savings – A February 2005 value analysis training-workshop conducted in the Oita Prefecture tested the use of design value analysis study for a one-kilometer road construction project.[41] Adjustments in the technical design and construction materials (for example – eliminating the sidewalk, changing the vertical slope from two percent to five percent, and minimizing of long-slope by using reinforcing bars in the retaining walls) resulted in a reduction of construction cost from Y9.0 million to Y6.0 million and minimized the environmental impact. After this project, two other road projects applied value analysis at the design stage. Collectively, these three projects saved a total of Y1.4 trillion (US$12 million) and resulted in an average 31 percent cost reduction per project.

E.3.2 Value Engineering Experience in South Korea

South Korea, like Japan, is one of the few countries in Asia that has reached a relatively more permanent and advanced level of adoption of value

[41] This training-workshop and the results of the test value analysis studies precipitated the issuance of the Oita Prefecture value analysis Guidelines in April 2005.

analysis in its decision-making framework for government projects. It has achieved this despite its having introduced value analysis only recently.

Rationale for Value Engineering – The main motivation for the conduct of value analysis on public works projects is the need to minimize cost overruns in construction, which are in turn due to poorly designed proposals. In the Seoul Toll Plaza value analysis study we reviewed, "recent increases in construction costs on Korean public works projects, largely due to change orders caused by poorly elaborated design, [became] a motivation of applying value analysis process in [the] Korean construction industry." [42]

Mode of Institutionalization and Organizational Base – Introduction of value analysis in the country was achieved through a federal statute called "Management of Construction Technology"[43]. This statute originally mandated the conduct of value analysis on all major projects with a budget of US$40 million. This threshold was subsequently reduced to US$10 million to expand the base of projects that would be included in more thorough cost analysis. The enactment of the statute had objective basis in a government study entitled "Strategies for Achieving Efficiency in Public Construction Projects", which recommended that government agencies be required to conduct value analysis to reduce life-cycle costs and improve project performance.

When the law was passed, the Korean Ministry of Construction and Transportation undertook further study on best practices and procedures so that value analysis implementation could be standardized in the project development process (i.e., planning, design, and construction). Subsequently, the KOCT published its "Manual and Guideline for Value Analysis of Constructed Facilities" and developed its "Database for Value Analysis Suggestions" which was made available for the public and private sectors to exchange information.

Implementation Framework and Value Analysis Savings – With the enabling conditions set by Government, i.e., law, oversight agency, value analysis guidelines, and value analysis database, it became a natural

[42] Seoul Toll Plaza value analysis Study Considering Performance Measurement and Life-Cycle Costs, J.Lim, M.Lee, G.Hunter, & S.Kim, <http://209.85.175.104/search?q=cache:kB4R4_j2AjwJ:www.infraam.com/board/download.asp%3Ffileid%3D1% 26id%3D415%26TableName%3Dboard_043+seoul+toll+plaza&hl=en&ct=clnk&cd=1&gl=ph&lr=lang_en>

[43] It is not clear from the reference we used what the exact year of issuance of the statute was. We read two articles written by same authors— J.Lim, M.Lee, & S.Kim,—from footnote #26, and in both cases, the year was not specified. Both articles were written in 2005.

response for private sector, especially the construction companies and academic institutions, to actively conduct research on value analysis and life-cycle analysis on public work construction projects.

An example of a value analysis study conducted jointly by private sector and academe is the Seoul Toll Plaza Value Analysis Study. This particular study provides some useful insights on the benefits of value analysis and some key lessons learned. A summary is described below.

Example of Value Engineering in South Korea – The Seoul Toll Plaza serves as the main gateway to Metropolitan Seoul for all commuters passing along the Kyungboo Express Highway, considered the main artery of the Korean Peninsula. Users of the highway experience considerable delay in their queuing time due to high traffic volumes. With highway expansion being planned, it was expected that queuing time would worsen.

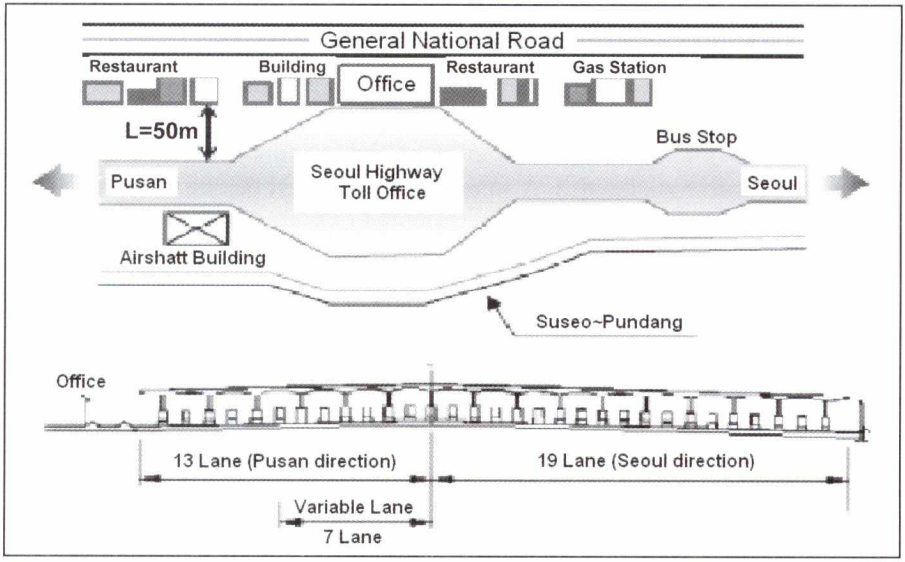
Value engineering became the natural choice of analytical tool in coming up with various options for selecting a solution that would allow the government "to reduce queuing time while maintaining toll revenue collection". A value analysis study was conducted by four teams, in order to identify the least cost option for upgrading and expanding the existing ticket pay and ticket booth systems on Kyungboo Express Highway.

In the "Analysis Phase" of the value analysis job plan, the brainstorming process generated 143 alternatives. These alternatives were then evaluated for effectiveness using a set of project performance criteria, that included, "Project Schedule", defined as the "time required to deliver the project (that is, improvement in delay to highway users) to the public". From the initial 143 options, 26 surviving alternatives remained. Eventually, the best alternative was adopted. The study found that innovative options from value analysis provide potential savings of up to 50 percent of original project cost while significantly increasing the performance of project functions.

In undertaking the value analysis study on the Seoul Toll Road Expansion Project, the authors of the study came out with several suggestions that would facilitate the establishment of a successful value analysis program in the public works sector. These included:

- Setting of clear value analysis responsibilities within the organization that's undertaking the public works project
- Providing and maintaining clear documented guidelines and procedures for the conduct of value engineering
- Building organizational capability by providing training for staff

Figure E.5: South Korea - Seoul Toll Plaza



Source: Seoul Toll Plaza value analysis Study Considering Performance Measurement and Life-Cycle Costs, J.Lim, M.Lee, G.Hunter, & S.Kim

- Using value analysis specialists and consultants whenever specific cases call for external expertise
- Evaluating and auditing the value analysis program to track the actual benefits of value analysis and assess areas for improvement.

E.3.3 Value Engineering Experience in Japan and South Korea Compared with Other Asian Countries

In order to provide a larger universe for comparing value analysis experiences in Asia, we have put together the various elements of value analysis in Japan, South Korea, Hong Kong and Malaysia in a comparative matrix. (See Table E.4).

Of these countries, Japan is the veteran, based on the number of years that value analysis has been in practice. The following general observations may be drawn from the comparison:

- Immediate and direct motivation for value analysis is cost reduction. The higher level goal is improving competitiveness and quality of services and /or products

- The introduction of value analysis has no fixed formula. It may originate from public or private sector. A key factor in the diffusion of value analysis practice is that there is supporting and supplemental action done by institutions like the government and academe
- Growth of value analysis practice is enabled when there is an institutional home – whether it is a government oversight agency, an academic center of excellence or a community of practice
- Value analysis is generally adopted by the construction industry. Others followed after having seen the benefits.

Table E.4: Comparison of Value Analysis Experiences in Four Asian Countries

VALUE ANALYSIS[44] PRACTICE	JAPAN	SOUTH KOREA	MALAYSIA	HONG KONG
Year Introduced	1957	2003	1986	1990
Motivation for Introducing Value Analysis	To improve industry competitiveness by managing costs	To reduce public construction costs	To introduce cost reduction/cost control in auto-motive parts manufacturing and value for money	To create awareness on the benefits of value analysis with end-view of encouraging its use in industries
Mode of Institution-alization	Private industry driven, comple-mented by government mandate — "Action Guide-lines for Public Works Cost Reduction" and academic knowledge build-up	Government mandated via federal statute — "Management of Construction Technology"; complemented by private practice and academic research	Government, but indirect and not mandated, the issuance of the country's National Auto-motive Policy in early 2000 prompted the industry to adopt cost control methods.	Private sector-driven and supported by academe and two HKSAR government issuances that strongly recommend a wider adoption of value analysis techniques in order to achieve an excellence in the quality of construction products:

[44] Japan and South Korea use the term value engineering; Malaysia and Hong Kong use value management.

VALUE ANALYSIS PRACTICE	JAPAN	SOUTH KOREA	MALAYSIA	HONG KONG
				▪ WTBC16/ 1998 (1998) Technical Circular (works) no. 16/1998 – Implementation of Value Management in Public Works Projects, Environment, Transport and Works Bureau, Government Secretariat, The Government of HKSAR. ▪ WTBC35/ 2002 (2002) Technical Circular (works) No. 35/2002 – Implementation of Value Management in Public Works Projects, Environment, Transport and Works Bureau, Government Secretariat, The Government of HKSAR, dated 13 August 2002.
Organizational Base or Institutional Home of value analysis	Ministry of Land, Infrastructure and Transport	Ministry of Construction and Technology	Institute of Value Management Malaysia (IVMM) (1995)	Hong Kong Institute of Value Management (1995) (HKIVM)
VE Users and Practitioners	▪ 1960 to 1980s – varied manufacturing and fabrication industries ▪ 1980's – architectural and construction industries	▪ Government, Academe, Private sector—construction ▪ Society of Korean Value Engineers	▪ Automotive and Construction sectors ▪ Universiti Teknologi Malaysia (2006) – Conducted an Intl Conference on International Construction Industry	▪ Construction Industry ▪ Government of Hong Kong Special Administrative Region (HKSAR) ▪ City University of Hong Kong

VALUE ANALYSIS PRACTICE	JAPAN	SOUTH KOREA	MALAYSIA	HONG KONG
	▪ 1990s – government ▪ Sanno Institute of Business Administration ▪ VE Teams in Industries ▪ Society of Japanese Value Engineers (SJVE)			
Key value analysis Publications and Knowledge Management Tools	▪ Guidebook for Value Analysis Activities (1971 and 1981) ▪ SJVE's website	▪ Manual and Guideline for Value Analysis of Constructed Facilities ▪ Publicly accessible database for value analysis suggestions	VE manual produced by IVMM	▪ The Value Manager, HKIVM's regular newsletter ▪ HKIVM's website ▪ A web-based Value Management Technique Centre for Construction Undergraduate students (www.bcm.cityu.edu.hk)
Quantified Value Analysis Benefits (In % cost reduction vis-a-vis original cost)	Up to 34% (In private sector) 10 – 20% (In public sector)	Up to 50% (Based on Seoul Toll Project value analysis studies)	No data available	No data available
Current Level of Institutionalization – High or Low?	High Government is catching up. Local regulation like the one established in the Oita Prefecture indicates future place of value analysis policy, at least among local governments.	High Government mandate assures permanence of policy in place	Low Practice is limited to specific industries. Efforts are fragmented due to lack of government imperative especially in construction sector, where value analysis is perceived to be most needed.	Low Practice is limited to specific industry and has no government imperative yet

VALUE ANALYSIS PRACTICE	JAPAN	SOUTH KOREA	MALAYSIA	HONG KONG
Prospects for Future Growth of value analysis Usage	High Industries' incentive to conduct value analysis is linked with their survival in globally competitive markets for products.	High Government mandate will ensure long-term application	High VE may be made mandatory by government for all capital projects. With increased pressure of global competition, there is motivation for Malaysian industries like the automotive sector, to maximize their products' values, processes, projects or services. There is also a strong advocacy from academic sector.	Uncertain Depends on how current efforts by academe and HKIVM will move. According to surveys done before 2002, with construction professionals, perspectives on VM were polarized: ▪ "Value management is one of the most useful decision tools for the industry" ▪ "Most of the practitioners in the HK construction industry misunderstood and had false perceptions of value management".
Reference Document	*Society of Japanese Value Engineering Guidebook For VE Activities - A Basic Value Analysis Manual,* English translation of "VE KATSUDO-NO -TEBIKI", Originally published in August 1971 (Japanese Version), Translated in 1981 (English Version).	*"Seoul Toll Plaza Value Analysis Study Considering Performance Measurement and Life-Cycle Costs",* J.Lim, M.Lee, G. Hunter, S. Kim	*"A Case Study of Value Analysis as an Innovative Tool in Malaysian Automotive Component Manufacturing Company",* A.Ramli, S. Sulaiman, F. Mitchell	▪ HKIVM Website ▪ Mei-Yung Leung, *Why Offer VM at Universities?: The HongKong Experience,* 20 Volume 29, Number 1, Summer 2006 Value World

E.4 Value Analysis Experience in Latin America

A comparison of value analysis experience in some Latin American countries is outlined below, citing representative information on the number of value analysis trainings, workshops and studies, the indicative cost reduction or savings potential from value analysis studies done and the institutions that were trained.

Table E.5: Comparative Value Analysis Experience of Latin American Countries

Elements	Argentina	Chile	Costa Rica	Nicaragua
Year value analysis was introduced	1993	1995	1992	2006
Institutions trained/ capacitated	National Highway Administration Ministry of Interior	Ministry of Public Works, Transportation and Telecoms HabitaCoop (Country's Largest Housing Coop) Ministry of Interior	n.a.	Ministry of Public Works
No. of value analysis trainings and workshops	4, all for public officials (1993 and 1995-96)	7, for public and private organizations (1995-96 and 2000	n.a.	2, for public officials (1993;95-96)
No. of value analysis studies conducted	5; national road and school construction projects (1994-1997)	3; pedestrian way, postal, and housing projects (1995)	1; hospital project (1992)	n.a
Estimated potential value analysis savings over initial project cost	18.4%	13% -22%	23.7%	n.a
Funding source(s) for value analysis studies/ Trainings	Inter-American Dev't Bank (1998/95) The World Bank (1995-1998)	Chamber of Construction Industry; Habitacoop; Government	Inter-American Development Bank	n.a
Value analysis programs in academe	n.a	Graduate Course in value analysis at Universidad Mayor de Santiago (2004) – SAVE Certified	n.a	n.a

Source: Report prepared by J. Devincenti for Castalia, 2008

A common trend in these countries is that value analysis has not been institutionalized. Value Analysis is not enshrined in the mandate of a particular government organization.

We also found no indication that it has been integrated in the business process of private sector entities. In Chile, value analysis was adopted by a university as a curricular offering, but there is little evidence of the growth of a value analysis industry. Besides this case, the spread of value analysis knowledge appears to be short-lived. There was no push in the public or the private sectors to require the application of value engineering. (Not all information are available for the elements we examined; in these cases we indicated "n.a." for "not available".)

Appendix F
Additional Materials Used in the Study of International Experience with Value Analysis

This appendix contains supporting materials to the descriptions of the application of value analysis in various countries, presented in this appendix. It contains:

- U.S. Office of Management and Budget Circular No. A-131 on Value Engineering (F.1)
- USA Federal Highway Administration (FHWA) Regulation on Value Engineering (F.2)
- Successful Practices in the US-FHWA Value Engineering Program (F.3)
- U.K. Government Efficiency Programme in Line with VfM Policy – Examples of Efficiency Targets and Implementation Plans in Public Service Agreements (F.4)
- United Kingdom – Department for Transportation (DfT), The Evaluation of Major Local Authority Transport Projects: A Guide for DfT (F.5)
- Value Analysis International Communities of Practice (F.6)
- References (F.7).

F.1 U.S. Office of Management and Budget Circular No. A-131 on Value Engineering

The U.S. Office of Management and Budget (OMB) Circular A-131 was issued in 1993 to require all federal departments and agencies to use value analysis as a cost management tool. The Circular also required each agency whose total budget or total procurement exceeded US$10 million in a given fiscal year to report every fiscal year to the OMB the results of using value analysis annually. <Source: http://www.whitehouse.gov/omb/circulars/a131/a131.html.>

May 21, 1993

TO THE HEADS OF EXECUTIVE DEPARTMENTS AND ESTABLISHMENTS

SUBJECT: Value Engineering

1. **Purpose.** This Circular requires Federal Departments and Agencies to use value engineering as a management tool, where appropriate, to reduce program and acquisition costs.
2. **Supersession Information.** This Circular supersedes and cancels OMB Circular No. A-131, Value Engineering, dated January 26, 1988.
3. **Authority.** This Circular is issued pursuant to 31 U.S.C. [[section]]1111.
4. **Background.** For the purposes of this Circular, value analysis, value management, and value control are considered synonymous with VE. Value Analysis is an effective technique for reducing costs, increasing productivity, and improving quality. It can be applied to hardware and software; development, production, and manufacturing; specifications, standards, contract requirements, and other acquisition program documentation; facilities design and construction. It may be successfully introduced at any point in the life-cycle of products, systems, or procedures. Value Analysis is a technique directed toward analyzing the functions of an item or process to determine "best value," or the best relationship between worth and cost. In other words, "best value"

is represented by an item or process that consistently performs the required basic function and has the lowest total cost. In this context, the application of value analysis in facilities construction can yield a better value when construction is approached in a manner that incorporates environmentally-sound and energy-efficient practices and materials.

Value engineering originated in the industrial community, and it has spread to the Federal Government due to its potential for yielding a large return on investment. Value Analysis has long been recognized as an effective technique to lower the Government's cost while maintaining necessary quality levels. Its most extensive use has been in Federal acquisition programs.

An August 1991 recent audit of value analysis in the Federal Government by the President's Council on Integrity and Efficiency concluded that more can and should be done by Federal agencies to realize the benefits of value engineering. Reports issued by the General Accounting Office and agency Inspectors General have also consistently concluded that greater use of this technique would result in additional savings to the Government.

5. **Relationship to other management improvement processes.** Value analysis is a management tool that can be used alone or with other management techniques and methodologies to improve operations and reduce costs. For example, the total quality management process can include value analysis and other cost cutting-techniques, such as life-cycle costing, concurrent engineering, and design-to-cost, approaches, by using these techniques as analytical tools in process and product improvement.

   Value engineering contributes to the overall management objectives of streamlining operations, improving quality, reducing costs, and can result in the increased use of environmentally-sound and energy-efficient practices and materials. The complementary relationship between value analysis and other management techniques increases the likelihood that overall management objectives are achieved.

6. **Definitions.**

   a. **Agency.** As used in this Circular, the term "agency" means an Executive department or an independent establishment within the meaning of sections 101 and 104(1), respectively, of Title 5, United States Code.

   b. **Life-cycle cost.** The total cost of a system, building, or other product, computed over its useful life. It includes all relevant costs

involved in acquiring, owning, operating, maintaining, and disposing of the system or product over a specified period of time, including environmental and energy costs.

c. **Cost savings.** A reduction in actual expenditures below the projected level of costs to achieve a specific objective.

d. **Cost avoidance.** An action taken in the immediate time frame that will decrease costs in the future. For example, an engineering improvement that increases the mean time between failures and thereby decreases operation and maintenance costs is a cost avoidance action.

e. **In-house savings.** Net life-cycle cost savings achieved by in-house agency staff using value analysis techniques.

f. **Contracted savings.** Net life-cycle cost savings realized by contracting for the performance of a value analysis study or by a Value Engineering Change Proposal submitted by a contractor.

g. **Total Quality Management (TQM).** A customer-based management philosophy for improving the quality of products and increasing customer satisfaction by restructuring traditional management practices. An integral part of TQM is continuous process improvement, which is achieved by using analytical techniques to determine the causes of problems. The goal is not just to fix problems but to improve processes so that the problems do not recur. Value engineering can be used as an analytical technique in the TQM process.

h. **Value Engineering.** An organized effort directed at analyzing the functions of systems, equipment, facilities, services, and supplies for the purpose of achieving the essential functions at the lowest life-cycle cost consistent with required performance, reliability, quality, and safety. These organized efforts can be performed by both in-house agency personnel and by contractor personnel.

i. **Value Engineering Change Proposal (VECP).** A proposal submitted by a contractor under the value analysis provisions of the Federal Acquisition Regulations (FAR) that, through a change in a project's plans, designs, or specifications as defined in the contract, would lower the project's life-cycle cost to the Government.

j. **Value Engineering Proposal (VEP).** An in-house agency-developed proposal, or a proposal developed by a contractor under contract to provide value analysis services, to provide value analysis studies for a Government project/program.

7. **Policy.** Federal agencies shall use value analysis as a management tool, where appropriate, to ensure realistic budgets, identify and remove nonessential capital and operating costs, and improve and maintain optimum quality of program and acquisition functions. Senior management will establish and maintain value analysis programs, procedures and processes to provide for the aggressive, systematic development and maintenance of the most effective, efficient, and economical and environmentally-sound arrangements for conducting the work of agencies, and to provide a sound basis for identifying and reporting accomplishments.
8. **Agency responsibilities.** To ensure that systemic value analysis improvements are achieved, agencies shall, at a minimum:
    a. Designate a senior management official to monitor and coordinate agency value analysis efforts.
    b. Develop criteria and guidelines for both in-house personnel and contractors to identify programs/projects with the most potential to yield savings from the application of value analysis techniques. The criteria and guidelines should recognize that the potential savings are greatest during the planning, design, and other early phases of project/program/system/product development. Agency guidelines will include:
        i. Measuring the net life-cycle cost savings from value engineering. The net life-cycle cost savings from value engineering is determined by subtracting the Government's cost of performing the value engineering function over the life of the program from the value of the total saving generated by the value engineering function.
        ii. Dollar amount thresholds for projects/programs requiring the application of VE. The minimum threshold for agency projects and programs which require the application of value analysis is $1 million. Lower thresholds may be established at agency discretion for projects having a major impact on agency operations.
        iii. Criteria for granting waivers to the requirement to conduct value analysis studies, in accordance with the FAR 48.201(a)
        iv. Guidance to ensure that the application of value analysis to construction projects/programs and other projects/programs, will include consideration of environmentally-sound and energy efficient considerations to arrive at environmentally-sound and energy efficient results.

c. Assign responsibility to the senior management official designated pursuant to section 8a above, to grant waivers of the requirement to conduct value analysis studies on certain programs and projects. This responsibility may be delegated to other appropriate officials.

d. Provide training in value analysis techniques to agency staff responsible for coordinating and monitoring value analysis efforts and for staff responsible for developing, reviewing, analyzing, and carrying out value analysis proposals, change proposals, and evaluations.

e. Ensure that funds necessary for conducting agency value analysis efforts are included in annual budget requests to OMB.

f. Maintain files on projects/programs/systems/products that meet agency criteria for requiring the use of value analysis techniques. Documentation should include reasons for granting waivers of value analysis studies on projects/programs which met agency criteria. Reasons for not implementing recommendations made in value analysis proposals should also be documented.

g. Adhere to the acquisition requirements of the FAR, including the use of value analysis clauses set forth in Parts 48 and 52.

h. Develop annual plans for using value analysis in the agency. At a minimum, the plans should identify both the in-house and contractor projects, programs, systems, products, etc., to which value analysis techniques will be applied in the next fiscal year, and the estimated costs of these projects. These projects should be listed by category, as required in the agency's annual report to OMB. VEP's and VECP's should be included under the appropriate category. Annual plans will be made available for OMB review upon request.

i. Report annually to OMB on value analysis activities, as outlined below.

9. **Reports to OMB**. Each agency shall report the Fiscal Year results of using value analysis annually to OMB, except those agencies whose total budget is under $10 million or whose total procurement obligations do not exceed $10 million in a given fiscal year. The reports are due to OMB by December 31st of the calendar year, and should include the current name, address, and telephone number of the agency's value analysis manager. The report format is as follows:

   - Part I of the report asks for net life-cycle cost savings achieved through VE. In addition, it requires agencies to show the project/program dollar amount thresholds the agency has established for requiring the use of value analysis if greater than $1 million. If

thresholds vary by category, show the thresholds for all categories. Savings resulting from value analysis proposals and value analysis change proposals should be included under the appropriate categories.

- Part II asks for a description of the top 20 fiscal year value analysis projects (or all projects if there are fewer than 20). List the projects by title and show the net life-cycle cost savings and quality improvements achieved through application of VE.
- Part III requires agencies to submit a detailed schedule of year-by-year cost savings, cost avoidances and cost sharing with contractors for each program/project for which the agency is reporting cost savings or cost avoidances. The aggregate total of all schedules shall equal the totals reported in Part I.A. of the annual report.

10. **Inspectors General audits.** Two years after the issuance of this revised Circular, Agency Heads shall ask the Inspectors General (IGs) to audit agency value engineering programs to (1) validate the accuracy of agency reported value engineering savings and (2) assess the adequacy of agency value engineering policies, procedures and implementation of this revised Circular. Periodically thereafter, agency IGs shall audit agency reported value analysis savings as the need arises.

11. **Related Guidance.** In general, value engineering investments should have positive net present value when discounted with the appropriate interest rate, as described in OMB Circular No. A-94, section 8.c. For detailed guidance on value engineering, refer to the appropriate sections of the Federal Acquisition Regulations.

12. **Effective Date and Implementation**. This Circular takes effect within 30 days of its publication in the **Federal Register**. Heads of departments and agencies are responsible for taking all necessary actions to assure effective implementation of these policies, such as disseminating this Circular to appropriate program and other staff, developing implementation strategies and initiating staff training. Since these policies must be implemented in the Federal Acquisition Regulation (FAR), agencies should not duplicate the development of implementing procurement regulations being undertaken by the Federal Acquisition Regulatory Councils. However, implementation of these policies in the FAR must be accomplished within the time period specified below, with inclusion in agency solicitations and resulting contracts, as appropriate, to occur immediately thereafter. Pursuant to subsections 6(a) of the Office of Federal Procurement Policy Act, as amended, (41 U.S.C. 401 **et seq**.), the Federal Acquisition

Regulatory Councils shall ensure that the policies established herein are incorporated in the FAR within 180 days from the date this Circular is published in final form in the **Federal Register**. Promulgation of final FAR regulations within that 180 day period shall be considered issuance in a "timely manner" as prescribed in 41 USC 405(b)."

13. **Sunset Review**. The policies contained in this Circular will be reviewed by OMB five years from the date of issuance.

14. **Inquiries**. Further information about this Circular may be obtained from the Office of Management and Budget (OMB), 725 17th Street, NW, Washington, DC 20503, Telephone (202) 395-6803.

Leon Panetta
Director

F.2 USA Federal Highway Administration (FHWA) Regulation on Value Engineering

Regulation 23 CFR part 627 was issued in 1997 by the FHWA to require each State Transportation Authority (STA) to undertake value analysis analysis on any project segments on the National Highway System that cost US US$25 million or more. This document explains the FHWA mandated guidelines for implementing value analysis programs in STAs. <Source: http://www.fhwa.dot.gov/ve/vereg.cfm>

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23 CFR PART 627 – VALUE ENGINEERING

Sec.

627.1 Purpose and applicability.

627.3 Definitions

627.5 General principles and procedures.

AUTHORITY: 23 U.S.C. 106(d), 106(f), 302, 307, and 315; 49 CFR 18.

SOURCE: 62 FR 6868, February 14, 1997, unless otherwise noted.

627.1 Purpose and applicability.

a. This regulation will establish a program to improve project quality, reduce project costs, foster innovation, eliminate unnecessary and costly design elements, and ensure efficient investments by requiring the application of value engineering (VE) to all Federal-aid highway

projects on the National Highway System (NHS) with an estimated cost of US$25 million or more.

b. In accordance with the Federal-State relationship established under the Federal-aid highway program, State Highway Agencies (SHA) shall assure that a value analysis analysis has been performed on all applicable projects and that all resulting, approved recommendations are incorporated into the plans, specifications and estimate.

627.3 Definitions.

Project. A portion of a highway that a State proposes to construct, reconstruct, or improve as described in the preliminary design report or applicable environmental document. A project may consist of several contracts or phases over several years.

Value engineering. The systematic application of recognized techniques by a multi-disciplined team to identify the function of a product or service, establish a worth for that function, generate alternatives through the use of creative thinking, and provide the needed functions to accomplish the original purpose of the project, reliably, and at the lowest life-cycle cost without sacrificing safety, necessary quality, and environmental attributes of the project.

627.5 General principles and procedures.

a. **State value analysis programs.** State highway agencies must establish programs to assure that value analysis studies are performed on all Federal-aid highway projects on the NHS with an estimated cost of US$25 million or more. Program procedures should provide for the identification of candidate projects for value analysis studies early in the development of the State's multi-year Statewide Transportation Improvement Program.

b. **Project Selection.** The program may, at the States discretion, establish specific criteria and guidelines for selecting other highway projects for value analysis studies.

c. **Studies.** Value engineering studies shall follow the widely recognized systematic problem-solving analysis process that is used throughout private industry and governmental agencies. Studies must be performed using multi-disciplined teams of individuals not personally involved in the design of the project. Study teams should consist of a team leader and individuals from different specialty areas, such as design, construction, environment, planning, maintenance, right-of-way, and other areas depending upon the type of project being reviewed. Individuals from the public and other agencies may

also be included on the team when their inclusion is found to be in the public interest.

1. Each team leader should be trained and knowledgeable in value analysis techniques and be able to serve as the coordinator and facilitator of the team.
2. Studies should be employed as early as possible in the project development or design process so that accepted value analysis recommendations can be implemented without delaying the progress of the project.
3. Studies should conclude with a formal report outlining the study team's recommendations for improving the project and reducing its overall cost.

d. **Recommendations.** The program should include procedures to approve or reject recommendations and ensure the prompt review of value analysis recommendations by staff offices whose specialty areas are implicated in proposed changes and by offices responsible for implementing accepted recommendations. Reviews by these offices should be performed promptly to minimize delays to the project.

e. **Incentives.** The program may include a value analysis or cost reduction incentive clause in an SHA's standard specifications or project special provisions that allows construction contractors to submit change proposals and share the resulting cost savings with the SHA.

f. **Monitoring.** The program should include procedures for monitoring the implementation of value analysis study team recommendations and value analysis change proposal recommendations submitted by construction contractors.

g. **State value analysis coordinators.** Individuals knowledgeable in value analysis shall be assigned responsibilities to coordinate and monitor the SHA's program and be actively involved in all phases of the program.

h. **Use of consultants.** Consultants or firms with experience in value analysis may be retained by SHAs to conduct the studies of Federal-aid highway projects or elements of Federal-aid highway projects required under §627.1(a) of this part. Consultants or firms should not be retained to conduct studies of their own designs unless they maintain separate and distinct organizational separation of their value analysis and design sections.

i. **Funding eligibility**. The cost of performing value analysis studies is project related and is, therefore, eligible for reimbursement with Federal-aid highway funds at the appropriate pro-rata share for the project studied.

F.3 Successful Practices in the US-FHWA Value Engineering Program[45]

A value analysis program is comprised of more than just the collection of studies or workshops that are completed, and the number of recommendations implemented. The program also includes well-established policies and practices that fully integrate value analysis into the surface transportation program and increase the overall effectiveness of the value analysis methodologies. Successful programs train staff and raise awareness in the benefits of applying value analysis techniques at all levels within the organization.

As part of the FY 2007 value analysis summary report, the states were asked to identify successful practices they utilize to enhance the delivery of their value analysis Program. The following provides a sample of the responses received from the state Departments of Transportation (DOT).

1. Effective program communication

Caltrans holds annual district value analysis coordinator's meetings and monthly phone conferences to communicate changes in policies as well as to share best practices and lessons learned. Caltrans has also initiated an awards program to recognize outstanding achievements of their value analysis coordinators, team members and champions.

2. Scheduling, coordinating and conducting value analysis studies

Several states noted that identifying candidate projects for value analysis studies as early as the scoping stage enables proactive scheduling and the earlier completion of studies in the design process. Minnesota is currently conducting a pilot process to evaluate the size, scope, and timing of projects that would be best candidates for a successful value analysis study.

Several states pointed to the composition of the value analysis study team as being crucial to the effectiveness of the value analysis program. New Hampshire noted that having both state and federal representatives participating on the value analysis team during each study is very beneficial as it provides both hands-on training and general oversight for the value

[45] FY 2007 Annual Federal-aid Value Engineering Summary Report, Successful Practices in the Value Engineering Program <http://www.fhwa.dot.gov/ve/2007/04.cfm>

analysis study and process. Other states, including Minnesota and Wisconsin, identified the use of certified SAVE Consultants as value analysis study facilitators to ensure a high standard for value analysis studies consistent with the profession and true to the value engineering methodology, while Arizona hires retired contractors (on grounds of recusing themselves from the letting of the project) to participate on studies of projects with potential constructability issues.

NYSDOT noted that a "portable" library of relevant reference materials, design guidelines, and standards that is sent to the value analysis location of the study prior to the arrival of the value analysis team often adds an element of efficiency to the overall study. Also the NYSDOT reports that conducting its value analysis studies in close proximity to the project site allows for multiple site visits by the value analysis team members which have proven to be beneficial on numerous occasions.

In contrast, Louisiana, for their smaller, less complex projects, substitutes the field visit with reviews of previously taken pictures and "drive-by" videos to shorten the duration of the value analysis study by one day. Reducing the duration of the value analysis studies to 2-3 days was also noted by the NCDOT as a means to best use available resources and gain stronger commitment from the identified participants. The required trade-off identified was greater up-front research and additional post-study efforts conducted by the value analysis Program staff.

3. Successful value analysis studies

Multiple Studies for a Project Corridor: The value analysis analysis for the Interstate 95 Corridor in Palm Beach County, Florida, encompassed several workshop sessions rather than one session at the conclusion of preliminary engineering. This process was used to refine the concepts and alternatives for the project and to gain early consensus on the project functions with the goals of the maintaining consistency with the Locally Preferred Alternatives; minimizing overall project impacts; maintaining the project schedule; and developing a project that can be implemented. The schedule for the value analysis sessions was established according to the key milestones of the project. This approach led the project design team to work closely with the value analysis team to develop recommendations between sessions.

Unique Stakeholder Involvement: The limits of work for the New Jersey Route 206 Bypass project extended into two municipalities, one initially supporting the project and one initially opposing the project. Representatives

from both municipalities participated in the value analysis study, providing them the opportunity to voice their needs along with the NJDOT. Beyond leading to significant savings, this study contributed to a final project that was ultimately supported by all parties.

Value Engineering at Project Scoping: To assist the NYSDOT Regional design staff develop a best value project alternative, this value analysis study for the State Route 390 Project from Trolly Blvd to State Route 104 was conducted during the scoping stages of the project, prior to the identification of a preferred alternative. This study explored several alternatives, not only from the construction/life-cycle cost perspective; but from the user cost considerations and delays to the traveling public. Although no direct cost savings can be attributed to this study, the Regional staff found the benefits provided the project's decision making process to be invaluable.

Design-Build Projects: Initially, when conducting value analysis studies for Design-Build projects, the NCDOT focused solely on the Request for Proposal (RFP) document (including scopes). Rather than generating a series of recommendations geared towards improving the project, these studies functioned more as the document "wordsmithing" sessions. In 2007, the NCDOT shifted the focus of these studies to a more traditional Value Engineering approach. Design-Build studies now begin with a review of the project by the Design-Build project engineer, followed by a review of the public hearing map and identification of any problem areas. This review leads to a list of issues/items that forms the basis for discussion of the study team to generate new ideas for recommendations for the Design-Build project. A "top level" review of the scopes of work is also performed in order to identify unnecessary or overly restrictive requirements in the scope of work's language. The NCDOT continues to refine their value analysis process for Design-Build projects but notes that the change in approach has already led to the generation of more implementable recommendations.

Focus on Specific Project Functions: The main issues of concern during the value analysis study for the Interstate 610/U.S. Route 290 Interchange project in Texas were Traffic Control, Accessibility to Ramps, ROW and Utilities. The most creative recommendation was to use the U.S. Route 290 to I-10 direct connector for U.S. Route 290 main lanes during construction, thereby minimizing traffic control by 2-4 phases. The team recommended a modification to the design to more effectively purchase property needed for storm water detention use. The team also recommended early meetings to coordinate the major impacts of four utilities to keep them apprised and obtain an estimated timeframe for their relocation work to be completed.

4. Implementation of Recommendations

Several states emphasized the attempts to incorporate past value analysis alternatives into current and future designs as "best practices." Specifically, Louisiana indicated that recurring value analysis recommendations are tracked to determine if their project development policy should be revised to formally incorporate these recommendations into their process. Louisiana also noted that approved recommendations are reviewed after construction is completed to determine the actual cost avoidance or added value.

Two states described strategies designed to improve the recommendation review and decision making processes. In order to develop a more thorough final report, the NCDOT instituted a two-step reporting process: an interim report that is completed soon after the study; and a final report detailing the brainstormed ideas, revised ideas, final recommendations and their disposition. The stage reporting process also provides natural encouragement to follow up with recommendation results and implementation, which, in turn, leads to more accurate records and reporting. For New Mexico's less complex projects, the value analysis recommendations presentation and disposition session before their "Decision Panel" have been consolidated to occur at the same meeting, shortening the overall approval process by approximately 6 weeks.

5. Integration of value analysis with Other Analysis Techniques

In addition to studies conducted for the Federal-Aid Highway Program, Caltrans utilizes the value analysis techniques to recently analyze improvements proposed for their "Utilities Database" and "Purpose and Need" processes. Caltrans also used value analysis to study a series of Safety Rest Area projects that had come in over estimated budgets to develop alternative ways to reduce construction cost while maintaining or improving project quality.

PennDOT has instituted a Value Engineering Accelerated Construction Technology Transfer (VE/ACTT) process for the purpose of evaluating major projects to assure the right project is designed for the best value and to ensure all issues regarding constructability are identified and addressed in design.

The NJDOT Program has incorporated a "Smart Solutions" approach into their value analysis. The traditional value analysis approach limits cost savings opportunities to alternatives that provide equal or better products. The additional Smart Solutions approach provides for savings opportunities for alternatives that provide an equal or better value. This means that the

alternative may not be an equal product, but based on the benefit to cost ratio, it is a more appropriate investment.

The NCDOT combined their External Constructability Review process with a value analysis study for a large bridge repair project that was scheduled for letting with a very limited scope of work. This approach allowed not only the identification of problem areas included in the proposed work, but also provided external input by the contracting industry for recommendations that could substantially reduce costs and construction time for the project. Finally, the WSDOT noted the successful combination of value analysis studies with a Cost Risk Assessment (CRA) on three combined CRA/VE studies. Since both the value analysis and CRA processes have several similar tasks and require similar teams, there are advantages both in cost savings and speculation improvements by combining the two processes.

F.4 U.K. Government Efficiency Programme in Line with VfM Policy – Examples of Efficiency Targets and Implementation Plans in Public Service Agreements

This appendix illustrates examples of efficiency targets and implementation plans of two U.K government agencies (Department for Transport and Local Government), in line with government's overall thrust for achieving VfM. These conditions are set in what are called "public service agreements".[46]

[46] Source: Sir Peter Gershon 2003 Report to the Prime Minister – "Releasing Resources into the Future", An Independent Review of Public Sector Efficiency (http://www.spss.com/uk/efficiencysummit/Gershon-efficiencyreview.pdf)

DEPARTMENT FOR TRANSPORT

C.5 Agreed target. The Department for transport will realize total annual efficiency gains of at least £785 million by 2007-08 of which at least half will be cashable, releasing resources to front-line activities.

Implementation plan. As part of this programme the Department for Transport plans, by 2007-08, to:

- achieve a total reduction in departmental civil service posts of at least 200 and in the Driver and Vehicle Licensing Agency by at least 500;
- be on course to have relocated 60 or more posts out of London and the South East by 2007-08 and consider further relocations as the department develops its future strategy;
- lead a project to improve roads procurement in local authorities through the application of Highways Agency expertise, to deliver annual efficiencies of £190 million, and more in later years;
- increase tax collection by the Driver and Vehicle Operator (DVO) Group by £75 million per annum, and achieve another £70 m of efficiencies per annum through transactional services and other areas within the DVO group;
- put in place its comprehensive and far-reaching agenda to restructure and reform the department, which will deliver efficiencies of over £25m from reforming both the central department and its support services; and
- deliver £125 million efficiencies as a result of Transport for London's own efficiency plans and a further £122 million from other areas of local authority spending.

LOCAL GOVERNMENT

C.18 Achieving greater efficiency across the whole of the public sector is essential to support the Government's continuous drive for improved public service delivery. Local government has a key role to play in this ambitious agenda, and many local authorities are already securing efficiencies through investment in technology and rationalisation of back office and procurement functions. The Spending Review builds on existing best practice and proposes efficiency savings in local government of 2.5 per cent per annum to deliver £6.45 billion of efficiencies and productivity improvements by 2007-08, releasing additional reources to front-line services.

C.19 Recent research carried out by Deloitte on behalf of ODPM concluded that universal implementation of e-procurement alone by all local authorities would secure savings of £1.1 billion. There is scope for significant additional savings through aggregation of demand by local authorities through the Regional Centries of Excellence and moving towards increased rationalisation of back office and transactional services. There is also scope for efficiencies with improvements in staff productive time. ODPM will lead and coordinate with other government departments the collective local government package and work in partnership with local government to help authorities secure savings.

C.20 Local government will be responsible for delivering over £6.45 billion of total efficiency gains by 2007-08, building on existing best practice. At least half of these savings will be cashable, releasing resources to front line activities. ODPM and other government departments will work in partnership with the Local Government Association, local authorities and other stakeholders to help secure these efficiencies. Efficiencies are anticipated in the following areas, with approximately:

- 40 per cent of the savings expected to be delivered through schools (see paragraph C.3);
- 10 per cent through policing (see paragraph C.7); and
- 35 per cent derived through procurement in other services (for example adult social care, social housing, children's services, highways maintenance and waste).

C.21 Further savings are also expected to be delivered through increased rationalisation of local authority back office functions and transactional services and improvements in productive time of staff.

F.5 United Kingdom – Department for Transportation (DfT), The Evaluation of Major Local Authority Transport Projects: A Guide for DfT

The following text is the executive summary of the U.K. Government's DfT Guide to Local Authorities on how to evaluate transport projects, following the government's "value for money" policy. Full document can be obtained from the DfT website.

<Source: http://www.dft.gov.uk/pgr/regional/ltp/major/pdfevalmajlocautranpro>

Executive Summary

The need for evaluation guidance

Transport carries a good reputation for the appraisal of schemes before implementation. Less well developed however is the use of retrospective impact evaluation, for accountability, or to inform the planning, appraisal and delivery of future schemes, or of retrospective process evaluation to help ongoing or future scheme management.

Purpose of the Guide and target audience

This guide promotes well planned and proportionate evaluation, primarily for local authority major schemes outside London. It presumes that evaluation plans will be required with funding applications for such schemes, which normally have a capital spending of more than £5 million. The guide provides advice and ideas, not binding requirements, as flexibility is needed to tailor evaluation to specific scheme and knowledge gaps.

The scope and scale of evaluation

Evaluations may vary widely in purpose and in scope and scale, depending on the nature of the scheme and the purpose of the evaluation. Evaluation for accountability needs however to review capital and ongoing expenditure as well as scheme impacts. Evaluation to provide information for future use should be directed at explicit needs and specific users. Care is needed to ensure that, whenever it is used, the meaning of the term evaluation is clear. For while in this guide and usually in central government it is confined to retrospective analysis, the word is widely used elsewhere to describe forward looking appraisal. It is helpful to distinguish between impact and process evaluation, and sometimes to develop thematic evaluation of a specific activity, such as capital procurement, for a single scheme or possibly across a range of applications and over time. The terminology of "counterfactual" is adopted in central government and many

local authorities to describe the alternative world against which the observed outputs and outcomes are being compared.

The key steps of managing an evaluation are deciding its purpose, planning the evaluation (including choice of performance indicators, methods of data collection and sources and methods of analysis, and risk assessment of the evaluation), followed by a management structure for the work itself, contract management, and presentation and dissemination. Common pitfalls include starting too late, lack of clarity of the purposes of the evaluation, poor evaluation planning and insufficiently effective presentation. The resources appropriate for evaluation in a specific case, in such a broad field as local authority schemes, cannot be decided by formal rules; but for a scheme with a capital cost of £10million, evaluation should cost less than £100k. The evaluation budget or budgets should be planned in advance and incorporated in the scheme budget.

Structure of the Guide

The Guide, after explaining its background and the nature of evaluation, devotes sections to preparing and managing any evaluation and then more detailed coverage of impact and of process evaluation, followed by a chapter on the presentation and use of evaluation results.

Impact evaluation needs to consider impacts, positive and negative, on the achievement of all transport policy objectives, as well as the beneficial impacts stated in promoting the scheme. There may also be an important place for thematic impact evaluation focused on one specific issue. The timing of an impact evaluation depends upon its purpose, and may vary from between a year or so after initial opening of a scheme to many years later after, for example, business location, housing and planning decisions have adapted to a major scheme.

Identification and estimation of this counterfactual is a central feature of most impact evaluations and may be derived in a number of ways. For a small scheme simple adjustments for general trends may suffice. For a large scheme formal modeling is needed, using either the original appraisal model or a new model. An analytical framework is needed, often including causal chain diagrams, and best use should be made of choices from a wide range of data collection and data analysis techniques.

Three illustrative examples of impact evaluations are provided of stylized local authority major schemes. Appendices provide more detailed guidance on transport scheme objectives, data collection, modeling and regeneration impacts. For process evaluation the first step again is to determine its scope. This may, in a few cases such as a scheme which was unusually successful or unsuccessful, extend to the scheme as a whole. This will entail consultation with a wide range

of players and analysis, perhaps using project management software, of all the material interactions between players and activities.

More often, process evaluation will be worthwhile for one or more specific activities, such as capital procurement, concession arrangements, handling of environmental issues, the implementation process, or media handling. Illustrative questions are suggested for such cases.

The usefulness of any evaluation depends largely or wholly upon the presentation and use of evaluation results. The need for publication, or risk of exposure to public scrutiny, may sometimes be a constraint on impartial reporting, but this is undesirable and there are ways in which these pressures can be mitigated. Presentation should "tell a story" and be targeted to the particular needs of each audience. The main output of evaluation for accountability may be the executive summary. Do's and Don'ts are suggested for evaluation reporting and dissemination.

F.6 Value Analysis International Communities of Practice

The following is a listing of some of the international organizations of value analysis— value engineering and value management— professional practitioners and advocates and their respective website, where available. Called communities of practice, they promote the adoption of value analysis among governments and industries, provide capacity building services, and foster value analysis knowledge creation through their information exchange events and activities.

ACES	Australian Cost Engineering Society
CSVA	Canadian Society of Value Analysis – www.scav-csva.org
EGB	European Governing Board – www.valueforeurope.com
HKIVM	Hong Kong Institute of Value Management – www.hkivm.com.hk
INVEST	Indian Value Engineering Society – www.invest-in.org
IVMM	Institute of Value Management Malaysia – www.ivmm.org.my
IVM-UK	Institute of Value Management-United Kingdom – www.ivm.org.uk
SAVE	Society of American Value Engineers – www.value-eng.org
SHVE	Society of Hungarian Value Engineers
SJVE	Society of Japanese Value Engineers – www.sjve.org
SKVE	Society of Korean Value Engineers
SIVE	Society of Iranian Value Engineers
VESB	Value Engineering Society of Beijing – www.vesb.org
VMIT	Value Management Institute of Taiwan
PAVE	Philippine Association of Value Engineers (not confirmed; no website)

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Appendix G
Adjustments to NEDA-ICC Documents to Introduce Value Analysis

This document contains Castalia's suggested adjustments to NEDA-ICC documents to formalize the introduction of value analysis. It contains:

- Revised Process Flowcharts
- Adjustments to ICC Project Evaluation Procedures and Guidelines

Value Analysis in Public Infrastructure Projects

Adjustments to NEDA-ICC Documents to Introduce Value Analysis

June 2009

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Acronyms and Abbreviations

CVS	Certified Value Specialist
FAST	Function Analysis System Technique
GOCC	Government-Owned and Controlled Corporation
ICC	Investment Coordination Committee
ICC-PE	Investment Coordination Committee Project Evaluation
ICC-PER	Investment Coordination Committee Project Evaluation Report
NEDA	National Economic and Development Authority
NEDA-ICC	NEDA's Investment Coordination Committee
PER	Project Evaluation Report (of the NEDA ICC-Secretariat)
PhP	Philippine Pesos
VA	Value Analysis (synonym for value engineering)

1 Introduction

This document contains Castalia's suggested adjustments to NEDA-ICC documents to formalize the introduction of value analysis. It contains:

- Revised Process Flowcharts
- Adjustments to the ICC Project Evaluation Procedures and Guidelines, including:
  - Insertion of a new section - Section II. This new section specifies which projects will be subject to value analysis, the purpose of evaluating the value analysis reports, and outlines the procedures to be followed by NEDA Secretariat staff in performing the evaluation.
  - Insertion of a new *'Technical Annex A: Value Analysis Report'* - Annotated Outline for use by Proponent Agencies'. This new Technical Annex contains a suggested format for the value analysis reports that must be submitted by the proponent agencies. There is an associated new form, the ICC–PE Form No.7 Summary of Value Analysis Study, that also needs to be filled out by the proponent agency.
  - Insertion of a new *'Technical Annex B: Value Analysis Evaluation Framework, Procedures and Guidelines'*. This new Technical Annex contains the evaluation tool that will be used by the NEDA staff in verifying the acceptability of the value analysis report. This compliance guidance document consists of a series of questions, with accompanying definitions and guidance on the criteria which must be met for a value analysis report to be accepted by the NEDA evaluator.
  - Insertion of a new *'Technical Annex C: Letters to a Proponent Agency for a non- compliant or a compliant Value Analysis Report'*. This new Technical Annex contains three sample letters that NEDA can send to the head of the proponent agency to inform them of the results of the evaluation of a value analysis report and to advise on the next steps.
  - Insertion of a new *'Technical Annex D: Revised Project Evaluation Report and Sample Write-up for a Compliant Value Analysis Study'*. This new Technical Annex proposes an adjusted format for ICC Project Evaluation Reports (PER's). It includes an additional section for the value analysis evaluation and a sample write-up of the result of an evaluation made on a value analysis report. The value analysis evaluation will be inserted under Section I. Technical/Market/ Environmental Evaluation.

1.1 Value Analysis in the Project Development Cycle

NEDA intends to revise the process it uses to evaluate projects requiring approval by its Investment Coordination Committee (ICC). Under the new process, proponent agencies will be required to commission value analysis studies at two, and possibly three, stages in the project development cycle.

First, value analysis should be used at an early stage in the project cycle (pre feasibility) when deciding the project concept or identifying an option. This will help a proponent agency select the right project. Subsequently, a second value analysis study should be undertaken at the feasibility stage to ensure the right design for the project. This should reduce costs and reduce the risk of subsequent variations.

Also, we recommend that value analysis be undertaken on project variations submitted to the ICC for approval that include a change in cost of the technical components of the project exceeding a given threshold. Based on the costs and expected benefits of value analysis studies, we suggest that an appropriate threshold is PhP 100 million (2009 prices). The objective of undertaking value analysis for variations is to minimize the increase in cost or improve cost efficiency of the variation.

The purpose of undertaking value analysis at an early stage in the project cycle when deciding the concept or identifying an option is to ensure that the right project is selected. The right project is the project that provides best value for money[1] in meeting the need.

The objective of undertaking value analysis at the feasibility stage is to ensure the right design for the project. This should drive better design and reduce the risk of subsequent variations.

The objective of undertaking value analysis for variations is to minimize the increase in cost or improve cost efficiency and get the right variation.

1.2 Evaluation of Value Analysis Reports

The proponent agencies must submit reports documenting the various value analysis exercises to NEDA for evaluation. NEDA staff will evaluate these reports as set out in the revised ICC Project Evaluation Process and Guidelines.

NEDA will evaluate the proponent agency's value analysis reports before evaluating projects from any other perspective e.g. financial, economic, and social. A compliant value analysis study will be a prerequisite for further evaluation.

[1] Value for Money is defined as the optimum combination of whole-of-life costs and quality (or fitness for purpose) of the good or service to meet the user's requirements.

That is, no other evaluation will be undertaken if the value analysis report fails to provide the NEDA Secretariat with confidence that the value analysis study was conducted in a professional manner and that the outcomes are credible. This is because it cannot be concluded that the proposed project or variation offers the best value for money and that the cost information is reliable.

The evaluation process will be set out in a new section in the 'ICC Project Evaluation Procedures and Guidelines'. This new section - Section II - specifies which projects will be subject to value analysis, the purpose of evaluating the value analysis reports, and outlines the procedures to be followed by NEDA Secretariat staff in performing the evaluation.

- If evaluation of the Value Analysis Report at concept or options stage indicates that the value analysis study has been conducted in a professional manner and that the outcomes are credible, NEDA will advise the proponent agency, via a letter, to proceed with the next step, say the feasibility study.
- If evaluation of the Value Analysis Report at feasibility stage or for a variation indicates that the value analysis study has been conducted in a professional manner and that the outcomes are credible, this will be explained in the Project Evaluation Report under Section I. Technical/ Market/Environmental Evaluation.

Four new technical annexes to the ICC Project Evaluation Procedures and Guidelines set out in detail the changes to procedures and additional informational requirements.

1.3 Contents of this document

The remainder of this document contains the suggested adjustments to NEDA-ICC documents:

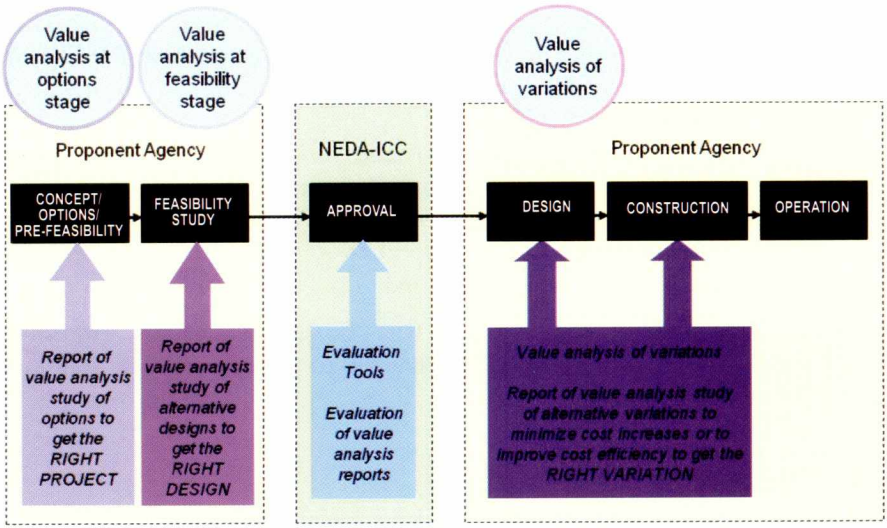
- Revised process flowcharts (section 2)
- New *'Section II Value Analysis Evaluation'* which we propose be inserted in the ICC Project Evaluation Procedures and Guidelines (section 3)
- New *'Technical Annex A: Value Analysis Report - Annotated Outline for use by Proponent Agencies'* (section 4)
- New *'Technical Annex B: Value Analysis Evaluation Framework, Procedures and Guidelines'* (section 5)
- New *'Technical Annex C: Letters to a Proponent Agency for a non-compliant or a compliant Value Analysis Report'* (section 6)
- New *'Technical Annex D: Revised Project Evaluation Report and Sample Write-up for a Compliant Value Analysis Study'* (section 7)

2 Revised Process Flowcharts

This section contains flowcharts which illustrate the changes required to the ICC project evaluation framework to introduce value analysis. It also explains the use of the NEDA Value Analysis Evaluation Toolkit developed by Castalia:

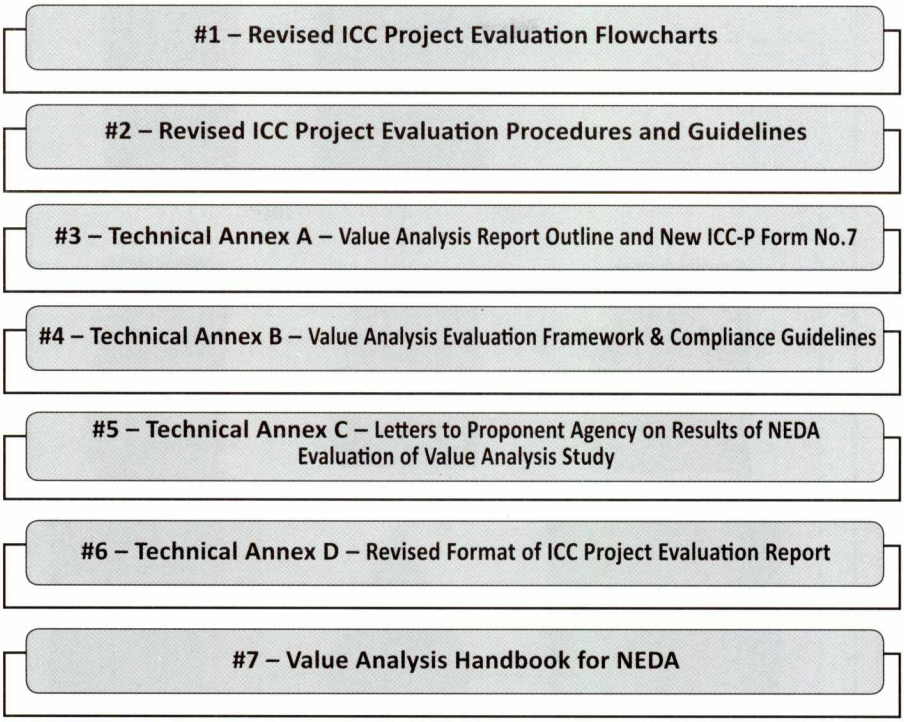
- Figure 2.1 illustrates at what point in the project development cycle value analysis will be undertaken and the respective roles of proponent agencies and NEDA.

Figure 2.1: Value analysis in the project development cycle



- Figure 2.2 illustrates the seven components of Castalia's 'Value Analysis Evaluation Toolkit'. The purpose of this toolkit is to help proponent agencies prepare value analysis reports and to help NEDA staff evaluate the acceptability of value analysis studies. Six of the components of this toolkit are contained in this report, the seventh; 'Value Analysis Handbook for NEDA' has been prepared as a separate, stand-alone document.

Figure 2.2: Components of the Value Analysis Evaluation Toolkit



- Figure 2.3 illustrates where evaluation of value analysis reports fits into the NEDA-ICC project evaluation process.
- Figure 2.4 illustrates how Castalia recommends value analysis be used at the concept or options (pre-feasibility) stage.
- Figure 2.5 illustrates how Castalia recommends value analysis be used at the feasibility stage.
- Figure 2.6 illustrates how Castalia recommends value analysis be used for variations.

Figure 2.3: Value Analysis in the NEDA-ICC Project Evaluation Process

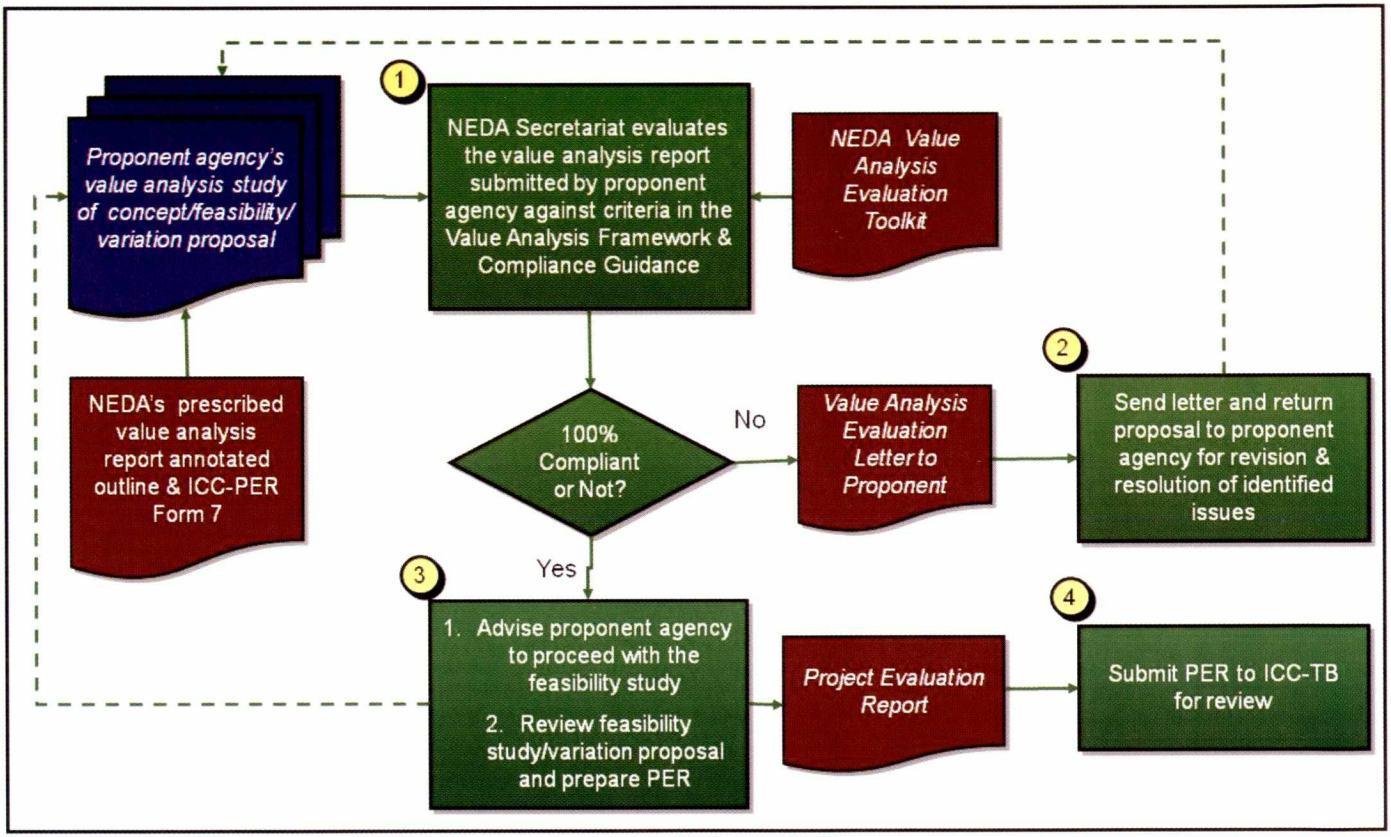
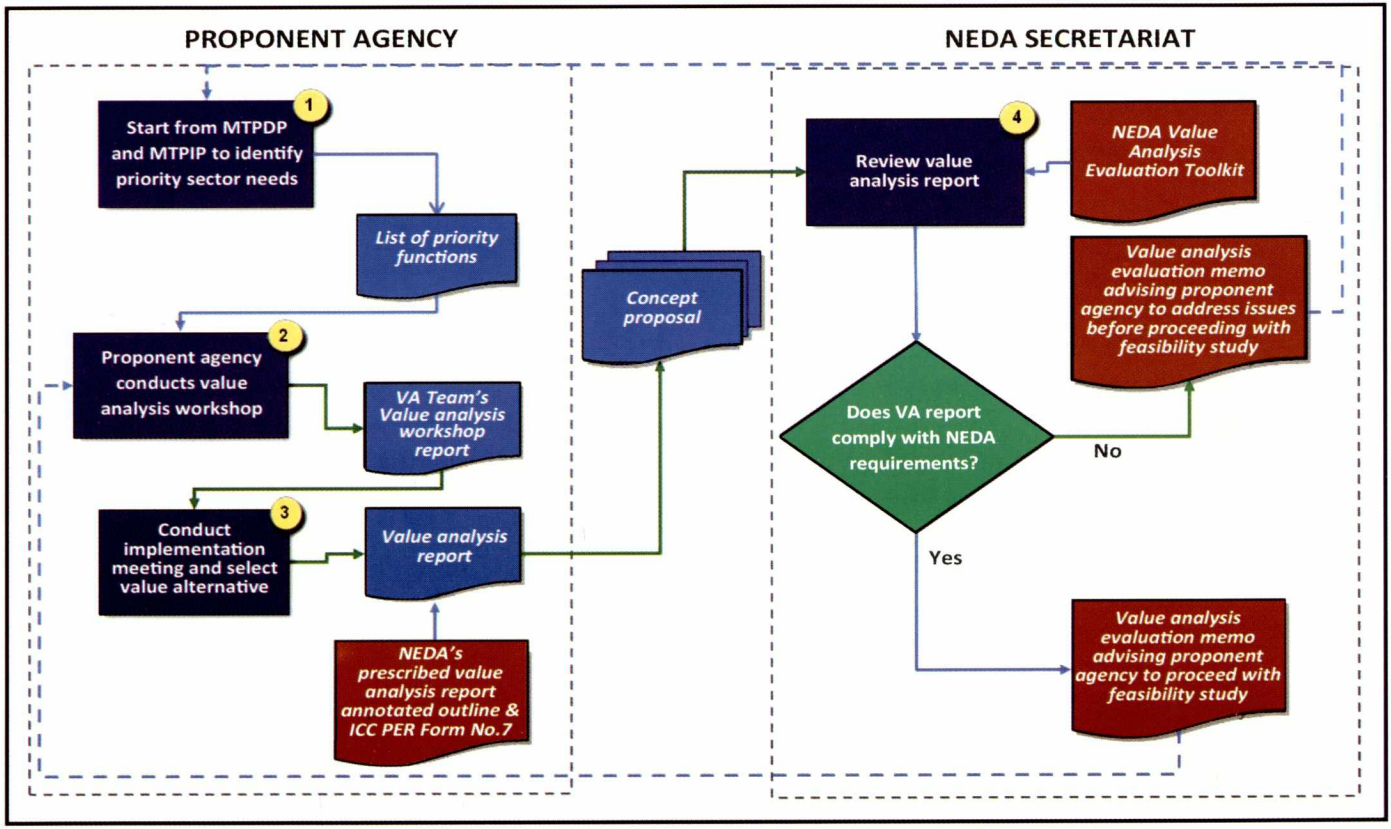


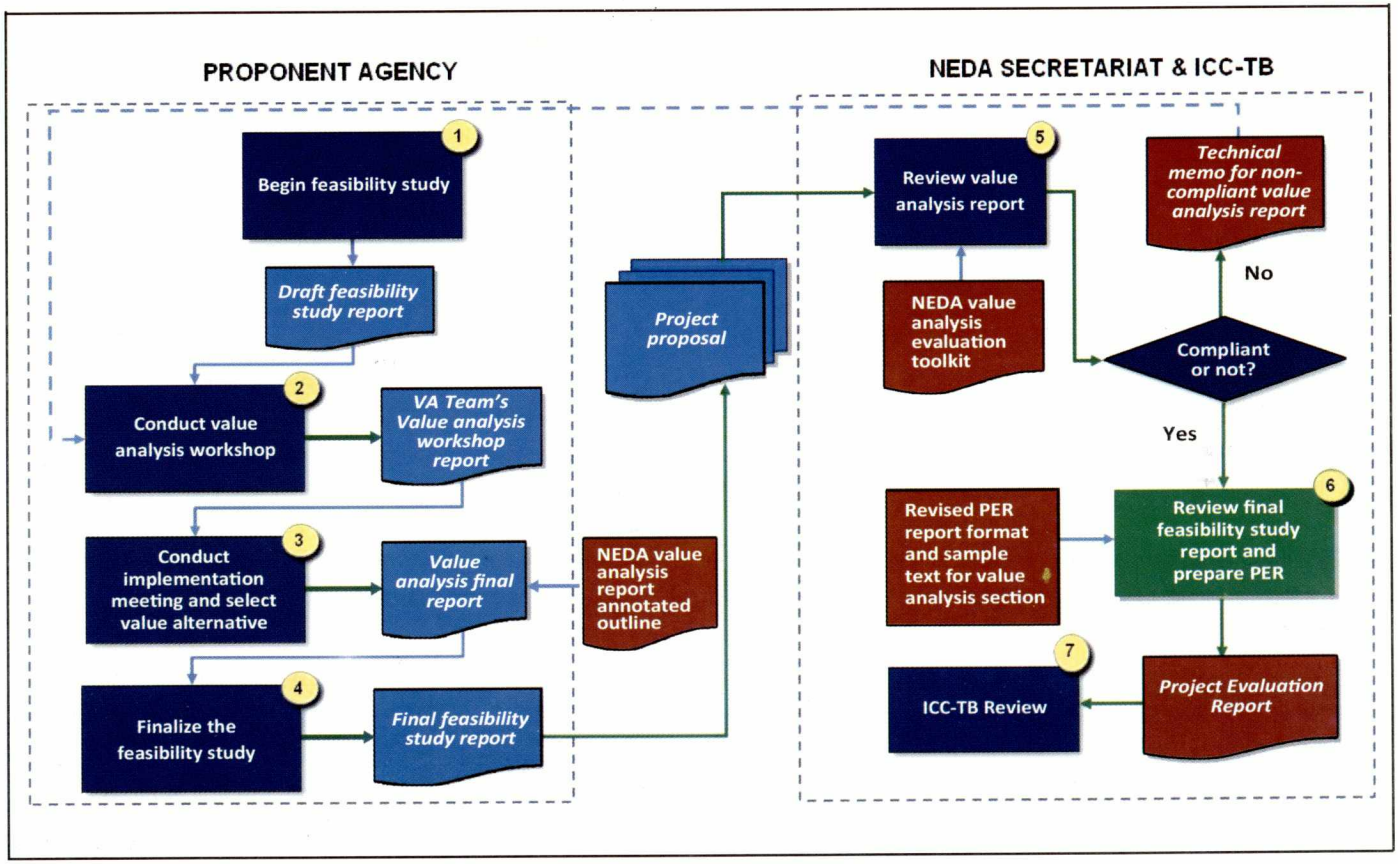
Figure 2.4: Value Analysis at Concept or Options (Pre-Feasibility) Stage



Steps for use of value analysis at concept or options (pre-feasibility) stage:

1. The proponent agency identifies priority sector needs and lists the "functions" to be met rather than describing projects.
2. The proponent agency commissions a value analysis study; the value team conducts a value analysis workshop and produces the value analysis workshop report.
3. The proponent agency's value manager organizes an implementation meeting with the agency management at which the Value Analysis Team Leader presents the value analysis study findings and recommendations. This is the 'Presentation Phase' in the value analysis Job Plan.
   3.1. The proponent's management chooses the best value alternative and directs the agency's concerned staff to prepare the project concept. This starts the 'Implementation Phase' in the value analysis Job Plan.
   3.2. The Value Analysis Team Leader and the proponent agency's Value Manager prepare the Value Analysis Report, documenting the value alternative chosen by management. This is prepared using the Revised ICC Project Evaluation Procedures and Guidelines 'Technical Annex A – Value Analysis Report - Annotated Outline & ICC PER Form No 7'.
   3.3. The proponent agency head submits the Concept Proposal & the Value Analysis Report to the NEDA Secretariat.
4. The NEDA Secretariat reviews the Value Analysis Report based on the Revised ICC Project Evaluation Guidelines and Procedures. Evaluation staff use the new 'Technical Annexes B - Value Analysis Evaluation Framework and Compliance Guidance' to evaluate the report and 'Technical Annex C – Letter to Proponent Agency re Compliant or Non-Compliant Value Analysis Report' to document the evaluation. Evaluation staff may also use Castalia's 'Value Analysis Handbook for NEDA', as necessary for reference.
   4.1. If evaluation finds the Value Analysis Report to be non-compliant, NEDA sends a letter on the evaluation findings to the proponent agency and advises what issues need to be addressed. The proponent agency may repeat the value analysis or improve the Value Analysis Report, as necessary.
   4.2. If evaluation finds the Value Analysis Report to be compliant, NEDA sends a letter on the evaluation findings to the proponent agency and advises that it proceed with the next stage of project development, e.g. Feasibility Study.

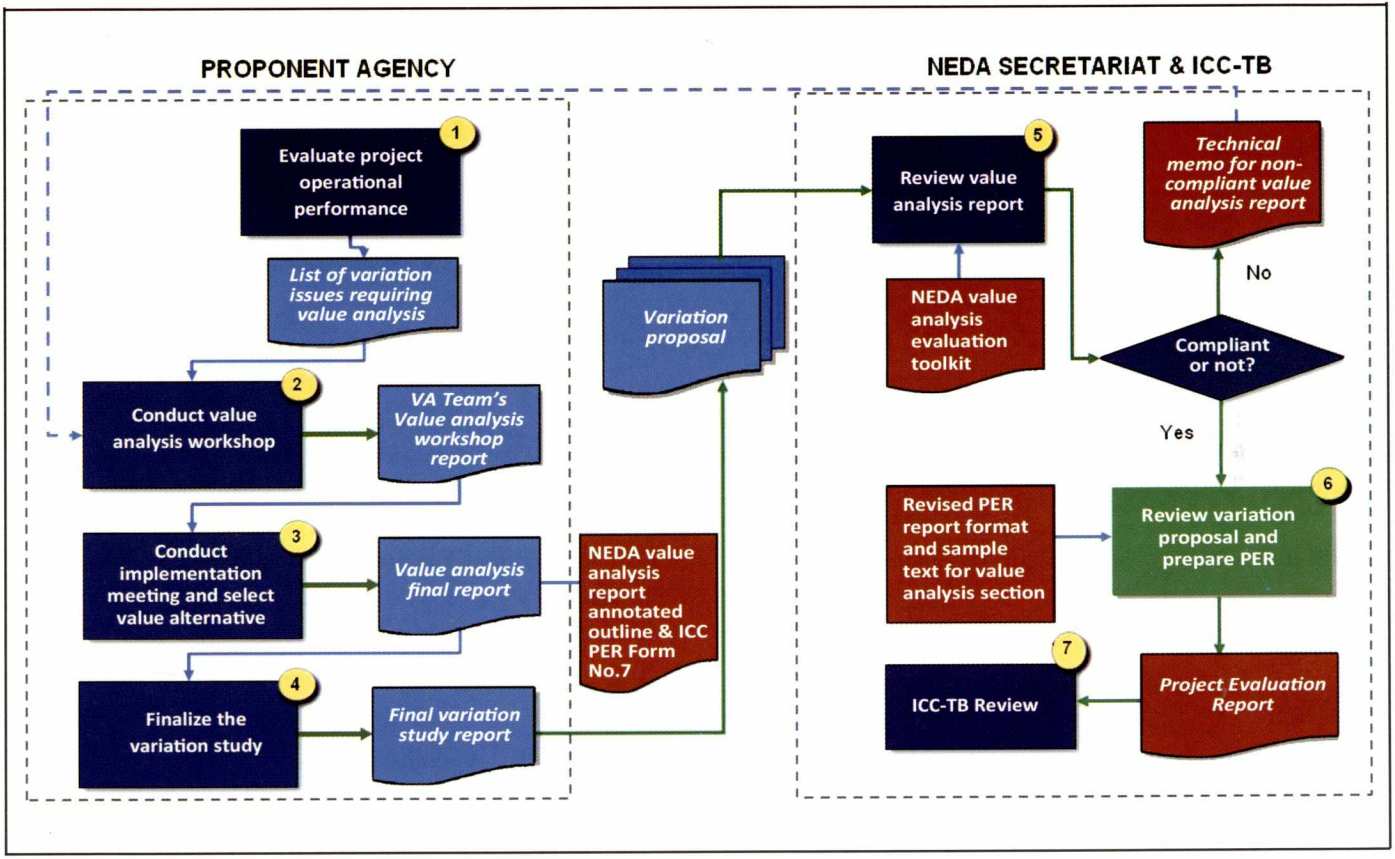
Figure 2.5: Value Analysis at Feasibility Stage



Steps for use of value analysis at feasibility stage:

1. The proponent agency starts a feasibility study on a project concept. Ideally, the concept should have gone through value analysis and was the management-chosen value alternative in the concept phase
2. At least halfway through the feasibility study, the proponent agency commissions a value analysis study; the Value Analysis Team conducts a value analysis workshop and produces a Value Analysis workshop report.
3. The proponent agency's Value Manager organizes an implementation meeting with the agency management; the feasibility study Team may also be invited. The Value Analysis Team Leader presents the Value Analysis study findings and recommendations.
   3.1. The proponent agency's management chooses the best value alternative and directs the feasibility study team to implement the chosen value alternative in finalizing the feasibility study.
   3.2. The Value Analysis Team Leader and proponent agency's Value Manager prepare the Value Analysis Report, documenting the value alternative chosen by management. In preparing this report, they use the revised 'ICC Project Evaluation Processes and Guidelines' new 'Technical Annex A – Value Analysis Report - Annotated Outline and ICC PER Form No 7'.
4. The proponent agency head submits the completed feasibility study and the Value Analysis Report to the NEDA Secretariat.
5. The NEDA Secretariat reviews the Value Analysis Report based on the revised 'ICC Project Evaluation Procedures and Guidelines' new 'Technical Annexes B - Value Analysis Evaluation Framework and Compliance Guidance' to evaluate the report. Evaluation staff may also use Castalia's 'Value Analysis Handbook for NEDA', as necessary for reference.
   5.1. If evaluation finds the Value Analysis Report to be non-compliant, NEDA sends a letter on the evaluation findings to proponent agency and advises which issues need to be addressed before NEDA continues the rest of the evaluation. NEDA Secretariat staff uses 'Technical Annex C – Letter to Proponent Agency re Non-Compliant Value Analysis Report' to document the evaluation. The proponent agency would need repeat the value analysis or revise the Value Analysis Report, as necessary, and re-submit the Value Analysis Report to NEDA.
   5.2. If evaluation finds the Value Analysis Report to be compliant, NEDA proceeds with the next stage of project evaluation and prepares a report on the evaluation of the value analysis study using new 'Technical Annex D - Project Evaluation

Figure 2.6: Value Analysis for Project Variations



Steps for use of value analysis for project variations:

1. The proponent agency conducts a project operational performance review and identifies variations that must be made on the project, requiring ICC clearance/approval.

2. The proponent agency commissions a value analysis study. The Value Analysis Team conducts a value analysis workshop and produces the Value Analysis workshop report.

3. The proponent agency's Value Manager organizes an implementation meeting with the agency management. The Value Analysis Team Leader presents the Value Analysis study findings and recommendations.

   3.1. The proponent agency's management chooses the best value alternative and directs the agency's project management team to finalize its variation study and prepare the project variation proposal document.

   3.2. The Value Analysis Team Leader and the proponent agency's Value Manager prepare the Value Analysis Report, documenting the value alternative chosen by management. In preparing this report, they use the revised 'ICC Project Evaluation Processes and Guidelines' new 'Technical Annex A – Value Analysis Report - Annotated Outline and ICC PER Form No 7'.

4. The proponent agency head submits the project variation proposal and the Value Analysis Report to the NEDA Secretariat.

5. The NEDA Secretariat reviews the Value Analysis Report based on the revised 'ICC Project Evaluation Procedures and Guidelines' new 'Technical Annexes B – Value Analysis Evaluation Framework and Compliance Guidance' to evaluate the report. Evaluation staff may also use Castalia's 'Value Analysis Handbook for NEDA', as necessary for reference.

   5.1. If evaluation finds the Value Analysis Report to be non-compliant, NEDA sends a letter on the evaluation findings to proponent agency and advises which issues need to be addressed before NEDA continues the rest of the evaluation. NEDA Secretariat staff uses 'Technical Annex C – Letter to Proponent Agency re Non-Compliant Value Analysis Report' to document the evaluation. The proponent agency would need repeat the value analysis or revise the Value Analysis Report, as necessary, and re-submit the Value Analysis Report to NEDA.

   5.2. If evaluation finds the Value Analysis Report to be compliant, NEDA proceeds with the next stage of project evaluation and prepares a report on the evaluation of the value analysis study using new 'Technical Annex D - Project Evaluation Report for a Compliant Value Analysis Report'.

3 Adjustments to ICC Project

Evaluation

Procedures and Guidelines

This section contains suggested adjustments to the first two sections of the ICC Project Evaluation Procedures and Guidelines and to the numbering of the sections and Technical Annexes. It includes 'Section I Rationale' which has been adjusted to refer to the new Section II Value Analysis and adjust numbering of subsequent sections. This is followed by an entirely new 'Section II Value Analysis' which specifies which projects will be subject to value analysis, the purpose of evaluating the value analysis reports, and outlines the procedures to be followed by NEDA Secretariat staff in performing the evaluation. This new 'Section II Value Analysis' is followed by the headings of the unchanged but renumbered remaining sections of the guidelines and the new and existing Technical Annexes.

I. Rationale

This set of guidelines on project evaluation aims to provide standards of procedures for the ICC in assessing development programs and projects to ensure their technical, financial, economic and social merits. The procedures are also formulated to achieve uniformity in and set the basis for evaluation. An appreciation of these procedures is deemed necessary in order for the proponents to understand the various information requirements of the ICC as contained in the ICC-PE Forms 1-6 and is envisioned to facilitate the processing of requests for ICC action.

These guidelines are organized into nine (9) sections. Sections II to VII cover the procedures in undertaking the value analysis, financial, economic, technical and institutional evaluation of programs and projects. Section VIII provides the steps in undertaking a sensitivity analysis of the selected parameters. The evaluation of technical assistance components of projects is detailed in Section IX. Section X describes the procedures in conducting public consultations on programs and projects.

II. Value Analysis Evaluation

These guidelines apply to infrastructure projects of government agencies, government-owned and controlled corporations (GOCCs) and private firms/ entities whose infrastructure projects meet the following criteria:

1. **At concept or options (pre-feasibility) stage** – all initiatives where the subsequent feasibility study may require ICC approval
2. **At feasibility stage** – all projects that require ICC approval
3. **Variations** – where a proposed variation involves a change in cost of the technical (geotechnical, engineering, construction, operations and maintenance) component exceeding PhP 100 million in 2009 prices

A proponent agency may request that a project be exempt from a value analysis study at any stage. However, NEDA will only agree to this exemption if the proponent agency convincingly demonstrates that the benefits of the value analysis study are unlikely to exceed the costs of undertaking the study.

A. Objectives

a. **At concept or options (pre-feasibility) stage** – to decide whether the project identified is likely to offer the best value for money in meeting the need and will therefore be accepted for ICC evaluation at feasibility phase. This decision will be based on the evaluation of a report documenting a value analysis study undertaken on the proposed concept or option.

b. **At feasibility phase and for variations** – to decide whether the project or variation submitted for ICC approval is likely to offer the best value for money in meeting the need and should therefore be evaluated as set out under Sections III to IX of these procedures and guidelines, or if the submission should be returned to the proponent agency for further development before resubmission.

B Procedures

1. **The proponent agency will commission a value analysis study and submit a report documenting this study to the NEDA Secretariat**

   The value analysis study should comply with internationally accepted standards and bodies of knowledge on value analysis[2]. The value analysis report should follow the structure set out in Technical Annex A "Value Analysis Reports – Annotated Outline for use by Proponent Agencies". This Technical Annex contains guidance on what the value analysis report must contain to comply with all the criteria that NEDA will use to determine the acceptability of the value analysis study. An additional ICC form, ICC–PE Form No.7 'Summary of Value Analysis Study' must be filled out by the proponent agency to accompany the submitted value analysis report.

2. **The NEDA Secretariat will evaluate the value analysis report**

   This evaluation will determine whether the value analysis study was conducted in a professional manner and whether the outcomes are credible. This determination will be based on the extent to which the value analysis study complied with the Value Standard of SAVE International. Evaluation will focus on the three main elements that ensure the success of value analysis:

   - The qualifications of the Value Team Leader
   - The composition and qualifications of the Value Team
   - Adherence to a value analysis "Job Plan"

   Evaluation will be carried out as set out in the detailed guidelines in **Technical Annex B "Value Analysis Framework and Compliance Guidance"**.

[2] The Society of American Value Engineers (SAVE) International is the largest and most widely known knowledge organization on value analysis. Its website, (http://www.value-eng.org/), contains the SAVE-International Value Standard and Body of Knowledge. SAVE International is also a certifying body for value specialists.

3. **The NEDA Secretariat will communicate the results of the evaluation to the proponent agency**

   a. **Concept or options (pre-feasibility) stage**

   If evaluation of the Value Analysis Report indicates that the value analysis study has been conducted in a professional manner and that the outcomes are credible, the NEDA Secretariat will send a letter to the Proponent Agency explaining this outcome and informing the proponent agency that the value analysis study provides an acceptable basis for conducting a feasibility study on the proposed concept or option.

   If evaluation of the Value Analysis Report fails to provide the NEDA Secretariat with confidence that the value analysis study was conducted in a professional manner and that the outcomes are credible, the NEDA Secretariat will send a letter to the Proponent Agency explaining this outcome and informing the proponent agency that a feasibility study of the project recommended in the Value Analysis Report would not be accepted for approval by the ICC if required. The letter sent to the Proponent Agency must also explain why the value analysis report failed to comply with NEDA requirements and what would need to be done to ensure compliance.

   b. **Feasibility stage and variations**

   If evaluation of the Value Analysis Report indicates that the value analysis study has been conducted in a professional manner and that the outcomes are credible, the NEDA Secretariat will send a letter to the proponent agency explaining this outcome and confirming that the NEDA Secretariat will pursue its evaluation as set out under Sections III to IX of these guidelines. The resulting Project Evaluation Report will include a section on the evaluation of the value analysis under Section I. Technical/ Market/ Environmental Evaluation.

   If evaluation of the Value Analysis Report provides the NEDA Secretariat with confidence that the value analysis study was conducted in a professional manner and that the outcomes are credible, the NEDA Secretariat will send a letter advising the proponent agency of its compliance and the next step.

   If evaluation of the Value Analysis Report fails to provide the NEDA Secretariat with confidence that the value analysis study was conducted in a professional manner and that the outcomes are credible, the NEDA Secretariat will send a letter to the Proponent

Agency explaining this outcome and informing the proponent agency that the feasibility study or variation will not be further evaluated until a compliant value analysis report has been received. The letter sent to the Proponent Agency must also explain why the value analysis report failed to comply with NEDA requirements and what would need to be done to ensure compliance.

Technical Annex C "Letter to a Proponent Agency for a non-compliant or a compliant Value Analysis Report" contains examples of letters which the NEDA Secretariat can use as a basis for communicating the results of evaluation of value analysis reports and what this means for the proposed project concept or option (pre-feasibility), feasibility or variation.

III. Financial Evaluation

These guidelines will apply to ... *no changes are necessary to this section and all subsequent sections of the existing ICC Project Evaluation Procedures and Guidelines. However, the number of the section need to be increased by 1 as follows:*

IV. Economic Evaluation

No changes to this section are required although the section number needs to be adjusted

V. Technical Evaluation

No changes to this section are required although the section number needs to be adjusted

VI. Social Analysis

No change to this section are required although the section number needs to be adjusted

VII. Institutional Evaluation

No changes to this section are required although the section number needs to be adjusted

VIII. Sensitivity Analysis

No changes to this section are required although the section number needs to be adjusted

IX. Evaluation of Technical Assistance Components

No changes to this section are required although the section number needs to be adjusted

X. Conduct of Public Consultations on Proposed Project

No changes to this section are required although the section number needs to be adjusted

Technical Annex A: Value Analysis Reports - Annotated Outline for use by Proponent Agencies

Technical Annex B: Value Analysis Framework and Compliance Guidance

Technical Annex C: Letter to a Proponent Agency for a non-compliant or a compliant Value Analysis Report

Technical Annex D: Revised Project Evaluation Report and sample write-up for a compliant value analysis study

Subsequent technical annexes as existing ICC Project Evaluation Procedures and Guidelines but with annex letter adjusted as follows:

Technical Annex E: Financial Analysis of Agricultural Projects

No changes to current annex are required

Technical Annex F: Financial Analysis of Projects

No changes to current annex are required

Technical Annex G: Financial Ratios

No changes to current annex are required

Technical Annex H: Adjustments to Inputs to Financial Statements for Economic Analysis

No changes to current annex are required

Technical Annex I: Issues of Technical Design

No changes to current annex are required

Technical Annex J: Elements of Social Analysis

No changes to current annex are required

4 Technical Annex A: Value Analysis Report - Annotated Outline for use by Proponent Agencies

The purpose of this new technical annex is to help implementing agencies prepare reports documenting value analysis studies and to facilitate the work of NEDA Secretariat staff in evaluating these reports. Reports prepared in accordance with this annotated outline will be evaluated more quickly and are more likely to be meet the requirements of NEDA than reports which are not prepared in compliance with this note.

All value analysis reports submitted by proponent agencies to NEDA should follow the structure set out in the following annotated outline. This annotated outline contains guidance on what the report must contain to comply with all the criteria that NEDA will use to determine the acceptability of the report. The outline and contents comply with the standards of SAVE International, the international certifying body for value analysis.

In addition the proponent agency must fill out a new project evaluation form, ICC–PE Form No.7 'Summary of Value Analysis Study'. This form is optional for a proposal at the concept stage of project development, but must be filled out for a feasibility study and variations proposal.

Annotated Outline for a Value Analysis Report

1 Report Front Material

1.1 Table of Contents

This sub-section should not only detail the parts of the value analysis report but also contain the lists of tables, figures, and appendices.

1.2 Cover Letter

This sub-section should contain a cover letter from the proponent agency head to NEDA requesting approval of the value analysis study. It should also contain details of the decision of the proponent agency's Executive Management Team to implement or reject each alternative proposed by the value analysis team. (In this note, the term Executive Management Team is used to refer to the authority within a proponent agency which decides which projects (at options phase, at feasibility phase or at variation phase, should be submitted for NEDA for approval.)

The Executive Management Team must identify which proposed alternatives it incorporated into the project's concept or design, and which proposed alternatives it did not incorporate. For each alternative that it did not incorporate, it must provide a convincing rationale for why the alternative was not incorporated.

1.3 **Distribution List**

2 Executive Summary

2.1 **Objective of Value Analysis Study**

2.2 **Summary Description of the Project**

2.3 **Project Issues**

2.4 **Alternatives Proposed during the Value Analysis Study**

2.5 **Alternatives Considered and Reasons for Rejection**

2.6 **Summary of Project Analysis**

This part briefly describes the Project Analysis Summary in accordance with the SAVE International Job Plan's six phases — Information, Function Analysis, Creative, Evaluation, Development, and Presentation.

2.7 **Management Team Comments**

This paragraph briefly describes the Executive Management Teams reasons for accepting or rejecting the value alternatives presented by the value analysis team and the rationale for the alternative that was selected.

2.8 **Implementation Plan**

This paragraph briefly describes the next steps set out in the Job Plan's seventh and final phase, the Implementation Phase.

3 Introduction

Section 3 of the value analysis report must fully describe the project and present the credentials of the value analysis team leader and members.

Section 3 should contain at least the following six sub-sections.

3.1 **Description of the Project**

3.2 **Value Analysis Team**

This sub-section should include certification that:

- The team leader was a professional value analysis expert who

is a Certified Value Specialist (CVS) as certified by SAVE International or equivalent certifying/accrediting organization

- Team members were bona fide experts with more than ten years of relevant experience
- A random spot-check of team members' credentials was done by the value team leader and that this spot-check showed the credentials to be valid
- The team was truly interdisciplinary and members were selected in accordance with Philippine Procurement Law
- The study was undertaken in compliance with the SAVE International "Job Plan" six-phase framework.

This sub-section should refer to an annex containing a tabulated summary of the names of the value analysis team members and their credentials and qualifications including educational attainment, professional licenses, relevant training in the last ten years, and relevant work experience in the last ten years. This section should also refer to documentation proving compliance of the selection of the value team leader and members to the Philippine Procurement law.

4 Information Phase

Section 4 of the value analysis report must demonstrate that the value analysis team has reviewed the project's criteria and objectives, has reviewed the preliminary cost information, and understands the project's expected benefits and limitations.

Section 4 should contain at least the following six sub-sections.

4.1 Approach

This sub-section should set out the approach used by the team.

4.2 Briefing Process

This sub-section should describe the process that the implementing agency used to brief the value analysis team on the project. It should indicate the implementing agency's source of information on the project, study issues and a summary listing of information provided to the value analysis team.

4.3 The Problem

This sub-section should contain a brief summary of the problem and a statement of need for which the project is the proposed solution.

4.4 Value Analysis

This sub-section should explain why the project was selected for a value analysis study.

4.5 Costs

This sub-section should describe the cost model including details of how the cost information was developed and justification that the cost information is relevant, timely and appropriate. Preliminary cost estimates must be developed using standardized and applicable unit costs. Life-cycle costing techniques should be used. That is, costing should include all costs associated with the project's design, construction, operation, and decommission (if applicable), over the project's useful life. Sources of cost information must be cited.

The level and accuracy of cost information will vary depending on the point in project cycle that the value analysis is conducted. For example, at the options phase it is likely that cost information will be significantly sparser than at feasibility phase.

4.6 Site Visits

This sub-section should list any site visits and relevant observations.

5 Function Analysis Phase

Section 5 of the value analysis report must demonstrate that the value analysis team has defined the project functions using an active verb and a measurable noun. The section must also demonstrate that the value analysis team has reviewed and analyzed these functions to determine which need to be improved, eliminated or added to meet the project's objectives.

Section 5 should contain at least the following five sub-sections.

5.1 Approach

This sub-section should briefly describe the approach used to identify functions.

5.2 Primary and Supporting Functions

This sub-section should list Primary and Supporting Functions using an active verb and measureable noun.

5.3 FAST Diagram

This sub-section should illustrate how functions of a project relate to each other using the graphical mapping tool known as the Function Analysis System Technique – FAST.

5.4 **Cost-worth Analysis**

This sub-section should set out the cost-worth values for each of the primary function(s).

5.5 **Allocation of Cost by Function and Results of Cost-worth Analysis**

It may not be possible to allocate costs by function and undertake a cost-worth analysis at the options phase if cost information is sparse.

6 Creative Phase

Section 6 of the value analysis report must demonstrate that the value analysis team has employed professional creative techniques to identify other ways to perform the project's function or functions.

Section 6 should contain at least the following two sub-sections.

6.1 **Approach**

This sub-section should briefly describe the approach used to generate the alternatives.

6.2 **Alternatives**

This sub-section should list a minimum of three workable alternatives (ways) considered for providing each function.

7 Evaluation Phase

Section 7 of the value analysis report must demonstrate that the value analysis team has followed a structured evaluation process to select the ideas that offer the potential to improve the project's value while delivering the project's function or functions and responding to performance requirements and resource limits.

Section 7 should contain at least the following five sub-sections.

7.1 **Approach**

This sub-section should describe how the criteria used to evaluate the ideas generated during the creativity phase were developed

7.2 **Criteria**

This sub-section should list and briefly define the criteria used to rank and evaluate the ideas.

New ideas must be reliable; have been used previously in similar circumstances on similar projects; and the process, material or service must have a satisfactory performance record.

7.3 **Ranking of Alternatives**

This sub-section should summarize (in a matrix or other) the approach used for ranking the alternative proposals and clearly display the results of the ranking, including how each proposed change responds to the criteria used for ranking.

7.4 **Providing the Function**

This sub-section should briefly describe "Why" and "How" the proposed alternatives would provide the needed function.

7.5 **Advantage and Disadvantages of Proposed Alternatives**

This sub-section should list the advantages and disadvantages of each proposal.

8 Development Phase

Section 8 of the value analysis report must demonstrate that the value analysis team has developed the selected ideas into alternatives or proposals with a sufficient level of documentation to allow decision-makers, including the design team (in a feasibility study or project management in case of a variations proposals) and the executive management team of the proponent agency, to determine if each alternative should be implemented.

Section 8 should contain at least the following five sub-sections.

8.1 **Approach**

This sub-section should describe the process for development (that is, full planning) of alternatives.

8.2 **Sketches, Drawings and Tables**

This sub-section should include sketches, drawings, tables, and other illustrative tools which demonstrate how a newly proposed alternative would compare with the original proposal. The proposed alternatives must have been vetted by the original project development/design team and this sub-section should include their observations, including counter-proposals and how design conflicts were resolved/addressed.

8.3 **Cost Estimates**

This sub-section should set out cost estimates of alternatives and compare them with the original proposal and list how and where costs were derived. Costs of alternatives must be derived using standardized and applicable unit costs.

8.4 Life-cycle Costing

This sub-section should set out the life cycle cost calculations.

Note: Life-cycle cost calculations may be minimal or generic at the options stage and may be substantiated with descriptions of cost components. These calculations are, however necessary, at the feasibility and variations stages.

8.5 Implementation and Value Enhancement

This sub-section should explain, in layman's terms, how the alternative value analysis proposals could be implemented and define in measurable terms, to the extent possible, the expected value enhancements (e.g. lower cost, better quality.)

9 Presentation Phase

Section 9 of the value analysis report must demonstrate that the value analysis team has developed a report, a presentation, or both, to document the work of the value analysis team and its recommendations. This is the Value Analysis Report described in this note. The report or presentation documents the value analysis process that led to the recommendations and conveys the adequacy of the alternative(s) developed to the implementing agency's Executive Management Team.

Section 9 should contain at least the following three sub-sections.

9.1 Audience at Presentation

This sub-section should list the officials present at the value analysis team's oral presentation (if made) to the Executive Management Team of the implementing agency.

9.2 Presentation and Issues Discussed

This sub-section should summarize the presentation made by the value analysis team and list all issues and questions discussed and provide a summary of why each value alternative proposal was accepted or rejected by the Executive Review Board.

9.3 Recommendations to Design Team

This sub-section should set out the specific recommendations made by the value analysis team to the design (proposal) team for action and the time frame given for objectively analyzing and implementing (if valid) the recommendations of the value analysis team.

10 Implementation Phase

Section 10 of the value analysis must demonstrate that the proponent agency has concrete next steps to implement the project. Once the decision is made by the Executive Management Team in the Presentation phase on which value alternative to implement, an implementation plan is set out with details on actions, by whom and by when.

Section 10 should contain at least the following two sub-sections.

10.1 Implementation plan

This sub-section describes the action steps, timeline, and persons within the proponent agency who are responsible for implementation. Immediate next steps would include finalizing the project proposal and submitting it to NEDA-ICC for review and approval, preparing documents for procurement activities, and other project mobilization activities. The goal of this plan is to prove that the proponent agency has sufficiently thought out the implementation of the project once NEDA approval has been obtained.

10.2 Monitoring the plan to completion

This sub-section describes the proponent agency's monitoring actions to ensure the implementation of the chosen value alternative. Unless the value alternative is actually implemented, no cost savings will be realized and the value analysis study would be useless.

11 Appendices

11.1 ICC- PE Form No. 7

This form is NEDA's required template for summary information on the value analysis report. This PER form should be filled out if the proposal being submitted for evaluation to NEDA is a feasibility study or a variation proposal. The form is optional for a concept proposal.

11.2 Credentials of the value analysis team leader and members

This contains the tabulated qualifications of the team leader and members including his relevant certifications and references.

11.3 Selection of the value analysis team

This contains the supporting documents that prove that the value analysis team was engaged following the Philippine Procurement law.

11.4 Other Supporting Documents

This contains all other information that support the descriptions of the Job Plan, such as cost assumptions and calculations, project sketches and drawings.

12 Acronyms and Abbreviations

13 Bibliographic References

ICC – PE FORM NO. 7
SUMMARY OF VALUE ANALYSIS STUDY

Proposal Title: _____

Parts of the Report	Brief Description
1) Qualification of the Value Team Leader	State name, credentials and certifications provided
2) Qualification of the Value Team	State names, credentials and certifications provided
3) Compliance with the Job Plan	In each of the phases, describe, as suited the key facts, assumptions, approaches, issues and remedies, findings/results and decisions.
a) Information Phase	
b) Function Phase	
c) Creative Phase	
d) Evaluation Phase	
e) Development Phase	
f) Presentation Phase	
4) Key Elements	
a) Statement of project description and objectives	
b) Statement of standing, if any, of where the proposed project stands relative to the country's overall development and investment plans	
c) Function diagram with costs and allocations[3]	
d) Life-cycle costing of alternatives[4]	
e) List and description of criteria used to evaluate alternatives	
f) Summary table of all short-listed alternatives with risk profile and associated development costs	
g) Summary table of pertinent comments of the Design Team and senior management of the proponent agency on the VA proposals of the VA team[5]	
h) Endorsement/certification by the head of the proponent agency, stating the following: a. which VA proposals will be incorporated into the project b. which VA proposals will not be incorporated and the rationale for non-inclusion	
5. Implementation Plan	State the summary of next steps and timing

[3] Mostly applicable for value analysis studies done at design and variation stages

[4] Same as footnote 3

[5] Same as footnote 3

5 Technical Annex B: Value Analysis Evaluation Framework and Compliance Guidance

This Technical Annex contains the evaluation tool that will be used by the NEDA staff who verify the acceptability of value analysis reports. This compliance guidance document consists of a series of questions, with accompanying definitions and guidance on the criteria to be met, in order for a value analysis report to be accepted by the NEDA evaluator.

Objective

The objective of this evaluation framework and compliance guidance is to help NEDA staff determine whether a value analysis study has been conducted in a professional manner, is credible, and may be accepted as part of the ICC project approval process. Proponent agencies will include a value analysis report as part of their submission of each project requiring NEDA-ICC approval. Value analysis reports provide an overarching summary of a project based on technical, financial, and economic needs. This summary is subject to functional analysis to ensure that the project's objectives are being met at the lowest possible cost.

Compliance with Value Standard

For NEDA staff and the ICC to be assured that a value analysis study has been conducted in a professional manner and is credible, it should meet the requirements set out by SAVE International in its 'Value Standard'. SAVE International is the international professional organization for value analysis. Its Value Standard is recognized around the world as the foremost set of standards and guidance on value analysis.[6]

For a value analysis study to be compliant with SAVE International's standards, the value analysis report submitted by the proponent agency to NEDA must clearly demonstrate that:

1. The study has been conducted under the direct supervision of a highly-experienced 'Value Team Leader' trained in value analysis methodology techniques. The Value Team Leader must be a Certified Value Specialist (CVS) or have an equivalent certification in value analysis.
2. The value analysis team performing the study (the 'Value Team') is a multidisciplinary group of professional experts. All of these experts

[6] The current version of the Value Standard, as of January 2009, may be found at http://www.value-eng.org/pdf_docs/monographs/vmstd.pdf.

have extensive experience and training in fields that are directly relevant to the value analysis study. Each member of the value team must have a minimum of 10 years of relevant experience with projects, or components of projects, that are similar to the project being studied.

3. For example, for a value analysis of a highway project, the Value Team may consist of several highway engineers, a transport economist and a transportation planner. For a light rail project, the team should include a light rail expert, a transport economist, an urban planner, and other experts as needed to help resolve specific issues.

4. The study was conducted in strict accordance with the first six phases of the SAVE International Job Plan, and the value analysis report documents that the team has accomplished these phases in an organized and professional manner. These phases and their minimum requirements are as follows:

   - **Information Phase** – The Value Team has reviewed the project's criteria and objectives, has reviewed the preliminary cost information, and understands the project's expected benefits and limitations
   - **Function Analysis Phase** – The Value Team has defined the project's functions using an active verb and a measurable noun. The team has reviewed and analyzed these functions to determine which need to be improved, eliminated or added to meet the project's objectives
   - **Creative Phase** – The Value Team has employed professional creative techniques to identify other ways to perform the project's function or functions
   - **Evaluation Phase** – The Value Team has followed a structured evaluation process to select the ideas that offer the potential to improve the project's value while delivering the project's function or functions and responding to performance requirements and resource limits
   - **Development Phase** – The Value Team has developed the selected ideas into alternatives or proposals with a sufficient level of documentation to allow decision-makers[7] to determine if each alternative should be implemented
   - **Presentation Phase** – The Value Team Leader has developed a report, a presentation, or both, to document the work of the value analysis team and its recommendations – this is referred to as the Value Analysis Report. The report or presentation documents the process that led to the recommendations and conveys the adequacy of the alternative(s) developed to the implementing agency's executive management team.

[7] Including the design team and the proponent agency

The value analysis report, when submitted to NEDA, must also contain a statement from the proponent agency explaining which alternatives will be incorporated into the project.

For any alternatives that will not be incorporated into the project, the statement must explain why the implementing agency did not accept the Value Team's recommendation.

Finally, the report must also discuss the implementation plan for the project, consistent with the requirements of the last phase of the Job Plan, the Implementation Phase. The report format is provided for in Technical Annex A of the Revised ICC Guidelines.

Evaluation Framework and Compliance Guidance

Table 5.1 presents the evaluation framework and compliance guidance in a tabular format that can be used directly by NEDA staff as template for conducting and documenting the evaluation of value analysis reports that are submitted by implementing agencies.

- The first column ("Value Analysis Evaluation Framework") lists and describes the three criteria for compliance with SAVE International standards.
- The second column ("Compliance Guidance") states what details the value analysis report must include in order to comply with the three criteria/SAVE International standards. This also serves as the evaluator's guide for verifying that the report has sufficiently documented its compliance with each criterion. The evaluator must note the presence or absence of required information and examine the clarity, accuracy and completeness of the report.
- The third column ("Evaluator Comments") is where the NEDA evaluator should state whether, in his or her judgment, the value analysis report meets the compliance criteria, and why or why not. This is also where the evaluator should note down all questions and comments regarding validity of information provided, clarifications on assumptions and calculations, and other related concerns.
- The fourth column ("Assessment - Pass/Fail") is where the NEDA evaluator should summarize his or her position and state whether the value analysis report meets each criterion ("Pass") or does not ("Fail").
- The "Summary Evaluation Row" at the end of the table is intended to summarize the three criteria and their required elements. The NEDA evaluator is advised to use this part as a final compliance check.

Table 5.1 Value Analysis Evaluation

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
1) Qualification of Value Team Leader The study has been conducted under the direct supervision of a highly-experienced Value Team Leader trained in value analysis techniques. The Team Leader must be a Certified Value Specialist or has an equivalent certification in value analysis.	• Physical evidence of certification is required, for example, a photocopy of the certification. Certification can be verified at the SAVE International website: http://www.value-eng.org/ education_cvs.php		
2) Qualification of Value Team Members The team performing the study (Value Team) is a multidisciplinary group of professional experts. All of these experts have extensive experience and training in fields that are directly relevant for the value analysis study. Each member of the Value Team must have a minimum of 10 years of relevant experience with projects, or components of projects, that are similar to the project being studied	• The value analysis report must include documentation that the team members are experts in the fields that are directly relevant for the study, and have at least 10 years of experience (or are certificable experts in their professional field) • The value analysis report must include certification from the Value Team Leader that a random spot-check of team members' credentials has been done, and that this spot-check shows the credentials are valid		
3) Value Analysis Job Plan The value analysis study was conducted in strict accordance with the SAVE International six-phase Job Plan, and the value analysis report documents that the team has accomplished these phases in an organized and professional manner.	The value analysis report must identify and summarize actions relative to the six phases: Information, Function, Creative, Evaluation, Development and Presentation. Validation of this is further described for each phase below.		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
3) a) Information Phase The Value Analysis Study Team must document that the information provided and analyzed was relevant to the study and/or adjusted, where necessary, to the specific conditions of the project. All physical data and cost data must be validated and certified to be relevant, current, project specific, and presented in accordance with industry specific standards, including life-cycle cost analysis.	The value analysis report should : • Contain a defined statement of need for which the project is proposed • Contain a summarized set of sketches, drawings, or other depictions sufficient for a non-technical person to understand the basic objectives and functions of the proposed project • Demonstrate that: – The cost data and cost model (if provided) is/are based on relevant costing procedures that are accepted in the industry – Preliminary cost estimates were developed using standardized and applicable unit costs – If no cost estimates are provided, the report must at least describe the necessary cost components and their degree importance to the overall project cost (This would be a typical scenario in an options stage value analysis report)		
3) (b) Function Analysis Phase Function Analysis is the cornerstone of value analysis. The Value Team must clearly identify the primary function(s) of the project and show how the Team defined those functions.	The value analysis report should: • Include a list of the functions and the costs allocated to the primary function(s) • Include, in summary form, at a minimum the following: – A Function Analysis System Technique (FAST) Diagram		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
	– A simplified one-page cost model that clearly identifies the most likely areas of unnecessary cost – An explanation of where and how the Value Analysis Team focused their efforts to reduce cost, following from the areas of unnecessary costs identified in the cost model – A determination of cost-worth values for each of the primary function(s).		
3) (c) Creative Phase The second most important feature of value analysis is the focus on creatively seeking alternative and less costly ways to perform the primary and, where applicable, most significant secondary functions of the project. There are a number of acceptable ways to perform this analytical process including Brainstorming, Gordon Technique, Delphi, Checklists, Attribute Listing, and Morphological Analysis.	Regardless of the method used, the value analysis report should clearly document how this phase was performed and display the results obtained		
3) (d) Evaluation Phase This phase involves determining which ideas generated during the Creative Phase should be seriously considered and developed in more detail. The challenge of this phase is to analyze all proposals objectively and identify the "best of the best"	The value analysis report should: • Detail the approach used to evaluate the ideas that were generated during the Creative Phase • Transparently display the criteria used for ranking the best proposed changes • Display the results of the ranking, including how each proposed change responds to the		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
solutions. All Value Team members should be comfortable with the process chosen and remain engaged in the process of evaluation. There are two steps involved in this phase: • First, is developing the criteria to use for evaluation of the options. • Second, is evaluating the options. The most common way of detailing or evaluating the creative ideas is with an advantage-disadvantage (pro-con) description of each idea, clearly identifying the source supporting the advantage/ disadvantage. Another common approach used is a matrix process of initially evaluating, ranking, and weighting criteria, which then may be used to help rank the proposed changes and determine the most appropriate.	criteria used for ranking • Show that the new ideas are reliable; have been used previously in similar circumstances on similar projects; and that there is a performance record of the process, material or service • Utilize life cycle costs to evaluate/rank each alternative against the other. (Note: life cycle cost may not be effective at the options stage due to sparse cost data. However, life cycle costs are required at the design and variations stage.)		
3) (e) Development Phase The development phase of the value analysis study takes the ideas that have been created and evaluated and further develops them into realistically workable solutions. At this stage, the ideas are thoroughly researched, preliminary ideas (plans, ideas, etc.) are sketched, and life-cycle costs are determined.	The value analysis report must: • Show the unit costs of the new proposal, and show that these were derived based on standardized and applicable unit costs • Develop each alternative using life cycle costs (when applicable). (Note: life cycle cost may not be appropriate at the options stage due to sparse data.)		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
This phase is the most difficult for a person who is not skilled in value analysis, and who has limited technical knowledge, to evaluate. This is because the proposed alternative changes represent the collective judgment of the experts on the Value Team, and are supported with limited detailed data. The decisions being proposed have not yet been scientifically or technically analyzed.	• Clearly note that the proposed changes were vetted with the original project development/ design team and the report must include the team's observations as well		
3) (f) Presentation Phase. The objective of the presentation phase is to present to, and to convince, the management of the implementing agency, that the integrated package of change proposals presented will provide the proponent agency with the same function at significantly less cost and at the same or higher level of quality than the project as originally proposed.	The value analysis report should include: • A clear description of the alternatives considered by the Value Team including the cost of the original proposal and of the alternatives being recommended • A statement or letter from the senior management team of the proponent agency stating that it has selected, or not selected, each of the alternatives recommended by the Value Team. In the case that the senior management team has not selected an alternative recommended by the Value Team, the senior management team must indicate why • An implementation agreement from the proponent agency, of how and when the proposed changes will be implemented		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
3) (g) Implementation Phase The objective of the implementation phase is to ensure that approved proposals are rapidly and properly translated into action in order to achieve the savings or project improvements that were proposed.	The value analysis report should demonstrate that the proponent agency has concrete next steps to implement the project. Once the decision is made by the Executive Management Team in the Presentation phase on which value alternatives to implement, an implementation plan is set out with details on actions, by whom and by when.		
Summary Evaluation			
This is intended to summarize the three criteria and their required elements. The NEDA evaluator is advised to use this part as a final compliance check.	The Value Analysis Report presented the following necessary elements: • Statement of project description and objective • Statement of standing, if any, of where the project stands relative to the country's overall strategic program. • Listing and certification of the Value Team Leader and team members • Function diagram with costs and allocations • Life-cycle costing summaries when appropriate. • Summary table of all short-listed alternatives indicating the risk profile and the cost associated with the development of each • Copy of each value analysis proposal with associated backup data (typically grouped by team and class of proposal) • Notes detailing pertinent comments of the design team and senior management team of the proponent agency		

Value Analysis Evaluation Framework	Compliance Guidance	Evaluator Notes	Assessment (Pass/Fail)
	• Endorsement by the head of the proponent agency, stating which proposals will be incorporated into the project, which will not, and for any proposals not incorporated, supported by a rationale for why or why not • Implementation plan demonstrating that the proponent agency has concrete next steps to implement the approved value alternatives		

6 Technical Annex C: Letters to a Proponent Agency for a Non-compliant or a Compliant Value Analysis Report

The purpose of this Technical Annex is to guide NEDA staff in preparing information that should be sent to the proponent agency after an evaluation of a value analysis report has been completed. There are three types of information that should be conveyed to the proponent agency — (1) whether the report is compliant or not (2) why a value analysis report fails to comply or does comply with NEDA requirements and (3) what needs to be done.

The guidance in this annex is useful to NEDA staff regardless of the type of value analysis report that is evaluated. Table 6.1 below shows the types of value analysis reports and the actions that NEDA staff should take after the evaluation is completed.

Table 6.1: NEDA staff action after evaluation of value analysis reports

Type of Value Analysis Report Evaluated by NEDA Staff	What NEDA staff should do	
	If the value analysis report is compliant	If the value analysis report is non-compliant
Value analysis report at the concept/options (pre-feasibility stage)	• Prepare letter advising the proponent that report is compliant and to proceed with next stage of project development • Note the proposal in own or office's monitoring database for future reference when the proponent submits the feasibility study for ICC evaluation	• Prepare letter advising proponent that report is non-compliant and that issues on report should be addressed • Attach matrix of evaluation showing specific issues and comments on the report
Value analysis report at the feasibility stage	• Prepare letter advising the proponent that report is compliant and that NEDA will proceed with full project evaluation. • Prepare the value analysis section of the ICC Project Evaluation Report. (See ICC Technical Annex D)	• Prepare letter advising proponent that: (1) report is non-compliant and that issues on report should be addressed; (2) full project evaluation on the feasibility study will not proceed until a revised value analysis report is submitted; and (3) the revised value analysis report must be found compliant by NEDA before full project evaluation on the feasibility study can be done.

Type of Value Analysis Report Evaluated by NEDA Staff	What NEDA staff should do	
	If the value analysis report is compliant	If the value analysis report is non-compliant
		• Attach write-up on evaluation showing specific issues and comments on the report
Value analysis report on project variations	• Prepare letter advising the proponent that report is compliant and that NEDA will proceed with full project evaluation. • Prepare the value analysis section of the ICC Project Evaluation Report. (See ICC Technical Annex D)	• Prepare letter advising proponent that: (1) report is non-compliant and that issues on report should be addressed; (2) full project evaluation on the variation proposal will not proceed until a revised value analysis report is submitted; and (3) the revised value analysis report must be found compliant by NEDA before full project evaluation on the variation proposal can be done. • Attach write-up of evaluation showing specific issues and comments on the report

Examples of letters and evaluation write-up are provided in this note.

- Example 1 – Letter to proponent agency for a value analysis study done at options stage that meets NEDA's criteria for acceptability
- Example 2 – Letter and evaluation write-up for a value analysis study done at options stage that does not meet NEDA's criteria for acceptability
- Example 3 – Letter to proponent agency for a value analysis study done at feasibility stage that meets NEDA's criteria for acceptability
- Example 4 – Letter for a value analysis study done on a feasibility study or variations proposals that does not meet NEDA's criteria for acceptability. The evaluation write-up would follow the content of Example 2.

Example 1

Letter to proponent agency for a value analysis study done at options stage that meets NEDA's criteria for acceptability

Date

Honorable XXX
Assistant Secretary for Planning
Department of Justice

Re: Evaluation of Value Analysis Report on Proposed "Rule of Law Project"

Dear Sir/Madam:

Thank you for submitting complete documentation on your proposal, the "Rule of Law Project". We received your project concept proposal and the supporting value analysis report last June XX.

We are pleased to inform you that the value analysis report was found to be compliant with the NEDA ICC requirements and supports the project concept that was proposed. In particular, we found that the value analysis report met the following three essential criteria for an acceptable value analysis report:

1. The study was led by a qualified and certified value specialist
2. The study was conducted by a qualified value analysis team
3. The study followed the basic Job Plan methodology of value analysis, consistent with internationally recognized standards and body of knowledge.

In this regard, we encourage the Department to proceed with your feasibility study. In addition, we also urge you to do another round of value analysis to confirm that the project design of your feasibility study team is the best value-for-money design.

We look forward to receiving your feasibility study and its supporting value analysis report for the proposed "Rule of Law Project."

Very truly yours,

Ruben S. Reinoso, Jr.

Assistant Director General

Example 2

Letter to a proponent agency for a value analysis study done at options stage that does not meet NEDA's criteria for acceptability

Date

Honorable XXX
Assistant Secretary for Planning
Department of Justice

Re: Evaluation of Value Analysis Report on Proposed "Rule of Law Project"

Dear Sir/Madam:

Thank you for submitting complete documentation on your proposal, the "Rule of Law Project". We received your project concept proposal and the supporting value analysis report last June XX.

We regret to inform you that the value analysis report was found to be non-compliant with the NEDA ICC requirements and does not support the project concept that was proposed. In particular, we found that the value analysis report did not meet the following essential criteria for an acceptable value analysis report.

1. The study was led by a qualified and certified value specialist
2. The study was conducted by a qualified value analysis team
3. The study followed the basic Job Plan methodology of value analysis, consistent with internationally recognized standards and body of knowledge.

In this regard, we encourage the Department to consider the issues discussed in the attached evaluation report before proceeding with your feasibility study. NEDA believes that these issues should be resolved to ensure that you have selected the right project for the need that you are trying to address.

Once you have addressed the issues, we would be pleased to receive a revised version of your value analysis report and re-evaluate it.

Very truly yours,

Ruben S. Reinoso, Jr.
Assistant Director General

Example 4

Letter to proponent agency advising on the results of NEDA evaluation of a value analysis study done either at feasibility study or variations stage that does not meet NEDA's criteria for acceptability

Date

Honorable XXX
Assistant Secretary for Planning
Department of Justice

Re: Evaluation of Value Analysis Report on Proposed "Rule of Law Project"

Dear Sir/Madam:

Thank you for submitting complete documentation on your proposal, the "Rule of Law Project". We received your feasibility study/variations proposal and the supporting value analysis report last June XX.

We regret to inform you that the value analysis report was found to be non-compliant with the NEDA ICC requirements and does not support the feasibility study/ variation proposal.

In particular, we found that the value analysis report did not meet the following essential criteria for an acceptable value analysis report: (Or, cite only the criterion that was not met by the report)

1. The study must be led by a qualified and certified value specialist
2. The study must be conducted by a qualified value analysis team
3. The study must follow the basic Job Plan methodology of value analysis, consistent with internationally recognized standards and body of knowledge.

In this regard, we encourage the Department to consider the issues discussed in the attached evaluation report. NEDA believes that these issues should be resolved to ensure that you have selected the right design/right variation for the proposed project.

NEDA recommends that the value analysis report be improved and resubmitted to the ICC for re-evaluation. NEDA will proceed with the complete project evaluation of your proposal once we receive and find acceptable your revised value analysis report. We look forward to hearing from you soon. Thank you.

Very truly yours,

Ruben S. Reinoso, Jr.
Assistant Director General

7 Technical Annex D: Revised Project Evaluation Report and Sample Write-up for a Compliant Value Analysis Study

This annex contains a revised Project Evaluation Report that illustrates how the evaluation of a value analysis study can be written up under Section I. Technical/ Market/Environmental Evaluation. The suggested adjustments to the format of the Project Evaluation Report are highlighted.

THE (REVISED) ICC PROJECT EVALUATION REPORT FORMAT

The Project Evaluation Report (PER) details the format of presenting the project to the ICC. It is divided into fourteen (14) sections:

A. Project's Historical Background

This section provides the milestones in project processing including highlights of previous ICC decision, where applicable, and the difficulties in securing ICC requisites.

B. Project's Sectoral Program Context

This section presents the following:

1. Brief overview of sector targets, existing programs and sectoral gaps based on existing master plans/sectoral programs;
2. How the proposed project addresses the needs, priorities and objectives of the sector;
3. The linkage of the proposal with other initiatives in the sector as well as related projects in other sectors.
4. The suggested format for presenting the summary of implementation schedule and program/project costs is:

Activity/Component	Year 1				Year N	TOTAL
Activity/Component	Foreign Source		Local Source		...	
Activity/Component	Foreign Cost*	Local Cost	Foreign Cost*	Local Cost	...	
TOTAL					...	

*Expressed in Foreign currency and Peso Equivalent

This section should also provide the source, financing terms and conditions including the computation of the grant element of the external financing source. It should also include the base year for costs and the exchange rate used, with appropriate referencing[8]. In addition, the choice of financing source should be clearly justified, i.e., a comparative analysis of financing alternatives.

C. Project's Regional and Spatial Context

This section indicates the geographical coverage of the proposed project and its linkage with other projects within the region and across the country. For area-specific projects, justification for the choice of area/s should be clearly stated. This may include, as annexes, location map and other relevant technical diagrams.

[8] The applicable exchange rate should be culled from the effective BSP reference rate at the time of evaluation.

D. Objective

This section states the problems that the project is designed to address. It may also state the extent to which the project intends to address the identified targets/gaps both spatially and sectorally. This should include, as annex, the validated project logical framework.

E. Project Description

This section presents the project's configuration and scope of works particularly a brief description of the components, the location and the areas of service/influence. This should clearly indicate the outputs of the project.

F. Project Cost and Financing

This section indicates the total cost (investment and operations and maintenance) broken down annually and by the following:

1. Activity and by project component;
2. Source (foreign and domestic funding); and,
3. Foreign and Peso cost requirement throughout the implementation period.

G. Institutional Arrangements

This section describes the institutional arrangements and cites the technical and financial capability and/or absorptive capacity of the implementing agents.

H. Implementation Schedule

This section presents the work program of the project, i.e., scheduled start and completion of project implementation.

I. Technical/Market/Environmental Evaluation

This section provides the results of the technical analysis on the selection of the alternatives, which have been identified to achieve the objectives of the project. Specifically, the technical analysis shall include findings on the acceptability of the value analysis study that was conducted by the proponent agency [9].

The analysis should include the appropriateness of proposed interventions that considers factors such as specific type of demand/market (i.e., market demand forecast) and possible adverse impact/s of the project.[10] Also, the analysis should include a review of the environmental impact of the proposed project design.

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[9] The ICC Project Evaluation Guidelines details the procedure for computing for the financial indicators.

[10] Whether the value analysis is conducted at the concept, design or variation stage of the project, a value analysis report must be submitted by the proponent agency to the NEDA for evaluation. NEDA's evaluation of any of these reports must be included in the technical analysis section of the PER. Typically, if a value analysis report on a proposed new project or project variation does not comply with the NEDA criteria, the proposal will not even be evaluated by NEDA until it is fully satisfied that the value analysis study underlying the proposal is acceptable and credible.

Sample write-up and table of findings:

The value analysis report was found to be compliant with the NEDA ICC requirements and supports the project concept that was proposed.

In particular, we found that the value analysis report met the following three essential criteria for an acceptable value analysis report:

1. The study was led by a qualified and certified value specialist
2. The study was conducted by a qualified value analysis team
3. The study followed the basic Job Plan methodology of value analysis, consistent with internationally recognized standards and body of knowledge.

Our specific findings are provided in the table below:

Value analysis Report Requisite Elements	Provided in the Report or Meets NEDA Criteria?
1. Statement of project description and objective	Yes; project information is very clear stated
2. Statement of standing, if any, of where the project stands relative to the country's overall strategic program	Yes; proposed project is top-ranked in the agency's MTPIP
3. Listing and certification of Team Leader and Members	Yes; needs only supporting copies of the certifications
4. Function diagram with costs and allocations	Yes; functions are clearly defined
5. Life-cycle costing	Yes; cost assumptions are based on industry standards and easy to verify
6. A summary table of all short-listed alternatives indicating the risk profile and the cost associated with the development of each alternatives	Yes; risk profiling is comprehensive
7. A copy of each value analysis proposal form with associated backup data	Yes
8. Notes detailing pertinent comments of the Design Team and senior management team of the implementing agency	Yes; comments of the FS/design team and management are well-documented
9. Endorsement by the head of the implementing agency, stating which proposals will be incorporated into the project, which will not, and for any proposals not incorporated, a rationale for why	Yes, endorsement is covered by a Board Resolution
CONCLUSION	The value analysis report provides sufficient information to confirm that the value analysis study has been conducted in a professional manner, is credible, and may be accepted as part of the ICC project approval process.

RECOMMENDATION	NEDA is confident that the proposed project or project variation (as described in the feasibility study or variation proposal) is the best value-for-money and right project design or project variation.

J. Financial Analysis

The financial analysis should determine the financial sustainability of the project and its overall success. This section contains the following:

1. Assumptions in estimating the financial indicators;
2. Financial indicators from the following perspectives: a total investment, equity/owner and, where warranted, budgetary. The indicators include financial internal rate of return (FIRR), weighted average cost of capital (WACC), net present value (NPV) and benefit-cost ratio (BCR) ; and
3. Sensitivity analysis using the following scenarios:
   - Case I: Increase in projected costs by 10% or 20%
   - Case II: Decrease in revenues by 10% and 20%
   - Case III: Combination of Cases I and II
4. Other measures of financial viability such as, but not limited to, cost effectiveness

K. Economic Analysis

The objective of economic evaluation is to ascertain the project's desirability in terms of its net contribution to the economic and social welfare of the country as a whole. This section contains the following:

1. Assumptions in estimating the economic indicators;
2. Economic indicators: economic internal rate of return (EIRR), weighted average cost of capital (WACC), net present value (NPV) and benefit-cost ratio (BCR); and
3. Sensitivity analysis using the following scenarios:
   a. Case I: Increase in projected costs by 10% or 20%
   b. Case II: Decrease in revenues by 10% and 20%
   c. Case III: Combination of Cases I and II

L. Social Analysis

Social analysis is conducted to determine if a project is responsive to national objectives of poverty alleviation, employment generation and income redistribution. This section identifies the target beneficiaries and affected groups, and the project's social impact on these groups. This may also include a discussion on social dimensions such as gender and socio-political issues involved.

M. Issues

This section highlights the issues that may hamper the implementation of the project, e.g., inconsistencies with existing laws, policies, guidelines and procedures. It also presents a summary of substantive adverse findings on the overall evaluation of the project as well as pending ICC requisite documents.

N. Recommendation

This presents the recommendation of the Secretariat regarding the project including the conditionalities, if any. In reviewing ongoing projects, the above-cited PER format will be adopted but not limited to (refer to PMS Manual on Project Monitoring). On the other hand, the PER format for BOT projects includes other elements (i.e., information on parametric formula, tariff setting, risk sharing, among others).

Appendix H

SAVE International Value Standard and Body of Knowledge

VALUE STANDARD
and
BODY OF KNOWLEDGE

June 2007

SAVE International
The Value Society

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SAVE International gratefully acknowledges the VP Education team and, in particular, Fred Kolano, (SAVE International Director of Standards and Resources), Randall Sprague, and Dr. Roy Woodhead for their contributions and additions to the original standard developed by the Paul Revere Chapter and John W. Bryant in May, 1997.

Foreword

This Standard was originally drafted in May 1997. It has been updated periodically to address changes in the business environment and technology and to meet future integration with the International Standards Organization. The *Value Standard* is intended to provide a practical guide for applying the principles of the value methodology in a consistent manner. It may be used by both practitioners and management.

The value methodology can be applied to a wide variety of applications, including industrial or consumer products, construction projects, manufacturing processes, business procedures, services, and business plans.

The value methodology is commonly applied under the names Value Analysis (VA), Value Engineering (VE), and Value Management (VM). These terms can be used interchangeably with value methodology throughout the standard and this document. Other value improvement processes also qualify as value studies as long as they adhere to the Value Standard's Job Plan and perform Function Analysis as part of their total process.

This Standard has been prepared by the SAVE International Standards and Resources Director, a member of the SAVE International's Vice President of Education's team. It is approved by the SAVE International Certification Board and the SAVE International Board of Directors. It seeks to state the *minimum* that clients and providers should expect when the value methodology is applied to a project.

This Standard will assist managers, value program managers, practitioners, and trainers in applying value methodology in their organizations in a consistent, standard manner. It may also assist those who procure value methodology services to develop proposal requests that ensure they receive complete and useful value methodology services.

The nomenclature used throughout this Value Standard and Body of Knowledge is as follows:

Value Study -- The overarching objective of a value study is to improve the value of the project.

Job Plan – Provides the structure for the Value Study which is part of a three-stage process (see Figure 1, page 12):

1. Pre-Workshop preparation
2. Value Workshop which applies the Six Phase Job Plan (see page 6)
3. Post-Workshop documentation and implementation

Value Methodology – Provides the process and structure that is used to apply the Value Job Plan used in the Workshop.

Value Standard – Establishes the specific six-phase sequential Job Plan process and outlines the objectives of each of those phases. It does not standardize the specific activities that are used to accomplish each phase.

Value Standard

Purpose and Scope of the Standard

The purpose of this document is to:

1) Define the steps and components that constitute a valid Value Study.

2) Document supporting information that defines a generic methodology, common terminology, and standard practice to guide practitioners and managers in effectively applying value methodology to improve the value of their projects.

3) Guide the practitioner and manager in determining at what point to apply value methodology to a project in order to maximize:
   a. the benefits of team innovation skills and
   b. implementation of alternative(s) that add value to the project.

This document may be used by both practitioners and managers as a guide for applying value methodology.

The Value Standard allows for the tailored application of value methodology and related practices to suit the intended application.

The Value Standard has not been prepared as a legal document. If the user intends to use the Value Standard for procurement purposes the user should consult expertise familiar with contract language, including seeking legal guidance.

Users of the Value Standard should be aware that some governing bodies require that value engineering facilitator hold specific licenses or other credentials not identified by the Value Standard. If so, the user should identify such considerations when soliciting and contracting for value methodology services.

A Value Study is the formal application of a value methodology to a project in order to improve its value. This application is also referred to as value engineering, value analysis, value planning, or value management. For purposes of this standard, the subject of a Value Study whether it is a product, process, procedure, design, or service will be referred to as the "project."

The Value Standard

The value methodology is a systematic process that follows the Job Plan. A value methodology is applied by a multidisciplinary team to improve the value of a project through the analysis of functions.

The Job Plan consists of the following sequential phases. (See Figure 1, page 13):

1. **Information Phase**
   The team reviews and defines the current conditions of the project and identifies the goals of the study.
2. **Function Analysis Phase**
   The team defines the project functions using a two-word active verb/ measurable noun context. The team reviews and analyzes these functions to determine which need improvement, elimination, or creation to meet the project's goals.
3. **Creative Phase**
   The team employs creative techniques to identify other ways to perform the project's function(s).
4. **Evaluation Phase**
   The team follows a structured evaluation process to select those ideas that offer the potential for value improvement while delivering the project's function(s) and considering performance requirements and resource limits.
5. **Development Phase**
   The team develops the selected ideas into alternatives (or proposals) with a sufficient level of documentation to allow decision makers to determine if the alternative should be implemented.
6. **Presentation Phase**
   The team leader develops a report and/or presentation that documents and conveys the adequacy of the alternative(s) developed by the team and the associated value improvement opportunity.

In order to qualify as a Value Study, the following conditions must be satisfied.

A. The Value Study Team follows an organized **Job Plan** that includes, at a minimum, the six phases identified in this standard. **Function Analysis**, as defined in this document, is performed on the project.

B. The Value Study Team is a **multidisciplinary group** of experienced professionals and project stakeholders. Team members are chosen based on their expertise and experience with the project. Sometimes individuals who have relevant expertise; but are not directly involved with the project are added to provide a different point of view.

C. The **Value Team Leader** is trained in value methodology techniques and is qualified to lead a study team using the Job Plan. The SAVE International Certification Board certifies, with the designation Certified Value Specialists (CVS), those individuals who have met specified training requirements and have demonstrated competency in the application of the Job Plan. The Team Facilitator shall be a CVS, or a VMP serving under the guidance of a CVS as defined by SAVE Certification criteria, or shall be the holder other active certification recognized by SAVE International.

Body of Knowledge

The information contained in this Body of Knowledge is a general guideline and is not meant to be either fully inclusive or exclusive of all possible techniques. Differences in the application of techniques used to accomplish VE Phases will be based on the nature of the project and the preference of the value practitioner.

History of the Value Methodologies

Value Analysis was conceived in the early 1940s by Lawrence D. Miles while he was employed by General Electric, a major defense contractor which was facing the scarcity of strategic materials needed to produce their products during World War II. Mr. Miles realized that if value and related innovation improvements could be systematically "managed," then General Electric would have a competitive advantage in the marketplace. With that in mind, Mr. Miles accepted the challenge and devised the function analysis concept, which he integrated into an innovative process he later termed value analysis.

Mr. Miles understood that products are purchased for what they can do—either through the work they perform or the pleasing aesthetic qualities they provide.

Using this as his foundational information, he focused on understanding the function of the component being manufactured. He questioned whether the design could be improved or if a different material or concept could achieve the function.

To focus on the function itself, he used an *active verb* and a *measurable noun* in combination to characterize the *benefit* that a part's function provides. He then searched for other ways or methods to achieve the benefit of that intended function. From this research, function analysis, the key foundation of value methodologies, was developed and has become a tool to help individuals and teams manage the way a concept is understood.

These specialized teams typically address project-related issues such as increased sales revenue, improved product performance, and reduced resource usage.

The U.S. Army and Navy, and other companies, soon realized the success of Larry Miles' methods. As the application of value analysis expanded, there was also a change in context—from review of existing parts to improving conceptual designs. This was one of two factors that marked the emergence of value engineering. The other was a desire by the U.S. Navy to use the Value Analysis techniques for project improvement in the early 1950s when there was a moratorium on hiring "analysts." Since engineering positions were available, individuals practicing this new discipline were employed as "Value Engineers."

As the value methodology gained in popularity, a group of practitioners formed a learning society to share insights and advance their innovative capabilities. Thus, in 1959, the "Society of American Value Engineers" was incorporated in Washington, DC.

Soon, the value methodology was used to improve the value of projects in government, the private sector, and the manufacturing the construction industries and value concepts spread worldwide.

Concurrent with this growth, a number of other value improving tools, techniques, and processes emerged, many of which were complementary to and were integrated with the value concepts. In an effort to attract the developers and practitioners of these emerging methods to our membership, the name of the society was changed to "SAVE International" in 1996.

Overview

The value methodology is a systematic process used by a multidisciplinary team to improve the value of a project through the analysis of its functions. Value is defined as a fair return or equivalent in goods, services, or money for something exchanged. Value is commonly represented by the relationship:

Value ≈ Function/Resources

where **function** is measured by the performance requirements of the customer and **resources** are measured in materials, labor, price, time, etc. required to accomplish that function. A value methodology focuses on improving value by identifying alternate ways to reliably accomplish a function that meets the performance expectations of the customer.

Function Analysis is the foundation of a value methodology and is the key activity that differentiates this body of knowledge from other problem-solving or improvement practices. During the Function Analysis Phase of the Job Plan, functions are identified that describe the work being performed within the scope of the project under study. These functions are described using two word, active verb/measurable noun pairings, for example one function of a hammer is to *apply force*. The team reviews the project's functions to determine those that could be improved. These may be project functions that seem to be performed inefficiently or with more than expected cost. These functions become the focus of the value methodology team in their endeavor to improve the project.

> Value is defined as a fair return or equivalent in goods, services, or money for something exchanged.

The identification and naming of project functions enables clear thinking by limiting the description of a function to an *active verb* that operates on a *measurable noun* to communicate what work an item or activity performs. This naming process helps multidisciplinary teams build a shared understanding of the functional requirements of the project and, as a result, it allows them to identify where opportunities for value improvement exist in the project.

Function analysis can be enhanced through the use of a graphical mapping tool known as the *Function Analysis System Technique* (FAST), which allows team members to understand how the functions of a project relate to each other.

A fundamental tenet of a value methodology is that basic functions (the necessary purpose of the project) must be preserved. This is because the basic function reveals the usefulness of the project and the reason for its existence. For example, the basic function of a wristwatch could be "indicate time." Other secondary functions support the basic function. These secondary functions typically provide esteem, dependability, or convenience value for the user. An example is a gold watchcase that performs an aesthetic function which pleases both customers and those whom they want to impress.

The value methodology is applied using a process known as the "Job Plan." The purpose of the Job Plan is to guide the Study team through the process of identifying and focusing on key project functions in order to create new ideas that will result in value improvements.

While a Value Study is guided by the function-based Job Plan, it can be further supported by many commonly used business improvement techniques (See Activities section for examples).

Applicability

Value methodologies can be applied during any stage of a project's development cycle, although the greatest benefit and resource savings are typically achieved early in development during the conceptual stages. At this point, the basic information of the project is established, but major design and development resources have not yet been committed. The reason this is the best time to apply a value methodology is because the manner in which the basic function of the project is performed has not been established, and alternative ways may be identified and considered.

Examples of these applications are:

- *Construction projects* could benefit by identifying improvements for various project phases: concept development, preliminary design, final design, procurement and construction.
- *Manufactured products*, whether consumer, industrial, or defense, may be studied with a focus on either the design or manufacturing process of that product. A product may be the subject of a value study at any time during the product's life. A value study can be applied at the onset of the product development to better understand the customer's needs, identify the functions necessary to satisfy those needs, and develop the initial concept. Throughout the design development, value methodology can be used to refine and enhance the concept, based on the latest facts. Even after a product has been introduced and is in production, a Value Study can be used to further enhance the product and respond to changing customer and economic conditions.

  A value methodology can be used to either develop new ways to manufacture a product or change an existing process.
- *Business systems and processes* may also be the subject of Value Studies. Many elements of a business or an organization may be improved through the application of a value methodology. This may be from the development of business plans and organizational studies to improving existing business processes.
- *Service organizations* can benefit from the use of value methodologies. In the past value methodologies have been used to improve processes and procedures in the medical industry (operating rooms, emergency rooms, etc.) and the legal system (police systems).

Value methodologies may be applied more than once during the life of the project. Early application of a value methodology helps to get the project started in the right direction, and repeated applications help to refine the project's direction based on new or changing information. The later a Value Study is conducted in project development, more likely implementation costs will increase.

A value methodology may be applied as a quick response study to address a problem or as an integral part of an overall organizational effort to stimulate innovation and improve performance characteristics. Value methodologies may be used to enhance an organization's quality programs, new product development activities, manufacturing processes, and architectural and engineering design.

Study Duration

A value study generally encompasses three stages. (See Figure 1, page 12):

1. Pre-Workshop (Preparation)
2. Workshop (Execution of the six phase Job Plan)
3. Post-Workshop (Documentation and Implementation)

The duration for executing the Job Plan in a value study depends on several factors: the size and complexity of the project, the stage of project development, the estimated cost of the project, etc.

A typical duration for the Workshop Stage is five-days, which does not include the Pre-Workshop and Post-Workshop efforts.

Projects with a concise scope or a low level of complexity may be performed in less time. Sufficient time should be allotted to adequately apply the value methodology process and document the team's findings. Shortening the time needed to execute the Job Plan phases may result in a less-than-optimal result.

Projects of very large scope or complexity may require 10-15 days or more to achieve the study's objectives. Consideration of these factors is important to ensure that the proper time is allocated and needs to be addressed as part of the upfront planning for a value study.

Job Plan Techniques

The value methodology is a structured, disciplined procedure aimed at improving value. That procedure is called the **Job Plan**. The Job Plan outlines sequential phases to be followed which support team synergy within a structured process, as opposed to a collection of individual opinions. The activities conducted during each phase of the Job Plan will stimulate the team to identify ideas and develop them into alternatives to the original concept or design.

The team and the project stakeholders should identify and understand the project's basic and secondary functions. Basic functions must be maintained, otherwise the intended study goals will not be accomplished.

Secondary functions are analyzed and evaluated with regard to their contributions to the project objectives. By making functionality explicit (via function analysis and FAST), organizations can manage innovation to provide a sustainable competitive advantage that leads to success.

Figure 1 illustrates the Job Plan process flow. Each of the Job Plan phases must be performed in sequence because each phase provides information and understanding necessary for the successful execution of the next phase. As the team gains additional knowledge about the project, a previous phase may be revisited.

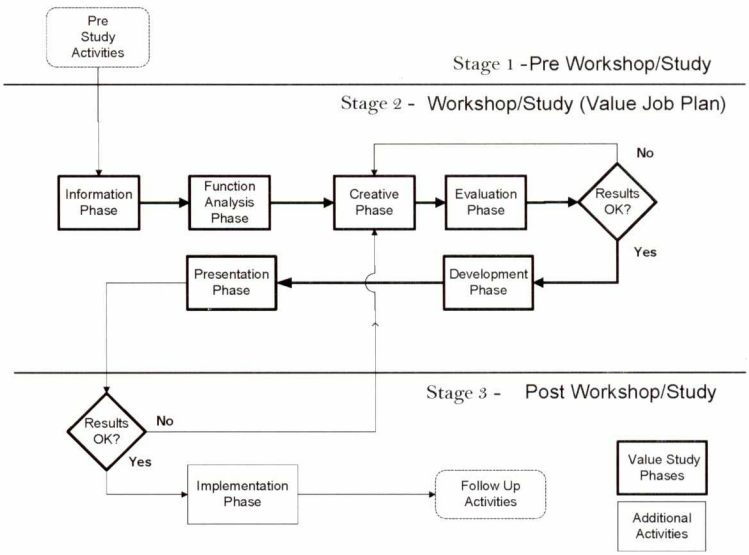

Figure 1.
Value Study Process Flow Diagram

Workshop Activities

The standard Three-Stage of Pre-Workshop, Workshop and Post-Workshop; and Six-Phase Workshop Job Plan Activities; are described on the following pages with related activities and suggested tools and techniques.

Pre-Workshop Activities

Purpose:
Plan and organize the Value Study

Fundamental Question:
What has to be done to prepare for a Value Study?

Common Activities:

- Obtain senior management concurrence and support of the job plan, roles, and responsibilities.
- Develop the scope and objectives for the Value Study
- Obtain project data and information
- Obtain key documents such as scope of work definition, drawings, specifications, reports, and project estimate
- Identify and prioritize strategic issues of concern
- Determine the scope and objectives of the study
- Develop the study schedule
- Undertake competitive benchmarking analyses
- Identify Value Team members
- Obtain commitment from the selected team members to achieve the project objectives
- Review the project costs
- Gather appropriate customer/user information about the project
- If appropriate, invite suppliers, customers, or stakeholders to participate in the Value Study
- Distribute information to team members for review
- Develop informational models and diagrams about the project
- Determine the study dates, times, location and other logical needs
- Clearly define, with senior management, the requirements for a successful Value Study results

Typical Outcome:
The desired outcome is a clear understanding of what senior management needs to have addressed, what the strategic priorities are, and how improvement will increase organizational value. It is during this phase that a view is formed as to whether subsequent phases are likely to yield sufficient value to justify the cost of the study within the terms set. It may be appropriate to increase or decrease study parameters at this time. Team members are knowledgeable of and committed to achieve the project's objectives.

Workshop (Job Plan) Activities

Information Phase

Purpose:
Understand the current state of the project and constraints that influenced project decisions.

Fundamental Question:
What is really going on in the tactical and operational contexts?

Common Activities:

- Obtain project data and information and key documents such as scope of work definition, drawings, specifications, reports, detailed project cost information, quality data, marketing information, process flow charts, etc.
  Tools: Quality Function Deployment, Voice of Customer
- Identify and prioritize strategic issues of concern. Further define the scope and objectives (management expectations) of the study
  Tools: SWOT (Strengths, Weaknesses, Opportunities and Threats); Project Charter
- Project Team presents the original and/or present design/product/process concepts
- Perform competitive benchmarking analysis
  Tools: Benchmarking, Tear Down Analysis, Pareto Analysis, Design for Assembly
- Determine the study schedule; dates, times, location and other logistical needs
- Distribute information about the project for team member review
- Understand project scope, schedule, budget, costs, risk, issues, non-monetary performance.
- Confirm the most current project concept
- Identify high-level project functions
- Visit site or facility
- Confirm success parameters

Typical Outcome:
This phase brings all team members to a common, basic level of understanding of the project, including tactical, operational, and specifics of the subject. The functional understanding establishes the base case to identify and benchmark alternatives and mismatches and set the agenda for innovation.

Function Analysis Phase

Purpose:
Understand the project from a functional perspective; what must the project do, rather than how the project is currently conceived.

Fundamental Question:
What are the functions and how are they related?

Common Activities:

- Identify the project functions (team format strongly encouraged)
  Tools: Random Function Identification
- Classify project functions
- Develop function models
  Tools: Function Analysis System Technique (FAST), Function Tree
- Dimension the model with cost drivers, performance attributes and user attitudes to select value mismatched functions to focus the creativity phase
  Tools: Cost to Function Analysis

(Function Matrix), Failure Measurement Error Analysis (FMEA), Performance to Function Analysis, Relate Customer Attitudes to Functions
- Estimate worth of functions to select value-mismatched functions on which to focus the creativity phase.
  Tools: Value Index (function cost/function worth)

Typical Outcome:

This phase focuses the team on validating that the project satisfies the need and objectives of the customer. It provides a more comprehensive understanding of the project by focusing on what the project does or must do rather than what it is. The team identifies value-mismatched function(s) on which to focus in order to improve the project.

Creative Phase

Purpose:

Generate a quantity of ideas related to other ways to perform functions

Fundamental Question:

How else may the functions be performed?

Common Activities:

- Conduct creative warm-up exercises
- Establish rules that protect the creative environment being developed
  Tools: Creativity "Ground Rules"
- Employ group idea stimulation techniques
- Generate alternate ideas that may improve value.

  Tools: Brainstorming, Gordon Technique, Nominal Group Technique, TRIZ, Synetics

Typical Outcome:

The team develops a broad array of ideas that provide a wide variety of possible alternative ways to perform the function(s) to improve the value of the project.

Evaluation Phase

Purpose:

Reduce the quantity of ideas that have been identified to a short list of ideas with the greatest potential to improve the project

Fundamental Question:

Of all these ideas, which are worth spending quality time to further develop?

Common Activities:

- Clarify and categorize each idea to develop a shared understanding
- Discuss how ideas affect project cost, and performance parameters.
  Tools: T- Charts
- Select and prioritize ideas for further development
  Tools: Pugh Analysis, Kepner-Tregoe, Life Cycle Costing, Choosing by Advantages (CBA), Value Metrics
- Explain how ideas are to be written as stand-alone risk-reward investment proposals

Typical Outcome:

The team produces a focused list of concepts that warrant quality time to develop into value-based solutions that can be implemented into a project or a project feature.

Development Phase

Purpose:

Further analyze and develop the short list of ideas and develop those with merit into value alternatives.

Fundamental Questions:

What is an informed description of each selected idea? What is the rationale for making this change? Which ones are mutually exclusive and are independent?

The selected ideas are developed into value alternatives that are clearly written so that the owner and other project stakeholders understand the intent of the alternative and how it benefits the project. Write-ups also identify any potential negative factors associated with the alternative. The alternative should include text, sketches, diagrams, assumptions, supporting calculations, vendor information, cost comparison work sheets, and other information which may be necessary to convey the intent of the alternative. The text should also identify other alternatives which may be enhanced or complemented by acceptance of an alternative. Issues addressed include reliability, customer convenience, quality control, capital cost, O&M cost, life cycle cost, schedule, risk, availability, political ramifications, and perception. Ideally, an action plan is developed for each alternative. The action plan should, at a minimum, include what needs to be done, who will do it, and when it will get done.

Common Activities:

- Compare the study conclusions to the success requirements established during the *Information and Function Analysis Phases*
- Prepare a written value alternative for each idea selected for further development
- Assess and allocate risk judgments and costs, where appropriate
- Conduct cost-benefit analysis
- Generate sketches and information needed to convey the concept
- Confirm that an alternative should be further developed
- Finish initial alternative development
- Develop an action plan to define implementation steps, dates, and responsibilities for each value alternative

Typical Outcome:

The Value Study team creates alternatives and low-, medium-, and high-risk scenarios and offers these alternatives to senior management as options that address the Pre-Workshop strategic objectives.

Presentation Phase

Purpose:

Present value alternatives to management team and other project stakeholders or decision makers.

Fundamental Question:

How can we help the project team and senior managers make more informed decisions so that they can select ideas that fit their strategic plans?

Common Activities:

- Prepare presentation and supporting documentation
- Compare the study conclusions to the success requirements established during the Information and Function Analysis Phases

- Offer to management "risk-reward" innovation scenarios to select value alternatives for implementation
- Exchange information with the project team
- Ensure management has full and objective information upon which they can make decisions
- Outline an anticipated implementation plan
- Prepare formal report

Common Value Study products include a briefing document, risk analysis; cost vs. worth comparisons; Present worth analysis; advantages vs. disadvantages

Typical Outcome:

Ensure management and other key stakeholders understand the rationale of the value alternatives. Also generate interest to sanction implementation.

Post-Workshop Activities

Implementation Activities

Purpose:

Ensure accepted value alternatives are implemented and that the benefits projected by the Value Study have been realized.

Fundamental Question:

What are the program changes, and how will the project team manage them?

Following delivery of the value study preliminary report, management and the project team should consider and agree upon the value alternatives to be implemented and then *how* and *by when* the implementation will occur. In some instances, additional study and information may be required. Implementation of alternatives is the responsibility of management with assistance from the project and value teams.

Common Activities:

- Review the preliminary report
- Conduct an implementation meeting to determine the disposition of each value alternative.
- Establish action plans for those alternatives accepted and document the rationale for the rejected alternatives
- Obtain commitments for implementation
- Set a timeframe for review and implementation of each value alternative
- Track value achievement resulting from implemented alternatives
- Sign off deliverables
- Validate benefits of implemented change
- Ensure that new practices become embedded by establishing and managing an implementation plan

Typical Outcome:

The project stakeholders determine what will be changed in the project as a result of the Value Study. These are changes to the original concept or base case of a study, resulting from the value alternatives, that the project development will incorporate in future design or product development activities.

Value Study Follow-Up Activities

Purpose:

Follow up on implementation of the Value Study results and improve the application of a value methodology for future studies.

Fundamental Question:

What have we learned about how best to create or improve value of the subject under study?

Common Activities:

- Prepare a report of the results of the study, lessons learned, or other items to be recorded and/or tracked through implementation
- Identify where opportunities were missed
- Identify roadblocks to innovation and understand why they existed
- Debrief and record lessons learned
- Integrate Value Study results into organization's lessons learned or program reporting

- Reflect on the value study and consider how the experience has developed new capabilities

Typical Outcome:

Individuals become better value creators by reflecting on theories they held before the value study, comparing the way things turned out, and ascertaining how that knowledge affects the way they believed their own theories in the first place. This is a key step in learning what will help the organization become better at managing innovation.

Roles and Responsibilities

Management

The aim of a value methodology is to increase organizational value through a union of strategy, tactics, and operations with emphasis on "customer need," cost effectiveness, and/or profitability. The link between the Value Study and the organization is the role of management in value improvement. Two key management roles exist: Senior Management and the Value Manager.

Senior Management responsibilities are to provide clear leadership and make strategic expectations explicit in a purposeful and prioritized manner. Senior management should understand the potential benefit from a Value Study, approve the expenditure of resources necessary to support the study, and guide the implementation for approval of required funding necessary to realize the recommendations.

The roles and responsibilities of the Value Manager (an organization's designated manager of value) vary throughout the life of the project. At all times the Value Manager should confirm that value methodology activities are coordinated and performed effectively in order to meet the goals and objectives of the organization. A value methodology can be used throughout project development with a different focus at each stage.

At the conceptual stage, a value methodology can be used to determine the cost versus the worth of basic project functions. At this early stage it is the Value Manager's responsibility to ensure that all parties who have a vested interest in the project participate in the Value Study, including suppliers, customers, clients, end users, and possibly outside interests, in order to gain the total perspective of real 'needs' vs. 'wants' so as to provide the maximum value for the project being studied.

As the project approaches the design phase, a value methodology focuses more on the functions of each element or component within the detailed design, with the results of function analysis and creativity being more limited since resources have been allocated and money spent. It is senior manager's responsibility during a Value Study at this stage of the project to assess which value alternatives are economically feasible based upon the requirements of the customer or client.

The roles and responsibilities of the **Value Manager** vary throughout the life of the project.

As a project moves into the implementation phase (construction or production), a value methodology process works to ensure changes are made. Although many projects can still benefit from a Value Study at this stage of a project, it is the responsibility of the Value Manager to encourage early involvement of the organizations that are affected by the changes to ensure the maximum benefit for any Value Study. For any given project, it is important that the senior management team be made aware that the earlier a Value Study can be performed, the more potential benefit there will be for the client or customer.

Another role of the Value Manager is to ensure that the proper amount of Pre-Workshop activities take place prior to any Value Workshop. These Pre-Workshop activities may not need the attention of the whole team. However, a successful Value Study is unlikely without proper planning and information sharing so all interested parties have a clear understanding of the purpose and details of the project. This, again, is the responsibility of the Value Manager in charge of the project. If these details are properly communicated with the clients and customers involved, the potential for a successful Value Study is greatly increased.

Executive Review Board: Senior managers set the initial strategic goals for the Value Study and, at a later date, decide which outputs will be invested so they can be implemented. These managers do not always participate in the day-to-day working of the Value Study but are part of the overall value program.

Sometimes managers are designated as Sponsors or Champions to support a value study and/or the value program within an organization.

Technical Champions: Those members of the Value Study team who are selected because of their technical expertise.

Value Team Members

Value Team members are expected to participate in a Value Study in the following ways:

- Participate in all meetings
- Gather information as requested
- Analyze information
- Identify functions
- Contribute ideas
- Evaluate ideas using their experience and expertise
- Develop alternatives
- Present results

Team Members' Responsibilities

1. Keep accurate notes as assigned by team leader
2. Consult with team leader on any problem that may handicap progress
3. Show respect through timely attendance
4. Share workload equally whenever possible
5. Be willing to admit if they don't know; but strive to get the answer. Don't be afraid to make mistakes
6. Stay focused - avoid tangents - follow the basic problem-solving steps and get help from Value Team Leader on what techniques may be most suitable for the particular problem
7. Don't waste time discussing whether or not a step should be used; do it and evaluate it all after the entire workshop
8. Understand the approach being taught and its purpose, including the reason for each step and the technique being applied
9. Do the job together as a team. Don't force individual solutions - sell them! Remember, there can be more than one solution to a problem
10. Be a good listener; don't cut people off and don't second guess what other people are going to say and what they are thinking
11. Bring all data that bears on the problem – some objective, some subjective. Keep an open mind and don't be a roadblock
12. Be enthusiastic about the project and what it is that you are doing

13. Do not attempt to take over as a Team Leader – be as helpful as possible. Remember, the leader already has a difficult job in trying to guide, control and coordinate the overall effort

Team Leader

The Value Team Leader will plan, lead, and facilitate the Value Study. Other key responsibilities are noted below.

This individual is also expected to have numerous skills and experience that are listed in Key Competencies for Value Practitioners (See Key Competencies for Value Practitioners). To ensure that the Team Leader is trained and qualified to lead the team, that person shall be a CVS (Certified Value Specialist) as certified by SAVE International, or equivalent, as defined elsewhere in this Standard.

Team Leader's Responsibilities

1. Ensure proper application of a value methodology and follow the Job Plan
2. Guide the team thorough the the activities needed to complete the pre-study, the Value Study and the post study stages of a Value Study.
3. Delegate responsibilities as appropriate
4. Schedule follow-up team meetings and prepare the agenda
5. Keep team focused on specific topic
6. Keep team members involved in the discussion and the work that needs to be done
7. Keep all team members together whenever possible. It is desirable that everyone breaks together, to maintain team continuity
8. Be a catalyst to keep team moving and motivated. Be diplomatic; not dictatorial.

Standard Revision Process

The SAVE International *Value Standard* is intended to provide a practical guide to apply the principles of a value methodology in a consistent manner. It may be used by both practitioners and management.

The Value Standard, originally drafted in May 1997, has been through a process of periodic updates to address changes in the business environment and technology, and to meet future integration with the International Standards Organization. Prior to 2007, a formal process for reviewing and updating the Standard did not exist. As part of the 2007 Value Standard update, the following process was developed and adopted to address future updates.

Standard Responsibility

The SAVE International Director of Standards has the primary responsibility for managing the review process and updating the Value Standard and Body of Knowledge. The Director of Standards appoints and maintains a Standards Review Team of experienced practitioners, one member of which (excluding the Director) should be a Fellow of SAVE International who is actively practicing a value methodology full time. Another member will be a member of the Certification Board. The team shall have a minimum of three members (including the Director of Standards) and a maximum of seven members. This team will perform a review of the document and recommend improvements/changes to the Board of Directors.

The Standard and Body of Knowledge will be reviewed for possible updating every four years, concurrent with the installation of a new SAVE International President. The Director of Standards and the Standards Review Team will review the current Standard and report to the Executive Board any actions necessary to update the Standard. This action will be completed by the fall Board of Directors Meeting following the installation of the new President.

SAVE International members in good standing can, at any time, provide the Director of Standards with a written request to modify or update the Value Standard or Body of Knowledge. When this occurs, the Director of Standards and the Standards Review Team will review the request and provide a recommended plan of action to the Board of Directors.

Once the Board of Directors approves an action to update the Value Standards and Body of Knowledge, the following process will be used to amend the wording or content of this document:

1. The Board of Directors approves the specific areas of the Value Standards and Body of Knowledge to modify.

2. The membership of SAVE International is notified of the scope of changes under review via *Interactions*, a magazine published by SAVE International. The membership will direct all comments to the Director of Standards.

3. The Director of Standards may add up to a total of seven members to the Standards Review Team in order

to ensure the proper expertise is present on the team to develop the changes.

4. The Director of Standards and the Standards Review Team will:

    a. Develop specific changes to the Standards to address the areas approved by the SAVE Board.

    b. Review the rest of the Standard to ensure that the changes do not conflict with the rest of the document.

5. A Board of Director's Oversight Team comprised of the President, Executive Vice President, and VP of Education will review, provide comments, and issues a preliminary approval of the change.

6. Once the Oversight team has approved the changes, the changes will be submitted to the Certification Board, whose members will review, provide comments, and approve the changes.

7. Any changes recommended by the Certification Board are to be agreed to by the Director of Standards, Standards Review Team, and Board Oversight Team before the changes are taken to the SAVE International Board for final approval

8. The SAVE International Board of Directors will review, provide comments, and issue the final approval of the change after any comments are addressed. Any changes made by the SAVE International Board of Directors will be resubmitted to the Certification Board for approval.

9. If, after going through this process, full agreement has not been reached, a special committee will be formed to resolve this issue. This committee, chaired by the President and comprised of the Certification Board Chair, the Executive VP, the VP of Education, the Dean of the College of Fellows, and the Director of Standards, will resolve any disputes.

10. Final revision will be posted on the SAVE International website followed by membership notification of the change.

Key Competencies for Value Practitioners

A Value Practitioner should understand the following principles and be able to effectively communicate them to management and team members. Mastery of these competencies will help ensure effective leadership of a wide range of multidisciplinary Value Study teams.

Value Principles

- Historical development of the Value Methodologies
- The relationship between an organization's strategies and a value methodology
- Fundamental value principles, methods, and job plans
- The relationship between value, functions, and solutions
- Function analysis
- Types of value
- Value drivers (e.g., cost, schedule, quality, risk, user attitudes etc.)
- Investment appraisal techniques
- Key thought-provoking questions

Value Job Planning

- Major phases and activities in a Value Job Plan
- Purpose and objectives of each phase of the job plan
- Overview of techniques in a typical job plan

Strategic Problem/Opportunity Framing

- Reviewing the business case
- Discounted cash flow modeling
- Analysis through key financial ratios
- Strategic models, decisions, choices, and uncertainties
- Identification of causal relationships and their modeling
- Identification of attributes and value drivers
- Analysis of performance attributes (non-monetary factors that affect value)
- Defining the base case and benchmarking
- Determining whether the remaining phases of the value study can justify the client's investment or whether what they have is good, as understood within the terms and references used

Function Analysis

- Purpose and need
- A "thing", "process", "product" or "project" and their functions

- Defining functions with active verb and measurable noun context
- Function classification
- Levels of abstraction
- Function Analysis System Technique (using how-why logic)
- If-Then and Caused-By logic flows of classical and technical FAST models, often termed "When"
- The differences among various FAST diagrams and models (customer, technical, classical, hierarchical)

Function, Performance, Worth, Cost and Customer Attitude

- Purpose and need
- Cost as resource expenditure
- Performance-to-cost relationships hitchhiking
- Cost-to-worth relationships
- Cost-to-function allocation
- Function worth identification and understanding
- Cost-value relationships
- Cost-value mismatches
- Pareto analysis of major cost drivers

Creativity

- Purpose and need
- Managing divergent thinking
- Brainstorming techniques
- Unrestricted idea generation
- Large quantity of ideas is the goal
- Suspending judgment until the evaluation phase
- Other idea generation techniques

Evaluation

- Purpose and need
- Managing convergent thinking
- Building greater understanding of other people's ideas
- Evaluation methods and techniques

VM Study Recommendation Documentation

- Document the key information related to a Value Study recommendations
  - Original Concept
  - Proposed Change
  - Discussion of benefits of the change
  - Cost impact analysis
  - Sketches
  - Implementation considerations
  - Follow-up actions
- Investment appraisal
- Technical implementation feasibility
- Political implementation feasibility
- Initial and subsequent revenue impacts

- Initial and subsequent cost impacts
- Initial and subsequent schedule impacts
- Life cycle cost analysis
- Initial and subsequent impacts on other key attributes
- Sketches and other communication aids

Presentation

- Purpose and need
- The relationship between a value methodology and the needs of senior management decision makers
- Presentation skills
- Content organization
- Implementation plan
- Change management strategies
- Explanation of value tracking process

Management of Value Programs

- Management roles and responsibilities
- Reporting responsibilities
- Establishing links between Value Study outcomes and organizational results
- Value training
- Facilitation skills training
- Organizing and implementing Value programs
- Team Leader skill development
- Strategic diagnosis and problem/opportunity identification techniques
- Selecting and leading Value Studies
- Coordinating Value Study logistics
- Facilitator skills
- Tracking Value Study implementation results and other reports as necessary
- Coordinating with other organization or client quality improvement programs
- Educating the organization in the value methods
- Recognizing Value success and failures and how to learn as a team
- Sharing value insights with the community and stakeholders
- Periodic Value Program review for continuous improvement

VM Glossary

In 1985, the Lawrence D. Miles Foundation created the College of Fellows of the Society of American Value Engineers (SAVE), now SAVE International, with the specific intent of developing a Glossary of Terms related to value. Over a two year period, approximately 10 Fellows worked individually and in teams to define, refine and finalize a glossary of value related terms. In 2006, the Glossary was reviewed by the Certification Board and those definitions most essential to the current application of value methodologies were identified and refined where necessary.

ASSOCIATE VALUE SPECIALIST (AVS)	AVS is a recognition designed for individuals who are new to the value methodology. An AVS is encouraged to progress to VMP or CVS certification.
CERTIFIED VALUE SPECIALIST (CVS)	CVS is the highest level of certification attainable through SAVE International. Designation is reserved for Value Specialists and Value Program Managers who have demonstrated expert level experience and knowledge in the practice of the value methodology.
COST:	The expenditure of resources needed to produce a product, service, or process.
COST, LIFE CYCLE:	The sum of all development acquisition, production or construction, operation, maintenance, use, and disposal costs for a product or project over a specified period of time.
COST MODEL:	A financial representation such as a spreadsheet, chart, and/or diagram used to illustrate the total cost of families of systems, components, or parts within a total complex product, system, structure or facility.
FUNCTION:	The original intent or purpose that a product, service or process is expected to perform. It is expressed in a two-word active verb/measurable noun structure.
FUNCTION ANALYSIS SYSTEM TECHNIQUE (FAST):	A graphical representation of the dependent relationships between functions within a project. • *Classical FAST Model:* A function displaying the interrelationship of functions to each other in a "how-why" logic. This was developed by Charles Bytheway.

	• *Hierarchy Function Model:* A vertical "hierarchical" chart of functions. This places the basic function at the top. The function of each major system is placed beneath the basic function. The functions that support each of these functions are then placed on the next row. This process is continued until the team feels the level of detail is sufficient for the intent of the study. • *Technical FAST Model:* A variation to the Classical FAST that adds "all the time" functions, "one time" functions and "same time " or "caused by" functions. • *Customer-Oriented FAST Model: This variation of the FAST diagram was developed to better reflect that it is the customer that determines value in the function analysis process. Customer-oriented FAST adds the supporting functions: attract users, satisfy users, assure dependability, and assure convenience. The project functions that support these customer functions are determined by using the how-why logic.*
FUNCTION ANALYSIS:	The process of defining, classifying and evaluating functions.
FUNCTION, BASIC:	The specific purpose(s) for which a product, facility, or service exists and conveys a sense of 'need'. In 'continuous innovation' projects the basic function must always exist, although methods or designs to achieve it may vary. In 'discontinuous innovation' projects, which seek to create new industries, the existence and persistence of the basic function is itself the focus of challenge.
FUNCTION COST:	The expenditure of resources to perform the function.
FUNCTION, HIGHER ORDER:	The specific goals (needs) for which the basic function(s) exists.
FUNCTION, LOWER ORDER (ASSUMED or CAUSATIVE):	The function that is selected to initiate the project and is outside the study scope.
FUNCTION, SECONDARY:	A function that supports the basic function and results from the specific design approach to achieve the basic function.

FUNCTION, SELL:	A function that provides a subjective expression of something that is to be achieved. In Function Analysis, sell functions are qualitative and are described using a passive verb and a non-measurable noun. Sell functions are also sometimes referred to as "aesthetic" functions.
FUNCTION, WORK:	A function that provides an objective expression of something that is to be accomplished. In Function Analysis, work functions are quantitative and are described using an active verb and a measurable noun. Work functions are also sometimes referred to as "use" functions.
FUNCTION WORTH:	The lowest overall cost to perform a function without regard to criteria or codes.
JOB PLAN:	A sequential approach for conducting a value study, consisting of steps or phases used to manage the focus of a team's thinking so that they innovate collectively rather than as uncoordinated individuals.
PERFORMANCE:	The capacity of a product to fulfill its intended function. Factors such as reliability, maintainability, quality and appearance are some examples.
PROJECT:	A temporary endeavor undertaken to create a unique product, service, or result. For the purpose of Value Studies, a project is the subject of the study. It may be a physical product such as a manufactured item, or a structure, system, procedure, or an organization.
PROCESS:	A sequence of activities that delivers a product or project.
SAVE INTERNATIONAL CERTIFIED PROFESSIONAL:	For the purpose of a Value Study, the Job Plan shall be facilitated by a Certified Value Specialist (CVS), or a Value Methodology Practitioner (VMP) working under the supervision of a CVS. SAVE International Certification requirements are identified by the SAVE International Certification Board, which maintains a list of currently certified individuals.
SCOPE:	The portion of the overall project that is selected for the value study. The analysis accepts everything within the defined scope in order to focus attention on the functions within those limits.
VALUE:	An expression of the relationship between function and resources where function is measured by the performance requirements of the customer and resources are measured in materials, labor, price, time, etc. required to accomplish that function.

VALUE ANALYSIS:	The application of value methodology to an existing project, produce or service to achieve value improvement.
VALUE ANALYST:	See VALUE PROFESSIONAL.
VALUE ENGINEER:	See VALUE PROFESSIONAL.
VALUE ENGINEERING:	The application of a value methodology to a planned or conceptual project or service to achieve value improvement.
VALUE INDEX:	A ratio that expresses function cost ÷ function worth. This ratio is used to determine the opportunity for value improvement, which is usually identified in the Function Analysis Phase.
VALUE MANAGEMENT:	The application of value methodology by an organization to achieve strategic value improvement.
VALUE METHODOLOGY:	A systematic process used by a multidisciplinary team to improve the value of projects through the analysis of functions. See Value Engineering, Value Analysis and Value Management.
VALUE METHODOLOGY ALTERNATIVE (or ALTERNATIVES):	An alternative or alternatives prepared by the value study team and presented to management to provide financial and/or performance improvements and which is within acceptable terms and conditions of the Value Study.
VALUE METHODOLOGY PRACTITIONER (VMP):	VMP recognizes individuals with basic value training and some experience in the application of the methodology. Value methodology practitioners participate in or lead Value Studies.
VALUE PROFESSIONAL:	One who applies the value methodology principles to study and search for value improvement. Synonymous with value analyst, value engineer, value practitioner, or value specialist.
VALUE PRACTIONER:	See VALUE PROFESSIONAL.
VALUE STUDY:	The application of a value methodology by SAVE International certified professionals using the Value Job Plan.

References

Publications Catalog, SAVE International: Describes textbooks and educational materials on Value Methodologies and related programs. This catalog includes videotapes and information on *Value World*, SAVE International's peer-reviewed, technical journal.

Annual Conference Proceedings, SAVE International: Includes all presentations given at each annual conference. Also available is a value bibliography, a compilation of all presentations since 1980, and articles from *Value World*. Each presentation shows title, author, abstract, and source. Papers may be individually ordered from SAVE International.

SAVE International website: http://www.value-eng.org

"Standard Practice for Performing Value Analysis (VA) of Buildings and Building Systems," American Society for Testing and Materials, Publication E-1699.

Value Certification Manuals (on SAVE International website/home/certification)

- Certification/Recertification Manual
- Certified Workshop Manual
- Certification Examination Study Guide
- SAVE International Internet Web Site: http://www.value-eng.org

Lawrence D. Miles Value Foundation Internet website: http://www.valuefoundation.org

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