

BRITISH COLUMBIA EXPROPRIATION ASSOCIATION

Title: Value Engineering – Applications and Lessons Learned

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Abstract

David Aberdeen, Chair of the Seminar's Planning Committee, was a Value Engineering (VE) Team Member for a Vancouver Island Highway project located at Campbell River. As a result of his participation he could see the value of the process not just for construction projects but also as a methodology to improve the thinking process and problem solving. He asked if I would present a paper on VE and relate as well as possible to those attending the seminar which most likely would include lawyers, appraisers, accountants and possibly bankers, individuals with a technical or business background including private and government organizations.

The major topics of this presentation are:

- Value Engineering is an extremely useful tool to provide visibility, optimize value and enhance problem solving, which is being applied more and more, even by the Canadian goose.
- The VE Methodology – Who, How, What, When, Where?
- Practical Applications of VE as related to lawyers, appraisers, accountants, industry, private and government organizations.
- Lessons Learned – it takes dedication, desire and commitment.
- Implementation must occur to optimize the value.

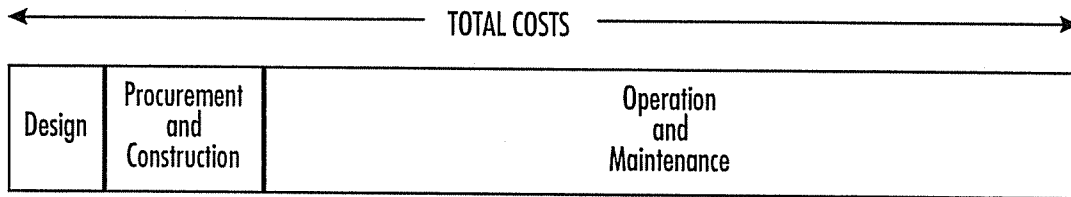
Questions and/or discussions are encouraged during the presentation in order to be responsive to specific interests.

Value Engineering

Value Engineering (VE) is a useful methodology being applied more and more on construction projects and in manufacturing.

Value Engineering is defined as:

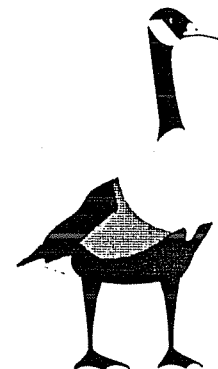
“The systematic application of recognized techniques which identify the function of a product or service, establish a value for that function, and provide the necessary function reliably at the lowest possible cost. In all instances, the required function should be achieved at the lowest possible life-cycle cost consistent with requirements for commitments, maintainability, and safety.”



Some of the industries utilizing VE to maximize the return on their investments include Medical and Health Care, Technology and Research, Education, Defense, Correctional, Housing, Energy, Waste Treatment and Processing, and Transportation. VE is being applied internationally including Canada, the U.S., Japan, Taiwan, Australia, Saudi Arabia, India, England, Brazil, and Germany. Here in B.C., you are probably aware of VE being utilized in the forest products industry, wastewater treatment plants, and on several phases of the Vancouver Island Highway Project. In Toronto, VE is being applied to optimize the value of their highways and subway system. Many of you may not know that the Canadian goose has been applying some of the principles of VE for many years.

This fall when you see geese heading south for the winter, flying along in “V” formation, you might be interested in knowing what science has discovered about why they fly that way. It has been learned that as each bird flaps its wings, it creates uplift for the bird immediately following. By flying in a “V” formation, the whole flock adds at least 71% greater flying range than if each bird flew on its own. (A VE team with effective interaction—as in a formation—will help a project achieve its desired goals quicker and more efficiently.)

Whenever a goose falls out of formation, it suddenly feels the drag and resistance of trying to go it alone, and quickly gets back into formation to take advantage of the lifting power of the bird immediately in front. (If we have as much sense as a goose, we will stay in formation and by working together, improve project value through proper use of VE). When the lead goose tires, he rotates back in the wing and another goose flies point. It pays to take turns doing hard jobs (VE eases the burden upon designers and owners, extending the range of possibilities for a better design solution). The geese honk from behind to encourage those up front to keep up their speed (VE is like honking from behind—the communication moves projects along in the right direction).



Finally, when a goose gets sick or is wounded by gun shot and falls out, two geese fall out of formation and follow it down to help and protect it. They stay with the goose until it is either able to fly or until it is dead. They then launch out on their own, or with another formation, to catch up with their group (if we have the sense of a goose, we will stand by each other and use VE to help find the best solution).

Moral of story:

If we flap our wings and fly in a “V” formation, we can be more efficient and fly greater distances.

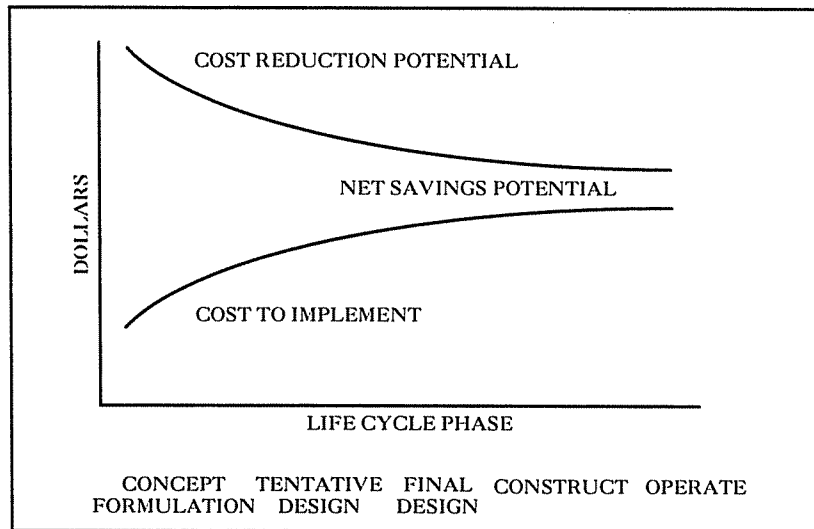
OR

If we utilize the VE methodology with a team approach we will obtain greater value and obtain new heights.

The VE Process

Value Engineering is a disciplined systematic methodology where you identify the function reliably at the lowest cost. It is called other names, including Value Analysis, Value Management, Value Control, Value Planning, etc. For our purposes, we will consider these to be all basically the same.

Value Engineering – achieving the required function at lowest cost – is of benefit to owners, architects, engineers, contractors, manufacturers, large and small private and government organizations. VE may be applied during conceptual, working drawing, or construction stages of a project. The earlier that VE is applied, the greater is the potential for savings as represented in the graph below.



In addition to starting VE as early as possible, normally it pays to concentrate on the 20% of a project that represents 80% of the cost. In a building-type of project, this will probably mean the greatest savings potential lie in the mechanical/electrical work. In a road project, the greatest potential will probably be in the right-of-way, excavation (standard or solid rock), concrete or asphalt paving, and in structural elements.

Many of us have participated in cost reduction programs in the past. The key to VE is that it applies the function approach. Function is what makes an item work and must be defined in words – a verb and a noun.

The verb answers the question – **What does it do?**

The noun answers the question – **What does it do it to?**




Examples of function descriptions by a verb and a noun are as follows:

Pencil – **Makes mark**

Screwdriver – **Develops torque**

Wheelbarrow – **Transports weight**

The VE Job Plan is a disciplined approach following a specific sequence of activities. The sequence of activities (the Job Plan) consists of five phases:

<u>Job Plan Phase</u>	<u>Phase Objective</u>	<u>Primary Objective</u>
Information	Gather data, investigate projects	
Speculation	Imagination, creativity, speculate on alternatives	
Analysis	Evaluate and analyze cost and function	
Development	Develop best ideas, best alternatives	
Presentation	Present results, "sell" recommendations	

Information Phase

During the information phase, we gather reliable factual data to learn as much about the system or operation as we can. We challenge everything and don't let "negativeness" stand in our way. Don't take no for an answer, and gather all the information and facts. Conduct a thorough review and try to talk with people as familiar with the subject as possible. Some of the key questions answered will be – What is the project? What does it do? What is the cost? What is the function? What are the high cost areas and what are the complex issues?

Speculation Phase

During the second phase or the speculation phase, we use our imagination to come up with as many alternatives as possible to perform the basic function. Answer the question – What else will do the job? Again, in this phase as in the information phase, we should not take no for an answer. We should be creative, "brainstorm", think of new ideas, new approaches to accomplish the same function. In our brainstorming we should not be afraid of criticism – the best idea may be criticized by others. The greater the number of ideas listed, the greater the opportunity to come up with a less costly or time-saving alternative.

Analysis Phase

During the speculation phase we generate a number of alternative ways of performing a particular function. The purpose of the analysis phase is to review the alternatives and to select the most promising for detailed evaluation. Review the advantages and disadvantages, rank the alternatives, and determine the likelihood of success. In the end, the alternatives with the greatest value improving potential that meet the desired objectives are chosen for development.

Development Phase

In the fourth phase, the best function and cost-wise alternatives from the analysis phase are selected for development. The more thoroughly this phase is carried out, the greater the probability of proving that the

idea selected is better than the design or method already in use. Develop an idea until you can choose the best in total value. Concentrate on the first choice, the best idea with all the available facts, compile all costs, use specialists, and record everything in order to convince others.

Presentation Phase

The final step in the VE Job Plan is the presentation phase. At this point, the best of the alternatives that will perform the stated function for the least cost, is selected. This selected alternative then has to be written about and presented to those individuals who are responsible for making a change. The main objective of the presentation phase is to communicate your ideas in order to sell the recommendation. The presentation should include exhibits, and be concise, factual, and accurate in order to implement change.



VE is a disciplined approach to obtaining a required function at the lowest cost. Management must realize that both time and money have to be allocated to VE in order for results to be achieved.

Typically 5% to 10% of project costs will be saved through the effective application of Value Engineering. In order to achieve this, top management must be committed to the VE process. In addition, there must be a Knight in every organization who is going to lead the VE charge.

The VE process is carried out by an independent team, normally made up of five to eight individuals. It is best if the team leader is a Certified Value Specialist. He organizes the VE team, facilitates the process, keeps the team focused and headed in the right direction and is ultimately responsible for the final report. Other team members are senior professionals representing the primary disciplines involved in a project. As an example, on the Vancouver Island Highway Project, most VE teams included the team leader, a civil engineer, structural engineer, geotechnical engineer, right-of-way appraiser, plus construction and cost estimating specialists. Usually team members have no prior involvement in the project being reviewed which helps to ensure fresh second opinions on high cost, complex issues.

Practical Applications

Practical Applications of VE as related to this audience include:

Lawyers –

- Introduction of partnering concepts
- Independent review of outline specifications and proposed schedule
- Constructibility comments
- Reduction of claims
- Claim defense
- Contract format and content

Appraisers –

- Reduction in buying land for right-of-way
- Reduction of property files to be reviewed and evaluation of business loss
- Lease land versus buy
- Build low-cost retaining walls versus buy land

Accountants –

- Construction management procedural comments
- Life-cycle cost analyses
- Accuracy of estimates
- Funding
- Budgets

Government and Private Owners –

- Risk assessment
- VE program recommendations
- Maximize value per \$ expended
- Savings of 5% to 10% of construction cost
- Increase likelihood of on time and within budget

Lessons Learned

I have been involved in over 500 VE studies and \$12 billion worth of construction. Several factors keep reappearing as reasons for successful value engineering. Some of these lessons learned include:

- Top management must be committed to the VE process – an example would be the Ministry of Transportation.
- Project Directors must be committed to the VE process – an example is the head of the Vancouver Island Highway Project.
- There must be a VE Officer who is the Royal Knight of VE who will follow through and maximize the implementation of VE recommendations.
- The earlier VE is undertaken the better – ideally no more than 20% or 30% through the design process.
- Implemented VE recommendations amounting to two percent or less of construction costs is unacceptable – 5% to 10% should be achieved.
- Members of the VE team should be given the opportunity to help sell the VE recommendations by participating in the decision approval process – the VE Team should have just as much or more involvement as the design team.
- Fifty percent of VE team members should have formal VE training (40-Hour Certified Training Seminar) and/or have participated in three prior VE studies.
- Eliminate roadblocks like “implementing VE recommendations will delay the project”- find a way to make it happen.
- Ensure design estimates given to the VE Team are accurate.
- Keep politics out of the VE process.

Implementation

The keys to implementation are:

- Keep design team and owner informed of VE progress during the study.
- Have a clear, concise presentation to the owner and design team at the end of the study.
- Have the VE team participate in the VE implementation decision/approval process.
- Eliminate roadblocks, biases, and personal preferences – encourage open minds.

- Develop a matrix summarizing the approval process: VE recommendation, Design Team Accept/Reject, Owner Accept/Reject, Alternative Recommendation.
- Conduct VE study no later than 25% through the total design process.

About Olympic Associates Company

Olympic Associates Company, based in Seattle, has provided planning, design, and project management services for over 40 years. Construction management, estimating, scheduling, dispute resolution, and training services have been provided on projects amounting to over \$15 billion in total construction value. More than 4,000 individuals have been trained in Olympic's public and private training programs including: VE, Scheduling, Project Management, and Quality Control.

About Peter Jobs

Peter has been with Olympic Associates Company for 34 years and President for 18 years. He has been a Certified Value Specialist for 23 years and a Director of the Society of American Value Engineers for several terms. He is a Fellow for the Society of American Military Engineers and has been an expert witness on more than a dozen construction disputes. He is Past President of the Park-Hill Rotary Club where he is a Paul Harris Fellow. He is an arbitrator for the American Arbitration Association and has participated in several training sessions. He has taught more than 3,000 individuals in project management and/or value engineering. Savings as a result of VE studies he has lead amount to over one billion dollars. He has provided project management and related services on projects amounting to over \$12 billion in construction value.

Some of the projects he has worked on include:

- Vancouver Island Highway Project – Vancouver Island, B.C.
- Toronto Transit/Subway – Toronto, Ontario
- I-90 Mercer Island to Kingdome – West End in Seattle, WA
- I-90 Central Artery/Third Harbor Tunnel– East end in Boston, MA
- Port Access – Miami, FL
- JFK Airport Redevelopment – New York, NY
- Evergreen Hospital Medical Center – Kirkland, WA
- Bellingham High School – Bellingham, WA
- Sydney Kingsford-Smith Airport – NSW, Australia
- Ala Moana Center – Honolulu, HI
- West Point Wastewater Treatment Plant – Seattle, WA
- Correctional Facility – Clallam Bay, WA

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