Ray Bradbury, the author of Fahrenheit 451, tells of the time he was researching and writing his famous novel about book burning. He used the Powell Library at UCLA for his work, because he had easy access to a typewriter (this happened in 1948-49!) in the basement of the huge building. Bradbury recalls that he rented a machine for ten cents a half hour; he spent $9.80 to write his story. “It was a passionate and exciting time for me,” he writes. “Imagine what it was like to be writing a book about book burning and doing it in a library where the passions of all those authors, living and dead, surrounded me.”

This story reminds me of a recent value study conducted in a Federal Building in a large American city. The value team met on a vacant floor of the soon to be remodeled structure. Analyzing functions and creating and evaluating alternatives in the very building shown on the architect’s plans gave immediacy to the team’s work. VM became passionate and exciting.

Like Ray Bradbury, we may do our best work when our value teams are closest to the topics we are studying. Going directly to the study subject is one of the reasons VM is successful in finding new solutions to old problems. We are not content to work apart, in isolation; we work close up, in collaboration.

This issue of Value World presents selected articles from several different countries. They tell stories about the application of the VM where the author lives and works so that we, the reader, might gain insights into new ways VM can enhance all manner of projects, processes and products.

- From Germany we have Wilhelm Hahn’s description of how he has folded mediation into the VM process to help resolve conflicts that may arise within the value team.
- From Canada we have Martyn Phillips’ explanation of how VM can be used for project development in conjunction with a risk management protocol.
- Also from Canada we have an article by René Donais and Richard Vézina on how value analysis is being applied to mass transit projects in Quebec.

In addition there are two SAVE International Paper of the Year Award winners. They are reprinted here to gain wider exposure for these exemplary papers.

- From Canada we have David Wilson’s Best Paper of 2000-2001 explaining how VM can enhance the traditional planning approach to transportation projects.
- From America we have Roger Sperling’s Best Paper of 2001-2002 originally published as an invited article in IIE Solutions magazine as an overview of the value methodology.

Each of these VM practitioners is adding value—where they are—in technical areas that they know. They also share in common the use of the value methods pioneered by Larry Miles. What they also share is an intense interest in developing high performing teams to solve problems of widely varied types—because VM can be used successfully anywhere, on anything. What they demonstrate in their writings is an infectious passion and excitement for the value methodology.

Now, please allow me some personal words. This issue of Value World is the last of eleven edited by your present editor-in-chief. It is with anticipation that I look forward to Michael S. Adams, AIA, PP, CVS-Life, taking over this responsibility starting with the spring 2003 issue. I am certain he will find, as I have, that serving SAVE International in this capacity gives an invigorating, broad view of the society, as well as a chance to make a significant contribution to presenting a positive image of SAVE to the value improvement world. I urge you, the reader, to support Mike with your contributions about the advancement of VM where you are, to appear on these pages in years to come.

Finally, I must acknowledge the stellar service provided by the three members of the Value World Editorial Board: Jill Woller, Gene Degenhardt and Ted Fowler. They have provided consistent peer review and editorial support for over four years, helping to select the best of the candidate articles for publication in Value World, making substantive suggestions for improvements, and proof reading the pre-production draft of the journal. Without their loyal support my job would have been much less passionate and not nearly as exciting.

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SAVE International is the only professional society in the United States totally devoted to advancing and promoting the value methodology, a powerful problem-solving tool that uses a professionally applied, function oriented, systematic team approach to analyze and improve value in a product, facility design, system, or service.
Resolving Severe Conflicts In Value Management Studies

Wilhelm Hahn, CVS

PREFACE
When facilitating my first Value Analysis (VA) studies on administrative process improvements I was faced for the first time with real conflicts between team members. Never before in any of my Value Engineering (VE) studies on products had I encountered such strong resistance from some team members. Checking my German and American VA/VE handbooks for help I was disappointed; there was not one single word about how to handle these situations. So I enrolled in a Business Mediation course. I found a lot in common between the Value Management (VM) process and the mediation process. This encouraged me to incorporate mediation in VM studies to resolve conflicts when they happen. The mediation tools have helped me improve my VM studies and become a better VM facilitator.

This article presents how severe conflicts in VM studies are resolved with a mediation process incorporated into the VM process. It describes how a VM facilitator guides the team through a conflict with mediation and resolves the conflict first, before resolving the actual problem of the study.

The mediation process has several steps, and success depends on the willingness of the people involved. The process can be started in any phase of the VM study. The tools of mediation are described and referenced to real business situations. Since the mediation process within a VM study can also be risky for the facilitator as well as for the affected team members, risks of mediation are addressed.

INTRODUCTION
A good VM facilitator tries to prepare for a VM study by looking not just at the content of the study but also at the system in which the study will take place. Figure 1 shows a model describing the elements of the system a VM facilitator has to concentrate on to take out as many roadblocks as possible. However, it is the things that cannot be planned beforehand that will challenge the VM facilitator the most. These involve human dynamics and social behavior of the team members.

Human dynamics should be positive at all times during a study, with the team members showing commitment to the project. Their social behavior should challenge themselves and their colleagues in a positive way to further progress and to arrive at the best results in a minimum of time.

But what can be done if conflicts and disputes arise during the study? The value methodology teaches that if any trouble occurs it has to be addressed before continuing. If conflicts are ignored team performance can be affected negatively. It might not even be possible to continue, because team members are arguing or even leaving the room.

There is a lot of potential for interpersonal conflicts in VM studies that are directed to improving processes, especially with the people directly involved with the process. But conflicts can also arise in studies on product design with the original designer present. In both cases individuals may have to risk losing self esteem.

The VM facilitator can interact to settle severe conflicts in VM studies and achieve a win/win situation between the conflicting parties when Business Mediation is incorporated into the VM job plan. Before describing the mediation process, situations with potential for conflicts are illustrated along with ways a VM facilitator can sense these situations.

SENSING CONFLICTING SITUATIONS IN VM STUDIES
The VM facilitator must be aware that conflicting situations between team members can arise in all phases of the VM process. A conflict may even already exist before a VM study starts. The facilitator needs to be perceptive to sense hidden conflicts or situations that might lead to open disputes. Situations for each phase of the VM job plan are outlined below.

Pre-Event / Kick off Phase
Get to know your team members before you start the actual study. Although it takes time, it is worth the effort to talk to each team member personally before the study. This is strongly recommended for studies with sensitive objectives. Usually there are winners and losers, if management wants to solve a problem. A way must be found to achieve the objectives without producing losers among the team members. A dialogue with the team members, individually or in a group, allows the VM facilitator to observe the interactions of the team members.

Information and Function Analysis Phase
Gathering information requires communication by all team mem-
bers. From the way the team members deal with the information, conclusions can be drawn about the potential for conflicts. It is essential to take enough time in this phase to build a working atmosphere and to uncover causes of lingering conflicts. The VM facilitator should seek to answer questions like:

- Is there a lack of communication in the team?
- Is there negative interdependence of team members?
- Do team members feel they are treated unfairly?
- Do team members have opposing or conflicting responsibilities?
- Is criticism constructive or destructive?
- Is there mistrust or a lack of confidence?
- Which team members have strong opinions about the project?
- Is there anger, resentment and touchiness?

**Speculation Phase**

This is the only phase of the VM job plan where no conflicts should occur if the rules of the game have been defined beforehand. However, the facilitator will not receive valuable ideas from team members if lingering conflicts from previous phases are still present. Again, by observing the team members and their body language in regard to ideas of other members, conflicts can be sensed. Even the sorts of ideas that are generated can indicate hidden conflicts are present. Break off the brainstorming session and address the conflict first, if necessary.

**Evaluation Phase, Presentation and Recommendation Phase**

Evaluating ideas and combining them into proposals can cause heavy disputes over power and influence within the team. In VM studies on processes territories are redefined; competence and responsibilities are assigned. There is tremendous potential for team members to lose face. If lingering conflicts have not been clarified until now, it is doubtful that the team will come up with a beneficial proposal.

The need for clarification of the conflict at this point of the study can take the team back into the analysis phase to check their function model, to determine if it is still valid under the new situation.

Another touchy point with potential for conflict is the presentation of results to the executive management. It often happens that the persons who present the results of the study get the credit if they emphasize their own importance in the study or add information that was not agreed upon in the team. Therefore, select the speakers carefully and make it a team presentation.

**Implementation Phase**

Implementing a proposal starts competition for resources. Conflicting situations can also arise if the team has agreed on a proposal, but external persons who are also affected by the proposal do not agree. Theoretically, this situation is avoided by having all affected people on the team. However, in complex business situations this is unreasonable. Even the agreement of the executive management for a proposal does not automatically mean that any manager who is affected will accept it.

The difficult questions are: When does a situation require intervention to prevent walking into a “minefield,” and what should this intervention look like? Unfortunately, there are no standard answers. Dealing with conflicts is an area of trial and error, because human behavior cannot be predicted. The mediation process offers a way to face even severe conflicts within Value Management studies.

**THE MEDIATION PROCESS**

The general purpose of a mediation process is to achieve a win/win situation for all parties instead of ignoring conflicts, compromising, negotiating positions, or even ending with a win/lose result. The process is based on propositions of Roger Fisher and William Ury of the Harvard Negotiation Project and a mediation training of the StW. Fisher and Ury recommended the following method:

- Separate the people from the problem.
- Focus on interests, not positions.
- Invent options for mutual gain.
- Insist on using objective criteria.

Mediation is the voluntary work on conflicts between the affected parties. With personal responsibility the parties activate possible resources and synergies and bring together different interests to reach a consensus. Support comes from an all-party mediator. He is responsible for the process but he does not have any authority to make decisions.

Many requirements that apply to the VM facilitator apply to the mediator as well:

- Be well informed of the business case.
- Have a position of trust for the team and for the parties.
- Be neutral and independent of the results.
- Follow a process and the rules of the game.

It is obvious that the roles of a VM facilitator and a mediator are quite equal. A VM facilitator is likely to play the role of a mediator when conflict resolution is required for a VM study to progress.

The recommended mediation process within VM studies consists of five steps. They are described below for use by a VM facilitator. All steps can be conducted in one session, or they can be conducted over time when necessary.

**Prepare Mediation**

The VM facilitator describes the process of mediation to the affected team members to determine if mediation will be useful. The process can only be started if the parties agree. At a minimum all involved parties must have a willingness and the competence to speak for their own interests.

The VM facilitator explains the ground rules of the process to the parties:

- He will not be a judge and he will not make decisions.
- He makes sure that the parties are attending of their own free will.
- Each party has to let the other party finish speaking without interrupting.
• No arguing "below the belt."
• He asks if the ones being affected by the conflict are present
• Confidentiality is agreed upon.
• Each party can ask for a dialogue with the VM facilitator in private.
• A time schedule should be agreed upon.

Note: It might be difficult to define exactly which team members who are affected by the conflict and which are not. The more people that attend the mediation the more difficult it will be to guide the process. Therefore, it is recommended to reduce the number of persons to a minimum, or to ask a co-mediator for support.

A mediation process incorporated into a VM process will always interrupt the main process of the VM job plan, but it has priority. If the results of the mediation process affects prior phases of the VM process, it might be necessary to step back into the affected phase. For example, if a severe conflict arises in the evaluation phase of the VM process and the resolution for this conflict requires an update of the function model, the VM process has to return to the function analysis phase.

Gather Subjects
All parties will have uninterrupted time to tell their view of the case or conflict. The areas of dissent are narrowed down and the areas of consensus are identified. By giving uninterrupted time to one party and asking the other party to listen, understanding between the parties should gradually increase. The VM facilitator groups the controversial issues of the parties and highlights the areas of agreement to take aggression and anger out of the process. Once the areas of the conflict are clear, the next step can follow.

Work on Areas of the Conflict
The main target of this step is to transition from positions, to interests and needs. Conflicts usually arise because the parties take positions they do not want to give up. Therefore, it is important to clarify the real interests of the parties. The VM facilitator must guide the parties away from their complaints toward new objectives. The parties themselves however, must define the objectives.

The heart of the mediation process is to distinguish between positions and interests and to search for options to meet the interests, rather than negotiating a compromise over positions. Figure 2 shows a typical result of a negotiated compromise. It is a compromise for both parties somewhere on the straight line between the positions of the two parties. Both parties will lose, but one will lose more than the other one. Figure 3 shows the result of a mediation process. First the "cake" to be shared is enlarged by looking for the interests of the parties and for options how these interests can be met. Then the cake is split. What is needed is a consensus of both parties to search for solutions other than the obvious, and thus achieve a win/win situation.

Form Options
The interests defined as objectives in the previous step are similar to brainstormable functions used in the speculation phase of the VM process. For example, the objective receive recognition broadens the view for many options. Brainstorming is used to generate ideas with the same rules as in VM. The ideas are evaluated and combined into proposals by checking them against the requirements and the interests of the parties. The best proposal is selected and a memorandum is prepared according to the SMART-rule

| S | specific | who does what |
| M | measurable | how to verify |
| A | achievable | feasibility |
| R | realistic | quality of content |
| T | timed | time schedule |

Memorandum
If the memorandum is set up properly according to the SMART-rule, it will serve as a contract of agreement. In many cases it might be a bit too formal to sign a written agreement by the parties. However, the obligation and commitment that radiates from a written agreement to the affected parties should not be underestimated.

TOOLS AND RULES FOR THE MEDIATION PROCESS
The basic tools for a mediation process are communication tools. Many of them are well known, because they are just as helpful in a VM study. However, the mediation process requires even more empathy and perception for what is going on than the VM process.

Active Listening and Paraphrasing
Listen actively and acknowledge what is being said. For some persons it might be the first time that a professional is really listening without interrupting with comments. Active listening to one party means to be present with two ears and two eyes, and simultaneously observe the other party. This works best if the furniture arrangement allows for having all parties in the field of vision.

Figure 2: Results of a negotiated compromise

Figure 3: Possible results of mediation
However, they may feel more comfortable with some piece of furniture between them. Summarize important statements of the parties with your own words. This will ensure correct understanding.

**Verbalize emotional contents**

This is one of the strongest tools to master emotions before a party loses control. Unfortunately, naming feelings is still avoided in business situations. However, to deal with severe conflicts, feelings cannot be disregarded once they become obvious. For example, in the mediation process it can be helpful to say to the party: "I can see that this issue touches you very deeply; you feel a strong disapproval." Once the feeling is named, it does not have to be the subject of further discussions.

**Re-frame and Neutralize**

This is another strong tool to mitigate or weaken reproaches and accusations. The VM facilitator neutralizes attacks of one party by re-framing them into a positive intention. For example, if the party says: "I never know what’s going on in the company," the VM facilitator would reframe this to: "You would like to have more information."

Behind each complaint or reproach there is a desire. Mediation encourages the parties to talk about desires instead of hanging on to complaints. Mediation is a future-oriented process, like VM, with the motto: Don’t worry too much about the past and what went wrong; concentrate on the future and how to do it better.

**Techniques of questioning**

- Open questions with who, when, what, where, how, and why.
- Use strategic questions to investigate and discover motives and targets.
- Use hypothetical questions to investigate interests, desires and personal requirements.
- Use skeptical questions to force the party to clarify the risks of a proposed way to go.
- Use circulating questions to help change the perspective and lead away from a tunnel view of looking at the problem.
- Ask questions to check the reality and how severe the conflict is.

William Ury says that in tough negotiations each side perceives the other as difficult. Negotiation is not only about how to deal with people who have particularly difficult personalities but to deal with difficult situations as well. Regardless, of who is being difficult, the challenge for the VM facilitator is to turn a confrontation into an exercise in joint problem solving.

**Basic rules for the VM facilitator in mediation**

When serving as a mediator the VM facilitator should:

- Take responsibility for the process but not for the results.
- Conduct self-reflection during the process.
- Leave the parties to their world and avoid giving up the all-party and neutral position.
- Neither get upset nor angry about the behavior of the parties, nor be impressed.

- Not play the game of the parties and have all parties against you.

Keep in mind that neither rules nor tools can make up for a lack of experience.

**RISKS AND OPPORTUNITIES OF MEDIATION APPLIED TO VM STUDIES**

**Types of Conflicts**

There are many risks of applying a mediation process in a VM study, but also many opportunities. A mediation process should only be suggested if the conflict couldn't be solved with simpler conflict resolution techniques. The VM facilitator must see a chance for resolving the conflict at all. This needs knowledge of classes of conflicts. Conflicts can be about:

- Matters and ways to achieve a target.
- Relations with other people.
- Systems of beliefs and values.
- Distribution and sharing.
- Internal conflicts.

The conflict over relations with other people is the most common conflict. Feelings are hurt when parties take things personally. Solving this kind of conflict needs personal engagement of both parties.

Conflicts over systems of beliefs and values are difficult to resolve. The parties have incompatible goals and principles. Mediation will hardly have a chance for success.

**Risks of Mediation**

There are very real risks in undertaking a mediation:

- That the mediation fails and thus the VM study is threatened to fail. In this case the VM facilitator has to ask his client to remove the affected person(s) from the team.
- That one of the parties agrees to the mediation process with a hidden agenda and has no interest in resolving the conflict.

Since the VM process will be interrupted by a mediation, the VM facilitator should inform the client first and get approval before starting the mediation.

Not keeping the many rules of the game will always be risky. The game can be aborted any time because it is based on the free will of the parties and the VM facilitator.

**The Opportunities of Mediation**

Mediation can be started whenever needed and agreed upon by the affected team members. It takes the feelings of the team members into consideration and can lead the team to a higher level of collaborating and team performance. Mediation encourages understanding of and appreciation for other team members. Creative and unconventional solutions to conflicts are possible because solutions are based on the interests and desires of people and not on their positions. If solutions are achieved, self-esteem of the affected team members will increase remarkably.

Sperling introduced the collaborative team model based on the Thomas-Kilmann Conflict Mode Instrument (TKI), a tool used
to help teams recognize their conflict styles and how that affects performance.\textsuperscript{11,12} He says that the descriptors of collaborating behavior are a good definition of the ideal team asked to solve a problem. When teams exhibit a high degree of cooperation along with a high degree of assertiveness they become collaborating teams—high performance teams. There is no doubt that every VM facilitator wants to develop his team into a high-performance, collaborative team. Business Mediation and the tools of mediation offer a way to guide a team in conflict resolution toward the collaborating mode.

CONCLUSION

If VM facilitators are afraid of VM studies with a lingering potential for severe conflicts, the mediation process incorporated into the VM process offers help to face conflicts and to achieve better solutions.

The mediation process has many similarities with the VM process. It is a structured approach based on the willingness of the affected parties to analyze the real interests, to brainstorm alternatives and to find a consensus solution to a conflict that arises within a VM study.

Also, guiding the conflicting parties through a mediation is very similar to guiding a team through the VM study. Many of the demands on a mediator are the demands on a VM facilitator. Therefore, it is appropriate for a VM facilitator to take the role of a mediator, if necessary.

The special tools of the mediation process, especially techniques of questioning and communication, will support a VM facilitator not only in severe conflicts, but in general when difficult situations arise in a VM study.

The risks of the mediation process for a VM study can neither be denied nor ignored. To keep the risks as low as possible, it is essential to follow some basic rules. The opportunities of the mediation process however, are to transform a conflicting team into a collaborative, high-performance team.

A successful mediation not only leads the VM team to more motivation to achieve better results in the VM study, but also leads team members to personal and professional growth.

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A Value & Risk Management Approach to Project Development

Martyn Phillips, CVS, CVM, FICE, FCIWEM

ABSTRACT

The "value methodology" has been practiced for over 50 years. Its use has recently become more usual for architectural, building and civil engineering projects. Significant benefits are derived through its application as a core tool for guiding improved business/project decision-making and control. Key characteristics of the process are: early and continued stakeholder consultation; team alignment and culture change; a managed risk approach; consideration of whole life impacts and integrated service delivery. With the formal inclusion of risk considerations, the value methodology is a particularly powerful project development aid and enabling mechanism for acceleration through the approvals process.

INTRODUCTION

Today, more than ever, there are many variables and viewpoints in any project, large or small. Often there are different stakeholder interpretations of what is required, timescales, and standards. Value management (VM) provides a basic framework and a tool set that, when properly applied, addresses issues of potential misunderstanding and misalignment at the start of a project, and in many cases, results in significant reductions in the whole life costs of the final project.

The term value and risk management (VRM) is used in this article to signify a holistic approach that is applied at specific stages throughout the life of a program or project. Depending on project scale, complexity and stage of development, the techniques for addressing different aspects of any particular project may vary. It is implicit in this discussion that, through the proper use of this modified value methodology, economic assessment, risk and uncertainty are addressed appropriately.

The VRM approach is a natural companion to good program and project management for complex or sensitive issue areas and for encouraging continuous improvement. It provides a vehicle for transforming the way organizations and individuals approach project planning and development.

There are two contrasting applications:

a) Strategic Choice - through strategic focusing, formulation of clear, unambiguous, strategic direction to enable approvals, funding and subsequent orientation of the development/implementation team. To build consensus on the way forward through complete gathering of the many and various stakeholder views, strategic focusing is, of necessity, an iterative process.

b) Value Enhancement - through value engineering—continuing value improvement for finessing to optimum quality, functionality and cost parameters.

PROJECT CONSIDERATIONS

Need for Project Improvement

Construction projects have acquired a reputation for confrontation between the contracting parties and in some cases the public as well, resulting in:

- Major claims and over-expenditure.
- Delays and service disruption.
- Poor overall value for money.
- Stakeholder discontent.

The causes of these problems can often be traced back to misalignment of stakeholder expectations from the outset.

The typical development of a project is shown in Figure 1, Project Stages. It is clear that a project is developed over time, with input from a number of different parties. It is this multiplicity of inputs at different stages that leads to the problems identified above. To avoid such problems, there is a need for a routine, proactive methodology that will “get it right, first time.” There must be absolute clarity of context, needs, objectives and communications.

Perceptions of Value and Risk

Value is determined not by the producer or promoter, but in concert with the customer/user. Nor is value related solely to money, as value criteria may include, for example, aesthetics, ease of operation & maintenance, environmental friendliness and provision for longer-term needs. Clients are really seeking to buy performance, not just traditionally practiced project development activities. Good project performance includes satisfying a range of stakeholders who may have differing views, values and thresholds of tolerance for perceived risk.

Figure 1: Project Stages
To reach consensus, all participants need to have a similar understanding of each other's values and constraints. The value workshop process enables this to take place, and provides a step-by-step methodology for exploring various options to arrive at the most suitable solution.

Workshop teams should be multi-disciplinary and represent the interests of all groups who may be impacted by the project under consideration. The mix of team members varies with the stage that the project is at, and whether an integrated team or an external, third-party team is used. Workshop participants may number between five and forty, but between twelve and twenty is a common group size.

**Value Study Workshop Process**

VM is systematic and applied through a VRM program or a single study and is guided by an external facilitator. VRM study workshops are intense and may be of short or long duration, depending on specific project and stakeholder circumstances and objectives. Much of the power of the VRM methodology lies in the rigorous, disciplined approach and the ability of team members to focus collectively, both inwardly and outwardly, on a broad range of topics. Participants examine stakeholder issues, values, functions, cost, benefit and relative worth, with a view to building consensus on the best way forward. This significantly reduces subsequent project development time and identifies the optimum choice of strategy and components.

The scope and stage of application vary with interpretation and location within the world. The common thread is a basic workshop process that is central to any formal value study. These phases are: 1) Information and Analysis, 2) Creativity, 3) Judgement, 4) Development, 5) Interim Output. The number and naming of the workshop phases varies somewhat between authorities. The workshop is preceded by and followed by the appropriate preparatory and closure activities.

**Analysis by Function**

A basic premise of traditional VM is expressed through the relationship between cost and function. The aim is to increase functionality while maintaining or reducing cost. A small increase in cost may be acceptable if large gains in functionality and stakeholder satisfaction are realized. The FAST diagram is an effective way to show functions and their relative cost, worth and potential alternative costs. It is also useful for examining risks and uncertainties. For strategic applications a somewhat similar “FOCUS” diagram is used.

**Risk Management Register**

Risk evaluation is seen increasingly as an essential part of smart project management. During the project development process, a particular risk can be lack of stakeholder agreement on project needs and proposals. This can derail the approval process and incur significant delays in project development and subsequent implementation.

Risks may be present due to limited experience, lack of information and general uncertainty regarding future conditions and viewpoints. Risks may also occur as parties, personnel and relationships change during the course of a long-duration project. Con-
stransformational lifetime there may be significant risk of the project not performing as required (e.g. through technical failure or inaccurate data).

As part of the workshop Information and Analysis Phase, specific project risks are identified and categorized in terms of potential severity and probability of occurrence. Related consequences are identified. This is the start of the risk register. No more work is done on it at this stage; it is addressed progressively in each of the subsequent workshop phases. Workshop Phase 2, Creativity, identifies potential means of addressing significant risks. Using agreed criteria, workshop Phase 3, Judgement, evaluates the practicality of these possibilities and categorizes them in terms of:

• Risk avoidance (consider alternatives that do not involve the risk).
• Risk reduction (consider reducing likelihood and consequences of the risk).
• Risk transfer (consider transfer of risk to another party or insurance).
• Risk acceptance (consider activities to control the likelihood & impacts of the risk).

The risk management register is completed as part of Workshop Phase 4, Development, with the inclusion of a risk response or contingency plan for each highly ranked significant risk. This type of plan varies greatly with the stage of the program or project. It is important to plan for monitoring and adjustment of the register over time.

The VRM study applies the appropriate techniques and level of analytical effort within the workshop to proceed through to formulation of recommendations. It may well recommend a more thorough risk evaluation to take place separately. Much is written elsewhere on statistical approaches to risk analysis and management.

3.5 VRM Application Stages

VM is used at various stages of program and project development for building consensus on situations and available options. It is applicable to various forms of business process refocusing, construction, environment, facilities & infrastructure management, government, health care, industry, manufacturing, transportation and utilities. It encourages a holistic approach and team synergy.

VM may be applied at any point during project development, but best results are obtained through early application. Ideally, the value process is used as early as the needs identification stage and for facilitating strategic partnering workshops, including development of dispute avoidance procedures. As the program, project, product or service is being developed, VM is applied as a continuous improvement mechanism to ensure maximum cost effectiveness, functionality and appropriate quality. It can also be applied with surprisingly good results as late as the tender assessment and contract negotiation stage for traditionally developed projects. Accordingly, the focus changes over time.

The value approach is applied best as a pre-ordained, step-by-step, series of events, carried out at key points. In this way, the VRM program sessions may be better planned and integrated to become invaluable milestone mechanisms for continuous improvement and to address changing project and procurement conditions. This results in better understanding of the context in which issues are judged, through the team members seeing the issues in the same light. Consequently, better commitment through “ownership” of decisions is established and “re-visiting” of project decisions, with related rework, is avoided.

HOLISTIC APPROACH

Project Framework

VM plays a very significant role in the strategic procurement and implementation process. It elicits the “best bang for the buck” through focusing on the “big picture” and asking tough questions about optimum costs and functionality. It is predominantly a function-based technique that identifies key areas to improve quality, streamline tasks and reduce whole-life costs. This approach is ideally suited to meeting the challenges presented by current trends toward downsizing in the general services and asset management function.

It is noteworthy that the process of building consensus is not linear, as tends to be the case for traditional project management. Consensus building requires successive iterations to review and confirm or modify various interim decisions. This actually speeds-up the overall project development schedule as it pre-empts many otherwise time-consuming meetings outside the workshop(s) process.

To guide sustaining decisions, VRM must view the whole picture before focusing on specifics. All too often, project proponents “rush their fences” by assuming that their deliberations are further along the process than they really are. When conducting a value study, it is wise to take both an analytical step backward and a speculative step forward in order to gain a better appreciation of all factors.

Prior to undertaking a VRM study, it is important to define precisely what the objective(s) and underlying “drivers” are (for both the project and study). Quite often, the true reason is not articulated well. Is the study objective simply to confirm best value for money and optimize where possible? Or, is there perhaps a lingering doubt about the concept being correct? The style of process application and choice of participants for either may be quite different.

Some examples of various applications, drawn from the author’s experience, are described in the following sections:

Strategic Choice (through Strategic Focusing)

Stage 1: Strategic Direction

Value studies are conducted at this stage to determine options for clear and acceptable business strategies prior to formal commitment to develop program(s) and projects.

Outputs:

• Business case; policy / strategy document; master plan; options identification; project requirements definition.
Example Applications:

- Formulation of municipal Environmental Strategic Plan Policy Document.
- Facilitation of River Water Quality Task Force.

Reason for Study: To build stakeholder consensus on issues and opportunities; to set direction and define a framework for resolution.

Stage II: Concept Definition

This type of value study is to derive optimum functionality and cost effectiveness for optimum scope, budget, timeframe, standards and risk management approach

Outputs:

- Feasibility and risk assessment; concept choice; target cost; key performance indicators; project implementation plan.

Example Applications:

- 2 + 4 day workshop for new university complex.
- 4-day analysis at functional design stage of urban highway and light rail.
- 3-week project redefinition and outline design through partnering.

Reason for Study: To finalize definition of project concepts and to develop the framework for project implementation.

Value Enhancement (through Value Engineering)

Stage III: Project Implementation

Currently, this is the most common application: to verify and “tighten” project design and construction proposals for optimum project performance.

Outputs:

- Concept development; design to target cost; functionality, schedule cost & constructability improvements; operations and monitoring plan.

Example Applications:

- Intensive 2-day analysis of $2Bn oil refinery project.
- 9-day workshop for $530M luxury development including towers.
- 3-week analysis of project tender for water supply extension.

Reason for Study: To identify ways and means for improving project delivery; to resolve concerns over cost and schedule.

Stage IV/ V: Systems Optimization

Efficiency reviews to optimize an in-service process or facility.

Outputs:

- In service functional enhancements and operational efficiencies; risk and reliability study; needs assessment; optimization plan; recommendations for strategic and organizational change.

Example Applications:

- 2-week analysis of bids for renewal of city cleaning operations contract.
- 5-year target price analysis of reliability of power supply to treatment plants.
- 4-day workshop to optimize control system for transmission pipeline and oil storage / shipping terminal.

Reason for Study: To provide a clear understanding of options to improve performance of currently in-service product, project service or system.

SUMMARY

Various authoritative sources have advised the need to address more rigorously the client’s business case. The value and risk management approach may be applied to a wide range of small, complex projects through to large projects or programs. Early application of the value methodology as an integral component of the strategic procurement process leads to significant savings relating to schedule, staff time, capital costs and lifecycle costs. In addition, experience shows that “it is never too late” to derive substantial benefits in terms of enhanced functionality, team building and cost improvement.

The value methodology is a time saving, cost-effective, consensus / team building approach. It is used to plan, develop and control projects, together with aiding transformation of business culture / practices and compatibility with community needs. Advanced VRM techniques applied through teams familiar with the process make for particularly quick and robust results. Suffice it to say, there are different value-based approaches, techniques and tools that are offered through various organizations.

With the pressures that typically accompany the initiation and development phases of many projects, the value methodology produces a high level of focused and tested proposals in a very short time. This enables well-founded, collaborative decisions on project strategy, scope and components, together with contractor selection and contractual relationships. With shrinking resources and continually growing regulations, organizations are benefiting from the competitive edge provided by this unique, strategic thinking methodology. In this way, decisions on strategic procurement of major services, projects and equipment can be made with confidence.

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VALUE MANAGEMENT IN TRANSPORTATION

Value Management (VM) studies have traditionally been applied to the design and construction phases of transportation projects. However, the opportunity to make significant and/or strategic changes in the project diminishes as the project evolves, because the timing of the VM study, usually near the end of the design phase, often leaves little time or desire to revise the project to any great extent. The result is a significant loss of opportunity to substantially improve the project and/or achieve success with the public and stakeholders.

TRADITIONAL TRANSPORTATION PLANNING APPROACH

The planning approach for transportation projects has traditionally followed a classic planning model and follows the scientific method. This model, comprised of sequential phases, initially defines the problem statement, and then develops an evaluation framework to determine the most appropriate alternative to address the identified problem. The generation and evaluation of alternatives is then undertaken using the evaluation criteria. Public consultation is an important element of the process, and generally overlays the technical workstreams of the planning process as a key input feature. In Ontario, as with many other jurisdictions, the planning process is entrenched in government (environmental) policy, with mandatory public consultation points and defined review periods by interested parties.

While this traditional planning approach has been utilized for over 25 years, concern has been leveled at transportation planners and engineers in recent times, because residents and key stakeholders do not feel that their perspectives are truly being captured and incorporated into projects. As such, increasingly knowledgeable residents and more sophisticated stakeholders are challenging the planning teams that use the traditional approach, to ensure that their concerns are addressed. This often results in significant project delays and an antagonistic relationship between the planners and affected residents.

The primary concern stems from when and how residents and stakeholders participate in the project. Before environmental legislation ushered in public programs for major capital projects, residents and key stakeholders, such as municipalities, agencies, school boards and business associations, really had a limited opportunity to be heard. In those autocratic times, chronicled in the movies and novels of the 1950’s and 1960’s, there was often no recourse for the affected party to be heard.

Environmental legislation changed all this by formally requiring project proponents to involve the public and other stakeholders in the project. In Ontario, for instance, there are two basic legislative acts that can apply to a project, namely the Ontario and the Canadian Environmental Assessment Acts. Each act is similar in intent, to promote the involvement of the public in the project.

While such legislation is intended to ensure that the public and stakeholders are consulted, there is no meaningful way to ensure that their participation will truly influence the outcome of the study. This is because the consultation process can become generally reactive in nature to limit “grandstanding.”

For instance, a generic planning phase study might include the following key consultation activities:

- Project Initiation Notice—to identify the project and request input.
- Public Meeting or Drop-In Center—to understand the need and justification, and to review the planning alternatives.
- Public Meeting or Drop-In Center—to review the selected alternative.
- Final Report—filed in the public record for review and to solicit comment.

While this example provides ample opportunity for the public and stakeholders to participate, their involvement is generally limited to reviewing the outcome of completed activities. The reactive role that the public and stakeholders perform in the study is often frustrating, because they must overcome significant hurdles to effect changes to the project. This is referenced in the article where Peakes and Hayes highlighted recent FHWA/ AASHTO design guidelines. They note, “Obtaining a community consensus on the problem requires proactive public involvement beyond conventional public meetings at which well-developed alternatives are presented for public comment”.

Clearly, the opportunity exists to improve the effectiveness of public consultation during the planning phase.

Value Planning -- defined here as the application of Value Management (VM) during the planning stage of the project -- offers significant advantages, in terms of public/stakeholder buy-in and an improved focus on what the project must truly deliver to successfully address the identified problem statement. Public involvement can be improved in a meaningful way through the application of VM by getting residents and stakeholders involved in the definition of project objectives and sensitivities.

VALUE MANAGEMENT: AN EFFECTIVE DECISION-MAKING PROCESS

VM emerged within the manufacturing industry in the mid 1940’s, was introduced into the construction industry in the early 1960’s initially in the building sector - and soon spread to other sectors,
including transportation.

Transportation is well suited to the application of VM because of its entrenched design and construction processes, relatively large capital expenditures, and the great expectations of residents and users. However, the opportunity to make significant and/or strategic changes in the project diminishes as the project evolves, because the timing of the VM study, usually near the end of the design phase or during construction, often leaves little time or desire to revise the project to any great extent. The result is a significant loss of opportunity to substantially improve the project and/or achieve success with the public and stakeholders.

**BENEFITS AND CHALLENGES OF VALUE PLANNING**

Value Planning (VP) is not new. Quite simply, it is a suite of VM techniques that are already in use today by many VM practitioners. The difference is when and how these techniques are used that sets VP apart from other more traditional applications of VM. More importantly, it is how the results are used that differentiates VP from other applications of value methodology techniques.

Others have discussed the benefits of utilizing VM early in the project cycle. For example, Kirk\(^2\) noted that strategic value planning could assist the owner to define the functions and performance expectations desired for the project. Sankey\(^3\) outlined how a design charrette could provide a conceptual design and cost estimate early in the design process so that a conventional VM study could be performed. Both perspectives confirm that the most significant opportunity to change exists early in the project cycle as illustrated in Figure 1.

**Opportunity for Change**

Value Planning, as presented here, also differs from concept stage VM studies through the involvement of the public and key stakeholders. The VP workshop provides a unique opportunity to interactively involve the public before key decisions are made.

Practitioners involved in a VP study must recognize that they will perform a different role than during the conventional design phase VM study. This is because much of the information usually available to the VM team during the design phase has not been assembled or developed at this point\(^4\). Concepts have not emerged and public sensitivities are yet to be discovered.

One criticism of the environmental impact/assessment process focuses on the relative lack of variety of trite alternatives considered in transportation and infrastructure projects. In fact, guideline manuals for some legislation outline typical examples of planning alternatives. Unfortunately, some proponents limit their alternative generation activity to the relatively prescriptive range outlined in the manuals. The public is occasionally presented with a similar, and sometimes inappropriate, range of alternative solutions that may or may not address the problem statement.

VP can be used to break this traditional planning paradigm.
by focusing the study team and the public on project needs by identifying “project success functions” and defining the project sensitivities that must be respected.

**A SUGGESTED VALUE PLANNING APPROACH**

A definitive VP methodology is difficult to establish because each project may require unique activities. However, a basic framework has been established, which will govern the actions of the team and define the sequencing of traditional and VM planning activities. A suggested planning approach, which incorporates VM into the process, is listed below:

- Project Initiation Notice.
- Data Collection and Review.
- Selective Preparatory Activities (e.g. demand analysis, safety review).
- Value Planning Workshop(s).
- Development of Evaluation Criteria.
- Generation of Alternatives.
- Evaluation of Alternatives/Selection of Preferred Alternative.

The VP Workshop consists of three or four sequential sessions within the allotted time:

- Project Overview.
- Value Management Overview.
- Session I - Quality Modelling.
- Session II - Function Analysis.
- Session III - Scenario Planning (optional depending on project complexities).
- Session IV - Creativity.

The VP workshops have typically been approximately three hours in duration. This is a fairly long public session but the enthusiasm generated during the workshop usually maintains a high degree of participant interest and flow.

**Finding Participants**

The VP workshop activity can include separate workshops with the owner, key stakeholders and the public if time permits. However, it is important to ensure that all interested parties have the opportunity to fully participate. Not doing this will draw complaints that the proponent is “stacking the deck.” This will undermine the linkages with the community that we want to otherwise develop.

Newspaper advertisements, websites and mail-out programs have successfully been used to notify the public and stakeholders of the project activities and these tools are obviously available to support the VP process as well to solicit involvement.

A preference questionnaire is usually sent out in advance of the workshop with several multiple-choice questions to the participants. The purpose of the questionnaire is twofold - to get the participants thinking about the project, and to help identify pre-workshop bias that they will bring to the session. The survey is not intended to be statistically accurate. It simply “kick-starts” the workshop thought process.

**Project Overview**

The workshop commences with a brief overview of the project. The exact content of the overview will obviously vary from project to project, but it should provide the basic need and justification elements of the project.

At the end of the project overview, we generally ask two simple questions:

1. What else do you think should be added to the problem statement for the project?
2. What would you do to improve the project?

Asking these questions at this time in the VP workshop accomplishes two objectives. The first is to fully understand what works and what does not with the project. The second is to relieve participant stress and anxiety before the workshop gets into the more complicated elements. The two questions stimulate a free flow discussion of the project that often identifies other problems not noted during the formal technical reviews. (Note: Treat the participants as the experts—they most likely know more about the project than you do!) The second question is designed to dissipate pent up frustration often associated with major capital projects. The question allows the participants to “get it off their chest” and often results in key ideas for consideration at the Alternatives stage.

**Value Management Overview**

An overview of Value Management principles follows to help provide the workshop attendees with a basic understanding of the techniques. Simple examples of Function Analysis and Creativity methods are beneficial at this point.

**Session I - Quality Modelling**

The first module identifies the project sensitivities using Quality Modelling. The technique used for the infrastructure projects draws on the methods presented by Kirk in 1994 and refined by Dell Isola.

The criteria identified during the Quality Modelling session will be used during the evaluation of alternatives later in the planning study.

**Session II - Function Analysis**

Random function generation techniques are used to identify the project functions. The verb-noun pair used to describe each function is truly a universal language that can overcome the usual communication challenges, which exist when technical and non-technical participants try to work together.

For these projects, a modified FAST (Function Analysis System Technique) diagram is produced with the public. We generally use an “Infrastructure FAST” diagram that always has Satisfy User and Satisfy Stakeholder (and sometimes Satisfy Owner) as the higher order functions. This ensures that the FAST diagram can be completed relatively quickly and ensures compatibility if multiple VP workshops are held with different perspective groups.

**Session III - Scenario Planning (Optional)**

In specific cases, it may be desirable to include a Scenario Planning session to explore a broader range of alternatives, or to better understand what the future may bring. A word of caution: Scenario Planning should only be considered for extended VP work-
shops with the owner and/or key stakeholders and agencies. This session is not suggested for use with the public.

Session IV - Creativity
The finale is the Creativity session. As in a conventional VM study, ideas are brainstormed and listed for the functions identified earlier in the workshop. Experience has shown that the session will last no more than 25 minutes. The key role of the facilitator is to keep it light and keep it moving, and not try to cover all of the functions. Select the most problematic ones or the most sensitive -- these are the project success functions.

The importance of the Creativity session cannot be overstated. This is because key ideas generated will be assessed, bundled together with other ideas, and/or modified to form the planning solutions and eventually the detailed alternatives. The challenge faced by most planning teams is to obtain buy-in from the public. In our experience, public buy-in to the broad range of alternatives (and later the detailed alternatives) is set in motion with the Creativity session. The ideas first surface here and evolve through interactive public involvement. This eliminates the surprise associated with most planning studies that present technically preferred solutions for comment.

CASE STUDIES
Two successful transportation case studies using the Value Planning approach are presented to illustrate the benefits of the VP process.

Kennedy Road and McCowan Road EA
The Kennedy Road and McCowan Road Environmental Assessment project was initiated by the Regional Municipality of York (located north of Toronto, ON) to identify improvements for these two roads to support local development. The Town of Markham had recently approved a major community expansion plan, which would bring over 10,000 new residents into area. This demanded a major road widening (with long time residences, a church, cemeteries and a substandard vertical crest curve). The overwhelming sentiment from this collective group was that Kennedy Road should not be widened.

The VP workshop approach was utilized for this study because of the diverse perspectives and sensitivities that existed. The critical objective was to get the combined group focusing on finding a solution together instead of rehashing their relative perspectives on the influx of new residents to the area. The workshop helped draw out a common interest in providing safe traffic flows and access to existing residences. More importantly, the group was able to reach consensus on the importance of the cemeteries, and one existing house, to the heritage of the area. As part of this project, separate breakout creativity sessions were held with a smaller group. A solution was developed that provides a four-lane arterial on a curvilinear alignment around the cemeteries and only slight impacts on the heritage property.

The final concept for the study was approved by the Ministry of the Environment without delay due to public concerns with the project. The region's project manager acknowledged that the VP process definitely contributed to the success of the project by gaining public acceptance of the required trade-offs and their participation in the solution.

Highway 3, Windsor to Leamington PDR/EA
Highway 3, a 40 km highway between Windsor and Leamington, ON, was considered unsafe by many area residents because of a number of high profile collisions and fatalities reported in the media. Highway 3 was originally planned as a staged freeway—two lanes of the ultimate four-lane freeway are currently built and are operated today as a two lane/two directional road.

Roads need to provide a consistent message to the driver in terms of safety and security within the corridor. In the case of Highway 3 however, the absence of potential roadside conflicts resulted in high operating speeds and questionable decisions regarding turning maneuvers, resulting in severe collisions.

The challenge for this project was to diffuse built-up public sentiment about safety concerns of the road, while remaining responsive. It was clear that most interested parties felt that the only way to improve safety was to widen Highway 3 to a four lane freeway, irrespective of the fact that only 10,000 vehicles use the road every day.

Three VP workshops were held to collect the perspectives of the owner (Ministry of Transportation, Ontario), public and stakeholders, and the municipalities. The Ministry workshop included a Scenario Planning session to explore potential long-term influences in the corridor pertaining to economic development and traffic.

The value of these sessions was the opportunity to isolate groups with common interests. This had two effects—consensus was reached faster in each workshop, and ideas generated by each group were focused on satisfying their key concerns. However, in many cases, the ideas generated to provide the functions were similar for each workshop. This suggests that good ideas can be generated for the project by anyone who shares a common understanding of the project functions.

TIPS, TRICKS AND TRAPS
Following are the top ten tips, tricks, and traps learned from experience gained during the six recent VP workshops:

1. VP should be done as early as possible in the project cycle. This maximizes buy-in and eliminates bias.
2. Do not over-present the project to the audience. It is better to tell them less and to listen more.
3. Make sure everyone has the same opportunity to attend. Selective invitations may suggest bias or skew results.
4. Prepare the participants in advance with a questionnaire. A pre-workshop survey with relatively easy and/or hot-button questions will get them thinking about the project.
5. Use simple examples of VM to illustrate what they are going to be doing during the workshop.
6. Be prepared for delays during the VP workshop. Let the flow govern when to move on to the next session.
7. Have several functions for the project in mind before starting the workshop. These can be used if or when the participants need additional stimulation.
8. Use the Infrastructure FAST model to stimulate function identification.
9. Never assume you know more than the workshop attendees do. You probably don’t!
10. Make sure the participants have fun. Making them feel comfortable, that you are listening, and that they can make a difference, will make the sessions worthwhile to them.

SUMMARY
Value Management can significantly improve the outcome of projects through application during the planning phase. It offers the opportunity to make strategic and/or directional changes in the project and to substantially improve the project and/or achieve success with the public and stakeholders. VM, applied in the early stages of the project, provides an improved focus of what the project must truly deliver to successfully address the identified problem statement. As such, planners can effectively use Value Management to Put the Value Back into Planning.

REFERENCES

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This article was excerpted from the paper, “Putting the Value Into Planning,” by David C. Wilson, presented at the June 2000 SAVE International Conference in Reno, Nevada. It was awarded the “SAVE International Paper of the Year Award, 2000-2001.”
Abstract
This article describes how the Value Analysis method evolved progressively towards Value Management over the course of several Metro projects in Montreal. The stages that have been completed and the results that have been obtained are described, as well as the intangible benefits. Also cited is the eloquent testimony of a value manager who has applied the method to his work.

Introduction
The Quebec government’s ministère des transports (Transport Ministry) has begun implementing its transport plan for the Greater Montreal Region. This plan is based on a vision of an integrated, multi-modal system for people, vehicles, and even goods in the various traffic corridors that serve the greater Montreal area.

Priority has been given to mass transit for people by bus, metro and light-rail systems. The plan includes many major projects aimed at improving access to downtown Montreal while at the same time reducing congestion on the bridges that give access to the island of Montreal. The Agence métropolitaine de transport -- the AMT (Metropolitan Transit Authority) -- is the agency that has been mandated by the ministère des Transports du Québec (MTQ) to plan and build the infrastructure needed for mass transit. This article is based on the Value Analysis program that was used in each development phase of several projects.

Context
Traditionally, the design and implementation of large transport infrastructure programs in Quebec are awarded to consortiums of engineering firms where each firm receives a mandate corresponding to its expertise (civil engineering infrastructure, transport studies, electrical and mechanical equipment). The client to whom the project will ultimately be delivered (the operator), in this case the STM (Société de transport de Montréal or STM) acts as a consulting expert for the stationary equipment and the Metro rolling stock. Thus the STM has a double role as systems expert and as operating client.

The same approach is being used for the refurbishing and replacement of existing Metro equipment such as ventilation shafts, telecommunications equipment, escalators, energy systems, etc. This project, involving expenditures of some $500 million over a ten-year period, is aimed at ensuring that the Metro system remains state-of-the-art.

In this general context, teams have a tendency to work in “watertight compartments.” Value Analysis is the catalyst that brings them together, creates a synergy, and avoids unnecessary repetitions in design that eat up precious time and resources. Furthermore, all the opportunities that are identified in the extension projects are applied to the renovation work, and vice-versa.

A value methodology consultant has demonstrated how to bring people from different backgrounds together as a team, which is an essential condition for successful completion of any large project. It is the synergy generated by teamwork that brings to light the opportunities individual members of the team would not have been able to identify if left to work on their own. Past experience has shown that when this dynamic works well during Value Analysis workshops it continues during the implementation phase. People who have successfully identified opportunities together believe in the value and feasibility of their recommendations.

Another intangible benefit stemming from the integration of Value Analysis (VA) into project management is the knowledge transferred to clients that enables them to integrate the concepts of Value Management (VM) into their own working methods and project management. In this way, VA that occurs early in the process increases efficiency and encourages proactive rather than reactive management.

Progression of VA towards VM
In the initial stages of a project, a needs analysis is carried out to examine the context surrounding the project and identify the expectations of such clients as travellers, regulatory bodies, operators, maintenance managers, and even politicians.

When VA is applied during the project’s initial stages, drawing up the complete function tree for the project will highlight the management functions, technical needs, key issues and risks that are inherent in the project. These can then be evaluated by each of the participants involved in the project.

This step involves the primary decision makers at the beginning of the process, before any investment has been committed. For example, in certain projects:

- Important route changes were proposed so as to link developments favored by certain municipalities. Project managers were unaware of the importance of these developments until VA workshops brought them to light.

- The location of certain station egresses changed radically to comply with safety requirements concerning the travelling public, so reducing the risk for loss of life — contrary to what has recently been observed around other stations whose design did not take such risks into consideration.

- Important changes in the profile of tunnels were also proposed so as to reduce the depth of some auxiliary structures, thus reducing their cost and improving accessibility.
For certain managers, VA has become the pivotal point for change. After using VA several times, one manager volunteered the following observations:

The function model is a great tool that allows a manager to defend his or her recommendations. I can truthfully say that when VA has been used, my superiors have accepted 90 to 95 per cent of my recommendations. They even adopted the model, so creating a common ground for discussion.

Our colleague continued:

The use of the function model as a reference for certain thoughts draws the team together toward a common goal and sets up lateral communication. The team adopts the results more rapidly and information is passed on faster than would otherwise be the case. The participants build a common vision that spreads throughout each individual sector of activity.

This approach lessens the chance of subjective decisions being taken; everyone involved becomes more objective in their outlook.

Value Management, and the various Value Analysis exercises that are involved, considerably augments the toolbox that the manager needs to explain his or her vision, orient the organization, translate objectives into action, set people to work, and keep up with a world that is in constant evolution.

THE PROPOSED APPROACH FOR THE PROJECT DEVELOPMENT CYCLE

The steps proposed by the consultant are based on the universal analysis work plan recognized by SAVE International. This is adapted to the specific context of each construction/renovation project on the transit system.

Value Analysis integrates very easily into each of the five stages of this type of project:

1) Feasibility—Identification of needs (FPS for functional performance specs) and choice of solution that meets the user’s requirements and budget.
2) Design—A draft design that meets the user’s requirements at least cost.
3) Preliminary Engineering—Optimization of design components.
4) Detailed Engineering—Validation that technical requirements have been met. [Approval of tender documents]
5) Construction—Value Analysis on change orders (VECP).

The consultant suggests linking the VA exercises at each stage to full multidisciplinary workshops with coaching support for the project teams.

Experience has shown that a workshop may need to stretch over several days during each of the first three stages (feasibility, design, and preliminary engineering). A one-day workshop may be sufficient for the detailed engineering stage while the importance of VA in the construction phase is a function of the number and the scope of the change orders.

The program for each of the workshops contains the following four phases:

1. Orientation
   - Hold a preliminary meeting with the AMT project managers and the consultant.
   - Review the work done to date by the consultant.
   - Confirm the scope of the mandate.
   - Validate the approach proposed for VA.
   - Draft a list of subjects to be covered in the workshop.
   - List the workshop participants.
   - Draft the working method for the workshop.
   - Confirm workshop logistics.
   - Obtain basic available documentation (reports, sketches and plans).

2. Information Search
   - Study and assimilate the information already received.
   - Research supplementary information.
   - Develop the workshop documentation and transmit this to participants.

3. Run the VA Workshop
   Typical workshop program:
   A. Explain how the workshop fits into the overall project (project managers, client and consultant).
   B. Introduce participants and have them state their expectations concerning the workshop.
   C. Describe the project in its current state of development.
   D. Identify/confirm the major factors to be optimised.
   E. Function analysis of the project components (how these serve the user’s needs).
   F. Search for alternative solutions.
   G. Estimate costs and possible savings.
   H. Evaluate opportunities on a value basis (advantages, inconveniences, criteria, weighting).
   I. Following the workshop, prepare an action plan.

4. Develop Recommendations
   Project personnel, coached by the consultant, develop recommendations based on the results from the workshop.

   At the Feasibility stage, the VA workshop (phase 3) is different. It is aimed at defining the needs that must be met and expressing them in a manner that can easily be understood. The function analysis (section E) takes place following an examination of the context in which the project is being carried out, thus allowing external factors and stakeholders to be identified together with their links to the project. This exercise leads to the preparation of the project’s function tree and the listing of the satisfaction and performance criteria that the project must meet. Sections F, G and H do not apply to the Feasibility stage, whose final product is more akin to a functional performance specification (FPS). This becomes the sole reference document for the project during the Feasibility Study. The same document provides the main input for developing engineering plans once the project has been declared feasible.
ADVANTAGES OF THIS APPROACH

The rigorous application of this approach offers many advantages:

• Everyone involved has a uniform understanding of the project.
• The project is optimized through all its stages: design, preliminary and detailed engineering.
• The "freeze on the needs" and the "freeze on the concept" considerably reduces, and even eliminates, costly repetition and iterations in the production of construction documents. The number of change orders that are issued during the construction period are significantly reduced.
• Those change orders are integrated into the construction based on their value to the project rather than simply as cost-cutting measures.
• Project costs and delays both are reduced.

EXAMPLES OF SIGNIFICANT RESULTS

• Value Analysis carried out during the preliminary studies for the extension of Line 2 to Laval produced savings of $94 million on a project estimated at $439 million (-21%) while at the same time adding a multi-modal station. Further analyses are scheduled for the detailed engineering phase to ensure that budgets and timetables are being adhered to.
• Comparable results have been obtained during the pre-project study of a bus line between Repentigny and Montreal. The "ViaBus Notre-Dame" project, using the CN right-of-way, stretches over 9.4 km, 4.9 km on its own route and 4.5 km on a shared route. The preliminary cost estimate for the project amounted to some $30 million; through Value Analysis, this was reduced to $25 million for a saving of approximately 17 per cent. The AMT is planning to have VA workshops for each design stage.

Experience with this methodology applied to these and other projects shows that economies identified at the design stage vary between 10 and 25 per cent of the total estimated project cost.

CONCLUSION

Used as an optimization method, Value Analysis not only allows you to increase the value of the work, but when the same principles are applied to project management, they provide a better decision making process during a period when project costs are only partially committed.

This application of Value Analysis to management, called Value Management, allows decision makers to adjust budgets, project size and phasing to the constraints associated with government financing plans. This brings about better management of public funds and elected representatives are provided with an increased awareness of the project’s realities and constraints.

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Understanding Value Engineering

Roger B Sperling, CVS-Life

PROLOGUE
In reporting the death of Silicon Valley co-founder William Hewlett in 2001 the news media were quick to acknowledge the unique corporate culture he and David Packard created in 1939. Their business philosophy, called the “HP Way,” is a people-oriented approach with decentralized decision making and management by objective. The tenets of the Hewlett-Packard philosophy are: respect for the individual, contribution to customer and community, integrity, teamwork and innovation. To a value engineer these are familiar characteristics embodied in the value methodology. They represent the way value practitioners view their work and help explain why the value process for solving problems is so successful.

INTRODUCTION
This article is an overview of the often-misunderstood term: value engineering (VE). Even though VE has a half-century of history as a successful technique for improving the value of projects, products and processes, there remains a vague understanding in the engineering community of what VE is and what it can accomplish. The goal here is to clarify the methods and applications of the value methodology and to foster a better understanding and appreciation for value improvement work.

VE HAS A 50 YEAR HISTORY
The history of value improvement work dates back to the 1940s when Lawrence Miles, working for General Electric, developed value analysis (VA). Miles’ concept evolved out of the need to redesign GE’s products because of shortages of critical raw materials during World War II. The U.S military then named the process value engineering, embracing it in their quest to eliminate unnecessary costs of defense systems. Expanding use of VE in the public and private sector soon followed in the U.S and abroad. Mandated VE studies now save millions of dollars of public funds and corporate VE programs assure the competitive edge in the private sector.

VE IS A STRUCTURED PROCESS
The search for better value is based on the VE Job Plan (see Table 1), an organized, step-by-step problem-solving methodology. The original concept is reviewed by the value team; function analysis and a creative session lead to the evaluation and development of alternative concepts, which are then presented to the stakeholders (owner, designer and users); implementation of the alternatives completes the VE Job Plan.

This systematic process, beginning with preparation and information phases, is the same whatever the item under study. It is carefully designed to analyze functions of a project, product or process before moving to the creative and evaluative phases. The final three phases, development, presentation and implementation, complete the protocol. All phases must be completed in an orderly way to achieve optimum results.

VALUE HAS A DEFINITION
The definition of value, as Value = Function/Cost, is a key to understanding value engineering. Improving value means improving (raising) function and/or improving (lowering) cost. It is, therefore, necessary to consider the function of an item—what its purpose is—before value improvements are suggested.

The unique approach of function analysis is the essential precursor to the search for creative alternatives. Understanding what work an item is intended to do must precede the search for better value alternatives. This is what makes VE unique and gives it the power to achieve surprising value improvements.

VE IS NOT COST CUTTING
Failure to understand the functional approach of VE leads to a false conclusion that VE is merely a cost-cutting exercise. Unfortunately, many studies are conducted in the name of value engineering where the function analysis phase of the VE Job Plan is omitted. This over-enthusiastic leap from the information phase-over the function analysis phase—to the creative phase (see Table 1) defeats the very goal of value studies, which is to improve value, not just cost.

An example VE Study illustrates this point. In the information phase of a wastewater diversion facility the team received instructions from the design manager to not change the sacred cow of the project’s location. But by moving the facility to a new location it was possible for the team to more than double the capacity of the system for the same cost and within the same “footprint.” Management was pleased—and surprised—that VE worked so well, because expectations for this study were low and only minor cost-cutting ideas had been anticipated.

VE IS A TEAM PROCESS
Value studies rely on the synergy of teams working together to solve a common problem. Typically, mixed-discipline teams, with some members having prior knowledge of the item under study, and some without, are used in value studies. The individual strengths of every team member are melded into a dynamic team that achieves often-startling results. Trained and certified team leaders are able to work with diverse teams and stimulate synergistic behavior that allows them to find solutions that may have been overlooked.

The VE process ensures that the ideas of each team member are considered objectively. When ideas are suggested for improving value they are faithfully recorded without prejudice; they are, so to speak, saved for later evaluation. This suspension of evaluation is what allows value teams to generate many new ideas; not all of them are of equal value but they are honored equally as one lesser idea can lead to a greater idea. The relative values of all ideas are determined in the evaluative phase by a careful judgment
process where each idea is given a fair evaluation against specific, stakeholder criteria.

**VE CONSULTANTS ARE A RESOURCE**

Outside value consultants often are needed to augment in-house resources. They can provide technical experts to sit on value teams and trained team leaders to lead studies. Where proprietary designs are being studied, in-house staff is used exclusively. However, consultants are needed to train the people who will be invited to form value teams and lead them.

Another example illustrates how two consultants, one a team member and the other the team leader, helped a value team of in-house design professionals achieve significant improvements to their own, very familiar design process.

The state highway design procedure under review was lengthy and complex. It was the way it had been done for years without questioning the rational. The team-member consultant had worked on contracts for the agency and had a view from outside the organization. He was able to make suggestions for improvement that were developed into viable alternatives to shorten the processing of designs. The value methods allowed in-house staff to accept ideas from the private sector that could enhance their process. Many schedule-shortening changes were finally adopted.

**VE TIMING IS PROJECT SPECIFIC**

The most frequently asked question is: What is the best time to conduct a value improvement study? The answer is: any time. However, the trend is to do VE sooner rather than later. The use of VE after the original design concept is nearly ready for release is prone to develop antagonisms between the stakeholders and the VE team. It is preferable to use VE sooner in the development process, allowing the design team and the value team to work in concert to explore—in functional terms—what the project, product or process is intended to serve and generate a wide range of alternative concepts. VE is an excellent way to sharpen the scope of work on ill-defined projects.

A third example study illustrates how the familiar assembly line operations for an electronic circuit board can be analyzed with a “new look” by VE to reduce component costs and manufacturing time. This study was not conducted at the early development stage of the circuit board but after it had been in production for some time. The purpose was to find value improvements to help regain market share for a highly competitive commercial appliance. Redesign of the assembly line—to reduce “move” and “wait” times—resulted from this study.

**VE PROGRAM NEEDS OVERSIGHT**

Successful application of VE requires a commitment from top management and a dedicated staff to manage the studies. Without willingness by managers—both in the private and public sectors—to support the training of staff in value methods, and to nurture the administration of an organized value program, the benefits of VE cannot be realized.

A full-time VE Coordinator is the individual who organizes VE study teams and monitors their performance. She reports to the consultant on the performance of the team and summarizes the results of each study to the project manager. Annual summaries of
implemented VE study results are elevated to management and VE successes are publicized to the organization.

**VE MUST BE EXPERIENCED**

Written descriptions of the VE process are inadequate to convey the energy and excitement that is inherent in value teams as they work to improve value of projects, products and processes. One needs to be part of a VE team to experience the value methodology and to become “infected” with the value ethic. This is why training workshops are organized as 40-hour classes with half of the time given to applying the value methods to a live project. Enthusiasm for the value methodology is generated from the understanding gained in the workshop, and this leads often to individuals launching their career in value improvement.

**CLOSING**

The prologue refers to the five tenets of the “HP Way”; the value methodology fully embodies them all:

- **Respect** - VE honors the ideas of its team members.
- **Contribution** - VE results in improvements to the benefit of owners and society.
- **Integrity** - VE maintains the integrity of the owner’s projects.
- **Teamwork** - VE relies on synergistic teams to produce surprising results.
- **Innovation** - VE develops alternatives from carefully evaluated creative ideas.

The future of the value methodology is bright as practitioners and applications expand worldwide.

Roger B Sperling, CVS-Life, has over 40 years’ experience in engineering and project management, and has led more than 90 value and quality-improvement studies and training workshops. He established the VE program at Lawrence Livermore National Laboratory and assisted the U.S. Department of Energy’s VE office. Until his retirement as vice president of Value Management Strategies, Inc., he devoted his efforts to the practice of value engineering and quality improvement. Sperling served as vice president-marketing for SAVE International. He has been editor of Value World for the past four years. He received his bachelor’s degree in engineering from the University of California at Los Angeles.

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**SAVE Advantage**

The best and most convenient way to learn the techniques of the Value Methodology and their application and to contribute to the growth and development of value technology is as a member of SAVE International. See page 24 for your SAVE Membership Application. Get more information about SAVE membership benefits at www.value-eng.org.
I saved the best part of my professional career until last. That occurred when—after 30 years in engineering design and management—I learned the art of value improvement and became a value engineering consultant. But I took a long and indirect route to that goal.

PERSONAL HISTORY
As a graduate of the UCLA School of Engineering in the 1950s I received a Bachelor of Science in Engineering, a degree with no stated specialty. However, I chose elective courses that fulfilled my personal goal of becoming an industrial engineer.

My first job was in instrument manufacturing designing and overseeing the manufacture of NASA-specified transducers that were part of the measurement packages of moon-bound space vehicles. I spent as much time on the shop floor as in the design office.

I was asked to be on the brand new value engineering (VE) committee in the late 1960s when VE was relatively new. We had a meeting to get organized. Then a change in career path took me away from this first, very brief VE exposure; I would not return to VE for almost 20 years.

INITIAL CONTACT
Soon after moving to a design manager’s position at a federally-funded national laboratory in the late 1980’s I was invited to receive value engineering training. Our management’s VE initiative was intended to expand the creativity of the engineering design staff, to help us “think outside the box.”

I thoroughly enjoyed the training, taking a pro-active part in leading my ad hoc team of engineers through the workshop exercises. I saw an opportunity to learn a new set of skills to apply to the research facilities design work of my organization.

INITIAL VE STUDY
My management wanted to try out the new VE concepts we had learned in the training workshop. They invited me to organize and lead a VE study on a fast-track design of a wastewater diversion facility. I accepted without hesitation. My peer engineering managers assigned six team members, one from each discipline (e.g., structural, mechanical, etc.) to be on the team.

Because none of the selected engineers/architects—or the outside wastewater consultant—had been trained in VE, I was a bit apprehensive at first. But I trusted the VE process to work as I had seen demonstrated in the workshop. I became comfortable leading the study although some of the team members were not sure this new approach to evaluating a design would work.

The most exciting part of the study was the oral presentation of the results. The team offered several VE alternatives that challenged the original design parameters. It took a measure of bravery to suggest alternatives that challenged the paradigms of the original design. But the VE alternatives significantly improved the project.

FORMAL VE ASSIGNMENT
Following the success of the initial study I was asked to develop VE guidelines for project managers to use in the application of VE on their projects. Criteria were developed for size of project, type of funding, complexity and schedule. Several iterations of the guidelines document were needed to set the correct tone for our organization and give meaningful incentives to design managers for the use of VE.

MARKETING VE PROGRAM
Marketing a VE program is necessary in any large organization. I prepared articles on the VE program for the department’s newsletter and I consulted with department staff on the applicability of VE. I wrote articles for publication in SAVE International’s Interactions, and Value World. Also, I wrote and presented papers at SAVE International Conferences. Soon I was elected to the SAVE board of directors.

CERTIFICATION
The training and experience gained over four years allowed me to apply for certification as a Certified Value Specialist (CVS). This afforded me recognition of my work in my new discipline of value improvement and validated my professional status among my colleagues in SAVE International. With further experience I achieved lifetime certification.

MOVING OUTSIDE
Following six years of laboratory VE work I took a position with an east coast VE consultant. I established a new west coast office, leading and teaching VE in North America and Europe. Each study broadened my VE skills and taught me about different fields of engineering.

TEACHING VE
One of my favorite assignments was to teach VE using the 40-hour Module I course. I learned the VE-specific teaching skills from my mentor and soon became a lead instructor. After guiding several hundred students through the value methodology I became a mentor to other VE managers and team leaders. I edited VE training manuals, giving me the opportunity to share my learning experiences as a team leader and VE instructor.

THE FUTURE
I encourage anyone interested in improving the decision-making process in your organization to investigate value engineering. By learning the tools and techniques of value improvement you will become a more valuable employee and you will have a more rewarding career.
Value World needs articles for future issues. Original papers, reprints from other journals, or sections abstracted from books or manuals will be considered for publication. Previously-published material must be accompanied by written permission to reprint from the copyright holder or the original publisher. Articles on all subjects related to value methodology will be considered for publication. All papers are subject to peer review. Some issues of Value World follow specific themes. Publication dates for accepted manuscripts may be affected by their relevance to the theme of an issue.

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