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Perceiving the Value of New Ideas

EDITORIAL

Roger B Sperling, CVS

This is the season for list making, poised as we are at the dawn of the 21st century—lists of past events, lists of future possibilities. The lists I find most interesting are the ones made in 1900 predicting changes that would occur in 2000. Some selected predictions, as listed in Knight Ridder Newspapers, March 14, 1999:

- Life will be as near a holiday as it is possible; work will be reduced to a minimum by machinery.
- Nobody who is anybody will lack his automobile and his air yacht.
- City streets and storefronts will be stacked high upon each other, translating life to a higher plane.
- Telephones will allow Americans to converse not only with people in other countries but with the inhabitants of Mars.

Prognostication, it seems, was a hit-and-miss affair 100 years ago. There were hints of changes in work, travel, cities, and communications springing from new technologies. But certainly the invention of the Internet was not on anyone’s intellectual radar then. Now many people recognize the Internet as perhaps the singular invention that has become the foundation for the bridge from the 20th century age of technology to the 21st century age of information. This one idea has spawned a technological revolution that bombards one daily with new innovations. Take some recent news items:

- For $500 or less buyers can get a personal computer as powerful as those sold 18 months ago for $2,000; if they commit to an Internet provider for three years the PC is almost free (USA Today, August 4, 1999).
- Personal computer makers are undergoing a major metamorphosis as they are forced to deliver an array of services via the Internet and take a slice of what each consumer spends (San Jose Mercury News, August 8, 1999).
- There is a video-game mentality to the stock market; Internet technology allows 100 trades per day, which contributes to the volatility of the market (CBS News, August 9, 1999).
- The “Internet computer”—aspirin sized, to sell for $1—has been developed that can be imbedded in household appliances, so people on the road can use the Internet to turn them on and off (Associated Press, August 21, 1999).
- General Motors plans to offer voice-activated Internet access in a “Web car” next year to transform GM into a global e-business enterprise (Associated Press, August 11, 1999).

These few items only begin to describe the exponential acceleration of technology wrought by the Internet. But a hundred years ago—or even 30 years ago when the idea was born—no one knew the impact it would have.

There are many who want to share the credit for the development of this new medium. I can point with pride to my alma mater, the University of California, Los Angeles (UCLA) as the birthplace of the Internet. Professor Leonard Kleinrock, Ph.D., writes:

This year marks the 30th anniversary of the first Internet connection—made right here at UCLA. In 1969, an elusive group of academia—including a UCLA team of 40 people—joined government and industry in evolving the ARPANET computer network, the prelude to the Internet.

That is history. The really interesting part is that 30 years ago the concept of the Internet was not fully appreciated. Kleinrock, leader of the team, continues:

None of us realized that [the general populace] would ever use this thing. It was an engineering project to get computers to talk to each other. ... I anticipated computer access would become just like a utility, like electricity ... but no one really understood the social impact, the business impact (UCLA Alumni News, February 1999).

The value of a new idea is not always perceived when offered. And it is not always apparent until it is developed. It may not be really understood until it has been applied and the whole world works on the idea and makes use of it.

I will not be so bold to set down a list of predictions for the year 2100. But I can say that society needs to encourage open-minded acceptance of new ideas so the technological revolution humans are living through can evolve in positive ways. As VM practitioners we have a responsibility to nurture those new ideas whose value may not yet be perceived.

The articles in this last Value World issue of the 20th century can help us to prepare for what lies ahead.

The concept of value ecology, the mathematics of value, Web site value communications, management of change, where value engineering should be going, and VM savings compared to cost reduction are the topics covered here. I hope they will strengthen your knowledge and spark your enthusiasm for the value management of new ideas in the exciting years that lie ahead.
Recognizing Value Analysis, Value Engineering, and Value Management in the Context of a Value Ecology

Roy Woodhead, Ph.D.

INTRODUCTION

This paper explains how Miles's (1972) original concept of value analysis (VA) has adapted, modified, and changed to arrive at today's many value methodologies and perspectives. It sees this process of change, development, and adaptation as a form of evolution within a value paradigm. A paradigm is taken as a collection of rules, codes of practice, and peer expectations that can be identified as belonging to a particular school, social institution, or profession. At the heart of all paradigms is a collective belief system based on concepts of value. Within paradigms certain perspectives, or alternative views, fight for dominance. This internal conflict takes place as the paradigms themselves fight for dominance against other paradigms. The difference between the facilitator as a leader and the facilitator as a neutral conductor provides an example of perspectives competing to dominate thinking; this is happening while the value paradigm is itself competing against cost-cutting paradigms.

The definition of value being used in this paper is based on a belief that a sense of value occurs when the criteria or expectations of dominant paradigms or perspectives are met or surpassed. Thus, terms such as value-for-money and profitability can be viewed as products of a financial paradigm that certain people promote to dominate a view of what a good decision is.

The paper then explains that it is the interaction of systems such as industrial projects, public-sector organizations, local economies, and national legislation that stimulated the need for value analysis to adapt along different lines in the United Kingdom and Australia than in the United States. This contextual effect on the value practitioners' selection and development of value methodologies is viewed as an ecological process. As systems interact and interface, they cause change and force adaptation; value analysis became value engineering (VE) because dominant paradigms and perspectives at one particular time caused the value practitioners to adapt in order to progress. This position is then used as a basis to argue that the various value societies (e.g., SAVE International, Institute of Value Management, Association Francaise pour l'Analyse de la Valeur, Institute of Value Management Australia, Hong Kong Institute of Value Management) need to integrate if value methodologies are to achieve their potential on a global scale.

THE INFLUENCE OF PARADIGMS AND PERSPECTIVES ON THE CAPITAL DECISION TO BUILD

Large complex decisions, such as the decision to build a new facility, can take six months to three years to arrive at, and are influenced by paradigms and perspectives (Woodhead 1999). Those responsible for the decision-making process seek to achieve a sense of “good” decision making by checking for fit with the expectations of dominant paradigms. Woodhead (1999) showed that, in the case of large construction projects in the United Kingdom, a capital-investment paradigm and cost-benefit-analysis paradigm influenced the process by which decisions were shaped and evaluated. Other paradigms, such as the marketing and planning permission paradigms, compete for dominance and play an important role in influencing the conversations within the decision-to-build process. The paradigms and perspectives fight for overall domination of the group decision-making agenda through the values and expectations of people. In positive episodes, the resultant forces bind individuals, roles, departments, projects, and organizations with a societal view of what will be deemed to be a good decision.

If a complex decision was made by one profession in isolation from others (for example, the marketing department alone made the decision to build), then a narrow or focused range of influences would steer the decision being shaped. In such cases a perceived good decision could be implemented only to discover that its success is evaluated by customers and the general public, who have a wider set of criteria. Because paradigms and perspectives (which also are adapting themselves) vie for dominance, the ways in which good decisions are recognized shifts over time. This has implications for value management (VM) interventions at different points of the project's life cycle; as the paradigms swap dominant positions, so do the underlying values. In the preproject stage (Woodhead 1999) the dominant values relate to strategic, marketing, organizational, and investment paradigms. During the design stage, however, architectural, planning control, and construction-management paradigms (to name a few) begin to dominate the decision-making agenda.

By considering paradigms and perspectives as systems that interact with other systems, it is possible to see that their purpose...
is to realize values and meet expectations based on certain expectations. The way in which systems interact and interface to achieve a sense of good decision is seen as an ecological process that this paper names value ecology.

UNDERSTANDING VM AS AN EVOLUTIONARY PROCESS

It is important to see today’s understanding of value analysis, value engineering, and value management as part of an evolutionary process in the same spirit of total quality management’s drive for continuous improvement. Harry Erlicher of General Electric assigned a purchasing agent named Larry Miles to discover how the better ideas had been achieved during World War II in the hope of creating a sustainable innovation process (Crum 1971). Miles went beyond his brief and developed value analysis. He recognized a need to resolve an innovation gap and achieved this by creating a new paradigm that said that customers don’t buy products, they buy functions experienced through products. The formula of value equals function divided by cost ($value = \frac{function}{cost}$) implies that the source of value is embodied inside the product. In the case of construction projects, value can also exist outside the project in other parts of the location; this was Roy Barton’s (1998) dilemma in a multistakeholder workshop reported on VEAMAC (Value Engineering Analysis and Management Academic Community).

On large projects, particularly in the construction sector, expert teams of external value analysts (or value engineers, as they also became known) were brought into a project to evaluate and suggest value improvements to the prevailing design and construction methods (Zimmerman and Hart 1982). Because the quantity-surveying profession and its cost-management methods were not established in the United States (Palmer 1992), the FAST diagrams developed into a type of cost plan used to identify, agree, monitor, and control project costs (Dell’Isola 1982). This paper argues that it was the need to achieve fit with dominant paradigms and perspectives that stimulated people such as Dell’Isola to develop the VE methodology to include a cost-management service.

Later, when value engineering crossed the oceans to the United Kingdom and Australia’s construction industries with different cultural paradigms from the United States, existing design teams were uneasy with the notion of an external team “looking for faults” (Palmer 1992). It was this contextual pressure that caused the role of the external VE team to be modified in both Australia and the United Kingdom. Value analysis evolved into value engineering because, for one reason or another, it was necessary for someone to make that change. Value engineering has evolved into value management because other influences have made such a progression necessary. As such, the ecological processes, where different systems interface, have caused views of value methodologies to shift and have acted upon the value practitioner’s approach to meeting his or her clients’ needs. Green’s (1994) “A Paradigm Crisis in Value Management” can thus be seen as a point at which such a need to adapt was manifesting. Barton’s (1997) work in Australia has also evolved from this paradigmatic crisis and has developed into “soft VM,” which places the facilitator in a neutral rather than leadership role. To argue that one value
approach is better than another is to ignore the ecological pressures that have caused the various approaches to evolve as they have.

Value management, soft VM, and "hard VM" are further stages in an evolutionary process caused by the need to adapt to different situations. The interaction between societal values through paradigms and perspectives, organizations, projects, and people is stimulated by ecological relationships between such constructs as management systems and legislative systems. Value analysis, value engineering, value management, and other value methodologies seek to align expectations—or exceed those expectations—with societal values, paradigms and perspectives, organizational values, project values, and, in some cases, individual values. Value is now taken as being more than the embodied functions within the product or process being studied.

**SO WHAT IS VALUE ECOLOGY?**

Decision-making processes can be seen to have three subprocesses that run sequentially. These three processes are decision shaping (Woodhead 1999), which shapes the decision; decision implementation, which considers how the proposed decision will be realized; and finally decision experiencing, which considers the outcome of the decision. The success criteria promoted by competing paradigms and perspectives often change as the decision moves through each of the three generic stages. This is because the assessors' dominant values and subjective expectations determine the criteria by which success is anticipated within each decision-making stage; however, it is common for large projects to experience some or all of the assessors changing at each decision stage. Acknowledgment of the ecological effect caused by competing paradigms and perspectives allows an opportunity for group decision-making processes to make more informed decisions by recognizing that changing values influence how success might be perceived at the different stages of the decision-making process. From this perspective, a theory of value ecology is defined as:

A gestalt where values related to notions of "good decision" influence, and are influenced by, competing paradigms and perspectives. These influences act on organizations, projects, and people by being used to determine if decisions achieve "good fit" with dominant expectations to achieve a sense of objectivity. The paradigms and perspectives are constantly changing because their underlying values are themselves modifying and adapting.

Value ecology is thus a theory that allows a further development to take place and provides an opportunity for the disparate value societies (e.g., SAVE International, Institute of Value Management, Association Francaise pour l'Analyse de la Valeur, etc.) to move toward an integrated global value community. It achieves this by explaining those different approaches to practice as a result of interaction between different systems, paradigms, and perspectives.

**WHY DO WE NEED A THEORY OF VALUE ECOLOGY?**

If value practitioners of different value-based approaches were simply climbing alternative routes up the same mountain, then it is the purpose of climbing the mountain that unites those mountaineers in a common goal. Value ecology creates a potential for a common purpose to be articulated that guides the various value-oriented societies toward a higher plateau based on greater collaboration. Major hurdles to unification are the perceived barriers that limit thinking. This paper argues that the value community needs to challenge assumptions that have become constraints to both its growth and common usage. In the United Kingdom, value management often is used as an interventionist strategy at key milestones, project pinch points, gateways, etc. (Male et al. 1998). In France value management is more of an integrated process realized through a series of meetings rather than workshops. Thiry (1997) argues that both approaches can, and should, be combined to achieve "integrated VM." Value ecology is a theory in which these different evolutions originating from Miles's value analysis can coexist, allowing the value practitioner to embrace them all—or parts of them.

At the moment, value management's potential to interact on a global stage is limited by its lack of critical mass caused by the fragmentation of its professional bodies sprinkled around the world.

This paper argues that the time has arrived to understand the different institutional views of value analysis, value engineering, and value management in the context of an evolving ecological process that is beyond control. This ecology has adapted to national and industrial situations, cultures, and contexts. By understanding how different threads of value analysis, value engineering, and value management have evolved on different continents, it is possible to understand why those differences exist. Value ecology illustrates the impotence of arguments about which "brand" of value analysis, value engineering, or value management is best; it is the recognition of influencing paradigms and perspectives that decides appropriateness.

**WHAT COULD BE ACHIEVED BY UNIFICATION?**

The national and international context in which value analysis, value engineering, and value management are practiced tends to focus on large capital investment in either construction projects or manufacturing processes. This usually begins with a request for a VA, VE, or VM study from a client. The invitation to practice a value methodology emphasizes that it is a methodology responsive to someone else's initial recognition of a problem situation. Value management could become more proactive, and its benefits could have a larger impact on society. For example, by the middle of the next century, 18% of the world's population will live in countries suffering from freshwater shortages (World Resources 1996). Value methodologies could be used to achieve an integrated freshwater

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policy that would avert or reduce this imminent disaster. That is, value practitioners could be used to solve multinational problems with tangled interests. To achieve this, the value community must influence other paradigms and perspectives and have a loud enough voice to draw attention to such a possibility. At the moment, value management’s potential to interact on a global stage is limited by its lack of critical mass caused by the fragmentation of its professional bodies sprinkled around the world. No VM-related institute, society, or professional body has more than 2,000 members, and a number of the well-known ones have fewer than 500 members.

Value management, soft VM, and ‘hard VM’ are further stages in an evolutionary process caused by the need to adapt to different situations.

An integrated value community, based on a pluralistic understanding of practice, could have one global professional body that increases recognition and utilization. A global institute could develop training criteria and professional development programs, and establish a ladder of opportunity for fledgling facilitators. The current small value societies could pool their resources and develop income from joint ventures such as global advertising in their own high-quality magazine. This single global professional body could lobby multinational governments and organizations, thus raising the profile and credibility of value methodologies. With such collaboration, value-based approaches could play a proactive role helping poor countries make better use of their limited resources from within a global perspective. A global institute could even provide a pool of expertise that could respond to natural disasters as befell Honduras in 1998. Value ecology thus promotes a view of “many paths to a common goal” in which the unifying objective is to achieve a common goal of increased value.

CONCLUSIONS

Good decisions are recognized through the criteria advanced by dominant paradigms and perspectives. However, these paradigms and perspectives are in competition, which means a view of “good” today may not be the same in the future. Therefore, avoiding a bad decision requires decision makers to check that their projects meet the expectations of existing and anticipated dominant paradigms and perspectives, which also are evolving. By recognizing that values shape paradigms and perspectives, and that value analysis, value engineering, and value management are methodologies that respond to situations where certain paradigms are (or will be) dominant, more informed decisions can be made.

The interactions between paradigms and perspectives and the various approaches to value can be seen as ecological relationships in action. Just as value analysis evolved through value engineering to realize value management, other approaches also may be the product of similar pressures and influences. This recognition could signify a means of bringing all value methodologies to a common forum so that a critical mass emerges.

RECOMMENDATIONS

This paper finishes by challenging the current situation to move forward from a collection of small societies and value-based organizations to a single global organization. The various value-focused professional bodies and institutes could use value ecology as an enabling theory and consider joining their assets, energy, and intellectual potential in an integrated strategy so that the benefits of value-based thinking can influence global projects.

REFERENCES


Roy Woodhead, Ph.D., is a senior lecturer at the School of Architecture at Oxford Brookes University, Oxford, United Kingdom. He possesses 14 years’ site-based experience in the construction industry and graduated from Sheffield City Polytechnic in 1992. Woodhead launched VEAMAC, an electronic discussion forum for VM practitioners and researchers, in 1997.
Communicating About Value Internationally:  
The VEAMAC Web Site

John Koga, CVS, AIA

INTRODUCTION

Nearly every time I review my e-mail messages the list includes a series of messages from a Web site called VEAMAC, which I have been following for about two years. Occasionally the messages pile up like junk mail, but junk mail they are not. I look forward to reading VEAMAC’s content and connecting, sometimes surreptitiously, with a variety of acquaintances. I consider the site very successful, am pleased with its impact on the value profession, and am wondering about its potential impact on SAVE International.

VEAMAC WEB SITE

VEAMAC stands for Value Engineering Analysis and Management Academic Community. It is a “communication initiative, not an organization” (Woodhead 1999). Roy Woodhead, a value management researcher based at the Oxford Brookes University School of Architecture in Oxford, England, manages the site. Woodhead is very dedicated to it and deserves to be commended. VEAMAC began in September 1997 with a face-to-face workshop at Oxford Brookes.

FIRST IMPRESSIONS

VEAMAC is filling a need for many practitioners distinguished with a passion for value engineering. It allows us to listen to the world as if we had a shortwave radio with a channel dedicated to value analysis. Others might compare it to a “chat room” because VEAMAC allows one to participate. It also is like a radio show that seeks listeners who will phone in and discuss a current subject.

A new subscriber initially may find VEAMAC a bit overwhelming, but it is not difficult to become involved. At first it may seem like overhearing a group of professors standing in a college plaza discuss a topic that interests one. However, with VEAMAC one can interject thoughts. One is not intruding on a private matter. But that picture is not an accurate representation. Move the analogy to the local pub and join a group at a table.

No, that’s still not right. Many other people join in the conversation. They include busy value practitioners, college students, and client representatives from various corporations. They informally type their thoughts into VEAMAC from around the world. So perhaps VEAMAC actually is a chat room uniquely specializing in discussions about value and closely related topics.

Regardless of the analogy, VEAMAC unites a unique group of participants in conversation and sufficiently interesting debate, with standards high enough to give it some priority in my day. It is also unique because the manager of VEAMAC posts a topic to debate every few weeks. While the topic is addressed, there are always a few mavericks who want to talk about something else. The participants seriously digest the topic. Discussions occur that address problems all value-focused practitioners face and some issues that many of us would never suspect. VEAMAC participants wonderfully blend the study of behavioral and other sciences with their project experience and value study experience. They refine value analysis in the fire of their scrutiny. The conversation may blend insight from a book by a Nobel Prize winner with experience from a value specialist in France or comments from a customer of value engineering in South America. It keeps participation interesting. One could be the author of several books on value analysis and still learn from VEAMAC.

GROWING RESULTS

"C,” the last letter in the acronym, denotes a defining concept: community. VEAMAC initially was intended as an electronic forum for value management academics and researchers. The hope was that discussion beyond the usual introductory conversation material would cause value-improving techniques to progress. VEAMAC’s primary function is to help all researchers advance value management as superior to parochial cost reductionism (Woodhead 1999). But VEAMAC is building a community beyond academia by allowing new theory to be scrutinized through collaboration with practitioners who adapt it in practice. It expedites the scrutiny beyond the conventional pace of publication and review. The electronic medium provides a cauldron constantly simmering with discussion.

By using VEAMAC, one quickly learns that value is not a concept owned by some practitioners in the United States or by an organization called SAVE International.

Upon subscribing to the Web site, one receives a welcoming letter that says, “It was decided at an early stage that practitioners should be provided with access to the discussions and debate this network facilitates. Let’s hope this electronic forum is the first step towards a global journal of value management. ...”

The VEAMAC community is serious. The first publication involving papers from many areas of the world is being assembled. Beyond such activity, VEAMAC does not have any other agenda,
provides opportunities to develop familiarity and partnerships to improve the value delivered throughout the world. It also has provided a place for the exchange of information such as meeting schedules and updates on the activity of value societies in various countries.

INTERNATIONAL POTENTIAL

English, the language spoken on VEAMAC, is a widely used language in business but certainly not the only one. That has not stopped formation of an international but English-speaking community on VEAMAC that is interested in value methodology. Regular contributors include people from Australia, England, Scotland, France, Canada, the United States, and Hong Kong. There also are subscribers from countries other than those listed. There were 111 VEAMAC subscribers in May 1999, with approximately half from the United Kingdom. It is difficult to ascertain all the countries represented solely by reviewing e-mail addresses. One can only guess the result if more countries were represented and some of the subscribers could use their native language on the site. Language diversity is not a problem easily solved, but it could expand conversation further as multilingual participants translated the thoughts. This could cause further progress toward the goal of increasing the usage of value-improving techniques.

VEAMAC is a good place to discuss value methodology and has issues addressed tenaciously. Where else can those of us with a passion for this subject be brought together in a similar fashion?

SAVE International has a Web site. The site offers a discussion forum. Perhaps it could provide discussion groups in various languages centered in one place. But perhaps that is premature. Why am I not participating on that Web site daily? How did VEAMAC get to be the habit it has become? One can attribute this to four things:

- One automatically receives VEAMAC e-mail without any effort on the part of subscribers.
- Participants have kept the conversation interesting.
- There is an easy, spontaneous participation by many.
- One can direct questions to some of those most knowledgeable about the subject—for free.

The automatic deluge of e-mail has made receiving and viewing VEAMAC mail a habit, and the quality has sustained it. Besides, one can enjoy building relationships with others who have a similar interest.

But there also is a concern. VEAMAC may be creating a group too separate from those using the SAVE International Web site and discussion forums. It takes time to correspond on any Web site and significant time to follow more than one. We may want to know what is on the SAVE International site but sometimes lack time to investigate.

SAVE INTERNATIONAL WEB SITE

The discussion forum on the SAVE International Web site (http://www.value-eng.com) began in January 1998, only a few months after VEAMAC. SAVE International’s site organizes the conversations by topic and records the flow of the discussion within each of 10 discussion groups. A strength VEAMAC does not have. This is a good organizational feature because it allows a topic to be continuously and easily discussed over a long period of time, but it also creates barriers to usage. One can easily come and go from the conversation, but is an occasional entry a discussion? Without using my Web browser to establish a subscription to the site, causing regular notification of change, spontaneity cannot occur. Many people participate, but it is not as easy to be involved. Perhaps the site has not had enough time to mature.

SAVE International’s Web site also serves a different audience. It is a primary source of information for prospective clients, students, and others just becoming familiar with value engineering. It serves the value practitioner who seeks information about SAVE International activities. Excellent questions are asked in the discussion group area. VEAMAC users could use it as an opportunity to teach. But because it is SAVE International, one has the feeling of being on stage. On VEAMAC one feels that the audience is more restricted. This allows discussion about the finer points of value engineering while believing one is not in front of the customer (at least one thinks one has that privacy). On the other hand, maybe a discussion in front of the customer, or rather with the customer, would be beneficial to both.

It’s unfortunate for SAVE International that VEAMAC and its high usage level did not initiate through SAVE International. It may be good to be separate if the basic function of each site is different. But are not all practitioners deprived of the diversity and unity that conversing in a single broad forum could provide? VEAMAC may become the primary conversation medium, sort of a United Nations of value methodology. But it would be nice—and perhaps appropriate, considering its roots—if SAVE International could play that role. Perhaps SAVE International’s site could be modified to offer a similar service, or instructions about getting regular updates could be offered. Perhaps the discussion group windows could become as easy to manipulate as conventional e-mail.

By using VEAMAC, one quickly learns that value is not a concept owned by some practitioners in the United States or by an organization called SAVE International. I am encouraged that Miles’s original principles have proved stalwart despite the trials discussed on VEAMAC. But I would like to see this proof occurring with similar frequency at SAVE International’s site. This article is in part my lament for the potential reduction in stature of the country and organization that began as the mecca for value methodology due to the impact of VEAMAC, assuming that theorists and practitioners find it to be the site of choice. But it is also a test of whether that thought is appropriate and a challenge for improving SAVE International.

Perhaps this lament is too chauvinistic and would restain growth of value methodology. General Electric has more reason to feel ownership. The company wisely chose to expose this method for others to use. Otherwise value analysis likely would have been lost. Perhaps placing a “Made in the USA” sticker on value methodology is distasteful to many, counterproductive, and unnecessary. (Do the French claim the invention of geometry because of Descartes?) Perhaps it is a natural occurrence for the...
point of origin to be diminished as the ripples expand throughout the world. Perhaps value engineering is but a point on the problem-solving continuum. SAVE International's goal is to spread the methodology as much as possible, and indeed, many practitioners in countries throughout the world are using it. Because of format, it is currently easier with VEAMAC to feel in touch with actual international usage.

CONCLUSION
Value practitioners are fortunate to have both Web sites available. One easily forgets how young this technology is. The developers of both should be commended. There also are other sites making a contribution. Should the SAVE International Web site strive to become the primary international communication medium? SAVE International, can we earn our name? Should we not try and see what happens? What are the consequences of waiting? What are the benefits? I close with open-ended questions—just as participants sometimes do on VEAMAC—and hope I am contributing to the thinking about this unique methodology.

The home page of the VEAMAC Web site is at http://www.brookes.ac.uk/other/veamac/home.html. To subscribe to VEAMAC, address an e-mail message to majordomo@brookes.ac.uk. Type the words subscribe veamac and your e-mail address in the message.

REFERENCES

John Koga, CVS, AIA, is manager of Boldt Value Services, Appleton, Wisconsin, and consults throughout the United States. He possesses 25 years' project experience and graduated from the University of Illinois with a bachelor's degree in architectural studies, earned the value engineering specialist's diploma from the University of Wisconsin, and is a member of the Construction Specifications Institute and SAVE International.

Share the Value

Value World is looking for original articles for upcoming issues. You can also submit reprints or abstracts from other journals or periodicals, if you obtain permission from the copyright holder(s). Each issue of Value World will follow a specific theme, featuring articles related to that theme. The deadline for the summer 2000 issue, "International," is February 15, 2000.

Text
1. Submit manuscripts as five typed, double-spaced paper copies for peer review.
2. A computer file of the final copy of accepted manuscripts is requested on a 3 1/2" diskette as a text-only file.
3. All material should follow The Chicago Manual of Style, with references in the following format: Author(s). Title. City: Publisher, Date, Page(s).
4. All submissions should include the phone and fax numbers and, if applicable, e-mail address of the corresponding author.
5. A 25- to 50-word biography of the author should be included at the end of the article.
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Kirsten Lambert, SAVE International; 60 Revere Drive, Suite 500; Northbrook, IL 60062; U.S.A.; telephone: 847/480-1730; fax: 847/480-9282; e-mail: valueworld@value-eng.com. Articles that do not meet these guidelines may not be used in Value World.
Memories of the Transition Years

This is the first article in a series called "My Value Career," personal stories by SAVE International members that describe how the individual entered and worked in the value management field. Bill Lenzer was president of the Society of American Value Engineers from 1982 to 1984.

In November of 1974, I saw an article about value engineering in Consulting Engineer. I remember that it featured Al Dell'Isola. I was excited. I immediately tracked down the Society of American Value Engineers and signed up for a workshop in January at the University of California, Berkeley. And I named the new company that I was in the process of forming Value Engineering, Inc. (VEI). Just think: This was even before meeting any of the local Dallas SAVE dignitaries.

I remember going to my first SAVE chapter meeting (I think it must have been in November) and meeting C. P. Smith, Smoky Doyle, and Jimmie Carter. Little did I know how these people and a few others would so influence the rest of my life and career.

I finished the workshop training and started attending chapter meetings on a regular basis. The society was hungry for new blood, even as it is now. I was asked to run for chapter secretary in April, and I was honored. I met other key people like Rand Creasy, Hal Morrow, and Bob Churchill. The next year I was asked to run against the incumbent president and, while I was a little afraid of making waves, I gave it a shot and won the election.

I have gained a lot of knowledge and made a lot of friends (and maybe a few enemies) over the years I have been involved with SAVE.

VEI was incorporated on January 13, 1975. It operated a full year without any full-time employees. Because of a downturn in the economy that year I was effectively encouraged by my current employers (who were also my initial 60% stockholders and partners) to switch my employment to the new company.

Creasy worked for me part-time during 1976. It was Creasy who observed the engineering and energy work that I was doing, and assured me that I was fully using the VE methodology. He was my mentor and encouraged me to go for my certified value specialist (CVS) certification. I was one of the first to take the test and became a CVS in 1977.

In 1978, I hired Ginger Adams as a "person Friday" in my small six-person office. She eventually studied the VE business and actively participated in SAVE. I encouraged her. She obtained her CVS and eventually became SAVE president. She and I were a strong team for almost 20 years.

In that same year I also became the southwest regional vice president and attended my first SAVE board meeting at the home of Larry and Eleanor Miles in Easton, Maryland.

Somewhere in all of this I met other significant figures in SAVE International's history: Carlos Fallon, Jerry Kaufman, Earnie Bouey, Tony Tocco, John Bryant, Pete Megani, Hal Tufty, Don Parker, Jim Dziekonski, and many more.

It was Jerry Kaufman who introduced me to the Japanese in 1978. This marked the accelerated beginning of one of my longer-term goals: to get involved in international activities. The next year, I conducted seminars in Japan with the Society of Japanese Value Engineering. The following year I began doing work in Germany.

In 1981, C. P. Smith went to work for VEI part time while he was functioning as SAVE executive director and senior vice president. Smitty, as he was known, taught Adams and me a lot, including how to put conferences together.

In 1982 I was elected SAVE president and served in that capacity for two years. I was 38 when I was first elected and think that I was the youngest ever to fill the position. In 1987, I was asked to serve as chair of the Lawrence D. Miles Value Foundation and continue in that position today.

After repeated requests, I returned to the SAVE board in 1992 to serve as vice president–international.

I have gained a lot of knowledge and made a lot of friends (and maybe a few enemies) over the years I have been involved with SAVE. It was in this learning environment that I transformed from a young, shy professional to a person who can get up and address a crowd of thousands.

Here I am, some 25 years after first learning about "true" VE, and I am still involved. I guess that, like a lot of my fellow Texans, I will have to go out with my boots on.
Several conclusions that may be of importance to the discipline and practice of value engineering were reached during the recent development of the S-Model for product and quality management. (1) The value of a product or service can be defined unambiguously and in the same monetary units as price and cost. (2) The value improvement associated with the change in a product attribute or the addition of a new product feature can be measured using straightforward marketing-research methods. (3) Value and variable cost are fundamental metrics that drive the bottom-line metrics of price, demand, and profit. (4) Trade-offs between design alternatives can be made in terms of their projected profitability computed from forecasts of value and cost. (5) The new methodology can be used to expand the range of the VE discipline to include the early planning stages of product development when major strategic decisions are made.

INTRODUCTION

Many important tools have been developed to support and manage the product development process and reduce its inherent risks. These include marketing research methods such as conjoint analysis (Green and Ward 1975) and cluster analysis (DeSarbo and Rao 1986), quality and performance management tools such as Taguchi methods (Taguchi 1993) and quality function deployment (Akio 1990), design and test-management tools such as the Boothroyd and Dewhurst analysis of assembly performance (Boothroyd and Dewhurst 1983), and value analysis (Fowler 1990). Despite being developed more or less independently, these tools have a common purpose: providing guidance to those persons responsible for the planning and development of new products for competitive markets.

Because these tools wrestle with a common problem, my students and I undertook the challenge of seeing if a single formalism could be developed to embrace the tools and show their interrelationships. The hope was that the resulting structured methodology, termed the S-Model (Cook and DeVor 1991; Cook 1992; Kolli and Cook 1994; Cook and Kolli 1994; Simek and Cook 1996; McConville and Cook 1997; Monroe and Cook 1997; Pozar and Cook 1998; Cook 1997) would provide greater quantitative insight and an increased breadth of applicability for the tools. It became clear at the outset that the students and I needed to strike a balance between simplicity and rigor to simultaneously provide ease of use and understanding for practitioners, as well as trustworthy results.

An early discovery was that key concepts were not defined in a consistent manner across tools and disciplines. For example, marketing specialists determine “part worths” to express buyer preferences obtained from conjoint analysis. Taguchi introduced the concept of the “cost of inferior quality” to quantify the loss of customer satisfaction when a product attribute is off its ideal specification. Within the VE community, the meaning of the term value has evolved over time. Today, it is expressed as a measure of the “function worth” divided by cost (value = function worth/cost). Difficulties in measuring worth, however, have led value engineers to define value as function divided by cost or performance divided by cost [value = (function/cost or performance)/cost]. Value, as defined by the S-Model, is synonymous with function worth. Thus, if we define VE Value to be value as defined by value engineers, VE Value is equal to S-Model Value divided by cost. In what follows, the term value will always refer to its S-Model definition, and the term product should be taken as meaning product or service.

Because of the lack of uniformity in defining value or worth, we resorted to a phenomenological model. This is a time-honored way of constructing a theoretical relationship between a directly measurable dependent variable in terms of one or more independent variables. The latter may or may not be measurable independently of the phenomenological relationship. The theory of elasticity, which connects internal stresses in a body to its internal strains, is a well-known example of a phenomenological model. The internal strains are directly measurable, and the phenomenological relationship is used to compute the internal stresses from the strains.

With this approach, we took value to be the intrinsic product property that drives demand. If value is increased the demand for the product increases, all other things being equal. Of course demand also is influenced by price, and the model was generalized to include the value and prices of all of the products competing in the market segment. This was necessary because a modification in the price or value of one product will not only change its demand, but change the demands of those products competing against it. An important outcome is that the values of competing products can be computed from their demands and prices. Moreover, the same phenomenological relationship can
also be used to structure marketing research surveys so that the value change for a proposed product improvement can be determined well in advance of production.

The contributions of value engineers to improving profitability often begin after marketing specialists have set key subsystem objectives during the product planning stage. Decisions during this stage have great strategic importance because they largely determine how the customer will ultimately value the product. Thus, the value-setting nature of product planning should be of innate professional interest to value engineers. The purpose here is to review the properties and applications of the S-Model as it offers the possibility of expanding the scope of the VE domain to include product planning as well as demand and profit forecasting, pricing, and marketing research.

OVERVIEW OF S-MODEL

The S-Model develops the linkages between a product’s fundamental and bottom-line metrics. Value, variable cost, and the pace of innovation are the fundamental metrics; price, demand, and profit (cash flow) are the bottom-line metrics. Their relationships are shown schematically by the two loops in Figure 1. The loop on the right connects customer needs to the needs of the manufacturer, and the loop on the left connects the needs of society at large with those of the manufacturer. Although only customer value is being addressed here, societal value has become increasingly important due to rising concerns about the environment. In principle, the change in societal value associated with a change in environmental attribute can be measured in the same manner as customer value from the willingness to pay for an improvement (Carson 1991).

After customer needs are evaluated—using the first stage of QFD, for example—the next step is identifying each customer need with one or more system-level product attributes. From a VE perspective, the system attributes represent the functionality of the product, as seen by the customer. If accelerate vehicle is a function identified by a value engineer, then the time needed to accelerate from 0 to 60 MPH would be an inverse measure of how well that function is being delivered. In the next step, noted as customer value, a value curve is generated for each system-level attribute. Procedures for doing this have been described in detail elsewhere (Simek and Cook 1996; McConville and Cook 1997; Monroe and Cook 1997; Pozar and Cook 1998; Cook 1997). Once the cost has been evaluated for a potential attribute improvement, it can be compared to the value generated to assess the merit of the proposed improvement. However, the merits of a proposal should be based upon its projected profitability, which is computed as follows: Once the changes in value and variable cost have been determined, the projected change in price is computed from the changes in value and variable cost, using the rule of thumb that the price change is one-half of the sum of the value change plus the cost change. Next, the change in demand is computed from the price and value change. Finally, the change in profit or cash flow is computed from the changes in demand, price, variable cost, and investment level (Cook 1997).

ASSESSING THE CHANGE IN VALUE FOR AN ATTRIBUTE IMPROVEMENT

The value change for an attribute improvement or an additional feature can be determined in a systematic and straightforward manner using the direct value (DV) method of marketing research (Cook 1997, 93–99). Potential buyers are asked to compare an alternative product over a range of prices against a fixed baseline product at a fixed price, $P_0$. The objective is to determine the neutral price, $P_N$, for the alternative at which one-half of the potential buyers choose it and the other half choose the baseline. When this occurs, the two demands are equal. We see from the equation below that their value difference is equal to their price difference:

\[ V - V_0 = P_N - P_0 \]

When using the DV method, it is imperative for respondents to evaluate each alternative over a series of price points and choose between the alternative and the fixed baseline at each price point (McConville and Cook 1997). The author highly recommends surveying persons within the company whose job it is to have a good understanding of customer preferences before surveying potential customers. The results of the in-house survey are used to determine whether the questions are clear and if the price ranges chosen are likely to include the neutral price. It is desirable to follow the in-house survey with a small presurvey to potential customers, then make an additional check and fine tune the survey before implementing it. If time and other resources are insufficient to survey potential customers, in-house survey results can be used as estimates of customer value.

S-Model value curves of the type shown in Figure 5 are similar to utility curves but differ in terms of their units and the processes used to acquire the information. Utility curves are dimensionless and generated from the preference considerations of a so-called decision maker (von Winterfeldt and Edwards 1986). Utility curves are
used in the Combinex method of value engineering (Fowler 1990, 138–148). The Combinex method, however, does not provide the important quantitative connections that value has to demand, pricing, and profits, and thus provides less scope than the S-Model. Moreover, because the estimates of utility are often made using a single internal decision maker, they carry an extra element of uncertainty vs. values obtained from a DV survey of randomly selected potential buyers.

FORECASTING THE DEMAND OF FUTURE PRODUCTS

Forecasting the demand for proposed future products can take place once their values have been estimated using the DV method and their prices have been projected. Other methods can also arrive at more rapid, but less reliable, ballpark estimates of value. Estimated value curves can be constructed using the baseline attribute in conjunction with the critical and ideal attributes, which are estimated by jury evaluation or taken from human factor studies (Simek and Cook 1996; Donndelinger and Cook 1997; Monroe and Cook 1997; Pozar and Cook 1998). Value at the baseline attribute is equal to $V_0$. When an attribute is at its ideal level, value is at a maximum for that attribute. When it is at its critical level, performance is so poor that the total value of the product goes to zero. For example, the critical attribute for interior noise can be taken as 110 dB(A), which is the threshold for pain. If an automobile were perfect in every other way but had an interior noise level this high, its value would be virtually zero. An exponentially weighted parabola is used to fit the points. The weighting exponent is the fraction of time during use that the attribute is of importance.

PRICING

For a monopoly, profit is maximized when price is equal to the sum, divided by two, of value plus variable cost [$price = (value + variable cost)/2$]. For $N$ competitors, the theoretical price can be obtained using elementary game theory. As expected, it drops as the number of competitors in the market increases (Monroe, Silver, and Cook 1997). Figure 2 shows this behavior for a hypothetical market in which all of the products have the same value of $100$ and variable cost of $30$. The monopoly price at $N = 1$ is equal to $65 \ (130/2)$. As $N$ increases, the theoretical price approaches variable cost. A product that is first to market enjoys, at least temporarily, the pricing advantage of a monopoly. For the example in Figure 2, the premium is seen to be roughly 20% before the second product enters the market. Thus, by knowing the changes in value and cost being planned for a future product, the value engineer can compute a theoretical estimate for the change in price that will optimize profits. This price can be used to gauge the accuracy of the product's target price, which may have been set by a financial planner in advance of having a good understanding of the product's expected competitiveness in the marketplace.

TOTAL QUALITY

A question of some importance is, What is the nature of the relationship between value engineering and quality engineering? Viewed from the S-Model perspective, there are strong linkages. First of all, there is a direct connection to Taguchi's theory of quality because his cost of inferior quality is readily computed from the value curve for the attribute of interest (Cook and DeVor 1991; Cook 1997, 193). Secondly, the S-Model defines the total quality of a product as being its net value to society (Cook and DeVor 1991). If this definition is accepted, value engineering and quality management become subsets within the product-management discipline. Quality engineers use experimental design and statistical process control to reduce costs and improve value, whereas value engineers analyze how function is generated and seek ways to reduce costs through reductions in part count, material costs, and process improvements while not sacrificing function. These represent important differences in practice, but the disciplines reside and operate within the single context of improving the net value of the product to society.

DISCUSSION AND SUMMARY

The review presented here should help broaden the dialogue between the VE community and those developing and applying the S-Model, to the mutual benefit of all stakeholders. A major point that should encourage future discussion is the ability to now compute function worth in the same units as cost. The inability to do this earlier led to defining VE Value in terms of a ratio equal to function worth divided by cost ($function\ worth/cost$). The ratio presents a problem when trade-offs have to be made between different subsystems. The reason is twofold: (1) The function worths for the two subsystems must be converted into the same units for making a direct comparison, and (2) the sum of the VE Values over all of the subsystems should equal the total VE Value for the product. Although the second condition is not as strong as the first in providing rigor, it can never be satisfied using a ratio of function worth divided by cost.

By contrast, the S-Model satisfies both conditions and allows
value vs. cost trade-offs to be made rigorously within and across subsystems. Value and cost changes are additive across subsystems because value and cost are computed at the full system level. For example, when a design change is made at a component level, the changes in variable cost and value always are computed at the full system level by considering its impact on all manufacturing and distribution costs and on all system-level attributes.

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Harry Cook, Ph.D., is head of the Department of General Engineering at the University of Illinois at Urbana-Champaign. He is a member of the National Academy of Engineering and a fellow of the Society of Automotive Engineers. He has published more than 40 research papers and written a book, Product Management, published in 1977.
The Management of Change

Arthur E. Mudge, CVS, FSAVE

Tomorrow's success—for that matter, tomorrow's existence—lies in each individual's ability to meet and overcome the challenges of today. The overall challenge of today is the management of change: change in all its forms, both personal and economic.

The world that each of us lives and works in is changing constantly and becoming more complex. Through the judicious management of change, we can meet today's challenge, guide it personally, and—at the same time—control our total costs. In essence, we can effectively administer the future.

Our key to improving our effectiveness as individuals is to increase our capabilities to:

• Cooperate so that all resources can be utilized effectively.
• Analyze the effect people in our organization have on one another and improve our abilities to work together.
• Develop those abilities and skills that will enable us to diagnose problem situations accurately, make effective decisions, and plan systematically for the future.
• Be sure that we effectively integrate the human and technical resources available to us to resolve concerns and problems.
• Manage change itself so that each function and organization can participate in the development of means for constructive permanent improvement.

The management and administration of the present and the future must be gained by first analyzing and understanding the major controlling element of today's problem. This element, simply stated, is change.

CHANGE
Alteration, modification, innovation—change by any name is an unalterable factor of everyday life. Like death and taxes, there is nothing so sure and constant as change. Change, whether we like it or not, is constantly affecting both our personal and business lives.

The world is changing more rapidly than ever before. Many factors contribute to the tempo of this change: accelerated programs of research and development, faster communications and transportation, constantly increasing competition from around the world, the emergence of new nations, ever-changing defense systems, business diversifications, and mergers.

Change is taking place even at this very moment, and it is taking place at an ever-accelerating tempo. It has been said that, due to this accelerating tempo, the same amount of change that has taken place in the last 50,000 years will again take place in the next 500 years.

A continuation of the review of this accelerating change highlights some significant facts. First, though a great deal of this past change has been good, some also has been detrimental to humanity's present and future. Second, no matter how much one directly or indirectly fears change, one cannot stop or prevent it from taking place. Yes, one can delay it, but one cannot stop it. Third, and most important, with the proper attention one can cope with—and even direct—change. In so doing, humans not only reduce the detrimental effects, but use this constant change to their advantage.

Many individuals believe that the basic cause of change is the direct result of correcting a mistake. Most times nothing could be further from the truth.

No matter what one's personal activity or business function, one can readily see the magnitude of the problem. At the same time we understand its magnitude, we realize that our survival depends on our adaptability to the problem as well as our ability to manage it.

It is said that the most effective way to cope with change is to help create it. By helping to create change, one takes a major step toward its management.

Before discussing the management of change, we must first come to a common understanding of what change is. Change is defined as:

• To be or cause to become different, alter.
• To exchange for or replace by another.
• A fresh approach.

With the above definitions in mind, our basic understanding of the term change begins. To reach a complete understanding, we also must look at the cause of change.

Many individuals believe that the basic cause of change is the direct result of correcting a mistake. Most times nothing could be further from the truth. Change most often comes about to improve what was done, with the best information available, under the original circumstances.

In addition, humans must realize that action and reaction, ebb and flow, trial and error—change—is the rhythm of our lives. The basic causes of change then can be noted as action and reaction.

These basic causes denote the type of change that takes place. Change resulting from action is creative change, and change
resulting from reaction is imitative change. A simplified restatement of this is, you can lead or you can follow. Change is not a sideline, but an integral part of the management task. Therefore, we must actively and knowingly manage change.

**MANAGEMENT OF CHANGE**

Thus, change is the central act of managerial responsibilities; motivating change before anyone else is creative equals progressive action. Additionally, if we don’t create change (action), we will be forced to change (reaction). In the latter case, there may also be a change of management and/or personnel.

Each of us, no matter what our personal station in life or function in business, is a manager. Each individual, in some way, must manage both personal destiny and/or business activities.

To provide the necessary management of anything—particularly change—one must control, guide, direct, and administer it. This cannot be done in a hit-or-miss manner; it can only be accomplished through the development and application of a specific plan, followed by a positive course of action.

Fortunately, new techniques have been developed and new sources of information have been uncovered to improve the ability to analyze, plan, and manage change. These include:

- Long-range planning, organizational restructuring, resolving conflicts within and between departments, and focusing organizational resources to achieve results.
- Development sessions in such areas as management and professional improvement strategies, team building, decision making, goal setting, and planning.
- Planning approaches that we can use to deal creatively with issues, with minimum outside help and significant cost savings.
- Coordination and working to solve problems and increase the capability of the individual to deal effectively with similar situations in the future.
- Lasting solutions to problems often require the building of different attitudes, skills, and levels of commitment, as well as technical input. Managers can accomplish the necessary planning, development, approaches, and coordination by being sure to create the key essentials. These key essentials are satisfaction, unity, challenge, communications, enthusiasm, sensitivity, and service.

These essentials challenge the underchallenged people and, in so doing, create the ingredients necessary for intrinsic job satisfaction. Most jobs are or are becoming simpler; in essence, many people are becoming underemployed. They are basically saying, You aren’t smart enough to make my job interesting. When people are underchallenged, managers’ roles become vital. The manager, rather than the job, must create the stimulus.

The toughest part of a manager’s job today is managing people. It is certainly easier to concentrate time and energy on the nonhuman aspects of business, but the nitty-gritty of management lies in motivating others to do a job and do it well. Humans expect their actions to fulfill needs other than financial ones: self-esteem and self-fulfillment, for example. Traditional incentives such as pay, title, and status are growing unimportant.

Managers sit in the forefront, coping with attitude change. Their effectiveness relies on the ability to anticipate human change and willingness to stay abreast of evolving trends and lifestyles.

There is yet another equally important point to understand about the effects of change and the management of it. Change, no matter what its magnitude, always carries with it a secondary effect; e.g., whenever change takes place it always results in a change in total cost. Analysis shows that, depending on the particular change and its cause, there is always a corresponding beneficial or detrimental effect on the cost. Normally, when creative change takes place, not only does it change create overall improvement, it also results in lower total cost.

It therefore follows that, if one makes a concerted effort to manage and create change, one is at the same time directly or indirectly managing total cost. By positive administration of change and cost, one creates improved value for oneself, the company, and the customer. It is quite understandable that, when one manages both change and cost—and thereby value—one reaps a harvest of nothing but creative actions and increased profits.

With these points in the forefront of the mind, one must make a vital decision. Do you, as an individual or group member, have the desire and necessary drive to take up today’s challenge and creatively mold it into tomorrow’s success? Do you want to be an individual who actively manages both change and value?

These thoughts—these challenges—should not be taken lightly. You as an individual should give your answer more than just a passing thought, for your decision can have considerable impact on the future of both you and your business associates.

If it is your desire to progress in this manner, take specific action to not only manage change, but to study and actively apply the techniques of value analysis and cost improvement.

Arthur E. Mudge, CVS, FSAVE, senior associate of the consulting firm Value Associates, has served as vice president and manager of Joy Manufacturing Company for 24 years. His area of responsibility covers the development, organization, and operation of the Joy Value Activity throughout its 42 worldwide operations. Prior to joining Joy he was employed by R.C.A.; Value Engineering, Inc.; Raytheon; and General Electric Company. He has held positions in time study, wage rate, planning, equipment procurement, facilities planning, and value engineering and analysis.
INTRODUCTION

Value engineering (VE) is a technique founded on an age-old and fundamental concept—value. It came into being at General Electric Co. in 1947 as a one-man concept, company confidential, for use in one of its departments: purchasing. It brought enormous savings, benefiting the company in lower costs and the customers in lowered prices, for all GE products, from toasters to turbines. Such was the measure of success with the technique that, by the 1960s, value engineering crossed all bounds and went into extensive use nationally and internationally. It grew into a worldwide profession, becoming a practical management technique universally applicable to any product or service. Whereas, in the 50 years of its existence, one would have expected everyone making an economic decision to think value engineering and use value engineering, it has not found real roots anywhere.

This paper examines the reasons for the waning of interest in value engineering and suggests ways and means to rediscover the technique. The aim is to find a niche for value engineering in the culture of organizations throughout the world, to raise it to where it rightfully belongs: in every manager’s arsenal of tools and techniques to make it a way of life for management anywhere, as it should be.

THE PARADOX

Where is value engineering, a proven management technique, today—after 50 years of existence?

The Users of Value Engineering

Value engineering is used in some industries, defense services, government agencies, and construction; for hardware, software, facilities, and services; on products, processes, procedures, methods, practices, and systems; and in manufacturing, design, planning, engineering, and purchasing. However, value engineering—a powerful and beneficial technique—has stagnated while other contemporary techniques such as total quality management have become widespread and popular. Efforts and energies are frittered away in modifications and extensions of the original concept—like FAST vs. function, analysis vs. engineering vs. management, and so on. The result: It has not yet succeeded in becoming a part of the management culture anywhere. Clive Bone, a management consultant, says that value engineering was not built into the working regime of the organizations that took it up (Clayton 1997).

The Need and Options

In the postwar years, high-performing manufacturing industries found it profitable to meet growing consumer demand by increased production—turning out new goods, in great numbers, quickly. Quality control was end-of-the-line inspection. If there were defects and rework, profits covered the added costs. Then came the OPEC-induced oil shock of 1973. Progressively escalating costs, material shortages, yields and efficiencies, waste (including defects and rework), resources (mobilization, rationalization, conservation), labor productivity, and quality became matters of serious concern. The obvious need was to find immediate and emergent solutions.

Value engineering, which had already been established, could have successfully addressed every one of these problems, quickly, and comparatively inexpensively. The features of value engineering that make it a natural fit to serve these very changing needs warrant reiteration. Lawrence Miles (1972) created value engineering to determine value by a clear understanding of the function(s) a customer needs and to incorporate good value by ensuring that the product or service has the appropriate performance and cost. Value engineering does this by substitution, accomplishing equivalent or better performance at lower costs. It identifies, isolates, and removes unnecessary and hidden costs and nonessential, non-value-adding elements: those that do not add to safety, to performance, to life, or to the appearance desired by the customer, and which, in fact, adds nothing whatsoever to the product (or service) under any condition. Value engineering makes changes on purpose, as a superior problem-solving system to manage performance and cost requirements. It secures the golden balance—just right, nothing more or less—in everything. As others add, anything less than the necessary functional capability is unacceptable; anything more is unnecessary and wasteful (Tufty 1983). It defines and segregates the necessary from the unnecessary and thereby develops alternative means of accomplishing the necessary at lowest cost (Mudge 1971). It balances infinite wants with finite resources (Fallon 1971). The technique covers a life cycle, concept, research, development, design, manufacture, and ultimate installation in the field, as well as feedback to improve the product and its cost (O’Rourke and Garvey 1994).

One would have expected everyone making an economic decision to implement value engineering. Paradoxically, relatively few progressive and pragmatic industries did take advantage of it and integrated the technique into their management structures. In others, value engineering’s bits and pieces are manifested in the individual specialist-oriented techniques developed anew and implemented. According to Industry Week (Sheridan 1994), almost all the 1993 best plant finalists in the United States adopted work teams, quality management, just-in-time, supplier partnerships, customer satisfaction programs, training, concurrent engineering, and reduced development time.

Quo Vadis Value Engineering?

S. S. Iyer, CVS
Table 1
Contemporary Management Techniques: A Broad Perspective

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</tr>
<tr>
<td>Changes Affect</td>
<td>Work unit Organization</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

Weights: minimum, (1); medium, (2); maximum, (3).

Value Engineering Compared With Other Techniques
The comparison with the specialist-oriented contemporary management tools and techniques, shown in Table 1, reinforces and clearly highlights the strengths of value engineering and the weaknesses in others that value engineering avoids.

Countries Using Value Engineering
Besides the United States, where the technique was born, Japan and South Korea are principal users. There is evidence to show its introduction to the United Kingdom, India, and Hungary more than 30 years ago. Canada, France, Germany, Austria, Portugal, Scandinavia, Sweden, Norway, Denmark, Ireland, Italy, Israel, Saudi Arabia, South Africa, Pakistan, Hong Kong, and Brazil are others known to be using the technique. Russia, Spain, and mainland China recently have joined the ranks. Taiwan started using the technique in 1987 and Australia in 1990. Nevertheless, the application of value engineering has been small in comparison with what happened to the productivity and quality management movements of the recent past.

VE Societies
Exclusive professional societies promoting value awareness would be a measure of how extensively and intensively the technique is used. SAVE International, the pioneer professional technical society, started as a national body in the United States in October 1959 and went on to demonstrate the benefits of VE practices and principles all over the world. However, its membership hovers around 2,000 after 40 years. In contrast, the International Project Management Association (IPMA) built a membership cadre of 14,000 in 25 years.

Certified Value Specialists
In 1973, SAVE started its certification program, for both individual value practitioners and training workshops, to respectively ensure individual competence and create professionalism in the range and depth of application of the value concept. There are only about 500 CVSs worldwide today; the Society of Japanese Value Engineering has 124 CVSs and almost 6,000 junior VE practitioners.

Interest in Academics
Not many academic institutions are now teaching value engineering. Is this due to lack of material and support for professors to teach, or lack of generation of revenues for the institutions? Known VE college-course offerings worldwide total 44 (SAVE International 1998). Many are noncredit courses, most of them are not SAVE International-approved, and their teachings deviate sharply from the value analysis or value engineering that Miles propounded.
Training and Career Paths
With very few exceptions, no value engineer has risen into the senior management ranks. In contrast, one sees a growing number of persons in the industrial engineering profession holding top management responsibilities. It appears that, if one spends too much time in value engineering, one’s career options may become severely limited.

Books and Other Publications
As in the case of college courses and training facilities, so also is the gap tremendous—by any standards—in publications. Books about value engineering are relatively few. Success stories and cases are even fewer. There is some question that it is perhaps due to the reluctance by industries to share information. Value methodology is said to be a well-kept secret.

QUO VADIS VALUE ENGINEERING
Where are you going, value engineering? Molded in the 20th century, the value methodology could be a 21st century global success, with efforts to carve out its rightful place, status, and stature.

Realign Priorities
Manufacturing—in conjunction with extractive industries and agriculture—remains the most important engine for economic growth and creation of wealth that underlies a nation’s standard of living. Miles originally applied his method to manufacturing, with spectacular success. That is where priority for a concentrated, massive, national, and international thrust to resurrect value engineering should be: where it is likely to be most fruitful.

Rediscover Value Engineering
Disillusioned by the backlash against layoffs, overwork, and upheavals from reengineering, companies are learning that the key to growth is not so much getting rid of people as getting more out of people. The Wall Street Journal reports that a big reengineering player and major international consulting company has been quick to discover value engineering as the candidate to replace reengineering (White 1996).

An American Management Association survey found that the quality management movement forced the quality levels of many things to rise but did not prove to be the instrument of effective, long-lasting improvements (Romano 1994). The higher quality, which comes at a price, is now spawning an affordability crisis. Besides, as defect-free products that meet all standards—open, company, national, and international—are becoming the rule, quality will soon virtually disappear as a competitive advantage or meaningful criterion for differentiating products and suppliers.

Customers will continue to want better and better quality, but at lower and lower costs. The future winner will be the one who delivers not the highest quality, but the highest quality per cost—customer value. Rediscover value engineering, because it is the natural fit for all the advantages provided by these modern techniques but without the ills and maladies.

Highlight the Benefits
Firstly, highlight the cost savings. Miles originally applied his method to the elimination of unnecessary costs. He showed that every product (or service) has, at any point in time, an average of 25% in unnecessary costs built into it. Add to this the increasing trend in costs of materials and labor. Cost management will continue to remain a perpetual priority requirement for every business and industry. This should be reason enough to expedite the resurgence. Secondly, highlight the collateral benefits. Value engineering is much more than mere cost savings. It is the answer to continuous improvement, growth, creativity, innovation, and creation of wealth.

Cultivate a Patron
People will make all the difference. It is they who transcend their companies, their industries, even their national-borders—to wit, Andrew Carnegie for steel; Henry Ford for mass production, mass marketing, and affordable cars; Goizeuta for Coke and the idea of economic value creation; and Matsushita for Panasonic and attention to the consumer, reducing prices to create demand. The quality movement in Japan had the Union of Japanese Scientists and Engineers (JUSE) and Dr. Ishikawa. INVEST in India had its problem days, but thanks to the staunch support of a large industrial house and its managing director, it has established value engineering as an integral part of some prominent industries in the country. The wise cultivate many patrons and profit from their support and munificence.

Follow a Role Model
Winning tools and techniques did not gain popularity or universal acclaim, or become a way of life, by accident. The strategies and actions that brought them to the very top, could—and should be—role models. Their experience is truly the best teacher. The postwar productivity movement and JUSE’s efforts for making total quality management a worldwide phenomenon (Walton 1986) may be role models for a VE renaissance.

Commence a Massive Teaching and Training Drive
Growth can come only from widespread use by qualified practitioners. The SAVE International-sponsored workshops that began with the 35th annual conference in Phoenix is but one step forward in the long journey of training. What all VE specialists and societies need is a massive training, like JUSE, to cover all management levels and shop-floor decision makers. Perseverance in organizing several training programs and covering millions of people made quality management a pervasive part of business thinking the world over. The goal should be to create a habit of value improvement (Walton 1986), and not for pecuniary gains.

We also should start a campaign to sell the technique to universities and colleges, as well as continuous education providers, as part of their regular curricula. Until these institutions build up their faculties, it would be helpful if the specialists and consultants would volunteer to train and teach. Recognition and rewards such as honorable membership and fellowship would be useful enticements for these teachers.
Globalize the Certification Program
There is prevailing apprehension that the SAVE International certification scheme is not meant to assist the practitioners, but help those with vested interests to protect their wares. Lest this apprehension gains credence, all societies should be able to certify and approve syllabi for training workshops under a standard scheme.

Begin a Worldwide Membership Campaign
Some specific suggestions for a membership campaign are:
• Pursue a plan to augment corporate membership in the VE societies.
• Seek sponsorship from companies for their VE practitioners as members.
• Canvass for individual membership with both VE practitioners and allied professionals practicing other value-adding methodologies.
• Make membership affordable.
• Provide incentives, such as lower membership fees for dual membership, to attract people to the fold.
• Organize joint activities with other appropriate professional bodies.
• Extend lower rates for individuals, on their own, to attend conferences and training courses.
• Invite as guests a fixed number of company executives, officeholders of other professional societies, and academics to every program.
• Use proven incentives such as guest status for speakers, waiving of fees, honoraria for papers, scholarships for students, and reduced fees for workshops.

Expand Dissemination
Value engineering is perhaps one of today's most misunderstood management techniques. Publishing success stories and case studies with details of how the technique was applied, and the results, will help to dispel misgivings and wrong notions. Urge VE practitioners to willingly share their success stories for formal publication. Publicize value engineering using all media, including the Internet, for creating discussion forums.

Integrate VE Activities All Over the World
One cohesive entity will be better. The dormant World Federation of Value Societies may merit revival.

CONCLUSION
Management focus seems to have shifted from production and productivity in the 1950s, to marketing and costs in the 1960s, toward national and international competitiveness in the 1970s, toward quality in the 1980s, and now to value. Now is the right time to change value engineering's image. The opportunity is monumental.

Quo vadis value engineering? Global, indeed. If the array of specialist-oriented management techniques could contribute to make the best to grow even better, imagine what the combination—which is what value engineering does—can and will endow. We should have the courage of conviction, will, and determination to create an epochal VE resurgence.

ACKNOWLEDGMENTS
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Management consultant S. S. Iyer, CVS, is a mechanical engineer and postgraduate diploma holder in metallurgy of iron and steel. Iyer has conducted several VE training courses and workshops, as well as other management development programs, for major industries and organizations such as steel plants, manufacturing companies, railroads, automobiles, electronics and electrical-component makers, government agencies, and professional societies. He authored the book Value Engineering and has contributed many papers at the international and national conferences of SAVE International, INVEST, Productivity Councils, and Institution of Engineers.
Thunder: Tone Deaf

Thomas R. King, CVS, FSAVE

This article was originally published in the first issue of Value World (July–August 1977). Its message is still relevant today.

One of my vivid early musical experiences involved tooting a tonette for the bandmaster as a prelude toward greater musical challenges—a trumpet, perhaps.

As I played a simple tune, the suspecting bandmaster jerked the instrument from my lips and observed that I was humming rather than blowing. Alas, no trumpet for me. Nevertheless, this proved no handicap over the years, as good music by others was personally appreciated.

A short time ago [my wife and I] attended the Franklin High School winter concert, which is free and not considered the big musical event of the year. The second number, titled “Russian Christmas Song,” was recognizable—even for an untrained ear—as a very demanding and beautiful piece. It involved Russian Orthodox songs put to an instrumental musical arrangement. (No musical instruments are used in Russian Orthodox services, I’m told.) It was evident that great coordination and stamina were necessary for this long number; the clarinets played almost unceasingly. At the climax, more than the normal applause fell upon the band for their efforts and they arose to nod their bow. Much to their astonishment, the audience also rose and showered them with a standing ovation. Pleasing disbelief and amazement registered on their faces. Smiles appeared.

I particularly focused on the sparkle in the eyes of one special girl (my daughter). What they registered was this: “Gee, they really liked it, and it’s important to them. And if it’s important to them, then it’s important for me, too.”

Dialogue at band practice the following day confirmed my suspicions of the effect. They reckoned that this was the first standing ovation for the band—ever. But this is not the important point. What is important is that the parents and other adults demonstrated an active expression of appreciation and commitment to the importance of the band’s efforts. Tone deaf or not, it was possible for others and for me to visibly provide encouragement toward musical excellence for the students.

Value engineering, suggestion systems, and productivity programs likewise have tone-deaf management at times—leaders untrained in value principles who may not understand details or techniques necessary to directly bring ideas to fruition. Nonetheless, as in the musical experience, this does not mean that a cost-conscious environment cannot exist under these circumstances.

The key is involvement and recognition; a manager must show by vivid example his interest in the value effort. Failure to provide this involvement will sentence even a well-structured program to its eventual doom. Peer functions will treat it as an orphan to fall at the first ax.

What is needed is a management commitment that extends past words and deeds. One deed could well be the open recognition of those individuals who do, in fact, contribute to a cost-conscious environment. Without commitment at the top, the value manager might as well be humming through a tonette.

Thomas R. King, CVS, FSAVE, has 40 years of experience in the manufacturing industry. He served for 29 years as division/corporate manager for Joy Mining Machinery and has worked for Republic Steel, Westinghouse Electric, and Carrier. King is a former president of the Society of American Value Engineers (now SAVE International).
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Type of Organization
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☐ Private Industry
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☐ American Express
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Value Engineering Savings Prove Superior to Cost Reduction

Roger B Sperling, CVS

ABSTRACT
A VE study and a cost-reduction exercise performed nearly simultaneously on the same facilities project demonstrate the superiority of value engineering over cost reduction in developing alternatives to reduce cost while maintaining quality and functionality. Detailed comparisons, made between the number of ideas and the potential savings between the two methods, illustrate how value engineering extracted double the cost impact of cost reduction from the same project. An analysis is offered of the six critical differences between the two methodologies.

INTRODUCTION
Just prior to a VE study on a $6.3 million addition to a research facility at a federally funded laboratory, the project manager conducted a cost-reduction exercise to determine if cost savings could be found. The VE study team was charged with finding savings superior to those already identified by cost reduction. Analysis of the detailed results from cost reduction and value engineering on the same project gives an opportunity to document the relative results from the two methods.

Table 1
Comparison of Savings From Cost Reduction and Value Engineering on Research Facility

<table>
<thead>
<tr>
<th>Category</th>
<th>Item</th>
<th>Cost Reduction</th>
<th>Value Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideas</td>
<td>Total</td>
<td>88</td>
<td>151</td>
</tr>
<tr>
<td></td>
<td>Coincident</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Unique</td>
<td>57</td>
<td>120</td>
</tr>
<tr>
<td>Proposals</td>
<td>Number</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Percent developed</td>
<td>44.3%</td>
<td>22.5%</td>
</tr>
<tr>
<td>Coincident proposals</td>
<td>Number</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Potential savings</td>
<td>$891,000</td>
<td>$1,766,000</td>
</tr>
<tr>
<td></td>
<td>Savings differential</td>
<td>$875,000</td>
<td>$875,000</td>
</tr>
<tr>
<td></td>
<td>Percent increase</td>
<td>98.2%</td>
<td>98.2%</td>
</tr>
<tr>
<td>Unique proposals</td>
<td>Number</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Potential savings</td>
<td>$1,327,000</td>
<td>$1,624,000</td>
</tr>
<tr>
<td></td>
<td>Savings differential</td>
<td>$297,000</td>
<td>$297,000</td>
</tr>
<tr>
<td></td>
<td>Percent increase</td>
<td>22.4%</td>
<td>22.4%</td>
</tr>
<tr>
<td>All proposals</td>
<td>Number</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Total savings</td>
<td>$2,218,000</td>
<td>$3,390,000</td>
</tr>
<tr>
<td></td>
<td>Savings differential</td>
<td>$1,172,000</td>
<td>$1,172,000</td>
</tr>
<tr>
<td></td>
<td>Percent increase</td>
<td>52.8%</td>
<td>52.8%</td>
</tr>
</tbody>
</table>

COST REDUCTION
The two-day cost-reduction exercise was led by the project manager and involved the in-house design team and members of the outside consultant design team. They reviewed the project documents at a preliminary design stage and listed ideas they thought could be pursued to reduce cost. The cost-reduction team recorded a total of 88 ideas, which were sorted and reduced to a short list of 39. "Priority 1" ideas were tabulated; brief paragraph descriptions served as proposals for implementation by the designers. These partially developed ideas were given to the VE team as a point of departure for the VE study.

VALUE ENGINEERING
The five-day VE study was led by a consultant team leader with an independent team of engineering and architectural professionals. They followed the VE job plan and recorded a total of 151 ideas based on a function analysis of the same project documents. These ideas were evaluated against job-specific criteria; a total of 34 VE proposals were prepared, with detailed technical and cost calculations and sketches as backup, for implementation by the designer. After the VE team completed its study, members reviewed the cost-reduction ideas, noting that there were coincident and unique ideas on both lists; however, no cost-reduction ideas were borrowed for use in the VE study report.

IDEA COMPARISON
An analysis of the cost reduction and VE ideas reveals, as shown in Table 1, that:
- Value engineering had 151 creative ideas—63 more than the 88 ideas from cost reduction.
- Value engineering had 34 developed proposals and cost reduction had 39.
- Thirteen coincident proposals for value engineering and cost reduction covered the same alternatives.
- Value engineering had 21 unique proposals, compared to 26 for cost reduction.
Value engineering yielded 70% more creative ideas than cost reduction. Each method produced some similar ideas, but value engineering produced more unique ideas than cost reduction. Value engineering developed somewhat fewer proposals than cost reduction, but they were more detailed and fully developed, compared with the brief, partially developed proposals for cost reduction.

SAVINGS COMPARISON
The potential cost savings from cost reduction and value engineering are shown on Table 1.
• Fewer VE ideas were developed into proposals than cost-reduction ideas (22.5% vs. 44.3%).
• The 39 cost-reduction proposals had total potential savings of $2.2 million, compared to almost $3.4 million for the 34 VE proposals. This is a 52.8% increase of VE savings over cost-reduction savings.
• The average savings for the cost-reduction proposals was $57,000, compared with $100,000 for the VE proposals. As shown in Figure 1, the VE proposals had savings potentials nearly twice that of the cost-reduction (CR) proposals, showing that the VE analysis extracted double the cost impact from the same project. For both the coincident ideas and the unique ideas, the potential savings were higher for value engineering than for cost reduction. The higher aggregate savings illustrate how VE developed superior cost-saving proposals.

![Figure 1](image)

**Comparison of Savings from CR and VE Proposals**

**METHODOLOGY COMPARISON**

The superior potential savings from the VE study, compared with the cost-reduction exercise, are not surprising. This is the expectation that has been fulfilled in thousands of VE studies worldwide over the past 50 years. Table 2 summarizes the differences in attributes of the cost-reduction and VE methodologies (Alasheash 1993).

The following attributes explain the difference in VE performance over cost-reduction performance.

**Time**
The VE study was longer in duration than the cost-reduction exercise. The cost-reduction team spent part of one day meeting to list suggestions and part of a second day preparing brief descriptions. The VE team spent five full days working on this one project. It takes more time to improve value than to cut cost.

**Method**
Cost reduction is essentially a one-step process, compared with the five-step VE job plan. The job plan organizes the search for ways to improve value. Larry Miles described his problem-solving method as using four separate kinds of thinking:

1. Exhaustive accumulation of information (the information phase)
2. Penetrating analysis (the function analysis phase)
3. Creative mental activity (the creative phase)
4. Judgment-type mental activity (the evaluation phase)

This problem-solving system is, Miles said, “preceded by ‘mind tuning,’ which directs all thinking toward a common objective, and followed by a development and refinement activity [development phase], which puts the results of the thinking process to use” (Miles 1961).

In contrast, the cost-reduction methodology is much less structured. Though the process of making a list of suggestions for reducing cost by examining a set of plans, specifications, and cost estimates requires technical judgment, it does not fully prepare the cost-reduction team to systematically examine all the alternatives as the value methodology does.

**Goal**
The VE approach seeks to improve value, not just save cost. The use of function analysis, the backbone of value engineering, raises the analysis of alternatives to a higher level. The definition of value (Value = Function/Cost) includes much more than cost. Value is related to function such that increasing functionality or reducing cost leads to better value. This relationship is fundamental to value engineering but lacking in cost reduction.

**Focus**
With cost reduction the focus is on finding ways of reducing the cost of items; with value engineering the focus is on searching for alternatives to satisfy functions more economically. The cost-reduction approach easily leads to studying only project details and ignoring larger issues, whereas value engineering explores the fundamental needs of the project. Thus, for example, while cost reduction offers alternative ideas for roof materials, value engineering presents alternative ideas for roof designs.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Cost Reduction</th>
<th>Value Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Two days</td>
<td>Five days</td>
</tr>
<tr>
<td>Method</td>
<td>Decision (1 step)</td>
<td>Job plan (5 steps)</td>
</tr>
<tr>
<td>Goal</td>
<td>Saving cost</td>
<td>Improving value</td>
</tr>
<tr>
<td>Focus</td>
<td>Costs of items</td>
<td>Functions of items</td>
</tr>
<tr>
<td>Team</td>
<td>Small, few disciplines, dependent</td>
<td>Large, many disciplines, independent</td>
</tr>
<tr>
<td>Results</td>
<td>Reduced cost (with equal or reduced quality)</td>
<td>Reduced cost (with equal or improved quality)</td>
</tr>
</tbody>
</table>

**Team**
The use of a large multidisciplinary, independent VE team increases the objectivity of the analysis above that of the cost reduction team, which is smaller, has fewer disciplines, and is
dependent on the project. The cost-reduction team most likely comprises members of the design team in a hierarchical structure, with a manager who "runs the show," contrasted with the egalitarian VE team structure, with a team leader who encourages member participation (Sperling 1996). Although cost-reduction teams could include members outside the current design team, the usual practice is to have the project manager lead the designers through a cost-reduction exercise. It is abundantly clear that the designers, as the "owners" of the design, have a psychological barrier to suggesting changes. In contrast, the VE team of independent design professionals has a far more open attitude about offering alternatives.

**Results**

Cost reduction can reduce cost, but often at the expense of quality. VE results are designed to reduce cost while maintaining or improving quality. The greater potential savings from value engineering over cost reduction for the same project documented here do not guarantee that the implemented savings—the final cost impact on the project—will be superior with value engineering. However, the thoroughness of the value methodology suggests that the project will benefit more from value engineering.

**CONCLUSIONS**

The serendipitous use of cost reduction and value engineering on the same project gives a direct comparison of the two methods. The reasons for higher potential savings using value engineering include the time, method, goal, focus, and team differences between value engineering and cost reduction. The decision to use a thorough but longer process (value engineering), compared with an incomplete but quicker method of reducing project cost (cost reduction) should favor value engineering over cost reduction without exception, because the VE results are superior.

**REFERENCES**


Roger B Sperling, CVS, vice president of Value Management Strategies, has devoted the past 11 years to the practice of value management. During his 40-year career in engineering and project management, he established the Plant Engineering VM Program at Lawrence Livermore National Laboratory. Sperling has led 100 VM studies on transit and transportation facilities, research laboratories, military installations, federal buildings, water and wastewater plants, and engineering design procedures. He serves SAVE International as editor-in-chief of Value World.

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