Looking Back to the Future (Editorial) 1
Jack V. Michaels, Ph.D., P.E., CVS

State of Value Analysis/Value Engineering in British Columbia 2
Bryan R. McConachy, P.E., and Christopher Baker

The Art of Adding Company Value 7
Graham Clayton

Characteristics of VE Application in Japan 8
Yoshio Nakagami, CVS

The Role of 'Soft Sciences' in Industrial Development 13
Ferenc Nádasdi, CVS, Ph.D., and Lajos Körmenyi, CVS, Ph.D.

A Kuhnian Crisis in Value Management? 19
Stuart D. Green, Ph.D.

Going Global: Value Methodology Makes Its Mark Worldwide
SAVE International has chapters in more than 25 countries around the world, typifying the international growth of value engineering. This growth is all the more remarkable when you consider that the roots of value engineering go back only a little more than 50 years.

World War II was the cocoon for value engineering. It was a period of survival that required innovation to overcome shortages of critical materials. Many substitutions were needed and were frequently accompanied by cost improvement. Lawrence D. Miles, an engineer at General Electric, was given the challenge of evolving an organized method of making cost improvements. Here are some subsequent milestones in the United States.

1947. Miles evolves the step-by-step methodology, relating product function and cost, which he calls value analysis.
1952. Miles conducts the first VA workshop for GE employees.
1954. The Navy Bureau of Ships, searching for the means to reduce the cost of ships and equipment, obtains VA training from GE. The Navy calls its programs value engineering.
1956. The Army Ordnance Corps initiates its VE programs at Watervliet Arsenal. The programs are rapidly expanded because of rewarding results.
1958. Miles receives the Navy Distinguished Service Award, the Navy’s highest civilian award, for his work in value engineering.
1959. The Society of American Value Engineers is founded in Washington, D.C.
1961. VE contract clauses, which permit contractors to share VE cost savings, are established in the Armed Services Procurement Regulations.
1962. The Department of Defense proclaims the VE contract incentive clause a requirement in contracts of more than $100,000.
1963. The Navy Bureau of Yards and Docks begins applying value engineering to construction projects.
1964. The Army Corps of Engineers initiates its VE programs.
1965. A Japanese delegation visits SAVE for assistance with problems, marking the start of VE programs in Japan.
1966. The Bureau of Reclamation implements the requirement of VE incentive clauses in construction contracts.
1967. The U.S. Postal Service institutes limited VE programs.
1970. The U.S. Congress recommends value engineering for federally funded highway projects.

1970. The General Services Administration begins its building VE programs.
1972. The Veterans Administration institutes limited VE programs.
1973. SAVE establishes programs for certifying value specialists.
1974. The GSA imposes requirements for certified value specialists in building design.
1977. The Lawrence D. Miles Foundation is incorporated.
1980. Miles is awarded the Presidential Citation by the Society of Japanese Value Engineers.
1982. The Department of Defense establishes its honorary VE award programs.
1985. Lawrence Delos Miles, the father of value engineering, dies on August 1.
1987. The governor of Minnesota declares the week of May 23 Value Engineering Week.
1988. The governor of Indiana declares the week of June 11 Value Engineering Week.
1993. The Office of Management & Budget issues a circular calling for governmentwide use of value engineering.
1996. Public Law 104-106 requires each executive agency to establish and maintain cost-effective VE procedures and processes.

We devote this issue of Value World to the international growth of value engineering, beginning with the State of Value Analysis/Value Engineering in British Columbia by Bryan R. McConachy and Christopher Baker. The authors rightfully boast about VA/VE growth, but bemoan the lack of government support. This issue also includes articles by value practitioners from the United Kingdom, Japan, and Hungary—three countries in which the value methodology is growing. Although this issue contains fewer articles than previous issues, we aimed for quality over quantity.

Whether you call it value engineering, value analysis, or value management, word of the methodology is spreading across the world. In fact, 15% of SAVE International members live outside the United States in places such as Australia, Italy, and India as well as Saudi Arabia, Germany, and Indonesia. Let us hear about the value methodology in your part of the world.

Goodnight and 30.
State of Value Analysis/Value Engineering in British Columbia

Bryan R. McConachy, P.E., and Christopher Baker

ABSTRACT

The American value engineering industry appears to have grown and matured over the past 20 years from a mandated requirement for value analysis/value engineering from the U.S. Environmental Protection Agency. Similarly, the growth of value analysis/value engineering in Canada has largely been limited to the provinces of Quebec and British Columbia, where single agencies mandated the VA/VE requirement. The absence of a national requirement has not only hampered membership in societies like SAVE International, but has virtually precluded the development of locally based practitioners able to meet the 50% practice requirement for CVS certification.

From a VA/VE perspective, the good news from British Columbia was that all province-funded projects with an estimated cost greater than $10 million would require VA/VE before approval. The bad news that followed was that government didn’t have any money for capital projects and would be looking to innovative project delivery strategies. This paper reviews whether the expected growth of value analysis/value engineering in British Columbia is going to be over before it starts.

CANADIAN VERSUS AMERICAN EXPERIENCE

There appears to be a strong link between the legislative requirement for value analysis/value engineering and the volume of VA/VE work. Even after the process has been seeded for a number of years in Canada, there continues to be limited acceptance of VE as a discipline. It does not appear able to grow on its merits and does not appear to be attractive to the private sector.

Since the EPA requirement was established, the American VA/VE industry has grown and matured. In comparison, without a government requirement for VA/VE in Canada, growth has been limited and has varied from province to province. This has not only hampered the interest in membership in societies like SAVE International, but has virtually precluded the development of locally based practitioners able to meet the 50% practice requirement for CVS certification.

One way of illustrating this disparity is to look at the 1996 SAVE International membership directory where, out of a total of about 750 members of SAVE International, we find 29 members in Canada (4%). Since the population of Canada is about 10% that of the U.S., this is a significant underrepresentation, especially when compared to other societies like AACE and PMI, where the Canadian members have historically made up more than 10% of the membership.

Of the 29 members in Canada, 19 are in the French-speaking province of Quebec. Of the remaining 10 Canadian members, seven are in our most-populous province of Ontario, with one each in the western provinces of Manitoba, Alberta, and two in British Columbia. The 19 members in Quebec represent more than two-thirds of the Canadian membership. One major firm reportedly started out doing VE work on wastewater treatment plants and then transferred the concept to work for Hydro-Quebec, the province-owned power utility. Like the EPA experience in the United States, this corporate support developed the industry.

Unlike the United States, Canada—through its British heritage—has adopted the use of quantity surveyors for the costing of buildings. Since building design has been the most prolific area of application of value analysis/value engineering to date in Canada, and particularly so in British Columbia, quantity surveyors are the discipline most involved in supplying value analysis/value engineering. Together with its provincial chapters, the Canadian Institute of Quantity Surveyors (CIQS) is the governing body for professional quantity surveyors in Canada. The CIQS has a publication, Value Analysis Service Guidelines, 1996, which provides both service guidelines and recommended scale of fees.

Value Analysis vs. Value Engineering

We have developed a preference for using the terms “value analysis” and “value engineering” for different value applications. We tend to apply value analysis to the process of analyzing the scope or content of the project (the “what”). Another reason to apply the term “value analysis” to the process at the earlier phases of the project is that fewer of the people involved in the analysis are engineers; the process is oriented toward planning rather than engineering. This is somewhat ironic, since we understand that the original name for the SAVE process was value analysis but was changed to value engineering when the U.S. Navy did not have a cost account for analysis (i.e., value analysis) but did have one for engineering, hence value engineering.

Once design development has been completed, a VE review is carried out on the engineering issues—i.e., the VE process is an opportunity to change the systems and components (the “how”). Currently, in our experience, a limited amount of VE work has been carried out after tender. We understand this is common...
practice in the United States. The process utilized on buildings in British Columbia, whether it is value analysis and/or value engineering, is generally similar to the U.S. approach. However, as a cultural group Canadians by nature tend to be nonconfrontational, and the VA/VE approach in Canada has evolved to follow the national psyche. This means that there is less emphasis on bringing in a parallel design team to carry out a peer-review process and more emphasis on facilitating or managing the design team of record to re-examine the planning and design approach to identify alternative, more cost-effective design solutions.

The British Columbia Ministry of Transportation and Highways (MoTH), in applying value analysis/value engineering to the new Vancouver Island Highways project, has found that the parallel design team peer-review approach is not cost effective. MoTH is now using an independent facilitator, with a review team drawn from internal design staff members who are not involved with that specific project.

THE PAST
The Public Sector Experience
Until recently, value analysis/value engineering had been applied only to province-funded buildings (primarily hospitals, schools, colleges, and correction facilities). The prime application of value analysis/value engineering was to reduce the scope and design of projects to meet the available budget. The process would often be suspended at the budget threshold, even if there were further opportunities to increase the value for money. That approach is changing. Over the past two years, our experience on more than 40 projects with cumulative capital costs approaching $500 million has been to identify more than $60 million in cost reductions, of which approximately $50 million were reductions to achieve the approved budget and $10 million were savings to reduce the cost of the project below the established budget.

One of the major drivers for the public sector in British Columbia to embrace value analysis/value engineering is the perception that public sector construction is not bottom-line driven (that is to say, based on a return on investment—ROI). A frequently voiced criticism of public sector projects in British Columbia and presumably elsewhere (often with good reason) is that government facilities tend to be overspecified and over-designed, and often go over budget. The last point, to be fair, has often been due to inadequate or overly optimistic budgets being established prior to commencement of planning and design.

As a tool for rescoping projects to meet pre-established budgets, value analysis/value engineering has been widely used by the British Columbia Social Capital Ministries in areas such as health, education, corrections, and public works. It is seen as a quick and clean way of identifying overdesign or overspecification, and correcting the problem before a project goes to tender.

Due to the initial success of value analysis in reducing the cost of facilities, agencies began to change budgets and scope in mid-design on subsequent similar projects. Understandably, no one—least of all designers—appreciates the goalposts being moved in mid-project, and this, together with the emphasis on cost cutting rather than value for money, has led to some negativity toward value analysis/value engineering from professionals engaged in public-sector design and construction.

The Private Sector Experience
Value analysis/value engineering has not been used extensively in the private sector—at least not in the buildings or the industrial sector that we collectively service. There has been a limited application of value analysis/value engineering in the hospitality industry in particular, but this is largely due to the marketing efforts of Value Management Incorporated rather than to industry acceptance.

We believe the major reason for the limited use of the formal VA/VE process is that the private sector is already bottom-line or ROI driven. As such, private-sector projects do not have the tendency for excess scope to creep into the development as do public-sector projects, where the multiplicity of stakeholders can and does inflate the scope of a project with enhancements that do not add to its functionality or value.

A number of similar processes to value analysis/value engineering are sometimes used in the industrial sector, but they are not usually called value analysis or value engineering. They are sometimes referred to as "cost reviews" (is the budget adequate for the given scope?) or alternatively, "design reviews" (has the best solution been adopted? is the scope right? are there better ways to accomplish the same objective?). The process is not as formal as the SAVE International VE process—it does not include functional analysis or brainstorming, but is more of an independent review by outside experts not involved in the development of the scope. The timing is generally in the development phase and, not unlike the public sector, is often initiated by an estimated project cost that exceeds expectations or is greater than the project economics would support.

THE PRESENT
Public Buildings
Our present provincial government, like many others in today's fiscal environment, is espousing stringent debt management, particularly within the capital spending envelope.

Since 1995, the province's Treasury Board has required that all capital projects over $10 million undergo a formal VA/VE study, and recently the province has imposed a freeze and intensive review of all capital projects.

While value analysis/value engineering has been used extensively as a tool to bring projects back on budget—but not necessarily to minimum cost, there is an increasing appetite in the provincial government to bring capital spending to a minimum consistent with, or below the level of, the services being provided.

There are a number of other ways of doing this, value analysis being one of them. A recent VA study to identify cost savings within a program to provide three new youth custody centres in the province ended up as a major review of the service philosophy of the ministry responsible for corrections. This led to a radical change in the type of facility being provided—changing from a
high security facility, with internal circulation modeled along the lines of adult prisons, to an open-plan, residential-style camp facility. The resulting savings of both built space and simplified construction were in the order of 30%.

One of the areas being actively pursued by the British Columbia government is cost modeling and unit rate budgeting methodologies for social capital projects such as schools, colleges, hospitals, etc. Properly and intelligently developed unit rates hold great potential for establishing realistic and cost-effective budget envelopes, on which subsequent VA process can be applied to achieve minimum cost and maximum value.

To date, this approach has been used very successfully on schools and, in developing the unit rates, the VA process has been used extensively. Cost models for elementary and secondary schools have been established, based on completed facilities. The models are then optimized by means of VA reviews involving a number of user groups and designers to identify desirable and cost-effective modifications to the cost models. In addition, regular audits of completed design-stage VA reviews ensure both compliance and feedback of cost-effective solutions into the cost models.

There is, however, a danger of pushing unit rate optimization too far. We are beginning to see that, if the unit rates are set too low, not only does service delivery suffer, but the facility’s life cycle costs begin to rise dramatically. Notwithstanding, there is currently a body of opinion in some of the provincial government ministries that a VA/VE study should be used to identify and justify cost increases from an artificially low base rather than the traditional approach of reducing to minimum cost.

**Municipal Projects**

Since the early 1990s, the British Columbia Ministry of Municipal Affairs (MMA) has required formal VE studies for all water and sewer projects of more than $10 million. This closely follows the U.S. experience with the EPA mandating similar requirements. The MMA has reported provincial experience to 1995 in a booklet, *Value Engineering for Municipal Projects*.

This booklet reported on the experiences of the following four municipalities:

1. Greater Vancouver Regional District: On the upgrade of two wastewater treatment plants to secondary treatment with a capital budget of $650 million, they reported present value savings of $17 million.
2. City of Kelowna: As of March 1995, had conducted five workshops on waste treatment programs.
3. Regional District of Nanaimo: They undertook a VE study on a water-pollution control centre in 1994, although it was not a requirement as estimated cost was less than the $10 million threshold. Some recommendations were rejected, as they were close to proceeding to tender. They commented, “It would have been beneficial to undertake the study earlier than the 85% design stage” i.e., value engineering should have been carried out earlier in the design.
4. City of Prince George: VE study conducted on an $8 million upgrade of a wastewater treatment centre when design was 20% complete—savings of $350,000. They commented, “Study could have benefited from additional detail design”—i.e., not enough design was done to enable an effective VE process.

Subsequent to the MMA booklet, the Capital Regional District of Victoria awarded a VE assignment on a proposed wastewater treatment plant to be carried out in March 1997.

**Transportation**

When the province’s Treasury Board decided that all capital projects over $10 million required formal VA/VE studies, the application of value analysis/value engineering shifted from simply meeting budget to demonstrating value for money in both scope and design of projects. This led to the first VA/VE assignments in our local transportation sector.

The Treasury Board requirement was imposed on the $100 million Duke Point Project, which consisted of a new $50 million ferry berth/terminal facility and a new $50 million access road. When the policy was announced, Bramcon Project Consultants had already been engaged by the Ministry of Transportation and Highways (MoTH) to review the scope and cost of the access road while the project owner, BC Ferry Corporation, had retained Value Management Inc. to conduct a VA/VE study on the terminal buildings.

Since the road portion of the project was far more advanced than the terminal, it was necessary to create a “forensic” VA/VE process where the preliminary designs were reviewed and coded to show how the scope had evolved and the costs had varied through the numerous design reviews that had been conducted. We used an internal team from other MoTH regional offices and one or two independent engineering consultants. VMI and Bramcon prepared a joint VA/VE report that met the Treasury Board requirements.

Subsequent experiences of the British Columbia MoTH include:

**PROJECT 1**

The Vancouver Island Highway Project (VIHP) is a (Canadian) $1.3 billion (about U.S. $948 million) upgrade between Victoria, at the southern tip of Vancouver Island, and Campbell River on the east coast. VIHP conducted a pilot project on value analysis/value engineering in 1995, commissioning nine separate studies on work having an estimated construction cost of Canadian $125 million (about U.S. $91.1 million).

**Timing**

Detail design substantially complete on sections selected expected to be tendered within three months.

**Outcome**

Savings in excess of $2 million were forecast as a result of this pilot program. The cost of the program was higher than normal since the goal was to introduce a cross-section of the Ministry and local consultants to the process. The pilot project concluded that the process had to occur earlier in the project life cycle to obtain optimal value. They also raised the prospect of using noninvolved Ministry personnel for future VA/VE studies.
One VA study was conducted in 1996. The $24 million grading section was at the end of preliminary design. An internal review team with an experienced facilitator was utilized. Savings of about $2,900,000 were forecast. One significant recommendation was that there should be a construction representative on all VA studies.

**PROJECT 2**
Upgrading the floating bridge across Okanagan Lake in Kelowna, British Columbia.

Timing
At the end of preliminary design when a scope was established and cost estimated but prior to award of the detail design.

Outcome
The VA study identified a higher cost alternative—a new replacement structure adjacent to the existing bridge—but potentially greater value for the expenditure. However, when the new bridge was developed to the same level as the upgrading option, the costs were higher and the project team refocused on the rebuild option.

**PROJECT 3**
Trans-Canada Highway 6-laning, Grandview to Cape Horn, Vancouver.

Timing
After the completion of functional design.

Outcome
Savings of $8 million identified.

**PROJECT 4**
Trans-Canada Highway Upgrade, Campbell Creek to Monte Creek, Kamloops, British Columbia

Timing
Detail design done; ready for tender. Complying with Treasury Board requirement.

Outcome
Identified about $6 million savings on the $23 million project.

**PROJECT 5**
Mount Washington Access Road, Courtney, British Columbia. VE studies by the MoTH Construction Supervision.

Timing
Contracts awarded; in construction.

Outcome
Both contractors on the two-lane mountain road showed a complete lack of interest in the VE process. However, the field crew could see a number of opportunities to reduce the cost through design changes. About $300,000 in savings were realized and, since the owner’s staff did the documentation, all savings were to the owner’s account.

**THE FUTURE**
Just as the Canadian practices for value analysis/value engineering were catching up to those in the United States, the rules changed and we now have to learn a different game. Canadian governments—federal and provincial—have choked on their own debt. Bond rating agencies are watching them very closely and monitoring their total debt—not just their annual deficit. This has led to a debt management plan in British Columbia which provided a maximum amount that could be borrowed even for “good debt,” like that which produces physical infrastructure, as opposed to “bad debt” that covers the costs of programs. That plan led to a significant reduction in the usual easy targets: capital projects that are not yet under construction.

Then, in the spring of 1996, it got worse. The province “discovered” they were running substantial deficits and froze all capital projects for what was supposed to be six months. Since it looked like this debt issue was not going to go away soon, the government had to consider other methods of delivering urgently needed infrastructure.

One potential solution to government’s financing dilemma is the use of public-private partnerships (P3) to deliver infrastructure. The government grants a concession to a private consortium to design, build, finance, and operate the facility and collect a revenue from those who use the infrastructure. Since these private developers are ROI oriented, they are not as likely to embrace a VA/VE process designed to catch the low-hanging fruit from the excessive designs of the public sector.

Alternative service delivery is another term we are hearing more and more in government circles. We are not clear what this really means. It appears to be a desire to farm out public sector program delivery (including facilities) to the private sector.

Design/build is one contracting strategy being used to obtain better value. Although it is our view that design/build contracts do not need the value analysis phase, as the design and construction are integrated for proposal preparation, we believe the majority of the potential transportation projects will still be designed and subsequently put out for open tender. Thus the justification for VE and VE work is still valid.

**CONCLUSION**
Does this mean value analysis will be over in British Columbia before it really gets established?

Not likely, in our opinion. The fundamental question has to be asked: Can government in Canada and its social program delivery really function like the private sector? The answer in our view is no; government is government. It may well be required by debt management pressures to perform more efficiently and cost effectively, but ultimately the major social programs in Canada will remain vested in government.

Reduced capital spending will inevitably result in reduced design and construction in the province and less value analysis/value engineering in general.
Reduced budget envelopes for the remaining capital spending will result in a radical rethinking of programs and the facilities required to provide the services. As a result, we believe there will be more emphasis on value analysis, as we defined it earlier—reviewing the "what" in terms of providing programs and capital spending in a more cost-effective way. There will be less emphasis on VE in its traditional role of alternative engineering or design—the "how."

However, dramatically reduced budget envelopes will also require very innovative design to meet the reduced targets. As a result, we believe there will still be an important role for VE in keeping design teams on track. In addition, reduced budgets may be detrimental to life-cycle cost efficiency, and VE will play an important role in determining value for money in capital vs. long-term cost decisions.

Bryan McConachy is the principal of Bramcon Project Consultants Ltd., which specializes in organizational development, value and risk analysis, and quality measurement. McConachy trained as a mechanical engineer and spent the majority of his career as a project manager in the industrial and transportation sectors. He has been active in societies including AACE International and the Project Management Institute.

Chris Baker is president of Value Management Incorporated, which specializes in value analysis and value engineering. Baker trained as a quantity surveyor and has more than 25 years' experience as a professional quantity surveyor on construction projects worldwide. During the last 15 years he has provided value analysis services to the public and private sectors in Canada.

Wanted: Your Submissions

If you have a case study or a presentation on the value methodology, share it with other value practitioners. Value World is looking for original articles on value engineering 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 submission schedule for the next two issues is as follows:

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<th>Issue Date</th>
<th>Theme</th>
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Text
1. Submit manuscripts as 3 typed, double-spaced paper copies for peer review.
2. A computer file of the final copy of accepted manuscripts is requested on a high-density 3-1/2" computer disk as an ASCII 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. Please note that telephone numbers and street addresses will not be included.
6. All material is subject to copyediting.

Charts/Graphs
1. Camera-ready artwork of all charts and graphs must accompany editorial matter when submitted for consideration.
2. Electronic files for charts and graphs should not be embedded or created within the text file for the article. These elements should be created separately and numbered consecutively (Graph 1, 2, 3 or Chart 1, 2, 3, etc.).
3. Electronic files for charts and graphs should be created in Microsoft Excel, Freehand or Illustrator. If electronic files for charts and graphs are created in other programs, they must be saved as EPS, TIFF, or JPEG files.
4. Do not use colors to differentiate information contained within a chart or graph. Value World will be reproduced as one color, so charts and graphs must use screen values of black to differentiate values.
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Photographs
1. Photographs can be provided as four-color or black-and-white prints, and will be returned at the author's request. Slides are unacceptable for reproduction.
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Send materials to:
Kirsten Lambert, Editor; Value World; SAVE International; 60 Revere Drive, Suite 500; Northbrook, IL 60062; telephone: 847/480-1730; fax: 847/480-9282; e-mail: value@value-eng.com. Articles that do not meet these guidelines may not be used in Value World.
Even to the uninitiated, the idea of “value management” can be appealing, with its hint of a technique for dramatically creating or increasing value. For the would-be initiate, there is also a tricky lexical minefield to cross.

In America, this management technique began its life as value analysis, later evolving into value engineering, which is how it is known there today. The Continent stuck with value analysis and Britain eventually settled for value management.

In Britain, however, value management refers to the overall strategic framework, which includes the specific techniques of value engineering and value analysis.

Is that clear? Well, put at its most simple, value management is a structured, team-based approach which uses techniques to improve the value of services or products. It can be applied to anything from building a power station to emptying dustbins. It has been used to deliver health-care services more effectively and to produce more competitively priced cars. Similarly, says Clive Bone, a management consultant, value management can be applied to a specific project within an organisation or to the organisation itself. He explains: “If a large organisation wanted to strip unnecessary costs to make itself more efficient, it would use the same approach and principles.”

Value management brings together several techniques, including the “scientific” method to ensure that there is a logical approach to problem-solving, and accounting, to determine whether value has been increased. To be effective, it needs the support of senior management and to heed the views of customers.

It also draws on aids such as flow charts and diagrams, and emphasises teamwork. There is nothing new about many of these techniques; it is the way they are used together that gives value management its power. It does not necessarily mean cost-cutting; the result may be an improved product at the same or lower cost, or it could be that a process has been speeded up.

Bringing this approach into an organisation is not a complicated process. Mr Bone says: “If a large organisation was involved, it would need a strategic steering group; it would need to ensure that it has trained team leaders and it would have to identify projects. There are two levels of activity: managing the programme and undertaking specific projects with appropriate teams.”

Value management was introduced to the UK more than 30 years ago. It met with enthusiasm which, however, declined dramatically. The problem, Mr Bone says, is that it was not built into the working regime of the organisations that took it up. It was always regarded as a separate function or department, often treated with suspicion by other parts of the organisation.

Recently, there has been an upsurge of interest in the technique. A rapidly rising public sector borrowing requirement focused the Government’s attention on the need to cut costs. The Treasury is strongly in favour of its use on capital projects, particularly in construction; the Audit Commission thinks it could be used much more widely by local government.

The recession stimulated a similar sharp rise in interest in the private sector. When the technique reach the UK, manufacturing was the first of many sectors to adopt it.

However, the number of companies taking up value management has been relatively small, and many of them seem reluctant to discuss it openly. Mr Bone thinks he knows why. “Because relatively few companies use it,” he says,” those that do see it as a secret weapon. When more companies use it, they will boast about it as an asset.”

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Characteristics of VE Application in Japan

Yoshio Nakagami, CVS

ABSTRACT

This paper depicts the characteristics of VE application and research in Japan. Annual national conference papers and case reports that have been published by SJVE have been comparatively analyzed against SAVE's annual international conference papers so as to visualize the profile of the subject. This paper will facilitate a deeper insight into the Japanese characteristics of VE application and research activities.

INTRODUCTION

There are so many VE papers that have been published to date by SAVE International, the Society of Japanese Value Engineers (SJVE), and many others. Particularly, those published by SAVE and SJVE seem to provide two collective sources of information regarding how VE concepts and techniques are being used and researched in both countries, east and west. A collective survey and comparative analysis of those VE papers so far published in both countries, with a focus on finding the Japanese characteristics in this professional area, should enable readers to have a deeper insight into typical characteristics of VE application and study in Japan.

OUTLINE OF THE SURVEY

Survey Samples Used

VE conference papers used as the two sample groups were: 1) VE papers and case reports that have been presented by Japanese speakers at their annual national conferences of SJVE from 1968 through 1995 and 2) VE papers presented by American speakers at SAVE's annual international VE conferences from 1966 through 1995.

Since its founding in 1965, SJVE has annually obtained copies of SAVE conference papers to be maintained for reference, and likewise maintains all annual SJVE conference papers and case reports, starting with those published for the first conference in 1968.

For the purpose of America vs. Japan comparison, papers by authors other than American and Japanese authors were not covered in the survey.

Survey Purposes

The survey was conducted in two correlated parts: 1) organizational backgrounds of the authors of those papers, and 2) the contents of their papers.

Part 1: Analysis of Authors' Organizational Backgrounds

This part was intended to identify specific types of organizations where VE is being utilized. The resulting distribution should reflect types of organizations where VE is positively used. For survey purposes, authors' organizations were grouped into the following four different groups:

- Private industries
- Government and public circles
- Consulting firms
- Professional/academic research institutions

Part 2: Analysis of the Contents of the Papers

The purpose of this part was to reveal specific areas of VE research and application being undertaken by the authors. The resulting distribution should reflect major areas of authors' research efforts and VE utilization. For survey purposes, contents of VE papers being surveyed were grouped into the following seven categories.

- Management of VE application: Organized promotion of VE application, planning for and follow-up of VE application, other aspects of managing VE application
- Specific application of VE: Dealing with specific methods of application to specific projects, case reports on VE application and other practical situations
- Technical factors of VE application: Dealing with VE concepts and techniques, problem-solving processes based on VE concepts
- Human elements in VE application: VE-oriented competence and attitudes, communication skills, motivational approaches, and other human factors in VE application
- VE promotion and enlightenment: Intended for wider VE promotion and diffusion of VE disciplines by emphasizing necessities and advantages of VE application
- VE-centered survey reports: Factual analysis and its results to identify VE application status
- VE application on the part of government/public circles: Governmental policies, reactions, practices, applications, etc., dealing with VE

RESULTS OF THE SURVEY AND ANALYSIS

Coverage of VE Papers Surveyed

Among the total of 600 SJVE conference papers and case reports published during the 28-year period of survey coverage 575, or 95.5%, represent Japanese authors. Likewise 890, or 82.9%, out of the total of 1,074 SAVE conference papers in the last 30 years represent American authors.
Unlike the single-book compilation of SAVE Conference proceedings, SJVE proceedings of each year consist of two volumes under different titles: Volume 1, containing selected conference papers, and Volume 2, case reports. Conference papers as used here represent results of authors' theoretical and/or methodological research in the form of VE theses, and case reports introduce actual results or stories of VE applications undertaken by the authors. Table 1 shows a breakdown of such conference papers and case reports counted by the six different time periods.

**PART I: AUTHORS' ORGANIZATIONAL BACKGROUNDS**

**Japanese profile:** The number of Japanese authors who were related to those 575 papers was 932, or 97% of the total of 961, for the entire period of survey coverage. The organizational background of Japanese VE authorship is extremely dominated by 910 practitioners from private industries, representing 97.7%.

Classified by types of industry, 495 (53.1%) represent various manufacturing industries, 478 (40.6%) construction sectors, 21 (4.0%) service industries, and virtually none from consulting firms and also from government circles.

Reviewing the Japanese trend as illustrated in Table 2, we can find that the percentage of authors of manufacturing backgrounds dominated in the 1970s, and the percentage by those of construction backgrounds increased in the 1980s, with some newcomers joining from service industries.

**American profile:** Meanwhile, the number of American authors was 976, or 81.1% of the total of 1,207 authors, as shown in Table 3. Their organizational backgrounds can be characterized in that the three highest circles—36.3% representing private industries, 26.1% consulting firms, and 22.1% governmental and other public organizations—altogether dominating the picture with a total percentage of some 80%.

Altogether, American private industries have been generally highest in VE paper authorship, but the recent trend since the latter half of the '80s shows a sharp fall. In the meantime, authorship from consulting firms keeps showing higher percentages than any other circles since the latter half of the 1970s.

Also, the government and public circles maintained higher percentages than their average percentages since the latter part of the '80s. Thus, the total percentage for both the government/public circles and consulting firms together exceeds the 60% level since then.

**PART II: ANALYSIS OF THE CONTENTS OF THE PAPERS**

**Japanese profile:** The great majority of SJVE papers surveyed represents the category of "Specific application of VE," with 355 papers (61.8%), followed by those under the category of "Technical factors in VE application," with 158 papers (27.5%), as shown in Table 4. Thus, 90% of Japanese VE papers can be seen as coming under these two categories.

Further analysis reveals that 243 among the majority group of 355 papers under "Actual VE application methodologies" represent "case reports" from Volume 2 proceedings, and that these come up to 42.2% of all Japanese papers. Thus, the net percentage of purely "Selected conference papers" as Volume 1

<table>
<thead>
<tr>
<th>Type of Organization</th>
<th>'68-'70</th>
<th>'71-'75</th>
<th>'76-'80</th>
<th>'81-'85</th>
<th>'86-'90</th>
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<td>2.2</td>
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</table>
proceedings under the same category is 19.6%.

American profile: The highest percentage here is 235 American papers, with 26.4% under “Technical factors of VE application,” followed by 176 (19.8%) under “Specific application,” 124 (13.9%) under “VE promotion & enlightenment,” and 123 (13.8%) under “Government & public aspects.” The overall trend is illustrated in Table 5.

### JAPANESE VE STATE OF THE ART AS CHARACTERIZED THROUGH THE COMPARATIVE ANALYSIS

Supported by the result of subject survey, VE application in Japan can be characterized in such aspects as types of organizations where VE is being applied, what are major areas of VE application and research, etc.

<table>
<thead>
<tr>
<th>Table 3</th>
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<tbody>
<tr>
<td>Trend of American Authorship (in Percent)</td>
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<tr>
<td>Type of Organization</td>
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<tr>
<td>Private industry</td>
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<tr>
<td>Governmental/ public organizations</td>
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<tr>
<td>Consulting firms</td>
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<td>Professional/ academic institutions</td>
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</table>

<table>
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<th>Table 4</th>
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<tr>
<td>The Contents of Japanese Papers (in Percent)</td>
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<tr>
<td>Category</td>
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<tr>
<td>---</td>
</tr>
<tr>
<td>Management of VE application</td>
</tr>
<tr>
<td>Specific application of VE</td>
</tr>
<tr>
<td>Technical factors of VE application</td>
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<tr>
<td>Human factors of VE application</td>
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<tr>
<td>VE promotion and enlightenment</td>
</tr>
<tr>
<td>VE survey reports</td>
</tr>
<tr>
<td>Government and public aspects</td>
</tr>
<tr>
<td>Other topics</td>
</tr>
</tbody>
</table>
What Are the VE Organizations?
The largest group of VE-using organizations in Japan are private industries, with a dominating percentage of 97%. This is where we can see a sharp contrast between the United States and Japan. American percentage is highest at 36.3% for private industries. By adding this to 22.1% for government and public circles, we can say that some 60% of American VE papers have been written by authors working for private and public organizations.

What Are Major Areas of VE Utilization?
VE utilization is most active within the manufacturing sector and construction sector of private industries, as can be proven by the fact that 93.7% of Japanese VE authors are from these two sectors.

Among the total SJVE membership, manufacturing membership represents about two-thirds and construction about one-fourth. This implies that VE is more widely spread in the manufacturing sector than in the construction sector.

A similar American trend can be seen in the two sectors of manufacturing and construction, where the data show that the largest portion of private industries represent the manufacturing sector, and many papers from the government and public sector deal with construction themes and topics.

It is notable that there are active newcomers in Japan in the use of value engineering, in addition to the above two sectors; that is, from such service industries as information system and physical distribution, and VE keeps finding new areas of application.

What Are Major Areas of VE Research?
Current emphases in Japanese VE research are being placed on “Technical factors of VE application” and “Specific application of VE.”

Research of technical factors covers the area of efforts as improving specific techniques such as function analysis, cost analysis, creativity, and evaluation.

Research of specific VE application methodology encompasses finding specific ways to apply VE to products, business, manufacturing processes, construction processes, etc., and designing best VE approaches to new product development, cost reduction, productivity enhancement, energy saving, and organization development.

The trend of VE, as described above, seems to reflect an ever-widening coverage of research themes as the purpose of VE application has kept diversifying. Stronger emphases have been placed on technical factors of VE application so that VE can be more effectively applied to help accomplishing objectives and targets, and to a wide variety of VE research themes and objects.

Comparing the above trend data with American data, however, one can say that the Japanese percentage of papers dealing with human elements is notably lower than that of the American papers, and that there are no papers dealing with “Promotion and enlightenment” on the Japanese side. Yet, the fact that 42.2% of all Japanese papers surveyed are case reports or success stories would help filling the statistical gap under the category of “VE promotion and enlightenment.”

<table>
<thead>
<tr>
<th>Category</th>
<th>'66-'70</th>
<th>'71-'75</th>
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<th>'81-'85</th>
<th>'86-'90</th>
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<th>30-Year Average</th>
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<tr>
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<td>3.9</td>
<td>11.1</td>
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<td>VE survey reports</td>
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<td>Government and public aspects</td>
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<tr>
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<td>2.6</td>
<td>5.5</td>
<td>6.8</td>
</tr>
</tbody>
</table>
CONCLUDING REMARKS

In describing the Japanese VE state of the art, this paper concentrated on illustrating the characteristics of VE application. Value engineering has been applied mainly in private industries, such as manufacturing and construction sectors. Research of VE application has placed emphasis on “Technical factors.”

Both the types of VE-using organizations and areas of VE application are growing. For instance, VE contract systems have been adopted in the public construction sector in the first half of the 1990s. Also, an increasing number of Japanese government and public organizations have begun adopting VE programs. Also, VE application in the service sector is being spread and is producing beneficial results.

It is expected that the above-mentioned trend would stimulate diversification of research activities to help achieve greater accomplishments of VE application.

As we realize that human activities on the part of corporate people from top management, managers, and through all levels of value practitioners are essential in bringing VE accomplishments higher, an equal emphasis should be given to human elements as well as technical factors.

Yoshio Nakagami, CVS, is professor of production management at the SANNO Institute of Management and chief researcher of SANNO’s Management Development & Research Division. He graduated from the Tokyo University of Agriculture & Technology. Since 1968, he has built his consulting career specializing in manufacturing and construction, largely in product development and product/process/method/office work improvement. He is a senior advisor for the Society of Japanese Value Engineers (SJVE), a licensed consulting engineer, and a member of the Project Management Institute and AACE International.

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The Role of ‘Soft Sciences’ in Industrial Development

Ferenc Nádasdi, CVS, Ph.D., and Lajos Körnendi, CVS, Ph.D.

INTRODUCTION

Political change is followed by economic change in most of the Middle and Eastern European countries. Looking at the events of the past 5 or 6 years, we must state that the achievements in economic development are rather poor. Earlier, the system of centralised planned economy set the margin for individuals of the society, and the main aim was to fulfill the “plan” that certainly never happened. The “centre” took care of the economy, science, social welfare, etc., and also took care of the resources. The majority of the society lived modestly but in social security. This was the so-called “equality in poorness.” In these countries there was no need for a manager “developed” in the free market economy.

In free-market economies the economy is changing rapidly; the economy-controlling role of the market is increasing. Having a look at the activity of industry, the main factors of the direction of changes are:

The traditional industrial activity is altering significantly. The process consisting of the following factors:


This change can be characterised by the following:

• Only the innovation controlled by marketing can be effective.
• Innovation is built into the products.
• In behalf of long term and sound operation, we must exactly know the expenditure and the performance of the certain phases.
• The ratio of the direct cost of material in the total cost is roughly decreasing.
• The ratio of direct labour cost in the total cost is falling.
• The expenditure of depreciation is going up.

These characteristics made the use of technological innovation absolutely necessary. The technological change became a combined activity because in several cases one product can only be produced by exploiting the knowledge of areas that are far from each other. It seems that these reasons resulted in the reevaluation of the so called “soft sciences.” Design, ergonomics, logistics, and value analysis can be ranked with the “soft sciences.” Value analysis became one of the most effective methods of elaborating decisions and product planning.

In the organisation of economic transition, the postsocialist countries have bifold problems to solve:

• To change over from a centralised economy into a free market economy; and
• To adapt the changes that happened in the free market economies in the economy of the given countries.

According to our experience, we think that in postsocialist countries the main problem is the lack of knowledge in connection with the economic transition. It seems that the “textbooks” of transition are being written now by scientists, experts, politicians, etc. The biggest task is to change human thinking. The fact is also working as a counterforce, the burdens of transition have come up already, but the results will only appear in a few years. The success of transition depends heavily on the progress of effectivity in economy and on the development in competition. We find that value analysis can help former socialist countries in understanding, learning, and establishing a free market economy.

1. THE ROLE OF “SOFT SCIENCES” IN INDUSTRIAL DEVELOPMENT

The high grade of specialisation resulted in certain areas of knowledge and science separating from the fields of general economy.

In the Hungarian industry, “soft sciences” have an outstanding role in solving the following issues:

a. Organisation of the production cycles (main theses):
• You have to produce what you can sell; production must be controlled by the market.
• You have to get to know the potential customer base.
• You have to decide on the technologies that fulfill the demand.
• The user’s requirements are not only technical ones, but there also emerges demand for design, prestige, easy repairability, etc.

b. Choosing and operating technologies and production equipment:
• There is a need for mass production, but you have to assure the thinness [sic] of the product by diversification.
• You have to choose a technology that enables the manufacturing of a product that fulfills the given market demand.
• You have to be able to change the product technology during the life cycle.

c. The connection between the company and the environment:
• A dramatic change in the market situation makes it necessary to improve the competitiveness of the products steadily.
• Nowadays mainly cost reduction is emphasised; the perfection of competitiveness is a much heavier task.
• The results of innovation that appear in products, technologies and services basically determine the market debut of the product.
• With traditional consumer goods (e.g., clothing) innovation
appears mainly in design and production technology.

We must state that in Hungary, and in other postsocialist countries as well, such problems and difficulties arise that may not even appear in countries with developed free market economies. These together also mean the problems of cooperation between different regions.3

2. THE ROLE OF VALUE ENGINEERING IN INDUSTRIAL DEVELOPMENT

Value engineering, as a “soft science” which is outside industry, can play an outstanding role in industrial development. It is especially true for Hungarian industry.

So as to make it spread more rapidly, the Hungarian professional control has undertaken more steps.

As an example, we show the Linking System of Value Analysis. In the selling market, companies face the requirements of quality and market price, while in the input market they face the quality and price of resources. It often happens that companies cannot meet the prices of the selling market when they use the input of proper quality. The situation is especially acute when it only comes agrround when selling the product. That is why we tried to connect the two markets. The company and the market is connected by two channels. One of them is the subsystem for realisation of the product. We can choose the significant function-holders—which determine the costs and quality of the product—on the basis of a Pareto or ABC analysis. This way we can determine beforehand whether market demand can be fulfilled economically or not. The other channel is the innovation subsystem of the company that helps solve certain problems (e.g., quality, cost, run, etc.) by proper action (e.g., R&D, investment, etc.). Generally, these problems can only be solved by innovation.

On the basis of the experience of some 500 projects, we worked out a know-how that can help in introducing value analysis in the main activities of the company.

With our further know-how developments, we encountered the specialties of the given professional fields. In the past we sorted the projects of value analysis into groups such as products (hardware), technology (software), and investment. In our view, there is a need for further elaboration.

In the following we bring forward the characteristics of value analysis of articles of clothing (e.g., clothes, footwear, gloves, etc.).4

3. THE CHARACTERISTICS OF USING VALUE ANALYSIS IN THE CLOTHING TRADES

While adapting value analysis in the clothing trades, we realised that in certain professional fields we have to decide on the conditions that enable us to use the method effectively. In the clothing trade, the materials (stocks) themselves play an outstanding role because usually they cannot be changed.

Considering fashion clothing, customers stick to the material (the uniforms and protective clothing of professional bodies belong to an other category). If the customer wants to buy a bag made of crocodile leather—and has the money—you cannot argue that he or she should buy one made of artificial leather only because that is cheaper.

In the clothing trade, a further specialty is that it is seasonal and fashions change from time to time. The stage of manufacturability (the ratio of wrong surface, the different physical characteristics in one piece of leather, etc.) also determine the conditions under which value analysis can be used. The issue of rationalising the use of materials appears another way than in mechanical engineering. An axle of a reductor can be made of different alloys under certain circumstances—of plastic as well. Some examples are known from the field of mechanical engineering, where it was possible to reach an economization of 70%.

A piece of clothing—shoes, gloves, etc.—is tied to the given sizing, so here we cannot speak of the common rationalising. Fashion articles are “perishable goods”; their realisation is tied to a certain season, a certain point of time.

Collection building happens in a relatively short period of time, and the customer (merchant) will not let you alter the product after confirming the samples, these facts also mean further difficulties. The existence of the listed characteristics does not confine the use of the method, only the possibilities are different. We can say as an axiom that, while designing fashion articles, mainly the method of value engineering can be used successfully.

The problem when the given product appeals to the customer, but he or she is not willing or cannot give the asking price, can be considered typical. While building the collection, value engineering makes it possible for us to decide whether the certain product is saleable or not.

So it does not come up in the trade fair, when it is rather hard to alter the certain product, but long before, when you have the possibility for adjustment.

The “count down” from the market price enables the use of the “turned back” value analysis, during which you can decide whether it is worth manufacturing the product or not.

It is an important experience of the studies on the practical adaptations.

4. FORECASTING THE PROFITABILITY OF OPERATION WITH CLOTHING ARTICLES

(illustrated by the example of footwear)

4.1. Analyzing the operation of the company

a. Calculation of the company’s income

\[ I_c = \sum_{i=1}^{n} p_i \times q_i \]  \[ \text{[HUF]} \]

where:

\( I_c \) = the company’s income \[ \text{[HUF]} \]

\( p_i \) = price of the certain products \[ \text{[HUF/pair]} \]

\( q_i \) = Quantity of the certain products \[ \text{[pairs]} \]

b. Break-even analysis of the company

\[ M = \sum_{i=1}^{n} p_i \times q_i - \sum_{i=1}^{n} d_i \times q_i \]  \[ \text{[HUF]} \]
where:
\[ M = \text{margin of the company} \] [HUF]
\[ dc_i = \text{direct cost of certain products} \] [HUF/pair]

c. Calculation of the company's profit

(3) \[ P = M - Oc \] [HUF]

where:
\[ P = \text{the company's profit} \] [HUF]
\[ Oc = \text{total indirect (overhead) costs of the company} \] [HUF]

\( Oc \) is divided between the produced amount in an inverse relationship: \( y = f(1/x) \), so the overhead cost of one pair of shoes is:

(4) \[ oc = \frac{Oc}{\sum_{i=1}^{n} q_i} \] [HUF/pair]

where:
\( oc = \text{the overhead cost per pair of shoes} \)

Essentially the company is profitable if:

(5) \[ P = M - Oc \] [HUF]

and \( M > Oc \)

where \( P = \text{the company's profit} \) [HUF]

d. The maximum allowable overhead cost can be defined before, at the level of design:

(6) \[ Oc_{\max} = \sum_{i=1}^{n} p_i * q_i - \sum_{i=1}^{n} dc_i * q_i - P_{\min} \] [HUF]

where:
\( Oc_{\max} = \text{the allowable maximum total overhead cost of the company} \) [HUF]
\( P_{\min} = \text{the expected minimum amount of profit} \) [HUF]

4.2. Forecasting the Success or Failure of the Product (*Planning From Beneath*)

The prime factor is to determine the price that we can get for the products by using the tools of marketing and comparing it to the price that is planned (rationally achievable) by the company.

While planning we compare the "planning from beneath" with the turned back planning. As the first step we introduce the planning from beneath.

a. Prime costs + profit-type pricing of a certain pair of shoes

(7) \[ pcp_i = dc_i + dcl_i + oc + P_i \] [HUF/pair]

where:
\[ pcp_i = \text{prime cost type price of a certain product} \] [HUF/pair]
\[ dc_i = \text{direct cost without labour} \] [HUF/pair]
\[ dcl_i = \text{direct labour cost} \] [HUF/pair]
\[ oc = \frac{Oc_{\max}}{\sum_{i=1}^{n} q_i} \] [HUF/pair]

the normative (expected) profit per one pair of shoes

\[ Pi = \frac{P_{\min}}{\sum_{i=1}^{n} q_i} \] [HUF/pair]

The technological time of certain products and machine costs can be considered as constant for a longer period of time. In this case the formula number (7) changes as follows:

(8) \[ pcp_i = dc_i + dcl_i + oc + P_i \] [HUF/pair]

where:
\[ dcl_i = \text{the constant that shows the labour cost per pairs for the certain type of shoes} \] [HUF/pair]

The \( pcp_i \) in the formula is the minimum price that secures the expected minimum profit, in case the producer can achieve it.

4.3. "Turned back" Planning

With turned back planning, the basis is the market price where we examine how much we can spend on direct material costs:

(9) \[ mp_i = mp_i - dcl_i - P_i \] [HUF/pair]

where:
\[ mp_i = \text{the direct cost of material that we can spend according to the market price} \] [HUF/pair]
\[ mp_i = \text{market unit price of the product} \] [HUF/pair]

The problem arises because a certain pair of shoes consists of several types of materials and accessories, so the question is how we could define—relatively cheaply and quickly—the optimal combination of materials. This question can only be answered by ascertaining the function cost.

According to the rules of value management there is no "expensive" or "cheap" material; there is only the array of materials that fulfills the demand of the customers, that enables to reach the minimal function cost.

Considering construction and technology of the product \( mp_i \) as an array of materials can be calculated according to the following formula:

(10) \[ mp_i = \sum_{j=1}^{m} q_{jgross} * e_j \] [HUF/pair]
where:

- \( q_j^{\text{gross}} = \text{gross material need of one pair of shoes per types of material} \) [piece, dm³, m, gr/pair]
- \( e_j = \text{cost price of certain types of materials} \) [HUF/material unit]

It is rather difficult to calculate the total material need, considering that the cost of materials and the contractors can change. During our experiments, we chose the most expensive materials on the basis of Pareto or ABC analysis; that means:

\[
m^{pi} \{ q_1 e_1 + q_2 e_2 + \ldots q_j e_j \}, \quad \text{where} \quad q_1 e_1 > q_2 e_2 > \ldots q_j e_j
\]

\[
m^{pi} = m^{pi} \times 0.75
\]

It means that by analysing 5% to 10% of the types of materials, we can determine whether the product manufactured by us falls within the price that is accepted by the market or not. If not, then we have two basic alternatives:

- Either we change the combination of materials so that we can fall within the given price, or
- We do not produce the given product.

Certainly, there can be interim solutions as well, e.g., cutting overhead costs by different measures, giving up a part of the profit, increasing the product-series, etc.

However, our experiments also pointed out that, by using value engineering, it is possible to establish product families that allows us to raise the series' size. By the solutions—of course—design has the first place. Increasing the size of the series makes it possible to cut the cost of tools per one pair of shoes, which can determine the profitability of the product itself.

Using this method, we can determine the possibility of success or failure with certainty.

All these back up the appreciation of "soft sciences" as factors of innovation that can help less experienced participants in the market of transitional economies in solving the problems in connection with competitiveness in the market.

That is why conclusions of practical examples become important parts of tuition; on the other hand, they can become efficient tools in the hands of the participants in the market when running through the anticipated problems.

5. HUNGARIAN-AMERICAN CONNECTIONS IN VALUE ANALYSIS

The restart of value analysis in Hungary owes many thanks to American contribution.
In 1996 the Hungarian-American connections developed further; the Society of Hungarian Value Analysts was admitted into SAVE, and more Hungarian value analysts achieved the honourable CVS qualification. Beyond the foregoing, the Society of Hungarian Value Analysts (SHVA) obtained the license to carry out the CVS qualification. The Qualification Board was formed in SHVA.

These changes mean a big possibility and a serious responsibility for us. Taking this as a starting point, we began modernising our training system.

During the past 25 years, the Hungarian school of value analysis has taken form but, in spite of achieving significant aims, did not have practical experience because of its tardy usage. However, this school has to develop further and has to be renewed. We think that the strict cooperation with SAVE International helps this aim of ours.

The Fifth Conference of Value Analysis on the 4th and 5th December—organised by SHVA—was an important event for us. The conference was granted by more state institutions and professional associations. The protector of the conference was, among others, the Minister of Industry, Trade and Tourism. In the conference we could listen to excellent lectures by our colleagues: Joseph V. Lambert, Katherine Dwyer, John W. Bryant, Russ Brzezinski, Dale Daucher. We can use the imparted knowledge and critical comments rather well. We decided to shift over to the module-system training. The 1st Module is taught as a 45- to 60-hour subject in most of our national universities and colleges. In these institutions we will also introduce the tuition of the 2nd Module in the near future, depending on the existence of essential conditions.

An important step in practical cooperation is that the environmental project that is being prepared with the cooperation of SAVE International, and SHVA is approaching its end. According to our plans, this year we will publish the methodology course, titled “Value Analysis of Investments,” in the College Faculty in Dunaujvaros of the University of Miskolc. The content of the methodology was compiled with the material and ethical backing of the Ministry of Industry, Trade and Tourism. Value Analysis Inc. took part in the job, and the administration was made by SZENZOR Organisation Company. In this work we reviewed the experiences of the past years, and we also processed the results of the companies’ projects. After compiling it in Hungarian we would like to hand the English version over to SAVE International.

We state that the development of Hungarian-American economic connections can significantly benefit from the Hungarian-American cooperation in value analysis, and it can contribute to a better use of collective advantages.

To sum up the results of the Hungarian-American connections, we think that the American way of theory and practical realisation was the most beneficial for us, while the American side had the opportunity to analyse the problems of controlled economies thoroughly, which can—incidentally—be applicable for other economies, too.

**SUMMARY**

It seems to become an established fact that “soft sciences” play an important role in industrial development, and this is why we emphasise the question of value management. Using value management correctly—relying on proper marketing information—we can predict the market success or failure of a certain product. Value management enables us to form a product so that—within certain limits—it can increase the competitiveness of the product. In spite of value management having a standardised methodology, in certain fields of profession we must consider the specialties of transitional economies. The presentation of usage in the clothing trade can give an example in certain fields of professions for solving practical problems in connection with value analysis.

We are grateful for the given critics and support.

**ENDNOTES**

1. For outside spectators, it is not always evident why nostalgia for socialism arose in a relatively broad mass of the people in the former socialist countries. In spite of giving no place for development and progress, the former system was “clear”; people felt secure, the future was “calculable.” The system worked with a low grade of efficiency, and losses generated by the society were covered by loans from abroad.

2. The specialization of the field of science appeared through the experts of these fields, who can work out the solutions in divisions to enable a higher level of utilization of resources in a relatively short period of time because of their high level of practical and theoretical knowledge. The specialization of the field of science appeared in the curriculum of universities and colleges and subject methodologies. The “soft” sciences became substantive disciplines, which made it necessary for teachers to specialize. The professional bodies also show the specialization of fields of knowledge and science.

3. The state took up too much beyond its possibilities in social welfare. The old systems (e.g., pension, health, education) mop up money from the budget like a “giant bag.” In addition to this, new tasks also appeared, like dealing with unemployment. The state wants to decrease its role in these systems, but the majority of inhabitants do not possess material resources that could make it possible for them to take over these burdens. So overspending still exists—although in a decreasing degree; this is the main reason for the budget deficit and inflation. The burdens of the former loans also mean further difficulties for economic development. According to our judgment, the general use of Value Engineering GDP could rise by 4-5%. It is foreseeable that it could give Hungary many additional resources that could not be acquired any other way. We propose for discussion that the governments of developed countries, their experts, and the IBRD should help former socialist countries in using “soft sciences.”

4. Prepared on the basis of the works of the college study group formed for using scientific accomplishments in practice.

5. Please do not judge us too strictly. Certainly, we are well aware of the fact that on the level of product there is only a margin (+ or -) but companies “spread” their overhead costs to the products somehow.
6. By success we mean that the company can sell the product and realizes the expected profit. Failure is the opposite of this.
7. These constants can be determined beforehand. This way we do not need time-consuming calculations.
8. In a continuative training the director of a fur company said, “We bought materials 20% cheaper but we nearly went bankrupt.” According to the follow-up analysis that we made together with the technologists, we found out that the losses resulting from waste doubled. We could have avoided it by using value engineering!

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A Kuhnian Crisis in Value Management?

Stuart D. Green, Ph.D.

SUMMARY

This paper contends that the discipline of value management is currently undergoing a paradigm crisis. An analogy is made to the wider discipline of operational research, which emerged from a similar paradigm crisis during the early 1980s. It is suggested that the underlying assumptions of traditional value engineering are identical to those of “hard” operational research. However, whilst this paradigm of optimization is perfectly valid when faced with well-defined technical problems, it has invariably failed when faced with the “soft” social problems which often distinguish the early stages of building design. It is argued that this is especially true for multifaceted clients. A generic framework for value management is seen to be provided by the concept of group decision support, as developed within the emerging tradition of “soft” operational research. The optimizing paradigm of value engineering therefore represents a special case of value management which can be justified in some circumstances. The distinction between unitary and pluralistic client organizations is seen to be particularly important in ascertaining which approach is appropriate.

Key words: Value management, value engineering, operational research, group decision support, paradigmatic validity.

INTRODUCTION

The purpose of this paper is to investigate the notion of a “paradigm crisis” within the discipline of value management. It builds upon previous work by the author (Green, 1993; Green, 1994; Green and Simister, 1996) which has established the distinction between the traditional discipline of value engineering (VE) and the emerging concept of value management (VM). In order to cover new ground, the repetition of previous arguments has been kept to a bare minimum. However, it is necessary to appreciate initially that VE is based on “hard systems thinking,” whilst VM is based on “soft systems thinking.” A comprehensive comparison of hard systems thinking and soft systems thinking has previously been provided by Checkland (1981). It has also been assumed that the reader is familiar with SMART value management, as developed within the soft systems paradigm (Connaughton and Green, 1996; Green, 1992; Green, 1996). This paper seeks to extend the debate beyond systems thinking in order to consider the notion of a paradigm crisis in the wider domain.

The paper has been written primarily for the VM research community, rather than for practitioners. Considerable emphasis has therefore been given to issues of theoretical validity and very little to issues of practical implementation. It has not been considered necessary to describe either the methodology or techniques of value management, which are well described elsewhere. Some American readers will undoubtedly find this paper provocative. The intention is to contribute to the ongoing theoretical debate and to introduce an element of critical thinking. If value management is really about challenging “sacred cows,” then this must also apply to the methodology of value management.

The Structure of Scientific Revolutions

Current usage of the term “paradigm” can be attributed to the hugely influential Structure of Scientific Revolutions (Kuhn, 1970). Kuhn provided a reinterpretation of scientific activity and used the notion of a paradigm to describe an implicit set of assumptions based on an accepted body of knowledge. It was controversially argued that the majority of scientific research is not concerned with “breakthroughs,” but with the progressive isolation and solution of problems within the prevailing paradigm. Research activity of this nature was labeled “normal science.” Kuhn further contended that there are identifiable periods of scientific research when the scientific community obviously shared a common paradigm. Major scientific breakthroughs were seen to occur only by the means of occasional “scientific revolutions” which resulted in the accepted paradigm being replaced with an alternative. One such revolution was seen to have occurred when Copernican physics was replaced by Newtonian physics. A further revolutionary paradigm shift was later caused by Einstein. According to Kuhn, scientific progress does not, therefore, depend solely upon steady constructive progress; it also depends upon occasional periods of crisis (“extraordinary science”) which involve “tearing down the established structure of assumptions.” The importance of Kuhn’s contribution is demonstrated by the widespread use of the phrase “Kuhnian paradigm crisis” to describe the situation where a previously accepted paradigm is proving to be deficient and a robust alternative has yet to emerge. The concept of competing paradigms has since been widely cited within the social science literature (e.g., Burrell and Morgan, 1979).

The Competing Paradigms of Operational Research

In the early 1980s, Dando and Bennett (1981) suggested that the discipline of operational research (OR) was undergoing a paradigm crisis. At the time, the OR community was experiencing a strong sense of disillusionment in the face of an increasing amount of criticism which challenged the established paradigm. Of particular note were the controversial papers of Ackoff (1979a,
between strategic and tactical decisions. Strategic decisions are problems, and by Ackoff (1979a) in terms of “problems” and Rittel and Webber (1972) in terms of “tame” and “wicked” appeared to fail when applied to problems of any significance. The uncertainty of strategic decisions relates not only to possible "messes." Rosenhead, however, characterizes the distinction between strategic and tactical decisions. Strategic decisions are seen to be distinguished by the presence of uncertainty. However, the uncertainty of strategic decisions relates not only to possible outcomes, but also to the very nature of the problem itself. The actors are no longer perceived to be external parties who analyze the problem from the “outside”; they are themselves a fundamental part of the problem. Such situations are multiperspective in nature and are invariably characterized by conflict. The various actors not only disagree as regards the comparative merits of alternative solutions, they also pursue different goals and may well have entirely different perceptions of what the problem actually is. It was concluded by Rosenhead, thereby adding further weight to the previous arguments of Ackoff (1979a, 1979b), Dando and Bennett (1981), and Checkland (1981, 1985) that the optimizing paradigm of traditional OR is of relevance only to tactical problems of little consequence; i.e., to puzzle solving in situations where the problem can be isolated from the actors and an agreed organizational objective is accepted by all. The realization that these assumptions are rarely justified for “real world” problems presented a deep-rooted challenge to the established tradition of OR. This led to a prolonged and acrimonious debate within the OR community, the end result of which was the emergence of the alternative paradigm of ‘soft’ OR. The table provides a direct comparison of the characteristics of the traditional paradigm of hard OR with those of the emerging paradigm of soft OR.

The dominant assumption behind hard OR is that problems can be modeled as if they were “objective realities.” The underlying ontological stance is one of positivism. An optimal answer is assumed to exist “out there.” In contrast, soft, OR questions the very notion of an objective reality and argues that social problems cannot be separated from the perceptions of the problem owners. The issue of differing perceptions therefore becomes a very central part of the problem. There is no longer any pretense at revealing an underlying “right” answer; the emphasis lies in building a shared understanding and common commitment. The underlying ontological stance is one of social constructivism.

Competing Paradigms of Operational Research

(Rosenhead, 1989)

Characteristics of the dominant paradigm of operational research

1. Problem formulation in terms of a single objective and optimization. Multiple objectives, if recognized, are subjected to trade-off on to a common scale.
2. Overwhelming data demands, with consequent problems of distortion, data availability, and data credibility.
3. Scientization and depoliticization, assumed consensus.
4. People are treated as passive objects.
5. Assumption of a single decision maker with abstract objectives from which concrete actions can be deduced for implementation through a hierarchical chain of command.
6. Attempts to abolish future uncertainty and pre-take future decisions.

Characteristics of an alternative paradigm

1. Non-optimizing; seeks alternative solutions which are acceptable on separate dimensions, without trade-offs.
2. Reduced data demands, achieved by greater integration of hard and soft data with social judgements.
3. Simplicity and transparency, aimed at clarifying the terms of conflict.
4. Conceptualizes people as active subjects.
5. Facilitates planning from the bottom up.
6. Accepts uncertainty, and aims to keep options open for later resolution.

Paradigmatic Validity in Value Engineering

It is evident that the above dichotomy between wicked and tame problems is by no means unique to the OR literature. The distinction has long been recognized within the design methodology literature. It is also widely recognized that the optimizing paradigm of traditional OR is inappropriate to the soft, messy, and ill-defined problems which invariably distinguish the early stages of building design (Powell, 1987; Rowe, 1987; Lawson, 1990). This is evidenced by the failed attempts of the 1960s to implement Jones’ (1963) “systematic design method.” However, it would seem that these same lessons have yet to be learned by the VE community, which continues to pursue the notion of design optimization. The traditional literature on VE (e.g., Dell’Isola, 1982; Miles, 1972) invariably assumes that design problems are both well defined and static over time. Clients are further assumed to be unitary in nature and able to articulate objectives which are both consistent and transitive. Furthermore, it is invariably taken for granted that a “system” possesses an objective underlying function which is waiting to be identified. It is also widely assumed that adequate decision support can be provided by the single-criterion cost models of building economics. Whilst these assumptions are by no means universal, they are strongly reflective of the currently dominant paradigm of value engineering. However, it is this same “optimizing” paradigm which has become increasingly discredited within the broader discipline of management science.

As a caveat to the above, it should be recognized that the practice of U.S.-style value engineering frequently differs dramatically from the theory (Palmer, 1992). Practitioners often intuitively weaken the underlying assumptions of value engineering and adapt the techniques for the purposes of problem...
Structuring in order to achieve a shared social reality. Elegant (1992) is certainly a forward thinker in this respect. For such practitioners, the dogma of “optimization” owes more to salesmanship than to a guiding paradigm. Whilst clients may well be attracted by a consultancy service which offers the “optimal answer,” they are unlikely to be attracted by a service which offers a shared social reality. It should also be stated that the distinction between hard and soft approaches is often confused. This is perhaps inevitable given that the VM community has only recently begun to address issues of paradigmatic validity.

In the United States, the traditional paradigm of VE is continually reinforced by the requirements of SAVE International. In the author’s experience, attempts by “outsiders” to question the underlying assumptions invariably produce a defensive reaction, leading to heated and acrimonious debate. Given the existence of commercial vested interests, such responses are perhaps inevitable. They are also highly characteristic of a Kuhnian paradigm crisis. Nevertheless, if VM is to continue to develop as a bona fide discipline, then the issue of paradigmatic validity must be faced. The first stage of this process is to recognize the existence of the two competing paradigms, as previously characterized in the distinction between value management and value engineering. However, it then becomes possible to argue that VE is a “special case” of value management, in the same way that hard OR is a special case of soft OR.

Recent Developments in Value Management

From a research perspective, recent methodological developments in value management seem to have primarily occurred within the United Kingdom and Australia, rather than the United States. This is arguably due to the absence of the vested interests and the associated constraining influence of SAVE International, which distinguish the VE community in the United States. Whilst there are a few exceptions, there has been little written in the American literature which seeks to relate value engineering to the wider domain of social science.

In Europe, the empirical research of Palmer (1992) has undoubtedly been influential in removing much of the mystique surrounding the American practice of value engineering, particularly with respect to function analysis. Palmer also observed a significant divergence between U.S. theory and U.S. practice. The notion of paradigmatic validity goes some way towards explaining why the dogma of the traditional literature is rarely implemented in practice. Kelly and Male (1993) have also made a major contribution to United Kingdom practice. Whilst their approach has been developed independently of SMART value management, it does possess a number of broad similarities. Both approaches recognize the potential role of value management for the purposes of problem structuring in group situations. They also both advocate the application of value management within the context of an evolving framework throughout the project life cycle. However, Kelly and Male’s approach remains rooted in the American tradition of function analysis. Furthermore, whilst it is significantly “softer” than U.S.-style value engineering, it still adheres to the false aims of “value maximization.” This is evidenced by the following definition:

Value management is a service which maximises the functional value of a project by managing its development from concept to occupancy through the audit (examination) of all decisions against a value system determined by the client (Kelly and Male, 1993).

The underlying ontological stance inherent in the above definition is one of positivism. It is assumed that the client is unitary in nature and that a consistent “value system” exists which can be modeled. There is seemingly no recognition that the very process of modeling will inevitably alter the values of the participants. An underlying positivism is also implicit within the very terminology of “function analysis.” The overriding implication is that “function” exists independently of the conflicting and transient aspirations of the project stakeholders. It is taken for granted that function can be analyzed in the same dispassionate way in which one would manipulate a quadratic equation.

In contrast to the above, the intellectual origins of SMART value management lie firmly within the still-developing field of soft OR. The approach therefore represents a decisive break with the American tradition by rejecting both the optimizing paradigm of hard OR and the associated terminology of function analysis. The broad theoretical framework for SMART value management is provided by the concept of group decision support (GDS), which can be defined as:

... any designed process that supports a group of people seeking individually to make sense of, and collectively act in a situation in which they have power (Bryant, 1993).

The above definition presents an obvious analogy to the role of value management in aiding design decision making in general and the briefing process in particular. It should also be recognized that there is a significant difference between the provision of GDS and the narrower concept of decision support to an individual. GDS differs in that it places less emphasis on substantive data and more emphasis on consensus building and the decision-making process. Given that building design is invariably a group activity which includes both designers and client representatives, it is clearly GDS which is relevant. This is especially true for multi-faceted clients where different interest groups possess conflicting objectives. Indeed, once the intellectual baggage of optimization is jettisoned, the concept of value management becomes almost synonymous with that of GDS. The above-quoted definition of GDS could therefore be suggested as a “metadefinition” of value management. It then also becomes clear that the decision conferencing strategy of SMART value management represents just one approach. The potential application of soft OR to the wicked problems of building design is readily apparent from the comments of Rosenhead (1989):

[d]istinctive features of these novel approaches include an aim of partial structuring of previously unstructured situations (rather than the solution of well-structured problems), and a process involving participation as a key component.
It is important to recognize that such approaches make no attempt to identify optimal answers. The emphasis lies on constructing a social consensus regarding the nature of the problem together with an agreed course of action. It is particularly important to secure the involvement and commitment of the problem stakeholders. The underlying ontological stance is therefore one of social constructivism. It is recognized that the very act of modeling will inevitably alter the nature of the problem.

To date, there has been little recognition of soft OR within the VM community. However, the relevance of soft systems thinking has recently been recognized within the field of project management (Saunders, 1992; Yeo, 1993). This realization reflects a long-standing recognition that the traditional hard-systems techniques of project management (e.g., critical path analysis, work breakdown structure, responsibility matrices) are not sufficient within themselves to secure successful project management.

**Beyond the Paradigm Crisis**

Given the wider interpretation of value management as a means of GDS, it becomes possible to argue that the two paradigms are complementary rather than mutually exclusive. Just as the techniques of hard OR continue to be useful in certain situations, so do the traditional techniques of value engineering. It is this “post-crisis” argument which is increasingly gaining acceptance within the OR community:

> [i] instead of seeing different strands of OR as competing for exactly the same area of concern, alternative approaches can be presented as being appropriate to the different types of situation in which management scientists are required to act (Jackson, 1993).

The above argument is also directly applicable to the alternative paradigms of value management and value engineering. It is clearly appropriate to adopt the approach which is pertinent to the given situation. The application of “hard” value engineering is perfectly justified in problem situations where a clear and predefined objective exists which is constant over time. These assumptions are indeed warranted when value engineering is applied to manufactured components or to specific building components during detailed design. For example, the function of a door frame is unlikely to be vehemently contested by different stakeholders. However, it would be far too much of a generalization to suggest that the application of value engineering is limited to the later stages of building design. Within the petrochemical industry, value engineering has long been applied successfully during the very early design stages. Indeed, engineering personnel engaged on such projects see no need for “soft” approaches and find the very notion of a paradigm shift to be incomprehensible. Practitioners who operate successfully within a tried-and-tested paradigm are invariably unable to see the need for any other paradigm. This phenomenon has been well illustrated by Keys (1991):

> ... once one is locked into a paradigm it is difficult to see the world in any other way or to see the need to do so.

Blackler and Brown (1983) provide a further insight by suggesting that, within the applied social sciences, the notion of a Kuhnian paradigm shift must be explained not only by issues of validity, but also by wider socioeconomic and political changes. It is therefore illuminating to compare the notion of a paradigm crisis in VM to the changes which have occurred within the United Kingdom construction industry over the last decade.

**UK Construction Industry: 1980s vs. 1990s**

The existence of a number of different categories of building client is widely recognized. Of particular importance is the distinction between speculative developers and owner-occupiers. Whilst both types of client have always existed, it was the former which dominated the construction industry of the 1980s whereas the latter dominates the industry of the 1990s. It is contended that this change in emphasis has had fundamental implications for the meaning of value for money and for the practice of value management. For the speculative developers of the 1980s, the objectives of building design could be taken largely for granted. Design was considered to be a technical process of maximizing floor area whilst minimizing construction cost and time. The clients were therefore unitary in nature and not dissimilar to clients who commission petrochemical process plants. Effective decision-support to clients of this nature can indeed be provided by the single-criterion decision models of investment appraisal. The same underlying philosophy is reflected in the 1980s approach to VE (e.g., Green and Popper, 1990). Alternative design options are generated and appraised in accordance with their impact on (i) construction cost, (ii) construction time, and (iii) investment value.

However, for the owner-occupier clients of the 1990s, effective decision support can no longer be based on single-criterion financial models. Client organizations are increasingly multi-faceted; not only do the various stakeholders possess differing objectives, they also often have differing perceptions of the “problem” which the building is intended to solve. Whilst the value managers of the 1980s could rely on the techniques of building economics for the purposes of decision support, this is no longer the case for the owner-occupier clients of the 1990s. It is simply not possible to represent “value for money” by simplistic cost models alone. Agreement regarding objectives cannot be taken for granted; it is initially necessary to construct a consensus understanding in order to resolve the pluralism. This is particularly true for the strategic design decisions which occur during briefing and concept development. Whilst such a consensus has been traditionally achieved by means of a dialectic debate amongst client members and designers over a period of time, value management seeks to enhance this process by the means of GDS. Only when the pluralism has been resolved will the single-criterion cost models of building economics become relevant.

It is important to emphasize that the above analysis is intended to be a characterization. The argument that there has been a dramatic switch from developer clients to owner-occupier clients over the last decade is clearly exaggerated. To a greater or lesser extent, the construction industry has always served both types of clients and will continue to do so. Nevertheless, there is no doubt
that the recession has placed the consumers of buildings in the ascendency. Even office users now expect to be able to influence the design of the buildings which they occupy rather than renting homogeneous space. Whilst it could be argued that the change in orientation from “supply-push” to “demand-pull” is short term, this would be to ignore similar trends in other sectors of society. The new decade heralded increasing consumer influence over a wide range of services such as transport, health, and education. Even those developer clients who continued to build during the early 1990s were building to order rather than building speculatively. They were therefore no longer able to ignore the wishes of the building occupiers. They would also be required to resolve the conflicting objectives of different user groups.

Problem Contexts and Building Clients
One of the key issues to arise from the previous discussion is the distinction between unitary and pluralistic clients. The paradigm crisis in VM has followed that of OR in that the “hard-systems” paradigm is clearly inappropriate when faced with the multi-perspective problem situations which characterize pluralistic clients. It is therefore useful to review the established methods of categorizing client organizations, and the extent to which they distinguish between unitary clients and pluralistic clients.

Gameson (1992) has summarized a wide range of published sources and concludes that construction clients are best classified in accordance with four categories:

- secondary inexperienced;
- secondary experienced;
- primary inexperienced;
- primary experienced.

However, the category of primary-inexperienced client was subsequently eliminated on the basis that an organization whose primary business is the construction of buildings is unlikely not to have an established means of accessing the necessary experience. Gameson also argued that clients cannot be categorized as "experienced" solely on the grounds that they possess previous experience of building; they must have previous experience of the particular building type in question. The same client organization could therefore be classified as "experienced" or "inexperienced" depending upon the type of project.

Whilst the preceding classification of client organizations is widely accepted, it tends to assume that clients are essentially unitary in nature, i.e., that they are composed of individuals who possess common interests and act in accordance with agreed objectives. A more realistic approach is perhaps that of Chernen and Bryant (1984), who recognize that clients are often multifaceted in nature, comprising several different interest groups whose objectives differ, and may well be in conflict. The potential for conflict within client organizations is further recognized by Walker (1989) and Baden Hellard (1992), although neither offer any further comment other than the need to "interpret the balance" between conflicting priorities. Hillebrandt (1984) also recognizes the existence of clients which are "multiple and complex," of which hospital clients are quoted as being the classic example:

[hospital building ... is a type of work on which problems tend to arise because the administrators, doctors and nursing staff have different views on how various conflicting objectives should be reconciled.

Perhaps the most influential demonstration of the complexity of multifaceted clients is provided by Morris and Hough’s (1987) study of major projects. Whilst this study was not specific to the construction industry, many of the conclusions are directly relevant. Of particular importance are Morris and Hough’s observations regarding the way in which political issues often detract from the clarity of a project’s objectives. It was concluded that the chances of eventual success are severely diminished if conflict and ambiguity regarding a project’s objectives are not resolved during its early stages. There is currently a distinct absence of formal approaches through which such conflict and ambiguity can be diminished. The potential benefits of GDS through value management are therefore substantial. However, these benefits will not be realized if practitioners continue to operate within the inappropriate paradigm of hard OR.

CONCLUSION
This paper has suggested that the discipline of value management is currently undergoing a paradigm crisis. It has been further proposed that this crisis is directly analogous to that which occurred within the discipline of operational research during the early 1980s. The validity of the underlying paradigm of traditional value engineering has been questioned. The concept of optimization is seen to be entirely inappropriate for the multi-perspective human problem situations which characterize the early stages of building design. This is particularly true for multi-faceted clients. It has also been suggested that the broader concept of value management is synonymous with the notion of group decision support, as developed within the emerging paradigm of soft OR. On the basis of this revised “meta-definition,” it becomes possible to argue that the alternative paradigms are complementary; different approaches are appropriate for different situations. Value engineering therefore becomes a special case of value management, in the same way that hard OR is a special case of soft OR. However, this “enhanced” interpretation only becomes meaningful once the notion of a paradigm crisis has been addressed. Ongoing research at the University of Reading is currently testing a range of soft OR methodologies for the purposes of value management.

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