

Historical Overview of Value Management

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This article is taken directly from one of the introductory chapters in Dr Roy Barton's Ph.D. thesis.

This overview places Value Management within an historical setting and, in so doing, provides a basis to pursue the research questions. It shows how Value Management was first introduced to the construction industry in Australia and how, since that time, it has developed into widespread practice applied to the design and construction of buildings and civil engineering structures. The historical roots of the core concept of "value" are explored, seeking to place this concept in a meaningful structure, appropriate for infrastructure project initiation.

Whilst Value Management did not commence its journey as a formal discipline until the late 1940s, principles upon which the discipline is (implicitly) based may be traced to periods centuries before that time. This is particularly so in relation to the concepts of value, utility and function which are discussed later in this chapter. The works of Aristotle and Plato together with those of economists and philosophers such as Smith, Bentham, Bernoulli and Jevons all have relevance. In 1947, without reference to any of these pioneers of economic and philosophical thought, Lawrence D. Miles developed a system of cost reduction which he called "Value Analysis". The system was based upon the theory that all cost is for function (utility) and that value may be expressed as a ratio between the cost of the function and the worth of the function. It is this system of Value Analysis which formed the roots of modern Value Management.

The core elements of Value Analysis form a problem-solving system to identify unnecessary costs in manufactured products. Virtually all of the Value Management literature right up to the most recent times makes no reference whatsoever to the historical basis of problem solving and the nature of value. A notable exception is Fallon (1980) who does make reference to the work of Adam Smith, Daniel Bernoulli and John Stuart Mill. There is no evidence to suggest that the development of Value Analysis was based upon any theoretical underpinning or reference to historical literature. Rather, the evidence suggests that Value

Analysis was developed as a pragmatic exercise, a deliberate effort to reduce unnecessary costs from manufactured products through the application of a set of techniques.

Miles created the system of Value Analysis when working for the General Electric Company of Chicago, USA. Dell' Isola (1982) describes how Miles was asked to address an apparent paradox at the company when facing shortages of materials in the years immediately following World War II.

The management of the company noted that in circumstances when they needed to purchase substitute products due to the unavailability of the ones which they had specified, the substitute products sometimes cost less and actually performed better.

A decision was taken to explore the possibility of seeing if these unintended (yet desirable) outcomes of the materials shortage situation could, in fact, be achieved by some deliberate process or processes. Miles was assigned the task and eventually designed a system which he called Value Analysis.

In describing Value Analysis, Miles (1989) says that:

Value Analysis is a disciplined action system, attuned to one specific need: accomplishing the functions that the customer needs and wants, whether those functions are accomplished by hardware, service, a group of people, professional skills, administrative procedures or other at the lowest cost. In its disciplined thinking, Value Analysis is comprised of specific mind-setting, problem-setting, and problem-solving systems. These systems will assist anyone who has the task of providing more of what the customer wants for less cost.

Fallon (1980) explains that the system worked remarkably well, delivering the following initial results:

- Knowing the actual cost of things 5% savings
- Improving materials and methods selection 10% savings
- Finding a better way to do what the product was intended to do 30% savings

The success of the process at General Electric has been well documented (Fallon (1980), Kaufman (1985), Dell 'Isola (1982)). The process quickly spread throughout the industrialised world, still focusing upon manufactured products. As time went by, the application of Value Analysis was extended to new product development and to whole systems. The process had a profound influence upon the manufacturing world.

In the early 1950s, the term “Value Engineering” was coined. As stated in the introductory chapter to this thesis, the Australian and New Zealand Standard on Value Management explicitly considers the terms "Value Analysis", "Value Engineering" and "Value Management" as synonymous. Whilst this is consistent with international literature and practice, the terms are, however, sometimes considered to convey separate, distinct meaning. There are differing explanations described by people who were active in Value Analysis at the time as to how the term “Value Engineering” came to be introduced. First, there is an explanation by Miles himself who describes Value Engineering, as "the name often used by qualified engineers in engineering work (Miles (1989)". That is to say, when qualified engineers conduct Value Analysis on engineering work, they refer to the process as Value Engineering.

A second scenario is a derivative of that cited by Miles and relates to the use of Value Analysis in the US Defence Department. By 1954, Value Analysis had become standard procedure in the design and manufacture of defence products. Anecdotal evidence suggests, and it is strongly held by many people, that the term “Value Engineering” was introduced by the US Defence Department as a means of classifying officers specialising in the techniques of Value Analysis. The reason for the change in name was simply that the Defence Department had no classification for analysts whereas they did for engineers.

A third scenario is that when the US Navy Bureau of Ships adopted Value Analysis for submarine design and "engineered the outcome", in the 1950s, they chose to call it Value Engineering. Further, it is suggested that as the application of Value Analysis widened to include the process of engineering new products (as opposed to analysis of existing products) the term “Value Engineering” was introduced to reflect that change. Whatever the reason for the introduction of this new term, probably an amalgam of the scenarios described above, the fact of the matter is that “Value Engineering” became the common term, subsuming, in most

cases, the term “Value Analysis”. To this day, however, there are some who prefer to differentiate Value Analysis and Value Engineering on the basis that “Value Analysis” is applied to existing products and “Value Engineering” is applied to new products. By far the majority of practitioners world-wide, however, use the term “Value Engineering” as the single term which subsumes the process of Value Analysis. This practice is supported by the Society of American Value Engineers (SAVE), now SAVE International. Recently, the society adopted the name "Value Methodology" as the inclusive title of Value Analysis, Value Engineering and Value Management.

It was in 1954 that the US Department of Defense formally adopted Value Engineering for use in procuring products for its ships. Ten years later, Value Engineering was practiced broadly within the US Defense Department and also by many US federal, state and local governments.

Following the successful use of Value Engineering within the US Defense Department, the process was introduced to the US construction industry in a formal in the early 1960's. Dell' Isola (1982) explained how the US Navy provided a conduit for Value Engineering to obtain a foothold in the construction industry through the use of Value Engineering incentive clauses. Such clauses were being used with considerable success by the Navy in procurement of products. They are, in fact, still used to this day. The system works by offering contractors incentives to reduce cost but maintain quality and performance. Should a contractor be able to nominate a proposal which is alternative to the one specified but which performs the same functions at the required levels of quality and performance as that originally specified, then the contract provided for any cost savings from such changes to be shared between client and contractor. The proportion of such sharing is specified in the contract. The savings are sometimes shared on a 50/50 basis but in other cases a 70/30 split in favour of the client is agreed to. These incentive clauses allowed for Value Engineering Change Proposals (VECPs) to be submitted by contractors on any part of the project.

In 1963, a major innovation in Value Engineering was the development of the Function Analysis System Technique (FAST) by Charles Bytheway of the Sperry Rand Company. The technique enables a set of functions performed by a product to be expressed in terms of a diagram similar to a critical path precedence diagram. The technique is based on linking functions on the basis of “how-why” logic. The diagram revolutionized the method of

function analysis. Bytheway's FAST diagrams became a central part of Value Engineering and continue to do so to this day. The diagrams were developed in the same era as critical path analysis, particularly precedence diagrams, and bear a very similar appearance to those diagrams. The term "critical path" was used as part of the process. The creation of the F.A.S.T. diagram was the single major development in Value Engineering since its inception in the 1940s.

From its early days, Value Analysis developed as a team approach to problem solving. Miles (1989) describes his method as:

A problem solving system implemented by the use of a specific set of techniques, a body of knowledge, and a group of learned skills. It is an organised, creative approach that has for its purpose the efficient identification of unnecessary cost i.e. cost that provides neither quality nor use nor life nor appearance nor customer features.

Central to the method is a small team of people (typically 5-7). This team is multi-disciplinary and drawn together from various components of the system in which the product is placed. Such a team for a study of a product may, for example, include representatives from marketing, manufacturing and purchasing.

Value Analysis method is designed around a "job plan". This "job plan" has been a characteristic of Value Analysis from its most early days and remains to this day, virtually in its original form. Miles (1989) describes the job plan as a five-step process. These five steps are information, analysis, creativity, judgment and development. Whilst it is recognised that this job plan was built up by Miles as a practical problem-solving method, the basic approach to problem-solving is consistent with general problem-solving literature except for the specific focus on analysis of functions.

History of Value Analysis and Value Engineering in Australia

Value Analysis was introduced into Australia in the mid-1960s. Its introduction was via the United States and (separately) via the UK. The following account of the introduction of

Value Analysis into Australia is based upon interviews undertaken as part of this research project with people who were directly involved at the time. They are Mr Eric Adam, Mr Alex Clark and Mr Robert White.

The earliest account available is that of Mr Eric Adam who, in 1966 was the Chief Executive of the Engineering Division of ACI Ltd. Faced with a mandate from the Board of Directors to find ways to reduce cost and improve performance, Adam contacted a visiting Value Analysis Practitioner from the United States, Mr Dusty Folkes who invited Adam to participate in a Value Analysis workshop. His participation was conditional upon his taking with him an actual product or problem situation from his company. Adam describes how he selected for the exercise a product packaging process. He thought there would be no possibility of reducing its cost. To his surprise, the Value Analysis approach led to several significant changes which reduced cost considerably and improved performance. Adam then applied Value Analysis to the Engineering Division at ACI until he left the company one year later. It was then that he established himself as a full time consultant in Value Analysis. He is the first Australian known to have done this. Adam worked with many companies in his consulting role, leading to substantial cost savings and product improvement. Many of these achievements are recorded in his textbook "Value Management (Adam, 1994).

Nineteen seventy-one proved to be a milestone year for Value Analysis in Australia. Adam was invited to submit a proposal to the State Electricity Commission of Victoria for the application of Value Analysis to its Loy Yang power station projects. Here, he conducted scores of value analysis studies and trained many of the staff of the Electricity Commission. Their work collectively led to millions of dollars in capital cost savings on power station projects as well as savings on a recurrent basis as a result of undertaking Value Analysis on operations as well as physical assets. These Value Analysis studies on power station design and construction are the first recorded exercises in Australia of Value Analysis applied to the construction industry.

During the 1970s, the enormous success of the Value Analysis program at the State Electricity Commission of Victoria led to the establishment of Value Analysis at Electricity commissions throughout the country. Value Engineering remains common place in the electricity generating industry in much the same form as introduced by Adam in 1971.

The Hawker De Havilland company used Value Analysis extensively in all of its divisions commencing in 1967/8. Value Analysis was introduced to this Company by its British parent which also used Value Analysis extensively, particularly in its aircraft division. It was introduced as part of a range of management improvement initiatives. The process worked on an on-going program basis (as opposed to separate projects) and selected staff were required to meet once per month to report on the cost reduction they had made by applying the principles of Value Analysis. The company found the process to be most successful as a cost-reducing device but also in improving product performance. This led to a range of design changes and standardisation of design.

The aircraft industry gained particular benefit from Value Analysis by targeting performance improvement (as opposed to cost-reduction). The British Harrier Jump Jet and the Concorde are frequently quoted as examples of innovating performance improvement using Value Analysis.

The Chief Designer at Hawker de Havilland Marine Division was Mr A.G. Clark who later took up a position with the Department of the Navy and formally established Value Analysis in that department. Clark joined the Department of the Navy in 1971 as Director of Value and Industrial Engineering. This was a newly established position and his duty statement included the introduction of Value Engineering to Navy procurement.

Clark reports that during the 1960s, there were some attempts by the Department of the Navy to import from the United States their model of Value Engineering. In 1968, the Department secured the agreement of the US Navy to use the US Navy model in Australia.

Until 1975, the Australian Government had five separate departments dealing with defence. These were the Department of the Army, the Department of the Navy, the Department of the Air Force, The Department of Defence and the Department of Supply. In 1975, all five departments were integrated into one Department of Defence following the issue and acceptance of the Tang Report. As part of its re-structuring, the new department established a central management services group which included a Directorate of Industrial Engineering and Value Analysis. Clark was appointed as its Director and continued to apply Value Analysis to various facets of the department's procurement methods. Over the next ten years Value Analysis was used extensively on the procurement of Defence products. The

Department established training programs during which hundreds of defence personnel were trained in the skills and techniques of Value Analysis.

In March, 1983, the Department published a handbook, Value Analysis (DRB 37). The preface to this manual reflects the vision which the Department had at that time for the introduction of Value Analysis, not only to its procurement processes but also to those of the government as a whole:

This Departmental reference book is part of a concerted effort to introduce the concepts and techniques of Value Analysis to a greatly expanded franchise, within its primary sponsor group the Defence Department, the Commonwealth Public Service as a whole, and those parts of the private sector of Australian industry which supply the government with resources in return for Taxpayers money. The book is part of the growing Australian effort to introduce a greater familiarity with the subject and help to ensure that the Department keeps pace with the training programs and adoption of VA practices currently taking place in the private sector and overseas.

Despite the grandiose vision, issuing the book did not lead to any significant change in the use of Value Analysis in the Defence Department, nor is there any evidence to suggest that VA was extended beyond the boundaries of the Defence Department at that time.

In the late 1960s, Mr Robert White began to work with Value Analysis in an informal way whilst head of the project planning and management division of P.A. Management, a large management consultancy. Like Adam, White's introduction to the subject was via Mr Dusty Folkes from the USA. In 1970, White formally established Value Analysis as a discipline at PA Management and was engaged by a number of companies to conduct Value Analysis mainly in the manufacturing industry. His work included some work on facilities including the re-design of a proposed new factory.

White observed that visiting practitioners were conducting Value Analysis studies in Australia which of themselves were successful, but since they were not part of any overall program, there was little or no follow-up and the system was falling into disuse. A key part of his work at P.A. Management was to initiate whole programs of Value Analysis which included follow-up and implementation services. A major initiative by White was to

commence Value Analysis at the New South Wales State Railways. White's "whole program" approach continued at State Rail, so that some projects would run over several weeks. White retired from the field of Value Analysis in the early 1990s.

The next major initiative in the Defence Department with respect to Value Analysis came about in 1988 when the Department convened a meeting of the then growing number of practitioners in the field of Value Analysis in Sydney. This group agreed to go on meeting as a regular forum and formed the pre-cursor to the current Institute of Value Management, Australia.

Value Engineering moved forward in the construction industry in the early 1980s. Leighton Contractors Pty Ltd entered into an agreement with a US Value Engineering organisation, Smith, Hynchman and Grylls, specifically with the US Value Engineering practitioner, Alphonse Dell' Isola. This agreement provided for Smith, Hinchman and Grylls to introduce Value Engineering to the company, to conduct Value Engineering studies and to train Leighton Contractors staff. The initiative proved to be highly successful and was seen as a direct contributor to the success rate in which Leighton won competitive bids for construction projects. Leighton developed a substantial skill base in Value Engineering and the processes were applied to most of their projects as a matter of course.

The term, "Value Management" seems to have been coined during the mid-1980s, probably in the USA. There is no doubt at all that when the term Value Management was introduced (in distinction to Value Engineering or Value Analysis), there was no intention to define a separate or new methodology. The use of the term Value Management was seen to be much more in keeping with the management trends which grew out of the 1980s rather than any new or separate process. The Australian and New Zealand Standard on Value Management states that for the purposes of the standard, the terms "Value Analysis, Value Engineering and Value Management are to be considered as synonymous terms. Many practitioners of Value Engineering refer to themselves as Value Management consultants. Similarly, the Society of American Value Engineers International treats the three terms synonymously under the umbrella term "Value Methodology".

During the mid-late 1990s, there was a discernable shift in the perceived meaning of the terms Value Analysis, Value Engineering and Value Management. The trend is for Value

Management to be seen as substantially different from the other two terms, yet there is by no means universal agreement as to what constitutes such differences. Conventional definitions of Value Engineering and Value Analysis remain in their original form and for all intents and purposes, they may be seen as identical in terms of processes, rhetoric and guiding principles. The term Value Management is being clearly differentiated from Value Analysis in terms of process, rhetoric and guiding principles. One school of thought, particularly strong in the UK and Europe is that Value Management may be seen as an umbrella term which embraces all techniques and processes of Value Analysis and Value Engineering. Others see Value Management as the application of Value Analysis to management situations (as distinct from products).

The most common distinguishing factor, however, is that of the problem “situation” to which the value processes are applied. There is now a discernable trend towards defining Value Management as “hard” or “soft” depending upon the situation being addressed (Green 1996, Barton 2000). In these cases, “Hard” Value Management refers primarily to the conventional methods of Value Analysis and Value Engineering, that is to say, to those problem situations which tend to be well-structured and well-defined. “Soft” Value Management refers to the emerging methodology of dealing with problem situations which are poorly structured or poorly defined.

A major Australian initiative from a government perspective in Value Management occurred in New South Wales in the late 1980s when the Department of Public Works developed a framework for the use of Value Management for public sector construction projects. This led to the publication in 1990 of a New South Wales Government Value Management Guideline Manual and associated policy for application to all public sector capital works projects. The policy broke new ground in Australia by requiring that all capital works projects with a construction estimate of five million dollars or greater must undergo a formal Value Management process. Other states followed this model with minor variations. During the 1990s, growth in the use of Value Management processes in the field of public sector infrastructure was quite remarkable.

The framework contained within the NSW Government guidelines provided sufficient flexibility for practitioners to conduct Value Management in various ways and sufficient rigidity to provide direction and allow the evaluation of performance. Whilst at the time of

its development, the Guideline focused on design and construction stages of infrastructure projects (as opposed to strategic and conceptual planning), the framework was sufficiently broad to enable such applications as the need became apparent.

This historical background informed the pursuit of the research questions, helping to explain the roots and nomenclature and practice of Value Management in relation to public sector infrastructure projects.