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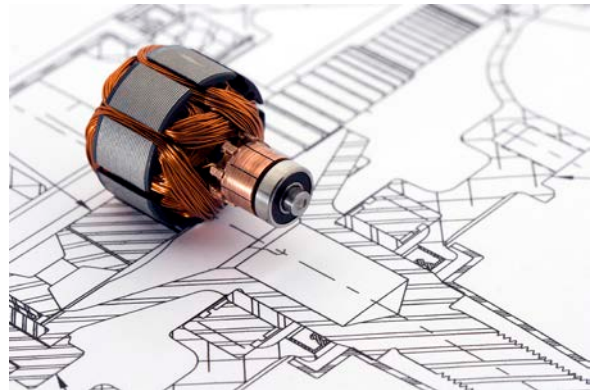
Business Excellence Through Inspired People

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Cost and Value in China and the United States

Cost reduction is a serious concern for most players across the global economy. A variety of approaches have been developed over the years in different communities. This article considers Value Analysis/Value Engineering and Cost Innovation as strategic tools.

Value Analysis/Value Engineering (VA/VE) was originally conceived during World War II in the United States when critical material shortages forced many manufacturers to substitute materials and designs. When the General Electric Company found that many of the substitutes were providing equal or better performance at less cost, it launched an effort in 1947 led by Lawrence D. Miles (1904-1987) to improve product efficiency by systematically developing less costly alternatives.



Miles was a vacuum tube design engineer who had developed a number of patents. He combined several ideas and techniques to develop a successful method for ensuring value in a product. The overall goal of Miles's technique was to produce a functional product without compromising on its quality. In 1961 Miles wrote the definitive book on the subject, *Techniques of Value Analysis and Engineering*. The Lawrence D. Miles Value Engineering Reference Center is now in the Engineering School at the University of Wisconsin and was created to fund ongoing efforts to preserve and extend VA/VE work.

VA/VE proposes that a project be managed in eight phases: Orientation, Information, Function Analysis, Creative, Evaluation, Development, Presentation and Implementation. The first phase involves careful identification of the problems to be addressed, breaking down the issues step by step into their constituents to assess potential gains and establish priorities. At the end of the Information phase the scope project is refined on the basis of all the data gathered. This makes up the input to the Functional Analysis – one of the distinctive elements in VA/VE. The functions of the entity are classified and their inter-relationship determined prior to costing each function. The scope of the project is then refined further in the light of the analysis. The alternative ideas generated in the Creative phase are assessed and prioritised in the following phase with the appointment of Idea Champions for each viable avenue. At the end of this phase the best ideas are put into Development where life cycle costs are determined to see if the potential benefits outweigh the costs. Major risks are identified and ways found to mitigate them.

The Presentation phase is the start of the organisational approval process. The presentation should ideally be less than half an hour and should:

- Describe the workshop objectives and scope

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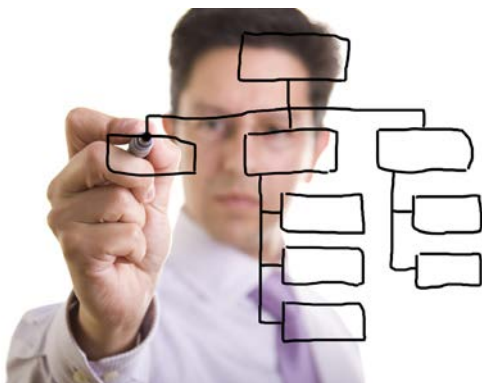
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- Identify the team members and recognize their contributions
- Describe the “before” and “after” conditions for each alternative
- Present the costs and benefits, advantages and disadvantages, and impact of each alternative
- Identify strategies to overcome roadblocks
- Demonstrate the validity of the data sources
- Suggest an action plan and implementation schedule

In the Implementation phase final approval is secured on the basis of a written report and steps are taken to enhance the prospects of success. Early disclosure is recommended to warn the originators of any objections to the proposal elsewhere in the organisation. This early warning gives the originators an opportunity to incorporate explanations and details into the final report to overcome the objections. These preliminary discussions often produce additional suggestions that improve the proposal and enable the decision-maker to contribute directly.



Implementation depends on the rapid approval by the decision-makers for each organizational component affected by the proposal. The VAVE team members should serve as liaison between decision-makers and other stakeholders by preparing information that weighs the risks against the potential rewards and by identifying potential roadblocks and solutions.

From this quick review we can see that VAVE involves careful iterative development of the problem to be addressed and careful management of the organisational dimension of making the proposed changes. A major turning point in the development of VAVE came in 1963 when a function-logic diagramming procedure called “Function Analysis System Technique” (FAST)

was created by Charles W. Bytheway.

In 1959 the Society of American Value Engineers or “SAVE” was incorporated. SAVE International® is the main international society for the advancement and promotion of the value methodology with members in more than 35 countries working in a variety of fields, including construction, product design and manufacturing, transportation, health care, government and environmental engineering. SAVE covers education and training, publications, tools for promoting the value methodology, certification, networking and recognition. In 1973, SAVE embarked upon a formal certification program for the competence of professional value engineers which has evolved to include three levels of certifications.

The first federal law in the USA requiring value engineering was passed in 1981: The Clean Water Act. Subsequent success of application of value engineering resulted in the first issuance of Circular A-131 by the Office of Management & Budget in 1988 which requires Federal Departments and Agencies to use value engineering as a management tool to reduce program and acquisition costs. That was followed by Public Law P104-106 in 1996 covering the acquisition of IT by defence agencies. The head of each executive agency must design and implement process for maximizing the value and assessing and managing the risks of the information technology acquisitions. Legal requirements for VAVE are now quite common in the US.

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Value Analysis first came to the UK in 1957 and the Value Engineering Association was formed in 1966 as an initiative by the Ministry of Technology. It became the Institute of Value Management in 1971. There is a European Association for the Management of Training and Certification in Value Management with a European Governing Board which was founded following an initiative by the European Council of Ministers to strengthen Europe's innovative capacity and competitiveness.

The European Standard EN 12973 provides a benchmark of good practice in VA/VE in Europe. It describes a range of tools and encourages the selection of the most appropriate methods. Guidance on the functional expression of the need and functional performance specification are set out in EN 16271 which covers Functional Need Analysis, Functional Need Expression and Functional Performance Specification.

In the US, VA/VE is strong in the defence industries and in 2010 the Department of Defense funded the Institute of Defense Analyses to explore the synergy between VA/VE and Lean Six Sigma. This study concluded that opportunities for synergy between the two approaches include the following:

- Function analysis and the FAST diagram. The disciplined use of function analysis is the principal feature that distinguishes the VA/VE methodology from other improvement methods. Function analysis challenges requirements by questioning the existing system, encouraging critical thinking, and developing innovative solutions.
- Cost focus. VA/VE only develops alternatives that provide the necessary functions. By examining only those functions that cost more than they are worth and identifying the total cost of each alternative, VE explicitly lowers cost and increases value.

The IDA authors suggested that VE does not take the place of Lean Six Sigma (LSS) efforts, but it does present significant opportunities to enhance LSS. They recommended that LSS training be augmented to include the VE approach to function analysis, creativity, and associated elements of evaluation and development.

At first glance VA/VE looks like an important means of cost innovation. While this may be literally true the strategy of Cost Innovation has come to have a specialised meaning in the last few years. Thanks to Ming Zeng and Peter J Williamson, Cost Innovation has been identified as a competitiveness strategy followed by some Chinese firms to globalize. Their book *Dragons at Your Door* has popularised the Chinese approach to Cost Innovation.

Zeng and Williamson discuss the case of the China International Marine Containers Group (CIMG) which was founded in 1980. It has adopted the slogan – learn, improve, disrupt. It licensed its first refrigeration technology from Graaff in 1993 at the same time that it acquired the innovative UK container firm, Clive-Smith Cowley. By 2005 Graaff was bankrupt and CIMG acquired its 77 patents.



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In 1999 global competition in container manufacturing was particularly intense. CIMG which already had a low cost base decided that this was the time to drive costs even lower. It streamlined its raw material procurement, benchmarked and rationalised its production and used foreign capital to make parts of its production more capital intensive. In all it took 46% of the cost out of manufacturing and overheads.

CIMG developed a cost Innovation strategy to move upmarket. Graaff was once again the source of new technology but CIMG used its lower cost design and engineering capabilities to improve on the new technologies. This drive went on to tackle the replacement of expensive aluminium in its refrigerated containers with cheaper steel. Taking steel treatment technology from Germany it was able to improve the performance of steel until it matched the performance of aluminium. The result was that between 1997 and 2003 production of refrigerated containers went up sevenfold.

The next stage meant increasing the variety of products offered to customers at low cost. For example, CIMG were able to reduce the set-up time for model changes in production from twenty to five minutes. Currently CIMG has over 40% market share in the international container business and 56% market share in the dry marine container market. It has 12 production bases in South, East and North of China.

Zeng and Williamson have collected a number of similar Chinese case studies in different sectors including, Lenovo in IT, Pearl River Piano and Wanxiang in automotive universal joints.

These developments are set in a wider context in a major study that has just been published by Nesta, China's Absorptive State: Research, innovation and the prospects for China-UK collaboration. This report lists ten key findings: the first is that China is increasingly adept at profiting from global knowledge and networks. Secondly China is maintaining its overall priority of becoming a more innovative economy under its new leadership with more emphasis on quality, efficiency and evaluation. Having reviewed the evidence Nesta concludes that China is embracing diverse innovation paths.

Nonetheless in the last five years a number of Chinese multinationals have emerged as global majors and China's capability for incremental re-innovation has become a major national asset. The report sets out the advantages of UK collaboration with China on science and innovation and the timing of its publication ties in with a major visit to China by David Cameron.

The top five Chinese R&D spenders are Huawei Technologies, China Mobile Communications Corporation, China Aerospace Science and Technologies Corporation, China National Petroleum Corporation and Shanghai Automotive Industry Corporation. This means the China's innovation strategy is directly relevant to several strong UK sectors featuring in our national strategy.

We don't know whether Chinese majors have adopted a systematic approach equivalent to VAVE but it is clear that VAVE remains a useful tool within the strategic armoury of Western firms, particularly when it is integrated with



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lean. There are also relevant parallels with frugal engineering and frugal innovation.

It is important to recognise that VA/VE looks at a given functional spec as the source of value. Lean start-up on the other hand brings any such assumption into question – insisting that customers' perceptions and reactions whether functional or more subjective are the ultimate source of value. As such it may be especially useful within a strategy that aims to keep up with changing consumer tastes.

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