

Internalizing the Value Methodology at an Automotive Supplier

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Abstract

Value Methodology (VM), also known as Value Analysis / Value Engineering (VA/VE), is a process rather than a program. While a program has a start and completion point with a specific desired result, a process is the ongoing use of a methodology to achieve organizational objectives. A program ends when time expires or results are achieved. A process is continuous action toward an objective. Too often, VA/VE is treated like a program and often dies when people tire of it or when instant results do not occur. The use of the Value Methodology (Job Plan) is a process to continually improve the value of products. To keep the process alive, it must be a part of the strategy to meet organizational objectives. This paper describes how a supplier in the automotive industry is internalizing the Value Methodology (VM) process.

Introduction

“Our customers want price reductions! We need to improve our profit margins! We have to grow the business!” These are some of the forces driving organizations, especially suppliers to automotive original equipment manufacturers (OEMs), to seek solutions to those challenges. Value Analysis / Value Engineering (VA/VE) is among many processes used, along with reengineering, kaizen, and total quality management (TQM).

In the U.S. automotive industry, VA/VE is defined as “a planned, clean sheet approach to problem solving, focusing on specific product design and process characteristics.”¹ Where value analysis is used to improve value after production has begun, value engineering is used to maximize value prior to production and expenditures for capital equipment and tooling.¹ In the “Big Three” OEMs, VA is usually associated with the purchasing or procurement functions, while VE is often tied to engineering and product development activities. Basically, the process is the same, but VA is retrospective while VE is prospective. To minimize the use of acronyms, this process will be referred to as the Value Methodology or VM, to be consistent with SAVE International's value methodology standard.²

A major disadvantage of VM, as with any other disciplined methodology, is the view that it is an extra task. “It is not part of my job. I don't have the time to do it. It's too cumbersome.” These are some often heard arguments for not using VM. This paper addresses an approach to minimize these arguments by internalizing VM as a part of the business culture.

Background

How does an automotive supplier start using VM? It is usually in response to a customer's request. With ever increasing pressure by OEMs for "cost-down" activities, suppliers turn to proven processes. Pressures are global, not just from the U.S. Big Three, but also from Asian and European OEMs. VM is one of those proven processes. There are three significant phases or levels of awareness of the value methodology.

The first level of VM awareness is *reaction*. A supplier's first encounter with VM is often an invitation by an OEM to participate in a workshop. This is usually a three-day event involving participants from the OEM and supplier(s) who are stakeholders in a product. An OEM sponsored workshop usually focuses on a current product and is initiated by the purchasing or procurement group. Although participating in a workshop is an additional demand on the supplier's limited resources (time and effort), meeting the customer's needs is paramount. Workshop objectives are typically cost reduction and ease of implementation. Since the product usually does not substantially change dimensionally due to impact on the mating parts, only incremental improvements result. However, this leads people newly introduced to VM to wonder:

- *What if we did this earlier in the life cycle?
- *What if we did this on our products?
- *What if we did this with our suppliers?

This leads to the second step in VM awareness: *recognition*. The supplier recognizes VM as a tool to meet customer requirements for quality, cost, and delivery without eroding profit margins. That is, price reductions to the customer can be made by reducing actual costs rather than by merely lowering prices. Further, if VM is used early enough in the product design process, functional improvements and cost reductions are likely.

Now the supplier has to determine how to use VM on its own. Since no one within the organization likely has significant VM experience, some expertise needs to be acquired. Either someone is hired as a VM program manager or, more often, a consultant is engaged. The range of the consultant's efforts go from conducting only workshops to developing an entire VM program.

Supplier sponsored VM workshops usually begin on current products. Information about these products is readily available and workshop results are

tangible. Results are usually cost reduction or a measurable quality improvement. Importantly, measurable results demonstrate the viability of VM. Without initial, visible, tangible results, VM will quickly be de-emphasized or completely discarded.

Cost reduction is the most visible success measure. It is seen by almost all portions of the organization, right up to the executive suite. Function improvement is certainly measurable, but less visible. Some measures of function increase are improved on-time delivery, reduced rejects (parts per million), and improved quality. These quality measures may include lowering the risk priority number on a Failure Mode and Effects Analysis (FMEA), a reduction in process variation, or improved reliability. Promoting measurable value improvement results is essential to continued use of VM.

People soon notice that more significant improvements can occur if VM is used earlier in the product life cycle. Since 70 to 85 percent of a product's cost is frozen by the design, it makes sense to use VM in the design phase.^{3,4} However, these VM events are more difficult to perform. Since the subject is a new product, current production, cost, and performance data are not directly available. Also, typical results are avoidance of cost, quality or performance problems and are often viewed skeptically. Thus the conundrum: do we do VM early to avoid problems and risk lack of recognition and reward for results, or do we wait to use VM to solve those problems when the product is in production and results are easier to recognize?

These internal VM workshops all have a common issue. They require a group of key project stakeholders to dedicate several days of time to the VM process. In today's automotive community, the suppliers are taking on more and more product design responsibilities from OEMs. At the same time, supplier organizations are becoming leaner. So, there is a significant resistance to devoting resources to a separate extra VM activity.

Thus, we arrive at the third level of VM awareness: *proaction*. To use VM proactively, it must be a part of the organization's culture; the way business is conducted, a way of life. VM needs to be incorporated in two of the most vital areas of the organization: the continuous improvement process and the product development process. Only when VM is integrated in these processes is it no longer viewed as an extra job.

Vehicles for Internalizing VM

Internalizing VM is more than just conducting lots of workshops. It is a concerted effort to integrate its use as a means to meet organizational objectives. For customer-focused organizations, VM makes eminent sense for maximizing value to the customer. Conveniently, VM complements two major OEM initiatives: Quality System Requirements QS-9000 and Advanced Product Quality Planning (APQP). Thus, its integration with them is not only feasible, but can actually be used to overcome many barriers to implementing VM.

The ISO-9000 based requirements of QS-9000 suggest the use of VM techniques. Specifically, element 4.4.2, design and development planning, calls value engineering a required skill for the supplier's design activity.⁵ This skill is the disciplined use of the VM Job Plan (Fig. 1) by a cross-functional team to improve product value. How actions of the Job Plan support other QS-9000 elements are shown in Table 1.

The unique feature of VM is function analysis. It is this feature that separates VM from other improvement or problem solving techniques.⁶ Identifying functions and their associated costs directly relate to QS-9000 element 4.4.4, design input. Since the customer wants function, it is this step that provides an unambiguous view of the customer's needs. Function analysis can be called the root cause analysis step in the problem-solving process to improve value.

Other features of VM are the use of cross-functional teams and the need to gather relevant data. Use of these teams in a VM event satisfies elements 4.1.2, organization; 4.2.3, quality planning; and 4.4.3, organizational and technical interfaces. Element 4.1.5 calls for the use and analysis of company-level data. The competitive analysis, benchmarking, and product and process performance data gathered and shared during the information phase of the Job Plan fulfill this element's requirement.

The development phase of the Job Plan relates to element 4.4.5, design output. This is where the best value (highest value ratio) proposals are selected by evaluating them against customer requirements. This verifies that the design output meets the design input requirements.

Another QS-9000 element, 4.2.3, quality planning, calls for Advanced Product Quality Planning. APQP is a structured method of defining and establishing necessary steps to ensure that a product satisfies the customer. Its objective is to facilitate communication to ensure that all required steps are completed on time.⁷ Again, the techniques of the value methodology support the elements of APQP (Table 2).

The first stage of APQP -- plan and define program -- looks much like the information phase of the VM Job Plan. Elements 1.1 through 1.8 require obtaining information needed to begin a value study: Voice of the Customer, business strategy, product/process benchmark data, product/process assumptions, customer inputs, design, reliability and quality goals. This is the same type of information identified and gathered in the pre-study and shared with the team during the beginning of a value study.

A cross-functional team is also essential to APQP. In fact, the VM project team usually has the same members as the APQP team. This team then uses the function phase to address customer requirements. Verb-noun descriptions of functions serve to focus the team on meeting customer requirements. In fact, an essential APQP tool, Design Failure Mode and Effects Analysis (DFMEA), uses the same verb-noun naming of functions to begin the body of the DFMEA document.⁸ Function identification is required so that the team can determine how a part may fail to perform its intended function. APQP teams brainstorm by function to determine potential failure modes just as VM teams brainstorm by function to create breakthrough ideas.

Table 2 shows how all phases of the Job Plan relate to APQP. If APQP and VM are so complementary, why is there any hesitancy about using them together? Many organizations still separate them making VM look like an extra task. The obvious answer is to make VM one of the tools and techniques of APQP. VM is another tool -- like design for manufacture/assembly (DFM/A), design of experiments (DOE), DFMEA, and quality function deployment (QFD) -- to assure that customers get what they want: high value products.

Table 1. VM Job Plan to support QS-9000 Elements

| QS-9000 Element | VM Job Plan Phase |
|--|---|
| <p>4.4.2 Design & Development Planning: “Design and development activities shall be assigned to qualified personnel equipped with adequate resources”</p> | <p>All: Value Engineering (VE) is among the required skills identified in QS-9000.</p> |
| <p>4.4.4 Design Input: “Design input requirements shall be identified and documented”</p> | <p>Information Phase: Information gathering tasks are used to identify & document requirements (voice of the customer and market trends)</p> |
| <p>4.4.4 Design Input: “Incomplete, ambiguous, or conflicting requirements shall be resolved ...”</p> | <p>Function Phase: Provides team with a common understanding of functional requirements.</p> |
| <p>4.2.3 Quality Planning: “...convene internal cross-functional teams to prepare for production of new or changed parts.”</p> | <p>All: The value methodology emphasizes a multi-disciplinary team approach.</p> |
| <p>4.1.5 Analysis & use of company-level data: “...shall document trends in quality, operational performance ...”</p> | <p>Information Phase: The information gathering tasks include product, process, cost, and quality data.</p> |
| <p>4.4.5 Design Output: “Design output shall be documented and expressed in terms that can be verified against design input requirements.”</p> | <p>Development Phase: Proposal selection using the value ratio ($V=F/C$) reflects proposal impacts on customer requirements and objectives.</p> |
| <p>Section II Continuous Improvement: 2.3 techniques for continuous improvement include value analysis.</p> | <p>All: Value analysis is a methodology to sustain continual improvement.</p> |

Table 2. VM Job Plan to support APQP

| APQP Section | VM Job Plan Phase |
|--|---|
| <p>1.0 Plan and Define Program: 1.1 Voice of the Customer 1.2 Business Plan / Marketing Strategy 1.3 Product / Process Benchmark Data 1.4 Product / Process Assumptions 1.5 Product Reliability Studies 1.6 Customer Inputs 1.7 Design Goals 1.8 Reliability and Quality Goals</p> | <p>Information Phase</p> <p>A VM study requires all these information items for both technical (engineering) and commercial (sales / purchasing) input.</p> |
| <p>2.1 Design Failure Modes and Effects Analysis (DFMEA) -- to identify and assess the probability and impact of failure to perform an intended function.</p> | <p>Function Analysis: same verb-noun function identification.</p> <p>Creative: Brainstorm by function to improve the performance of an intended function.</p> |
| <p>2.2 Design for Manufacturability & Assembly -- to optimize the relationship between design function, manufacturability and ease of assembly.</p> | <p>Evaluation Phase: to identify the advantages and disadvantages of proposals with a cross-functional perspective including manufacturing and assembly.</p> |
| <p>2.3 Design Verification -- to verify the design meets customer requirements derived from section 1.0.</p> | <p>Development Phase: to verify that the selected proposals meet the customer's requirements for overall value from the information phase (V=F/C).</p> |
| <p>2.4 Design Reviews -- a series of scheduled verification activities.</p> | <p>Implementation Phase: to execute the action plans to implement VM proposals.</p> |
| <p>5.0 Feedback, Assessment, Corrective Action -- Continual improvement to reduce variation and improve customer satisfaction, delivery, and service.</p> | <p>All: VM is used to improve existing products and generate improvements for future products.</p> |

Recommendations

The strategy for achieving an organization's mission should reflect using the value methodology. At Freudenberg-NOK, the mission statement includes "using lean systems as the central theme of its culture." Lean systems refer to lean production -- the continual quest to eliminate all waste, replacing mass production with one-piece flow -- as in the Toyota Production System.⁹ While initially practiced as kaizen and continual process improvement, this strategy now includes VM.¹⁰ VM is a natural evolution of the lean philosophy, especially for product improvements. James Womack, in his book *Lean Thinking*, says that defining value is the critical first step in lean systems.¹¹

If you do not want VM to be seen as an extra job, do not treat it like one. A VM *workshop* is not always necessary. Use workshops for instruction, team building, and time compression. A formal workshop, conducted by a skilled facilitator, is effective in training participants new to the value methodology, gaining consensus on value improving proposals, and doing so in a concentrated time period (three to five days, depending on the project's scope). However, following the VM Job Plan outside of a workshop is still practicing value methodology. This is appropriate when participants possess VM skills (from workshop experience), have a team orientation (like an APQP team), and have sufficient time to meet program timing requirements.

The essential feature to the VM process is function analysis. However, this phase of the Job Plan is too often minimized or eliminated, especially in abbreviated workshops of less than three days (cost reduction focus) and almost always when there is no formal workshop. Since the identification of product functions is necessary for DFMEA, and DFMEA is required by most OEMs (in APQP), the function phase should never be missed. The output from the function phase should feed directly to the DFMEA process and serve to initiate the creativity phase. To create by function is not only a VM technique, but is also a part of DFMEA. The development of DFMEAs was formally done in a separate workshop and also suffered from the "extra task" stigma. Now, DFMEA is an integral part of the product development process, usually done without a formal workshop. The same approach can apply to VM.

Organizations that are QS-9000 registered require documentation of their quality systems for both the product development and continuous improvement processes. VM should be included in this documentation. When a formal workshop is not used, a checklist, indicating completion of specific Job Plan actions can be included. This checklist or a VM workshop report demonstrate the use of VM, as required by QS-9000 audits.

Above all, management commitment to the VM process is necessary. If the expectation for VM is clearly communicated and demonstrated, it will be used. Training of those involved in product development and continuous improvement is the first step in this commitment. Inclusion of the VM Job Plan in APQP and QS-9000 documentation is necessary. That is where the company "says what it does." VM workshop reports and checklists document the use of VM and the Job Plan. Those responsible for product development and continuous improvement need to be held accountable for following the VM Job Plan to meet objectives. This is where the company demonstrates that "it does what it says."

Summary and Conclusions

The following actions lead to internalizing VM:

1. Incorporate VM in the continuous improvement process. VM is one of the tools used to meet customer cost-down requirements without eroding profit margins.
2. Incorporate VM in the product development process by using it as a way to achieve APQP objectives. Leverage the function phase to lead to value improvements and reduce product failure probability (DFMEA).
3. Use VM workshops only to train, build teams, or compress time. Use a checklist to ensure the Job Plan is followed without workshops.
4. "VM is not an extra job, it *is* your job." That must be the clear message from top management regarding the use of VM in product development and continuous improvement to provide customers with high value products. Management needs to "walk the talk" by providing resources for VM and make people accountable for using VM to meet business objectives.

VM JOB PLAN

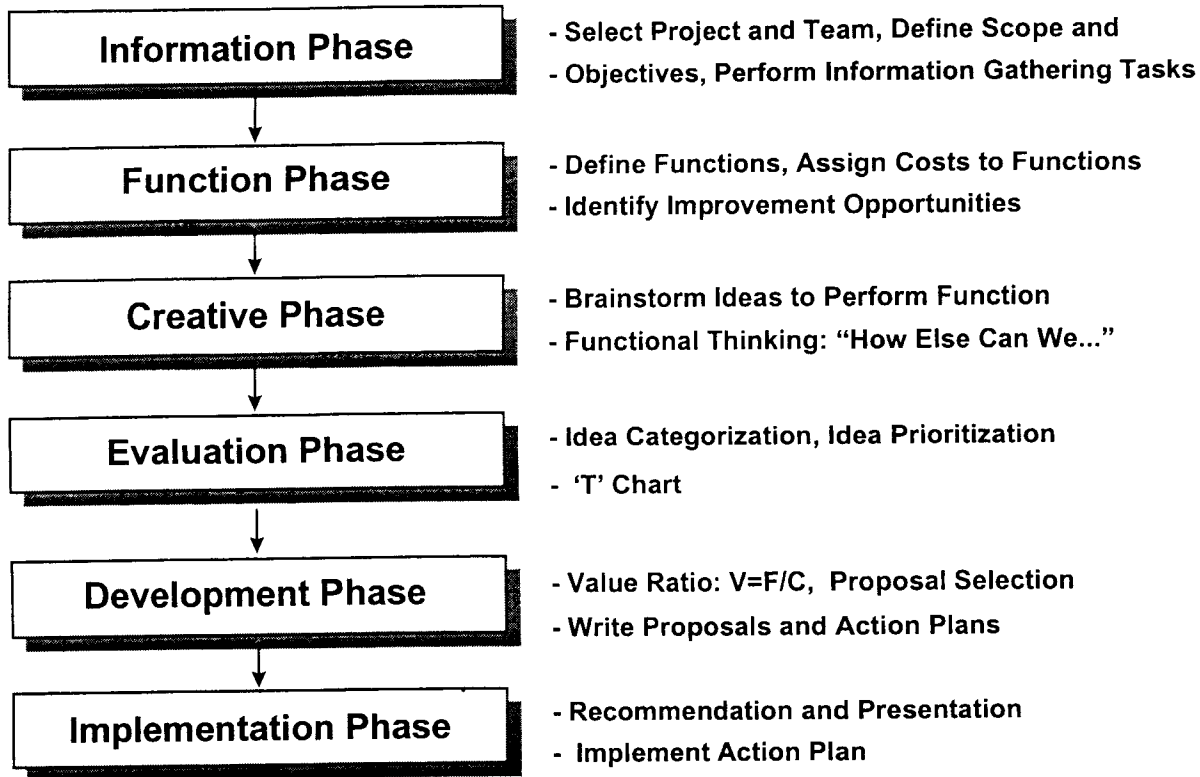


Figure 1/VM Job Plan at Freudenberg-NOK

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