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INSIDE THIS ISSUE:

Optimizing Business Strategy and Performance
Business strategies are selected based on the existing capabilities and strengths and they become the means to achieve a particular goal or set of goals or objectives. A business strategy may be improved through business internal processes, product development procedures, organizational and market segment arrangements. Competitive market has led to corporate evolution to align their business strategies and performances on various dynamic opportunities for innovation and competition. Identification of key factors to improve company performance from the standpoints of organization, technology, and capability, is considered as the most important thing in optimizing business strategy.

In this role, the theme of the spring issue of Value World discussion will be “Optimizing Business Strategy and Performance” using value engineering method as a strategy to provide competitive advantages for the organization. Generally, the current business performance and future expectations involve challenges common to all business, i.e. how to produce the best product and/or project, how to value technologies and resources, and how to determine the cost, quality, and schedule implications of a particular product/project in the market.

Optimizing Business Strategy

This issue of Value World presents four selected papers to stimulate debate and to explore the application of value engineering in optimizing business strategy and performance on various contexts.

The first paper, written by Hiroshi Tsuchiya, CVS, FSAVE, emphasizes on the new product development based on life research. In this term, Life research is used to grasp the real needs of products or services, to find the seeds of development or improvement, and to create a new concept based on the people’s current living conditions and life experiences. He argues that the needs of the customer or user are generated from their actual lives, and companies must produce and provide their customer with high value products or services. By identifying these needs, the potential for creativity will increase, and consequently, both users and companies could make a significant improvement.

Furthermore, Lori Braase, AVS, Alison Conner, CVS, Margie Jeffs, AVS, Jodi Grgich, and Darcie Martinson, AVS outline the use of value engineering (VE) and “Balanced Scorecard Approach” to develop business strategy maps. When using the VE methodology to develop strategy maps and scorecards, they argue that the function analysis and, specifically, Functional Analysis System Technique (FAST) are essential elements for the strategic planning approach. Both methods were applied to develop a strategy map for the Nuclear Science and Technology Directorate at the Idaho National Laboratory.

The third paper, written by Mahesh Natarajan, AVS, and Ragavendra Prabhakar, provides an explanation of “Open Innovation”, which is described further into combining internal and external ideas as well as internal and external paths to market, in the effort to advance the development of new technologies. The extent and type of innovation should be determined by current business performance and future expectations and by the organization’s tolerance for risk. They argue that the fruits of innovation remain the propelling force behind the churning out of new products and the solutions to keep the core business running which eventually result in improved value for a product, for example a recently launched Tata Nano, the world’s cheapest car.

The last paper in this edition is written by Abdulaziz S. Al-Yousefi, CVS-Life, FSAVE, discussing the critical factors on the process of decision-making by employing “Quality Based Decision-making” (QBD) method. The QBD is consisted of various tools, namely Management Decision Matrix (MDM), Quality Satisfaction Model (QSM), and Quality Priority Model (QPM), which are used to differentiate between needs and desires by defining four levels of priorities. He further explains how QBD can be used to improve decision-making that leads to optimal expenditure of owner’s funds while meeting required function, quality, and performance.

I hope this edition of Value World conveys some new insights in the way we conduct our value methodology studies. I can be contacted at maberawi@eng.ui.ac.id
and I would be pleased to accept and respond to any comment and enquiry you may have on the direction and content of Value World. Your valuable contribution and feedback are important to the success of our journal as it will guide its future development.

With warmest regards from editorial desk,

Dr. M. A. Berawi
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New Product Development Based on Life Research

Hiroshi Tsuchiya, CVS, FSAVE

Abstract

“Life Research” is to grasp the real needs of products or services, find the seeds of development or improvement, and create a new concept based on the people’s current living conditions and life experiences. It has been applied in Japanese companies ever since around 1985 and effects have been demonstrated. The speaker is one of the pioneers of the research and practical instruction in VE. He will address the necessity of life research, scope of its application, practical methods, and other details.

What is “Life Research”?

As symbolized by globalization or mega-competition, the environment surrounding corporate entities is in the era of revolutionary change. No matter how times change, companies must always contribute to the society. From this standpoint, they will be sure about how they should think and act in the future. Because of such a background, VE is seemed to be focused on. Also, “Life Research” is one of the methods which may be helpful in the current business situation.

Life research is to grasp the real needs of products or services, find the seeds of development or improvement, and create a new concept based on the people’s current living conditions and life experiences.

Everyone wishes to live an affluent life. “Affluent” means living in great comfort or in other words, satisfied with own life. In respect to the products or services generated by companies, it should be understood as to satisfy the needs of the people who use those products or services. We call this satisfaction in VE terms: “Value”.

No matter how times change, companies must generate and provide with their clients and users with high value products or services. This is the mission of companies and without achieving it; they are not allowed to survive. Now, we can be sure that understanding the needs of the customers and users correctly is the origin of the corporate “Mono-Tsukuri (manufacturing)”.

There are five fundamental principles in pursuit of value. The first principle is “user-centered”, which means to think from the viewpoint of the users. In this principle, there is an intended meaning for the producers to be the users as well and overwhelmingly pursue what the user’s needs are or what they want the companies to do. Therefore, in thoroughly following this principle, eventually there will be another challenge to grasp the actual situation regarding the life scenes of the users. The needs and wants of the users are usually generated from their actual life scenes.

Of course understanding the users’ needs is part of the research work in the marketing field, so we do greatly expect from their research outcomes. However, since VE is an extremely practical activity, it is not possible to spend much time on the researches and collection of the outcomes. It is expected to draw a conclusion in a short period of time.

Because of these factors, the life research was developed as one of the easily applicable methods and it has been applied since 1985 in various companies with successful results.

The term “life research” was originally used in the field of home economics from long time ago. However, the life research which we refer to has a different content. It is an easily accessible and practical activity to discover the needs and seeds of improvement of the products or services provided by the producers who simulate being the users.

Why Life Research is necessary?

1) Reflecting to technical and economic changes

The type of the current environmental changes has shifted from the changes occurred as an extension of the past and traditional way of thinking to those which completely deny the conventional methods. In reviewing from a technical standpoint, a multiple of cutting-edge technologies have appeared and accelerates the innovation. The rapid progress of nanotechnology, biotechnology, electronics and IT technology are some factors for speeding up the innovation pace.

Technology innovation is evolved by applying new combination of accumulated technical information. Therefore, the more useful information we have, the more possibility for new technology innovation will occur. Consequently, many new products and services are developed and introduced to the market one after another. However, this situation stimulates the diversification of values among the people, who are becoming more
diverse and unique than in the past. Changes in people’s values may restrict the market size, thus the companies eventually must be involved in even more competitive world. How do we cope with those challenges? We must develop even more innovative and advanced products and services which satisfy the needs of the customers and users and introduce them to the market earlier than our competitors. There is no other option.

The development of engineering technique has led the innovation any time in the history. This will further be accelerated in the future. Since the amount of technology information is pretty much accumulated, most of the new techniques are highly feasible, if only we can correctly understand “what we should produce”. In such a backdrop, we can see how important it is to accurately understand the needs of our customers and users. The needs of the customers and users are the main source to generate high value products or services which overwhelm other competitors. Life research is a way of complying with such a demand.

Another issue is the globalization; a competitive market without borders is expanding rapidly. Globalization leads to the fact that not only the value judgment of users regarding the products or services being launched into the market becomes diversified, but also it will make more difficult to provide the users with high level of satisfaction. In order to overcome such difficulties, we need to address the issues in the same way as we do with the changing of the technology environment.

2) Using easily accessible and trustworthy information

There is a professional discipline to research and grasp the needs of the customers and users. However, there are more easily accessible and trustworthy source of information within the companies. They are the company employees and their immediate community of families and friends. People who belong to a company are producers and ordinary citizens at the same time. So, they have something in common with the customers and users regarding the needs of the products or services. Also, company employees always think seriously about developing and improving their products or services to be more high value and overwhelm their competitors. Not only the employees but their families, relatives, close friends etc. are the potential sources of information. These people are able to think about the needs of the customers as it is his/her own business, and are highly interested in the issue. We need to gather these valuable awareness and capabilities and utilize them as company energy. Traditionally, people used to think that the re-search of the customer or user’s needs, seeds of development or improvement should have been conducted by professional experts and was not reachable by other people. However, this is not correct.

Most of the products or services provided by companies are generated and produced in-house. There are quite many products whose concepts were originated from the ideas generated by the employees, their close families and friends who are not experts in a certain field. As it can be attested to by this fact, an organizational contribution by the company employees and their related people will be more expected than ever before.

3. Areas of Life Research

In the life research, products or services generated by companies are divided into four areas; Home, Office, Factory and Shop depending on what kind of life scene they are addressed and used. In each of the areas, the company employees and their related people who pretend to be the customers or users will figure out the needs, desire, expectation, complaints (inconvenience, dissatisfaction, and disappointment) etc. of the products or services through their actual life scenes. Then, they will discover the seeds of development or improvement from their findings. (See Figure 1, above.)

This area addresses the life research for domestic life and includes the following subjects:
- (Housing) Residence, hoard, storage, security, interior, exterior, gardening, furnishings, DIY
- (Electric appliances) Audio-electric, information devices, cooking appliance
- (Healthcare) Healthcare equipment, laundry, house cleaning, medical supply, sports ware, leisure
- (Foods) Kitchen instrument, kitchen ware, ingredients, cooking
- (Clothing) Clothes, costume, cosmetics
- (Learning) Books, stationery, learning, enrichment courses
- (Child care) Child rearing goods, toys
- (Events) Overseas travel, domestic travel, theater, sports meet, excursion, hiking
- (Others) Transportation, pet care, family affair, savings, shopping, social affair

2) OALS (Office Appliance Livelihood Study)
This area addresses the life research for office environment and clerical works pursuing comfort of office appliances and tools. Includes the following subjects:
Office space, interior, information devices, office machinery, office equipment, stationery, air-conditioning, lighting, information system

3) FALS (Factory Appliance Livelihood Study)
This area addresses the life research in factory, work environment in manufacturing floor, processing facility, tools, production methods, etc. anything except the products or services. Includes the following subjects:
Factory equipment, processing facility, processing machinery, processing tool, delivery tool, work space, lighting, day lighting, safety, storage, inventory, information system, production system

4) SALS (Shop Appliance Livelihood Study)
This area addresses the life research in retail shops which sell products and services to users. The shops will pursue how they can comply with their customers’ needs and expectations from the standpoint of the customers who come to buy goods at the shops. Includes the following subjects:
Shop appearance, in-shop environment, guiding of customer, care for customer, selection of goods, display equipment, display tool, layout of goods, display, storage, stock

<table>
<thead>
<tr>
<th>Application Method</th>
<th>Target Subject</th>
<th>Description of the Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilization Analysis</td>
<td>X</td>
<td>The use of the target subject is divided into several processes and we try to understand the “needs”, “expectation”, and “point of improvement” for each process. (For detailed research, Life Behavior Chronological Analysis will be conducted.)</td>
</tr>
<tr>
<td>Similar Product Analysis</td>
<td>X</td>
<td>Observing the similar product which has a great hit in the market, we try to extract the popular factors. (It is more likely to apply cause analysis, cluster analysis, and regression analysis using aesthetic adjectives.)</td>
</tr>
<tr>
<td>10 Things in Daily Life Analysis</td>
<td>X</td>
<td>The daily life activity is divided into ten areas and we try to understand the works for a specific area, the “needs”, “expectation”, and “point of improvement” for the equipment or tool to be used. (We think of the means from the relationship between teh “Objective” and “Function” for using the work, equipment, and tool.)</td>
</tr>
<tr>
<td>Life Style Analysis</td>
<td>X</td>
<td>We sort out the user’s life style and try to understand the “needs”, “expectation”, and “point of improvement” for each type of life style. (We aim to develop the needs by each type of life style and use them as seeds of improvement as well as review the differences among each of them to improve the accuracy of the research outcomes.)</td>
</tr>
<tr>
<td>Trend in Life Style Change Analysis</td>
<td>X</td>
<td>We prospect how the “needs” and “expectation” change or have changed according to the changes in the economic society, people’s sense of values, and their living circumstances, and try to incorporate their elements into the development of the products/services or the seed of improvement.</td>
</tr>
</tbody>
</table>

Table 1. Major methods of life research.
The Worker’s Psychology | Desire for Work
---|---
**Cue to Work** |  
- It is not an enjoyable work, but it cannot be helped.  
- I want my family to be neat and clean.  
- I want a comfortable finish.  
- I want to finish it quickly.  
- I want an iron to be enjoyable to use while I do the work.  
- I want a well-pressed iron.  
- I want an iron which finishes quickly.  
- I want to know how to do well.  

**Preparation** |  
- It is annoying to collect all the tools and clothes together.  
- I cannot use it immediately after taking it from the storage space.  
- Small space, but easy to be messed up.  
- It takes time to heat up.  
- It is annoying to pour water.  
- I cannot tell if it has attained a suitable temperature to use.  
- I want a tool to help the stuff to be stored collectively.  
- I want a tool to be able to use quickly, even in a small space.  
- I want a compactable tool to use.  
- I want an iron to heat up quickly.  
- I want an iron into which I can pour water easily.  
- I want an iron which automatically tells the suitable temperature.  

**Main Work Process** |  
- Finishing varies between workers and there is a trick to ironing.  
- I cannot do well with finishing and it is annoying.  
- I want to finish it quickly.  
- I want to reduce time and effort.  
- The work is boring.  
- I want tips and know-how to work on well-finished clothes.  
- I want an iron which gives me well-finished clothes.  
- I want to smooth the wrinkles easily.  
- I want an iron which finishes quickly.  
- I want an enjoyable iron to use.  

**Preparation for Storage** |  
- I worry about a fire caused by forgetting to turn the power off.  
- I worry about clogged steam port.  
- I worry about storing it while it is still hot.  
- It takes much time to cool down.  
- I want an iron with an easily handled cord.  
- I want an iron which is safe even when the power is left on.  
- I want an iron without a clogged steam port.  
- I want an easy-care iron.  
- I want an iron which cools down quickly.  
- I want an iron that can be stored while it is still hot.  

**Storage Work** |  
- I cannot store all the stuff collectively.  
- It is space-consuming.  
- I have problems storing it.  
- I want a tool to help the stuff to be stored together in one place.  
- I want a space-saving tool.  
- I want a tool to be visually desirable if it is left out.

Table 2. Psychology and expectations for ironing.

Individual. The type to be selected depends on the area or nature of the subject. In order to find seeds of development through daily life without a limitation on the subject, usually company employees or their related people conduct the research individually. The research findings will be collected and put together as life proposal information. Usually a project team is formed to evaluate the research findings and develop a specific concept. Also, the project team will conduct a study when the area or the specific product or service has already been determined as the subject of life research. (See Table 1, bottom, previous page.)

2) Major approaches
There are two major approaches. One is used if you have the target product or service clearly determined, and the other is applied if you do not have a specific target yet and will try to discover seeds of development thorough people’s daily life. Depending on which subject is under consideration, the approach to be taken will be different. As various methods are applied for life research, the author will describe the most major ones and their outlines in Table 1 (previous page).

These methods are relatively simplified ones to understand and confirm the customer or user’s need, which is the starting point of a VE study, because they are supposed to be applied to develop and improve high value products or services under a severe time constraint. However, you will need a considerable time and effort in order to ensure all these tasks are accomplished properly. Therefore, you may want to choose appropriate ones as necessary depending on the nature of the target product or service.

In the case of a VE study, the target product or service is determined most of the time. Therefore, among
There is a multiple of applicable methods for life research, and the procedure of utilization analysis which is the most universally used method was described including a simple example.

After all, the needs of the customer or user are generated from their actual lives, and the people who have the highest interest in the issue are the company employees. By identifying the needs, the potential for the creativity will be increased, and consequently, both the users and companies could make a significant improvement.

**Utilization Analysis**

The target product or service is what you produce and provide in the market. Therefore, you should have a deep understanding on the purpose of its use, function, composition, etc. However, you may not necessarily be familiar with what kind of expectations do the users have about the product/service or how they are actually using it. In some cases, you have never used it on your own.

Here, you as a producer will simulate being a user and actually use the product/service. Through your feeling about the usability and experience, you will grasp the user’s needs, desire, expectation, complaints (inconvenience, dissatisfaction and disappointment), etc. and correctly understand “how do the users want the product/service to be”, and consider the countermeasures for increasing user satisfaction. Traditional steps for this action are as shown below:

1. Clarify the reasons and how they come up with using the product/service.
2. Clarify the scenes and environments where to use the product/service.
3. Clarify the use procedure and time schedule.
4) Identify the user’s expectation and mind regarding each of the above items (1) – (4). Regarding the item (3), identify by each step of the use process.

5) Generate expectation, desire and ideas if possible regarding the item (4).

6) Consider the complaints, expectations, and desire by each of the use process.

7) Organize “what should be done and how” and develop countermeasures for solving the problems.

Above is an example using the above steps. (See Table 2, page 7, and Figure 2, previous page.)

Summary

There is a multiple of applicable methods for life research, and the procedure of utilization analysis which is the most universally used method was described including a simple example.

After all, the needs of the customer or user are generated from their actual lives, and the people who have the highest interest in the issue are the company employees. By identifying the needs, the potential for the creativity will be increased, and consequently, both the users and companies could make a significant improvement. (See Figure 3, next page.)

About the Author

Hiroshi Tsuchiya is CVS, fellow of SAVE International and certified management consultant by All-Japan Federation of Management Organizations. He was general manager of General Research Institute and chief of Value Management Research Institute at the SANNO Institute of Management and executive director of Society of Japanese Value Engineering (SJVE). Currently, he is emeritus professor of the SANNO Institute of Management and presidential advisor of SJVE. As a pioneer expert in VE field in Japan, he has been engaged in the instruction, education and training for many company employees as well as university and college students for many years and has provided consultation service to several hundred companies in electric, machinery, automotive, etc. He is one of the three main editors of the latest SJVE’s publication “Value Engineering Handbook”. He has written a number of papers and books on VE.

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Check the “Conference Details” Web page to download the following documents (http://www.value-eng.org/2010conference/details.php).

SAVE 2010 Annual Conference Brochure: Important information on keynote speakers, pre-conference workshops, daily program schedules, special events, sponsorship opportunities, hotel information, and the conference registration form.

2010 Technical Program Presentations: Abstracts of the presentations scheduled for the SAVE 2010 Annual Conference technical program.

2010 Program Author Information: Technical presenter biographies.

2010 Conference Schedule: Schedule-at-a-glance for pre-conference events, workshops, and for technical program presentations.
Abstract

The Value Engineering (VE) Methodology is an effective tool for business or strategic planning. In conjunction with the “Balanced Scorecard Approach” (Drs. Robert Kaplan, Ph.D., and David Norton, Ph.D., from the Balanced Scorecard Collaborative/Palladium Group), function analysis can be used to develop strategy maps and scorecards. The Functional Analysis System Technique (FAST) diagram provides an integrated approach to strategy map development by formulating a cause and effect relationship and establishing the “how” and “why” behind the strategy map. By utilizing the VE Job Plan, one is able to move from strategic thinking all the way through to execution of the strategy.

Introduction

The Balanced Scorecard concept evolved from a one-year multi-company measurement research project begun in 1990 by Drs. Robert Kaplan and David Norton. Since then, Kaplan and Norton have written a number of books and offered extensive training on this topic. As a result, several hundred companies have implemented the Balanced Scorecard approach with a high degree of success. In their books, Kaplan and Norton site multiple case studies where the concept has been used to drastically improve performance of organizations through identification, alignment, integration, and execution of their strategies.

After receiving training in and applying the Balanced Scorecard approach, authors of this paper sought a systematic approach for developing and implementing strategy maps and scorecards. Being certified in the value management discipline, they recognized the value in employing Value Engineering (VE) and Functional Analysis System Technique (FAST) diagramming as a means to this end. As described below, the authors propose how VE can be used to aid in the development and implementation of strategy maps and scorecards.

Strategy Maps and Balanced Scorecards Overview

Many, if not most, organizations and institutions engage in some form of strategic planning. Multiple strategic planning definitions and approaches exist for identifying an organization’s vision, understanding its mission, conducting a situation analysis, determining goals, and identifying strategies and tactics. Definitions for each of these terms can be found at the end of this document. However, research has shown that execution of strategies, not development, is where companies fail.

In 1990, Kaplan (the Baker Foundation Professor at Harvard University) and Norton (President of the Balanced Scorecard Collaborative/Palladium) began a research project on measurement which eventually led them to development of a balanced strategy mapping and measurement system. The term to describe the management tool that evolved is a “balanced scorecard.” The “balanced scorecard” consists of a strategy map describing an organization’s strategy and a scorecard for measuring and managing that strategy.

In Kaplan and Norton’s book, Strategy Maps’, the premise is that “Successful execution of a strategy requires three components:

(Breakthrough results) = (Describe the strategy) + (Measure the strategy) + (Manage the strategy)

The philosophy of these three components is simple:

- You can’t manage (third component) what you can’t measure (second component)
- You can’t measure what you can’t describe (first component)

To describe, measure, and manage the strategy, Kaplan and Norton developed what have been termed as strategy maps and balanced scorecards. At the highest conceptual level, maps and scorecards provide a framework that helps organizations translate strategy into operational objectives that drive both behavior and performance. This framework enables a balance between:

- Financial and non-financial factors
- Tangible and non-tangible assets
- Long-term and short-term priorities
- Strategic and operational decision-making
- Top-down articulation and bottom-up execution
A strategy map is a pictorial model (or visual representation) used to holistically describe an organization's strategy. A generic strategy map template is shown in Figure 1 (right) and an example of a completed map is found in Figure 2 (below right). The model shows the cause and effect relationship of the strategic objectives hypothesized to create value for the customer. In order to remain “balanced,” strategy maps take into account different perspectives, including:

- Staff/sponsors’ interests
- Lead and lag indicators of performance

- Financial performance (note: public and non-profit organizations usually have a primary focus on mission versus financial performance)
- Customer objectives which define the customer’s value proposition
- Internal processes needed to create and deliver the value proposition
- Learning and growth objectives describing the organization’s intangible assets and their role in strategy. Intangible assets include human capital, information capital and organization capital.

As a guideline, each strategic objective should be:

- A short (3-8 word) statement that describes a strategy, something that an organization wants to be able to do well
- An action statement that clarifies what strategy will be implemented
- A linked set of priorities that deliver the overall strategy
- Enduring, and relevant for 3-5 years.

Each strategic objective should also have one or two performance measures.

A scorecard is built around strategic objectives and contains measures, targets, and initiatives surmised to drive the organization towards accomplishing its strategic objectives and in turn, its mission and vision. The information contained in the scorecard can and should be
cascaded to individual performance goals to assure each and every person in an organization is working toward accomplishment of the strategy.

In addition to the scorecard elements suggested by Kaplan and Norton, the generic scorecard shown in Figure 3 (right) contains a column for consideration of risks in achieving the strategic objectives.

**VE Methodology Overview**

The Value Engineering (VE) process uses a six-step job plan, which is part of a decision process that has been optimized over the last 50 years by many people and application experiences. The use of a function and logic approach inspires people to ask key questions, which reduce the potential that a need or issue is missed. It is important to understand the functions that the customer values and then use function analysis to provide the inputs to their strategic direction. The use of a value-based decision-making approach helps ensure that resources (e.g. time, money, and expertise) are directed toward the solutions that have the highest potential for meeting the customer needs.  

**Scorecard**

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Risks</th>
<th>Measures</th>
<th>Targets</th>
<th>Initiatives</th>
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<td></td>
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</table>

Figure 3. Example of generic Scorecard.
The VE Job Plan applied at the Idaho National Laboratory (INL) includes the following phases:

- Phase 0: Preparation / Planning
- Phase 1: Information Gathering
- Phase 2: Function Analysis
- Phase 3: Creativity
- Phase 4: Evaluation
- Phase 5: Development
- Phase 6: Presentation/Implementation.

The unique aspects of VE can greatly enhance the outcome of a strategic planning effort. These aspects include:

- Utilizing facilitators trained/certified in the VE process
- Generating formal documentation of the results and team recommendations
- Engaging an interdisciplinary team of those involved or affected by the recommendations
- Performing function analysis that introduces a different perspective of the project or organization
- Following a formal job plan.

This paper will demonstrate the considerable benefit that can be realized in utilizing VE to plan the future of an organization with strategies that can be planned through execution and visually represented on strategy maps and scorecards. This proposed approach is described below.

Using the VE Job Plan to Do Strategic Thinking

**Phase 0: Preparation / Planning**

During the Preparation/Planning Phase, the personnel that will devise the strategy are identified. The composition of the team varies according to the organization or program under study. Staff personnel and management are the primary team members of a strategic planning team. Subject matter experts for potentially related technologies and integrated disciplines, customers, supporting organizations, and key stakeholder are recruited or called upon to participate in the Value Engineering (VE) study to answer questions, identify customer needs and expectations, and fill in information gaps as needed.

Once the VE team is assembled, they can begin to work together to collect the data necessary to build and formulate a more solid mission, vision, and end state.

Potential outcomes of the Preparation / Planning Phase are the identification of the Members of the Strategy Planning Team, Names of Potential Experts that could be called upon as needed, and an understanding of the Issues the team needs to address.

**Phase 1: Information Gathering**

During the Information Gathering Phase of the Job Plan, pertinent facts and information are gathered to begin to bring all team members up to same level of understanding of the organization or program.

When using VE to develop a strategy map and balanced scorecard, the information gathering phase can be utilized to collect the pertinent data which will help to:

- Understand and describe an organization’s current situation
- Understand customer needs and expectations
- Identify strengths and weaknesses
- Acquire knowledge of current technology states (i.e., experimental, developmental, demonstrated, deployable, fully operational, etc.)
- Define where it wants to be in the future
- Determine how to fill the gap between where it is today and where it aspires to be.

A couple of techniques that can be used in gathering this type of information include interviews of key customers and stakeholders, and SWOT (Strengths, Weaknesses, Opportunities, and Threats) Analysis.5

**Interviewing.** As part of the information gathering phase, team members can be assigned to interview managers/staff as well as stakeholders/customers of the organization. If interviews are conducted, a standard set of questions should be designed in advance to gather information on customer needs, mission, and vision; strengths, weaknesses, opportunities and threats; key strategic issues, and the end state (what the organization will look like if the vision is achieved). This data can then be compiled prior to the VE workshop into a draft vision, mission, and desired end state as a place to start the strategic thinking.

**SWOT Analysis.** A SWOT Analysis is used to understand the strengths, weaknesses, opportunities, and threats related to the organization or program under study. The analysis can begin to define the current situation of the organization or program, which in turn will begin to into the organizational strategy.

Securing as much of the information as possible can be one of the most difficult efforts to accomplish but one that may provide the greatest value to the strategic planning study if completed thoroughly. The team will begin.
to grow into a cohesive working team through a shared understanding of the customer expectations and possible future of the organization or program.


**Phase 2: Function Analysis**

The Function Analysis Phase of the Job Plan sets the Value Engineering Systematic Approach apart from all other systematic approaches. Within the Function Analysis Phase, the functions of the organization or program are defined in two words, one action verb and one measurable noun, and the relationships of these functions are evaluated. Through this evaluation, basic, secondary, and dependent or “when” functions are identified.

Many techniques are used to identify the functional relationships: Functional Flow Block Diagramming (FFBD), Functional Analysis System Technique (FAST), etc. This paper will demonstrate the application of FAST in the development of a strategic map and score card.

Figure 4 (below) illustrates the critical path functions identified by the team for the deactivation of a building. The functions on the critical path have been numbered for tracking purposes. At this point, the team could take each function on the critical path and break it down further or define supporting functions, as needed.

**Functions to Strategy.** Through the illustration above, you can begin to see the outline of a strategy map. The Basic Function, or the primary reason for existence (1.0 Deactivate Building), can now be developed into the mission statement of the organization or program. The higher order function, or future outcome on the FAST Diagram (Close Building), can be built upon to define the Vision Statement. The critical path functions are similar in definition and logic to strategic objective on a strategy map, and the supporting functions or “when” functions may equate to the learning and growth objectives that need to be developed in order to accomplish the strategic objectives.

Functions and FAST are the crux of developing a strategy map and balanced scorecard. The FAST diagram can be used to validate the mission of the organization and further develop the how and why logic necessary to define the strategic objectives.

To demonstrate the application of FAST to the development of a strategy map, the FAST diagram in Figure 5 was built to define the functions and test the “How” / “Why” logic of the Nuclear Science and Technology Directorate at the Idaho National Laboratory. From this FAST, the vision and mission statements can be crafted from the higher order and basic functions, respectively. The vision statement on the strategy map was created from a combination of the higher order function and the visionary statement, “Ensure future clean energy for our children.” Using the higher order function alone may not create the emotional aspect of a vision statement. The vision should create excitement and provide a future picture of what is different as a result of the mission. It may be productive to develop draft mission and vision statements prior to the VE Study and enhance them utilizing information gleaned during development of the FAST diagram and strategy map.

**Perspectives and Strategic Objectives.** The VE team can begin to identify the strategic objectives from the customer perspective, using the functions on the critical
path. For each function, ask “For whom? Why? And what do they need?” This will produce an initial list of customers that can be prioritized for the strategy map. Strategic objectives from an internal organization perspective are typically the critical path functions. The strategic objectives from a learning and growth perspective come from the “When” functions and/or by asking, “What resources (high level) are needed to accomplish the function?” The resulting list can be categorized and then formulated into representative learning and growth objectives.

The following illustrates the thought process used to create the customer perspectives:

Conduct world class nuclear energy research for whom and why or what do they need?

- The US Citizen needs the Idaho National Laboratory (INL) to do innovative nuclear energy research development & demonstration (RD&D) for the nation’s benefit (energy security, clean environment, etc.)
- Nuclear industry and utilities need the INL to provide solutions to complex nuclear industry problems (fuels and materials issues).
- DOE, Nuclear Programs, and International Partners need the INL to lead and coordinate nuclear RD&D efforts.
- The world needs the INL to analyze and promote economic and stable nuclear energy solutions.

Figure 6 (above, next page) illustrates how the team can go from a FAST diagram to a strategy map to begin formally defining the future end state and vision for the organization or program.

The FAST provides an effective way to promote team involvement and understanding about the strategic direction of an organization or company. It provides a method to ensure the necessary functions were considered systematically and are not unintentionally omitted from the strategic thinking through the validation of the cause and effect relationship.

As illustrated here, the FAST diagram is a means to develop the strategy map but not necessarily the end—it provides a way to understand the cause and effect relationship and may not be an identical match to the strategy map.

The outcomes of the Functional Analysis Phase will be a FAST Diagram and a Strategy Map describing the organization’s high level strategy.

**Phase 3: Creativity**

During the Creativity Phase, the team should brainstorm ways of accomplishing the strategic objectives (stated as functions) of the organization. Brainstorming how to accomplish each of the functions will lead to potential initiatives for each of the strategic objectives. In addition, the team should brainstorm potential measures for each of the strategic objectives/functions. In the evaluation phase, these measures will then be down selected to a smaller number of metrics (1 or 2 per strategic objective/function).

When brainstorming measures, the team should consider two types of strategic measures: “lead” and “lag” measures. While lag measures assess performance re-
results at the end of a time period or activity, lead measures assess intermediate processes, activities and behaviors. For example, if a strategic objective is to grow customer confidence, “hours spent with customers” would be a lead measure while “customer retention” would be a lag measure. Both types of measures are important. Lag measures provide outcome information and lead measures can drive desired behavior and activities.

The outcomes of the Creativity Phase will be brainstormed lists of potential **Strategic Initiatives** and **Measures**.

**Phase 4: Evaluation**

The Evaluation Phase is the time when the lists of strategic initiatives are evaluated to determine their value and potential impact for meeting the strategic objectives. Using typical VE evaluation tools and techniques, the strategic initiatives are defined down to a manageable set and then measures necessary to monitor and gauge the performance of those objectives are evaluated. A “good” strategic initiative should have:

- An Owner – accountability at the Leadership Team level
- Clearly defined start and stop dates and progress milestones
- Clearly defined deliverables
- A budget and committed resource allocation.

When evaluating measures, the following guidance should be considered:

- Each strategic objective should have one to two measures
- Both lead and lag measures should be used, as appropriate
- Lead measures are usually assigned to the Internal and Learning and Growth perspectives; occasionally to the Customer perspective
- Each strategic objective should have at least one lag measure.

The outcomes of the Evaluation Phase will be a Preferred Set of Initiatives and Measures for each Strategic Objective.

Phase 5: Development
Key milestones or tactics that support the accomplishment of the strategic objectives are defined in the Development Phase. During the Development Phase, the balanced scorecard will be defined and populated with the tactics and targets. An example of a balanced scorecard that could support the INL Nuclear Science & Technology (NS&T) Directorate is shown in Figure 7 (below).

The outcome of the Development Phase will be a Balanced Scorecard.

Phase 6: Presentation/Implementation
The Presentation Phase is utilized to ensure the new strategy is presented to senior management by the VE Team to obtain their immediate (although verbal) feedback and approval. In addition, follow-on activities could include development of pictures/posters to use to communicate to staff and management the newly defined strategy and balanced scorecard. These items are necessary to maintain communication and reinforce the shared vision for the organization or program.

The Implementation Phase is typically long-term with little VE Study Team direct responsibility. Potential outcomes could include a Project Execution Plan (PEP), a resource loaded schedule, individual performance goals, work packages, etc. This is a crucial phase for the success of the organization. If the Strategic Plan and Scorecard are integrated, communicated, and used as the basis for planning, the goals and strategies of the organization may not be completed. Also, members of the VE Study Team may be less interested in participating in future strategic development activities if their efforts do not appear valued.

Kaplan and Norton suggest that the most successful strategic implementation occurs when the senior management team uses a “new” system to manage strategy, with the following dimensions:

<table>
<thead>
<tr>
<th>Strategy Map</th>
<th>INL Specific</th>
<th>Balanced Scorecard</th>
<th>Action Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perspective</td>
<td>Objectives</td>
<td>Measurement</td>
<td>Initiative</td>
</tr>
<tr>
<td>Customer</td>
<td>Provide Solutions to Complex Nuclear Industry Problems</td>
<td>• Industry won’t collaborate.</td>
<td>• Identify testing and analysis needs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td># of contracts FY-09: 1 FY-10: 3 FY-11: 5</td>
<td>$200</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Front lines • DOE won’t fund.</td>
<td>• Submit proposals.</td>
</tr>
<tr>
<td></td>
<td></td>
<td># of meetings with Industry participation FY-09: 4 FY-10: 6 FY-11: 10</td>
<td>$500</td>
</tr>
<tr>
<td></td>
<td></td>
<td># of new equipment procured FY-09: 2 FY-10: 3 FY-11: 5</td>
<td>$600</td>
</tr>
<tr>
<td></td>
<td></td>
<td># of new equipment installed FY-09: 1 FY-10: 2 FY-11: 3</td>
<td>Develop installation plan.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Congress changes the mission of the lab.</td>
<td>• Identify funding.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Congress changes the mission of the lab.</td>
<td>• Install equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Funding for facility upgrades, new equipment, or new facilities is not available.</td>
<td>• Develop PEP to identify testing equipment and facility upgrades.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Training is not available.</td>
<td>• Identify funding.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Expertise is limited.</td>
<td>• Initiate procurement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Programs have limited funding.</td>
<td>• Design facility upgrades.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Develop installation plan.</td>
</tr>
<tr>
<td>Internal</td>
<td>Build World-Class Nuclear Energy Capability</td>
<td></td>
<td>• Identify funding.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Install equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Work with HR to interview recent university graduates.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Arrange on-site university visits.</td>
</tr>
<tr>
<td>Learning and Growth</td>
<td>Develop, Attract, and Retain World-Class Expertise</td>
<td></td>
<td>• Assess training needs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td># of current employees trained on new capability FY-09: 2 FY-10: 3 FY-11: 5</td>
<td>• Provide on-site training.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Arrange off-site training.</td>
</tr>
</tbody>
</table>

Figure 7. Example of a Balanced Scorecard for the INL NS&T Directorate.
Strategy should be the central organizational agenda. The balanced scorecard allows organizations to describe and communicate their strategy in a way that could be understood and acted on.

Create incredible focus; every resource and activity in the organization was aligned to the strategy. The organization structure should mobilize all employees to act in fundamentally different ways. The balance scorecard provides the logic and architecture to establish new organization linkages across business lines and employees.

When a new strategy is being launched, all employees must understand the strategy so they can find new ways to conduct their daily activities. Organizations need top-down communication, not top-down direction. One study showed that 67% of employees in well-performing organizations have a good understanding of overall organizational goals and 26% of the senior managers are highly effective communicators. Compare this with 33% of employees in poor performing organizations and 0% of senior managers.

The outcome of the Presentation/Implementation Phase will be a fully Functioning and Executable Strategy.

Conclusion

The Value Engineering (VE) Methodology is an effective strategic planning tool for organizations, projects, companies, etc. After half a century, function analysis remains a key piece of design; whether it is a building, a computer system, a car or a plane. This simple concept, to focus on “what” needs to be done, remains the basis for requirements development, problem solving, gap analysis, etc. When using the VE methodology to develop strategy maps and scorecards, function analysis and specifically Functional Analysis System Technique (FAST), are essential elements of this strategic planning approach.

Strategy without action does not lead to success. The critical, and maybe the most difficult part, is implementing the plans developed during the process. Obviously, management commitment is paramount. Leading the organization toward the vision and mission creates excitement and interest for employees and customers. Employees align their personal goals to the organization’s goals and the cohesiveness increases as the strategy is implemented.

Definitions

**Strategic Planning:** A long-term, future-oriented process of assessment, goal setting, and decision-making that maps an explicit path between the present and a vision of the future; that relies on careful consideration of an organization’s capabilities and environment; and that leads to priority-based resource allocation and other decisions.

**Vision:** An inspiring picture of a preferred future. A vision is not bound by time, but represents global and continuing purposes, and serves as a foundation for a system of strategic planning. A vision is a short, simple statement of an ideal and unique image of the future of an organization. Vision statements provide the vital spark, energy, power, and passion necessary to achieve goals.

**Mission:** The reason for an organization’s existence. It succinctly identifies what the org does, why, and for whom. A mission statement reminds everyone of the unique purposes promoted and served by the organization. An organization’s mission statement concisely states the basic purpose for the organization’s existence. The mission provides the essential foundation for strategic planning. It should be brief (25 words or less) and understandable so the main points are clear to all members of the organization. The mission statement provides answers to the following questions: What do we do? For whom? Why? How do we do it?

**Goals:** The general ends toward which the organization directs its efforts. Goals address the primary issues facing the organization within broad groupings of interrelated concerns. They are founded on the vision and may involve coordination among several organizations with similar functions.

**Objectives:** Clear targets for specific action. They mark interim steps toward achieving an organizations long-range mission and goals. Linked directly to goals, objectives are measurable, time-based statements of intent. They emphasize the results of actions at the end of a specific time.

**Strategies:** Methods to achieve goals and objectives. Formulated from goals and objectives, a strategy is the means for transforming inputs into outputs and ultimately, outcomes, with the best use of resources. A strategy reflects budgetary and other resources.

**Actions or implementation plans:** Detailed methods of specifying how a strategy is implemented. Ask speci-
fication includes staff assignments, material resource allocations, and schedules for completion. Action plans separate strategies into manageable parts for coordinated implementation of goals and objectives.

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About the Authors

Lori Braase, AVS: Lori Braase is the Lead for the Facilitation and Consultation Services Group in the Systems Engineering Department at the Idaho National Laboratory (INL). In addition, she manages the Value Engineering Program for the INL and serves as the Systems Engineer on a key Department of Energy nuclear program. Her 18 years of experience includes management, systems engineering, technical and large group facilitation, VE, decision analysis, and strategic planning. Lori has a Master’s Certificate (14-credit) in Applied Nuclear Energy and a BBA in Business Management, both from Idaho State University. She has been an active member of the SAVE International since 1995 and received her Associate Value Specialist (AVS) certificate in 2001.

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Abstract

In a world where change is the only constant thing, companies need to deliver products in a better way, which will change the dynamics of the market. This will help the companies to withstand the competition. The products should be innovative, cost effective, with a shorter leadtime and which should also have a better intellectual property (IP) rights to keep the competition at bay. Is there a secret mantra, which will help the companies to achieve these things? The secret mantra will be open innovation. Open Innovation coined by Chesbrough can be described as: combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies. To implement open innovation, it requires a paradigm shift in the way companies operate. This business model can be extension of the service sector business model, which has been a primary driving force in South Asia’s booming economy. The extent and type of innovation should be determined by current business performance and future expectations and by the organizations tolerance of risk. This papers showcases a successful business strategy, which has helped Satyam computer services limited to grow up in its value chain creation for the customer and to itself by implementing open innovation. It will help in understanding few known theories of open innovation in a better way, it also provide a practical insight of the business model, as well as it answers few of the intriguing questions regarding the IP and tools be used.

What Is Open Innovation?

Chesbrough, who coined the term Open Innovation describes in his book “Open Innovation: The New Imperative for Creating and Profiting from Technology” as a process of combining internal and external ideas as well as internal and external paths to market to advance the development of new technologies. It emphasis on using the various sources of technology to develop a solution.

The picture above (Figure 1) represents the way to address the market by leveraging technology, ideas from various sources. In this internal technology base (companies own R&D) works with other sources of technology, which abets that in developing a solution to the market. With this process the company adopts a more open approach in developing a solution, which gives the company operational advantage like access for vast pool of knowledge, access to technology, reduced time to market at reduced cost. These factors contribute to a increased value of the product. This process integrates various fields of management, computer science and engineering to drive innovation, competition, and quality of life through service systems.

Why Open Innovation?

Innovation was the mantra of the industry to stay ahead of the competition. The fruits of the innovation remained the propelling force behind churning out new products and solutions to keep the core business running. It was a highly insulated model, where they listened only to top management. They failed to listen to the users, who wanted a better value for the product. The value of the product depends on ability to deliver a better product at a cheaper price. When the companies fail to do that, the value curve for the product starts declining. The repeated failures of the industries to come up with in-
novative products and solution for the problem forced them to embrace open innovation. But how did open innovation help in solving the problem?

It helped in improving the areas, like reducing cost of the product, time to market and the availability of technology, which resulted in improved value for the product. A good example of this will be a recently launched Tata Nano, the world’s cheapest car. (See Figure 2. below.)

This was possible for the reason that they were able to connect to the customer needs and affordability. The car developed with affordable price tag of $2000 was feasible due to its innovation at various level— from its engineering, marketing and to its manufacturing. This they achieved by building partnerships with suppliers and putting everyone in the same room to work through problems and make suggestions—that has enormous value addition to the product. They had their suppliers engaged in very early stage of design to co-create low cost product. One such engagement with a German supplier resulted in developing a very cost effective ECU.

It’s a small control unit that controls all aspects of engine operation. Even for the simplest engines, they can be expensive due to its complexity. It is required because an engine today must satisfy emissions norms, sound norms, produce an acceptable spread of power, and return an acceptable level of economy and still more. This complexity makes it crucial and in the case of the Nano, expensive. However, Tata worked with Bosch to take the ECU down to an unprecedented price. Among the solutions employed, is the fact that the sensors used by the ECU to govern the engine are down to half the usual number.

In a similar fashion Tata engaged with different vendors to co-create value for customers.

**A Successful Open Innovation Implementation**

Satyam views open innovation as a process innovation (i.e. the process of developing a new product or solution), which enables product innovation and thereby creating value for the customer. (See Figure 3 above.)

It has an impressive track record in the field of engineering services, which is evident from the position it achieved itself in the survey conducted by the Black book of outsourcing. Along with engineering services it also offers service in myriad fields ranging from telecom, health and banking.

Increased deregulation and networking tools is driving open innovation with fresh rigor generating new wave of revenues. To make the most of new opportunity, Satyam evolved itself in pursing innovation, which gives the customer a better value for their product, which resulted with partner Innovation award in 2008.

**How Value Is Created**

Innovation is hardwired in the way business is performed at satyam. While other organization is creating external innovation network. Satyam innovates from...
within. As Venky Rao (senior vice president of innovation and leadership) explains the way it is achieved “Cultivating an innovative network from inside out, starting with employees and marrying innovation management training with leadership development”. This innovation strategy followed in Satyam helps in unleashing and harnessing grassroots creative energy.

Innovation at Satyam is driven by the i3 framework, which is inspired from the IDEO innovation framework. The power of i3 approach—information-based, integrative and iterative.

The execution of i3 framework can be simplified into four different stages:

- **Ideation**
  - Challenges
  - Leveraging the Deep Dive methodology in the i3 approach

- **Project Selection**
  - Three types of Innovation investment approaches
  - Using the cash curve approach to monitoring investments

- **Development**
  - Satyam’s unique incubation model – FUTURUS

- **Commercialization**
  - Choosing the optimal Innovation business model

- **Additional key metrics**
- Satyam’s RTLC Metrics Tool - StarTrac

Tools and ecosystem for open innovation In order to harness the grass-root innovation, there is a requirement for ecosystem to be in place. This ecosystem should act as enablers of innovation help in capturing the thoughts & ideas of the people involved and also transform the same into intellectual assets. This will act as the tools for open innovation. The four programs, which Satyam operates to foster innovation serves as tools for the ideation phase:

- **i-DNA**, “Create a environment for creativity and innovation”. This is achieved by having customized innovation workshop and surveys to understand innovation climate, which results in formation of the thinking clubs. This acts a process for seeding the innovation culture into the system and abet the next level in the process of innovation.

- **Deep dive.** “It is a 3-5 day long event in which a cross functional team (CFT) participates. This CFT is not restricted to only engineers with different background. This CFT consists of people who develop the product, who manufacture the product, who use the product and who service the product. This CFT brainstorms on the given focus area, develop new concept and prototypes the same. This helps in developing a product that is co-created with
users.

- Idea Junction, “a crowd sourcing site invites ideas from anyone in the company on a variety of topics, ranging from HR policies to new business models.”

- Intellectual assets, “the enablement team converting an idea into a valuable intellectual asset for Satyam and clients.”

In the project selection phase, the business priorities act as the driving force. The business priorities can be classified into three major types:

- Differentiate, “Rule changing innovations”. This kind of product will result in creating a new market for itself. It acts as a game changer for the company

- Compete, “Competitive advantage investment”. This is mainly adopted when the focus is on reducing cost and improving the existing services or products

- Sustain, “Scale investment”. This is followed when there is a requirement to ensure the quality and service level.

The Cash curve analysis is used to monitor the innovation investment and to understand the payback of the same

**Enablers Of Innovation**

The enablers of innovation are the people, information and the infrastructure. It is achieved by having the right mix of people and an environment that will stimulate people to think innovatively. It should also contain a mechanism to address the failure of such a team.

The following few can be requirements of such a team

- People with exposure to a Various Domains
- Subscription to Technology Journals and Websites
- Tie up with Technical Institutions and societies
- Training and Access to Innovation tools
- Developing a culture for Innovation.

Thinking innovatively also requires a conducive atmosphere. It should facilitate a easy way to visualize the concepts, mock up and test them. Satyam has such multiple innovation lab that aid in performing such activities. One such lab has a virtual vehicle development platform, which helps in design and testing of components in virtual space. The FUTURUS and Global Innovation hub act as enablers of business intelligence solution The BI & PM practice has been assisting customers by developing proof-of-concepts and conducting customer demonstrations based on real-time business scenarios and challenges faced today. These things act as the tools in the development phase.

The commercialization of the product is based on different key parameters like the following:

- Consumer profiling and segmentation
- Competitive response and timing
- Marketing and investment plan.

Few of the key additional metrics for the commercialization stage are 1) Product development efficiency 2) Portfolio effectiveness 3) status of key projects 4) ratio of learning over investment in innovation projects. All these programs abets in fostering innovation, which is driven by the innovation framework in Satyam. All these tools can be used either a NPD cycle or EPD cycle.

**Power of Partnership**

Satyam partners with its clients, suppliers and academic institution to achieve business transformation through open innovation. This helps in adding value to the product with much lesser time to market.

**Benefits**

The most common issues that are plaguing the companies is the inability to deliver products with a better value. The value of the product depends on the ability to deliver a better product with lesser price with reduced time to market. The benefits of Open innovation are enormous in terms of value delivered to its stakeholders.

A particular division within the Engineering services serving a leading North American appliance manufacturer has engagement with the client’s product development team for more than 8 yrs.

The business expectation of that team was:
1) Engineering Design support for Systems, NPI, Value engineering and using DFSS methodologies
2) Globalized Engineering workforce
3) Synergy amongst various entities and creation of Center of excellence across Global Technology centers.

But the realized benefits exceeds the expectation by a large scale

1) 20+ NPI launches
2) 100+ patent for disclosure
3) Annual Cost savings 30-40 
4) Productivity savings to the tune of $ 80 Mn in the last 4 years
5) Developed Centers of excellence for few strategic areas from India on Reliability, Harness, Appearance Parts and Predictive engineering.

All these things help in adding value to the product.

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Value World is accepting submissions!

Value World is a SAVE International journal with the objectives to explore, develop, and elucidate the knowledge of value methodology; to keep practitioners and researchers informed on current issues and best practices, as well as serving as a platform for the exchange of ideas, knowledge, and expertise among value methodology researchers and practitioners.

Value World provides an opportunity to share detailed insights from different understandings and practices associated with value. It provides an international forum for cross-disciplinary exchange of insights and ideas regarding value and practices for dissemination. Value World will publish your work to international society of practitioners and researchers with interest in value from a wide variety of sectors.

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Submit papers to the SAVE business office at info@value-eng.org. High resolution PDF format is preferred.
Quality Based Decision-Making (QBD) in Project Management

Abdulaziz S. Al-Yousefi, CVS-Life, FSAVE

Abstract

Poor value and quality do exist in all engineering projects due to many factors. One of the most critical factors is the process of decision making or lack of quantifiable decision tools. Decisions are normally based on cost and/or time, since they can be estimated and measured. In most case, those decisions depend on the experience and knowledge of the decision makers.

However, few decisions have been made based on Quality and Performance. That is because of lack of quantifiable tools to measure them. Quality can be defined as “conformance to requirements” but the question that is always being asked: “How can we measure this conformity?” or in another word “Can we measure Quality?” In engineering project, the answer is neither yes nor no. The answer is “we should”. The fact of the matter is “If we cannot measure it, we cannot improve it”

Quality Based Decision-making (QBD) is a new methodology that comprises of some practical tools. QBD purpose is to clearly identify and prioritize the most important areas for improvements.

This paper will be explained and show how QBD can improve decision-making that leads to optimal expenditure of owner funds while meeting required function, quality and performance.

Introduction

Before doing brainstorming and ideas generation sessions, we need a solid base for discussion that prioritizes potential areas (subject) for improvement. This paper establish this base by introduces the methodology QBD and demonstrates some practical tools that will differentiate between needs and desires by defining four level of priorities.

In order to explain QBD, we need, first, to describe some of its tools. They are as follows:

1) Management Decision Matrix (MDM): It measures the level of importance

2) Quality Satisfaction Model (QSM): It defines the rate of satisfaction

3) Quality Priority Model (QPM): It prioritizes potential areas for improvements via combining MDM and QSM.

What is Quality Management (QM)?

So far, there is no agreeable definition exist for Quality Management. But different quality experts tried to define it according to the industry they work in. QM is a group of thoughts and principles. It consists of methods, tools and techniques and years of experience. QM can be defined as “A cooperative form of doing business that relies on the capabilities of both labor and management, using teamwork, to continually improve quality, economy and productivity to complete satisfaction of the customer.”

Quality Priority Model (QPM):

Combine the level of importance with the rate of satisfaction.

Rather than dwelling on QM concept and definitions, let us introduce the methodology of QBD and its quantifiable tools that will help us to identify potential areas for improvement of our work.

Identifying areas of potential improvement is one of the most important challenges facing management. We know from experience that most improvements identified address specific issues. Specifying these issues is essential in any decision making session.

In order to explain what QPM is, let us assume we want to establish a Value Engineering (VE) Program in an organization. The team used the following methodology to identify and select areas for improvements:

1) The team reviews the available information and documents to allow each team member to identify area of improvements.

2) Team members were asked to suggest areas that they felt could be improved. No effort was made to identify how they might be improved. It was enough
that one or more team members felt that a particular area could benefit from this effort.

3) These identified potential areas for Value study were discussed, listed, and arranged in generally functional categories.

Management Decision Matrix (MDM):
Measuring level of importance.

The results of the previous work were compiled and became the agenda for more discussion of specific functional requirements and functional alternatives. Identifying specific “Value-improvable” issues change from project to project and from study to study.

Let us assume that the management team came up with the top ten (10) most important improvement potential areas (categories), as follows:

A– Management Support of the VE Program.
B– Adequate VE Training
C– Acceptance of Change and management flexibility.
D– Suitable VE Study Team
E– The right VE Study facilitator
F– Having the right information
G– Time of conducting VE Studies
H– Written Procedures for the VE Program.
I– VE and Quality Awareness
J– Following up the implementation of VE Studies recommendations and proposals

These improvement potential areas are in no particular order. In order to determine the level of importance of each area, we tabulate them as shown in figure 1. This is a paired comparison between all categories.

We begin by comparing category A with category B, by placing (in the box where A intersects with B) one of the following five ratings:

A1 A is more important than B, but minor preference and count one point for A
A2 A is more important than B, but major preference and count two points for A
B1 B is more important than A, but minor preference and count one point for B
B2 B is more important than A, but major preference and count two points for B
C0 A and B have the same preference and count one point for A and one point for B.

Then we compare the importance of A with the rest of categories. Then we move to B and compare it with the rest, and then we do the same with C, D, E, F, G, H and J.

We determine the number of occurrence of each let-
For example, A gets 11 points and B gets 5 points and so on.

The total number of occurrences of all categories is 69. Therefore, the percentage (%) weight of each category is determined by the formula \( Y = \frac{100}{69} \times \frac{X}{16} \). Thus, it is 16% for A and 7% for B and so on.

Finally, we set the highest number in row Y (which is A=16) to 10. Accordingly, we adjust the numbers in row Z to be out of 10 using the formula: 10(Y/16). By this we get the level of importance of each category out 10 as shown in row Z of figure 1 (previous page).

Figure 3. Level of importance and rate of satisfaction.

<table>
<thead>
<tr>
<th>Potential Areas for Improvements</th>
<th>Level of Importance Out of 10</th>
<th>Rate of Satisfaction Out of 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Management Support</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>B Adequate VE training</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>C Acceptance of Change</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>D Suitable VE Team</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>E The right VE facilitator</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>F Having proper information</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>G Time of VE Study</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>H Written Procedures</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>I VE awareness</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>J Follow-up system</td>
<td>8</td>
<td>6</td>
</tr>
</tbody>
</table>

Figure 3. Level of importance and rate of satisfaction.

Now, that we determined the weight of the importance of each potential improvement area, we move to develop the quality profile of our existing practice by using the “Quality Satisfaction Model (QSM)” where we measure the degree of satisfaction within the organization for each potential area via asking team members to give their judgment of the rate of satisfaction, out of 10, whereas: 10 is most satisfied, meaning, it has been well taken care of. While 1 is least satisfied and it needs to be improved.

For example, the team agreed to give A=4 out of 10 and give B=5 of 10, and so on. Once we are done with the satisfaction rating of all categories, we tie the points together to form the “Quality Profile (QP)”. If QP gets smaller this means we have more poor quality areas. Therefore, QSM lets you visualize the level of quality rather than just reading it. (See figure 2, previous page.)

Priority of Potential Areas for Improvement

The level of importance (Figure 1) and the rate of satisfaction (Figure 2) are summarized in figure 3 (top right) and graphically represented in the Quality Priority Model (Figure 4, above right), where it prioritizes potential areas for improvements, as follow:

**Priority No. 1 (top left quadrant of figure 4):** Potential areas with high importance and low satisfaction. These are the top priority and should be discussed first.

**Priority No. 2 (bottom left quadrant of figure 4):** Potential areas with low importance but with low satisfaction. They are medium priority.

**Priority No. 3 (top right quadrant of figure 4):** Potential areas with high importance, but high satisfaction. They are medium low priority.

**Priority No. 4 (bottom right quadrant of figure 4):** Potential areas with low importance and high satisfaction. These are the lowest priority and will probably discuss them if we have some spare time.

Therefore, The VE team discussed and generated ideas according to the following sequence of priority in Figure 5 (right).

Conclusion

Upon the completion of this analysis, we brainstorm and generate some ideas around these subjects. However, brainstorming and generating ideas are useless if we
do not have solid base for discussion and have clearly defined needs and requirements. QBD methodology establishes this base by using practical tools that will help management team to prioritize potential areas for improvement. Furthermore, it differentiates between needs and desires by defining four level of priorities.

Reference

Al-Yousefi, Abdulaziz S., “Value Management: concept and definitions”, 2004
SAVE International “Value Methodology Standards”, 2006

About the Author

Abdulaziz S. Al-Yousefi, CVS-Life, FSAVE, is the founder and owner of the first Value Engineering office in the Arab World. He is a Certified Value Specialist for life (CVS-life) from SAVE International: The Value Society. He is the only Arab to get a Fellow of SAVE International. He served in the past: as the president of The SAVE International- Arabian Gulf chapter; the General Secretary of the Saudi Council of Engineers and the Vice president of PMI-AGC. He is a board member of SAVE International Certification Board, the Saudi Council of Engineers, King Abdulaziz Quality Award and Saudi National Quality Council. He has more than 25 years experience in Value Engineering (VE), Life Cycle Cost-ing (LCC), Project Management and Design Reviews of large-scale projects.

Figure 5. Priorities of potential areas for improvement.

<table>
<thead>
<tr>
<th>Priority No. 1</th>
<th>Priority No. 2</th>
<th>Priority No. 3</th>
<th>Priority No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A,E and F</td>
<td>G and C</td>
<td>H, J and D</td>
<td>B and I</td>
</tr>
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<td>Management Support</td>
<td>Time of VE Study</td>
<td>Written Procedures</td>
<td>Adequate VE Training</td>
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<td>The Right Facilitator</td>
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<td></td>
<td>suitable VE Team</td>
<td></td>
</tr>
</tbody>
</table>

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