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ScienceDirect

Procedia Computer Science 3 (2011) 917–924

Procedia Computer Science

www.elsevier.com/locate/procedia

WCIT-2010

Review the benefits of using Value Engineering in Information Technology Project Management

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Abstract

The fast-growing movement of the modern societies shows increasing implementation of operational projects in the areas of IT in organizational and national levels.
And it is special and important because of the very high risks that large projects (and even small ones) experience, so we decided to examine the role of value engineering in the process of project implementation and to deal with it step by step in our project, hence the importance of beginning to define value engineering and its position among the different nations. Finally, we have proposed the expression of different techniques used in value engineering with different phases of expression during the life of IT projects, using techniques based on the proposals presented.

Selection and/or peer-review under responsibility of the Guest Editor.
Keywords: Value Engineering, Project Management,Information Technology, Organization

1. Introduction

Nowadays with the advent of global and highly competitive markets, project managers are paying serious attention to providing valuable products to customers with the lowest fees. This vision has brought success and the competition has led the manufacturers to provide quality goods, in order to maintain their authority in the field. Since consumers are also always looking for quality and affordable goods and services and products are provided in hot competition fields, in addition to improving the quality of services and products, continuous improvement and how to use the methods to balance between the cost and the applications of a product play a fundamental role, and is one of the most important factors of economic development [1].
The value of a product is different from different perspectives, Therefore producers of goods and services trying to obtain customer approval in return for price are presented. They are following ways to make additional costs for removal and replacement of low-cost methods rather than to have previous methods. Overall, the goal is to create the best value through attention to cost and performance. [1].
as was noted above, the purpose of applying value engineering is to implement the projects, increase performance and reduce costs in all phases of research and operational projects. In a closely related approach, combining the lifetime value of engineering projects to increase productivity can be noted as:
Performance ratio of output to input is defined in the project. [2].
So we can clearly understand that the purpose of applying value engineering is , to improve the performance outputs and Inputs, by having a conceptual approach to value engineering studies along with project management, project analysis, value analysis, and value management.

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1877-0509
doi:10.1016/j.procs.2010.12.150

Increased productivity means increased performance worth index. Performance index value is simply the price performance ratio of the cost function, so when increasing the value of index performance, productivity in the process of producing the final product increases [3].
Today, after nearly half a century since the design of value engineering projects, management capabilities with operational growth and expansion has been associated with frequency, performance indicators in projects and gained maximum efficiency in project implementation and made the best and most value for their products and the methods used were value engineering [1].
Using value engineering process in a range of project managements has faced restrictions such as the correct application of standards and rules governing the organization, but the direction of the project , the extent and complexity is greatly enhanced to deal with shortages of resources and additional costs to the project and to use modern methods and practices by management to use resources that are available and the optimum utilization of human resources, teamwork, distribution of authority and responsibility to be able to run a plan to fulfil the desired manner. In fact, a value engineering effort is organized in the framework of the project. Project management has consistently sought to use less time spent to value engineering in the final product utilization while preventing the undue increase of the costs or the quality of work.
Value engineering is in fact an organized effort aimed at studying and analyzing all activities of a plan since the formation of the initial thinking to the design and implementation stages with full implementation plan to realize the lowest cost and time [4]. The project cost categories not only includes the design but also the ownership costs, including operation, maintenance and consumption costs throughout the useful life of the project. Application of value engineering in the project implementation has become according to the complexity of things, especially in big implementation projects. The aim of this method is to eliminate or modify anything that causes unnecessary costs, without damage to essential functions. Value engineering is continuously increasing the development of technology, eliminating the portion of costs that do not play a role in promoting quality in terms of unnecessary executive costs.
In traditional methods of cost reduction, mainly from past experiences, attitudes and habits that have been repeating, creativity is not observed. Conversely value engineering, information, identification of problem areas, proposed and developed methods and initiatives, develop new ideas and perspectives that integrate the all-round, is to be recommended.

2. Value Engineering position in different nations

Considering the history and background and looking at the history of this field it can be clearly recognized that the use of the field and engagement in various projects in countries like United States of America, European countries and also countries like Japan and India which have a lot of experience in this field are caused by cost-saving project implementations. The fourteenth meeting of "Value Engineering Society" which was introduced in 1973 suggested that for every one dollar invested in management, value engineering projects obtained about 4.53 dollars savings in administrative costs. These figures show the savings rate of 1.8 billion dollars at the end of 1973. Presenting these statistics led to the use of value engineering in different industries and governments in America and Canada as the first states in the world using value engineering. In addition to the Americas, countries such as Japan, India and even Saudi Arabia also have special attention in this field. Among 698 Japanese companies, about 71 percent of their value was in engineering products and benefit services [4].
The following table shows the rate of utilizing value on the one hand, and various projects and the amount of savings made in various projects in the United States of America on the other.

Table 1. Rate of utilizing value

	field	The considerable
1	Road	Rate of return on investment to 113 dollars per dollar cost in investment and an average of 845 million dollars in 1999
2	Health	24 percent cost reduction in projects related to health in a period of six years in New York
3	Construction	Savings equivalent to one billion dollars in 2000 in projects of building highways in the United States
4	Industry	Reducing costs in the range between 5% to 100% in different parts
5	Environment	In environmental projects due to high costs for using a lot of potential methodologies
6	Government services	Average Return on investment rate of 20 dollars per dollar invested

Table 2: Rate of utilizing value

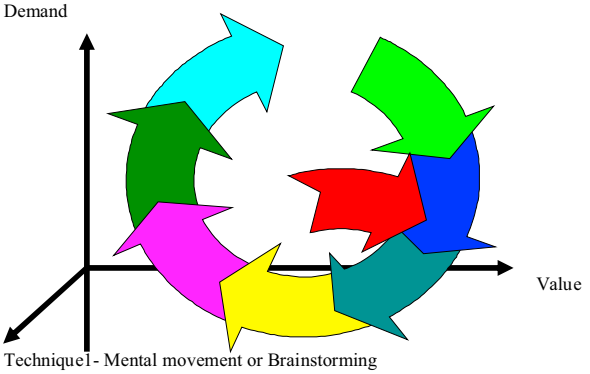
Row	Percent usage	field
1	79.9	Electronics
2	91.3	Transport (road and traffic)
3	90	Production Equipment
4	84.5	Machine Manufacturing Co. and auto manufacturing
5	50	Chemical industries
6	39	Construction Industry
7	37.5	Food industry

Looking at the statistics above it can be clearly recognized that the present world is increasingly becoming more complex and with implementation of various projects and creating broader common denominators, combined with the value engineering project management.

2.1. Value engineering techniques

Value Engineering Task Force due to relying on, and flexibility in its business plan, along with the increasing use of project management leads to improve results. This tool is trying "cost", "time" and "needs" and making them closer to an optimum level [1].

Figure 1: Philosophy of value in value engineering methodology



Technique1- Mental movement or Brainstorming

In this technique all the participants conduct in an environment that is strictly barriers- empty. Thus creative ideas are expressed. Rules for this technique are expressed by Dr. Osborne: -Criticism is forbidden, the opposing views should be avoided for a while. -Welcome the free rotation the more ideas out of mind and being more daring, the better. -Quantity is desired. Any idea that is likely to emerge more ideas is effective. - Compound and modify ideas: each team member in addition to its role in creating their own ideas should suggest how ideas of others help or combine two or more ideas. [1]

2.2. *Technique2-Delphitechniq*

this technique is used for decision making and reaching consensus. Delphi technique consists of five stages: Each group member independently decides about the subject he writes. - Written comments to be sent to a central station and the central station collect comments and are reproduced. - For each member, all the views will be sent. - Each member comments about others' opinion and perhaps a new awareness of others opinion, and the result will be written to the central station. Stages before it is unanimity achieved Flow chart that represents how the process is different in the Delphi technique is as follows:

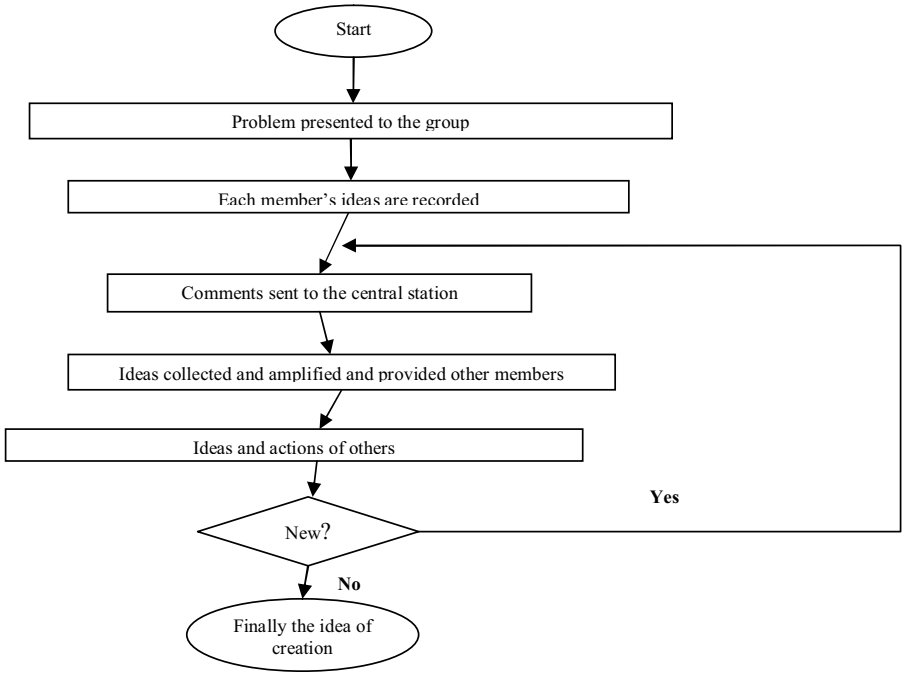
2.3. Technique 3 - Collapsed sociological analysis technique

this technique is technically a desired shape and structure of various dimensions for the study and analysis of development. Initially existing surfaces and different aspects of the phenomenon seem to develop.

For the various aspects of a topic it can be formed and components compared with the main dimensions and their

components on concentric circles and twisting the circular posts of different dimensions and compared with components. [1]

Figure 2 - Algorithm Method Delphi technique



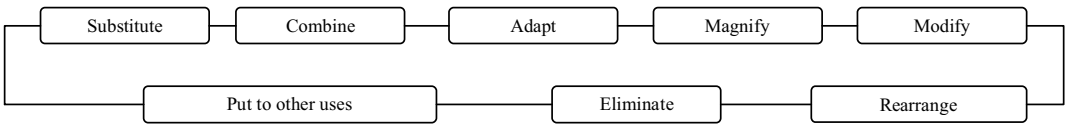
2.4. Technique4-Nominal Group Technique

The word "nominal" is used because people are not allowed to have verbal contact with each other and find the real meanings of the word group and it includes five stages: - Group members face each other on a table and problems or issues solved together and written decision to each member is given and they should remain silent and independent without consulting each other. - Each member to turn an idea to the group when there is the opportunity, and not until all ideas are proposed, the debate will not begin. - Opinions recorded in the group discussion are to be put in concepts to evaluate in the next step. - Each member independently and secretly grades beliefs. - Group decision making would be the highest total score given. [1]

2.5. Technique 5 - a comparative Scamper technique or a controversial ideas and questions

Scamper is a word composed of initial verbs and ideas that is used in detection and by application and it is very effective in practical situations. This tool is in short: Substitute: What can be replaced? Rather than the person to whom? Rather than what things? What other material? What other process? What elsewhere? Etc. Combine: What can be combined? Mix of units? Do we combine these ideas? Combine the concepts? Adapt: adapt? What else is like this? What other ideas do you suggest? Does it offer the same news last? Magnify: Maximize? More time? Repeated more? Stronger? Longer? Thicker? More value? Multiply? To create? Duplicate? Modify: to change, the new rotation? Significant change, colour, movement, sound, fragrance, shape, body and other changes? Put to other uses: to have other applications? New ways for practical use? Other applications? Applications elsewhere? Access by other people? Eliminate: Remove? Shrink? What do we remove? What differentiation (low), Smaller? Condensation? To lower? Shorter? Lighter? Unencrypted? Simplify? Treat small? Rearrange: to change the composition? Components to move? Other patterns? Other maps? Other sequences? Cause and effect move to? [1]

Figure 3 - Component technique Scamper



2.6. Technique 6 - FAST Technique

FAST technique is a systematic guide map for the task. This diagram of a method for organized search and collection of processes provides a method and step functions and tools needed to achieve. FAST charts for each set of tasks that are related to each other and work is in fact very broad range of its application are briefly introduced and presented in graphics and drawing functions in the FAST diagram. [1] It includes the FAST technique that could yield a larger system to consider.

2.7. *Technique 7 - model nature*

Selection of a powerful form of flows of items on laws of nature with choice of images. In fact, this technique patterns is derived from nature and analysis generalized to practical cases. [1]

2.8. *Technique 8 - Quality Home*

Matrix is set in the western part of the house with quality demands and customer needs. The second floor of the house is designed into needs quality characteristics. The main floor of the house shows, the dependency matrix design characteristics and customer needs. In the gable room, the matrix will express the relationship between designs characteristics. The matrix analysis is useful and specification design makes style. Lower class target values for design parameters are included. East, shows designing a product or service compared with what competitors are doing. [1].

2.9. *Technique 9 - DO IT technique*

the name of this technique has been formed from four English words. Chosen because these four words solve this problem, first it is necessary to precisely define topic. The question is why there is this problem? We have tried so hard to divide it into smaller problems. In this stage, with focus on the topic and understanding it can be more accurate definition of its receipt. Question can be seen from different angles. Among the ideas is the best choice. Based on ideas gathered, the analysis is done. Weaknesses of each idea are found in this article is how to think them into strength. The idea should become practical solution after evaluating and selecting the best ideas. [1].

2.10. *Technique 10 - the illusion of creative techniques*

Very often what we think is reality, is not reality. Five human sense of reality are understood. The assumption is to give the report and precise sense of the human environment. Is it really so? Things that your eye sees so that it would interpret, is causing this error or illusion. Eye sees something else that is in mind. Sort of mind work. Therefore, images that your mind sees is not copied the direct object, but it is a summary of the codes through which neural network is to reach the brain. All individuals in all cases have the same understanding of a subject and the eye and brain perception of communication not always leads to a coherent understanding of reality. Sometimes these two are together. On the other hand, contrary to previous experience in the subject, it is effectively visible. In fact, most of the time, the desires, expectations and previous experiences make us what we would like to see, not what we really see out there. [1]

2.11. *Technique 11 - mandatory communication techniques*

The technique of placing two different objects together and try to communicate between them will help to fluidization mind and the creative direction cause theories and ultimately cause new products or adding new features to old products. [1] Now with a concise method and its main function, it pays to consider trying to have a permanent place to review the value engineering and manage IT projects. In order to be able to influence the value engineering project management, we must first component and to the expression of step by step evolution of project implementation, introduce a short process. Complex project management processes can be organized in five process groups, which respectively are:

• Early processes (Initiating Processes): This process gives the project recognition and a license is issued to it.
• Planning Process (Planning Processes): to define and refine goals, as well as best practices among other methods of operation in order to achieve desired project goals, committed to reaching their deals.
• Process Executive (Executive Processes): to coordinate people and other resources for program data.
• Process Control (Controlling Processes): the project goals through regular monitoring and evaluation of the processes. Regular monitoring processes with the aim to specify deviations from the plan, to implement corrective actions if necessary.
• Process closing (Closing Processes): accept the project or phase, implemented, and give it to recognize the end of a regular point and provides specific guidance [5].
This section will try to review the structure of project management processes, "Following my tank" and place value in engineering project management, especially IT projects.

2.11.1 *The starting phase of Project:*
This phase includes defining and organizing and preparing the project plan. [1]
In this phase the required reviews are performed. Reviews on how project is very effective. At this stage it should be necessary to consider about the market, review technical and financial to be done based on the needs and demands of the project and combining it with restrictions there of the best decisions and best planning to be done. Market review: In this section, and type of customer to review the market. The main criterion is of people who are stakeholders in the project. Including those stakeholders in a project where information technology can be like: Management, Project Manager, Project sponsor, Project team, Customers, end users, Society.
But the most famous is the community goal. IT projects should be carefully focused on the target community and collecting examples of the target sectors of society affected by the project, the needs and demands of their level, the aim of culture, society, education level, community level access to target, substrates required for benefiting from the project results and ... Identify, as necessary considerations should be done in connection with the performance improvement [6]. The next issue of the review is that special attention should be made to the kind of market. We should review information about the list of required tools and equipment for project implementation, companies and organizations that are providing services, how to provide or receive services and goods, both domestic and imported equipment, or how products and services to the community goal are. Also reviews of other market must be noted in the review, market review of strengths and weaknesses, opportunities and chances, the risk of existing problems and eventually providing services to the community. [1] In this section, Gary gives two special topics of special effects in his update. Organizational level, personal interests, supporters of penetration in different stages of project work and the amount of support that high-ranking person's support of the project, must be carefully examined. About projects, particularly project management and project sponsors of projects that are being implemented, each followed by absorption of a society have a common goal [6].

Table 4: Member and Reason suggestion

Members	Reasons suggested
leader	Nobility to the issues in meetings, decision support
One or more selected customer target community	Features, applications, customer price point of view, the number depending on the importance of customer
Shopping Section	1) List of tools, equipment 2) check companies producing and selling agents
Commercial sector sales and services	Study of obtainable in the market share
Value Engineering	Training and implementation techniques have been proposed at this stage

Proposed combination of value engineering team review of market and target
In this section, the proposed technique is morphological and sociological analysis. Review of product structure and dimensions in reviews, processing capacity, application, number of transactions, security coefficients, operation volume, space required for creation and communication between server and client, size, weight, dimensions desired for the product , potential customers and how to position products and the results of projects such as personality, mood, income, amount of target age, gender, education level and education, the other dimensions of market, product reviews and results of the project is considered. The relationship between dimensions and different status in terms of customers shapes the overall structure and dimensions in the analysis to be done.
Other techniques at this stage Delphi technique is a search, all participants will share and they can according to the opinions and experience agree or express their disagreement. In this way, after several rounds of reviews about the requirements the end result will be achieved.

In addition to the techniques presented above, two other techniques at this stage can be proposed. Modelled from nature, which provide technical suggestions and new ideas can create new products or make new parts to the preliminary results of the project in the success of the project.
Another technique that can provide better results is the Bulls, the technique requires that the communication link with a new and different problems, creating new combination between two or more different technologies and provides newer ideas and a more efficient product, better conditions that the community aims to provide.
Technical reviews: The technical means, tools, functions and operations are examined[1]. in the technical review results and products of a project, technical product standards for its product, software requirements and technical characteristics of software type of network communication required, how to develop software on the network, review technical specifications and operating system compatibility for them to set up programs, how users access technology, user level access to the product technically, review methodology and a variety of selection processes in different projects, technical and manufacturing companies or services provided by companies and sales representatives, equipment and accessories needed, review of technical manpower and Chart .

Table 3: Members and Reason suggested

members	Reasons suggested
leader	Nobility to the issues in meetings, decision support
Technical department	1) of product standards and technical specifications required 2) Assessment of equipment needed
Production and technical department	Evaluation of selected methods and methodologies in the production process
shopping	1) of the company producing 2) review vendors and equipment suppliers 3) review to ensure participants and guarantees the executive sales representative
Administrative Organization Section (Involved with the project)	1) of professionals and contractors needed 2) estimated workforce 3) provide organizational chart
Value Engineering	A training and implementation techniques have been proposed at this stage

Technique that can be suggested at this stage is the nominal group technique. At this stage members do not have contact with each other orally and with decisiveness .On the other hand, when comments are written it makes it possible for audiences, to concentrate for reasons based on their approval or opposition to express the issues raised, and ultimately the opportunity for group decision. Financial review: In examining the financial aspects of projects finance, such as profitability, investment, and cost and revenue analysis in the financial review to determine the annual operating expenses, working capital, total investment plan, financed resources, the amount of fixed investment and currency rival, facilities is examined and determining the amount raised and brought by the Shareholders. At this stage, due to the use of value engineering calculation based on the output stage is done [1].

2.11.2. *Planning Phase*
At this stage, a comprehensive project to be developed and drawn. [1] On issues such as project planning phase, defining project scope, defining project activities, sequencing activities, duration of activity if accepted, and due to the systematic nature of the FAST technique could have more optimal results for phase planning project. FAST diagram of a system can function, cause and effect connections, connections that need to perform transposition when other activities are in line with performance and are based on mechanisms and other operations in the project and are to be depicted and expressed. [1].

2.11.3. *The Executive Phase*
Administrative phase of resources needed by the committee research project is anticipated to begin and the project is required to be collected and taken according to plan.
At this stage, due to the implementation of activities, through allocation of resources and manpower in the steps taken before, duties and activities as a pre-determined program is done and presented in a special technique that is not recommended at this stage.

2.11.4. *Phase Control*
Control and review various issues in different phases of the same issues that must be beginning the project as one of the key parameters in the process of projects taken up and run. So to control various processes in the project it is recommended to use the Delphi technique.

2.11.5. *Closing phase*

at this stage to review the final product production and project evaluation, project documentation, project members to estimate performance, declare victory or failure. In this phase, including the proposed solutions can be combined and the Delphi technique cited. Using these two techniques can be prominent features in the project as bright spots identified and examined the reasons for failure, so that using it can be concise and accurate troubleshooting projects, and this causes possible correct errors in its projects, or repeat them in future projects.

3.Conclusion

The issues are realized to be clearly a high risk in IT projects at national and institutional levels. IT project managers with all the different risks in different IT projects, are trying to minimize errors, to achieve maximum efficiency and through this reduce administrative costs and increase profits and interest productivity in organizations .this way it can increase the quality of organizational processes and to enhance desirable results, but due to the very rapid development of new technologies today it has met on the one hand, and the existence of the company differences with different products in terms of cost, functionality, performance and support ... On the other hand has caused any project done in this area associated with complications, and project management team with decision making problems such as technology selection, selection means, how to do electronic transactions and ... Therefore, value engineering to try this based on the proposed techniques, always analyze any possible problems with a logical and efficient use of collective wisdom and expertise of the best decisions to be taken this way to further reduce potential risk.

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