The Study of the Effective Organizational Factors in the Execution of Value Engineering

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***Abstract*—Today's organizations are in dynamic environment and every day are confronting with increasing changes. So their managers with perception of world condition have no alternative except preparing the various tools of development in order to forerun the global competition. One of the most noteworthy tools is value engineering. The aim of this paper is the study of organizational factors affecting the execution of value engineering. The population of the study includes all executive managers of Tabriz manufacturing's who attend the MBA course. The t-test has used to investigate the factors affecting the implementation of value engineering. The results show that management support, resources availability, organizational strategy, organizational structure, communication and information technology, and organizational culture have positive effect on implementation of value engineering.**

***Index Terms*—Value, value engineering, organizational factors.**

I. Introduction

The twenty first century is the era of the change in the traditional paradigms of organization and management, and the era of the formation of theories which are sometimes in direct contrast with the classical management theories. Accordingly, the increase in competition, speed, and flexibility has forced the organizations to make use of all the facilities necessary for the optimum use of the available resources and ultimately, for obtaining customer satisfaction. In a situation in which the complexity and vastness of communications have turned the world into a small village, organizations have to make use of all their available and potential capacities for survival and triumph. The competition paradigms has had a revolutionary route since the twentieth century; that is, in the beginning, competition took shape on the basis of price; then, it was based on quality; and now, competition is based on customer, initiation and innovation, and on value chain. Attention to value chain, too, requires understanding and using the value engineering technique in the organization.

With regard to the historical evolution of value analysis and propounding it under titles such as, value engineering, value analysis, value control, value methodology etc, various definitions have been presented with different titles; some of them are referred in the following:

"In Value Engineering on the basis of team decision making, value and cost of functions are estimated; then functions are ranked by computing the value index in order to identify the functions which have little value index, and finally the required decisions of reforming actions are taken for the purpose of reducing the costs of these functions and increasing the value index of them as a matter of fact" [1].

"Value Engineering (VE) or Value Management (VM) is one of the important project management tools. It can be defined as the systematic effort directed at analyzing the functional requirements of systems, equipments, facilities, procedures, and supplies for the purpose of achieving the essential function at the lowest total cost, consistent with meeting needed performance, reliability, quality, maintainability, aesthetic, safety and fire resistance" [2].

VA or function analysis provides the methods to identify the problem and to begin to define the functions that need to be performed. The concept of VA can be extended to incorporate the costs of the impacts made by environmental burdens. This extension opens new avenues for an eco-friendly green product development [3].

"Value Analysis is a competitive, creative and planned method whose objective is to satisfy the users of the products by means of a set of originating solutions considering functional, economic and specialty criteria" [4].

Generally, value engineering is a set of techniques whose aim is to omit unnecessary costs and these costs don't perform any role in enhancing the value and function of the product.

In order to identify the effective organizational factors in the implementation of value engineering in the organization, while studying the resources rebated to value engineering through the review of literature, we have determined the most important organizational factors effective an executing value engineering in the organization as follows:

Management support: Implementing value engineering in the organization requires the coordination of procedures, tactics and policies of the top managers of the organizations with the related project.

Resources availability: Successful implementation of value engineering in the organization requires allocating the necessary resources.

Organizational strategy: Organizational strategy must support the value engineering project in the organization.

Organizational structure: structure is a framework that gives shape and direction to all the organizational activities. Therefore, we cannot expect value engineering activities of the organization to be successful unless the organizational structure supports the organizational changes along the line of deleting the activities lacking added value.

Communication and information technology: In any organization that tries to implement value engineering in the

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organization, the managers should emphasize intra organizational communications. The communication system inside the organization should be coordinated with the other components of the organization.

Organizational culture: Organizational culture is a system of common inference that the members have about the organization. In order for the organizational culture to support value engineering, such components as innovation and risk – taking, attention to organization members and ambition should be included in it.

With regard to the importance of implementing value engineering in the organization, the present research aims to determine the effect of each of the above factors executing value engineering.

II. Literature Review

Extensive researches have been done about value engineering; some of them are as follows:

Green studied the distinction between value management and value engineering on the basis of their underlying assumptions. The traditional approach to value engineering is analyzed, and is found to reflect the optimizing paradigm of hard systems thinking. In contrast, the alternative approach offered by value management is based on the learning paradigm of soft systems thinking [5]. Fong highlighted the current development of value engineering in Hong Kong in terms of owners' acceptance of it. Details of VE education, research and professional institution in Hong Kong are also given [6]. Cheah and Ting conducted a survey among industrial practitioners in Southeast Asia. The results of survey indicated that there is generally a lack of understanding in value engineering concepts among industrial practitioners and it is important for the government to take the lead in promoting value engineering practices in domestic projects [7]. Sakao and Shimomura proposed a novel engineering discipline for producers toward sustainable production and consumption, Service Engineering (SE) [8]. Ibusuki and Kaminski suggested a methodology for the product development process in an automotive company, aiming at the correct systematic approach of Value Engineering (VE) and target-costing in cost management [9]. Male et al. presented a series of study styles for conducting value management with the potential to take VM to its next stage of development [10]. Thakker et al. considered a new way for optimal material selection strategy using a combination of three well known methods; the Cambridge Material Selector based method, the adapted value engineering techniques and the technique for order preference by similarity to ideal solution [11]. Barney et al. provided insight into the release planning processes used in the software industry to create software product value, by presenting three case studies [12]. Zhang et al. developed a value engineering knowledge management system (VE-KMS), which applies the theory of inventive problem-solving and integrates its creativity tools into the creativity phase of the VE process [13]. Neiger et al. proposed a novel value-focused process engineering methodology for process-based supply chain risk identification with the aim to increase value to supply chain members and supply chain as a whole [14]. Wang et al. developed a three-phase evaluation model incorporating fuzzy theory, value engineering and multi-criterion to find optimal strategies for product configuration change, so as to select suitable combination of parts suppliers [15]. Lee et al. developed RETRIEVE (Remembering Tool for Reusing the Ideas Evolved in Value Engineering), a system designed to (i) capture ideas from the past value engineering (VE) study cases for use in solving the current problems and improving the current situations; and to (ii) support the development of a VE proposals [16]. Rosenboom et al. described an experimental program conducted to study the behavior of six prestressed concrete bridge girders, which were tested under static and fatigue loading conditions. The behavior was also examined using value engineering to evaluate the cost-effectiveness by investigating the overall system performance [17]. Shu et al. studied on the decision-making of district cooling and heating systems by means of value engineering [18]. Brad determined the mathematical relationship between the business value of the new product and the influential factors in the decision-making process of investors using the strategic analysis matrix approach and general dimensional analysis [19]. Andersen discussed the concept of product value as the ratio between the degree of need satisfaction of a product and product life cycle cost. Strategies for improving product value were presented [20]. Chadraba and O'Keefe tested value perception by comparing samples from four countries [21].

III. Methodology

This study is applied in its objectives and descriptive in methodology. Since, in descriptive research, the properties of population are tested by survey, the current research employs a descriptive survey with special properties suitable for this topic. Library studies have been utilized for the purpose of preparing and developing the theoretical concepts and literature review in this research. In addition, field methods have been used to collect the necessary data.

Fiche research has been used for gathering the theoretical concepts and literature review. In addition, a questionnaire has been designed to answer the research questions. The validity of the questionnaire has been determined by face validity method. It means that a number of experts on this subject have been asked to express their comments on the designed questionnaire after studying it. By applying the received comments on the questionnaire, it was found out that the designed questionnaire has the necessary validity. Cronbach's alpha coefficient has been employed to calculate the reliability of this questionnaire; that is, the questionnaire has been sent to 20 members of the population, and this coefficient has been computed for them. The computed value for each of the dimensions has been shown in the Table I.

TABLE I: Cronbach's Alpha Coefficient

Organizational factors	Cronbach's alpha Value
Management support	0.754
Resources availability	0.897
Organizational strategy	0.901
Organizational structure	0.914
Communication and Information Technology	0.867
Organizational culture	0.896

The population of the study was all the top managers of the producing organizations of Tabriz, Iran, who attended the MBA course. Based on krejcie and Morgan Table, 36 out of 40 people were chosen as the research sample by using simple random sampling technique.

IV. Research findings

Having collected, summarized and classified the data, whether or not the data were normal was tested by the Kolmogorov-Smirnov test. Then, the t-test was used to study the effect of the above 6 organizational factors on implementing value engineering. In order to analyze the data, SPSS software has been used. The results of the normal distribution of data are shown in table II, and the results of t-test are displayed in Table II.

TABLE II: Results of Normal Distribution

Organizational Factors	Kolmogorov-Smirnov Z	Sig.	Result
Management support	1.201	0.123	Normal
Resources availability	0.859	0.752	Normal
Organizational strategy	1.247	0.133	Normal
Organizational structure	1.148	0.653	Normal
Communication and information technology	0.935	0.569	Normal
Organizational culture	1.114	0.927	Normal

As Table II, the distribution of data related to organizational Factors is normal.

TABLE III: Results of T-test

Hypothesis	Average	t value	Sig.	Result
Management support resources have positive effect on implementation of value engineering.	4.489	17.563	0.00	Accepted
Resources availability has positive effect on implementation of value engineering.	4.297	15.657	0.000	Accepted
Organizational strategy has positive effect on implementation of value engineering.	4.645	18.685	0.000	Accepted
Organizational structures have positive effect on implementation of value engineering.	4.042	14.362	0.000	Accepted
Communication and information technology have positive effect on implementation of value engineering.	3.996	13.537	0.000	Accepted
Organizational culture has positive effect on implementation of value engineering.	4.068	14.387	0.000	Accepted

According to Table III, the results of t-test indicate that management support, resources availability, organizational strategy, organizational structure, communications and information technology, and organizational culture have effects on implementing value engineering in the organization.

V. Conclusion

The present research has been carried out with the purpose of studying the effect of organizational factors on executing value engineering in the organization. Accordingly, after making sure of the normal distribution of data, a t-test was used. The results of t-test indicate that management support, resources availability, organizational strategy, organizational structure, communications and information technology, and organizational culture have effects on implementing value engineering in the organization.

On the whole, the increase in competition and necessity for speed and flexibility in the organization, attempt to reduce the end price and increasing the quality of the product and service, specialization of the activities, variety in the customers, needs and desires, and customers, various needs are all among the main factors that conduce the organizations toward implementing value engineering in the organization.

For the successful implementation of value engineering in the organization, the organizational factors affecting its execution should be identified. Without understanding the rate of effect of each organizational factor on the successful implementation of value engineering, there cannot be a positive view of the successful execution of these value engineering projects in the organizations.

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