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RESEARCH ARTICLE

MULTI-CRITERIA DECISION MAKING METHOD & VALUE ENGINEERING–A NEW CONCEPT IN VENDOR SELECTION

Anup Kumar Rajak *, Malay Niraj, Shalendra Kumar

Department of Mechanical Engineering National Institute of Technology Jamshedpur- 831014, Jharkhand, India

A R T I C L E I N F O

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A B S T R A C T

In this paper we have discussed the concepts of value engineering based function analysis to optimize function and cost ratio in particular situation. The supply selection problem is multi-objective problem involving both qualitative and quantitative factors. These factors and their interdependencies make problem highly complex one. The vendor selection issue has been founded out as one of the fundamental operation in the supply chain. The vendor selection process can be a very complicated and emotional. In this study, a value engineering decision support system has been developed for solving the vendor selection problem with multiple that vendor selection criteria will continue to change based on an expended definition of excellence to include traditional aspects of performance like Quality, Service, Cost, Delivery, Reliability and General reputation.

INTRODUCTION

Value Engineering is an effective problem solving technique. It is essentially a process which uses function analysis, team-work and creativity to improve value [1]. In today's global economy, success is not possible unless a company's supply base is competitive on a worldwide basis [2]. As more companies are attempting to restructure their supply base, they are turning more and more to international outsourcing. In most Industries in the west one of the main objectives of traditional supplier relations objectives of traditional supplier relations has been minimize 'vulnerability' to supplier opportunism and has consequently led to the two sides viewing each other as adversaries [3].

Vendor evaluation and selection is one of the most important components of supply chain, which influence the long term commitments and performance of the company. A supply chain is composed of entities involved in designing new products and services, procuring raw materials, transforming them into semi-finished and finished products and delivering them to end customers. Different parts of a product may and often do, come from all over the world. This practice creates longer and more complex supply chains and therefore changes requirements for the new supply chain management. Supply chains exist both in service and manufacturing organizations.

Literature Survey

According to Leung and Wong (2002) performance directly influences organizational efficiency and effectiveness[5]. Value creation can be developed through new products and services (Miller and Floricel, 2004) and desires for products, and services, besides other value-added offerings (Maskell and Baggaley, 2001).

According to Gheorghe and Liviu (2011), the notion of function is the backbone in a VE exercise which enables the creativity of the product or project to be enhanced (Fong, 1999). Weber et al. [10] and Kingsman et al. [11] to be chosen largely depend on the company's objectives and the type of industry in which the company competes.

The problem becomes more critical in manufacturing units where lot of time and revenue is spent on purchase. Good suppliers allow enterprises to achieve good manufacturing performance and make the maximum benefits for practitioners. A well-implemented integrated supply chain management can affect every part of an organization, increasing asset uptimes, reducing maintenance costs, increasing profits and enhancing the creditability of the business with its customers in supply chain is a group decision making under multiple criteria. Chen et al. [12] & Swaminathan and Tayur [13] describe major issues in traditional supply chain.

In a complicated system development, the decision is made through an organization structure which consists of people with different backgrounds [14]. Function modeling analyzed the product based upon the functions of its components and outside elements. These outside elements, which intersect in a relevant way with the components of the system, are called super system elements. Sharma, D.V.S [15] again has beautifully applied the techniques of VE in elimination of child labour in his article presented in the seminar in Indian Institution of Industrial Engineering and published in the proceeding of IIIE. According to O'Brien, J.J [16] Value Engineering recognizes the increased benefit from early implementation.

Functional Analysis

Three basic elements provide a measure of value to the user: function, quality and cost. These elements can be interpreted by the following relationship:

$$Value = \frac{Function\ Quality}{Cost}$$

Where: Function = the specific work that a design/item must perform.

Quality = the owner's or user's needs, desires and expectations.

Cost = the life cycle cost of the product.

Therefore, we can say that:

Value = the most cost-effective way to reliably accomplish a function that will meet the user's needs, desires and expectations. The main objective of VE is to improve value and VE techniques can overcome many of the roadblocks to achieving good value [17, 18].

Multi Attributes/criteria Decision making method (MCDM - method)

Almost any alternatives, such as an organisation, an action plan, or a product of any kind, can be evaluated on the basis of attributes. An attribute is a property, quality or feature of alternatives in question. Some attributes may break down further into lower levels of attributes, called sub-attributes. To evaluate an alternative, a criterion is set up for each attribute [18].

MCDM method includes three Phases like Selection of criteria/ attributes, Evaluation Phase and Decision Phase.

Selection phase

The following parameters have been selected for value analysis [19, 20 & 21].

- Cost
- Quality
- Service
- Delivery
- Reliability
- General reputation

The following points are given to the different vendor for cost, quality, service, Delivery, reliability and general reputation through comparison. According to cost, here less cost of vendor has more value than high cost of vendor, so low cost of vendor getting more value.

Quality can be defined as an owner's or user's needs desires and expectations. Here we give better point to better vendor. The following points are given to reputed vendor for service, delivery, reliability and general reputation, here maximum point got for best reputed vendor.

Evaluation phase

In this phase we have chosen factor comparison method to evaluate the maintenance practice which has most value.

Factors of Selection

- Cost (A)
- Quality (B)
- Service (C)
- Delivery (D)
- Reliability (E)
- General reputation (F)

Degree of importance

- Major Difference (3)
- Medium Difference (2)
- Minor Difference (1)
- No Difference (0)

Factor comparison matrix

Assuming one company has the following requirements while selecting maintenance practice

- Cost – Average
- Service- High
- Quality -Very high
- Delivery - Very High
- Reliability - Very High
- General reputation - High

The proposed processes for vendor selection are based on weighted points scored as shown in evaluation matrix table and finally vendor 'B' type get highest point and alternately it should be selected as a best vendor.

RESULT

After analysis of above actions, keep the total valuation scores of all vendors in order from high to low and endeavor with the highest score is the best vendor.

With the help of Value engineering we evaluate one of the best Vendor selection, in this study we had taken five parameters for selection of Maintenance practice which are cost, quality, service, delivery, reliability and general reputation and with the help of different phase of Value engineering we found the vendor as vendor 'B' since it got highest score point in evaluation phase.

Table 1 Value point for specific parameters of vendors

Vendor	Point out of 10					
	Cost	Quality	Service	Delivery	Reliability	General reputation
Vendor 'A'	9	7	9	7	8	9
Vendor 'B'	9	8	9	9	9	8
Vendor 'C'	8	8	7	7	7	6
Vendor 'D'	7	8	9	6	7	7
Vendor 'E'	7	5	6	5	6	5

Table 2 Table for paired comparison matrix

Cost (A)	Quality (B)	Service (C)	Delivery (D)	Reliability (E)	General Reputation (F)	Total Weight	Adjusted Weight
A	B1	C1	A2	A1	A3	6	7
	B	B2	B1	B1	B1	6	7
		C	C1	C1	C1	4	5
			D	D1	D2	3	4
				E	E2	2	3
					F	0	1

Table 3 Table for criteria evaluation matrix

Vendors	Cost A 7	Quality B` 7	Service C 5	Delivery D 4	Reliability E 3	General reputation F 1	Total score
Vendor 'A'	9 (63)	7 (49)	9 (45)	7 (28)	8 (24)	9 (1)	210
Vendor 'B'	9 (63)	8 (56)	9 (45)	9 (36)	9 (27)	8 (8)	235
Vendor 'C'	8 (56)	8 (56)	7 (35)	7 (28)	7 (21)	6 (6)	202
Vendor 'D'	7 (49)	8 (56)	9 (45)	6 (24)	7 (21)	7 (7)	202
Vendor 'E'	7 (49)	5 (35)	6 (30)	5 (20)	6 (18)	5 (5)	157

CONCLUSIONS

The results of this study show that the factors related to quality, services, delivery, reliability and general reputation of vendors are the major criteria for assessment and choosing the best vendor in the kind of industry. The study is very helpful for new industry or small scale industry for selecting the best vendor for economic point of view it is new concept for selection of vendor and enhance the moral of employee for taking a strong decision. The time consumption for taking a decision is less in this concept comparison to other technique with the help of VE.

Some of the salient features of the proposed model include-

- This research addresses the strategic importance of vendor selection and order quantity allocation, emphasizing the impact of such decisions on the different stages comprising a supply chain.
- This study may be best suitable concept to achieve the goals of Total Quality Management, Just- in Time & Six Sigma concepts.

This model gives full consideration to vendor demand in supply chain relationship, which enables the hub enterprises to address the issue of vendor selection on function, reasonable and inefficiently.

References

Chen C.T., Lin Ching-Tong, Huang Sue-Fn (2006) , "A fuzzy approach for supplier evaluation and selection in supply chain management", *International Journal of Production Economics* 102(6), pp 289-301.

Chen Wei Tong, Chang Po-Yi, Huang Ying-Hua (2010) "Assessing the overall performance of value engineering workshops for construction projects", *International Journal of Project Management* 28, pp 514–527.

Fong, P. S. W. (1999), "Function-oriented Creative Group Problem Solving, Creative and Innovation Management", 8(3), pp 210-222.

Gheorghe, B. & Liviu, M. (2011), "New challenges for value analysis/ engineering in the light of current economic developments", Review of Management and Economic Engineering, 10 (4), pp 153-166.

Kingsman, B., L. Hendry, A. Mercer, and A. De Souza (1996) "Responding to Customer Enquiries in Make-to-Order Companies: Problems and Solutions", International Journal of Production Economics, 46–47(1), pp. 219–231.

Leung, M.Y., Wong, K.M. (2002), "Value elevation by the evaluation of behavioral facilitation skills", In: Proceedings of SAVE International 42nd Conference, Colorado, USA, May 5–8, pp 139–145.

Ling Xu and Jian-Bo Yang, Introduction to multi-criteria decision making and the Evidential reasoning approach", (Tech. report No. 0106, University of Manchester Institute of Science and Technology, ISBN: 186115 111X, 2001).

Lou S.H. (2001) "Value Engineering in Risk Management", master thesis, Taiwan University.

Maskell, B. H., & Baggaley, B. L. (2001), "Future of management accounting in the 21st century. *Journal of Cost Management*", pp 1-4.

Meimoun Eric and Locke Dick (1999) "International purchasing: Selecting, Engaging and managing the world's Best Suppliers", Houston: American Productivity & Quality center, pp 6.

Miles, L.D. (1972), "Techniques of Value Analysis and Engineering", McGraw-Hill.

Miller, R., & Floricel, S. (2004), "Value Creation and games of innovation", Research Technology Management, pp 25-37.

Niraj M. (2011) "Selection of Maintenance Practice through Value Engineering", *International Journal of Scientific & Engineering Research*, Volume 2, Issue 12.

O'Brien, J.J (1976) "Value analysis in design and construction", McGraw Hill Inc., New York.

Rajak, A. K., Niraj, M. and Kumar, S. (2015) "Improvement in Automobile saleability/acceptability and feasibility through Value Engineering", *International Journal of Scientific & Engineering Research*, Volume 6, Issue 6.

Ram and Susan Helper Mudambi (1998) "The 'Close but Advensarial' Model of supplier relations in U. S. Auto Industry", *Strategic Management Journal* 19.8, pp 776.

Saaty T. L., Multicriteria decision making: The analytic Hierarchy Process, (RWS Publications, Pittsburgh, 1988).

Sarma DVS (2002) "Elimination of child labour through Value Engineering", Proceedings of IIIE.

Swaminathan, J.M. and Tayur, S.R. (2003) "Models for Supply Chains in E-Business", Management Science, 49(10), pp 1387-1406.

Vaidya O. S. and S. Kumar, Analytic hierarchy Process: An overview of application, *European journal of operational research*, 169, 1-29 (2006).

Weber, C. A., J. R. Current, and W. C. Benton (1991) "Vendor Selection Criteria and Methods," *European Journal of Operational Research*, 50(1), pp 2–18.

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