MANAGEMENT TOOLS FOR DECISION-MAKING - VALUE ANALYSIS

Cezarina Adina Tofan

Abstract: Value analysis can be considered the method that defines the competitiveness of the enterprise, being an organized and creative method that satisfies the needs of the beneficiary by a specific activity of the products design, systems or services in terms of their functionality, economic and multidisciplinary. It is a useful method for stimulating and organizing the innovation. Although generally definition for the value analysis is known as a method of reducing the costs, in fact, it is a method that explains and responds to the client's expectations (within the functions of the product).
In the context of the contemporary competition it is necessary a permanent control of the products under the double aspect: of the functions they perform (respective of the concordance with the request) and of the costs[1]. A useful step in this regard is the value analysis. This method aims to optimize the whole product life cycle both at the manufacturer level (cost optimization) and the user level (function optimization). It should be made judicious assessment for the purpose of deciding which criteria are the most critical and in that of determining the degree of accuracy necessary for the data required in order to take a decision. Furthermore, it was shown that the early stages of the value analysis are intended to reduce the degree of uncertainty. This uncertainty relates equally to the marketing, production and financial aspects of a business and the enforceability of its technology.

Keywords: Decisional analysis, adopting the decision, cost of production, decisional methods and techniques, value analysis

JEL Classification: M10, M11, M15, C8.

Introduction: The general term of the value analysis universally refers to a technological investment necessary to determine whether the proposed innovation can be translated into a physical reality.

It is customary to invest very little money outside the technical area before the enforceability to be demonstrated.

Inevitably, the physical form of the final innovation has a major influence on many non-technical factors and limits the amount of useful information that can be collected until it reaches a degree of certainty about the main characteristics of the product.

The method was developed towards the end of the Second World War due to the shortage of the strategic raw materials caused by the high demand for the armaments production. Created situation has made necessary to use some substitutes for these materials, which imposed to redesign the products manufactured in the new conditions.

[1] Maria Niculescu, *Diagnostic economic*, vol. 1, Economică Publishing House, 2003, p 278 – 279;

Method and discussion

Value analysis is a method of research and systematic and creative design which, by the functional approaching aims to objective function study to be designed and implemented with minimal cost in condition of quality, reliability and performance to meet the user requests. Some publications which treats this method use the phrase "Value Analysis", while others use "Value Engineering", but leaving it clear that it is actually basically the same methodology, but with names that differ depending on the time of the study.

Value Analysis (AV) - applies to the existing objects, being a systematic process of improving them by eliminating unnecessary costs acting on the feedback mechanism.

Value Engineering (IV) - applies to the new objects, being a systematic process to prevent and eliminate the causes that generate the unnecessary costs by making the functions with minimal cost, without neglecting the performance, applying from the concept and design phases and acting on the *best-before* mechanism.

Briefly, the objective of a study of AV can be expressed by the relation:

AV = max (VIG/CP) (1.1)

where:

VIG - value of global use (utility) of the studied object (degree of satisfaction of the consumer needs);

CP - cost of production of the studied object

Economic dimensioning of the functions using the value analysis The product, from the point of view of the manufacturer, must be analyzed by answering the questions like*: What means or resources are consumed to achieve the product and its functions? How much do the product and its functions cost? The production cost is: "A sacrifice of resources or value".*

An acceptable definition is *the production cost represents the total consumption of resource required at a certain level (workshop, department, company) to achieve a product or activity*. The notion of cost of production is very complex.

There are numerous classifications of the production costs from several perspectives, which there are presented in Table 1.

Typology of the production costs *Table 1*

N	Classificati terion	Types of	Description	Examples
1.	Changing production e	- variables - partial le - partial nt - constant)	- it changes with the ction volume; - are basically variables but ave fixed components; - are basically constants they contain variable nents; - not change with the ction volume.	- consumption of raw als; of working time; - wages that have constants nents; - machinery maintenance - machinery depreciation.
2.	Distribution	- direct	- can be individualized for	- direct raw materials; direct

	h product	- indirect	roduct - are common for more cts	; - Administrative expenses;
3.	Relationship production s	operational administrative nold	- refers to the technological ions - not directly related to the s	- material consumption - interest, penalties
4.	Content of rk	- passed work - manpower	- refers to materials and nent - refers to operations l out by people	- materials - wages research expenses
5.	Control n	- standard - real	- refers to the planned mption - refers to the incurred ses	- standardized costs - exceeding standards
6.	Making the on	- accounting - marginal - incremental - relevant - of unity - discretionary - technical - incorporated - irreversible	- are recorded in the nting records - refers to the change of the ost, to achieve the last units duct - refers to any change in al costs - are affected by the gement decisions - refers to the losses ed with respect to an ideal on - are determined by gement decisions - are determined by the ction - are created by previous ons and can not be modified - are fixed by a previous on	- raw materials, utilities, rents, consumption of materials - operating costs - cost of giving up at the ageous command - research expenses - consumption of materials, - depreciation costs - insurance, taxes
7.	Economic t	- expenditure (primary)	- regard to the nature of ses	- raw materials; recoverable als; fuel; depreciation; wages; security contributions; loyment contributions; tax on , etc. - direct: raw materials,

		- articles of ıting	- are considering achieving of expenditures	red material - Indirect costs of maintenance peration of machines, general , general
8.	Responsible nducting	- of ɔtion - of execution - of use	- are determined by uctive solution and the ed technology - are determined by failure project - are determined by fect project and mentation	- standardized costs - deviations from norms - service expenses

after processing Condurache G., Ciobanu R.M., Niculae M., *Analiza si ingineria valorii, Performantica* Publishing House, *Iasi, 2004, p. 28-30*

To facilitate reasoning of the economic sizing functions, the following practical rules are considered useful:

R1. After the way in which a landmark, an operation or, in general, an element of cost involved in carrying out the functions, we distinguish:

a) Parts (operations, cost elements) that participate to achieve a single function.

In this case:

$a_{ij} = 1; \quad k_{ij} = 100\%; \quad c_{ij} = c_i$

b) parts (operations, cost elements) that causes several functions in known proportions, rigorously.

For this, the economic sizing parameters are determined.

c) Parts (operations, cost elements) that cause several functions in proportions difficult to determine based on physical principles, objectives, rigorous.

In this case there are necessary techniques for gathering the ideas, brainstorming methods of creativity or similar type and/or statistical investigation between the specialists.

R2. To reduce the risk of misinterpretation in the economic dimension of functions there are recommended few rules of analysis:

a. In the table of the economic sizing (landmarks/functions matrix) will perform analysis from both parts to function and reverse.

b. To be convinced that a cost element contributes to achieve a function is useful its modification for increasing, decreasing or elimination. If the function modifies its usefulness we can conclude that there is a link between the element and function.

c. For the same purpose, to determine the rate of participation of the cost element in carrying out the functions is necessary to modify the item to ascertain to what extent it induces changes to the functions. Functions that are more strongly influenced will have a higher coefficient of determination of analysed landmark (item).

Economic sizing of the functions and calculation weighting of the functions in the cost of production Economic sizing of the function represents the operation that determines the

cost of each function. It requires a good knowledge of the constructive-functional solution of the product, of the value engineering techniques and a very intense work.

In the value analysis, the quantitative and qualitative assessments as a starting point the cost functions based on the following arguments:

a) Looking a product just as a physical body, its cost can be considered in the first instance, fully justified if we consider only the design complexity and the quality of the used materials.

So, the cost of a product just expresses what and how much it was consumed, not what has been achieved.

If, for example, the production cost for a reference of type fuel pump, such as 10,000 lei, it is highlighted only the economic effort, and not the characteristics that required these expenditure and their levels of quality and performance.

b) In the value analyzing, the product is not only defined as a set of materials component (parts, assemblies), but primarily as a set of utilities determined by the relationship between object, user and environment. Therefore, the costs will be assessed in relation to the services that the user obtains from the product, the functions cost expressing more clearly the link between the economic effort and the economic effect.

Deepening analysis based on previous observations, the product cost can result as unjustified. Continuing the previous example, and anticipating some methodological issues, we assume that:

- "Fuel transfer" is not continuous, uniform, even though for the engine, coal and hose were spent 7,700 lei;

- "Reliability", "aesthetics" and "handling" are in doubt, although each attribute required the technical and economical effort etc.

In this case we can conclude that it spent too much for some features of the part, both the costs of some functions and the total cost are too high.

To achieve the economic dimensioning of the functions, we must emphasize the following key concepts in relation to a product:

- Function is determined (materialized) of a part of the studied object, of one or more pieces taken as a whole or partial;

- Each Ri piece has a (c_i) cost, consisting of the following items of expenditure:

$$c_i = c_{mi} + S_i + u_i \qquad (1.2)$$

where:

c_m – material expenses; S_i – wages costs (direct labour)

$$S_i = \sum_{k=1}^{K} S_{ik} \qquad (1.3)$$

s_{ik} – wages costs (direct labour) for each technological operation "k";

u_i – general expenditure of section:

$$u_i = \frac{d \cdot S_i}{100} \qquad (1.4)$$

d –key of distribution of the section general expenses for "i" piece;

n –total number of pieces (i=1...n); K -the number of technological operations

Economic dimensioning of the functions can be performed *globally* or *detailed* by following the steps, with examples for a product: a) Develop the diagram of relationships between pieces and functions and between the technological operations and functions. b) Establish the participation weights of each Ri piece at the Fj functions, respectively, of each technological operation (k) at the Fj function. c) Distribution of the material and workmanship costs of the pieces on each function. d) Calculation of the costs and the functions weights in the total cost of the product.

The objective of the systemic analysis of the functions is to identify the critical functions/ oversized economically, namely the functions whose costs are much higher than the value of their use[2].

To achieve this objective, there is compared for each function the two types of weights determined at the earlier stages: the use value weights (q_j) with the weights of production cost (p_j).

In relation to the coordinate system $qjOp_j$, all functions of an *ideal product* will be located on a line (Δ_1) inclined at 45°.

At a *real product*, its functions may be located in q_jOp_j plan both on a regression line (Δ_2), and in its vicinity, the line will not be inclined at 45 ° (Figure 1).

Through such graphs we can assess whether there is disparity between the functions cost and their contribution to the product value.

The line equation (Δ_2) is $p_j = b \cdot q_j$ and the angular coefficient (b) is determined by the method of the least squares.

$$b = \frac{\sum_{j=1}^{N} p_j \cdot q_j}{\sum_{j=1}^{N} q_j^2} \qquad (1.5)$$

$$\alpha = arctg\, b \qquad (1.6)$$

where:

S - Entropy of the system, showing the degree of dispersion of the points F_j in q_jOp_j plan.

Clearly, the smaller S is, the closer F_j points are on the (Δ_2) line. It may be considered that an object is well designed if $S \leq 0.01$.

In Figure 1 it is shown that the F_3, F_5 and F_1 functions are critical functions for the presented case because their weights in the use value are much lower than weights in the cost of the product and they have to redesign.

[2] Condurache G., Ciobanu R.M., Niculae M., *Analiza si ingineria valorii, Performantica* Publishing House, *Iasi, 2004, p. 32*

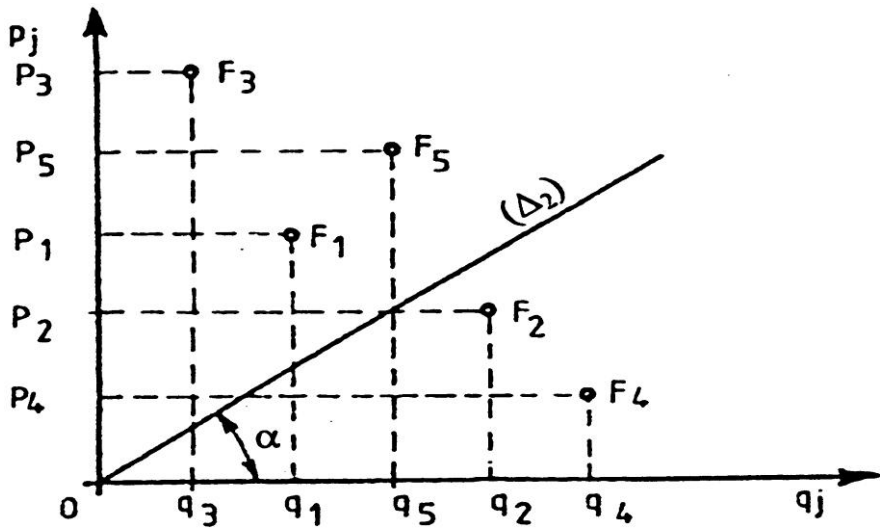

Figure 1 Systemic analysis for a real product

Conclusion

It may be considered that the analysis of value should be the concern for reducing uncertainty in all areas that have an impact on the commercial success of an innovation, as the selection procedure and evaluation to reflect all these factors, as the organizational structure to provide the framework of working in which the evaluation can take place, and finally, it might be necessary to decide more resources than usual for collecting information related to the assessed object.

As a technique for investigating the value analysis is expensive and difficult to achieve. But its application represents a modality to improve the products and company performance. It allows an optimal product, means a product that will perform the required functions necessary from the point of view of the buyer needs, in accordance with a minimal cost.

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