# VALUE ANALYSIS OR VALUE ENGINEERING – ESTABLISHING THE NOMENCLATOR AND THE IMPORTANCE LEVEL OF THE FUNCTIONS

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***Abstract:*** *Value Analysis / Value Engineering, by its nature, is an interdisciplinary issue that focuses on improving the value of the functions required to achieve the goal in question. Its purpose is the systemic application of the recognized techniques to identify the functions of the product as well as the value of these functions and to provide only those functions that are necessary to perform the required performance at the lowest total cost.*

*One of the most important stages of the Value Analysis / Value Engineering method is the elaboration of the nomenclature and the importance level of the functions.*

**Keywords***: Value Analysis / Value Engineering, function, function nomenclature, the importance level of functions.*

**JEL Classification***: M410*

## *1. Introduction*

Rich and Holweg (2000) defines Value Analysis/Value Engineeringas a process of systematic review that is applied to existing product designs in order to compare the function of the product required by a customer to meet their requirements at the lowest cost consistent with the specified performance and reliability needed.

The fundamental principle of the Value Analysis method, put forward by A. Fernandez, is based on an essential principle, i.e. this method should study the value of each function in consensus with the customer and compare the cost of technology or components before establishing the so-called functions and the technical functions needed to answer three

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questions: what should it be done? how should it be done? what decision should be made?

The basic notion used by the Value Analysis / Value Engineering method is the *function*, as a special quality of the object designed, studied, modernized, etc., in relation to the production environment on the one hand and, on the other hand, the user.

The Value Analysis mechanism starts from the correct identification and classification of functions in order to highlight the value of utility that has a primary role in the guidance of the designers and other specialists.

Etymologically, the notion of function comes from *functus* that can be assimilated to the concept of performance, operation, action involved in achieving a goal. Identifying functions and analyzing their content is an evolutionary process. The increasing complexity of the activities carried out within a company requires a new perspective of analyzing and classifying the functions (Dragomir, C., 2008, p. 50). Referring to STAS 11272/1-79, Annex 1 of the standard, we note that at point 3 a classification of functions is performed in relation to several criteria that help us to interpret them, as we can see below in Table 1.

***Table 1. Classification of functions from the Value Analysis point of view***

| Classification Criterion | Function Type | Function Feature |
|---|---|---|
| According to the importance of the functions | ▪ main functions | ▪ corresponds to the main purpose of the object and directly contributes to the realization of the utility value;<br>▪ main functions can be objective or subjective. |
| | ▪ secondary or auxiliary functions | ▪ serves to complete the main function and indirectly contributes to the realization of the utility value;<br>▪ secondary functions are objective |
| According to the measurement possibilities | ▪ objective functions | ▪ functions characterized by objective measurable dimensions with the aid of one or more measuring units |
| | ▪ subjective functions | ▪ functions characterized by psychosensory and social effects (organoleptic, aesthetic, fashion, prestige, etc.); |

| Classification Criterion | Function Type | Function Feature |
|---|---|---|
| | | ▪ the dimensions of the subjective functions are estimated through a survey or a statistical survey |
| According to the contribution to achieving the utility value of the object | ▪ necessary functions | ▪ functions that contribute to the achievement of the utility value of the object |
| | ▪ unnecessary functions | ▪ functions that do not contribute to the achievement of the utility value of the object |
| In relation to the time of the analysis | ▪ existing functions | ▪ the necessary or unnecessary function at the time of the analysis |
| | ▪ new functions | ▪ necessary functions, derived from the users' requirements, attributed to the studied object after the analysis |

*Source: STAS 11272/1-79, point 3, Romania 1979*

Once the functions of an object subjected to the Value Analysis are determined, they are entered into the 'Function Nomenclature' where they are ranked according to importance, on a scale of 1 to 5 (1 = desired, 2 = required, 3 = important, 4 = very important, 5 = vital) according to the following scheme of principle:

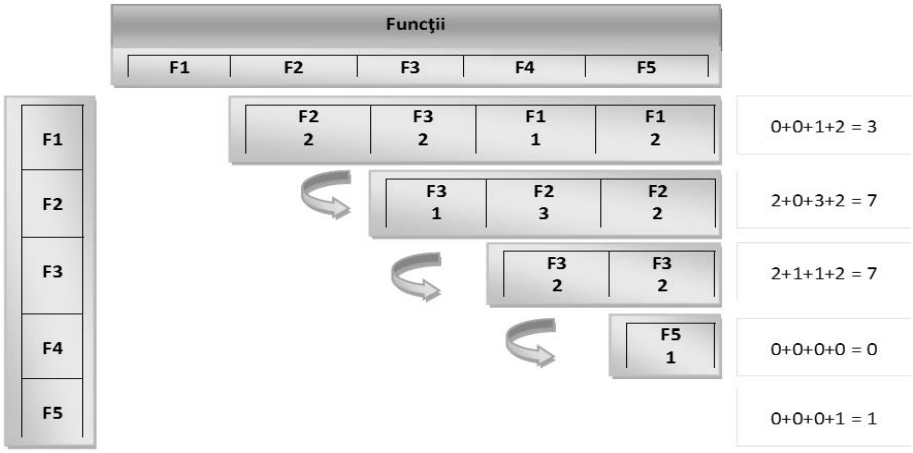


*Figure 1. Clasification of functions according to their importance*

*Source: Charlot, X., (2006), Analyse Fonctionnelle – La Londe les Maures, 11 au 17 juin 2006, 48, http://www.in2p3.fr/actions/formation/ConduiteProjet06/doc-Charlot.pdf*

The nomenclature of functions must be correct, otherwise wrong conclusions may be drawn.

## 2. *Setting the nomenclature and the importance level of the functions*

As I have already pointed out, the correct setting of the function nomenclature of a product is the most important methodological issue of the Valuation Analysis.

The product chosen to make the nomenclature and the importance level of the functions is the low-voltage insulated in PVC cable for vehicles that is also used in electrical installations.

Thus, we determined that the global function (Fg) of the product is given by the electricity transmission. To achieve this function, there are more seven auxiliary functions, derived from the socio-economic functions of the product that are based on the quality-utility-competitiveness correlation, as shown in Table 2.

***Table 2. Functions of the low voltage electrical cable***

| Function | Function name | Category |
|---|---|---|
| F1 | Ensures the cable availability | Objective |
| F2 | Protects the cable against external action | Objective |
| F3 | Ensures that the cable is connected to its external environment | Objective |
| F4 | Ensures the ecology of the cable | Objective |
| F5 | Ensures the easiness of the cable handling | Objective |
| F6 | Ensures the aesthetics of the cable | Subjective |
| F7 | Ensures the socio-cultural effects | Subjective |

To perform the systemic analysis of the functions, each function mentioned in the above table was structured on elementary functions, as shown in Table 3.

***Table 3. Nomenclature of the low voltage electrical cable functions***

| General Function | Function Name | Specific Function | Function Name |
|---|---|---|---|
| F1 | Ensures the cable availability | F1.1. | Ensures cable reliability |
| | | F1.2. | Ensures cable maintenance |
| F2 | Protects the cable against external action | F2.1. | Ensures propagation resistance |
| | | F2.2. | Ensures the minimum radius of curvature |
| F3 | Ensures that the cable is connected to its external environment | F3.1. | Ensures connection to temperature |
| | | F3.2. | Ensures connection with intermediaries, customers or merchants through the storage and shipping flow |
| F4 | Ensures the ecology of the cable | F4.1. | Ensures the use of environmentally friendly materials |
| | | F4.2. | Ensures the environmentally friendly production at the time of manufacture and use |
| | | F4.3. | Ensures product recycling |
| F5 | Ensures the easiness of the cable handling | F5.1. | Ensures easy handling through an appropriate construction dimension |
| | | F5.2. | Ensures ergonomic use by using appropriate materials |
| F6 | Ensures the aesthetics of the cable | F6.1. | Ensures the use of specific copper cable colours |
| | | F6.2. | Ensures the product's aesthetics through its constructive shape and the colours assigned to the materials |
| F7 | Ensures the socio-cultural effects | F7.1. | Ensures the existence of jobs, the need for qualification and poly-qualification |
| Fg = F1+F2+...+F7 | The global function of the product | | |

In order to create the Value Analysis model, we take into account that the value of a product relates both to the cost of the product and to the required function of a product or service.

On the other hand, we consider that the value is inversely proportional to the cost because a product that generates a high cost has a poor, unattractive value for the client, instead it is directly proportional to the function, because the customer, when buying the product, by default, buys and the function it performs.

The cost is easy to measure, but the function of the product, which is the object or the purpose of the product, is more difficult to quantify; however, the function can be measured by its characteristics, performance and delivery characteristics.

This requires the technical sizing of the functions. Practically, it starts from the principle of proportionality, according to which between the cost of each function and its usefulness is a constant ratio, which requires knowledge of the importance that can be given to functions in relation to which the same importance will be given to the consumption of the necessary resources.

For the stated purpose it is necessary to determine the weight of each function in the global function considering the following pyramid of functions:

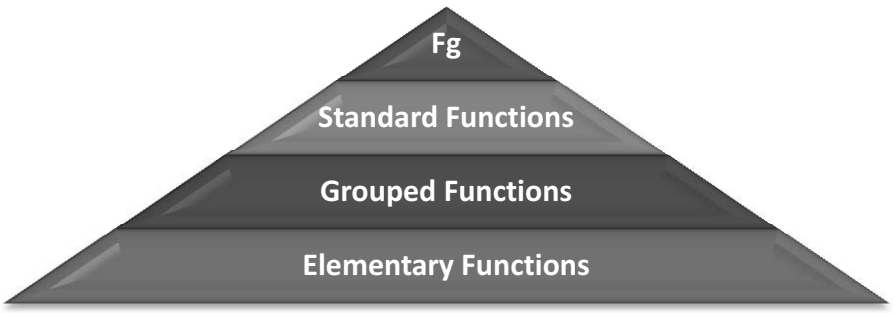


*Figure 2. Pyramid of functions*

Determining the function weights is very important and requires the comparison of the elemental utility values of different nature but whose corresponding variables are measured by different units of measure. The result of the calculations is entered into a square matrix of functions, as shown in Table 4.

**Table 4. The Function Matrix**

| * | F1 | F2 | F3 | F4 | F5 | F6 | F7 |
|---|---|---|---|---|---|---|---|
| **F1** | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| **F2** | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| **F3** | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| **F4** | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| **F5** | 1 | 1 | 1 | 0 | 1 | 0 | 0 |
| **F6** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **F7** | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| **if** | 5 | 7 | 6 | 2 | 4 | 1 | 3 |
| **pf** | 0,18 | 0,25 | 0,21 | 0,07 | 0,14 | 0,04 | 0,11 |
| **Cfg** | 0,89 | 1,75 | 1,29 | 0,14 | 0,57 | 0,04 | 0,32 |

*if – importance level of the function
pf – function weight
Cfg – quantification of the global function

To complet the function matrix we considered the following reasoning:

- the diagonal of the matrix is filled in with number 1;
- compare the functions on the rows (lines) with the functions on the columns, two by two, and assign number 1 to the function considered more important and number zero to the symmetric box relative to the main diagonal;
- determine the importance level of the function (if) summing the values of each column, specifying that the value of a function cannot exceed the total number of the functions taken into consideration, according to the relation:

$$if_j = \sum_{i=1}^{7} a_{ij} \quad (1)$$

in which:

a – the individual value of the 'j' function found at the intersection of the column with the line

i - number of lines

- determine the weight of each function (pf) in the total utility value of the product according to the relation::

$$pf_j = \frac{if_j}{\sum_{j=1}^{7} if_j} \quad (2)$$

The technical dimensioning of the functions allows the critique and identification of some functions that are oversized or sub-dimensioned from the technical point of view and the correlation between the technical and the qualitative level of the product as compared to the socio-economic needs and to the similar products made by other rival entities.

## *Conclusions*

Drawing attention to the general concept of the Value Analysis / Value Engineering, we note that the basic notion it operates with is the function as a special quality of the object designed, studied, modernized, etc., in relation to the production environment, on the one hand, and with the user, on the other hand, which must be correctly identified and classified for the purpose of highlighting the elemental or global utility value.

One of the most important stages of the Value Analysis / Value Engineering method is the setting of the nomenclature and the importance level of the functions. In this approach, we considered that the value is inversely proportional to the cost because a product that generates a high cost has a poor, unattractive value for the client, but it is directly proportional to the function because the customers buy not only the product, but also the function it performs, which is why we made the technical dimensioning of functions based on their matrix.

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