

## PRODUCT VALUE RESIZING IN CORRELATION WITH THE ENVIRONMENT

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**Abstract:** Considering the fact that existing products are created by implementing information into substance using energy obtained through burning fossil fuels, pollution generators, the paper means to resize their value. The paper highlights the fact that the reconsidering of product value in correlation with the environment must be applied in practice without the limiting of social requirements and accompanied with an increase of life quality level for people.

### 1. INTRODUCTION

The economic growth registered in the last decades created abundance and the possibility of fulfilling a wide range of requirements for the population of the industrialized countries, but also discomfort in life quality for all the inhabitants of this planet. The state of discomfort is mostly due to diversification and expanding, at world level, of some phenomena highly intensified by man's actions.

It is unanimously acknowledged [6;2;3] that the huge volume of consume in the case of market economy, but especially the way in which it is produced and consumed, represent the main factors that contribute to the intensification of present worrying phenomena.

The consumption society, the main beneficiary of economic growth is in full process of convincing the population in order to take full advantage of the abundance created.

It has been established, as estimation, that, in the present moment, there are 101 kg of materials being consumed for each inhabitant of our planet, food and fuels not included. Every person on Earth, according to the UNO statistics, consumes annually 137 kg of steel in cars and household items. More than 87% of the cars produced annually and 84 % of the paper is consumed in the countries with a developed economy. The same countries are the users of more than 80 % of the total amount of energy  $5.10^{24}$  ergs that is consumed daily on the entire planet. Almost 75% of the energy consumed in the present is produced by means of fossil fuels burning, producing 80 % of the total amount of the gasses with bad effects in the atmosphere [7]. If for each and every inhabitant on the Earth there are annually emitted 1000 kg of carbon dioxide, [7], in the USA, where the standard of living is very high, there are 6800 kg registered for one person. In order that all the inhabitants of the Earth to enjoy a standard of life similar to those of Americans, according to the papers [3, 6, 15] there is a need for 1.2 planets with the same size and resources as the Earth.

All this consumption is accomplished with the price of seriously deteriorating the environmental conditions and endangering future economical development.

The main phenomena intensified and extended by the unmonitored spread in the environment of products which are secondary to economic activities, are:

- Water, air and soil pollution;
- Global warming;
- The thinner and thinner ozone layer and its penetration, in extensive areas;

- The reduction of natural resources among which the most worrying in short time is the capacity of assimilation environment has.

The negative effects which are owed to the phenomena mentioned above influence negatively human health and ecological balance.

The decrease in the present level of environmental deterioration, which reached the bearable stage, imposes for the future the reconsidering of both production and consumption conditions on the basis of the agreement between economic and environmental laws, of fulfilling the social need together with the possibilities of the environment.

## 2. VALUE APPROACH IN THE CONTEXT OF VALUE ANALYSIS AND ENGINEERING

A method widely used within the research-designing activities for the creation and manufacturing of products, in order to fulfill more and more numerous and diversified customer requirements is that of value engineering (VE). Applied with consistency from the very moment it appeared, the method contributed to the creation of products with better and better technical performances and with costs able to satisfy both the customers and the producers.

The main objective of VE, according to the classic papers [5, 9, 10] but also to new ones [8, 14] is the maximization of the following rapport:

$$\frac{V_i}{C_p} \rightarrow \max. \quad (1)$$

Whose terms represent the usage value of the product  $V_i$  and its production cost  $C_p$ . It is considered [8] that the objective can be accomplished in the following condition is also fulfilled:

$$\frac{\sum F_i}{\sum C_{pi}} \rightarrow \max \quad (2)$$

Where  $\sum F_i$  represents the sum of the "i" functions of the product (partial use values) and  $\sum C_{pi}$  is the sum of production costs of the functions.

Within the VE, the concept of value has a different meaning than the term used currently, in every day speech. A product is usually attributed greater value if it is sold with a greater price [9]. In the case of VE the value increases only if the product has a greater number of functions it covers with reduced costs. In these conditions the value of a product is defined by the rapport:

$$Value = \frac{Functions}{Costs} \quad (3)$$

which is not quantifiable and which, considering the fact that the functions are those which cover the social needs, can be also expresses in the following form:

$$Value = \frac{The\ fulfillment\ of\ a\ need}{Costs} \quad (4)$$

Effectively, the size of the value triggers a direct relation between the fulfillment of a need and the implicit costs in such a way that it can also be expressed by the rapport:

$$Value = \frac{Quality}{Costs} \quad (5)$$

Papers [4; 5; 8; 11] specify that the factors that contribute to the accomplishment of value are: the producer, the customer and society. These papers reflect the rules of market economy which does not see the environment as a participant in the accomplishment of product value and also does not involve it in the use of the profits resulted from their consumption. The most damaging aspect of this part of the market economy is the creation and usage of products whose value was confirmed by the volume of market request but is not in accordance with the requirements of the environment.

A new approach based on the most recent evolutions in the field of knowledge, regarding the aspects previously presented, is offered by the theory of entropic value [1]. According to this theory, the value of the product is objective. It is a form of manifestation of matter and it is governed by economic, social and natural laws. In this sense it is possible to take into account the extension of the theoretical basis some of the principles of VE are based on, such as the functional approach. As a consequence, the functions, regarded as functions that confer value to the product, will not be evaluated anymore only by traditional dimensions, technical and economical, but will be also characterized by a dimension related to the environment. In this way the including of the environment as a participant is motivated, together with the producer, the consumer and the society for the accomplishment of value.

### 3. ARGUMENTS FOR THE RECONSIDERING OF PRODUCT VALUE

The continuous manufacturing of products according to VE classic methods and means, can lead to the deepening and expansion of the present crisis of the environment. Such a possibility is determined by the fact that, within this method of research-design, in its classical form, it is exclusively aimed the maximization of the rapport between  $V_i$  and  $C_p$  (see.cap.2), without taking into consideration the factors that contribute to the accomplishment of value.

An example that shows the insufficiency of the conditions pursued when designing products in accordance with VE requirements, emphasized by rapport (1) is the cooling installations. A stage in the existence of these products was the one in which CFC was used as a frigorific substance that assured the cooling function, the one by means of which the main component of the cooling version use value was assured. Even though the product answered the social demand in the conditions of complete fulfillment of the rapport (1), confirming its value by its large demand from the customers, it was later proved that it had to be reconsidered. The elimination from the market of CFC as a consequence of its declaration as a substance that contribute to the destruction of the ozone layer, according to the Montreal protocol in 1987, confirmed the fact that the appreciation and the initial acceptance of the value of these products were not based on correct and sufficient arguments.

Another example of the interfering of society between the relations between economy and environment is the Kyoto protocol, in 1997. According to this protocol, it was mentioned a reduction of 8 %, by 2012, of greenhouse gases resulted from human deeds.

The purpose pursued is to reduce the intensity of the processes that may cause global warming.

The two examples are in fact the recognition, at a world scale, of the fact that the value of present products, in the way it is considered within the market economy, is obtained in conditions that seriously affect the environment.

The accomplishment of rapport (1) maximization is possible in various ways, as it can be seen in papers [10; 8; 12; 4]. In the case that no special conditions are imposed, all the ways of maximizing are mainly concentrated exclusively on technical and economical factors. In many cases the maximization is obtained in conditions of insufficient awareness of designing data, as it is the case of the first example above, or by ignoring the environment, bearing in mind the advantage of the producers and customers. The accomplishing of product functions as partial use values by means of using some harmful material carriers and some processes that trigger major impacts upon the environment and jeopardize people's health, even if it assures the maximization of rapport (1), as it has been proved in practice [15; 3], can not lead to the accomplishment of real value.

Not even in the case in which the denominator  $C_p$  in rapport (1) is diminished, the implications of the unilateral justification of the VE fundamental objective can not be avoided. It is possible for  $C_p$  to be diminished by a drastic decrease in labor costs and by means of using working hours without correlation with the bearable limits of the human body. It is also possible that the products are made or manufactured in places that have secondary side effects for the environment or the human body. To all these there is something adding, such as the fact that, besides the components of costs that can be evaluated, there are others that are not covered by either the costumer or the producer.

These components consist of both the direct contribution of the environment with elements the manufacturing of the product is not possible without and also in the taking over and integration within the natural circuit of all sorts of refuse resulted from the manufacturing processes. Each and every of the factors mentioned above contribute to the insurance of the manufacturing costs that can lead to the maximization of rapport (1), but which does not mirror reality.

The argumentation presented above leads the conclusion that Value Engineering, as a research-design method, in its classic form, can no longer be used in conditions of safety and should be reconsidered.

#### 4. ANOTHER VARIANT OF RECONSIDERING PRODUCT VALUE

A way by means of which the value of the product can be conditioned in relation to the requirements of the customer and the manufacturer but also with those of the environment is that of changing the final target of the rapport (1). It can be considered adequate the optimization of this rapport and not its maximization in the condition of a reduced numbers of restrictions, as it I the case nowadays, when talking about value engineering. As a consequence rapport (1) will express a new condition, which is:

$$\frac{V_i}{C_p} \rightarrow optim \quad (6)$$

This condition does not exclude the maximization but it imposes that its accomplishment should be obtained in correlation with the capacity of the environment. The accomplishment of the optimization is possible in various ways. Two of them are applicable nowadays with simple means too: the reduction of the energy amount consumed and the efficient use of materials. In every product, as it is already known, an

amount of energy is incorporated. The energy used nowadays is mainly obtained by means of burning fossil fuels, inducing pollution in the environment using out traditional resources [3; 15; 16]. The smaller the amount of energy necessary for the implementation of the functions within the product- for the accomplishment of use value- the lower the pollution and the manufacturing cost of the product. In this way the optimization condition can be fulfilled, being practically satisfied all the three parts involved in the accomplishment of value within society: the environment, the producer and the customer. A lot more profitable for the environment proves to be the use of energy obtained by unconventional methods- solar, hydraulic, wind, geothermal, and so on, which does not pollute and which leads to fewer restrictions as far as the consumption is concerned as it reduces its cost.

The materials used within the structure of the products, as carriers of their functions allow, as well as the energy, the efficient action for the accomplishment of optimization conditions. What is wanted is that, together with the elimination of the possibility of being polluting, the materials to be extracted from the environment and processed in order to be used so that the amount of pollution produced is minimal. Unlike energy, the materials used for product manufacturing, are recycled and reused after their life cycle is over, removing the perspective of their exhaustion as resources. In literature [15; 16; 6] there are presented various ways of using materials in such a way that condition (6) is met.

A way by which we can distinguish between the products that have been conceived and accomplished taking into account the requirements imposed by the environment is ecolabelling. According to community standards, the product bearing this label are made in conditions of strict compliance with environmental requirements all through their entire life cycle- manufacturing, selling, use and post use. It is obvious that ecolabelling also confirms the fact that the product use value is accomplished by means of using materials and technologies which do not have significant harmful impact upon the environment. Even if ecolabelling does not confirm the complete fulfillment of all the requirements of the parts involved in obtaining value, it surely guarantees the taking into account of the environment according to everything previously mentioned.

In the conditions mentioned above the re-conceiving of new products and the development of the already existing ones will have to assure the optimization of rapport (6) starting with the conceiving- designing phase, by means of diminishing economic requirements with the environmental ones. This optimization does not have to take place on the background of reduced fulfillment of social requirements, but on the one of their expansion in the conditions of a high level of life quality. In the long run, this objective becomes possible in the framework of a new way of development with bases in the present, **sustainable development**.

## 5. CONCLUSIONS

- One of the features of present development in our society is the consumption of huge amounts of products;
- The volume of present consumption in the conditions of production technologies hostile for the environment favors the deepening of the environmental crisis;
- Value engineering as a research-design method must be reconsidered by synchronizing it with the most recent evolutions in the field of knowledge;
- In order to avoid from now on the conceiving of products whose value can not be synchronized to the requirements of the environment, it is necessary to reconsider the fundamental objective of value engineering;

- The including of the environment among the factors that take part in the obtaining of value has to do with its objective framework;
- Ecolabelling is a way by means of which there can be identified those products that are conceived by taking the environment into account;
- The step towards the synchronization of economic requirements with those imposed by the environment will be accomplished at the moment of complete fulfillment of social requirements within the coming eco development.

## REFERENCES

- [1] BRAN, P., Economica valorii, Editura Economică București, 1995
- [2] BROWN, R.L., Ecoeconomia, Editura Tehnică București, 2001
- [3] BROWN, R.L., Starea lumii, Editura Tehnică București, 2000
- [4] CONDURACHE, GH. Managementul valorii produsului. Editura Gh.Asachi Iași, 1995
- [5] CRUM, L.W., Ingineria valorii. Editura Tehnică București, 1976
- [6] GORE, AL., Un adevăr.incomod, Rao International Publishing Company, București, 2007, ISBN 978-973-103-110-5
- [7] GRIDAN, T., s.a. Încălzire globală sau glaciațiune. Editura Didactică și Pedagogică București, 2006, ISBN (10) 973-30-1199-1
- [8] IONIȚĂ, I., Ingineria valorii, Editura Economică București, 2000, ISBN 973-590-590-399-7
- [9] MILES, D.L., Techniques of Value Analysis and Engineering. McGraw-Hill Book Company, New-York, 1972
- [10] ORĂNESCU, P. Analiza valorii. Academia Ștefan Gheorghiu, București, 1997.
- [11] PETRESCU, P. s.a. Elemente de analiza valorii, Editura Academiei Române București, 1981.
- [12] PLĂHTEANU, BORIS Ingineria valorii și performanța în creația tehnică, Editura Performantica Iași, 1994.
- [13] POPESCU, I. s.a. Dezvoltarea durabilă – o perspectivă românească. Editura Economică București 2005, ISBN 973-709-139-6
- [14] TUREAC, I. s.a. Dezvoltarea durabilă în construcția de mașini. Editura Universității Transilvania Brașov, 2006, ISBN 973- 635-639-6.
- [15] TUREAC, I. s.a. Dezvoltarea durabilă și reconceperea produselor în construcția de mașini. Editura Universității Transilvania Brașov, 2001, ISBN, 973-9123-32-8.
- [16] TUREAC, I. s.a. Ingineria valorii. Editura Universității Transilvania Brașov, 2002, ISBN 973-9474-44-6.