SYNTHETIC ANALYSIS OF INDICATORS USED IN THE ANALYSIS OF PRODUCT QUALITY DIFFERENTIATED AND NON-DIFFERENTIATED ON QUALITY CLASSES

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Abstract

Product quality has been and will remain one of the most important indicators of increasing economic and financial performance of a company. Quality is that which ensures the greatest part of the competitiveness of a product or service, this being the result of some important aspects such as: products and services of quality to meet consumers requirements, low costs without affecting the quality level, the performance of contractual obligations, customer satisfaction and last but not least obtaining profit.

Research and results concerning this issue will result in the prerequisites in the process for quality assurance that can develop both internally and externally. The purpose of this article lies in the approach and illustration of the aspects of products differentiated and non-differentiated in quality classes.

In launching this research I will try to highlight some aspects that most efficiently the indicators mentioned above, indicators that read to what extent a certain product meets the characteristics specified to its destination.

Key words: quality,coefficient of operation, coefficient of equivalence, defect rate, degree of disponibility

JEL Classification: L1-Market Structure, Firm Strategy and Market Performance

1.Introduction and context study

The analysis of product quality must be continuously one of the most important objectives of a company, because it is a reliable source of increasing economic and financial performance, competitiveness and strengthening of the company on the domestic market, but also abroad. The product and service quality has always manifested and has constituted itself as one of the most important factors for increasing the competitiveness of a company. Various resources of information point to the fact that this indicator is allocated an increasingly larger interest, such an issue being an established objective both on national and international level.

The analysis of production quality categorized according to classes of quality represents a particular significance in establishing the potential of production and sales of companies that run that type of activity. Such an analysis can be run on each product, on categories of products or groups of products or on company level.

In connections with the current concerns in the field of quality of products, it can be evidenced by the plethora of studies and articles on quality analysis from all points of view: control, evaluation, assurance, improvement.

In expertise literature the concept of quality of products and services has allocated several definitions to the concept of quality, such as: the usefulness of the product, the availability of a product or of a service, guaranteeing customer satisfaction, performance the functions for which it had been created, etc. Quality is therefore a complex notion that is ultimately defined according to the purpose and utility of a product or of a service. Here are some of these definitions:

1. Quality reflects the degree of utility of a product, the degree in which, through all its technical and functional, psychosensorial and economic characteristics, it satisfies the need for which it had been created and complies with the restrictions imposed by the general objectives of a society in terms of social and economic effectiveness, and protection of the social and natural environment.

2. Quality refects the degree to which a product or a service, through all its technical, economic, social and operational characteristics, meets the needs for which it had been created. [2]

3. By product quality one understands all the properties and characteristics of a product that satisfy to a certain degree the needs of individual consumption or production. [1]

4. According to ISO 8402-1986 (EN-28402-1991): Quality means all the characteristics of a tangible or intangible entity an it gives it the ability to meet the needs expressed. Entity - self contained contents, limited existence,

value and content. The needs are expressed in the form of specifications and they represent requirements expressed in a contract. [6]

In conclusion, the quality is a general concept and one can find it in all domains, yet it has a subjective character and particular significations for all domains, sectors, functions or certain objects. , and depending on the basic characteristics it contributes to meeting or not the needs for which it had been created.

Quality is a general term applied to the different features and properties, either individual or generic and it has been defined in different ways by various experts or consultants in the quality field, which have assigned this term different meanings. [7]

The present research is directed toward a central goal basically which make reference to the key indicators used in the analysis of product quality differentiated and non-differentiated on quality classes. This objective is divided into the following areas: the methodological analysis of the indicators used in the analysis of the quality of products differentiated by quality class and the methodological analysis of the indicators used in the analysis of the quality of non-differentiated products quality classes.

Also, this study and its results will contribute to the development of the theory and practice of economic improvement in terms of quality of products. This paper will provide a series of theoretical and practical information that provides the ability to supplement the aspects offered by other studies.

2. Theoretical approach on product quality

The improvement of quality at company level has certain characteristics, depending on the domain and nature of activity and the oportunities to measure the quality. Economic and financial analysis treats separately: [4]

- the quality of products specific to different quality classes;
- the quality of products categorized in classes of quality.

A characterization of production quality undifferentiated in classes of quality is achieved in practice by using a system of indicators [3], out of which the most currently used are:

a) the coefficient of technical equivalence ratio or of the unique parameter by means of which the qualitative characteristics of a product are reduced to a single one, in which the beneficiary is particularly interested;

b) the dynamics of refusals from beneficiaries by determining the average coefficient of rejected products reported to the total delivered production;

c) the dynamics of complaints from beneficiaries by determining the number of complaints or the value of claimed products over a certain period of time;

d) the dynamics of expenditures with remedies under warranty, expressed as an absolute sum or level per one million lei production share;

e) technical and economic indicators specific to each sector: efficiency of installations, fuel or energy consumption, endurance, degree of finishing, etc.

f) the renewal rate of production determined as a ratio between the value of new entries in the nomenclature and the amount of goods produced.

As we have stated before, the economic and financial analysis makes a different between products undifferentiated in classes of quality and products differentiated in classes of quality.

The main criteria underlying the classification of products in classes of quality are:[4]

- the quality of materials and of the raw materials used;
- technological procedures used for processing raw materials;
- deviations from internal rules governing the parameters concerning the quality of products;
- national or international standards which provide regulations on the nature of the classification of products in classes of quality.

3. Synthetic Methodology of analysis of quality indicators used in differentiated and non-differentiated on quality classes

3.1. Quality of products differentiated by quality classes

On product level, production quality can be studied using the following procedures:[4]

1. The medium coefficient of quality by product ($\overline{K}$), calculated by means of one of the following formulae:

$$\overline{K} = \frac{\sum qi \times ki}{\sum qi} \quad (1)$$

1.Deviation coefficient of quality:

$$\Delta\overline{K} = \overline{K}_1 - \overline{K}_0 = \frac{\sum qi_1 \times ki_1}{\sum qi_1} - \frac{\sum qi_0 \times ki_0}{\sum qi_0} \quad (2)$$

2.The influence of the components:

2.1.The influence of the physical volume of production sold:

$$\Delta^{qi}_{\overline{K}} = \frac{\sum qi_1 \times ki_0}{\sum qi_1} - \frac{\sum qi_0 \times ki_0}{\sum qi_0} \quad (3)$$

2.2.The influence of quality class:

$$\Delta^{ki}_{\overline{K}} = \frac{\sum qi_1 \times ki_1}{\sum qi_1} - \frac{\sum qi_1 \times ki_0}{\sum qi_1} \quad (4)$$

or:

$$\overline{K} = \frac{\sum gi \times ki}{100} \quad (5)$$

where:

qi – the physical volume of production sold from the "i" class of quality;

ki - „i" class of quality;

gi – the average of products of "i" quality over the volume of total sales.

We register an improvement of quality when the medium coefficient of quality ($\overline{K}$) tends to 1 (I class quality is considered superior), and vice versa.

1.Deviation coefficient of quality:

$$\Delta\overline{K} = \overline{K}_1 - \overline{K}_0 = \frac{\sum qi_1 \times ki_1}{\sum qi_1} - \frac{\sum qi_0 \times ki_0}{\sum qi_0} \quad (6)$$

2.The influence of the components:

2.1.The influence of the structure of production on quality classes:

$$\Delta^{gi}_{\overline{K}} = \frac{\sum gi_1 \times ki_0}{100} - \frac{\sum gi_0 \times ki_0}{100} \quad (7)$$

2.2. The influence of quality class:

$$\Delta^{ki}_{\overline{K}} = \frac{\sum gi_1 \times ki_1}{100} - \frac{\sum gi_1 \times ki_0}{100} \quad (8)$$

2. The medium quality coeficient per product, calculate don the coefficient of equivalence ($\overline{Ke}$):

$$\overline{Ke} = \frac{\sum qi \times kei}{\sum qi} \quad (9)$$

1.Deviation of coefficient of equivalence:

$$\Delta\overline{Ke} = \overline{Ke}_1 - \overline{Ke}_0 = \frac{\sum qi_1 \times kei_1}{\sum qi_1} - \frac{\sum qi_0 \times kei_0}{\sum qi_0} \quad (10)$$

2.The influence of components:

2.1.The influence of the physical volume of production sold:

$$\Delta^{qi}_{\overline{Ke}} = \frac{\sum qi_1 \times kei_0}{\sum qi_1} - \frac{\sum qi_0 \times kei_0}{\sum qi_0} \quad (11)$$

2.2. The influence of coefficient of equivalence:

$$\Delta_{\overline{Ke}}^{kei} = \frac{\sum qi_1 \times kei_1}{\sum qi_1} - \frac{\sum qi_1 \times kei_0}{\sum qi_1} \quad (12)$$

or:

$$\overline{Ke} = \frac{\sum gi \times kei}{100} \quad (13)$$

where:

kei - coefficient of equivalence of the „i" class of quality.

The coefficient of equivalence of a class of quality is determined as a ratio between the unit price of a product of the „i" class of quality and the selling price of the product with the highest quality. When quality coefficient tends to 1 in the development process we register an improvement of quality:

$$1 \rangle \overline{Ke}_1 \rangle \overline{Ke}_0 \quad (14)$$

1.Deviation of coefficient of equivalence

$$\Delta\overline{Ke} = \overline{Ke}_1 - \overline{Ke}_0 = \frac{\sum qi_1 \times ki_1}{\sum qi_1} - \frac{\sum qi_0 \times ki_0}{\sum qi_0} \quad (15)$$

2.The influence of components:

2.1. The influence of the structure of production on quality classes:

$$\Delta_{\overline{Ke}}^{gi} = \frac{\sum gi_1 \times kei_0}{100} - \frac{\sum gi_0 \times kei_0}{100} \quad (16)$$

2.2. The influence of the structure of production on quality classes:

$$\Delta_{\overline{Ke}}^{kei} = \frac{\sum gi_1 \times kei_1}{100} - \frac{\sum gi_1 \times kei_0}{100} \quad (17)$$

3. The average selling price ($\overline{p}$), calculated as the arithmetic average of the volume of production of the „i" class of quality and the price corresponding to the the „i" class of quality:

$$\overline{p} = \frac{\sum qi \times pi}{\sum qi} \quad (18)$$

1.Deviation of the medium selling price:

$$\Delta\overline{p} = \overline{p}_1 - \overline{p}_0 = \frac{\sum qi_1 \times pi_1}{\sum qi_1} - \frac{\sum qi_0 \times pi_0}{\sum qi_0} \quad (19)$$

2.The influence of components:

2.1.The influence of the physical volume of production sold:

$$\Delta_{\overline{p}}^{qi} = \frac{\sum qi_1 \times pi_0}{\sum qi_1} - \frac{\sum qi_0 \times pi_0}{\sum qi_0} \quad (20)$$

2.2. The influence of the average selling price:

$$\Delta_{\overline{p}}^{pi} = \frac{\sum qi_1 \times pi_1}{\sum qi_1} - \frac{\sum qi_1 \times pi_0}{\sum qi_1} \quad (21)$$

or:

$$\overline{p} = \frac{\sum gi \times pi}{100} \quad (22)$$

where:

pi - the selling price corresponding to the „i" class of quality.

The quality of products improves when the medium price decreases, in comparison to the standard basis ($\overline{p}_1 \rangle \overline{p}_0$), which reflects an increase of the average of high quality products in the larger context of prduction.

As a conclusion, these indicators express the degree of compiance to the requests of the product and/or of the service.

1. The deviation of the medium selling price:

$$\Delta\overline{p} = \overline{p}_1 - \overline{p}_0 = \frac{\sum gi_1 \times pi_1}{100} - \frac{\sum gi_0 \times pi_0}{100} \quad (23)$$

2.The influence of components:

2.1.The influence of the structure of production on quality classes:

$$\Delta_{\bar{p}}^{gi} = \frac{\sum gi_1 \times pi_0}{100} - \frac{\sum gi_0 \times pi_0}{100} \quad (24)$$

2.2.The influence of the medium selling price:

$$\Delta_{\bar{p}}^{pi} = \frac{\sum \grave{g}i_1 \times pi_1}{100} - \frac{\sum \grave{g}i_1 \times pi_0}{100} \quad (25)$$

3.2. The quality of products non-differentiated quality classes

The main methods used are: [8]

a)coefficient of equivalence of technical or unique parameter by means of which the qualities of a product are reduced to one, namely that which the client is interested in;

b) operating coefficient (the score) is used in the case of complex products.

The stages of determing the operating coefficient are:

1.establishing the qualitative traits of the product;

2.defining the order of importance of each defining trait;

3. apreciating each qualitative trait whith a number of points;

4. establishing the coefficient of exploitation, according to the formula:

$$KE = \frac{\sum_{i=1}^{n} g \cdot npi}{Np} \quad (26)$$

where:

gi-the share of each qualitative attributes;

npi-the number of points for each qualitative appropriation.

c)defect rate- is set by the formula:

$$Rdf = \frac{\sum_{i=1}^{n} ndi \cdot npi}{Np} \quad (27)$$

where:

Rd-defect rate;

ndi-number of products by categories of defects;

npi-the number of points per category of defects;

np-number of products subject to verification.

The effective rate of defects is compared with the allowable rate for that category of products.

d) degree of availability rate of the product:

$$Rd = \frac{1}{1+\alpha}, \text{ unde}: \alpha = \frac{tnf}{tn} \quad (28)$$

where:

tnf-downtime of a product over the life;

tn-during normal operation of the product.

The more $Rd \langle 1$ the more unsatisfactory the quality of the product.

e) the ratio between the expenditure incurred in the process of exploitation over the life of the product (based on information from users) and the purchase price thereof.

g) dynamics from beneficiaries, can be characterized on the basis of: the share of the total value of deliveries (in dynamics) and the average number of refusals by 1 million lei deliveries (or another order of value of shipments).

h) expenditure dynamics with remedies in the warranty of the products, expressed in absolute size or as a level to 1000 lei turnover.

i) technical-economic indicators characteristic of each area of activity (yield, the content in useful substance, durability, speed of work, etc.).

4.Conclusions

Quality has a rather complex character, caused by the multiple attributes and properties that a product or service must possess in order to be considered a quality or a service product. Thus, for a quality evaluation one must consider a number of criteria or quality parameters used in complying the utility of the product.

The indicators of product quality constitute quantitative formulae of their characteristics and indicate the extent to which a certain product, during the use, meets the the specific conditions for its intended purpose. If a quality indicator relates to a single characteristic it is called simple indicator, and if it relates to several features or to the product as a whole it is called complex indicator, and if it serves as a basis to defining the quality by comparison it is called basic indicator. Class indicators or quality indicators are used in industry fields where products can be included in several quality grades (I, II). The indicator used is the medium average of production of a certain quality (extra, I, II) reported to the total production. To synthetically express the quality of the entire production one uses the following indicators: [5]

- the average coefficient of quality expresses, in one figure, the quality of the entire production. One can state it by calculating he average of coefficients indicating classes of qualities (the figure indicates the class of quality) reported to the amount of products of different qualities, and the total figure reports to the entire quantity of products;
- the general medium quality coefficient – it is used in companies manufacturing several homogeneous products of different quality classes (cement, fabrics). It is calculated by formulating the average value products, all reported toe the total value of products;
- the average price of the product - is calculated for each product whose price varies depending on quality, reporting the product value to its quality.

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