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Quality Analysis of the Product

Abstract. In this article, the analysis of the quality of the product is presented and new approaches based on the indices methods for the product quality are considered. Quality includes various components. The main of them are technical and economic indicators of the product quality as well as quality of production technology and capacities. Furthermore, indicators of reliability, durability, labor, capital and research intensity are also in this list.

Key words: quality, key indicators of the product and service quality.

Introduction

When market relations occur, the strategic priority of any enterprise is provision of necessary product quality level. Furthermore, the key concept related to market items (product, service) is its competitiveness. Quality is complex concept reflecting various factors (beginning from dynamics of development of national economy to the process of organization and management of the product quality in any economic unit). In addition, international experience shows that in the open market, where competition is intense, there are some factors that make quality essential for survival of manufacturers, and determine the results of their economic activity.

The quality is multidimensional concept. Its provision requires consolidation of creativity and real life experience of various specialists. The problems related to quality provision might only be solved in cooperation of government, managers and enterprise's labor unions. Consumers dictating their preferences play a very important role in the solution of this problem.

Product quality is all the features of goods that make it suitable to satisfy particular needs. Quality is determined only for particular period and might be replaced by more developed technology.

Nowadays, product quality is the main component of effectiveness, profitability of the enterprise and therefore, this area shall be prioritized.

The issues of competitiveness and quality are considered in scientific works of domestic sci-

entists such as Dimidenko D.C Derevyanko V. I., Bogomolov L.A. Dzhuran D., Dreiper and others.

Methods

It might be stated that economic science accumulated many theoretical and empirical materials reflecting quality as an important factor of competitiveness in contemporary conditions.

However, some aspects of this problem require further research because transformations in market economy, forms of ownership and methods of economic management changes industrial relations and determine new quality criteria. It might be asserted that theoretical and methodological aspects of competitiveness in relation to the quality are not considered sufficiently in most of scientific works. Not all of the problems related to evaluation methodologies of product competitiveness have been solved. Furthermore, only few scientific works consider model of sustaining competitive position of a company through increase in the level of product quality.

Main body

One of the important indicators in the activities of industrial companies is product quality. Constant improvement in quality is one of the tools for competing in the market and defending positions. High product quality increases the level of demand and profit not only through higher turnovers, but also through high prices (figure 1)

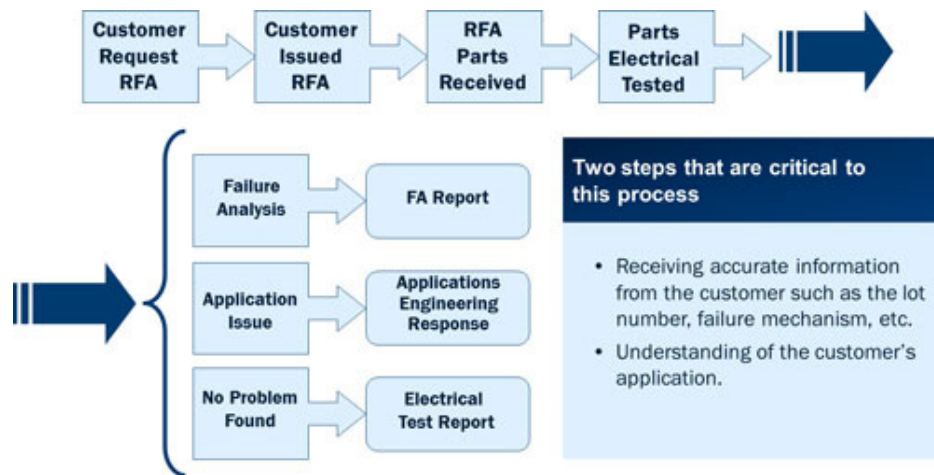


Figure 1 – The product quality

The product quality shall guaranty the customer satisfaction, product reliability and low costs. All these properties are produced in manufacturing activities, stages and sections of the enterprise. The value of the product is also created with these properties. The value creation starts with product development and finishes with its realization and post sale support.

Because a manager is responsible for each stage, division or production activity it is clear why he is also responsible for the product quality. It is assumed that guaranties are technological, ecological, ergonomic, economic and other quality indicators satisfying consumers demand. Quality costs are related not only with product production, but also with production management.

Result 1. The purposes of the analysis and evaluation of quality cost are:

- Determination and evaluation of level of investments necessary to increase and provide quality;
- Provision of required product quality with minimization of overall production and exploitation costs

- Determine the relation of quality provision costs with enterprise's economic performance;
- Determine critical areas of production activity requiring measures for improvement production administration.

The costs related to technological quality control are usually classified in the following categories: labor costs of workers involved in the control process, material costs, and goods in process used in the control process, depreciation of control equipment; other expenses related to overall support services.

Analysis of quality provision costs is usually made to determine the most important objectives for quality improvement. Depending on aims, objectives of the analysis, availability of information there might be different cost management methods. Competently administered analysis of quality provision costs might be the potential for significant cost reduction and improvement of the enterprise's image. Analysis of the product quality shall be presented as a table (Table 1)

Table 1 – Analysis of overall goods quality indicators

Indicator	Previous period	Reporting period	
		Plan	Fact
Weighted average goods quality grade.	0,65	0,81	0,75
Proportion of, %			
a) Highest quality goods	70	80	80
b) Exported goods	0,5	1,5	1,0
c) Defective goods	0,8	0,4	0,3
d) goods reclamation.	0,4	0,7	0,6
Defect losses, thousand tenge.	520	450	400

The evaluations provided in the table show that for the reporting period the organization has performed some work for improvement of goods quality. This is supported by the increase of highest quality goods proportion by 10 % in comparison with previous period. Decrease in share of defected goods result in the decrease of losses by 120 thousand tenge. The negative factor is increase in number of consumer reclamations.

The share of goods, average grade coefficient, and weighted average price are computed for the goods that are characterized by categories or standards on comparative basis. When plan execution is evaluated, actual share of each category in overall goods volume is compared with planned volume. When the quality dynamics is studied, actual shares are compared with shares of previous periods.

Table 2 – Quality analysis of product X

Product grade	Unit price thousand tenge.	Production (units).		Production volume in thousand tenge			
		planned	actual	planned	actual	for first grade price	
						Planned	Actual
I	1,2	10450	11200	12540	13440	1 2540	13440
II	0,8	4800	5050	3840	4040	5760	6060
Total:		15250	16250	16380	17480	18300	19500

From table 2, it might be conclude that if all goods were sold at first grade prices, the full production volume would comprise 18300 thousand tenge which is bigger than actual volume for 3050 thousand tenge and volume of production would increase up to 18300 thousand tenge exceeding actual amount by 3250 thousand tenge. The amount of 3250 is enterprise's lost benefit. If all the goods were the first grade, the planned volume of goods production would comprise 18 300 thousand tenge. Actual – 19500 thousand tenge. The panned and actual grade coefficients

$$\text{Planned grade coefficient} = 16830 / 18300 = 0,895,$$

$$\text{Actual grade coefficient} = 17480 / 19500 = 0,896.$$

Increase or decrease in the goods production based on their grades in reporting period in comparison with plan is determined by the following formula:

$$\Delta \text{Grade coefficient} = \frac{\text{Actual grade coefficient}}{\text{Planned grade coefficient}} \quad (1)$$

The reserve of increase in quality of goods is equal to the difference between value of actually produced goods and the production volume of first

grade goods For planned indicators this comprises: 18300 - 16380 = 1920 thousand tenge and for actual ones 19500 – 17480 = 2020 thousand tenge.

Goods quality is criteria influencing such indicators as revenue, profit or goods production.

Since changes in goods quality firstly influence on price and cost of goods, the following formula might be derived

Change in the volume of produced goods

$$\Delta V_p = (P_1 - P_0) * Q_p, \quad (2)$$

change in revenue of sold goods

$$\Delta B = (P_1 - P_0) * Q_{ПК}, \quad (3)$$

Change of profit:

$$\Delta P = [(P_1 - P_0) * Q_p] - [(C_1 - C_0) * Q_{hq}], \quad (4)$$

where P_0, P_1 – is the price of the item before and after change in quality;

C_0, C_1 – cost of item before and after change in quality

Q_p – Quantity of highest quality goods produced;

Q_{hq} – The quantity of sold goods of highest quality.

It might be also useful to consider analysis of influence of goods grade structure on production volume (in monetary terms) of each item (table 3).

Table 3 – Influence of goods grade structure on its price

Grade	Wholesale price, Thousand tenge.	Goods grade structure %			Change of average price, tenge.
		Planned	actual	+, -	
I	1,2	68,5	68,9	+ 0,4	+ 4,8
II	0,8	31,5	31,1	- 0,4	- 3,2
Total:		100	100	-	+ 1,6

The table 3 shows that with the increase of goods quality in regard to planned indicators (increase in share of 1st grade goods and decrease of 2nd grade goods), the average price increase for 1,6 tenge, while the overall actual value of production by 26 thousand tenge (16250*1,6 tenge).

Similar calculations are performed for all types of goods for which grades are determined, after that the results are totaled.

Important indirect indicator of quality is defective products. It is divided by removable, irremovable, internal (identified in organization) and external (identified by consumer). In the analysis process, the deficiency dynamics is analyzed based on total amount and share in overall goods production. Losses from defective products are determined (Table 4).

Table 4 – Analysis of losses from defective goods

Indicators	Thousand tenge.
Cost of defective goods	620
Expenses related to defects removal	90
The amount of defective products	210
The amount withholder from chargeable workers	100
Losses from defective products	400

The main causes of decrease in goods quality might be:

- Bad quality of raw materials
- Low level of technologies and production administration
- Incompetent workers
- Production arhythmia and others.

After studying the causes of decreases in quality and defective products, the responsible centers are established and measures for defective product prevention are developed. Economic effectiveness of such measures is evaluated based on the level of goods quality, increase of profitability and decrease of costs.

Result 2. The indicators of standardization and unification – are indicators showing if product comprise of standardized, unified and original components as well as the level of unification in comparison with other items.

All the details of the product are divided into standard, unified and original ones. The higher is the percentage of standardized and unified details, the better it is for manufacturers as well as for customers. The indicators of standardization and unification include the following:

- a) object standardization coefficient;
- b) the coefficient of inter-project unification of construction objects sets;
- c) coefficient of repetition of object components.

The control of the quality of bread products is performed to avoid defective finished goods. There are many defects types but we will consider most common of them. We also consider the ways to remove the defects when it is possible. The most common defects of the bread are bubbles and spots at the crust, lack of luster at crust, bleak or very dark crust colors, bent or convex crust and others.

Result 3. The contemporary approach for the entrepreneurship strategy is notion that the quality is the most effective way to satisfy consumer demands and reduce the production costs.

Overall indicators characterizing the quality of produced product (any type or purpose)

- a) Share of new product in total production value;
- b) Share of the highest quality products;
- c) weighted average product grade ;
- d) average grade coefficient;
- e) share of approved and unapproved products;
- f) share of certified products;
- g) share of products complying with international standards;
- h) share of exportable products, including products exported to developed industrial countries.

Individual indicators of the production quality, characterizing one of its features:

- a) usefulness (milk fatness, ash content, iron content in ore, protein concentration in food).
- b) Reliability (durability, operational safety)
- c) Technological effectiveness, construction and technological effectiveness (energy capacity, labor intensity)
- d) Product aesthetics

Indirect indicators are penalties for low-quality products, volume and share of defective products, share of deficiency products (complained), loss from defective goods etc.

First purpose of the research– to study the dynamics of mentioned indicators, in comparison with planned ones, the reason for their changes.

For production which quality is characterized by a grade or standard, the share of production of each grade (standard) in total production, average grade coefficient, the average price of a product are calculated. For evaluation of plan implementation based on the first indicator, the actual share of each grade in the total amount of production is compared with planned shares and for studying the dynamics actual share of each grade is compared with past periods data.

If a company produces products in accordance with grades and grade contents are changed, it is necessary to calculate the change in weighted average prices and cost of the production unit and then based on the algorithms above determine the effect of grade content on revenue, income from sale and production of goods.

The calculation of effect of the grade content of the product on production volume in monetary terms might be performed by all four approaches (those used in analysis of product production structure) described in the previous paragraph.

The level of correlation between particular quality characteristics reflected in monetary terms and their costs or overall product price might be determined by *correlation coefficient*. It might be calculated by the following formula:

The value of r is +0,758, indicates high positive correlation between package of goods (one of its quality indicators) and the price that includes all the cost of goods. This is also supported by scattered diagram.

Result 4. One of the methods used in the analysis of quality cost changes is *index method*.

The index of cost might be calculated with consideration of quality and influence of such factors as consumption of new raw material and their costs on this index might be analyzed.

For the evaluation of quality and competitiveness of the product, the score method and unit price method are used. According to the score method, each quality parameter is assigned a score based on different scales (from 5-10, or 100). After, the average score characterizing the quality of the product is identified. For the calculation of price of a new product, the following formula might be used:

$$P_n = P_b / T_s * T_n \quad (5)$$

Where P_n –is the price of new product (monetary unit), P_b – the price of basic product (monetary unit) T_s – total scores characterizing quality parameters of basic product, T_n – total score, characterizing quality parameters of new product

The method of unit price is determined based on main quality parameters: capacity, productivity etc. the following formula is used:

$$P_n = P_{arB} / P_{arB} * P_b \quad (6)$$

Where – P_{arN} the value of new product quality parameters (score); where – P_{arB} the value of basic product quality parameters (score).

Both of these methods shall be used in making decision regarding the production start-up and analysis of effectiveness of quality improvements. However, to select raw material for goods production all the types of project analysis shall be conducted (commercial, technical, organizational, social, ecological and economic). In addition, all available methods shall be used in accordance with particular conditions. Only such analysis will provide comprehensive and reliable information for the decision- making.

Conclusion

The level of quality of the product is determined based on qualitative and quantitative characteristics. If they meet standards, the production shall be certified.

The ultimate purpose of certification is not only increasing the product quality, but also provision of safety and healthy environment for the future generations.

Low-level (noncompetitive) quality of goods is not abstract concept, but real reason for business failure. Therefore, the quality problem is recognized as the strategic problem. The entities ability to achieve its objectives is determined by its system of administration and management - the quality management system.

Quality management system – includes organizational structure, methods, processes and resources necessary for overall quality management.

Therefore, it is necessary to create and improve the quality management system. Since external as well as internal factors are substantially influence on the produced goods quality, the quality indicators shall meet the following requirements:

- shall result in the increase of the production effectiveness;
- shall take into account new technologies and achievements of the industries;
- shall be stable;
- shall include all the properties of goods that satisfy the needs in accordance with these goods designations.

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