

# ECONOMIC ASPECTS OF QUALITY MANAGEMENT

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The contribution is dealing with the economic aspects in terms of quality. It reveals various aspects of evaluating the economic variables in relation to meeting the quality requirements set for products. The article is an assessment of costs incurring to an organization to ensure quality also in the entire life cycle of the product. The contribution is a treatment of ways of evaluating costs of product life cycle as seen by the manufacturer and the customer as well, while paying due regard to the criteria of system recovery.

**Key words:** quality, life cycle, product, manufacturer, recovery criteria, maintenance costs, depreciation, rate of return

## 1 INTRODUCTION

In these days for most of the organizations the management of quality does not only mean an inevitable and mandatory part of obtaining or holding the certificate of quality, but it turns into an inseparable part of company management with the aim to achieve higher performance and maintain competitiveness in the market. Currently, company leaders and managers view management as a chance to optimization, institutionalization and formalization of company processes, making flow of information transparent, unified and more efficient. In compliance with the STN EN ISO 9000:2000, Quality Management is defined as „coordinated activities focused on direction and control of an organization with respect to quality“.

Most of the analyses conclude that efficient management of quality results in:

- improved economic results,
- greater interest in customer requirements,
- improved corporate culture and staff leadership,
- remarkable changes in the personal development of the employees.

Quality assurance through allocating costs to quality is to be focused not only on the technological aspect of manufacturing, concerned mostly with engines, devices, but also on human factor, the quality of which is of substantial effect in the shaping the final product.

## 2 COSTS OF QUALITY

The art of entrepreneurship consists in defining the relation between maximization of manufacturing and costs on the one hand, and creation of value, i.e. assessment of quality by

the customer on the other. Consequently, quality from the customer point of view is about the materialized ideas on the product he or she is a willing to buy. Manufacturer's point of view of quality is mostly related to lowering costs bound to the deficiencies and defects of the product in the process of their generation or in the course of their selling and utilization.

Costs of quality are part of the economic control of companies, also tactical management of quality and important variables of company functions. These costs enable detection of all the principle factor that affect the quality of a certain product.

The issue of economic analyses of quality is rather demanding as the success of entrepreneurship requires positive results to be obtained at various levels and at the same time. They are as follows: high quality, low costs, short delivery terms, low inventories, full use of capacity and the like.

Improvement of product quality and quality management is essentially a triple final benefit:

- success of the manufacturer on the market, marked with larger amount of selling, higher product prices, greater revenues and consolidating one's position in the market,
- obtaining further numbers of customers giving the manufacturer prospects for the future,
- efficient conversion of all the invested material and non-material assets into the quality of manufacturing.

Economic aspects of quality involve wide variety of economic analyses and its various methods as far as to the entire influence of the quality on the economic efficiency of

manufacturing and the entire entrepreneurial unit. The starting point to the economic synthesis of quality is at cost and price analyses. At the given prices, the decisive factor of profit consists in the costs, and when quality contributes to the rise in the prices, consequently the source of profit is in the price level.

### 3 COST-RELATED ANALYSIS OF QUALITY

Any activity within a company is linked with consumption, or making use of the available sources – factors of manufacturing. Money assessment of consuming factors of production in a company is expressed in the economic category of „costs“. Analysis of the costs falls into two main areas, termed as by classification and relation.

#### Classification analysis

Any company wishing to succeed in the market and comply with the standards of quality, is to give special emphasis to. Inevitable criterion to an analysis and cost assessment is classification of costs, defining the contents and outlining correctly the cost items that can be classified by various aspects for example direct costs, indirect cost, costs of quality, measurable costs and those difficult to allocate, costs of sustainment, improving quality, preventive and follow-up costs, cost on the part of the manufacturer, user, those defined by the stages of the product life-cycle, etc.

The most frequently used classification of cost of quality by the European Organization for Quality, the EOQ :

- *Costs that ensure quality compliance*

The ones allocated by companies in terms of prevention, error detection risk aversion, product compliance investigation, involving cost for preventive actions and assessment (checks and testing's).

- *Costs of poor quality*

Represent the costs allocated to remedies due to errors arising when meeting the quality requirements, or failing to meet them, often related to the costs of internal or external deficiencies and overly stated requirements.

- *Opportunity costs*

They are related to cancellations of orders owing to poor quality or deadlines of delivering products for the customer as well as the follow-up losses from unrealized orders. Expression of opportunity costs in monetary terms is often more complex an issue.

#### Relation analysis

Such an analysis is the follow-up to the classification analysis and enables us to analyze cost and monitoring mutual relations and causal interdependencies between the various kinds of costs, e.g. the proportion of labor related to the entire costs of quality, analyzing mutual relations and consequences between costs of quality prevention, controlling quality as well as defining both the internal and the external impacts of errors made to quality, analyzing the implications of poor quality in production on the increasing or decreasing the costs, relation of costs of procurement and operation, relation of costs of procurement and final liquidation of the product, analyzing the internal and external losses from poor quality and own cost of own production.

For company management of quality it is inevitable to have regular data on costs for summarizing and a follow-up evaluation from the aspects of its relevance and transparency. Experts recommend use of table and graphical evaluations which tells us much on raising or reducing costs of quality, and also applying useful statistical tools and indicators on ratios. Among the most frequently used ones are:

Total costs of quality at the manufacturer –  $N_Q$

Index of change of in the cost of quality at the manufacturer -  $I_{NQ}$

The proportion of the costs of quality on the total costs of the manufacturer -  $P_{NQ}$

Proportion of the costs of the errors on the total costs of quality -  $P_{CH}$

Proportion of costs of the prevention from costs of quality –  $P_p$

Proportion of the costs of quality from the value added –  $P_{PH}$

Proportion of the costs of quality on the total price of the product –  $P_N$

#### 4 COSTS OF THE PRODUCT DURING ITS LIFE CYCLE

The life cycle of the product is an important marketing notion that enables insight into the dynamics of company competitiveness. Product life cycle is treated in the ISO/IEC 15288 Standard titled as the Processes of the life cycle. The notion of product is understood as everything the company is offering to its customers to satisfy their material or non-material needs and requirements. Life cycle is understood as a series of periods of time, not always equal, through which each product is liable to pass until recycled. The simplest classification of the individual stages of the life cycle falls into three periods of time:

1. Pre-production stage – comprising all the activities of non-productional departments and the entire issue of research, development, design, construction including the procurement of material, tools, measuring devices, agents, manufacturing equipment employed until the beginning of the manufacturing process itself.
2. Stage of manufacturing – representing the time of realization the product itself.
3. Post-manufacturing stage – including mostly the period of storage, conservation, package, delivery and use of the product at the customer and finally the liquidation of the product.

Costs of the entire life-cycle for the product can be divided to costs evaluated by the manufacturer and the ones manufactured by the customer. Should we are to evaluate the costs from the aspect of the manufacturer, the total costs of production ( $N_V$ ) should involve costs of research and development related to the product ( $N_W$ ), costs of manufacturing – technical preparation of the production process ( $N_{ZV}$ ), costs of production ( $N_{VP}$ ) and costs of sales ( $N_{OP}$ ). Then we can write

$$N_V = N_W + N_{ZV} + N_{VP} + N_{OP}$$

From customer points of view, the costs of product life cycle ( $N_{ZC}$ ) is made up of:

- costs of procurement ( $N_O$ ), which comprise costs related to the acquisition of the product ( $N_{OV}$ ), purchase of the product, where the purchase price includes the costs of the

manufacturer in the phase of planning, production, sales and the profit margin of the manufacturer ( $N_{OJ}$ ) as well as the costs incurred with setting the product into operation ( $N_{OPr}$ ).

$$N_O = N_{OJ} + N_{OPr} + N_{OV}$$

- operational costs ( $N_P$ ), which are made up of the costs of maintenance and servicing ( $N_{PU}$ ), cost of non-disponibility ( $N_{NE}$ ), opportunity costs ( $N_{OC}$ ) and those of the administration ( $N_{AM}$ ) – Then it can be written that

$$N_P = N_{PU} + N_{NE} + N_{OC} + N_{AM}$$

- costs of liquidation and recycling ( $N_{LR}$ ), which are related to the protection of the environment.

The sum pouf the categories mentioned above are making up the total costs of the product life-cycle:

$$N_{ZC} = N_O + N_P + N_{LR}$$

For a customer it is important whether the entire benefits of the procured product will be larger than the costs of the life-cycle. However, one has to become aware of the fact that the total cost of a life cycle are significantly influenced by the manufacturer already in the period of designing those product parameters that are decisive for the customer. The user can also substantially influence and there by optimize the total costs.

#### 5 CRITERIA OF RECOVERY

Another aspect of monitoring costs is in the issue of recovery in terms of the product or productional facility, particularly when they are making up a functioning system. In such cases, there is a direct relationship between the costs and its recovery.

The economy of system depends also on its design, level of strength or reliability and on the possible maintenance alternatives. In some systems, such as the automatic system of controlling aircraft landing, the need to ensure reliability is overriding the considerations related to cost of maintenance. In some mechanical systems, they are high and, it can be advantageous

to allow for the system to be worn out before it is recovered, than to bear all the high costs of its maintenance.

The criteria set for optimal recovery policy are based on the minimum average costs incurred for a certain period, while disregarding the time-distribution of costs in the course of the recovery interval. The variations in financing options depend on the interest rates or on the applied rate of return.

Among other criteria of recovery are sometimes:

- Recovery following the worn out of the nova ignoring all the economic consideration and is hardly acceptable for large system or only in cases where design and technology change quite often.
- Recovery following the total depreciation of the system, relying on the depreciation rates set arbitrarily so as to enable recovery within the shortest period possible and thereby making it free and salable, once completely depreciated.

Another criterion might be set by interim monitoring of the curve of economic revenues in the light of the total costs of maintenance, or recovery.

## 6 CONCLUSION

Quality is part of the company management that cannot be neglected, as it bears consequences to the entire economic output. Quality is the basis for the success of a company living in a competitive environment and the costs are fundamental to the generation of the highest profit. Life cycle is an area which is related not only to material products but also services that are passing through certain stages during their presence in the market. From the stage the product is found influences the rate of certain cost items, mostly costs of promotion, sales support, or those stimulating sales. Success of the product depends also on the decision when it pays for the company to invest or on the contrary, to reduce cost items.

This is an area that give rise to the issue of recovery often handled by employing pre-established criteria that should reflect all the

decisive aspects with emphasis on quality and economy.

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