

Increasing the Effectiveness of the System by Supply Chain Management on the Basis of the System-Assessment Mechanism

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Abstract— This article is devoted to the development of one of directions of optimization of the system of quality supply chain management in modern enterprise-self-assessment mechanism. In the work of organized approaches to classification by quality costs a new category "anticrisis" quality costs, allowing you to reveal the cost of the quality in the crisis of the organization. Proposed architectural mechanism for self-evaluation. The authors formulate and test hypotheses about the positive impact of the introduction of this mechanism in the system of quality supply chain management.

Keywords— Assessment Mechanism, Quality management, Supply chain management system, Effective mechanisms to control costs

1. Introduction

Supply chain management is an integrated approach beginning with planning and control of materials, logistics, services, and information stream from suppliers to manufacturers or service providers to the end client; it represents a most important change in business management practices [1-3]. It is one of the most effective ways for firms to improve their performance [4]. SCM includes a set of approaches and practices to effectively integrate suppliers, manufacturers, distributors and customers for improving the long-term performance of the individual firms and the supply chain as a whole in a cohesive and high-performing business model [5]. management of modern companies more and more focuses on the quality costs by creating effective supply chain management mechanisms. The diversified business of large structures involves accumulation, distribution and use of significant resources between business units. Effective strategic management of costs for the company's quality

supply chain management allows obtaining tangible competitive advantages that will form stable financial input flows and increase the company's profits. Many SCM studies were conducted in developed countries. Furthermore most of the previous research focuses on the relationship between supply chain management practices and organizational performance [6-10]. in the other side the supply chain of performance there are some studies focused on measuring supply chain performance, such as Performance metrics in supply chain management by [11, 12]. Specifically in the supply chain performance effectiveness. There are very few studies such as [13].

2. Methods

In this article, we used such research methods as analysis, synthesis, deduction, induction, classification, systematization, expert assessment, and statistical analysis.

We systematized different approaches to the definition of "quality" concept, as well as disclosed the main features of this concept. The classifier of quality costs has been expanded due to the introduction of the author's category of "anti-crisis quality costs". The author proposed his self-assessment mechanism, which has been introduced into the quality management system and allows optimizing this system by increasing feedback efficiency.

Modern companies operating in highly competitive markets are forced to carefully manage their costs. One of the main reasons for quality supply chain management is that preventive measures are cheaper than fixing future problems identified as a result of product use. According to Chin-Chow Yang, the benefits of accurately measuring quality costs include: focus of the company's management on the low productivity areas that need improvement. It follows that the quality costs should be quantified.

According to E. Deming, quality should be understood as satisfying customer requests, not only within the framework of meeting their expectations, but also in order to predict future changes in these requests.

According to D. Juran, quality is a measure of conformity with the product purpose or use. According to A. Feigenbaum, quality represents full compliance with the consumer expectations regarding different parameters of products or services, including a set of marketing, development, production and service.

The Japanese scientists' approach to determining

quality is also very interesting. They use quality not through benefits, but through losses. For example, G. Taguchi believes that quality reveals the losses of society associated with inefficient production. K. Ishikawa considers quality as an activity in the design, development, production and maintenance of products, due to its efficiency, usefulness and full compliance with its requirements.

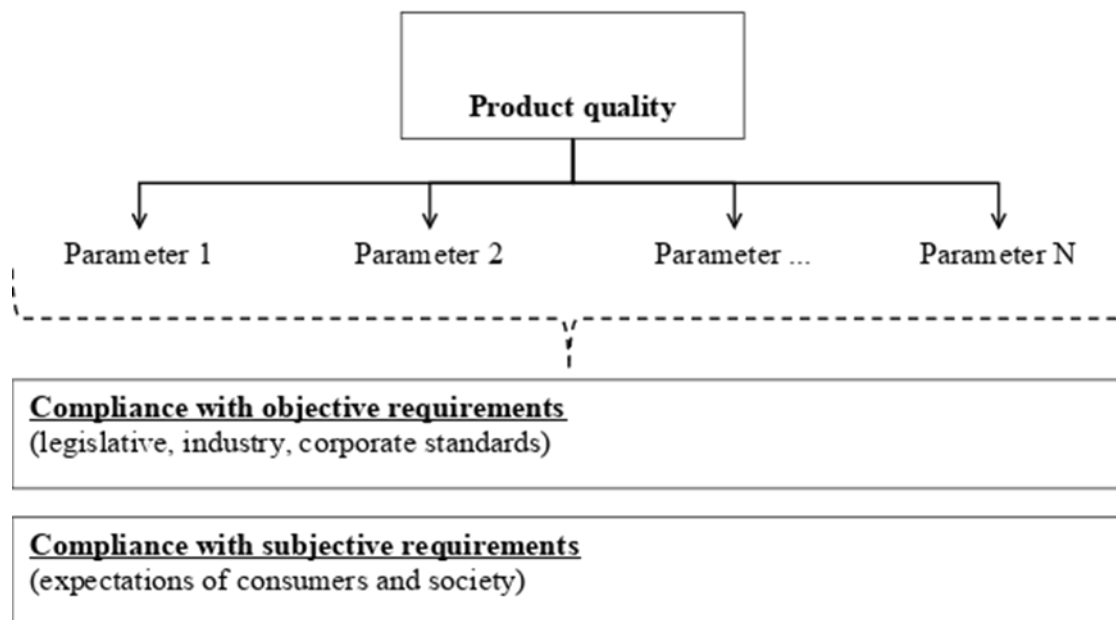


Figure 1 - Definition of the “quality” concept

According to the International Standard ISO 9000:2015, quality is a set of features corresponding to the requirements defined for a given object. Thus, we can define the dual nature of quality. Forming the quality supply chain management system, the enterprise management should ensure the decomposition of product parameters and verify their compliance (Fig. 1).

The information on quality costs is an important aspect in making management decisions by the enterprise management. In their work "Supply chain management: Strategic Aspect", E.J. Blocher, K.H. Chen and T.V. Lin introduced the “hidden factory” concept into the scientific community. Other researchers disclose the quality costs through three areas of company's expenses: costs for preventive measures; costs for conformity assessment of products and their service processes with the requirements and standards.

Such a quality cost classification seems quite objective and requires the introduction of another criterion. Hence, the company's quality costs are classified according to four criteria: preventive costs, monitoring costs, costs for individual defect elimination, anti-crisis costs.

1. Preventive costs include defect elimination costs, i.e. the costs for preventing production of low-quality products. The costs incurred by the

company at this stage can reduce the costs in subsequent stages.

2. Monitoring costs include company's expenses aimed at organizing monitoring and checking the product quality.

3. Defect elimination costs are incurred, if certain problems that can be solved within the framework of the current company's activities were identified within the framework of product quality monitoring.

4. Anti-crisis quality costs arise when the company finds itself in a situation requiring restructuring of business processes and associated with the significant problems in product quality.

At the same time, presence of the quality cost classifier in itself is not a tool for managing the indicated costs. Moreover, the quality management system should include self-assessment mechanisms with financial KPIs. Carrying out the analysis of quality costs, the company's management receives important information for making management decisions.

3. Results

Quality cost analysis methods.

1. Coefficient analysis. The coefficients can be analyzed in dynamics: for example, if the share of the total quality costs to the total production costs is much higher in the current period than in the previous ones, then one should diagnose the relevant procedures and

apply corrective management actions.

2. Trend analysis. The analysis allows making the necessary management decisions to adjust the situation, makes it possible to identify problem areas in the company's processes and quality procedures.

3. Pareto principle. This method is aimed at identifying factors - the root causes - of quality decline, imposing them on the direction of quality costs. Cause and effect charts are used in modern practice of quality management and quality supply chain management so often that they can be distinguished as a separate quality cost analysis method.

4. Cause and effect charts (Ishikawa diagram). These diagrams allow determining the potential causes of quality problems, management can determine the causes of frequently recurring problems and take corrective measures to eliminate them, to show the main reasons in the context of each factor.

This implies the need to include an effective information system in the quality supply chain management system. The information system that provides the quality cost data management should be understood as a set of interrelated methods, techniques, tools, software used to collect, process, store and provide information in order to implement the tasks of the quality supply chain management system.

The quality supply chain management system involves several management levels: strategic, tactical and operational. At a strategic level, the information system accumulates, processes and stores information about market conditions, competition, and features of scientific and technological progress at the present stage; this will allow making informed decisions on investments in quality, identifying strategic reserves. At a tactical level, the information system serves management decisions with a planning horizon of up to 1 year, and uses both internal and external information with this purpose. At an operational level, the information system informs the company's management about what is happening with the quality costs at the moment through a set of online indicators.

The following requirements are imposed on an information system providing a quality supply chain management system:

1. Flexibility - the information system should easily adapt to organizational changes.
2. Multiparametricity - the information system

should provide the ability to configure a sufficient number of parameters to characterize the supply chain management features of a particular enterprise.

3. Congruence - the information system does not contradict the goals and objectives of the quality management system, but helps to achieve them.

4. Fragmentation - the information system assumes the autonomous operation of individual modules in order to reduce operational risk and delimit management tasks, while all modules are linked together at the database level.

5. Security - the information system runs smoothly and maximizes the likelihood of information leakage from databases.

6. Convenience - the information system's interface should be simple and understandable to users, and the system configuration should not require any specialized knowledge and skills of the system administrators.

Almost all the quality management systems are organized according to this principle. However, there is a significant drawback in such a quality supply chain management system construction: management does not understand how correctly the whole system works. Therefore, a self-assessment mechanism should be introduced into the quality management system.

The self-assessment mechanism of the quality management system should include various groups of subjects (enterprise personnel). Opinion polarization should be measured using a relevance coefficient that linearly estimates the average degree of variation in expert judgment. The relevance coefficient will be calculated according to the following formula.

where C_{rel} – relevance coefficient;

n – number of assessment subjects;

X_{empl} – assessment of the quality management system by employees associated with production, product sales;

X_{econ} – assessment of the quality management system by employees of the company's economic service;

X_{man} – assessment of the quality management system by the company's quality management.

The following value interpretation exists for the relevance coefficient.

1. High relevance interval.

C_{rel} is varies from 0 to 33%.

The coefficients that fall into this interval characterize the objective perception of the quality management system on the part of employees, economists and enterprise management. Using this situation, management can improve the quality management system by applying and developing the employee initiative. The likelihood of success of such actions is

very high in this case.

2. Medium relevance interval.

Crel varies from 34 to 66%.

The coefficients that fall into this interval reflect a lack of objectivity in perception of the quality management system. The current situation should be used to adjust the position of assessment subjects. It is also necessary to step up the mechanisms for improving and increasing the

effectiveness of the system of making managerial decisions in the quality field.

3. Quality management system inoperability interval.

Crel is over 66%.

The coefficient falling into this interval reflects significant differences of opinion of the employees, economists and management regarding effectiveness of the quality management system.

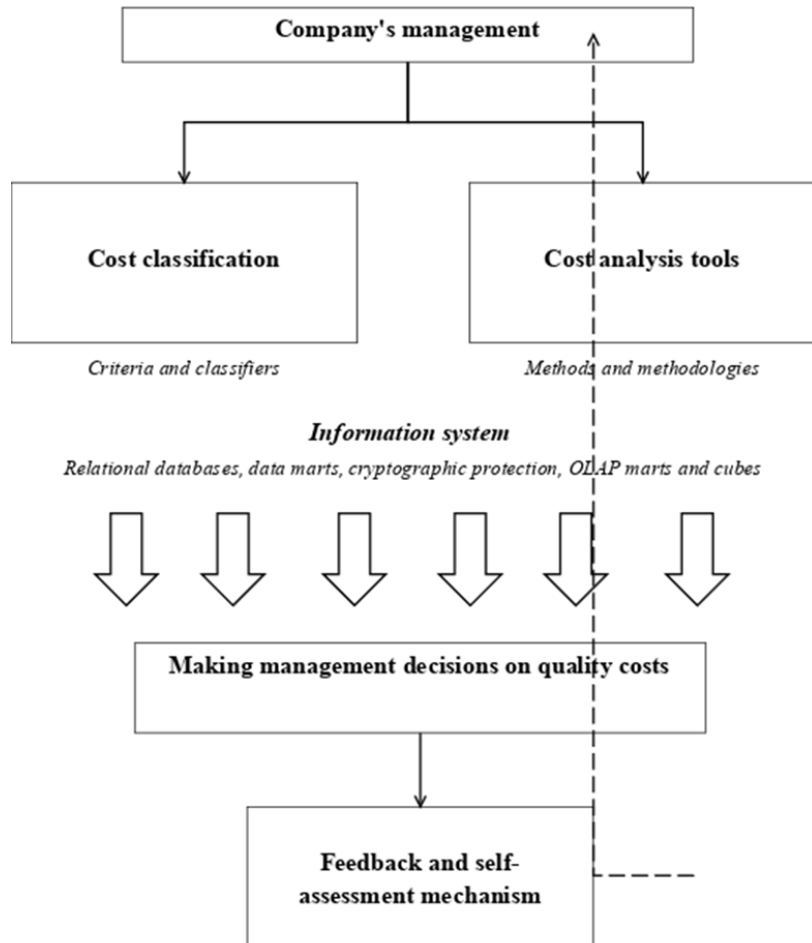


Figure 2 - Quality management system

Management decisions will face the internal employee resistance, and innovation will be completely ineffective. The primary management tasks should be:

- identifying the causes of discrepancies;
- establishing closer contact with the company's personnel;
- determination of the employee satisfaction degree with the quality management process.

Implementation of the self-assessment mechanism into the quality management system requires not only theoretical justification, but also practical testing. Implementation of the self-assessment mechanism in the quality management system will lead to an increase in the effectiveness of this system. For

verification, we will use the services of ELVENT LLC specialized in construction work and consulting services in construction. From February to June 2018, the specialists of this company carried out introduction of a self-assessment mechanism into quality management systems. The self-assessment mechanism users (in the studied firms) included two structural units: accounting or economic department.

It should be noted that the implementation of the self-assessment mechanism in the accounting department took on average 3 business days longer compared to the economic department. The resistance level was also higher in the accounting department.

Thus, the introduction of a self-assessment mechanism is more appropriate for the economic department, rather

than accounting. In our opinion, this can be explained by the traditional conservatism of the views of accountants. However, such a mechanism is a rather mediocre tool for identifying problems in the quality supply chain management. Thus, implementation of the self-assessment mechanism in the quality management system will lead to an increase in the effectiveness of this system.

4. Conclusion

SCM emphasizes the overall and long-term benefit to all parties across the chain through cooperation and information sharing. This signifies the importance of communication and the application of IT in SCM. The formalized self-assessment mechanism makes it possible to fairly objectively assess the optimality of the quality management system, to understand how effectively the quality management is carried out in the company. The use of statistical methods increases the relevance of this mechanism and makes it a good tool to increase the competitiveness of modern companies. A distinctive feature of the proposed mechanism is the relevance coefficient, which allows assessing the degree of divergence of opinions about the quality management system. This makes it clear whether it is possible to introduce innovative methods, or whether it is necessary to reorganize the management process and eliminate existing shortcomings first.

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