Measuring the effectiveness of the quality management system as a tool for improving the organization’s activities

A L Akhtulov¹, L A Ivanova² and E B Charushina²

¹ Omsk Tank-automotive Engineering Institute, 644098, 14 military
town, 119, Cheremushki vil., Omsk, Russia
² Omsk State Technical University, 644050, pr. Mira, 11, Omsk, Russia

E-mail: ahtulov-a1949@yandex.ru

Abstract. The article discusses some recommendations that will help organizations develop and implement their own methodologies for assessing the effectiveness of quality management systems, and suggests a method for determining the effectiveness of processes. The main tasks of evaluating the effectiveness of the quality management systems are formulated. Considered the choice of criteria for their significance.

1. Introduction

In the works [1-6] it is noted that the management at the present stage of economic development all over the world is aimed at creating management systems focused primarily on quality assurance and should be effective and efficient. Issues of efficiency, effectiveness and quality of management systems are relevant when creating the quality management system of the organization.

In the management of an organization, historically, the first to begin to independently discuss the problem of efficiency. The review cited in [6] states that the first management theories were formed to solve the problem of the effective use of labor and technology in industrial production.

As noted in the standard [7], the main task of the organization is to continuously improve the effectiveness of the quality management system. Despite the fact that this standard declares the obligation to determine and increase the effectiveness and efficiency of both individual processes and the quality management system as a whole, but the practical implementation is quite complex and time consuming.

Efficiency is defined by the standard [7] as the degree of implementation of planned activities and the achievement of planned results. In addition, it is explained that performance can be considered performance, achievement (degree of completeness of the action), fulfillment, carrying out (degree of fulfillment) of a command, duty (duty), assignment (goal), promise.

2. Formulation of the problem

In work [1] it is noted that the practice of applying standards [7, 8] proved that “the process approach is so effective that its application seriously changes not only the level of income and expenses, not only the organization of work and the structure of the enterprise, but also the psychology of the staff”. Without questioning this thesis, it is necessary to clarify that the process approach in the quality management
system is as effective as it is implemented (or as we want to implement it), and the economic aspects of quality are not part (characteristic) of the processes and the process approach, but the mechanism for their assessment.

3. Theory
The methodology for evaluating the effectiveness of the quality management system was considered by the authors in [9], but determining the performance indicators of each process is not an easy task for a particular organization.

The standard [8] notes that the use of processes in an organization along with their identification and interaction, as well as the management of processes aimed at obtaining the desired result, can be defined as a process approach. In this case, the quality management system is considered as a system that controls a set of interrelated processes. In addition, each process is considered [1] as a kind of autonomous system with its own "rules of construction":

- the inputs and outputs must be clearly defined and measured;
- each process must be managed;
- process owners must be identified;
- evaluation of the effectiveness of each process;
- the establishment of interaction between the processes occurring in the organization.

Thus, the organization must identify and link those processes that are necessary for its normal functioning.

4. Results
The use of software products will allow you to build the necessary interrelated model of quality management system processes. One of the common tools for building a model is SADT (methodology of structural analysis and design). SADT is a means to collect all the necessary information and to graphically represent this information in the form of a coherent and consistent model.

Graphic image allows you to visually track the entire sequence of processes. Each organizational unit of the organization knows what it has at the inlet and what it should receive at the output, the resources used, what factors influence the process, etc. Using the application package, such as ARIS, BPWin, Business Studio, etc., it is possible to quickly obtain data on the development of a process or organization as a whole (figure 1).

Many experts talk about the meaning of effectiveness and efficiency, methods of evaluation, but they are silent about the characteristics of the process [9]. At the same time, in order to evaluate the effectiveness of the process, it is necessary that when evaluating performance, indicators characterizing economic performance (measured in monetary terms) are used.

The greatest difficulties are caused by the definition of performance indicators and process efficiency. These indicators for each process are set on the basis of the definition and purpose of the process. Since performance characterizes the degree of achievement of the process goal and planned results, therefore, the performance indicator is embedded in the process goal itself.

After the characteristics of the processes are determined and the process model is built (the model of interaction of the quality management system processes), it is necessary to identify and classify the costs of the process.

According to the British Standard [10], the process costs are the sum of the costs for process conformity and costs due to nonconformity and constitute the total cost of the process.

It is necessary to highlight the following characteristics: the purpose of the process, its resources, results, performance indicators and efficiency.

The purpose of the process determines its desired outcome and the corresponding strategic direction of activity.
The resources of the process are financial, technological, labor and information resources with the help of which the transformation of inputs into outputs is carried out. The result of the process depends on the purpose of the process. Process performance indicators characterize the degree of implementation of the planned activity, i.e. achieve the goal, in the results.

Performance indicators reflect the extent to which resources are optimized and losses are eliminated when the desired result is achieved.

![Figure 1. Performance evaluation.](image)

5. Discussion of results
These indicators (table 1) should be designed in such a way that they can show a general “picture” of the development of processes.

Table 2 shows an example of the choice of criteria for evaluating the effectiveness of quality management system processes.

As noted in [2], the practice of applying the standard [8] proved that the process approach is so effective that its application seriously changes not only the level of income and expenses, not only the organization of work and the structure of the enterprise, but also the psychology of the staff.

After the characteristics of the processes, the criteria and the process model (the model of interaction of the quality management system processes) are determined, it is necessary to identify and classify the costs of the process.

Improving the process will lead to an increase in its efficiency, and therefore, to a change in the ratio “costs of compliance - losses due to non-compliance.” With this interpretation of the cost of the process, all costs, its components, will be classified according to the principle of “utility” [2].

The cost of the process consists of the costs of compliance with the process and the costs due to nonconformity and constitute the total cost of the process. Compliance costs - costs [6], which are necessary to fulfill all established and estimated needs of customers (consumers) in the absence of
deficiencies in the existing process. Costs due to discrepancies - the cost of time spent, materials, resources associated with the process of receipt, production, shipment and correction of unsatisfactory products and services.

Table 1. Performance indicators

| №№ | Type                          | Designation                                |
|-----|-------------------------------|--------------------------------------------|
| 1   | Financial indicators          | Labor productivity                         |
| 2   |                               | The average salary per worker              |
| 3   |                               | Profitability of the main activity         |
| 4   |                               | Number of customers                        |
| 5   |                               | Number of concluded contracts              |
| 6   |                               | Number of paid contracts                   |
| 7   | Customer Satisfaction        | Number of fully implemented contracts      |
| 8   | Indicators                    | Number of repeat orders                    |
| 9   |                               | Positive reviews                           |
| 10  |                               | Claims                                     |
| 11  |                               | Awards                                     |
| 12  | Indicators of innovation and  | Number of new products developed           |
| 13  | staff                         | The number of new technologies             |
| 14  |                               | Advanced Training Personnel                |
| 15  |                               | The number of new products launched into production |

Table 2. Criteria for evaluating the effectiveness of quality management system processes.

| №№ | Process                                      | Criteria for evaluation                                  |
|-----|----------------------------------------------|----------------------------------------------------------|
| 1   | Organizational roles, responsibilities and   | Degree of fulfillment of quality objectives             |
|     | authorities                                   |                                                          |
|     |                                              | The degree of fulfillment of goals in the field of ecology|
|     |                                              | The degree of fulfillment of occupational safety goals  |
|     |                                              | The degree of fulfillment of goals in the field of social management |
|     |                                              | The level of execution of decisions and actions according to the results of the quality management system analysis by the management |
|     |                                              | The level of sufficiency of information for analyzing the quality management system |
|     |                                              | The degree of adequacy of the resulting data analysis and decisions |
|     |                                              | The level of management of significant environmental aspects |
|     |                                              | The level of risk management identified                  |
| 2   | Planning                                     | The degree of implementation of plans in the quality management system |
| 3   | Documents management                         | The degree of documentation and availability of relevant documentation in all places of its use |
|     |                                              | The degree of relevance of the documentation             |
| 4   | Records management                           | The degree of fulfillment of the requirements of the records management procedure |
| 5  | Personnel management | The degree of documentation of compliance with the requirements of management systems |
| 5  | Personnel management | The level of staff training in the field of quality |
| 5  | Personnel management | The level of personnel training in the field of ecology |
| 5  | Personnel management | The level of personnel training in the field of industrial safety |
| 5  | Personnel management | The level of staff satisfaction with work in the organization |
| 5  | Personnel management | Staff turnover rate |
| 6  | Infrastructure management | Level of provision with production premises |
| 6  | Infrastructure management | The degree of fulfillment of the equipment modernization plan |
| 6  | Infrastructure management | The degree of implementation of the equipment maintenance plan |
| 6  | Infrastructure management | The degree of compliance of equipment with labor protection requirements |
| 6  | Infrastructure management | Process automation level |
| 6  | Infrastructure management | The degree of effectiveness of the equipment |
| 7  | Environmental management | The level of compliance of discharges into the water with the norms of maximum permissible discharges |
| 7  | Environmental management | The level of compliance of emissions to atmospheric air with maximum permissible emissions |
| 7  | Environmental management | The level of soil contamination in the working area |
| 7  | Environmental management | The level of soil contamination beyond the boundaries of the enterprise in the radius of its impact on the environment |
| 7  | Environmental management | Degree of compliance with environmental legislation |
| 7  | Environmental management | The level of efficiency of the cleaning equipment |
| 8  | Occupational Safety and Health Management | The degree of provision of employees with personal protective equipment |
| 8  | Occupational Safety and Health Management | The level of compulsory social insurance of workers from industrial accidents and occupational diseases |
| 8  | Occupational Safety and Health Management | The degree of compliance with sanitary and hygienic standards |
| 8  | Occupational Safety and Health Management | The degree of fulfillment of fire safety requirements |
| 8  | Occupational Safety and Health Management | The degree of compliance of workplaces with labor protection requirements |
| 9  | Management of metrology equipment | Degree of compliance of measuring instruments and test equipment with the technological, safety and environmental requirements |
| 9  | Management of metrology equipment | The degree of fulfillment of the schedule of verification, calibration, verification, certification of measuring instruments |
| 10 | Civil Defense and Emergencies | The degree of preparedness of the organization for emergency situations |
| 11 | Development of production technology | The level of output of finished products |
| 11 | Development of production technology | The level of consumption of raw materials per unit of production |
| 12 | Purchase of raw materials | Level of compliance of the purchased raw materials with the established purchase requirements |
| 12 | Purchase of raw materials | The degree of fulfillment of the procurement plan |
| 12 | Purchase of raw materials | The degree of implementation of requirements for the safety of transportation and storage of raw materials |
| 13 | Purchase of materials | Level of compliance of the purchased materials with the established procurement requirements |
| 13 | Purchase of materials | The degree of fulfillment of applications for materials |
The degree of implementation of requirements for the safety of transportation and storage of materials

|   | Product measurement and monitoring | Level of provision with monitoring and measurement devices |
|---|-----------------------------------|----------------------------------------------------------|
|   |                                   | Carrying out the control in full in accordance with the documentation. The degree of compliance with the requirements of regulatory documentation during laboratory testing of products |

|   | Management of nonconforming products | The degree of fulfillment of the requirements of the management of non-compliant products |
|---|---------------------------------------|--------------------------------------------------------------------------------------|
|   |                                       | The number of non-conforming products identified at the consumer                     |

|   | Corrective actions | The degree of implementation of corrective measures according to the results of the internal audit |
|---|-------------------|-----------------------------------------------------------------------------------|
|   |                    | The number of recurring mismatches                                               |

|   | Warning events | The degree of implementation of preventive measures on the results of the internal audit |
|---|---------------|-------------------------------------------------------------------------------------|
|   |               | The number of inconsistencies in the processes                                    |

On the one hand, the principle of continuous improvement is a fundamental principle of building a quality management system, and, according to the standard [7], "the continuous improvement of the organization’s activities as a whole should be considered as its constant goal". On the other hand, according to the same standard, quality improvement in the first place should be understood as "improving performance, efficiency, or traceability", and with an increase in the cost of the process, efficiency may decrease. Therefore, the stage of evaluating the economic feasibility of improvements is one of the most important.

It is necessary to analyze the functioning of the organization's processes in order to take corrective and preventive measures. Since the corrective measures were carried out on time, it is a guarantee that these inconsistencies will not be repeated later. Preventive events prevent the occurrence of an event.

### 6. Summary and conclusions

In accordance with the standard [8], the application of the principle of continuous improvement should be a permanent goal for the organization. The implementation of this principle requires, first of all, a certain restructuring of consciousness and the formation of the need for constant improvement of processes and the system as a whole for each employee of the organization. At the same time, the efficiency and effectiveness of all processes should increase.

Currently, for many successful organizations, improving the efficiency and effectiveness of management processes and systems as a whole may be the only way to beat their competitors in the future.

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