

# Standardization As the Main Component of Quality Management Principles

Stefanovskaya O.M.

Department of Industrial Enterprise Management  
Irkutsk National Research Technical University  
Irkutsk, Russia  
olyastefanovskaya@mail.ru

Konyukhov V. Yu.

Institute of Economics, Management and Law  
Irkutsk National Research Technical University  
Irkutsk, Russia  
c12@ex.istu.edu

Zott R.S.

Deputy Head of District  
"Tarasovsky Coal" LLC  
Irkutsk, Russia  
zottroman@gmail.com

**Abstract**—In modern market conditions, the efficiency of enterprises depends largely on their quality policy, on the standards for development and implementation of management decisions. The main element in product quality management systems is standardization, a process of finding the most rational norms, enshrining them in regulatory documents, such as standards, instructions, methodologies, in other words, a set of instruments that determine compliance with standards. The standardization process is one of the most important elements of the modern mechanism of product quality management. A standard is an inherent part of standardization, a regulatory technical document that establishes a set of rules, regulations, and requirements for an object of standardization approved by a competent organization. Standards are presented in the form of documents containing specific requirements, rules or regulations that are binding. Standards include all items for physical comparison: state primary standards for the units of length, mass, strength, etc.

**Keywords**—*standardization, quality management, innovative development, universal quality management, production, control*

## I. INTRODUCTION

There is a direct correlation between the quality management system based on the implementation of standards of ISO 9000 series and the dynamic quality assurance system as a component of the entire original system, projection and detection of quality systems assurance. This correlation is determined by the choice of quality management principles, the satisfaction of which is a necessary requirement for the competitive livelihood of the enterprise.

In these conditions, it becomes necessary to use a systematic approach in order to analyze the technical condition and control the dynamic parameters of the system. Quality management systems development and product quality assurance are the main components of the competitive pressures in the global

market. In this regard, organizations and enterprises pay special attention and control to ensure the quality of products and services. Product quality management and standardization have become a major part of the manufacturing process. The quality management system being developed is based on the implementation of a family of international standards ISO 9000. That is why it is necessary to consider important features of the application of this series of standards in which the role of the customer is defined and the requirements for both the product and the quality system are established.

All of this forms the basis of standardization, and it is able to create a holistic quality management system in an enterprise or an organization [1].

## II. STANDARDS OF ISO 9000 SERIES

Each standard has its own provisions and principles. Let us consider main components of the standards of the ISO 9000 series:

1. Product quality is a distinctive manageable object. Control actions should be carried out on the basis of the automatic control systems principles, consistently setting targets for quality, organizing the actions of the executive mechanism that ensures the implementation of these tasks [2].
2. The goal of quality management is to create products of the quality of such level that is able to meet the needs and demands of consumers.
3. The component of the overall system of successful management of an enterprise or an organization is standardization and quality management.
4. The standardization process involves all personnel working in an enterprise or an organization.

5. Quality management should be applied to all stages of the life cycle of an enterprise or an organization and to all enterprise management levels.

6. The main condition for successful standardization is the harmonious interaction of all structures, all participants in the production process.

7. To implement a quality management system and standardization, a pre-developed model has to be created.

8. The actions of the enterprise or organization personnel, their duties, responsibilities and rights are strictly documented.

All approaches of the quality management system and standardization are set forth in the ISO 9004 standard, which is a methodological guide for the application of a quality system. This standard contains the minimum requirements to meet the needs of consumers.

The procedure of ISO quality management system implementation is common for both international and Russian enterprises. The QMS is implemented at an enterprise by accredited certification centers which carry out all the necessary actions to standardize the company. The final stage of standardization is the issuance of the certificate valid for up to three years.

The development of the ISO 9000 system is carried out individually for each organization and goes through several stages.

The first stage - preparation - is characterized by the enterprise documentation analysis for compliance with the international standards requirements. This stage defines methods for implementing the standard. Also, all the necessary regulatory documents are prepared - methodologies, orders, and regulations. An agreement for certification with a company or an enterprise is signed.

At the second stage the existing QMS undergoes checking. Certification center experts visit the audited enterprise to understand how the current enterprise system complies with international requirements.

At the third stage, according to the results of the audit and analysis, specialists evaluate readiness of the company to operate under the ISO 9000 quality system and, in the event of a positive result, issue the certificate.

Subsequent monitoring of the QMS of the enterprise implies regular documentation checks and evaluation of the effectiveness of the implemented system.

The certification process takes several months.

The ISO standards requirements are basic for all organizations ready to improve the QMS effectiveness of the company. The demand for an ISO QMS depends on the degree of the enterprise focus on the quality of products and services provided.

As all international standards, ISO 9000 is periodically tested for compliance with the existing needs of various stakeholders - government agencies, enterprises, governance institutions, and businesses. The result of such checks is the

revision of the current standard provisions and the release of its new version.

The ISO 9000 standards series includes:

- International standard ISO 9000. Quality management systems. Main provisions and vocabulary.
- International standard ISO 9001. Quality management systems. Requirements [3].
- International standard ISO 9004. Quality management systems. Recommendations for improvements in the operation.

In its form, the standards of ISO 9000 series set requirements for the organization and provide recommendations on the use of management tools such as:

- strategic planning,
- organization structuring,
- process approach,
- office administration and documentation management,
- personnel management.

Standards for quality management systems are widely implemented throughout the world. Most enterprises use these standards in the following cases:

- As a tool for enterprise development, using the requirements and recommendations of standards as a model for improving the management system.
- To demonstrate the ability to consistently supply products and provide services that meet requirements of consumers.
- To evaluate own suppliers.

The quality management system and standardization are powerful tools for improving the efficiency of an enterprise or an organization. The ISO 9000 standards do not contain requirements for the economic aspects of activity, but the record of implementing quality management system shows that greater degree of work organization and coordination significantly increases its efficiency and has a positive effect on the profitability of the enterprise.

### III. BASIC PRINCIPLES OF QUALITY MANAGEMENT SYSTEM

At the modern enterprise, quality management and standardization hold a leading position in the overall management of the organization, along with financial, investment, production, and social aspects [4]. The lack of a regular quality system in many Russian enterprises at a certain business scale leads to the fact that there are not enough management resources to occupy a competitive position in the market. Consequently, an enterprise seeking to take a leading position in the market should incorporate a set of actions, methods, and means for efficient information processing to ensure effective functioning of the organizational structure, methodologies, processes, and resources in the quality management system. Obviously, the more efficient the information processing algorithm in the quality management

system becomes, the more reliable the position of the company in the market is. Consider basic principles of the QMS that can affect the competitiveness and successful functioning of the enterprise. Eight principles of quality management are the main and integral part of the ISO 9000 standards for management review and implementation of preventive actions. These principles do not only create a framework for the remaining provisions of these standards but, more importantly, provide top management with the basis for implementing a good management practice to support the management system of an organization [5].

Recommendations for the operation improvement that should be taken into account while implementing a management system based on the ISO 9001 standard in combination with the following eight principles of quality management:

1. Focus on a customer – Organizations depend on their customers and, therefore, must understand their current and future inquiries, fulfill their requirements and strive to exceed expectations. An organization cannot exist without consumers. There are many aspects of its relationship with consumers, but perhaps the most important one of them is the awareness of their current and future demands and expectations. By understanding those, an organization will be able to concentrate its efforts on meeting current customer requirements and plan its activities focusing on their expectations and resorting in some cases to the help of its suppliers. It is very important that the top management of the organization strategically foresees general and market demands of present and future consumers to develop prospective plans and conclude contracts to meet these requests.

2. Leadership from managers – Leaders establish the unity of purpose and direction of the operation of an organization. They have to create and maintain an internal environment in which staff can be fully involved in the tasks of the organization.

The introduction to the ISO 9001 standard says, "To create a quality management system, a strategic decision of the organization is required." The strategy should be coordinated and communicated to the staff by the leaders of the organization. Section 5 "Management Responsibility" of ISO 9001 should be considered particularly carefully by most representatives of top management. Only with proper information sharing within an organization can the implementation of policies, establishment and monitoring of goals be achieved, which will give impetus to improving the operation of an organization and provide employee motivation to pursue a better life.

3. Employee Involvement – Employees of all levels form the basis of the organization, and their full involvement in the work makes it possible to benefit from using their abilities. The staff is the basis of any organization. An organization cannot exist without workers. The ISO 9001 standard establishes the requirement for the competence of personnel at all levels. It is necessary to make sure that the qualification of each employee is sufficient for the effective performance of the duties.

4. Process Approach – The process approach is one of the cornerstones of the standard. The process should be considered in terms of the question "what is happening?" in the organization while manufacturing products or providing services, in other words, what to do to deliver products or services to the consumer?

An organization should provide its customers with the subject matter of the contract [6]. And regardless of whether the organization manufactures products or provides services, it has to consider itself as a servicing organization — the only difference is in the final product. All divisions of the organization should function as one team with a common goal.

Therefore, the processes should "permeate" the entire structure of the organization, and not be carried out only in departments that are directly related to the manufacture of products or the provision of services. It is important to establish the interaction of all processes that in relation to each other are "input" or "output" processes. The whole complex of processes should be considered as a unified system, none of the elements of which exist in isolation.

In addition, for each organization process operations have to be identified as well as risks associated with them, which will allow to develop documentation corresponding to the competence of the personnel involved in the process.

5. Systematic approach to management – It is not enough to identify processes – they need to be managed. To do this, an organization should understand to what extent processes are interrelated and how to integrate them into a system. In addition, for the processes to function efficiently an organization has to answer the following questions:

- Who is responsible for or who owns the process?
- Does this employee know that the process takes place in proper sequence and interacts with other processes effectively?
- Who is responsible for providing the process with resources (staff and equipment) necessary for its effective implementation?
- Who is responsible for measuring and monitoring the process?
- Who is responsible for improving the process, if necessary?

By conducting such an analysis periodically, managers will ensure that the processes operate in accordance with the adopted policy and enable achievement of goals dictated by business requirements. That is why there should be a clear understanding of the ways how to manage processes, how the organization should assign duties, responsibilities and authorities necessary to sustain the maximum degree of efficiency and effectiveness of processes.

6. Continuous improvement – An organization should not be intimidated by the demands of continuous improvement; on the contrary, it should be considered as a long-term goal. There are always areas for improvement and sources of necessary information in business, the main ones are [7]:

- data feedback from consumers that gives an opportunity to find out what they think about the organization, products and services;
- threats and risks to the business, analysis of which will help to determine where improvements should be made;
- data feedback from the staff which can suggest what improvements should be introduced in relation to the moral climate in the organization and motivation of employees;
- results of discussions with suppliers of aspects of the operation of the organization which will indicate possible improvements in products or services;
- data of internal audits and analysis of own operations which will determine what areas should be improved and will identify appropriate reserves.

Before embarking on improvement actions, at the commencement of work it is necessary to make measurements in this area so that there is information to compare with the results of the improvement made. If there is no certainty that the planned improvement benefits the organization, it should not be carried out.

7. Fact-based decision making – Making a decision based on thoroughly researched and presented in an explicit way facts should be the basis of any business. If the provisions of ISO 9001 are applied as prescribed by this document, then fact-based data, once analyzed, can be further used in making decisions on all aspects of the business, including:

- continuous improvement;
- process improvement;
- increasing customer satisfaction;
- improving the moral climate in the organization and increasing employee motivation;
- senior management adoption of informed decisions that take into account interests and points of view of all parties concerned.

Making right decisions is always a difficult task for any organization, and only the use of fact-based information with experience and intuition can be helpful.

8. Mutually beneficial relationships with suppliers – In any business the role of a supplier is no less significant than the consumer. What happens if the organization has no suppliers? Probably it will be forced to leave the business since it is not able to purchase necessary materials and services [8].

Strong collaboration in the interest of both parties – the supplier and the organization. It should be remembered that an organization is a consumer in relation to the supplier that seeks to do everything thoroughly but perhaps cannot without having complete information about the requirements. This situation is typical for small businesses that rely on their suppliers too much.

Therefore, an organization should inform its suppliers not only about their own requirements but also about current and future requests from their customers, thus allowing making a

plan for the release of promising products or services. At the same time, it is possible to optimize resources usage in the interests of both parties. The exchange of information with suppliers should be carried out in a comprehensive manner and should be constantly improved by establishing reliable interconnections that will help to resolve problems that arise. The existence of such relationships with suppliers is valuable for any party, and, if necessary, they can work together for prompt realization of presented opportunities for mutual benefit.

The eight principles of quality management are basic principles of ISO 9000 standards which are fundamental standards of management systems today. Top management of the organization should implement these standards, monitor and analyze their effects, taking into account the concept and methodology arising from the above principles when introducing or updating the management system. In order for the implementation of ISO 9000 standards to yield results, a clear understanding of the nature of these principles is required, and how they work in conjunction with the requirements of the ISO 9001 standard "Quality management systems. Requirements".

#### IV. STANDARDIZATION. MAIN FEATURES

Standardization is carried out in accordance with the principles [9]:

- voluntary application of standards;
- maximum consideration in the development of standards for legitimate interests of stakeholders;
- use of an international standard as the basis for the development of a national standard;
- inadmissibility of creating obstacles to the production and circulation of products, the execution of works and the provision of services to a greater extent than is minimally necessary to fulfill the goals specified in article 11 of the Federal Law;
- inadmissibility of the establishment of such standards which contradict technical regulations;
- ensuring conditions for uniform application of standards.

As one of the elements of technical regulation, standardization is based on certain starting points – principles that reflect the basic laws of the process of developing standards, ensure the achievement of the goals and objectives of standardization, determine the conditions for its effective implementation.

1. The principle of voluntary application of standards. In the context of the Law "On Technical Regulation" the voluntary nature of standards is not only the main principle of standardization but also the main element which determines the legal status of standards in the Russian Federation as documents that are not binding and are applied solely on a voluntary basis. However, speaking of the voluntary standards, it is necessary to consider a number of the following provisions [10].

Firstly, the requirements envisaged in the standards, for example, for the manufacturer of a product that voluntarily wished to follow them, having indicated it, for example, when marking products, become binding [11].

Secondly, it is impossible to exclude the possibility of the mandatory application of standards, both as a whole and its individual provisions, in the case of a direct indication of this in contracts and agreements. If the parties to the contract have expressed their will to make the requirements of a standard binding, then the fulfillment of these requirements will be mandatory. This provision meets the general rules of the Civil Code of the Russian Federation on contracts and obligations (including their execution).

Thus, the principle of voluntary application of standards indicates the right of the manufacturer (seller, performer) to voluntarily (that is, voluntarily, without coercion) assume responsibility for fulfilling the requirements provided for in the standards. Volunteering is always a choice.

2. The principle of maximum consideration in developing standards of the legitimate interests of stakeholders. By means of an objective consideration of the opinion in the development of standards, the necessary needs of all the parties concerned are satisfied. The development of national standards should be carried out openly with the participation of technical committees on standardization which unite the most competent entities and (or) individuals interested in the standardization of a particular object on a voluntary basis. Taking into account views of stakeholders in the development of national standards is achieved as a result of the procedure for public discussion of the draft standard which takes into consideration all the comments because the parties involved in the discussion are equal, and different points of view converge. When developing standards for an organization, conditions for free participation in the discussion of draft standards for a wide range of employees of the concerned departments of an organization should also be provided. When developing standards of an organization for products supplied to the internal and (or) external market, to side works performed by an organization, or to the side services rendered by it, opinions of representatives of other organizations, customers and (or) purchasers of the products supplied, work performed and services rendered should be taken into account.

3. The principle of applying an international standard as the basis for developing a national standard, unless such application is deemed impossible due to non-compliance of the requirements of international standards with the climatic and geographical features of the Russian Federation, technical and (or) technological features, or for other reasons, or the Russian Federation opposed the adoption of an international standard or its separate provision in accordance with established procedures.

International standards reflect the advanced experience of the economically developed countries of the world, the results of scientific researches, the requirements of a wide range of consumers and government agencies and represent the rules, general principles, or characteristics for most countries, therefore, the application of international standards in the development of national standards is one of the important

conditions for the output of domestic products to the global market. Therefore, the preferential use of international standards as a component (basis) of the development of national standards should take place as such, except for cases where such use is deemed impossible.

This principle generally reflects the provisions of paragraph 1 of section 8 of article 7 of the Law "On Technical Regulation" with the only difference that in the development of draft technical regulations international standards should be used in full or in part as their basis. In this case, the obligation is compulsory. In the principle under consideration, such binding is not envisaged.

4. The principle of the inadmissibility of creating obstacles to the production and circulation of products, the execution of works and the provision of services to a greater extent than is minimally necessary to achieve the objectives of standardization. This principle indicates that requirements (for example, unreasonable restrictions or exaggerated requirements) on products, related processes, and work and services that can create additional barriers that restrict the freedom of entrepreneurial activity and, thereby, hinder the achievement of standardization objectives or contradict them should not be set in standards.

5. The principle of the inadmissibility of establishing such standards that contradict technical regulations. One of the goals of standardization is to promote compliance with technical regulations. Accordingly, the standards can supplement, specify (but not duplicate) any requirements of technical regulations, thereby ensuring an increase in the minimum level of security established in them, but not contradict them.

6. The principle of ensuring the conditions for the uniform application of standards should be considered by taking into account the provisions of paragraph 2 of section 2 of article 15 of the Law "On Technical Regulation" according to which national standards are applicable equally regardless of the country and (or) the place of origin of the objects of technical regulation, as well as the performance of work and the provision of services, types or characteristics of transactions and (or) people who are manufacturers, performers, sellers, purchasers.

The standards of organizations may contain information constituting a commercial secret (secret production). The implementation of such standards by non-employees of the organization that developed and approved the standard can be carried out only with the consent of the organization on a contractual basis. In addition, the procedure for developing, approving, registering, changing and canceling the standards of organizations is established by them independently. In accordance with this, it is very difficult to ensure conditions for the uniform application of the standards of organizations. Uniformity in application can manifest if the standards of organizations are developed, for example, within a holding or a joint stock company with an extensive network of subsidiaries. In this case, their member societies will equally apply the standards approved by the parent organization.

It is interesting to note that earlier in the Russian Federation Law "On Standardization" it was directly indicated that state (now national) standards, as well as industry standards are not

subject of copyright (section 4 of article 6). However, with regard to the standards of the enterprise (now - the standards of organizations) and the standards of scientific, technical, engineering societies and other public associations such a reservation was not made.

7. In the Concept of the national standardization system development, along with the above-mentioned principles there are such principles of standardization as:

- ensuring the continuity of work on standardization in the Russian Federation;
- validity of the development of national standards;
- openness of national standards development processes;
- ensuring the availability of national standards and information about them for users;
- unambiguous understanding of the requirements included in national standards by all interested parties;
- progressive and optimal requirements of national standards;
- application of the requirements of national standards in contracts concluded between the manufacturer and the consumer.

Thus, standardization is a complex process which has its own structure and principles which makes it possible to raise the level of an enterprise quality management system.

#### V. CONCLUSION

Standardization is the process of establishing and applying rules with a view to streamlining in this area for the benefit and with the participation of all stakeholders (in particular, to achieve overall maximum savings while complying with functional conditions and safety requirements). A standard is a regulatory technical document on standardization which establishes a set of rules, regulations, and requirements for a standardization object and is approved by the competent authority. Standards are presented in the form of documents containing specific requirements, rules or regulations binding.

The standardization of the ISO 9000 quality management system offers the following possibilities to any manufacturer:

- arranging the organizational structure of production into the system;
- increasing demand for manufactured products, and, therefore, improving sales;
- creating own brand well-known in the world market;

- increasing product competitiveness;
- reducing financial losses by reducing defects due to the improved quality of goods production;
- gaining an advantage at tenders and competitions for the procurement of goods;
- increasing the number of regular customers.

Standardization is essential; standards provide an opportunity to increase the competitiveness of goods and services abroad.

Standardization at an enterprise entails business reengineering of an organization, which is directly related to the introduction of information technologies. Software is used to optimize business processes and service them. To implement a full-fledged quality management system, an enterprise needs to document its activities in all areas that are elements of the quality of this standardization and to ensure the real functioning of business processes in all these areas in full compliance with the standards. The final step in the standardization of the quality management system is compliance testing and certification.

#### References

- [1] B.S. Ageev and V.V. Chursin, "Operating reliability improvement for fuel injecting facilities of diesel engines," Works of the All-Russian Research Institute – Heavy Engineering, vol. 34, pp. 50-55, 1981.
- [2] A.A. Alekseenko and S.V. Ratner, "Project funding of innovation activities," Quality. Innovations. Education, vol. 4, 2014.
- [3] A.M. Bondaruk, "Automated quality management systems in technological processes," Moscow: Ufa, 2017.
- [4] A.G. Vasilyev, D.A. Ivashintsov, P.M. Fedorov and S.G. Shulmann, "Modern methods for reliability and environmental safety assessment for power engineering facilities," Proceedings of All-Russian Research Institute of Hydrotechnics named after B.E. Vedenev, vol. 233, pp. 3-10, 1997.
- [5] V.V. Vensel, "Integrated regression and correlation: Statistical modeling of dynamics rows," Moscow: Finances and Statistics, 1983.
- [6] A.L. Galinovsky, "Quality management information systems in automated and automatic production," Moscow: INFRA-M, 2018.
- [7] B.I. Dotsenko, "Dynamic systems diagnosing," Kiev: Tehnika, 1983.
- [8] A.S. Dulesov, "Calculation of reliability indices for electrical systems using experimental planning methods," Proceedings of Higher Educational Institutions. Power Engineering, vol. 11, 1990.
- [9] V.V. Efimov, "Means and methods of quality management," Moscow: KnoRus, 2018.
- [10] D. Kouzen, "Statistical quality control methods," Moscow: Fizmatgiz, 1961.
- [11] I.M. Lifits, "Competitiveness of goods and services," Moscow: Yurayt, 2017.