

IMPROVING THE METHODOLOGY FOR THE DEVELOPMENT OF THE QUALITY MANAGEMENT SYSTEM IN THE DIGITAL ECONOMY

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Annotation

In this article are discussed the issues of improving the methodology for the development of a quality management system in the context of digitalization. A modern quality management system combines an organizational structure, documentation and information structure, as well as processes that affect quality. For the effective functioning of the quality management system, these structures must be interconnected and fully cover the organization. With the transition to digital technologies, it is necessary to improve the methodology for the development of quality management systems.

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Digitalization is still singled out among the trends of modern world development, which is rapidly and intensively affecting the transformation of all spheres of public life. The most important feature of digitalization and its generating mechanism at the end of the last century and the beginning of this century is considered to be the emergence and spread of the Internet, which led to the formation of a single global information space.

The development of digital technologies significantly expands the possibilities of quality management in companies in various fields of activity by reducing the "human factor". Digital transformation eliminates the "routine work" of many quality management tasks that must be performed by people in any organization. With the advent of digital technology, the challenge is to change processes and procedures so that people and digital devices can contribute to quality improvement.

The development of digital technologies has led to a change in views on modern technologies. This is especially true for high-tech industries, but it is also important for other industries. Not only individual machines and digitally controlled devices are appearing, but also entire technological robotic complexes. In such systems, existing quality management methods lag behind technological processes in their capabilities. This discrepancy can be eliminated by integrating quality management methods with the capabilities of digital technologies. The capabilities of these technologies make it possible to improve the efficiency of solving many quality management tasks. As an example, digital technologies such as multidimensional data storage, operational analytical processing and data mining, and others can be cited.

Literature review. The issues of improving the quality management system at enterprises are considered in the scientific works of many foreign scientists, in particular, I.Ansoff, M.H. Meskon, M.

Albert, Y.Khedouri, A.Fegenbaum, J.H. Harrington, G.G.Azgaldov, V.G.Versan, G.G.Belekchan. Such scientists as V.A.Vinarik, E.A.Kovrigin, N.S.Yashin, L.F.Popova, S.V.Bocharova and others dealt with issues of quality management and development of the quality management system in the digital economy [8-12]. N.K.Yuldashev, D.T.Yusupova, M.U.Badalova and other Uzbek scientists conducted scientific research on the study of common problems of improving the quality management system in Uzbekistan [13-14]. Although these studies conducted by foreign and domestic scientists are an important theoretical and methodological source, some issues related to improving the methodology for the development of quality management systems in the context of digitalization have not been fully studied, and this represents the relevance of the topic.

The main part. The quality management system (QMS) is a part of the overall management system of the company, which operates in order to ensure stable quality of products and services provided [6]. The methodology of the quality management system is based on the principles of systemic and process approaches. The principle of consistency is implemented in the management of the company as a system of interrelated processes aimed at achieving set goals. The process approach allows you to identify the processes that most affect the achievement of goals. At the same time, the inputs and outputs of processes, internal and external customers, suppliers and other stakeholders are identified and measured. Thus, the processes performed within the product life cycle determine the construction of the organizational structure of the enterprise. The execution of all processes for all elements of the organizational structure is documented. At the same time, the effectiveness of the quality system at each level is confirmed by relevant quality data. Accordingly, a modern quality management system combines an organizational structure, a documentation structure and an information structure, as well as processes that affect quality. It is obvious that for the effective functioning of the quality management system at the enterprise, these structures must be interconnected, fully cover the organization and all processes [8, 10, 15].

The organization of the quality management system involves the creation of the following documentation structure:

- Quality Manual;
- Quality policy and objectives;
- Mandatory documented procedures;
- Regulations of processes and procedures, work instructions;
- Quality records.

The Quality Manual is a general guidance document that describes the interaction of all elements of the quality system. The policy and goals in the field of quality determine the directions of movement, the ways of development of the company. Regulations of processes and procedures and work instructions are normative documents that employees of the enterprise follow in their activities. Quality records are the media of information that appears in the course of the organization's activities, they record all the events that have happened. Quality records allow you to get information about the functioning of the quality management system and identify new, more advanced ways of developing an enterprise in the field of quality. Thus, the documentation of the quality management system reflects the principles of the organization and development of an integrated quality management system in the enterprise.

Currently, the issue of developing a quality management system in the context of digitalization is becoming more and more urgent, which leads to the improvement of its methodology. Methodology is a system of principles, methods and approaches that is used to solve certain tasks or achieve goals in any field. In the context of quality management systems, the methodology covers a sequence of steps and tools aimed at improving processes and improving the quality of products or services.

The main components of the methodology:

1. Principles: Customer orientation; leadership; employee participation; process approach; systematic approach to management; continuous improvement; factual approach to decision-making; mutually beneficial relationships with suppliers;
2. Methods: PDCA (Plan-Do-Check-Act): a cycle for continuous process improvement; DMAIC (Define-Measure-Analyze-Improve-Control): methodology used in Six Sigma; Lean: an approach to optimizing processes by eliminating losses; tools: root cause analysis: using techniques such as "5 why" or "Ishikawa Diagram", to identify the causes of problems; control cards: for monitoring and managing processes; surveys and questionnaires: to collect feedback from customers and employees;
3. Implementation stages: current status analysis: understanding current processes and identifying problems; setting goals: defining clear and measurable improvement goals; developing an action plan: drawing up a strategy and steps to achieve goals; implementation: implementation of developed solutions; monitoring and evaluation: evaluation of results and correction of actions, if necessary.
4. Quality culture: creating an environment in which quality is perceived as a shared responsibility, and all employees actively participate in the improvement process; methodology is the basis for effective quality management and contributes to the creation of a sustainable and competitive organization.

Improving the methodology for the development of a quality management system is an important process that includes several key aspects:

1. Analysis of the current state of the QMS: it is important to evaluate existing processes, identify weaknesses and opportunities to improve the quality of products or services.
2. Personnel training and development: it is necessary to invest in employee training in order to enhance their competence in the field of quality management.
3. Introduction of modern tools and technologies: it is important to use modern methodologies such as Lean, Six Sigma, Agile to improve the efficiency of processes.
4. Stakeholder engagement: It is necessary to involve customers, suppliers and other stakeholders in the improvement process in order to receive feedback and take into account their needs.
5. Continuous monitoring and evaluation of results: It is important to establish a KPI system to track the progress and effectiveness of implemented changes.
6. Innovation and adaptation: it is necessary to introduce innovations, including in the field of digital technologies, and adapt to changing market conditions and customer requirements. The use of SMM, SEO, and digital marketing contributes to rapid adaptation to the market.
7. Documenting processes: It is important to create and regularly update documentation to ensure transparency and consistency in actions. In this regard, digital technologies can serve as an important help, which reduce routine work, speed up document flow, reduce transaction costs, etc.

These steps will help to create a more effective and adaptive quality management system that contributes to achieving the strategic goals of the organization.

Currently, digitalization is an important "catalyst" for the development of quality management systems. Digitalization is the introduction of modern digital technologies into various spheres of life and production, the transfer or transition to a digital method of communication, recording and transmitting data using digital devices. Digitalization is a long-term process associated not only with the acquisition of computers, software and the use of Internet technologies that are created in society and are equally accessible to all organizations, but also with a significant improvement in the quality of management

and business process management at the enterprise itself [9].

Digitalization represents the foundation of the next industrial era. With the help of cloud technologies, factories and warehouses can now communicate with each other and exchange large amounts of information between different branches of the same company, and this process takes only a fraction of a second. The same decentralized technologies characterize the blockchain, a reliable, transparent and hacker-proof resource that is now used to make transactions on the market.

With the help of sensors and analysis of the information loaded into them, modern machines can independently learn ways to improve their work efficiency. This kind of ability of modern equipment is called artificial intelligence. Artificial intelligence studies data, identifies certain trends, improves the quality of production operations and contributes to the productivity growth of industrial enterprises. Constant data exchange is possible throughout the entire production chain. This creates optimal conditions for planning and allows efficient allocation of resources. Processes and components can be standardized and digitally interconnected, making the dream of a smart enterprise a reality.

The fourth industrial revolution means increasing automation of absolutely all processes and stages of production: digital product design, creation of a virtual copy of it, collaboration of engineers and designers in a single digital design bureau, remote configuration of equipment at the factory to meet the technical requirements for the release of this particular "smart" product, automatic ordering of necessary components in the right quantity, control their deliveries, monitoring the path of the finished product from the warehouse at the factory to the store and to the end customer, quality control. But even after the sale, the manufacturer does not forget about his product, as it used to be in the classic model: he controls the conditions of use, can change settings remotely, update the software, warn the customer about possible breakdowns, and at the end of the use cycle — take the product for disposal [14].

Taking into account the state standards applied to the quality management system, currently the following can be indicated as the directions of digitization of the quality management system [9]:

1. digitization of the design of processes for the production of products and services: electronic model with manufacturing instructions (design and technological information); electronic drawings; electronic 3D model; electronic model and electronic structure supplied to all departments of the enterprise; an electronic model that can be used for a variety of purposes is a "digital twin";
2. digitization of production:
 - development of a system of digital models of products and production processes that are developed and put into production, with a high degree of adequacy of models to real objects and real processes (convergence of the material and digital world, causing synergetic effects);
 - creation of original ecosystems of digital platforms, advanced digital technologies. Predictive analysis and a big data-based approach make it possible to integrate geographically distributed participants into the design and production processes, increasing the level of flexibility and adaptability;
 - Digitization of the entire product lifecycle (from initial design to disposal). The more timely adjustments are made, the lower the cost of the product, so the design processes become a priority.

At the stage of formation of digital production, new key competencies are being formed:

- the use of system engineering, when it is necessary to constantly take into account the system, as well as its individual elements;
- the formation of a multi-level matrix of goals and constraints as the basis for a new design, which significantly reduces risks, the amount of testing and the amount of work in the garden by improving test-based products;

- change management throughout the life of the product;
 - digital certification based on thousands of virtual tests of individual components and the entire system as a whole [9];
3. Digitization of the metrological support of the quality management system.
- the goal is to develop methods for processing and analyzing large amounts of data;
 - Metrology of communication systems for digitization. In complex scenarios, maintaining reliable, secure and efficient communications and metrological verification are taken into account. This includes monitoring of complex high-frequency measurements for 5G networks, non-linear and high-frequency statistics, measurements made in digital communication networks, and complex antenna systems.
 - Metrology for simulation and virtual measuring instruments. Automated production management is actively supported to automatically evaluate measurement results by developing analytical methods and verification procedures for network and virtualized measurement systems, as well as modeling measurement systems in order to plan and analyze experiments, methods and standards for virtual measurement processes.
4. Digitization of analytical activities in quality management systems.
- data registration and analysis. The advent of high-speed data storage and processing systems makes it possible to solve the problem of measuring and recording all types and, most importantly, the necessary data more efficiently than ever before, which may (or may not) affect product quality. The use of the Internet of Things to measure the performance of processes as well as products is a prerequisite for the formation of large data sources;
 - monitoring and control of quality management system processes;
 - checking and verifying the development and design;
 - making decisions based on data in conditions of uncertainty.

State standards of quality management systems require the creation of sufficiently strict algorithmic processes for performing procedures. If the process is complex and branched, the execution of operations depends on changing parameters, then it is necessary to regulate all types of processes, or rely on the decision of experts responsible for the course of the process. Any uncertainty can lead to an undesirable situation in the process [13]. The integration of modern digital technologies makes it possible to solve this problem using predictive analysis. Thanks to predictive analysis tools, companies can analyze and predict processes occurring over time, identify trends, anticipate changes and, therefore, plan for the future more effectively [12].

Conclusion. Summing up, we can say that now it is necessary to apply the basic provisions of the TQM concept, reflecting one of the most important trends in the development of quality management, but also to improve the methodology for the development of a quality management system in the context of digitalization. It should be noted that: quality management is not a narrowly specific activity limited by organizational or subject frameworks, but a management activity covering the entire enterprise;

all aspects of the quality management system in a global sense, necessary for its viability, clearly focused on the needs of the consumer;

the key factor in quality assurance is the personnel working in the organization;

the main task of the head is to activate the potential abilities of employees, providing an effective system of motivation and training;

in the context of the digitalization of the economy, it is necessary to have an effective information

exchange system;

the basis of quality management is not the elimination of defects themselves, but their root causes;

freedom is needed in choosing the methodology, tools and methods that create the basis for teamwork.

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