



Methods for Evaluating the Quality of Building Materials and the Competitiveness of Industrial Firms

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Abstract: The ISO 9000 family of international standards serves as the foundation for a quality management system model that is widely accepted worldwide. The article's goal is to demonstrate how a construction firm may improve its quality and product management system to gain a competitive edge in the contemporary market. We believe that the best way to address the issue is to put the ISO 9000 series of international standards into practice. Enhancing the technical level of a product's quality, the quality of its manufacture, the production process, and the quality system itself are all ongoing goals of quality improvement. The writers of the paper provide a created sequence along with a specific strategy for enhancing the organization quality management system. The development of an enterprise quality management system was also approached from a risk-based perspective. The primary research techniques used to evaluate the technical state of specific construction materials are mixed, integrated, and differential techniques. The primary outcomes of the authors' implementation of these methodologies are demonstrated, along with the computation process. The article then offers a methodology for determining the product quality level, which is assessed using a collection of metrics that excludes economic variables.

Key words: material quality, quality of manufacture, enterprise quality management

INTRODUCTION

The market circumstances that modern construction enterprises work in are always shifting. In order to be competitive, businesses must be able to swiftly adjust to changes in the external environment. In this sense, the quality management system need to be adaptable and rapidly “customizable” to the evolving needs of the stakeholders involved in the business. Enterprise management can only benefit from having such a management system as a helpful tool.

In the current state of the market, a higher standard of product quality is required. As the economy continues to grow rapidly, quality is increasingly becoming a determining element in raising production efficiency at a contemporary construction company. Additionally, the manufacturing of inferior goods seriously impairs the financial standing of individual businesses, the building industry and the national economy.

In the face of intensifying market rivalry, a contemporary enterprise's competitiveness is determined by its quality.

Because of this, enhancing product quality is an important objective that can boost production effectiveness. The relationship between production costs and results is what ultimately establishes production efficiency.

The basic manufacturing qualities of a product—such as its dependability, durability, and maintainability—determine its quality since they can meet specific requirements for continued use. Numerous characteristics define a product's quality, and characteristics are defined by indicators that quantitatively describe one or more of the product's characteristics.

Scientific and technological advancement indicators as well as the industry's production culture define the quality of goods in the architecture and construction sectors. A specific position is reserved for the importance of building product quality in relation to the requirement to make items more competitively priced. The construction sector has several challenges in maintaining and raising the quality of its goods. The introduction of novel materials, automation of technical processes, and structural and component improvement are the ways in which it may be solved.

Product quality may be measured by comparing it to other similar items that serve similar purposes, albeit it is a relative term. The degree of product quality is the relative attribute of the product quality determined by comparing it to the matching set of fundamental indicators. Qualitative indicators are values that describe the characteristics of a high-quality product. They may be particular, relative, or absolute.

The criterion for the level of product quality is an integral quality indicator, which identifies the ratio of the useful total effect of the operation of the product and the total cost of its manufacture. Product quality management is carried out by systematic monitoring of compliance of quality indicators with standards, technical specifications, regulatory documents, targeted impact on the quality of documentation, equipment, tools, materials, components and the manufacturers' qualifications [1, 2].

The quality problem of such an industry as architecture and construction is acquiring a special role at the moment. The manufacture of quality products is the main way to increase competitiveness in world markets, and it is also one of the main components of economic progress. A special place in the problem of ensuring the quality of products in the construction industry is occupied by new progressive design developments and studies.

The quality management system in construction is a product of our time. This is a special tool for ensuring high-quality execution of construction work and eliminating all sorts of risks that could threaten the safe operation of constructed facilities.

Construction is traditionally one of the largest sectors of the economy of any country, which solves many tasks of a state nature, namely, GDP growth. That is why it is important that the industry operates efficiently and reliably. This is only possible with a quality management system [3].

The quality management system in construction is a set of processes of a construction company that are created to implement a quality policy through management, planning, provision and improvement of quality.

The core component of the system is a quality policy, which outlines the goals for the development and operation of a construction quality management system along with the roles and responsibilities of senior management in achieving the objectives.

The choice of the model for a construction quality management system is the first step in its creation and implementation. The operations of a construction business are then contrasted with the model's guiding principles. Documentation is then created and put into use. It is assured that the quality management system will make all processes run more smoothly. The last phase involves the

ongoing enhancement of the organization's operations through the application of continuous process improvement.

The main fundamental documents for the creation and implementation of a quality management system in construction are ISO standards 9000 and 14000.

It is also important that in recent years in developed countries ensuring product quality is no longer the concern of individual firms. This is becoming a nationwide problem. So, this problem is considered as the most important national task in Japan. The United States organizes national quality months. The Swedish government conducts nationwide campaigns for the quality of building products. And the Netherlands develops a nationwide five-year plan to improve the quality of products and parts of the construction industry. Developed countries pay special attention to the quality of products due to the conditions, forms and methods of the intensified competition for sales platforms for building materials. Most countries spend a lot of effort to improve the quality of products and determine their prestige and position in the global market in the fight against competitors [4].

The problem of ensuring the quality of construction products is particularly relevant in Russia. This problem arose even in a policy economy, when all work to ensure and improve product quality was planned and controlled by the state. However, at the same time, the requirements of consumers were not important, and the quality of the products was evaluated according to the requirements of regulatory documents, which most often did not meet the requirements of customers. The monopolistic position of manufacturers and the lack of a powerful market incentive for growth in the form of competition do not give interest in improving the quality of products and in spending additional financial resources for these purposes. In this regard, the commodity shortage exacerbated the situation with product quality, when demand increasingly exceeded supply, and the consumer was deprived of choice and was ready to buy goods of any quality and at any price. That is why the problem of ensuring product quality is important and serious for the development of the country's economy, its progress and prosperity.

Market relations have exacerbated the problem of quality and competitiveness of products by construction enterprises and factories. An effective means of solving this problem is the implementation of the provisions of international standards ISO 9000 series, which reflect the world experience in ensuring product quality, and the main emphasis is on measures to guarantee a stable production.

To achieve this goal, it is necessary for the manufacturing company to keep under control all the technical, administrative and human factors that affect the quality of the products. To achieve the goals defined by the company's policy in the field of quality, it is necessary to develop and implement a quality system that covers 2 interrelated aspects:

- 1) The demands and expectations of the customer;
- 2) The organization's interests and wishes.

Enhancing the technical level of a product's quality, the quality of its manufacture, the production components, and the quality system are the ongoing goals of quality improvement. The following order is advised for the process of enhancing the quality system:

- choose the course of improvements and the methods by which they will be carried out;
- investigate the distinctive aspects of the issue;
- examine the data gathered, describe the modifications, and, if required, verify the changes through experimentation;
- alter the item for enhancement;

After making modifications, evaluate how the improved object functions; add the improved solutions to the documentation.

"General standards for quality management and quality assurance" is ISO 9000. "Guidelines for Selection and Application" provides definitions for important terminology, an explanation of contractual terms, an overview of standard kinds, and the fundamental ideas behind putting quality management policies into practice. It lays out and disseminates the guidelines for using the contract's quality assurance models (ISO 9001, ISO 9002, and ISO 9003) and outlines the manufacturer's three primary responsibilities in the area of quality, which are as follows [5]:

1) to attain and sustain a degree of product quality that will guarantee ongoing fulfillment of customer objectives;

2) to instill trust in management on the achievement and maintenance of the necessary quality at a specific level;

3) to give the customer assurance that the targeted quality of the given goods is being attained or will be attained; if the contract calls for it, this assurance may entail supplying the necessary documentation.

Particular attention in the ISO 9000 standard should be given to the conclusion of a contract, which, as a rule, is preceded by an assessment of the existing quality system at the enterprise in order to determine the ability of the supplier to meet the requirements of the standards and additional technical requirements for products or services that are established in the technical conditions of the contract.

A risk-based approach to the creation of a QMS is used to develop the international standard ISO 9001: 2015. This is one of the key changes in the new version of the standard. The fundamentals of risk management in the updated version of the standard are integrated into the quality management system as a whole, and taking risks into account when making decisions turns preventive actions into part of the process approach. The foundation for enhancing the efficiency of the quality management system, getting better outcomes, and averting negative impacts is provided by risk management-related activities. The company must determine the risks and opportunities that need to be taken into account, plan and carry out measures to lessen them, and assess how effectively these measures worked [6].

However, not every organizational process has the same amount of risk when it comes to how it could affect the company's capacity to accomplish its objectives. Moreover, the effects of inconsistent systems, goods, or services vary depending on the kind of organization. When improper items or services are supplied by certain companies, it might have a minimal impact on consumers. Inconsistencies, however, can occasionally have detrimental effects and even deadly results. As a result, risk-based thinking calls for a quantitative assessment of risk when deciding how rigorous and in-depth to make the approach to organizing and overseeing the quality management system, as well as its procedures and undertakings.

The standard's language suggests that a risk-based strategy be used throughout the whole process of the quality management system's operation.

Risk should be viewed as both a bad thing and a chance to identify places where procedures need to be improved. A thorough, formal risk assessment together with the compilation of "risk registers" or any other paperwork is not required by ISO 9001: 2015 standards. One may refer to GOST R ISO 31000-2010 "Risk management. Principles and Guidelines" can be called a useful guide to risk-based decision-making methods.

Because the new ISO 9001: 2015 standard must be implemented, there will be a greater interest in using a risk-based approach to create a QMS, and the tools and methods that have been established may be extensively applied. Utilizing risk-oriented thinking, a construction business may increase its competitiveness by enhancing administration, guaranteeing high-quality goods and services, and boosting client happiness and confidence.

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