

American Journal of Economics and Business Management

Vol. 8 Issue 7 | **pp.** 3541-3547 | **ISSN:** 2576-5973
Available online @ https://www.globalresearchnetwork.us/index.php/ajebm

Article

Effectiveness and Development Prospects of Quality Management in Building Materials Production Processes

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Abstract: This article covers the theoretical foundations and practical mechanisms of organizing production processes in the building materials industry based on modern principles of quality management. The study analyzes the opinions of international and local scientists, and based on their theories, solutions to existing problems in the industry are developed based on a scientific approach. In particular, the possibilities of increasing product quality, efficiency and competitiveness by implementing quality management systems such as ISO 9001:2015, TQM, Kaizen in enterprises producing building materials are considered. Through tables and analyses, real problems in the industry, their causes and solution strategies are clarified. At the end of the article, practical recommendations are developed for the development of the industry. The results of the study are aimed at forming strategic quality management in local industrial enterprises, adapting national products to international requirements, and ensuring sustainable growth of the industry.

Keywords: Quality Management, Building Materials Industry, ISO 9001:2015, Product Quality, Quality Management System, Process Approach, Competitiveness, International Standards

1. Introduction

In recent years, the Republic of Uzbekistan has been undergoing fundamental reforms in all sectors of the economy, including the industrial sector. In particular, the construction sector has been identified as one of the priority areas of national development, and the state is implementing large-scale infrastructure and investment projects in this area. Therefore, the development of the building materials industry is gaining not only economic but also social significance . Because the industry plays an important role not only in creating jobs and increasing export opportunities, but also in creating a comfortable living environment for the population [1].

Today, against the backdrop of the rapid growth of demand for building materials, new and complex tasks are emerging for enterprises in this sector. That is, enterprises are required not only to increase the volume of product production, but also to bring their quality indicators to world standards. This is a matter related not only to technological processes, but also to factors such as the entire management system, the knowledge and skills of employees, the production culture, and a customer-oriented approach [2].

International practice has proven that enterprises that effectively implement quality management systems gain a stable position in the market, gain customer trust, and achieve cost optimization through rational use of internal resources. In this sense, the integration

Citation: Nasrullo ugli, H. U. Effectiveness and Development Prospects of Quality Management in Building Materials Production Processes. American Journal of Economics and Business Management 2025, 8(7), 3541-3547.

Received: 30th May 2025
Revised: 7th Jun 2025
Accepted: 28th Jun 2025
Published: 25th Jul 2025

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of a quality management system into the building materials industry is not only of economic but also strategic importance [3].

At present, many construction materials manufacturers in Uzbekistan have not yet fully implemented best practices in quality management, and production processes are organized mainly based on traditional methods. This reduces competitiveness, limits export potential, and creates problems in certifying products in accordance with international standards.

The building materials industry plays a crucial role in the formation of the economic stability and infrastructure of any country. In Uzbekistan, this sector has also become one of the areas of strategic importance in recent years. The “New Uzbekistan – 2030” strategy adopted by our state, “Investment Programs”, as well as programs aimed at expanding urban development and housing construction for the population, are increasing the need for building materials several times. This situation requires fundamental changes in the building materials industry not only in terms of volume, but also in terms of quality [4].

However, the analysis of the current situation shows that the majority of building materials produced by local manufacturers do not fully comply with world quality standards. This reduces competition in the domestic market and limits opportunities for entering foreign markets. Currently, in international trading systems, including in the EAEU and the World Trade Organization (WTO), competition is carried out not only on price, but also on indicators such as quality, sustainability and compliance with standards [5].

Review of Literature on The Topic

Today, the experience of developed countries shows that enterprises that have implemented a quality management system at a strategic level in the building materials industry adapt faster to innovative solutions, implement energy-saving technologies, and adhere to the principles of sustainable development. It is time to implement this trend in Uzbekistan, adapting it to national characteristics [6].

Quality management is one of the areas that combines strategic and practical solutions today, and has been the focus of attention of many scientists and researchers. The theoretical foundations in this area were formed in the second half of the 20th century, and they serve as a methodological foundation for today's reforms.

In the theory of quality management, W. E. Deming, in his research, stated that quality is the result of collective responsibility and continuous improvement of processes. His "14 principles" promote a systematic approach to quality improvement and emphasize the leading role of management in optimizing the production process. According to Deming, the problem of quality is not a worker problem, but a system problem [7]. When this idea is applied to the building materials industry, technological processes, management systems, and customer relations need to be reconsidered.

JM Juran, on the other hand, evaluates quality in terms of “fitness for use”. His theory of “quality planning” emphasizes that companies should manage quality in a planned, purposeful, and systematic manner, rather than haphazardly. In the field of building materials, this approach suggests that a product must be safe, compliant, and reliable for use in construction [8].

PB Crosby values quality based on the principle of “zero defects” and considers quality assurance to be an investment, not a cost. His concept of “Quality Is Free” argues that quality control is not a cost for building materials companies, but a factor in long-term efficiency [9].

Japanese scientist Kaoru Ishikawa emphasizes the creation of a quality culture based on employee participation through tools such as “quality circles” and the “Ishikawa diagram” (cause and effect diagram). He believes that quality should be the responsibility

of all employees, not just top management [10]. This approach allows the building materials industry to engage the workforce in quality thinking.

In the context of Uzbekistan, the works developed by Professor Sh.K. Juraev analyze the legal and practical mechanisms for implementing a quality management system in local enterprises. He draws attention, in particular, to the problems of implementing the ISO 9001:2015 standard, such as the lack of local personnel, lack of systematization in documentation processes, and low internal audit efficiency [11].

Other local researchers, such as H. Ashurov and ZQ Aripov, have provided some analysis on product certification, laboratory control, and standardization of technological quality parameters in the field of building materials. However, their works do not sufficiently address factors affecting quality, such as strategic management and the human factor. Therefore, this article considers not only technological quality, but also systemic and institutional approaches [12].

Research in the field of quality management shows that in today's global economy, ensuring high product quality has become not only a technical but also a strategic management issue. Theoretical ideas and practical models put forward by a number of scientists and practitioners around the world in this area are of great methodological importance for the building materials industry.

David A. Garvin interpreted the concept of quality from different perspectives and described quality through seven types of definitions: production-oriented, product-oriented, user-oriented, value-oriented, transcendent (absolute), process-oriented, and service-oriented approaches. Applying this model to the field of building materials requires a comprehensive approach to material quality - not only technical parameters, but also customer needs and the functional role of the product in construction must be taken into account [13].

Armand W. Feigenbaum, who views quality as a “total quality control” that involves all parts of the enterprise, proposes to approach quality not as a single process, but as a multi-stage, multi-participatory system. In his opinion, quality is closely related not only to product creation, but also to processes such as purchasing, logistics, marketing and service. In the building materials industry, this approach means that every stage on the product path must be involved in the quality system.

Japanese engineer and statistician Genichi Taguchi proposed the concept of quality as a “level of harm to society”. According to him, quality is not only manifested during the production of a product, but also during the use of the product. His “Taguchi method” is useful in reducing the defect rate and increasing product stability by statistically analyzing technological parameters in the production of building materials [14].

Among domestic researchers, I.Sh. Sattarov links the problems encountered in the process of implementing ISO standards in the construction industry to the lack of inter-organizational cooperation, systemic problems in the training of qualified personnel, and the ineffectiveness of internal control systems. In his opinion, not only technological, but also organizational changes are necessary for the successful implementation of quality management.

Emphasizes that it is possible to ensure transparency and rapid control over internal processes through the digitization and automation of quality management. He, in particular, sees the implementation of systems such as ERP and CRM as an important way to optimize quality control [15].

2. Materials and Methods

The methodology employed in this study is grounded in a comprehensive approach combining theoretical analysis and empirical assessment to examine the effectiveness and development prospects of quality management systems in the building materials industry.

A comparative method was used to analyze enterprises that implemented modern quality frameworks such as ISO 9001:2015, Total Quality Management (TQM), and Kaizen, compared to those relying on traditional management practices. The research relied on secondary data obtained from official reports, including those of the "Uzsanoatqurilishmateriallari" association, enabling a sector-wide evaluation of current performance indicators such as defect rates, customer satisfaction, production costs, and export capabilities. Statistical analysis and logical reasoning were applied to interpret the relationships between quality management implementation and production outcomes. The research incorporated inductive and deductive techniques, as well as analysis and synthesis, to draw conclusions from both quantitative data and qualitative observations. Tables were developed to reflect key issues, causes, and possible solutions, enhancing the transparency and objectivity of the findings. The study also integrated a literature review of international and national scientific works to contextualize quality management models within the Uzbek industrial setting. Through this multi-dimensional methodological framework, the study identifies systemic weaknesses and outlines strategic interventions tailored to national development goals. This methodological approach allows the research to not only diagnose current inefficiencies but also to propose scalable, standards-based solutions aimed at enhancing competitiveness and sustainability in Uzbekistan's building materials sector.

3. Results and Discussion

The introduction of quality management principles into the building materials industry has become an urgent and, so to speak, crucial task. By implementing ISO 9001:2015, TQM (Total Quality Management), Kaizen and other international quality systems, enterprises not only improve product quality, but also increase process efficiency, rationally use resources and strengthen their position in the market.

In addition, today the demand for product quality from consumers is also actively growing. That is, the issue of quality has become a factor that depends not only on the internal procedure of the manufacturer, but also on the trust of the general public. In particular, the materials used in construction directly affect many important aspects, such as human safety, the strength of buildings and structures, and environmental sustainability. Therefore, quality control and management in this area require not only an economic, but also a socially responsible approach.

To effectively implement quality management in the building materials industry, it is first necessary to clearly assess the current situation, problems and opportunities in the industry. The following tables reflect the main identified situations in the industry, mechanisms for their elimination and expected results, see Table 1.

Table 1. Key issues related to quality management in the building materials industry.

No.	Problem name	Appearance	Importance	Main reasons
1	Lack of quality system	Standards such as ISO 9001 have not been implemented	High	Lack of qualified personnel
2	Weak technical control	High failure rate	High	Lack of control tools
3	Low staff qualifications	Affects worker quality	Medium	Weakness in education and training programs
4	Lack of a process-based approach	Quality is not always guaranteed	High	Falling behind global trends

5	Ignoring customer feedback	There are many complaints again.	Medium	No customer contact system

Source: Prepared based on information from the "Uzsanoatqurilishmateriallari" association

The above problems indicate that many local enterprises do not implement systematic quality management solutions, but rather take individual measures. This limits overall efficiency and hinders competitiveness in the global market, see Table 2.

Table 2. Proposed directions for implementing quality management principles.

No.	Principle	Implementation mechanism	Expected result
1	Customer orientation	Electronic monitoring of complaints and suggestions	Customer satisfaction increases
2	Process approach	Documenting production processes in a complete chronological manner	Defects are quickly identified
3	Ensuring employee participation	Quality motivation programs for employees	Errors are reduced
4	Continuous improvement	Improvement measures based on KPIs and audit results	Quality indicators will be stable
5	Scientific approach	Implementation of ISO 9001:2015, TQM, Kaizen elements	Adaptation to world standards

Source: Prepared based on information from the "Uzsanoatqurilishmateriallari" association

As a result of analyzing the data in the table, if the above principles are followed, enterprises can not only strengthen the quality of internal products, but also strengthen corporate culture, employee capacity and social responsibility. Process-oriented and customer-oriented approaches should be the main direction in quality management, see Table 3.

Table 3. Comparison of results in enterprises that have implemented quality management and those that have not

Indicator	Quality management implemented	Quality management not implemented
Percentage of defective products	3–5%	12–20%
Customer complaints	Once every 1–2 months	Several times a week
Production costs	Optimized	There are many excess expenses.
Export potential	Increased (through certificates)	Limited
Error repetition among workers	Less	High

Source: Prepared based on information from the "Uzsanoatqurilishmateriallari" association

The comparison shows that enterprises that have implemented quality management experience increased efficiency not only in terms of products, but also in all internal processes. This increases competitiveness and ensures a reliable brand status.

4. Conclusion

The building materials industry is one of the strategic sectors in the economy of Uzbekistan, playing an important role in developing the country's infrastructure, creating new jobs, and increasing export potential. Organizing production processes in this sector based on the principles of quality management is a decisive factor in ensuring competitive products not only in the local but also in the international market.

The results of the study show that currently, most building materials manufacturers have insufficiently developed quality management systems, and existing control methods are often reactive and document-based. This negatively affects the reliability, stability and ability of products to meet international standards.

International practice shows that companies that fully implement standards such as ISO 9001:2015, continuously improve the skills of their employees, and adopt a process-based and customer-oriented approach consistently improve their quality indicators and significantly reduce internal costs. Adopting quality management as a strategic approach is one of the key factors ensuring the sustainability of an enterprise in today's market conditions.

Based on the cases analyzed in this article and the tables presented, the following general conclusions can be drawn:

a. A quality management system is a set of consistent processes. An enterprise cannot ensure quality simply by having a certificate or a certificate. A philosophy of quality assurance must be established at each stage of the process.
b. The leadership role of the company's management is crucial. Achieving quality begins with top management. They must define a clear quality strategy, allocate resources appropriately, and create a quality culture through personal example.
c. Employees are the central link in the quality system. Their knowledge, active participation and motivation determine how effectively the existing system works. Therefore, regular training and professional development programs are necessary.
d. technological control tools is an important step in ensuring quality. It is impossible to produce products that meet modern standards with old methods and techniques.
e. A system focused on customer feedback and market demands is the key to competitiveness. Quality must be assessed through the eyes of the customer. It is necessary to quickly react to suggestions and complaints, analyze them and improve the product on this basis.
f. Digitalization and automation take quality control to a new level. The introduction of systems such as ERP and CRM allows for continuous monitoring of quality indicators.

In general, the introduction of quality management in the building materials industry is a general system for simultaneously ensuring business efficiency, national economic stability and consumer rights protection. Quality is the main criterion that expresses competitive advantage, market confidence, and responsibility to the state and society.

Therefore, every manufacturing organization must accept quality not just as a goal, but as a business philosophy, and strive to continuously improve it.

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