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MECHANISM OF INTRODUCTION OF QUALITY MANAGEMENT SYSTEM AT THE ENTERPRISES OF THE CONSTRUCTION INDUSTRY: CASE OF THE REPUBLIC OF KAZAKHSTAN

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Abstract. *Purpose* – The aim of the research was to apply the principles of the quality management system in order to establish a framework for implementing quality management practices within the construction industry.

Research methodology – The study involved analysing the global experience of certifying enterprises according to ISO 9001 standards. The research used a qualitative approach, analysing QMS documentation, case studies, and literature to gain a comprehensive understanding of QMS implementation in established companies.

Findings – It resulted in the development of a system model for introducing and implementing the quality management system in construction industry enterprises, following the ISO 9001 standard.

Practical implications – The enterprises of the Republic of Kazakhstan are not exceptions from world practice, including the enterprises of the construction industry. However, there are few construction industry enterprises that would be certified according to quality management standards, including the ISO 9001 standard. Some do not have the financial and human resources to implement a quality management system, others lack understanding of where to start.

Originality/Value – The study also focused on generalising and providing detailed insights into the processes involved in implementing the quality management system at construction industry enterprises.

Keywords: quality management system, project, enterprise, construction industry, competitiveness, advantage, profit.

JEL Classification: L15, M11, O14, O53.

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1. Introduction

Currently, there is a demand for high-quality goods and services, and manufacturers across industries are actively seeking ways to enhance the quality of their products and services. The construction industry, being a crucial component of the housing market in the Republic of Kazakhstan, is no exception. A viable solution to this is the adoption of a quality management system, which will positively impact the production process of goods and services

(Podra & Petryshyn, 2023). Stakeholders in the construction industry increasingly recognise the importance of implementing a quality management system (QMS). Adopting standards for construction companies means that the results of their work will be reflected, among other things, in lower energy consumption (Nešović et al., 2023). These guidelines advocate using energy-efficient materials, best practices for site management, and advanced technologies for monitoring energy use.

Implementing a quality management system (QMS) is a comprehensive and time-intensive endeavour that involves various tasks and affects multiple aspects of the enterprise and its quality management subsystem. The increasing daily requirements for quality and safety necessitate a more stringent adherence to global standards. As a result, implementing a QMS becomes an effective avenue for enterprise growth and expanding market share (Trigunarsyah et al., 2023). In Kazakhstan, construction companies often struggle with effective personnel management and the integration of management systems. The problem is that there is a need to improve the relationship between enterprise management systems and systemic approaches. The work of a construction organisation depends on a number of external and internal factors influencing its activities. Successful management and prevention of negative impacts on the activities of the construction organisation by the market and internal economic factors is possible through effective management mechanisms, one of which is the quality management system (Sweis & Jaradat, 2022). It provides stable and successful management, as well as the company's activities. QMS is aimed at ensuring the efficiency of the organisation by focusing not only production but also management and organisational processes to meet customer requirements, which in turn leads to a reduction in unproductive costs and an improvement in the quality of products and services rendered (Abd-ElwahedI & El-Baz, 2018).

ISO 9001 is a globally recognised quality management standard. When companies are looking for suppliers, they often require them to have QMS based on the 9001 standards. Obtaining a certificate improves the credibility and image of the manufacturer or company that provides services, it becomes a powerful marketing tool in the market (Elsokhn & Ezeldin, 2023; Omirbayev et al., 2021). Another principle of quality management under this system is to achieve customer satisfaction with the goods or product of the project. The steady increase in consumer confidence regarding the product produced by the company cannot be underestimated: this is the key to increasing demand for products and, as a consequence – a direct increase in sales and revenue (Arslan et al., 2023).

The advantages of implementing the ISO 9001 certificate have long been realised, not only by Kazakhstani companies – this quality management system has gained widespread international recognition. Over a million certificates are issued in 200 countries a year, with many organisations implementing the standard without certification or documentation. In the Republic of Kazakhstan, the implementation of quality management ISO 9001 is performed on a voluntary basis (Anup et al., 2015). The state does not impose such measures on business owners, but the many benefits that participants – the company itself, consumers, and partners – receive in the process play a crucial role in the fact that more and more managers are choosing to introduce this system in enterprises and receive the full range of benefits from it (Barbosa et al., 2023).

The study, along with Brooks (2020), highlights the benefits and shortcomings of QMS based on ISO standards. Research by Carvalho et al. (2023) and Alshahrani and Husain (2024) evaluated QMS effectiveness in construction companies and examined government programmes supporting small businesses. They concluded that further development of QMS mechanisms is needed for small enterprises in the construction industry.

Diaz et al. (2019) reviewed various QMS establishment methods, outlining objectives, rationales, and effectiveness assessment approaches. Kiew et al. (2016) proposed a QMS framework for the real estate sector, noting the need for further research on property valuation. In China, the focus is on providing safe, quality living and working spaces through effective construction quality management (Knop, 2022). The civil engineering sector faces high competition and customer demands, prompting companies to enhance production processes and adopt QMS and planner system (LPS) integration. This integration improves quality, time, and costs in construction projects (Lei, 2023). Performance measurement is crucial in quality management, but most construction companies lack systematic indicators for certification compliance. Lin et al. (2023) studied efficiency measurement and indicator development in Brazilian construction companies, presenting 173 indicators grouped into 10 processes.

Quantitative analysis, though time-consuming and costly, is essential for selecting effective quality management practices. This study explores principal component analysis (PCA) to analyse quality management practices from effective organisations, benefiting construction professionals with limited resources. The primary goal for construction organisations is to develop a QMS that meets design and regulatory requirements, considers labour and environmental protection, and builds cost-effective facilities (Rehmani et al., 2023). The study outlines seven principles of management for construction companies and examines the stages of developing and implementing ISO 9000 quality systems.

The ISO 9001:2015 standard requires restructuring QMS functions to comply with new requirements (Kazakhstan Institute for Standardization and Certification of the Committee for Technical Regulation and Metrology, Republican State Enterprise, 2017). This standard emphasises a process approach and constant improvement, eliminating the need for six mandatory documented procedures. The article proposes constructing and presenting a documented QMS procedure using diagrams and tables.

Hence, the significance of a quality management system for the growth of enterprises, including the construction industry, becomes evident. Consequently, the objective of this study was to consolidate the procedures of the quality management system in order to establish an implementation framework specific to the construction industry.

2. Materials and methods

The research uses a qualitative questionnaire approach to data collection. Generalised suggestions in the study on how to implement QMS were made in consultation with experts through an unstructured interview. This study was employed to develop a comprehensive system model for QMS implementation. These methods enable a thorough understanding of the mechanisms necessary for an efficient QMS in the construction sector. The main source document in the study used the standard ISO 9001-2016. Furthermore, the methodological

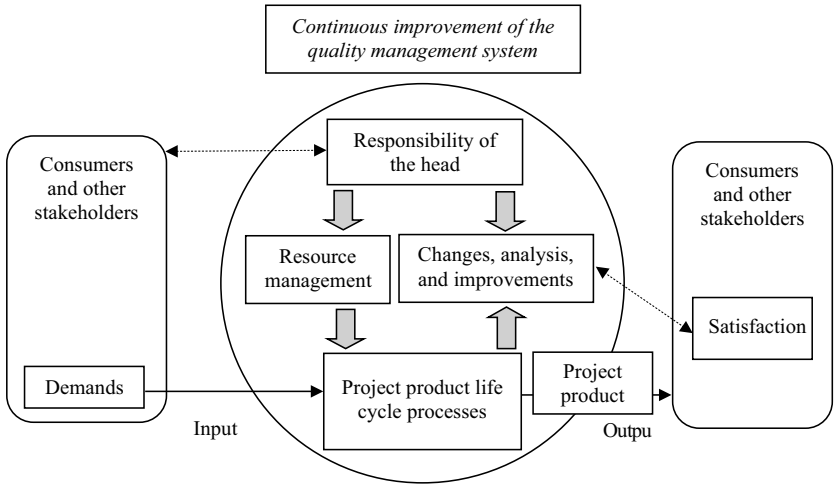

Figure 1. A system model depicting the process of implementing and applying the ISO 9001 standard-based quality management system in construction industry enterprises

elements of research were used in the study, which lie in the use of the basic ideas of system, process, technological, and activity approaches.

Figure 1 presents the constructed system model of the mechanism of implementation and application of the quality management system in the construction industry according to the ISO 9001 standard, which will be described and detailed in the main part.

The study focuses on exploring the process of developing a quality management system for construction industry enterprises. It specifically investigates and analyses the key processes that are likely to occur throughout the life cycle of both the enterprise itself and the projects undertaken by these enterprises.

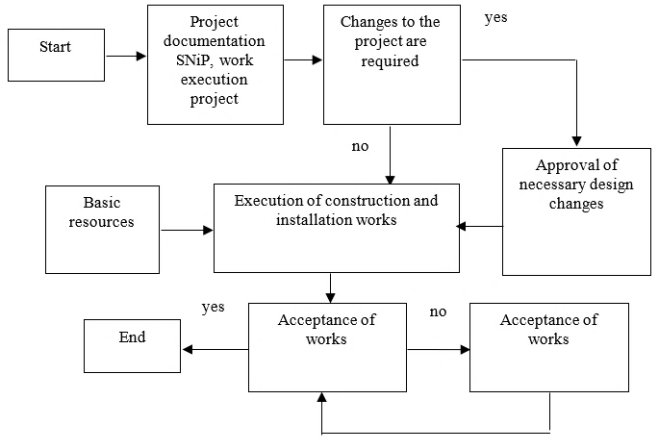

Figure 2. Block diagram of the construction process

To understand which main processes accompany the performance of works in a typical project for the construction industry and which aspects and processes will require special attention when developing the mechanism of quality management system implementation, a block diagram of the construction process was developed (Figure 2).

The conclusion part should discuss the obtained results with direct and special stress on the value-added, as well as policy implications and future research directions.

Figure 2 offers a rational and unambiguous structure for overseeing building and installation projects, emphasising the value of decision-making, documentation, and quality control at every stage of the undertaking. This methodical approach reduces the possibility of mistakes and rework by ensuring that projects are finished effectively, on schedule, and to the necessary standards.

3. Results and discussion

3.1. Main features of the quality management system

The quality management system that meets the requirements of ISO 9001 is a guarantee of the stability of the organisation. It gives confidence to the organisation itself and creates trust in it among consumers. Consumers are confident that the company can supply products that constantly meet customer requirements. Modern approaches to quality management stimulate economic participants to implement international standards of quality systems, which will have a positive impact on the export-import activities of enterprises in Kazakhstan. The problem of implementing quality systems becomes key for Kazakhstani enterprises if their goal is to enter the international market and establish long-term relations with foreign partners.

It can be noted that the leaders of successful organisations cannot imagine management where quality management would not play a decisive role. This is especially important at the current level of development of economic systems, for which there is typically a high degree of competition and a gradual transition to non-price competition with a primary focus on quality. Such companies are also focused on solving quality problems and using information on technologies and systems, the effectiveness of practical use of which is possible only in developed management. The requirements largely relate to the compliance of consumer requests and wishes with the actual parameters of the product. Furthermore, the market efficiency of the organisation increasingly depends on consumer satisfaction with a differentiated product. The favourable climate of investment sites depends on how the problems of the quality of their infrastructure and production environment, the quality of staff, and the quality of management in general are solved (Abbasi & Al-Nagrash, 2022).

Before considering the procedure and mechanism of quality management systems in the construction industry, it is worth mentioning a company that has been certified for many years by the ISO standard, namely BAZIS-A. BAZIS-A, a large construction company and a reliable developer in Kazakhstan, has been operating in the construction market since 1991. Over 29 years of BAZIS-A's activity, more than 15.5 million m^2 of residential and administrative buildings and more than a hundred social and infrastructural facilities have been erected. Below, the study considers the main advantages for BAZIS-A from the implementation of the standard and how the presence of this system significantly distinguishes the construction

company BAZIS-A from other enterprises in the construction industry of the Republic of Kazakhstan.

ISO 9001 is an international standard that regulates administrative and production processes in a business structure. It requires a clear organisation of the management system of the production company with a focus on a particular result, that consistently provides a high-quality end product. ISO 9001 technology enhances project efficiency and saves money by reducing waste and defective products. Transparency in documentation allows managers to monitor site activities, control deviations, and correct them early on. Qualitative changes in business processes can be made based on documented evidence rather than trial and error. Employees face challenges in implementing the quality management system, but as they master the principles and follow a specific algorithm, the system becomes more predictable, reducing their workload and increasing productivity. A prestigious certificate increases a company's rating and opens opportunities for successful development.

The advantages of implementing the standard for interested participants in the process provide BAZIS-A with wide opportunities for profitable contracting in the domestic and international markets, including participation in public procurement. The owner of BAZIS-A receives an increase in profits by increasing the efficiency of construction processes and the quality of work performed. Moreover, BAZIS-A staff's work is facilitated due to the fact that many internal production and business processes are adjusted to automation. Also, implementing the standard for interested participants guarantees that BAZIS-A customers buy a quality product.

Although it is impossible to calculate the benefits of QMS in exact monetary terms, they are obvious and real – as evidenced by the practical experience of thousands of small and large companies around the world. The obvious advantages of implementing the standard are as follows:

1. Improvement of the credibility and image of the enterprise.
2. Increase in the rating positions of consumers and the growing flow of customers.
3. Transparency of documentation and business processes, which provides opportunities for effective transformations in the processes of planned activities.
4. Opportunity for managers to quickly make informed decisions through full control over production processes.
5. Improvement of culture and working conditions.
6. Increase in employee satisfaction.

Attention should also be drawn to the company that also belongs to the construction industry and is certified according to the ISO 9001 standard, namely the Karaganda plant of metal structures. This company has a "working" quality management system, the implementation of which has given the company great benefits. According to the statistics available at the plant, more than 80% of customers require the company to have an ISO 9001 certificate, and, accordingly, the company does not lose customers. This company clearly defines the responsibilities and powers of its employees. This organisation demonstrates the ability to produce products of the required quality, considering that MS ISO 9000 assumes that the term "quality" can be combined with such adjectives as "bad", "good", and "excellent", but in general, the quality is "necessary", such as required by the customer. Quality products are not necessarily of the highest quality. There are demands and, therefore, orders for different levels

of quality. However, when ordered at any level of quality, KZMK provides the load-bearing capacity of structures and their geometric parameters. Differences in quality, as a rule, relate only to the degree of processing. The implemented "working" quality management system also has increased controllability for the company at all stages of production and increased operational control at all stages of production. Internal interactions between processes (subdivisions) are worked out, which reduces production time. Incoming quality control of purchased materials becomes intensified, and the company gives preference to suppliers who have a certified quality management system (incentives to obtain a certificate from suppliers).

Considering the mechanism of implementation of the quality management system in the construction industry, it is necessary to identify three main components of this process, namely: identification and documentation of the process, and the QMS implementation process and the QMS certification and audit process. The study will focus on the first two components.

3.2. Identification and documentation of the process

The process is a horizontal integration of work or operations aimed at the result (production, external, and internal services) or the development of control effects (Dovgal et al., 2024). As a form of process description, it is recommended to use a process map, which combines the scheme (algorithm) of the process and the definition of its inputs and outputs. The process map should describe the requirements for process inputs and outputs. The first draft of such a card can be made at the stage of process analysis. The final version of the map is agreed upon with stakeholders and is usually included in the process document. The process map contains the following data:

1. The purpose of the process (target outputs) – the planned result of the work – the planned products.
2. The non-target outcomes of the process – impact on the environment, labour protection, and the and the safety of third parties.
3. Consumers (external or internal) of the results of the process – products as well as non-target outputs.
4. Initial data of the process: indicators of product quality (works); indicators of environmental impacts; occupational health and safety indicators; indicators of emergency, fire safety.
5. Process manager – developer, general contractor, site manager, contractor, foreman.
6. Executors – the general contractor, the chief of a site, the manufacturer of works, the foreman, and the workers of the corresponding specialties.
7. Input data about the process – building permit, developer, general contractor, project.
8. Resources: staff – middle and lower managers, specialists, workers; building materials, construction products, machines and mechanisms, tools; auxiliary facilities; information resources; provision of documentation.
9. Suppliers, contractors.
10. Monitoring and measurement of the process: reports per shift, month, quarter; performance indicators of the process – the implementation of planned tasks.
11. Documentation for process management: external and internal.

The schematic image helps define the process and present it in laconic form, both as a whole and according to the main components and parameters. A special role is played by the schematic representation of the process: in the analysis of the process (stage "planning" of the Plan-Do-Check-Act (PDCA) cycle); discussion of the process by a group of experts when a single view of it should be developed; standardisation of the process or making changes to the existing process (stage "impact" of the PDCA cycle).

There are many methods of schematic representation of the process. Each of them has its advantages and disadvantages due to the scope of the method and its focus. The most popular are the following methods: block diagram; sequence diagram (algorithm); flow chart; process map; activity network diagram; process/function diagram; process decision programme chart; object-by-step description.

It is recommended to perform the development of the system of processes first, followed by the preparation of the process. Starting from scratch, the entire set of processes required for QMS and their interactions are determined. People who would be responsible for the processes are appointed. Often, these employees are called process managers or owners of the process. If necessary, one can unbundle the processes to clarify responsibilities and authorities. Then the process planning gets started, which is aimed at establishing the objectives of the process in terms of the quality of its results and the methods of its implementation. That includes determining the sequence, interaction, and characteristics of the operations that make up the process and the resources required. The results of process planning, including its objectives and implementation procedures, are documented.

After that, ensuring the process is necessary. The work is organised by a group, which was determined by the process manager. Activities to ensure the planned level of process quality may include one-time actions (allocation of financial resources, purchase of materials, structures, and equipment that provide the planned characteristics of the process, staff training), and repetitive actions (maintenance and preventive repair of equipment, constant provision of the necessary production environment). To evaluate the actions in this and the next steps, it is necessary to evaluate the effectiveness of the process. Process management includes the organised work by a group of employees that was determined by the process manager. And finally, the work is performed by a group to improve the process.

In each process, improvement has to be initiated to achieve improvement goals. Therefore, it is necessary to form a group to improve the process. Depending on the complexity of the process and the size of the construction organisation, the group may include specialists and heads of departments involved in the process. All participants in this activity must accept the ideology of PDCA and master and apply the method of describing the process for its analysis and standardisation in practice. Having passed all steps for each process, it will be possible to speak about the proper statement in the building organisation of the management of QMS processes. The composition and type of process system will be affected by the size and features of the construction organisation, the scope of QMS application, and the types of products and services rendered.

It is desirable that, having identified the processes required for the QMS, the construction organisation build them in the form of a complete model. The construction organisation must retain overall administrative responsibility in cases where the processes are outsourced to a

third party – subcontractors or specialised organisations (outsourcing processes). Additional special requirements for third-party organisations may apply to: performance of geodetic and research works; design of construction objects; logistics; acceptance testing of products in testing laboratories; ensuring industrial safety and safety of third parties; environmental protection; introduction and use of information technologies.

If the construction organisation decides to outsource the implementation of any process that affects the compliance of the work performed with the established requirements, it must ensure the management of such a process. The following processes can be distinguished in the construction organisation:

- receipt from the customer (developer) and incoming control of design and working documentation;
- preparation of construction production in accordance with the construction management plan (CMP), activity management plan (AMP), work execution project (WEP), or other organisational and technological documentation of the contractor;
- drawing up schedules for providing construction with resources;
- selection, training, and retraining;
- creation and maintenance of infrastructure and production environments;
- input control of applied building materials, products, construction, and equipment;
- execution of work schedules and logistics in the current period;
- operational control in the process of construction and installation works, inspection of hidden works; inspection of responsible building structures and sections of engineering networks and systems of engineering and technical support; metrological support of production;
- assessment of the conformity of the performed works and their acceptance;
- collection and analysis of data on the technological process of construction and installation work execution;
- development and implementation of corrective and preventive actions.

Table 1 demonstrates an example of a process model, and Table 2 – a process matrix according to Figure 2.

Table 1. Example of process model "Implementation of construction and installation works"

Process name		Process purpose
The set of technological techniques and operations performed for the construction of objects in a certain sequence by skilled workers with the help of appropriate construction machinery and small mechanisation, installation devices, technological equipment, and measuring instruments in accordance with the requirements of design and technological documentation		Production works in due time in accordance with the design and technological documentation
Process inputs (process providers)		Process outputs (consumers)
Design and technological documentation, building materials, products, and construction equipment		Completed construction project
Regulations	Design, technological, and regulatory documentation	
Basic resources	Materials, construction machines and means of small mechanisation, assembly means and devices, technological equipment, control, and measuring devices	
Measurement criteria	Term of performance of works, compliance with the requirements of the project, and sanitary rules (SR)	

Table 2. Matrix of correspondence to the block diagram

Activities	Responsible performer	Co-performer	Coordination (who accepts)	Approval (who approves)	Information (who receives information)
Provision of construction sites with design and budget documentation (DBD), WEP, rules, and regulations	Planning and technical department	Planning and economic department			
Logistics	Deputy Head of the Logistics Department	Design and technical department		Head of Department	
Production of construction and installation works	Site manager	Foreman, master, workers			Technical customer, head of department
Approval of changes in the project	Planning and technical department	Site manager	Project organisation	Technical customer	
Transfer of completed work to the customer	Site manager	Planning and technical department			Head of Department

By offering an organised framework for establishing a Quality Management System (QMS) in the construction sector, Table 1 supports the findings of the study. Every parameter in the table is in keeping with the QMS's guiding principles, which place a strong emphasis on resource management, systematic documentation, regulatory compliance, and ongoing progress. Table 1 emphasises how crucial these components are to producing effective and superior building results. Construction businesses may guarantee that their projects fulfil industry standards and client expectations by adhering to comprehensive process inputs, outputs, and measurement criteria. This will improve the overall success of the project and foster organisational growth.

Table 2 offers a thorough and organised method for setting a Quality Management System (QMS) into effect in the construction sector, which is in line with the study. Every aspect in the table helps to ensure that construction operations are carried out methodically, with accountability, transparency, and adherence to quality standards guaranteed. Table 2 guarantees that all parties involved are informed about their responsibilities and the information flow by delineating the roles of approvers, co-performers, and accountable performers. Construction firms in Kazakhstan are better able to handle the difficulties of efficient people management and system integration thanks to this alignment with QMS principles, which eventually improves project performance and customer satisfaction. The development of a quality management system is conditioned by:

- requirements of the developer (technical customer), who pays the money and therefore has the right to choose a contractor that provides the specified parameters of the product;

- requirements for bidders;
- requirements of banks that, when providing loans to organisations, want to be confident in their solvency;
- requirements of insurance companies that reduce the amount of insurance premiums to organisations that have a certified quality system;
- requirements of the self-regulatory organisation (SRO) to the construction organisation accepted in its structure;
- threat from the risk of property liability for damage caused to the developer (technical customer);
- the ability to provide competitive advantages;
- the need to address internal issues related to the development of the quality of procedures performed, i.e., the need to create a system managed by the director;
- enhancing the reputation of the organisation, including the use of the system certificate for advertising purposes.

The main components of the stages of the development of a quality management system can be described by an algorithm consisting of 9 steps. The first step lies in decision-making on the need to develop (refine) the system with the use of the ISO 9001 standards. It is made out by the order on the organisation in which stages of development, the list of the developed documents, terms and responsible for performance are defined. The general director of the organisation issues an order in which:

- contains the date of the beginning of work on the creation of QMS;
- a management representative responsible for the QMS is appointed;
- the project manager for the development and creation of the QMS is appointed;
- the composition of the working group of leading specialists of the organisation responsible for the development of QMS is determined;
- the terms of approval of the plan of work for the creation of QMS are defined.

The second step is an analysis of the current state of quality management (documentation, operation, activities of management, and contractors). The results of the analysis are reported in the assessment audit. Analysis of the QMS operating at the enterprise consists of: detailed acquaintance with the management system operating at the enterprise, its analysis, and assessment for compliance with the requirements of ISO 9001-2016; questionnaire, prepared in advance by interviewing staff, familiarity with current regulations and executive documents of the enterprise, and the study of production technology and process control systems.

Planning work on the development of documents to assess the need for specialists, time, and finances is a third step. The document "System development plan" is issued. The basis for developing a QMS plan includes ISO 9001-2016 requirements and the results of the survey and analysis of QMS operating in the organisation.

At the next stage of creating an organisational structure of the quality service, technical training is performed. The organisation of this service is determined by the order in which its structure, functions, and concrete replacement are defined. The order is accompanied by a plan of technical training and a schedule of employee certifications. The development of the organisational structure of the quality system involves the definition of officials and departments of the organisation, which will develop, implement, maintain in working order, and improve the quality system (Nielsen et al., 2024). When creating the organisational structure of the QMS, the following actions are in order:

- to appoint a representative of the management of the quality system in the person of one of the deputy heads of the organisation, develop and approve their job description;
- to form a quality council, develop, and approve regulations for the quality council;
- to form a quality service comprising 1–2 people (depending on the size of the organisation), develop and approve regulations on quality service;
- to appoint representatives of the quality system in the subdivisions in the person of the heads of departments, to make changes in their job descriptions;
- to appoint internal auditors of the quality system (after their relevant training).

Then, the detailed planning of quality system document development is to be assured. It is made out in the form of a matrix of the responsibilities of employees to provide quality service in terms of performance. In turn, the development of documents, their implementation, and experimental operation from 3 to 6 months is a six step. It is executed by the order on the statement and implementation. At the same stage, the training of all personnel of the enterprise is performed after the development of the first edition of the QMS documents to perform procedures in accordance with the requirements of the created QMS documents and record quality. Training is conducted directly in practice by responsible process owners. Deficiencies and gaps in documented procedures identified at this stage should be corrected.

After that, as soon as the first document of the quality system is developed in the organisation and its experimental operation is started, it is necessary to start tracking its functioning: to what extent the real processes occurring in the construction organisation correspond to the document; that there were no deviations registered or reasons for their occurrence; how to conduct an internal audit of the quality system by independent trained professionals from among the employees of the organisation, how to plan and implement corrective and preventive actions. The finalisation of system documents is executed by the order on the statement and introduction of completions. And lastly, it is necessary to determine the certification body, introduce the changes to the documentation with the reviewer's comments, conduct a certification audit, and obtain a certificate.

Each of these steps provides validity when combined with other strategies to create a strong QMS. They guarantee careful planning, comprehensive preparation, the participation of all pertinent parties, strict testing, and ultimate confirmation by certification. This methodical procedure complies with ISO 9001 standards, promoting ongoing enhancement and guaranteeing that the QMS efficiently meets the organisation's quality goals.

The process of certification auditing the quality management system in the construction industry is quite extensive, and therefore this issue will be considered in future studies. Certification of quality management systems shows that the company faithfully adheres to the requirements of international quality standards. The quality management system of a construction organisation is a kind of declaration of control and rejection of defects in products or services. Some companies have the construction organisation's quality management system certificates, which are based on the ISO 9000 standard. Such organisations are most likely to have a high level of production and are the most competitive. The quality management system is a guarantee of product efficiency and quality within the framework of the construction materials contract.

4. Conclusions

The study underscores the significant need for quality goods and services across all industries, with a particular emphasis on the construction sector in the Republic of Kazakhstan. The scientific justification for the research lies in the comprehensive analysis of Quality Management System (QMS) implementation as a solution to enhance product and service quality. The research scientifically explores how QMS affects various enterprise aspects and improves adherence to global quality and safety standards, which is crucial for enterprise growth and market expansion. It delves into the complexities of QMS implementation, detailing the processes and methodologies necessary for successful integration and continuous improvement within construction organisations. QMS implementation is necessitated by the increasing global requirements for quality and safety that compel companies to adhere strictly to international standards. The study identifies that Kazakhstani construction companies frequently face challenges in effective personnel management and integration of management systems, which affect their overall performance.

The social justification for the research is rooted in addressing the practical challenges faced by construction companies in Kazakhstan, particularly in personnel management and system integration. The research highlights the significant social benefits of implementing QMS, such as improved management stability, enhanced product quality, and increased customer satisfaction. These improvements lead to better working conditions, higher employee satisfaction, and greater consumer trust in the company's products, directly impacting the industry's social fabric. The study also emphasises the broader societal benefits, including energy efficiency and environmental protection, resulting from the adoption of standards like ISO 50001 and ISO 9001. The adoption of the ISO 9001 standard is highlighted as a pivotal move for construction companies aiming to improve their management systems. This standard, which has gained international recognition, is adopted voluntarily in Kazakhstan, bringing numerous benefits to companies, including enhanced competitiveness and the ability to meet international market requirements. The implementation of ISO 9001 aids companies in achieving higher efficiency, reducing waste, and maintaining control over production processes through transparent documentation. Along with the processes of production, services, and project activities, it is necessary to manage the processes of management, provision of resources, and control. Despite initial implementation challenges, such as the restructuring process and extensive documentation, the long-term benefits for staff productivity and satisfaction are substantial.

ISO 9000 series standards do not contain requirements for economic efficiency, but the experience of their implementation in the construction industry shows that greater organisation and coherence significantly increase their efficiency and have a positive impact on profitability. Therefore, it is important that as many companies as possible implement a quality management system in production processes and the life cycle processes of construction projects. The study also explores the benefits experienced by companies like BAZIS-A and the Karaganda plant of metal structures, which have successfully implemented QMS. These benefits include improved credibility, increased customer satisfaction, enhanced operational control, and better internal process integration.

The study's findings contribute to a deeper understanding of the mechanisms required for effective QMS implementation and offer valuable insights for construction enterprises aiming to improve their quality management systems. Further development of scientific research is seen in the detailed consideration of the audit processes of the quality management system at the enterprises of the construction industry, which will be capable of demonstrating the efficiency of implementing the processes of the quality management system.

Author contributions

Yeldar Zhuman, Jappar Juman, Aiymzhan Makulova, Bakhytbek Kalaganov, Akkhozha Tagay, Uldar Bastarova contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

Disclosure statement

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References

Abbasi, G. Y., & Al-Nagrash, Q. (2022, February 21–24). Implementation of ISO 9001:2015 Quality Management System in first-class construction contractors – Case of Jordan. In *Proceedings of 2022 Advances in Science and Engineering Technology International Conferences* (pp. 1–4). Dubai, United Arab Emirates. IEEE. https://doi.org/10.1109/ASET53988.2022.9734853

Abd-ElwahedI, M. S., & El-Baz, M. A. (2018). Impact of implementation of total quality management: An assessment of the Saudi industry. *South African Journal of Industrial Engineering*, *29*(1), 97–107. https://doi.org/10.7166/29-1-1902

Alshahrani, M. A., & Husain, K. S. (2024). The effectiveness of the implementation of ISO 9001 on SMEs performance: The case of an emerging economy. *International Journal of Quality & Reliability Management*, *41*(1), 84–106. https://doi.org/10.1108/IJQRM-08-2022-0233

Anup, W. S., Arun Kumar, H., & Saqhi, S. N. A. (2015). Study of quality management system in construction. *International Research Journal of Engineering and Technology*, *2*(2), 462–467.

Arslan, M. A. O., Thiruchelvam, S., & Hayder, G. (2023). Measuring the availability of the requirements of the quality management system (ISO 9001:2015) clause leadership, performance, and planning: A case study. *International Journal of Construction Management*, *24*(8), 867–874. https://doi.org/10.1080/15623599.2023.2239437

Barbosa, A. de S., Bueno da Silva, L., Morioka, S. N., da Silva, J. M. N., & de Souza, V. F. (2023). Integrated management systems and organizational performance: A multidimensional perspective. *Total Quality Management and Business Excellence*, *34*(11–12), 1469–1507. https://doi.org/10.1080/14783363.2023.2181153

Brooks, T. (2020). *Implementation and effectiveness of the ISO 9001 quality management system in the construction sector in the UK and Ireland* [Doctoral thesis, Queen's University Belfast].

Carvalho, M., Sá, J. C., Marques, P. A., Santos, G., & Pereira, A. M. (2023). Development of a conceptual model integrating management systems and the Shingo Model towards operational excellence. *Total Quality Management and Business Excellence*, *34*(3–4), 397–420. https://doi.org/10.1080/14783363.2022.2060810

Diaz, L., De Oliveira, M., Pucharelli, P., & Pinzon, J. (2019). Integration between the last planner system and the quality management system applied in the civil construction industry. *Revista Ingenieria de Construccion*, *34*(2), 146–157. https://doi.org/10.4067/S0718-50732019000200146

Dovgal, O., Borko, T., Miroshkina, N., Surina, H., & Konoplianyk, D. (2024). Circular economy as an imperative for sustainable development. *Scientific Bulletin of Mukachevo State University. Series "Economics"*, *11*(1), 19–28. https://doi.org/10.52566/msu-econ1.2024.19

Elsokhn, N., & Ezeldin, A. S. (2023). An examination of quality management system implementation in Egyptian contracting companies. In S. Walbridge, M. Nik-Bakht, K. T. W. Ng, M. Shome, M. S. Alam, A. el Damatty, & G. Lovegrove (Eds.), *Lecture notes in civil engineering*: *Vol 251. Proceedings of the Canadian Society of Civil Engineering annual conference 2021* (pp. 251–262). Springer. https://doi.org/10.1007/978-981-19-1029-6_19

Kazakhstan Institute for Standardization and Certification of the Committee for Technical Regulation and Metrology, Republican State Enterprise. (2017). *Quality management systems. Requirements* (ST RK ISO 9001-2016). https://files.stroyinf.ru/Index2/1/4293729/4293729769.htm

Kiew, P. N., Ismail, S., & Yusof, A. M. (2016). Integration of quality management system in the Malaysian construction industry. *Journal of Organizational Management Studies, 2016*, Article 117211. http://doi.org/10.5171/2016.117211

Knop, K. (2022). Multivariate nonconformity analysis for paving stone manufacturing process improvement. *Management Systems in Production Engineering*, *30*(4), 331–341. https://doi.org/10.2478/mspe-2022-0042

Lei, L. (2023). Multiple-processes integrated management system of construction project based on ant colony algorithm. In M. Atiquzzaman, N. Yen, & Z. Xu (Eds.), *Lecture notes on data engineering and communications technologies: Vol. 167. Proceedings of the 4th international conference on big data analytics for cyber-physical system in smart city* (pp. 485–494). Springer. https://doi.org/10.1007/978-981-99-0880-6_53

Lin, J., Yu, R., & Xu, X. (2023). Grey relational analysis method for building material suppliers selection based on the 2-tuple linguistic neutrosophic number. *Journal of Intelligent and Fuzzy Systems*, *44*(3), 4185–4196. https://doi.org/10.3233/JIFS-221410

Nešović, A., Djurović, S., Cvetković, D., & Marašević, M. (2023). Building density impact on final energy consumption for artificial and automatic lighting control system in the sports hall – Numerical case study analysis. *Applied Engineering Letters*, *8*(3), 101–110. https://doi.org/10.18485/aeletters.2023.8.3.2

Nielsen, J. E., Spasenić, A. T., & Stevanović, A. (2024). Designing an organizational structure as a prerequisite for achieving business excellence in manufacturing companies. *Economic Horizons*, *26*(1), 41–61. https://doi.org/10.5937/ekonhor2401041E

Omirbayev, S., Mukhatayev, A., Biloshchytskyi, A., & Kassenov, K. (2021). National model of the quality assurance of education in Kazakhstan: Format, tools, and regulatory mechanisms. *Scientific Journal of Astana IT University*, *8*(8), 63–73. http://doi.org/10.37943/AITU.2021.24.30.007

Podra, O., & Petryshyn, N. (2023). Theoretical and methodological aspects of analysing the foreign economic activity of enterprises. *Economics*, *Entrepreneurship*, *Management*, *10*(1), 51–58. https://doi.org/10.56318/eem2023.01.051

Rehmani, K., Ahmed, S., Rafique, M., & Ishaque, A. (2023). From validation to execution: Exploring the practical implementation of the conjoint framework of quality management and high-performance work systems. *Heliyon*, *9*(6), Article e16718. https://doi.org/10.1016/j.heliyon.2023.e16718

Sweis, R. J., & Jaradat, M. (2022). Project management performance of construction projects in Jordan: A comparative study of ISO 9001-certified and non-certified companies. *The TQM Journal*, *34*(5), 1341–1364. https://doi.org/10.1108/TQM-02-2021-0060

Trigunarsyah, B., Moohialdin, A., & Islam, M. S. (2023). Quality management system framework for construction companies in the Kingdom of Saudi Arabia. *International Journal of Productivity and Quality Management*, *39*(3), 302–329. https://doi.org/10.1504/IJPQM.2023.132262