# **EVALUATION OF THE IMPACT OF THE INTRODUCTION OF EN ISO 9001: 2015 IN AN ENGINEERING COMPANY**

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Quality assurance is key to delivering services in the construction process, most of which are provided by engineering companies. Factors that affect quality assurance in construction services include inadequate specifications in tenders, incomplete or poor input data, inadequate communication between participants, inadequate quality control, etc. In order to achieve a high level of quality, it is important to establish a quality management system. The aim of this article is to present the basic concept for the introduction of a quality management and quality assurance system in engineering companies in accordance with the requirements of the EN ISO 9001:2015 standard. By analyzing and considering the characteristics of the company ZEU d. o. o., an assessment of the impact on the company's operations and business is made. The main findings are that the introduction of a quality system leads to the introduction of structured processes, better control of projects, a reduction in errors, improved efficiency and productivity, increased customer confidence and, last but not least, a higher reputation of the company.

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# 1 Introduction

Quality assurance is one of the key factors for the competitiveness and success of companies, especially in the engineering sector of the construction industry, where accuracy, efficiency and compliance with standards play a central role. In this context, the international standard EN ISO 9001 provides a comprehensive framework for establishing and maintaining a quality management system (QMS) to improve processes, increase customer satisfaction and optimize business.

ISO 9001 is an internationally recognized standard that provides for the implementation of a structured quality management system (QMS) to improve customer satisfaction and meet applicable legal and regulatory requirements. Its implementation leads to more consistent quality, improved operational efficiency and higher customer satisfaction. It generally applies to any organization, regardless of size, industry or sector.

For an engineering company, the introduction of the ISO 9001 standard is important because it enables a systematic approach to business management and control, which leads to more efficient provision of services and preparation of documentation (spatial, investment, technical and others). All this requires a well-thought-out management and organization method, appropriate control mechanisms and efficient working methods. Unfortunately, many service companies in the construction industry, especially design offices and engineering companies, do not have a QMS. They list and manage their business processes in a unique way for which efficiency and effectiveness cannot be measured (Hozjan, 2024).

The aim of the paper is to present the introduction of a QMS in the company ZEU družba za načrtovanje in inženiring d. o. o. (ZEU) and to analyze the effects of the introduction. The theoretical part presents the basic quality concepts and the philosophy of quality management, which are important for the company's business policy. The main part focuses on the introduction of the SIST EN ISO 9001:2015 standard in the ZEU and on the evaluation of the impacts of the introduction of the standard. The paper thus contributes to understanding the importance of systematic quality management in engineering companies.

# 2 Theoretical Background

There are several definitions of the term "quality", and different authors in different literatures cite it in different ways. The internationally recognized definition comes from the ISO 9000 standard, where the first part of the definition refers to the concepts of the overall properties and characteristics of a product or service, also known as the mix of characteristics (Bravi, Murmura, & Santos, 2019).

ISO 9000 is a set of basic principles and terminology related to QMS. It contains the basic concepts, definitions and guidelines for understanding quality management and is not intended for certification. ISO 9001 is the standard that specifies the requirements for a QMS, it is more detailed and prescriptive than ISO 9000 and is used for certification purposes. ISO 9001:2015 follows the standardized framework, which consists of ten clauses related to the following areas: Scope, Normative references, Terms and definitions, Context of the organization, Leadership, Planning, Support, Operation, Performance and evaluation, and Improvement. Organizations must implement processes, document them, and measure their effectiveness (ISO, 2015).

In order to achieve effective quality control and quality improvement, companies today often use the following modern quality management tools: TQM, 8D method, Deming circle, Ishikawa diagram, brainstorming, Pareto diagram, FMEA, 5 Why, Six Sigma, BSC (Balanced Score Card), benchmarking and others.

This paper focuses on Total Quality Management (TQM) and the associated QMS. The basic principle of TQM is based on emphasizing the importance of people, processes and results achieved. Theoretically, TQM focuses on three key areas: customer focus, continuous process improvement and extensive employee involvement (Andoljšek, 2003). In the service sector, employees are a key production factor, usually working in an interdisciplinary team with different skills and abilities. The right combination of knowledge and personality traits of team members contributes to the success of the entire team.

QMS is a system for the management and control of an organization in the area of quality. It represents a part of the organization's operational and business activities that ensures that processes are carried out in accordance with quality. Thus, it forms the basis for the production of a quality product or the provision of a comprehensive service (Skukan & Katjuša, 2008).

# 3 Implementation of EN ISO 9001:2015

The quality of services is the result of comprehensive management that is customeroriented as an organisation's management system and promotes the full involvement of all employees in continuous improvement. It is important for the company that chooses EN ISO 9001:2015 quality management to establish, document, implement and maintain a QMS and strive to continuously improve its performance in accordance with the standard's requirements. Top management must demonstrate their commitment to the development and implementation of a QMS (ISO, 2015).

As part of establishing a QMS, the company must define the processes and their application throughout the company and the sequence of processes and their interdependencies; establish methods, including criteria, for the successful operation of the processes; ensure the availability of resources or information to support the processes; monitor, measure and analyze the processes; implement measures to achieve the planned results; and implement continuous process improvement activities (ISO, 2015).

Quality management in work processes comprises planning, controlling, maintaining, and creating product or service quality. It can be divided into three levels: quality control (QC), quality assurance (QA), and quality management (QM). QC is the basic process of checking the conformity of products or services through observation and assessment using methods such as measurement, testing or comparison. Even if QC does not add value, it prevents the continued use of unsuitable products or the provision of unsuitable services. The control results can be used as feedback for previous processes or information for future processes (Šuman, 2020). The introduction of the ISO 9001 standard is limited in the paper to engineering companies in the construction industry, which are defined as micro and small enterprises under the Companies Act (The Official Gazette of the Republic of Slovenia, 2021).

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# 4 Implementation of EN ISO 9001:2015 in ZEU

#### 4.1 Description of the engineering company

ZEU was founded on April 3, 1974, and is headquartered in Murska Sobota. The company's services include a wide range of professional tasks, i.e. preparation of documentation in the field of geodesy and spatial informatics, project documentation, spatial planning and urban planning documentation, professional bases for spatial planning needs, investment documentation and related land acquisition, obtaining administrative approvals and permits, regulation of real estate ownership, real estate valuations and professional consulting in real estate transactions. ZEU is a multi-project company structured as a functional project management organization (Hozjan, 2024).

### 4.2 Impact of introduction of EN ISO 9001:2015 in ZEU

In order to implement the standard effectively, a structural analysis was first carried out in which the organizational structures, business processes and market segments that influence the company's activities and business were identified. This gave us an insight into the internal workflows, the dynamics between the different parts of the company and their impact on performance and competitiveness in the market. While introducing the standard, umbrella, main and support processes and their owners, workflows and interrelationships were identified. In addition, criteria and methods for effective process management were defined. The implementation activities were also aimed at establishing a system for measuring, monitoring and analyzing processes and defining measures to achieve the set goals. In addition to the identification and documentation of processes, ZEU also took into account the commitment of management to implement and maintain the QMS, the understanding of the requirements of the standard, the perceived need for employee training to acquire appropriate knowledge and skills and the promotion of employee participation in the implementation.

The changes in the company's business activities and an evaluation of the impact of the introduction of the standard are described in more detail below.

# 4.2.1 Changes in the company's operations

The introduction of the SIST EN ISO 9001:2015 quality standard entails a number of changes in the company's operations, including the adaptation of existing activities, the training and awareness-raising of employees and the establishment of a continuous improvement system.

One of the most important changes is the need to plan and document processes. This includes defining clear instructions and responsibilities for carrying out the processes and setting up a monitoring and measuring performance system. The company defined an umbrella process (management, planning and acquisition), four main processes (spatial planning, development of project and technical documentation, engineering services in the preparation and execution of investments and regulation of property relations) and a support process (common functions), which were presented with a process flow and a definition of resources.

In addition, the company has made the necessary adjustments to existing working practices and systems to ensure compliance with the requirements of the standard, including reviewing and updating existing documents and procedures.

A new organizational chart of the company was also created, namely, the introduction of a quality management manager as a joint function (Figure 1). Together with the management, this person is primarily responsible for making employees aware of the importance of quality assurance in providing their services or preparing documentation.

In addition, with the introduction of the QMS, a system of continuous improvement was also established at the level of the quality system manager, which aims to identify opportunities for improvement and measures for their implementation. However, the result of all changes is an improvement in the quality of services, a commitment to continuous progress and the adaptation of processes to changing market conditions and customer needs.

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Figure 1: New organizational chart of ZEU

# 4.2.2 Evaluation of the impact

The impacts of the introduction of EN ISO 9001:2015 are generally divided into financial (impact on company revenues, assets, costs, etc.) and non-financial (impact on customers, employees, company performance, organization of processes, etc.) and are as follows for the ZEU:

- improving process synchronization (coordination, structuring and efficiency), which leads to an increase in the quality of services and their projects;
- by focusing on meeting the needs and expectations of customers, their satisfaction increases, which is the key to attracting new customers and retaining existing ones;
- as the number of customers increases and the quality of services improves, the company's revenue increases;
- EN ISO 9001:2015 promotes the analysis and continuous improvement of processes and thus increases the efficiency of design, planning and project implementation services;
- QMS helps to identify and manage risks, reducing the occurrence of potential negative impacts on projects;

- the introduction of EN ISO 9001:2015 helps a company to work systematically and in accordance with professional rules, legislation and other regulations;
- the QMS enables greater transparency and a clear definition of responsibilities within the company, which contributes to better internal communication and easier decision-making;
- clearly defined processes and responsibilities enable better management of projects;
- the quality assurance system reduces the possibility of errors and irregularities in projects, which helps to reduce the number of complaints and/or the need for corrections, which in turn means lower costs for the company;
- the regular and organized training and further education of employees leads to greater work efficiency and satisfaction, which has a positive effect on employee motivation and lower staff turnover;
- the increased bureaucracy associated with the introduction of the standard can lead to lower employee satisfaction;
- the introduction of EN ISO 9001:2015 and certification will enhance the company's reputation and improve its competitive position;
- the QMS introduced and the certificate obtained demonstrate that the company operates in accordance with the standards and procedures, which strengthens customer confidence in the company's ability to provide a high level of service quality.

In general, the introduction of EN ISO 9001:2015 has numerous positive effects, which are primarily reflected in improved service quality, higher customer satisfaction, better project management and greater transparency of processes and responsibilities within the company. However, it is also important to understand the potential challenges that arise for the company, such as additional workload for employees, higher implementation costs, changes in working habits and limited flexibility and creativity in some processes.

# 5 Discussion

A well-prepared QMS resulting from the implementation of the EN ISO 9001:2015 standard has a significant impact on the engineering company by reducing the occurrence of errors, weaknesses and deficiencies in the design, planning and project

implementation services. At the same time, the obtained certificate can be a good marketing tool for companies to create a good image and expand the company to other markets. Table 1 summarizes the basic characteristics of introducing a QMS in an engineering company in general, based on a SWOT analysis.

STRENGTHS			WEAKNESSES		
_	better ability to comply with legal requirements and regulations,	-	costs for the introduction of a QMS and certification,		
_	better participation in public procurement,	-	increased bureaucratic effort due to more extensive documentation,		
_	better access to advanced technological knowledge,	_	need for additional education and training of employees,		
_	better risk management and planning,	_	inconvenience for employees due to		
_	lower costs (rationalization),		changes in working habits.		
_	greater competitiveness,				
_	interoperability between new and old services and processes,				
_	better management of processes,				
_	continuous quality improvement,				
_	better management of documentation.				
	OPPORTUNITIES		THREATS		
_	strengthening the company's reputation and position on the market,	_	hesitation in the introduction of standards,		
_	-				
	increase of the business influence,	_	unmotivated employees,		
_	increase of the business influence, increasing the satisfaction of employees,	_	unmotivated employees, lack of understanding of the QMS,		
_	increase of the business influence, increasing the satisfaction of employees, customers and partners,	_	unmotivated employees, lack of understanding of the QMS, unusable QMS documentation,		
_	increase of the business influence, increasing the satisfaction of employees, customers and partners, easier expansion into new markets and the		unmotivated employees, lack of understanding of the QMS, unusable QMS documentation, adverse impact on the business than		
_	increase of the business influence, increasing the satisfaction of employees, customers and partners, easier expansion into new markets and the development of new market niches,		unmotivated employees, lack of understanding of the QMS, unusable QMS documentation, adverse impact on the business than expected,		
_	increase of the business influence, increasing the satisfaction of employees, customers and partners, easier expansion into new markets and the development of new market niches, competitive advantage,		unmotivated employees, lack of understanding of the QMS, unusable QMS documentation, adverse impact on the business than expected, possible extension of time to complete a		
	increase of the business influence, increasing the satisfaction of employees, customers and partners, easier expansion into new markets and the development of new market niches, competitive advantage, opportunity to innovate processes and approaches in design and construction (IT		unmotivated employees, lack of understanding of the QMS, unusable QMS documentation, adverse impact on the business than expected, possible extension of time to complete a task or project due to the need to implement procedures consistently,		

Table 1: SWOT analysis of the introduction	of QMS in an	engineering	company
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Overall, we can conclude that the implementation of the ISO 9001:2015 standard in engineering companies brings numerous benefits, which are reflected in improved service quality, higher customer satisfaction, more efficient project management, and greater transparency and accountability within the organization. The system ensures compliance with the standards, but also represents an opportunity for the organization to take a leading role in the market and leverage competitive advantages. Despite the tangible positive effects, it is also important to recognize the challenges that the introduction of the standard can bring. These include additional burdens for employees, new costs due to implementation, changes to working practices and restrictions on flexibility and creativity in some processes.

Implementation may also lead to inadequately prepared documentation of the quality system, an extension of the implementation time of the task or project, and even the occurrence of effects that are opposite to what is expected of the business. Therefore, it is important for small and medium-sized companies, where most engineering and consulting companies operate in the field of construction, to be aware of all the benefits but, above all, the challenges.

### 6 Conclusions

Quality assurance is crucial to the successful operation of engineering companies, especially in the construction process. Quality of service must be integrated into all phases of the project lifecycle, with the key being the early detection and correction of errors. In addition, it is important to meet market and client requirements, considering the fundamental requirements of the construction industry. A well-established quality assurance and management system in an engineering company, resulting from the introduction of the EN ISO 9001:2015 standard, has a significant impact on the quality-of-service delivery (design, planning, supervision) and thus creates the customer's trust that the ordered services will achieve the planned (expected) quality.

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