

# Improvement of Quality Management by Process Approach: Case of Research and Experimental Development Company

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## ABSTRACT

In order for the programs co-financed by European Union funds to run successfully, various projects are implemented in various sectors. The project implementation and monitoring processes are created in accordance with the requirements of the regulatory acts established by Latvia and the European Union. Non-compliance with the rules may result in the return of the granted EU fund co-financing. Processes introduced that do not comply with regulatory enactments may result in the occurrence of a risk of conflict of interest. In order for the implementation of the project to proceed efficiently, the company needs to implement high-quality processes.

The aim of this paper is to analyze the quality system by using a process approach in order to develop improvement suggestions for the prevention of possible errors in the processes of preparing the project applications and progress reports. Research methods such as qualitative content analysis, Porter's "five forces analysis model", Work distribution structure, Process mapping, Value stream mapping and FMECA were applied for the assessment of the quality management system. Based on both the theoretical research and a case study of a Research and Experimental Development Company proposals are developed for processes, for the quality management system and for the integrated management system.

**Keywords:** Quality management, Process management, Integrated management systems.

## 1. INTRODUCTION

Internally and externally prepared project documentation plays an important role in project implementation. If the documents prepared for the first time do not comply with regulatory requirements, their second check takes additional time. Processes introduced that do not comply with the rules may result in a risk of conflict of interest, as well as the return of co-financing from the EU fund granted. Conversely, in cases of inconsistencies, the payment period of the support grant can be extended up to 2-3 weeks.

The most important tasks of research were to analyze the processes of preparing the project application and Progress Report by using the method of Process mapping, as well as to do an assessment of risks, errors and hazards, by using the method of FMECA analysis; to perform an assessment of the company's quality management system, by conducting an internal audit; to analyze the possibilities of an integrated management system in the company; to develop recommendations for the prevention of possible errors during the implementation of the project

application and Progress report preparation processes in the Research and Experimental Development Company.

Currently, there is a lack of effective control mechanisms in the project application and progress report preparation processes, which results in errors and losses. By improving the existing processes, the enterprise's quality system, as well as improving an integrated management system, the enterprise would reduce the risk of a conflict of interest and the costs related to loss of quality, as well as improve the quality of the provided service.

The paper is organized as follows: Section 2 describes the research methodology, Section 3 provides a literature overview on quality systems and quality management, followed by a qualitative content analysis of the selected literature on the elements of quality systems. In Section 4 the analysis of integrated management system benefits is done. In Section 5 – the process management role in a company is provided. In Section 6, the main results of the analysis are described. Section 7 contains the main conclusions.

## 2. RESEARCH METHODS FOR PROCESS APPROACH APPLICATION IN QUALITY MANAGEMENT

The design of the research includes a company assessment regarding the current situation in the industry in order to improve the company's strategy. Then all the project units necessary for the company to achieve the main project goals were identified.

In order to depict and improve the processes of preparing the project application and Progress Report, process mapping is carried out. This allows us to get a structured representation of the company's processes, their analysis, simplification, and efficiency. [1]

By analyzing the theoretical aspects, the authors of the paper found out that risk management, which includes risk assessment, is an important tool in project management. In order to evaluate the risks of the process of preparing the Progress Report of the project application and find out their causes, FMECA, or the analysis of possible causes, consequences and dangers of errors, was used. This method allows us to evaluate the reliability and quality of the system. Within its framework, it is necessary to identify potential damages, their possible causes and consequences. After calculating and prioritizing possible consequences, risk prevention actions were determined and implemented [2].

In order to be able to evaluate the process of preparing the progress report and its value, it is necessary to carry out value flow mapping. This method maps the value flow in all processes starting from, for example, the material entering production, until the product is handed over to the customer. This method is also used in service and administration processes. As a result of the

method, violations during service provision are recorded. One of the most important goals of the method is to depict not only the current state of the process, but also to create a map of the future state of the process, which helps to calculate the cost and final value of the product or service. [3]

An internal audit was conducted to evaluate the company's quality management system. This method allows to provide the management of the organization with objective assessments, identify processes that are not working properly, so that they can be improved in the future [4]. The method is widely used in both private and public sectors, which helps to improve the performance of organizations in the long term. As part of the study, an internal audit will be conducted in the company based on the requirements of ISO 9001:2017.

An evaluation of the most important aspects of the involved persons was carried out for the development of proposals for the improvement of the integrated management system. This is a method that helps to identify common elements that need to be integrated into a system to meet the needs of all involved.

PESTEL analysis was used to assess the external environmental factors that affect the company's quality management system. This method allows to identify various conditions and situations that the company may have to face in the future. This method examines the political, economic, social, technological, environmental and legal factors that can affect the company and the industry [5].

The methodology will allow evaluation of the existing quality management systems and processes of the company in order to develop proposals for their improvement using the process approach.

### 3. QUALITY SYSTEM AND QUALITY MANAGEMENT

To ensure quality, the organization creates and manages a quality system. The system includes and regulates both human resources and production equipment. It is necessary to produce a high-quality product or perform a service. A common structure is created for the entire life cycle of a product or service. The main purpose of the quality system is to ensure and control quality.

When creating a system, it is also important to analyze economic factors so that the costs of a product or service are economically beneficial for the organization.

In general, the quality system is a fully documented, structured and planned way of management in the company, which determines how people, equipment and all processes in the organization will work. The main goal of the system is a high-quality product or service.

When creating procedures and processes, the quality system defines the job description of the employees involved. Every employee in the organization is aware of their duties and is also responsible for their actions. Control measures such as internal and external audit are necessary for this system to work [6], [7]. It helps to identify weaknesses and deficiencies in the quality system, resulting in new system improvements.

In order to ensure the operation of the quality system, it also includes the operation of the quality management system (hereinafter referred to as QMS) in the organization. QMS is defined as a set of processes, methods and tools aimed at improving the organization and achieving its goals [8], [9], [10], [11], [12]. An important role in the development of the system is played by the management, which must be involved in the creation of the quality policy. In order to achieve their goals, companies must engage their employees and improve their knowledge of the importance of customers and satisfying their requirements.

In order to find out what set of elements and tools makeup QMS, a qualitative content analysis is conducted. In total, 10 scientific articles were analyzed. By gathering information, 15 QMS elements were obtained: involvement of employees and executors, processes and process approach, customer service, satisfaction and expectations, management and decision-making, quality assurance, methods, models and tools, quality planning and preparation of procedures, making improvements, quality and process control, quality objectives, business strategy, information technology, relationship management, new documentation, risk assessment, involvement of employees and performers, processes and process approach, customer service, satisfaction and preferences, management and decision making (see Figure 1. QMS elements).

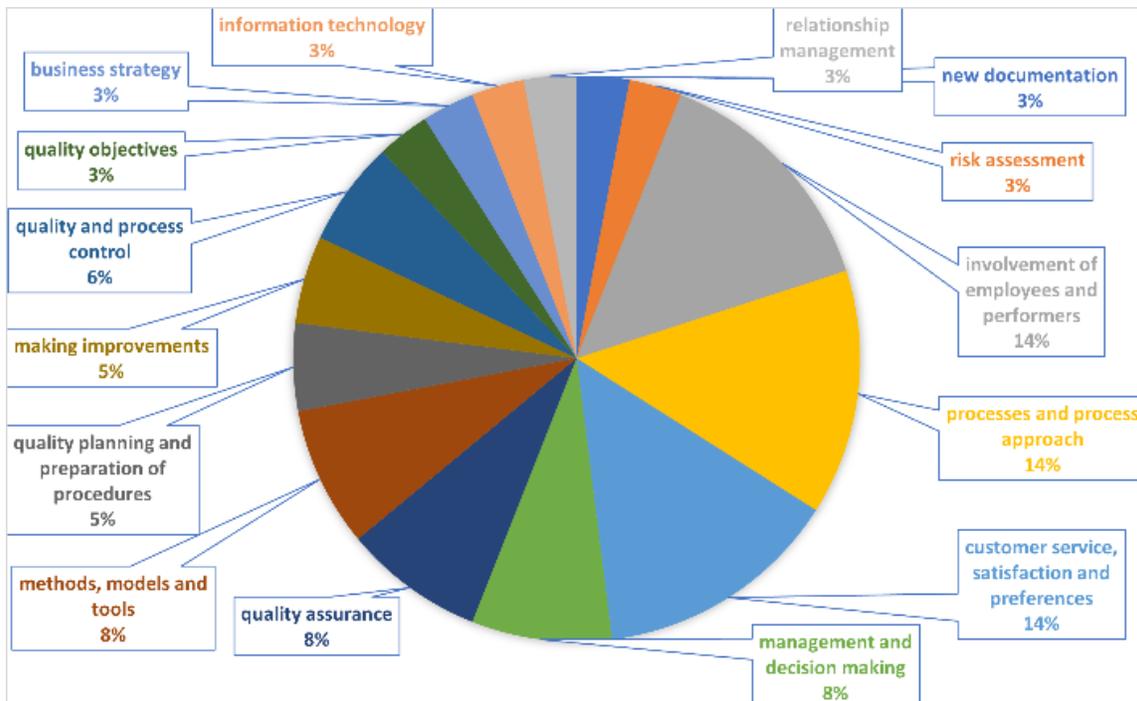


Figure 1. QMS elements [created by authors]

As a result of the qualitative content analysis, it was found out that the most frequently selected literature sources mention the involvement of employees and performers, processes and approach to processes, as well as customer service, satisfaction and requirements (14%) as QMS elements.

Leadership and decision-making, quality assurance and methods, models and tools (8%) follow as next important elements. Then, QMS elements such as quality and process control, making improvements, quality planning, and preparing procedures reached the 5 to 6 % mark.

The 3% mark was achieved by such elements as: quality objectives, business strategy, information technology, relationship management and new documentation.

The International Organization for Standardization has defined the following main principles of the quality management system: customer focus, management or leadership, human involvement, process approach, improvement, evidence-based decision-making and relationship management. [13]

In comparison with the QMS elements collected by the authors, it can also be concluded that all seven principles of the International Organization for Standardization are also included in the QMS elements. The difference is only in the priority - how organizations perceive the elements and principles of QMS.

From the collected literature sources and the obtained results, the authors conclude that elements of QMS can be used differently in each company. There are companies that use only the primary elements and principles defined in the quality standards, while others use only those elements that are appropriate for their organization and scope.

Therefore, it can be concluded that the implementation and maintenance of QMS in the organization requires close cooperation of management and employees in order to ensure processes, methods and control mechanisms in the company, which ultimately ensure the quality that customers want and value.

According to the results of the internal audit, the authors concludes that the Research and Experimental Development Company (further "Company") has implemented a quality management system and its elements, but no QMS policy has been established. The Company has not defined the influencing internal and external conditions, set quality goals, as well as defined the scope of QMS.

The quality system in the Company is primarily oriented towards customers and their requirements. The Company takes all necessary steps to prevent repeated errors. The Company documents and stores all the documentation related to the provision of the service in order to be able to prove the conformity of the service provided. The Company operates fully in accordance with the requirements of regulatory acts and has also determined the rights and obligations of customers.

The authors of the paper would like to emphasize that the Company has a great potential for the creation of a full-fledged quality system in the Company, because based on the selected quality standard requirements (24), only 4 inconsistencies and 7 improvement opportunities were found.

The management of the Company demonstrates leadership and is interested in the possibilities of improvement and improvement of the existing quality system, however, at the moment, no decision has been made to introduce a quality system in the Company based on the requirements of ISO 9001:2017.

In general, the Company uses elements in the existing quality system that are included in the main principles of QMS: orientation, management or leadership, human involvement, process approach, improvement, evidence-based decision-making and relationship management.

In order to assess what risks the inconsistency of the identified elements creates in the Company, the authors choose to perform an assessment of the FMECA analysis of the inconsistencies that have been identified as a result of the internal audit.

The authors evaluated the following QMS elements:

- external and internal conditions;
- sphere of quality government system;
- quality policy;
- quality goals and planning to achieve them.

External and internal conditions can significantly affect the quality management system. Using the FMECA analysis, the authors estimated that the degree of risk of occurrence of internal influencing factors is 100, while the degree of risk of occurrence of external influencing factors is 60. Failure to assess these factors in time and not improve procedures can cause substantial losses to the Company and cause an increase in the number of non-compliances. In order for the Company to be able to assess possible risks, causes and consequences in time, as well as to improve the existing quality management system, the authors conclude that the Company needs to define and evaluate all external and internal conditions affecting QMS.

In order for the Company to be able to prevent the risk of non-compliance in time, it also needs to set intermediate quality goals that need to be met. Currently, the Company has defined the overall quality goal of the project, however, the small goals that can help the Company regularly review the existing quality system and improve it have not been set. This risk rating is 60.

In general, the authors conclude that the Company primarily needs to supplement the existing quality management system with the assessment of external and internal influencing factors, as well as setting quality goals, in order to improve the system's operation in the future and prevent the possibility that the quality management system does not work according to the desired results.

#### 4. INTEGRATED MANAGEMENT SYSTEM

Starting from the 20th century, the introduction of an integrated management system (hereinafter referred to as IMS) in the company was also one of the methods to improve the organization's management processes. IMS is a unified management system in an organization where there is coherence and harmony at all levels [14], [15], [16], [17]. In literature sources, it was most often mentioned that IMS consists of quality, environmental and occupational safety management systems and standard requirements.

IMS is a unified management system in an organization that combines and executes in harmony at least 2 systems. There are common goals, directions and processes that work and aim for the result while meeting all the requirements.

IMS is evaluated and divided according to its degree or level. Karapetrovic offer the following distribution of integration levels in the organization [14]:

- first level - integrated documentation, where a common manual with common procedures has been created;
- second level - agreed basic processes, goals and resources. Planning, development, implementation and other activities have been created and integrated, as well as specific goals, employees and financial resources have been linked;
- the third level - an "all in one" system is created when there is complete coherence in all procedures and instructions. A single system has been created including all the points mentioned above.

Such a division of levels allows organizations to determine whether the existing system/systems have actions and signs that confirm that the company operates an IMS.

On the other hand, I. Mežinska has developed the general self-assessment model for the assessment of 2 or 3 standardized management systems, using responsible persons, processes and documents as key points. In the case of two control systems, it is possible that there can be 4 different degrees of integration, while in the case of 3 systems there can be 7 different degrees of integration [18].

In addition to the IMS concepts already collected, for example, Abrahamsson *et al.* [19] have studied IMS from a different point of view. They define a complete IMS as a system that includes the management of the needs of all relevant stakeholders, including all suppliers, customers and other stakeholders in the supply chain. The authors also emphasize that IMS or management systems in general are not based only on standard requirements, therefore it is important to implement systems in the organization that best suit its scope. In order to fully integrate the management system, the authors propose to identify all involved persons and their requirements. It is based on an assessment of the most important aspects of the involved persons. It further explains that an effective IMS starts with a (process-based) integrated analysis of aspects (risks and opportunities) that can be carried out continuously, focusing on the most important aspects. A system implemented in this way will monitor the entire supply chain of a service or product from the first supplier to the last customer, as well as monitor the other parties involved. [19]

In general, the authors want to highlight the effectiveness of this approach also in companies that do not integrate standards and their requirements into their organizations. Such an approach helps any company to build an effective system, which is also a part of IMS.

IMS is a unified management system in an organization that works in harmony and simultaneously fulfils all requirements set by various regulatory acts or standards. In the IMS, uniform documentation has been created, combined processes, and the system is monitored as a whole. IMS development can be started step by step, it is important to assess the requirements and involved persons in the beginning in order to be able to determine which parts of the system are primarily necessary to integrate and improve.

When conducting an internal audit according to the requirements of the ISO 9001:2017 standard, the company has a quality management system. In addition, the company has created and implemented work safety and data protection systems. The authors of the paper would like to draw attention to the fact that these systems are not certified according to ISO requirements, but are designed according to the company's needs, using system elements (for example, processes, documentation, etc.).

Guided by the simplified IMS level self-assessment method developed by I. Mežinska [18] for three systems, the authors conclude that the degree of integration of the company's management systems is: two employees responsible for all systems (IMS and data protection system for one person, and work safety system for the other person), processes and documents for each system.

I. Mežinska [18] has also developed an in-depth self-assessment model for companies that have standardized their management systems according to ISO standards, in order to assess the degree of integration in several elements. However, the authors concluded and decided that this method will not be used within the scope of this study, because the company does not implement management systems guided by standard requirements, but adapts the systems to the requirements of the company and Latvian laws and regulations.

The authors would also like to add that separate documents, procedures, processes, goals, management and monitoring

mechanisms have been created for all systems, which shows that the systems are not mutually integrated in the company. These systems operate in the company as independent mechanisms that are not combined and streamlined. As it is previously noted: IMS is a unified management system in an organization in which at least 2 systems are combined and work in harmony.

It is possible for the company to create an integrated management system including the management of the needs of all involved parties. To do this, it is necessary to evaluate the most important aspects of the people involved [19].

When evaluating the most important aspects of the involved persons, the authors generally conclude that the integrated management system in the company should primarily be created in accordance with the regulatory enactments that determine the requirements for quality satisfaction of the requirements of interested parties on a daily basis. Such an assessment helps to effectively improve the system, which increases the quality of the company's operations and processes. In the event that one of the important aspects changes, then this is one of the methods to evaluate, improve and optimize the company's IMS.

## 5. PROCESS MANAGEMENT

The process approach is focused on achieving goals and results. Each business process must be clearly defined in order to achieve a result. Like QMS, the process approach uses different methods, tools and instruments to achieve the set goals. Actions to be taken using the process approach are – measure, evaluate, identify, discover, analyze, execute, monitor, refine, improve and manage [20], [21], [22], [23], [24]. It is important to constantly evaluate business processes in order to be able to improve. The process approach is aimed at improving competitiveness and advantages in the market.

The process approach is used for interrelated processes and is also used at every level, function and department of the organization. Business processes must be sequential and are influenced by different procedures and resources [23]. Researchers have indicated that the process approach is a management strategy and that not only employees think about this method, but also management [24].

## 6. MAIN RESULTS OF ANALYSIS

In the process of preparing the project application, the Company must prioritize processes with additional information verification procedures so that the input of the data is accurate according to the specification in the application. Likewise, when creating processes and descriptions, the Company must clearly and accurately define all procedures and criteria from the beginning, so that everyone is clear about who and how they are being carried out.

It is necessary for the Company to implement effective control mechanisms and procedures for assessing and monitoring the risk of conflict of interest in the quality system, as well as to carefully plan the Company and project budget taking into account various influencing external and internal factors in order to reduce the degree of probability of risks.

In the preparation process, the Company needs to implement effective control and management mechanisms that help to improve the process of document verification of costs attributable to research by reducing the degree of probability of risks.

The non-value-added time for the research eligible cost document review process and the preparation of the cost file at the end of the quarter is larger than value adding but in the

particular business it is unavoidable. About 11% of the total activities add value to the final product, while 89% do not add value to the final product or cause losses. The Company needs to streamline those activities that cause losses and do not add any value to the final product.

The Company primarily needs to supplement the existing quality management system with the assessment of external and internal influencing conditions, as well as setting quality goals, in order to improve the system's operation in the future and prevent the possibility that the quality management system does not work according to the desired results.

It is possible for the Company to create an integrated management system including managing the requirements of all involved parties. To do this, it is necessary to evaluate the most important aspects of the people involved. It is primarily necessary to create an integrated management system in the Company in accordance with the regulatory enactments that determine the requirements for high-quality satisfaction of stakeholders' needs on a daily basis.

Of the external and internal influencing factors, the Company's quality system can be most significantly influenced by political, legal, knowledge and information, employee and top management factors. The Company must continuously monitor the latest changes in regulatory acts, employee motivation, teamwork and knowledge level, so that the quality system in the Company works effectively and meets the legislative requirements.

The Company must create risk registers, where written and visual data on the researches implemented by partners, involvement in projects and real beneficiaries are collected. Regular collection and accounting of information will ensure that the Company excludes the possibility of risk occurrence, as well as during audits it will be possible to prove that the Company has integrated procedures that ensure the management of these risks.

Supplement the methodology developed so far by creating templates for sample preparations (for example, a list of the distribution of wages, calculation of vacation and sick pay, a list of recommended accounts, a list of accrued vacation days). The development of such supporting materials will help partners to prepare documents and make calculations according to project requirements, as well as reduce the time spent on reviewing documents. Unified documents help to streamline the time spent by both the Company and cooperation partners on project activities.

Every time new studies are approved in the project (call and project selection), the Company must organize a seminar in the office premises for project managers and accountants. Holding a joint seminar would eliminate the causes and unclear questions that arise for accountants when it is necessary to submit accounting documents and make postings for the first time. Also, within the seminar, it would be possible for the Company to get feedback from cooperation partners in order to understand what needs to be improved and prepared, so that cooperation partners immediately understand the requirements of the project.

The auditor of eligible costs must create checklists that are adapted to the sections of the system (work contracts, procurement contracts, final recipients, and claimed expenses). Creating such checklists will ensure that data is collected and stored in a single file throughout the quarter that can be used when the data is run into the system.

The management of the Company must ensure and motivate employees to learn new knowledge in the field of EU fund projects, accounting and record keeping, as well as provide training in the use of Microsoft products. It is also necessary to organize team cohesion measures so that employees can

understand each other and participate in quality system improvement processes.

The top management of the Company together with the employees need to organize a joint meeting to jointly set and regularly review the quality goals. It is possible to list them on the SharePoint site with goals, tasks, responsible persons, and deadlines, as well as indicate what is the status of progress towards achieving the goals. Company management needs to set a deadline for each goal in a team meeting so that regular meetings can be organized and reviews of achieved results, developed proposals and implemented improvements

## 7. CONCLUSIONS

The process approach, or business process management, is a set of various activities, methods and tools that help to monitor the organization's business processes and improve them. This approach anticipates and helps achieve the set goals and outcomes. In order to be able to evaluate and improve processes in the company, it is necessary to be aware of and identify business processes. Each organization defines and creates processes according to its scope of activity. It is important to define all processes in the company so that they can be evaluated, executed and improved using the process approach. As a result, improved processes help organizations to more efficiently and fully achieve their goals and outcomes.

In order to improve the company's quality system, it is necessary to improve the existing processes by introducing additional control mechanisms, to carry out regular risk assessment, to use control lists, to create unified documentation, as well as to motivate and train employees in order to reduce the number of non-conformities and improve the service provided quality.

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