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THE IMPACT OF FMEA METHOD ON QUALITY MANAGEMENT SYSTEMS IN CONTRACTING PROCESSES

Ermin Cero
Department of Management, Faculty of Economics and Social Sciences,
International Burch University Francuske revolucije bb, Ilidža 71210, Bosnia and Herzegovina
ermin.cero@ibu.edu.ba

Ema Hasičević
Department of Management, Faculty of Economics and Social Sciences,
International Burch University Francuske revolucije bb, Ilidža 71210, Bosnia and Herzegovina
ema.hasicevic@stu.ibu.edu.ba

Abstract
This article employs both an empirical and theoretical approach to examine how Failure Mode and Effect analysis within Risk Management during contracting process can influence quality management system in companies. Empirical data were obtained from company records which contains implementation of FMEA method. These records show indicators both before and after the FMEA method implementations to establish a baseline metrics and identify and potential changes. Based on several indicators of company performance, the research shows a gradual improvement. Therefore, the last part of the study proces that applying Failure Mode and Effect Analysis is an efficient methodology used to prevent and identify risks associated with business within processes. This analysis demonstrates the practical implications of integrating Failure Mode and Effect Analysis (FMEA) method into risk management practices. If adopted by organizations, the research provides benefits of FMEA integration into their quality management practices.
Keywords: FMEA, risk management, company performance, production efficiency, quality management, contracting process

INTRODUCTION

All organizations with a main goal of entering into global markets must aim at minimum quality for their goods or services. Hence, since the beginning of market liberalization, quick adjustments have become a need as there is increased competition within all sectors. Therefore, competitiveness within global markets, creates a norms for high standards of quality to attain business excellence. To become part of the globalization market, organizations must achieve a high level of quality in all areas of their business including in their product quality.

Under these new circumstances, firms usually restructure their management systems with two key aims: reduce costs and increase product/service quality.

- Reduce costs; increase price competition
- Increase product/service quality, i.e., compete in quality.

To achieve this objective, organizations must explore all options which can include use of prevention technologies that prevent errors thereby maintaining required quality standards.

Throughout the article, preventing business failures is stressed as the cornerstone of Total Quality Management (TQM) showing application methods for risk management and assessments in business processes. Using the FMEA method for evaluation of its influence on the contracting process, this study aims to establish connections between installed quality systems and performance indicators.

FMEA Methodology will be examined, with a focus on how it is really important for mitigating risk and error prevention in business processes. The analysis will make use of qualitative methodologies to find recurrent themes, patterns, and changes in key performance indicators before and after the application of the FMEA method.

This study aims to show how management with the implementation of the FMEA Method may greatly improve the quality of structural parts of the management system, reduce its errors, and promote their success by developing a risk management model.

LITERATURE REVIEW

In the research of the management system "Total Quality Management"- (TQM) is an indispensable term. It is a concept developed after World War II to improve the quality of products and services. It was developed by American scientist Edward William Deming (Injac, 2001).

Total quality management is a management style, i.e. a form of leadership, which ensures the engagement of everyone, from the president of the company to the last employee, in achieving quality and maximum customer satisfaction.

TQM is one of the ways of leading an organization with the intention of participating all associates and cooperation among all groups, in improving the quality, which is achieved by the organization code:

- Goods and Services,
- Activities and Objectives,
- Customer Satisfaction,
- Long-term Profitability,
- Advantages for contributors and compliance with the requirements of society (Gutošić & Reite, 2001).

One of the characteristics of the quality management system is preventive action in terms of preventing the occurrence of errors in business processes. Appropriate activities and measures shall aim to act on business processes to prevent process variability greater than permitted. In the event of such variability, the business process would become unreliable and would generate the occurrence of costs due to (in)quality (Montgomery, 2019). All potential errors need to be systematized and, together with their causes, consolidated in a document commonly referred to as the Catalogue of Possible Errors. They can be reached based on experience in business process management. Their particular significance is manifested in the preparation of the FMEA analysis. In fact, they make up its essence.

FMEA is a systematic method by which problems on a product or in the process are identified and prevented before they arise. According to McDermott et al. (1996), it focuses on preventing errors as well as reducing the possibility of errors occurring, and increasing customer satisfaction.

The basic parameters of the FMEA method's recognition refer to three key elements in its application:

- The probability of an error occurring,
- The probability of error detection and,
- The importance of possible consequences of the error for the management system (Dobrović, 2004).

The implementation of FMEA, depending on the complexity of the business process and risk assessment, may take a long time. Therefore, the use of FMEA can cause collateral damage in certain areas outside the process itself. The traditional FMEA method presupposes the creation of a form for the identification of all potential errors and events and forms of occurrence, determining the consequences of potential causes, strictness, control of existing design, probability of detection, intensity of occurrence, impact, priority with regard to risk, proposing preventive and corrective activities, probability of success of preventive and

corrective actions. Therefore, the traditional FMEA- method requires complex patterns, timing, and engagement of a lot of people.

Simplified FMEA can contribute to cost reduction and is commonly used in the identification and improvement phase within the DMAIC process (Brussee, 2004). The simplified FMEA method looks at activities that may represent an error despite the proposed project, goals, modifications, and completion as expected (Basu, Wright, & Price, 2015).

By applying the simplified FMEA method, it is assumed that all related activities in the project will be carried out correctly.

The analysis using the FMEA method is carried out by carrying out the following activities:

- Identifying potential errors,
- Determination of the potential effects of any potential error,
- Assessment of the severity of each potential error (Failure Demerit Value- FDV) for the internal or external customer,
- Identifying all potential causes for potential errors,
- Probability of failure remedy (PFR) before the next process cycle, based on consequential controls and
- Calculating the risk priority number (RPN), i.e.: RPN= FDV x PF x PFR.

The aim of the measures should be:

- Reducing the likelihood of errors occurring,
- Reducing the significance of errors,
- Increase the likelihood of error detection.

The FMEA method is applicable everywhere, where complex products are developed and business processes are planned. It is suitable for feedback monitoring of errors, but it is most effective for the preparation of preventive action, which means before the end of the production cycle or business process. It is equally effective if used in series production as well as in piece production. Due to its characteristics, it can be used in non-manufacturing business processes, although this is rarer in practice, which suggests that the possibilities of applying this method in non-manufacturing processes have not been used.

RESEARCH QUESTION AND HYPOTHESES

The research model in this study is structured around the application of the FMEA method within the quality management framework. The model examines the relationship between FMEA implementation focusing on how this method influences product quality, with

independent variable being defined as level of implementation of FMEA method within the company, and the effectiveness of the quality management system within the company.

The research of the study involves a content analysis, which includes a thorough review of existing literature on FMEA, TQM, and risk management practices. It includes examinations of academic papers, relevant industry reports, and books. Besides, qualitative data is collected from company records which include the implementation of the FMEA method.

These records show indicators both before and after the FMEA method implementations to establish baseline metrics and identify potential changes.

Following the defined problem and subject of research, the hypothesis is defined:

Applying the FMEA method in risk management significantly contributes to the quality management system.

The research aims to answer the following questions:

RQ1: How does the implementation of the FMEA method affect the overall quality management system?

RQ2: What changes can be observed before and after the application of the FMEA method?

RESEARCH METHOD

Data Collection

The data for this study was gathered through an application of Failure Mode and Effect Analysis (method) in the contracting process. The steps involved in gathering data are as follows:

1. Identification steps of the contracting process:
    - The contracting process was divided into separate steps, including:
    - Receiving and analyzing requests
    - Drafting proposals
    - Harmonization
    - Contract verification
    - Contract finalization

2. Developing a document of potential errors:

To help in forecasting and preventive maintenance, at every stage of the contracting procedure were recognized.

3. Assessment of the problem:

The importance of every identified error was evaluated from the viewpoint of the client/customer, considering any possible effects on the contracting process.

4. Identification of all possible error causes:

By identifying the error causes, a comprehension of mistake's origins was made possible.

5. Evaluation of the probability of errors happening:

Historical data was used to determine the probability of errors happening.

6. Overview of current control and monitoring techniques:

It evaluated the efficacy of the current control, audits, and monitoring techniques.

7. Evaluation of error detection probability estimation:

This includes evaluation of the likelihood of finding errors prior the finalizing the process.

8. Calculation of risk probability:

Before and after following the execution of corrective actions, the degree of risk probability was determined.

9. Identification and implementation of corrective measures:

To reduce identified risks, implemented corrective actions were identified.

10. Reassessment of factors to determine the effectiveness of the corrective activities within the process:

To confirm if the corrective activities were successful in mitigating risk, certain factors were reevaluated.

Data Analysis Approach

To evaluate the possibility of error occurring (PF Values), and the severity of it (FDV Values), an empirical and theoretical approach was used. The results were combined to get a detailed picture of how the Failure Mode and Effect analysis method affected the contracting process. This methodology ensures that Failure Mode and Effect Analysis method implementation in the contracting process is carefully recorded and examined to offer a route for risk identification, assessment, and mitigation.

Table 1. “Form for conducting analysis using The FMEA method”

FMEA BUSINESS PROCESS														
Process name:		Contracting process			Expert team for FMEA			Disclosure		Action executed				XYZ
Manager of the process:		XYZ			Date of first FMEA			XYZ		Date of first FMEA				XYZ
Process step (activities)	Potential error	Potential consequences	FDV	Potential causes	PF	Existing control	PFR	RPN	Repair action (activities)	FDV (1)	PF (1)	PFR (1)	RPN (1)	RPN-RPN (1)
A-01.1 Receipt and analysis of requests														
Receiving requests	The request was not received	Cannot start the process	4	The request was not sent or the negligence of the employees	5	Execution control	1	35	Boost control	1	1	1	1	34

Record of requests	The request is not recorded	Request lost	4	There is no clear procedure or negligence of employees	5	Execution control	1	35	Make clear written proposal	1	1	1	1	34
Confirmation of receipt of request	Receipt of the request has not been confirmed	The request is lost and the deadlines are passing	4	There is no clear procedure or negligence of employees	5	Execution control	2	40	Create a clear written proposal	1	2	1	2	38
Analysis of requirements	Errors in analysis	Request rejected without reason or accepted and will not be able to be fulfilled	8	Unclear request or lack of expertise of process participants who perform request analysis	5	Execution control	2	70	Education of process participants, increasing competence	2	1	1	2	68
Checking the understanding of the request	Errors in comprehensibility control	Accepting a request that cannot be fulfilled	7	Unclear request or lack of expertise of process participants who perform request analysis	6	Check the comprehensibility of the request	4	216	Education of process participants, increasing competence	2	2	2	8	208
Distribution of processing requests	Distribution errors	Wrong location, delay	2	There is no clear procedure or negligence of employees	4	Execution control	1	18	Create a clear written proposal	1	2	1	2	16
A-01.2 Proposal making														
Creation of text proposals	Wrong text	Extension of production time, postponement	2	Incompetence of process participants who prepare the text	4	Execution control	4	54	Education of process participants, increase in competence	1	2	2	4	50
harmonization of text proposals	Giving consent to wrong text	Harmful contract for the organization, financial damage	8	Incompetence of process participants who prepare the text	5	Execution control	4	180	Education of process participants, increase in competence	3	2	2	12	168
Control of text suggestions	Incorrect control results	Harmful contract for the organization, financial damage	8	There is no clear procedure or negligence of employees, incompetence of controllers	5	Control of text suggestions	5	280	Education of process participants, increase in competence	3	2	2	12	268
Correction of the text proposal	No correction was made	Harmful contract for the organization, financial damage	7	There is no clear procedure or negligence of employees, incompetence of controllers	5	Execution control	4	162	Education of process participants, increase in competence	2	1	1	2	160
Approval of text proposal	Incorrect text approved	Harmful contract for the organization, financial damage	7	Incompetence of process participants who prepare the text	5	Approval of text proposal	5	216	Education of process participants, increase in competence	2	1	2	4	212
A -01.3 Coordination														
Delivery of the proposal to the other	The proposal is not timely delivered or	Extending deadlines, decline in	4	There is no clear procedure or	5	Execution control	1	30	Create a clear written procedure.	1	2	1	2	28

party	not at all	reputation		negligence of employees					Increasing competence						
Negotiation	Bad execution negotiations	Threatened interests of the organization,	7	Inexperience of negotiators	6	Execution control	4	280	Education of process participants, increasing competence	2	2	3	12	268
Alignment	Giving consent to a bad text	Harmful contract	7	Inexperience of the participants in the process who give consent to the text	5	Execution control	4	270	Education of process participants, increasing competence	2	2	3	12	258
Compliance level control	It was not implemented control	Threatened interests of the organization	7	There is no clear procedure or negligence of employees, incompetence of controllers	5	Control of the degree of agreement	4	324	Education of process participants, increasing competence	2	2	3	12	312
Continuation of negotiations	They didn't continue	Harmful contract	4	Interference in communication	6	Execution control	3	140	Improve communication	1	2	1	2	138
Alignment	Giving consent to bad text	Threatened interests of the organization,	7	Inexperience of the participants in the process who give consent to the text	6	Execution control	4	315	Education of process participants, increasing competence	2	2	2	8	307
Compliance level control	No control was carried out or it was implemented badly	Harmful contract	7	There is no clear procedure or negligence of employees, incompetence of controllers	6	Control of the degree of agreement	1	126	Education of process participants, increasing competence	2	2	1	4	122
Compliance verification	There is no agreement about essential elements	Extension of deadlines, loss of reputation	4	Inexperience in preparation	6	Compliance verification	1	70	Education of process participants, increasing competence	1	2	1	2	68
A-01.4 Contract certification															
Preparation for certification	No preparation was done	Extension of deadlines	3	There is no clear procedure or negligence of employees	5	Execution control	1	48	Make clear written procedure	1	2	1	2	46
Certification from the initiator	Authentication was not performed	Stopped process	4	There is no clear procedure or negligence of employees	5	Control from the initiator of the contract	1	30	Make clear written procedure	1	2	1	2	28
Legal certification	Error in assessment of legal form	Legally invalid contract	7	There is no clear procedure or negligence of employees	5	Legal control	1	54	Make clear written procedure	2	2	1	4	50
Financial certification	Error in estimation	A harmful contract for the organization	7	There is no clear procedure or negligence of employees	5	Financial control	1	54	Make clear written procedure	2	2	1	4	50

Commercial certification	Error in estimation	A harmful contract for the organization	7	There is no clear procedure or negligence of employees	5	Commercial control	1	54	Make clear written procedure	2	2	1	4	50
Quality assurance	Error in estimation	Quality interests are not protected	7	There is no clear procedure or negligence of employees	5	Control of the quality manager	1	54	Make clear written procedure	2	2	1	4	50
Signing by an authorized person	Signed despite errors in assessment	A harmful contract for the organization	7	There is no clear procedure or negligence of employees	5	Control of the authorized person to sign	1	54	Make clear written procedure	2	2	1	4	50
Distribution of the certified contract to the other party	Wrong distribution, not distributed on time	The competition learns the terms of the contract, loss of reputation	7	There is no clear procedure or negligence of employees	5	Execution control	1	120	Make clear written procedure	3	2	1	6	114
Distribution records	Incorrect or missing records	The competition learns the terms of the contract, loss of reputation	8	There is no clear procedure or negligence of employees	5	Execution control	1	60	Make clear written procedure	3	3	1	9	51
A-01.5 Conclusion of the contract															
Checking readiness for assembly	Wrong assessment about readiness	A harmful contract was concluded for the organization	8	Incompetence in process management	4	Readiness control to conclude a contract	2	150	Education of process participants, increase in competence	3	4	1	12	138
Signing by an authorized person	Signature on wrong place	Repeating part of the procedure, deadlines	5	The formalistic approach, i.e. Negligence of the responsible person	4	Control by an authorized person	1	60	Education of process participants, increase in competence	1	1	1	1	59
A-01.6 Final actions															
Records of contracts	It is not registered or incorrectly recorded	Protracted sequence, loss of contract	5	There is no clear procedure or negligence of employees	4	Execution control	1	60	Make clear written procedure	1	2	1	2	58
Distribution of contracts to users	Wrong distribution or not distributed	Competition finds out the terms of the contract, extension of deadlines, loss of reputation	4	There is no clear procedure or negligence of employees	4	Execution control	1	25	Make clear written procedure	1	1	1	1	24
Archiving of contracts	Not archived or was archived incorrectly	Loss of contract, loss of reputation, extension of time	4	There is no clear procedure or negligence of employees	4	Execution control	1	25	Make clear written procedure	1	1	1	1	24

The very look at the value of the indicator of the severity of potential errors, that is, the value for FDV, indicates those errors that can significantly affect the entire process and its result. Consequently, since the error is added to a quite concrete activity in the process, already at this stage of the research it is possible to come to the realization of which activities in the process should be paid special attention. From the data shown in Table it can be concluded:

- The first process step has hazardous activities that can cause dangerous possible consequences 33.33% of the total number of activities; the second process step 80.00%, the third 62.50%; the fourth 77.77%; the fifth 50.00% and the sixth process step have no activity of very high danger or greater.
- The contracting process consists of a total of 33 activities and has 19 hazardous activities or 57.57%, which can cause dangerous possible consequences.
- The sixth process step has no activities that contain a very high or greater danger. This does not mean that there are no certain hazards in the process, the possible consequences of which do not have to be very dangerous or of a greater degree of danger. The FDV value for the activities in this process step is 5 and 6, which means small or medium danger and possible consequences. This is understandable given that significant errors and dangers occur within the process before its completion, i.e. reaching the final, sixth process step.
- The greatest potential danger and possibly dangerous consequences are found in activities in the second process step (80.00%), the fourth (77.77%), and the third process step (62.50%).
- The greatest attention in the contracting process, given the dangerous activities and the possible dangerous consequences of these activities, should be directed to drafting contract proposals, harmonizing the text of the contract, and certifying the contract.

When known dangerous activities and their possible negative consequences and the indicator of the severity of potential errors are quantified, it is possible to approach the identification and implementation of prevention measures, to prepare in a timely manner, and reduce the possibility of dangerous consequences due to the implementation of hazardous activities. This protects the business interests of the organization and meets the requirements of interested parties. It is part of the risk management system in the contracting process, and consequently in the organization in general. In this way, the business of the organization takes place in the field of security, but the process of risk management should continue further.

Identifying the potential causes of errors in the process is important to be able to predict, recognize, and prevent them. In business processes, the engagement and actions of people are necessary. Man is essentially not "perfect", which in this context means that he is also peculiar to making wrong decisions, which will result in mistakes, i.e. deviations from the planned,

expected, given, demanded, etc. It's not a problem if an error happens. The problem arises if the same error is repeated from cycle to cycle. This means that the quality management system does not exist and does not work. Where a quality management system exists, after the first occurrence of an error, an analysis of the cause of its occurrence is carried out for reasons to identify and locate the cause and to permanently eliminate it by appropriate corrective measures and actions. The investigation of the cause must not be aimed at personalizing responsibility in terms of searching for the culprit but must be directed to the cause of the error, and personalization is desirable only for the purpose of easy identification of the location of the cause and coming to the knowledge of the problem.

Table 2. “Causes of errors in the process”

Causes	**A-01.1**	**A-01.2**	**A-01.3**	**A-01.4**	**A-01.5**	**A.01.6**	**TTL:**
Process							
Incompetence	2	4	6	-	1	-	**13**
Lack of written procedures	2	3	3	9	-	2	**19**
Negligence of process participants	3	3	2	9	2	2	**21**
Responsible person's intention	-	-	-	1	-	-	**1**
Others - participants outside the organization	3	-	-	1	-	-	**4**
Communication	-	-	1	-	-	-	**1**
TOTAL	**10**	**10**	**12**	**20**	**3**	**4**	**59**

Table 2 presents an analysis of the potential causes of the errors in Table 1. A total of six major potential causes of all potential contracting errors were identified.

The next activity in FMEA analysis is to determine the existing controls for each individual activity. Assessing the probability of detecting errors or problems in the contracting process and calculating the degree of probability of risk in the process point to the priorities of the work of the process team, to the determination of corrective actions in the process.

In the example presented, the process manager should decide that special attention should be focused on activities within the third and second process steps, since in them the highest probability of risk. In addition, these two process steps are essential for the quality of the entire contracting process, the quality of the process results, and consequently, the degree of satisfaction of interested parties. The quality of designing and implementing corrective actions depends on whether the organization's business will take place in the field of safety or uncertainty.

For each activity in each process step, at this stage of FMEA analysis, it is necessary to determine the specific corrective action that needs to be carried out, to significantly reduce the

size of the likelihood of risk of this activity and affect the increase in the security of the entire business process. These are:

- Creating clear written procedures.
- Educating participants in the process to increase competence.
- Transparency and ethics in business.
- Improving communication.

After the corrective actions have been carried out, it is again necessary to quantify the probability of potential error (PF) indicator. These values are significantly lower after corrective action and range from 1 (very small) to 4 (intermediate- intermittent error). This is a significant improvement over the period before the establishment and implementation of corrective actions in the process.

Table 3. “Relationship between process capability (Cpk) and number of errors per million operations (DPMO) after corrective actions have been carried out”

Sigma	Grade	DPMO	Errors in %	Accuracy in %	Cpk	Frequency
3,5	4	36.508	3.66%	96.34%	≥ 1.17	1 out of 2.000
4	3	6.210	0.62%	99.38%	≥ 1,33	1 out of 15.000
4,5	2	3.221	0.32%	99.68%	≥ 1.50	1 out of 150.000
5	1	233	0.023%	99.977%	≥ 1.67	1 out of 1.500.000

The number of errors after corrective actions in the process decreased significantly (earlier from "1 of 8" to "1 in 400"), and after the corrective actions (from "1 of 2014" to "1 in 1500000). From "medium" and "high probability" of potential errors, after corrective actions were carried out, this probability decreased to "small" and "very small", which is essential progress. Given that CPK after conducting corrective actions ranges from 1.17 to 1.67, which means that in these cases CPK> 1 (1< CPK< 3), the process is reliable. Once the value of existing PER controls has been re-established, it is possible to calculate the magnitude of the probability of risk in the contracting process (RPN), after corrective actions have been carried out. The results of this calculation shown in Table 4 show a significant decrease in the size of the likelihood of risk following the implementation of corrective actions.

Table 4. “The magnitude of risk probability in the contracting process (RPN)”

Process step	Activity in the process	Risk Probability Magnitude (RPN)	Risk Probability Magnitude (RPN1)	RPN-RPNA (%)
A-01.1	Checking the comprehensibility of requests	216	8	-96,3
A-01.2	Control text suggestions	280	12	-95,72
	Approval of text proposal	216	4	-98,15
	Harmonization of text	180	12	-93,34

	proposals			
	Correction of the text proposal	162	2	-98,77
A-01.3	Compliance level control	324	12	-96,30
	Alignment	315	8	-97,47
	Negotiations	280	12	-95,72
	Reconciliation	270	12	-95,56
	Continuation of negotiations	140	2	-98,58
	Compliance level control	126	4	-96,83
A-01.4	Distribution of the certified contract to the other party	120	6	-95,00
A-01.5	Checking the readiness to enter a contract	150	12	-92,00
	Checking the comprehensibility of requests			
A-01.6	There are no activities with a risk probability greater than 100			
		Average:		-96,13

In all activities, and in all process steps, there was a significant reduction in the overall size of the likelihood of risk. The average reduction in the likelihood of risk is 96.13%. This result was achieved by applying the "process improvement implementation concept" based on four improvement groups. It can be concluded that a significant improvement in process reliability, the quality of process results and an increase in the degree of fulfillment of the requirements of interested parties can be achieved by reducing the size of the likelihood of risk in the contracting process. This is achieved by consistently implementing a plan of corrective measures and activities.

RESULTS

The results of the study show how the adoption of the FMEA method impacts quality during the contracting process. The analysis made use of data collected both before and after the FMEA method was examined. Product quality was improved throughout the Failure Mode and Effect Analysis method implementation.

Before the implementation, there were identified recurring errors in the process that made it difficult to meet client/customer needs. For the identification of critical error locations, FMEA methodology was used which led to the introduction of corrective measures and significant reduction of error frequency.

- Before the implementation: "Requirement analysis" has RPN value from 70.
- After the implementation, there was a noticeable error reduction as seen by the RPN score falling to 2.

The hypothesis was: Applying the FMEA method in risk management significantly contributes to the quality of organizational management and overall business performance.

Therefore, after conducting the research using both empirical and theoretical approaches, it was proved and justified the existence of this interdependence. Hence, the Failure Mode and Effect model has a positive impact on increasing efficiency, showing a slight improvement on the impact of determined variables.

However, it cannot be stated that the company in general has been more successful since the implementation, but it can be said that it gradually improved over the years due to the results showing a slight improvement in the efficiency of the business.

CONCLUSION

Organization management is a complex process that consists of continuously coordinating the activities of all participants in the process, to achieve the desired results, which are the result of the synergistic effect of the overall structure. To manage an organization, it is necessary to establish dominant control over all parameters of the process and management system. The management system is as developed and successful as its least high-quality structural element is developed and successful.

The management system is exposed to significant and numerous hazards daily, which means that it continuously operates at risk and that the result of the management process may be different than expected. By simulating the FMEA method as one of the effective methods for risk management in business processes, companies strive to think in long-term terms, neglecting short-term profits, to create conditions for their own more stable, successful long-term development.

Hypothesis testing was carried out in the exact sense of the word and based on the knowledge of the movement of performance indicators through the observed periods, the following conclusion was reached:

It cannot be clearly stated that the company has been more successful since the implementation of the Failure Mode and Effect methodology and introduction of the quality management system than in previous years when the company did not have the system introduced, but it can be said that its success, according to a greater number of indicators, gradually improves.

The company has recognized quality as a fundamental tool for achieving its goals and for achieving long-term progress through meeting the needs of its customers. Quality today has become a "resource" that separates successful companies from unsuccessful ones and in the conditions of global business quality is a fundamental factor in bidding for customers.

While the research has demonstrated improvements in quality management systems following FMEA implementation, there remains a need for further exploration into the long-term impacts of FMEA on overall organizational success. Future studies could examine the scalability of FMEA in larger, more complex business environments or investigate the application of FMEA across different industries to assess its adaptability and effectiveness. Additionally, research could explore the integration of FMEA with other quality management methodologies to develop a more holistic approach to risk management and process improvement. By expanding the scope of FMEA research, organizations can gain deeper insights into how best to leverage this methodology to enhance both operational efficiency and competitive advantage.

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