

## THE PRELIMINARY PROJECT OF PROCESS TEMPLATE "THE FAILURE MODE AND EFFECT ANALYSIS"

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**Abstract:** Nowadays process management is a symbol of progress and competitiveness. It is also used in systems management, which are aimed at a continuous improvement. The document which describes the processes and allows to implement and perfect them is a process template. The paper presents the project of a process template to analyze the failure mode and effect analysis - FMEA. It was prepared for the company, which is located in the Podkarpackie Province. As a part of the strategy managers implement an idea of continuous improvement. As a part of this work the pilot quality management tools and Lean Manufacturing are launched. Now there is time for formalization of these activities on the basis of the conclusions of previous work. The process template presented in the paper can also be used in other companies.

**Keywords:** Failure mode, effect analysis, FMEA, ISO 9001

### 1 INTRODUCTION

In the conditions of the present times, in order to talk about reaching effective and successful business organizations delivering goods or providing services, it is essential to have an efficient and modern management system. ISO 9001 promotes, and at the same time since 2015 has required the implementation of a process approach to management of the organization. This approach assumes that all activities in the organization are carried out within the framework of processes. If these processes are able to identify the organization, it can be managed effectively. As one cannot manage something that is never noticed. Only in this way the organizations will be able to achieve their goals by achieving the objectives of the individual processes. Only in this way one can provide an adequate allocation of resources, identify processes and activities bringing added value and increase the efficiency of processes.

### 2 PROCESS IDENTIFICATION

The identification process should determine such data as:

1. Name of the process.
2. The owner of the process.
3. Suppliers.
4. Customers.
5. Inputs.
6. Outputs.
7. Added value/target.
8. Applied evaluation measures.

After the processes identification one needs to manage them properly and remember that they are related with each other in various ways. As a part of the management system of the organization it is

necessary to identify and manage numerous mutually related processes.

To enable the organization to function effectively it is necessary not only to identify and properly manage a large variety of process connections, but also to document them, to be carried out reproducibly.

One of the documents describing the processes are process templates. The template is a convenient tool used for the presentation of the activities covered by the management process. This template represents the overall picture of the work process and characterizes only its key elements. Therefore, among other things, it is often used as an element of system documentation in quality management. The process template should be treated as a compendium of knowledge about a particular process and relationships with other processes or stakeholders. The template can be created for activities with a high degree of complexity, and for the conducted sub-processes.

An improvement can also be implemented through the tools of quality management. One of these tools is Failure Mode and Effect Analysis - FMEA. It was developed in the USA for the needs of the defense industry in the late forties of the last century. [3, 4] The way the FMEA is conducted is a procedure highly planned and systematic. It allows to achieve:

- A reasonable selection of solutions in the design.
- Detection of deviations necessary in a process or a product.
- Recognition of the right resources of monitoring and an analysis in the process of product design, efforts within the company and in the production process.
- Reduction of the costs, including the costs of defects and improper prevention.
- Determination and elimination of unnecessary

operations in the process, and as a result, shortening of the process duration.


- It makes an increase of internal and external customer satisfaction. [1, 2, 5]

In order to have the benefits of the skillful use of FMEA it seems purposeful to establish a procedure to analyze the failure mode and effect analysis, e.g. in a company producing furniture, as a repeatable in the future conduct of the analysis may translate into a higher quality of process and product.

### 3 PROCESS TEMPLATE PROJECT "THE FAILURE MODE AND EFFECT ANALYSIS"

In table 1 based on [6] there is presented a project of the process cars developed for the analyzed company.

Table 1 *The process template for the failure mode and effects analysis*

				KP NO.-17
		PROCESS TEMPLATE		
<b>Process name :</b> The failure mode and effect analysis				
<b>Owner/ leader:</b>		Director		
<b>Objective:</b>		The aim of the procedure is to establish a series of basic actions to minimize or complete eliminate of the causes of defects in the manufacturing process of furniture, by identifying potential defects and to propose and implement specific corrective measures.		
<b>INPUT (A):</b>		A list of employees Control protocols Reports on Customers' complaints Tips to adopt indicators Schedule		
<b>SUPPLIER (S) internal /external</b>		Processes conducted in a company; reports from employees		
<b>CUSTOMER (CI): internal /external</b>		Processes conducted in a company and their owners		
<b>Measurable objectives for the process</b>	Number of efficient use of FMEA method during a year	<b>Indicators</b> ..	W1=Min 3 times per year	
<b>Reference procesures:</b>		no		
<b>Connected procedures:</b>		no		
<b>Records:</b>		F1/17 FMEA form		
<b>Process step</b>	<b>Operations</b>	<b>Person in charge</b>	<b>Record</b>	
1.	First, the owner appoints a team consisting of no more than 6-8 people, who know the problems of the processes in the company (including employees of marketing, logistics). The owner appoints the project leader.	Director P.P.H	-	
2.	On the first day of work related to FMEA, the leader selects the object of research and defines the foundation for the implementation of a correct FMEA analysis. He also prepares the FMEA form where all the data resulting from the analysis will be listed.	Group leader	-	
3.	After selecting an object of research, the working group led by the leader carries out the decomposition of the product process and defines the functions of the product and the purpose of the process.	Working team		

4.	The team then determines for each operation all the possible potential errors. To identify potential incompatibilities one needs to use the knowledge and experience of team members, data from the analysis of similar processes, research benchmarking protocols of control, reports of non-compliance and complaints from customers. In the following days the working group identifies and analyzes all potential causes of disclosure of errors. The identification is performed using quality management tools, e.g. the Ishikawa diagram. Then the team determines the effects the detected failures cause (both direct impacts as well as from the point of view of the customer).	Working team	F1/17 FMEA form
5.	After identifying the failures, their causes and effects, the team co-chaired by the leader estimates indicators W, Z and R. The working group uses the instructions contained in the tables 6.5.1., 6.5.2., 6.5.3. determines for each indicator corresponding number from <1-10>.	Working team	F1/17 FMEA form
6.	When the indicators are already estimated, the working group proceeds to calculate the number of priority risk LPR using the following formula: $LPR = W * Z * R$	Working team	F1/17 FMEA form
7.	On the basis of the LPR numbers, the team determines the failures ranking in the order from largest to smallest LPR value.	Working team	-
8.	After determining the hierarchy of incompatibility the team selects critical errors on the basis of a fixed LPR limit value included in the assumptions. In the case when the calculated number of priority risk for a particular non-compliance is higher than the set limit of LPR, then the incompatibility should be regarded as critical.	Working team	-
9.	After defining the critical defects, FMEA team determines the appropriate preventive and corrective actions for all critical errors.	Working team	Register of corrective actions
10.	On the last day of work of the FMEA group, the leader determines the persons responsible for the proposed actions and sets deadlines for implementation of the recommendations.	Group leader	Schedule
11.	After the proper FMEA analysis, the appointed manager implements and monitors corrective actions.	Director	Report on corrective actions
<b>SOLUTION (A):</b> FMEA form Register of corrective actions Schedule Report on corrective actions			
<b>Enclosures.</b> Table of priority number selection F1/17 FMEA form.			
<b>Indicators to estimate Z for P.P.H.</b>			
Z	Failure significance	Description	
1	Very low	The process failure does not affect the quality of the product	
2-3	Low	The process failure causes a slight inconvenience	
4-6	Average	The process failure causes difficulties, which requires the repair	
7-8	Big	The process failure has a major impact on the production of non-conforming products	
9	Very big	The process failure causes the inability to repair non-conforming products	
10	Critical	The process results failure causes the production of products threatening the security of the user.	

Indicators to estimate R for P.P.H.								
R	Failure existence		Description				Occurrence frequency	
1	Impossible		The failure of the process is almost excluded				1 per 10 000	
2	Very rarely		Relatively very few process defects				1 per 1 000	
3	Rarely		Relatively very few process defects				1 per 400	
4-6	Average		Sporadic occurrence of defects in the process				1 per 80	
7-8	Often		The failure of the process repeats cyclically				1 per 20	
9-10	Very often		The failure of the process is almost inevitable				1 per 2	
Indicators to estimate W for P.P.H								
W	Failure detection		Description					
1-2	Very high		The process failure will certainly be detected					
3-4	High		A big chance of detecting failures in the process					
5-6	Average		Limited opportunity for detection of failures in the process					
7-8	Low		High probability of undetected failures in the process					
9	Very low		Very high probability of undetected failures in the process					
10	Impossible		The lack of any opportunity to detect failures					
No. of operation	Potential kind of failure	Potential failure results	Potential failure reasons	Z	R	W	WPR	Recommended corrective actions
:	:	:	:	:	:	:	:	:

The developed process template can be useful not only in one particular improvement case in the selected company. It can be used for virtually any process. Earlier, however, the appropriate tables of numbers priority selection should be developed.

#### 4 CONCLUSION

Thanks to the procedurally documented failure mode and effects analysis which helps in meeting the established quality parameters and their possible improvement, one achieves an increase in the reliability of the product and an increase of customer satisfaction. Conflicts and misunderstandings are avoided as well as the need of modifications, thus the reliability of customer increases and the complaints and costs are reduced.

Production processes are run more efficiently, what allows to avoid faults with lower manpower and resources even before the loss. Employees' motivation to work together over the quality and responsibility for the products grows, employees realize the consequences of faults before they actually occur. Failure mode and effects analysis provides aggravating arguments in the case of product liability, i.e. it is an evidence (a written document) which ensures proper organization of the production and good quality of products and it can reduce quality costs.

It should be noted that thanks to archiving of the completed failure modes and effects templates, the company increases information resources that not only facilitate subsequent analysis of quality but also make it more reliable.

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