ORGANIZATIONAL STRUCTURES AND IMPROVEMENT OF THE QUALITY PROBLEM ANALYSIS PROCESS

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Rezumat. *În prezenta lucrare voi prezenta modul de analiză a unei probleme reclamată de către client. Scopul analizei este de a determina cauzele rădăcină care au dus la apariția problemei. Primul pas constă în delimitarea problemei, iar pentru aceasta avem nevoie de recuperarea a cât mai multor informații din unitatea service. Scopul acestui pas este acela de a înțelege cât mai bine cauzele care au dus la apariția problemei. Următorul pas este cel de analiză a informațiilor obținute şi a referențialelor existente şi de a putea construi un lanț cauzal care să ne conducă spre cauza sau cauzele rădăcină care au dus la apariția problemei. Ultimul pas este cel de a identifica actorii necesari pentru rezolvarea problemelor şi de urmărire a aplicării soluțiilor propuse de aceştia.*

Abstract. *In this paper we will present the analysis method used to solve a client complaint. The analysis aims to determine the root causes that led to the appearance of the respective problem. The first step is the problem delimitation, and for this we need to recover as much information as we can from the repair shop. The main aim of this step is a better understanding of the causes that led to this problem. The next step is to analyze the existent information and all the existent references to be able to build the causal chain that could lead us to the root causes of the problem. The last step is the identification of the necessary actors that could solve the problem and to follow the application of the proposed solutions by them.*

Keywords: quality, analysis, parts, processes, clients, suppliers.

1. Introduction

Under the socio-economic current environment, quality has become a strategic tool of global business management, as well as a determinant of their competitiveness. It is important that the quality-customer relationship is more strongly reflected in the definition of quality, because virtually the beneficiary - not the producer - decides what quality is.

Researches in this field show that it is more difficult to acquire a new client than to keep an existing one; the costs of attracting a new customer are 3 to 15 times bigger by branch and product than those involved in the loyalty of an already existing customer.

Identifying and continuously improving the analysis process of the issues appeared in the product life at customer represents a strategy to keep the existing

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customers because customer loyalty is determined by the value received, the value received by the customer is created by the company's products, the success obtained in competitive markets requires a focus on the continuous improvement of the value delivered to the customer.

In this present paper, we intend to present a method used to identify the causes of an issue appeared at the customer level: central arm-rest does not stay in the upper position.

2. Problem Delimitation

Some of our clients claim that for the vehicles equipped with front armrest, after a short use, the part cannot be locked into the upper position.

Fig. 1: Customer complaint presentation

2.1.Repair shop data analysis

After having analyzed the data obtained from the repair shop we observed that there are 12 claims regarding this customer complaint for the vehicles manufactured in a period of three months.

The main persons that are affected by this malfunction are the front seat passengers.

As we mentioned earlier, this customer complaint is found on 12 vehicles and the distribution as a function of mileage is the following:

- 7 cases with a mileage lower than 10km
- 3 cases with a mileage between 10 and 100 km
- 2 cases for a mileage higher than 100km

Analyzing these data, we can conclude that the customer effect occurred at the first uses of the centre armrest.

Besides the information about the mileage of the occurrence of the customer effect, the service units also sent pictures showing the area where the piece is broken (Figure 2).

Fig. 2: Part breaking area

2.2. Analysis of part evolution

Before physically recovering the parts, we searched the existing databases to see if this problem was new or was also encountered on other vehicles in the past.

The search results have showed that this problem has not been analyzed before and there are no product developments over time.

2.3. Customer complaint reproduction

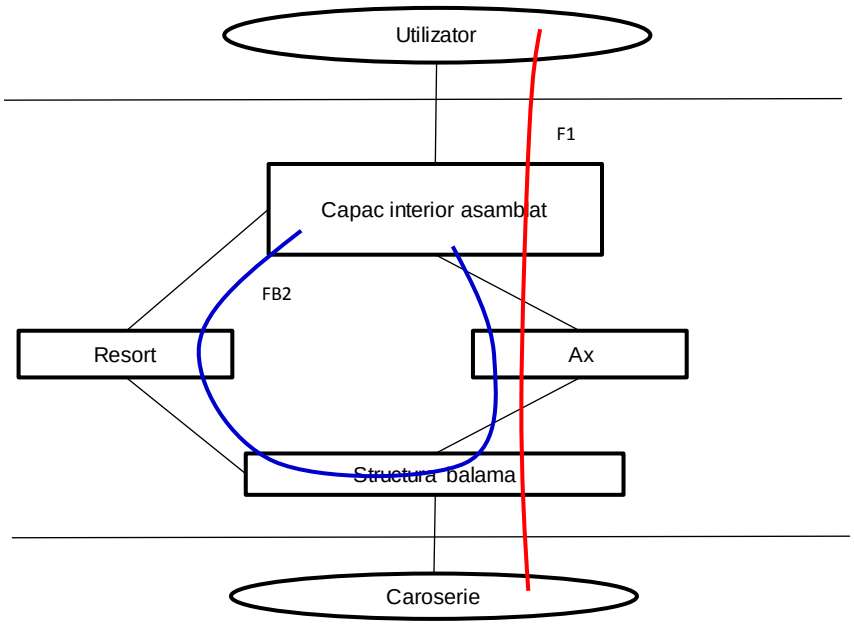
Another important step in delimiting the problem stage is the reproducing of the client effect.

For the submitted complaint, the reproduction of the client effect consists in mounting a new piece on a support vehicle and imaging tests that can lead to a similar breakage of the piece. Thus, in our case, the client effect was reproduced by applying an effort in the X direction to the armrest in the open position at the end of the course.

3. Problem Analysis

3.1. Diagram block construction

The first step needed to analyze a problem is to determine the life cycle stage of the part when the customer effect occurs, in our case being customer usage, maintaining the end of the course in an open position.



F1 Flux deschidere cotiera
FB2 Flux menținere cotieră în poziție deschisă

Fig. 3: Block diagram

By exploiting the block diagram and all the information in paragraph 2, the fault mode to be validated is: *The pin that locks the armrest in the open position is broken.*

3.2. Failure mode analysis

The visual analysis of the recovered parts of the reclaimed vehicles has shown that there is a break in the armrest pin.

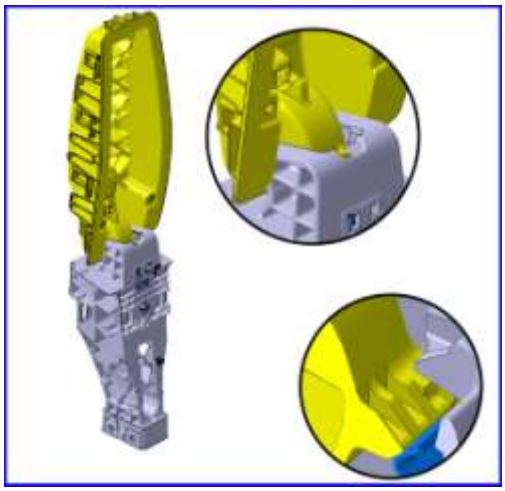


Fig. 4: Armrest in open position

In conclusion, this failure mode is retained and the associated failure causes are as follows:

FC 1.1: Non-compliant piece in relation to the specifications

FC 1.2: Risk of breaking the part under normal conditions of use

3.3. Failure causes analysis

3.3.1. Study of the failure cause 1.1

In the specifications of the part, there is an effort to break the piece in the maximum open position, its value being of 25daN for a period of 5 seconds.

Figure 5 shows how to apply the effort to perform this test.

Fig. 5: Carrying out the test from the specifications

To verify the strength of the parts, we tested 5 new pieces, the results being shown in Table 1.

Table 1. Measurement results

Part No	*Effort (daN)*	*Breaking*
1	20	YES
2	18	YES
3	21	YES
4	20	YES
5	22	YES

After analyzing the data obtained in the table above, we found that the parts do not meet the requirements of the specification. Thus, the cause of the FC 1.1: Non-compliant piece in relation to the specifications is validated. The next step is to determine the causes that may lead to this problem, especially because at the initial validation of the product in accordance with the specifications the problem had not been identified.

The underlying cause of this problem may be either the nonconformity of the material used to make the piece, or the incompatibility of the part injection process.

For the material nonconformity analysis two pieces were sent to a specialized laboratory: one piece of the current production that was broken during the previous test and one piece recovered from a problem vehicle.

The results of the laboratory analysis have shown that the material used by the supplier corresponds to the requirements imposed by the specification, so the Failure Under-Cause 1.1.1 complaint is invalidated.

For the second Failure Under-Cause 1.1.2, Injection process non compliance, the same two parts were analyzed by the laboratory and it was found that both have internal air gap defects in the rupture priming areas (see Figure 6).

Fig. 6: Air gap defects in the rupture area

In conclusion, the *Failure Under-Cause 1.1.2. Injection process non compliance* is validated.

3.3.2. Study of the failure cause 1.2

The laboratory analysis of the parts sent shows that the rupture is brutal-brittle type and is caused by a mechanical shock during use.

The Failure Under-Causes associated with this failure are the following:

F.U.C. 1.2.1. There are no specifications in the user's manual on how to use the armrest

F.U.C. 1.2.2. Accidental breakage of the armrest under normal conditions of use

3.3.2.1. Study of the Failure Under Cause 1.2.1

In the users' manual there is no information regarding the use of the armrest.

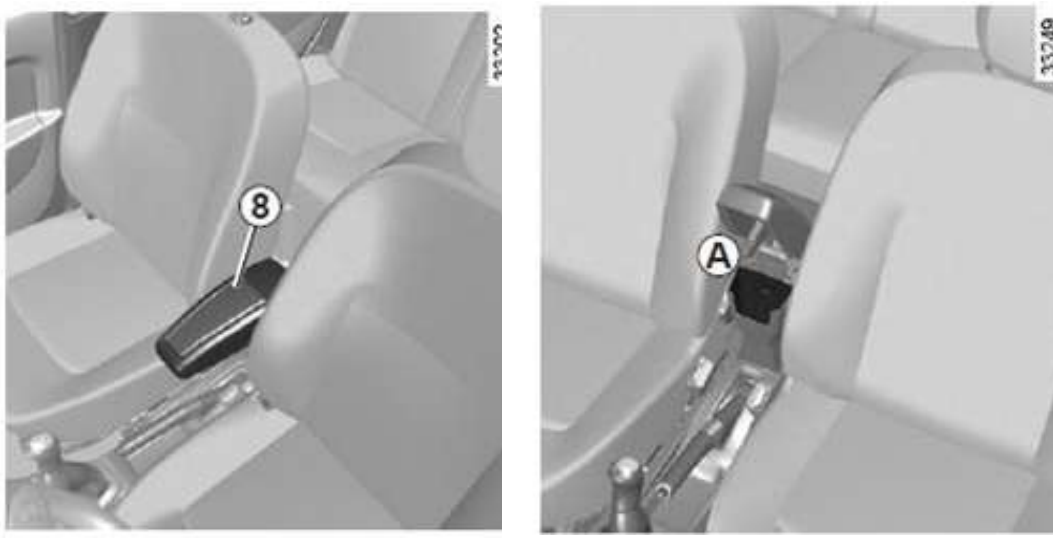


Fig. 7: Users manual

In conclusion, the *Failure Under-Cause 1.2.1 There are no specifications in the user's manual on how to use the armrest* is validated.

3.3.2.2. Study of the Failure Under Cause 1.2.2

During the test performed in the shop, we found that there is the risk of part breaking in various situations, presented in the following figures.

When bucking the seatbelt

When using the handbrake

When shifting in the gears 2,4 and R

During the seat positioning

Fig. 8: Conditions when the armrest can be accidentally broken

In all these situations we managed to break the armrest, so the *Failure Under-Cause 1.2.2 Accidental breakage of the armrest under normal conditions of use* is validated.

4. Causal Chain Synthesis

According to the analysis, the causal chain for the presented problem is the following

Customer Complaint: *The central armrest does not stay in upper position*
Failure Mode 1*: The pin that locks the armrest in the open position is broken*
Failure Cause 1.1*: Non-compliant piece in relation to the specifications*
Failure Under Cause 1.1.1*: Part material nonconformity*
Failure Under Cause 1.1.2*: Injection process non compliance*

Failure Cause 1.1*: Risk of breaking the part under normal conditions of use*
Failure Under Cause 1.2.1*: There are no specifications in the user's manual on how to use the armrest*
Failure Under Cause 1.2.2*: Accidental breakage of the armrest under normal conditions of use*

In Table 2, we have a synthesis of real failure causes and where the problem was generated.

Table 2. Customer complaint synthesis

Causal Chain	*Product*	*Process*	*Design*	*Other*
FM: The pin that locks the armrest in the open position is broken				
FC 1.1: Non-compliant piece in relation to the specifications				
F U C 1.1.2: Injection process non compliance	x			
FC 1.2: Risk of breaking the part under normal conditions of use				
F U C 1.2.1: There are no specifications in the user's manual on how to use the armrest				x
F U C 1.2.2: Accidental breakage of the armrest under normal conditions of use			x	

The data presented in the table show that the problem has multiple causes and so we need to create a hierarchy of these causes.

4.1. Failure causes hierarchy

Table 3. Failure causes hierarchy

				Weight
Cause	FUC 1.1.2	FUC 1.2.1	FUC 1.2.2	
FUC 1.1.2		6	6	57%
FUC 1.2.1	1		1	10%
FUC 1.2.2	1	6		33%

Criteria

1= less important than; 3= same importance; 6= more important than

For the calculation of the weight, we sum up all the values filled in the table, and for each cause is calculated the ratio of the sum to that line and the sum of all the values.

As we can see from Table 3, a greater weight has the injection process non conformity, so by solving this problem we will reduce the number of incidents that occurs amongst our clients.

Conclusions

In this paper we presented an analysis method that helps identify the root causes of customer problems.

Thus, starting from a problem found on several vehicles delivered to our clients, using a well-defined method, we have succeeded in identifying the causes that lead to this problem solving.

R E F E R E N C E S

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