

The 8D Methodology: An Effective Way to Reduce Recurrence of Customer Complaints?

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Abstract—An investigation was made to identify the variables influencing the customer complaints management process throughout a case study in the automotive industry. The process follows the 8D methodology to satisfy customer complaints; i.e. to solve problems, reduce the overall costs of quality and to improve customer satisfaction. This work also describes the improvement in the customer complaints process achieved by an effective use of the 8D methodology. Throughout the case study, the problem was defined; the variables influencing the process were measured; the causes for the process failure were analyzed; improvements were planned and made and the variables were controlled until a defined performance level was reached. The improvement and reduced variability in the 8D process was achieved by integrating and managing the quality data in an integrated management system and by the reorganization of tasks and methods. A faster and more qualified reaction to complaints and therefore problems was achieved, reducing and preventing problem recurrence, representing cost savings whenever a complaint appears or is avoided.

Index Terms—8D, customer complaints, integrated management system, problem recurrence, quality improvement.

I. INTRODUCTION

A. Customer complaints

Complaints are expensive, both as direct and indirect costs; however, for this cost, companies can extract priceless knowledge, because complaints contain the direct Voice of the Customer (VOC). If complaints are transformed into knowledge about customers, they can provide a valuable amount of capital for enterprises. To explore this capital, companies must design, build, operate and continuously upgrade systems for managing complaints [1].

Understanding that complaints are an important output of business, researchers are working in order to create a better fulfilment of the complaint treatment process.

A definition of “complaint treatment” by Dee et al. [2] is: “A process that addresses issues that concern customers”. Other authors take a further look at management of complaints, defining it as: “Fixing the policies, systems, or protocols so that the problem would not occur for future customers” [3].

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Complaint satisfaction is also interesting within the complaints treatment research, since to implement a system to handle complaints is no longer enough [4]. Such system must guarantee complaint satisfaction and customer retention [5].

Hallen and Latino [6] showed in their case study of a chemical manufacturer, that complaint feedback can be used to identify root causes of problems that lead to customer dissatisfaction. Furthermore, the results of the case study showed that eliminating root causes of problems improves customer satisfaction [6].

The definition of customer satisfaction is not a clear, but much depends on the feedback and complaints [7]. Zairi [7] argues that weaker organisations with substandard service quality and products will no longer compete in the future.

B. The 8D methodology

The 8D methodology involves teams working together in order to solve problems, using a structured 8 step approach to help focus on facts, instead of opinions. The 8D steps are: D1-team formation; D2-problem analysis; D3-containment actions; D4-root cause analysis; D5-corrective actions; D6-verification of the effectiveness of the corrective actions; D7-preventive actions; D8-congratulate the team.

The 8D methodology is effective in developing proper actions in order to eliminate root causes and in implementing the permanent corrective actions to eliminate them. It also contributes to explore the system of control that allowed the escape of the problem. There are reports of the successful use of this methodology to deal with chronic recurring problems, mainly defects or warranty issues [8]. As a whole, this methodology was never intended to replace a systemic quality system. The 8Ds' objective is to face the problems and discover the weaknesses in the management systems that permitted the problem to occur in the first place.

According to Rambaud [8], the biggest abuse in the implementation of the 8D methodology involves using it solely as a one-page problem-reporting effort. This misuse is often further exaggerated by requiring the report to be written within 24 hours. Some steps can take a few hours, while others can take weeks. In manufacturing, many chronic problems can occur only with a unique set of conditions, which calls for extensive studies and experiments.

II. RESEARCH METHODOLOGY

The research question for this investigation is: “How the chosen quality characteristics of speed and quality of the answers to customer complaints prevent them from

recurring?" According to Yin [9], questions including "how" and "why" should be answered using research strategies like case studies, experiments or histories [10]. Explanatory case studies seemed appropriate for the present research, as they seek to explain how and why some events occurred. Explanatory theories can facilitate theory testing with a rich and extensive data collection effort, including qualitative and quantitative evidence. However, they are the most difficult and the most frequently challenged [10].

The choice between single-case and multiple-case studies depends on the research objectives and the availability of resources. Due to resource constraints a single case study was performed. Many industries of the automotive sector use the 8D methodology, thus one company of the automotive sector was selected. The case study was performed in 2009, in a Portuguese facility of a multinational manufacturer that produces multimedia car systems and sells them to several car manufacturing companies.

The unit of analysis is associated with the kind of case to which the phenomena under study and the research problem refer, and about which data is collected and analyzed [11]. It should contribute to clarify the boundaries and scope of the study. In this research the unit of analysis is the process of the customer complaints management.

In order to facilitate data collection, it was necessary to construct a case study protocol, the interview instrument for conducting the case study [9]. It contains all the pertinent questions to be asked when investigating the company customer complaint management process. It is a major tool for increasing the reliability of case study research and is intended as a guide for the investigator in carrying out the study. The case study protocol must assure that data collection would involve converging lines of inquiry and triangulation of evidence. Within each data source there is an emphasis on depth and quality, rather than population size. Thus, a single case can add to the understanding of a phenomenon provided multiple data sources are used and over-generalization is avoided [9]. There have been repeated calls for more qualitative case-study-based research in operations management [12], despite the clear difficulty of drawing generalized conclusions. The case study protocol included the analysis of all the organization activities affected by the customer complaints treatment process. This research proposed to identify how and why organizations manage and improve their customer complaints process, detailing the quality of the customer feedback and the delays in that process.

III. CASE STUDY

A. The challenge

In the selected automotive company, it was agreed in contracts with customers that replies to customer complaints had to be time controlled by certain rules defined. Ideally, these replies should also provide the necessary quality of information to solve the problem according to the 8D methodology's steps.

Due to various internal and external factors, the speed and quality of the customer complaints management process was not always reached, deviating from the pre-established

objectives by the organisation. This low performance in the problem solving process increases the time response to prevent recurrence of non-conformities and also represents a decrease in the customer's satisfaction. This non fulfilment of customers' expectations can also increase costs associated to the poor quality of products, such as inspection costs, failure costs, warranty costs, and other costs defined in the contracts. The challenge for this research was to investigate ways to improve the response time and quality of the investigations made to solve problems triggered by customer complaints.

B. Quality characteristics

The response time rules after receiving a complaint and the associated step in the 8D methodology were the following:

- Y1 (1 day) - D1;
- Y2 (2 days) - D2 and D3;
- Y14 (14 days) - D4 and D5; D6 and D7 defined;
- Y60 (60 days) - all steps completed.

For example, after receiving a customer complaint, steps D1 to D3 would need to be completed within 2 days and the customer would receive the second feedback on the complaint.

To understand the voice of the customer regarding these rules and of the 8D quality requirements, a Kano analysis was used. Each need was classified as a "dissatisfier", "satisfier", or "delighter". The response rate for these questionnaires was 80%, much higher than previous. All the customer's replies regarding the response time rules and a good explanation of each step (by completing several points for each step) were classified as dissatisfiers.

The time needed to solve a customer complaint does not always have the same impact on cost savings. Sometimes problems originate many complaints, while others only a few. However, the total costs are expected to continuously increase over time. Estimation of the costs associated to complaint recurrence is possible, but to measure the costs associated to image loss and customer dissatisfaction is a harder task. Defect recurrence costs rise whenever the same defect occurs due to a low quality or slow reactivity problem solving investigation, increasing the total warranty costs.

The total number of customers' complaints in 2008 was 984 (543 of them were recurring complaints partially appearing after the non-compliance of the different rules). Increasing the quality and speed of problem solving investigations and replies to the customer, results in cost savings associated to the prevention of recurring complaints and increases customer satisfaction by fulfilling the requirements.

The quality of the 8D reports was something not defined yet. It was defined by the research team based on the Kano analysis. The classification for each step of the 8D reports was first divided into 3 categories: "Poor" (0%), "Ok" (70%) and "Excellent" (100%). The "Ok" and the "Excellent" classifications were defined according to the several points indicated by the customer's feedback to the Kano analysis and to individual interviews. The weights for the final 8D report percentage were divided as follows: D3-13%, D4-32%, D5-26%, D6-11%, D7-6%, and D8-6%. D1 and D2 were not classified, because the team realized these steps were standard procedures, i.e. the team assigned was

pre-defined and the problem analysis steps were defined in standard work instructions.

C. Impact of existing 8D methodology

Data already existed for the response time rules, however, in order to validate the measurement system, it would be needed to understand if all the customer assistants were measuring in the same way, i.e. if they were considering the right times for the rules defined and reporting accurate measures to the file in use to track them. By interviewing each customer assistant about their perception of the definition of each rule, opinions seemed to diverge and originate controversy among them. They gave distinct definitions for each of the 8D step and there was no agreement between them.

This controversy was reflected in the data from a sheet used by the customer assistants to report the time needed to complete each of the speed rules defined before. Therefore the current measurement system was not reliable enough to guarantee an accurate measure; so another measurement system had to be used.

A random sample of 8D reports was chosen and the necessary dates were manually taken from the different information systems to calculate the time it took for each step to be completed and to know which of the rules were accomplished in time or not. By collecting each date and information according to the specifications, it would guarantee that the response time and quality evaluation would be respected.

Thus, generated data resulted in an average quality level of 50% for the complete 8D reports.

A sigma value was used as a metric to relate the ability of a process to perform defect-free work. The higher the sigma value, the better the process was performing, thus the probability that a defect will occur would be lower. Considering one opportunity to fail in each of the four response time rules (e.g. it took 3 days to complete D2 and D3 or it took 71 days to complete an entire 8D report), then 151 defects were found in 189 opportunities, which means an initial sigma value of 0.66.

D. Root cause analysis

Brainstorming was used to gather ideas about the possible causes that lead to exceed deadlines in the customer's complaint process. Doing a mixed approach, customer assistants stated ideas, resulting in a list of 72 possible causes to the customer complaint process failure. Causes that were identified in the observation process were added and similar causes were verified. Individual interviews were conducted with low level of standardization and structure in order to find more specific causes. A Fishbone analysis was conducted in order to understand the cause and effect relationships of the defects regarding the response time and quality of the customer complaint treatment process. To each cause identified by the interviewees and by process observation, the "5 Whys" method was used to take out the root causes affecting the process. For example:

Signature process takes a lot of time. Why? The signature process is unclear. Why? There is no standard procedure for signing the 8D reports.

A particular cause regarding the measurement system was that it needed constant manual input and control, as well as it was difficult for the databases to communicate between themselves, which was derived from the different languages and different data they shared. It was also hard to involve the persons external to the plant if the data was not entirely integrated and prepared for them.

E. Improving the quality of the use of the 8D methodology

A research team decided to reduce the number of defects, focusing on improving the customer complaint management system. This could be achieved by pursuing the following objectives:

1. Have an accurate and precise measurement system;
2. Increase the communication between problem solving teams;
3. Have a standard 8D report between supplier, plant and customer;
4. Reduce waste in the reporting system;
5. Increase the quality of the problem solving investigations;
6. Keep the customers informed, providing a speedy feedback with reliable information;
7. Have a single point of contact for analyzing on-site the defects occurred at the customer;
8. Have a reporting system to check recurring complaints after problem resolution;
9. Use measures based on cause reduction rather than complaint volume reduction.

To accomplish these objectives a set of improvement initiatives were considered. The matrix (see Table 1) relates them with improvement actions that are described subsequently.

Table I - Relationship matrix between objectives and improvement actions

Objectives	Improvement Actions					
	A1	A2	A3.1	A3.2	A3.3	A3.4
1	X					
2	X		X	X	X	X
3	X					
4	X					
5		X				
6	X	X	X	X	X	X
7			X			
8			X			
9		X				

1) A1. Effective measurement system

A system which would allow an effective measurement system according to the customer requirements was sought. After evaluating different possibilities, the Enterprise Resource Planning (ERP) system was adopted to manage the quality data. In this system, all the persons involved can track the progress of the complaint and the time spent. Each one can contribute to the problem solving, this way, an increase in the awareness, know-how and participation of the persons involved can be foreseen. The control of the indicators was made by control buttons on the ERP platform. This allowed the complaints to have the respective response time

measures. An analogy was made with production processes, where a part or material can only move forward when the required inputs are present, therefore making it impossible for errors to be passed to the next step. This concept of mistake proofing is many times called as Poka-Yoke. The input data was to be periodically verified by the section manager in order to find if the data inside was accurate. The interested parts were instructed to consult their complaint list daily and a reminder was also included so that the system could warn the person when the deadline was getting closer, according to the ERP workflow. Process simplification was also possible within this integrated system, which saved time by reducing the number of tasks to complete in a customer complaint process using the databases as it can be observed in Figure 1.

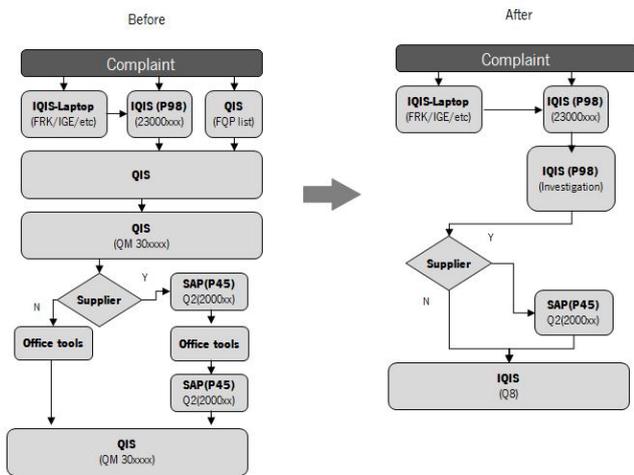


Figure 1 - Complaint process before and after the implementation of the solutions

It is possible to observe that there was a reduction in the process steps, maintaining only one integrated quality information system (IQIS-P98) to manage data from customer complaints. Occasionally the customer complaints were originated of defects caused by the organization's suppliers. A link of information between IQIS and the other SAP® module P45, used to manage the organization's complaints to their suppliers was created. The quality information system (QIS) processes were eliminated from the process flow as much as the office tools.

The monitoring of the response timings would be made automatically by a transaction in ERP (SAP®) to summarize statistics about the indicators. The response time was measured every time, in the right time.

2) A2. Quality of the 8D methodology

An initial quality improvement of the 8D reports was made by the measurement system itself (ERP system). Customer assistants noticed and complained about the increase on the amount of quantity of information that was necessary to put in the new system. However, the new system required the same quantity of information as the old system, since the 8D structure was exactly the same. The new control system that the new measurement system had required that all the information in the 8D report had to be completed according to the rules defined and according to the quality evaluation rules. One could not advance to the next step without

previously completing the step before. The customer assistants were so intrigued, because in the new system, they could not skip any steps as it was verified in the old system 8D reports where the information was many times incomplete, the investigation made was poor, and thus the quality of the 8D reports was low.

This new system would allow a quality increase of the 8D report contents. In order to control the quality of the 8D reports, an 8D evaluation sheet was adopted as the standard. Every 8D report would need to be completed with this evaluation sheet, represented in an automatic calculation form.

3) A3. Speed

a) A3.1. Rule Y1

An approach was used to eliminate delays for complaints under specification (i.e. no trouble found after the analysis of the device) and customer complaints. In case of deciding a defect part was under specification, further analysis could be made by the development together with the customer in order to find the causes which originated the initial complaint. In this case, special agreements were to be made with the customer. In case of deciding upon customer fault regarding a compliant, the organization should strive to help the customer, so the investigation should continue, but both the team and customer should reach an agreement regarding the closure of the 8D report after the Y2 rule. In under specification or customer fault cases, both complaints do not need an associated 8D report, because corrective actions, for instance are not applicable at the plant. Therefore, 8D reports for these cases were abolished. In the system the complaint can be closed after the investigation on problem analysis was completed

For the fulfilment of the first rule (Y1), one person was assigned to be associated to each customer plant. Only after confirming the defect and providing an initial problem analysis he or she could decide on what to do with the part: to take it for investigation; to send it for repair; to scrap it. A faster problem analysis and faster containment actions at the customer and at the organization's plant were achieved. In some cases, this person saw in the system if this was a recurring defect or a defect which was already under investigation and he or she could choose not to send the defect part to the plant for investigation, therefore reducing warranty costs. This is an example of the use of the reporting system, in some cases called "lessons learned" process. In case of sending the part for investigation, this person opened a complaint in the ERP system in order to provide information about the problem and automatically notify the defined team in the production plant so that they could start analyzing the problem and providing containment actions even while the part was still in transport, reducing the time to start solving the problem.

b) A3.2. Rule Y2

The interdepartmental and intradepartmental lack of communication problem, partially associated to the Y2 rule, was approached with the placement of a form in the company's intranet to plan the occupation of the internal and

external laboratories by the team requesting the analysis of the defect part, thus eliminating the variation in the waiting times and allowing a specific completion date to be set

c) *A3.3.Rule Y14*

The adoption of ERP to fill in 8D reports made possible for the different modules in the Quality department to interact between them allowing the share and transfer of information. Unlike the past system, only one 8D report format was to be used inside and outside the company, standardizing the 8D reports, reducing time to convert between supplier and organization or between organization and customer, which often raised incoherencies and lack of data.

Whenever talking about process related issues, responsibility was given to the person in each production line with the task of line quality controller to fill in the 8D reports and to fulfil the Y14 rule. With this change, the know-how regarding problem solving was copied to the "gemba". By sharing responsibilities in filling in the 8D reports by defect location (process, supplier, transport, customer), each of the persons directly involved in the 8D fill-in (logistics, purchase quality, production, person at the customer's plant) would have the responsibility to fulfil each of the 8D steps on time, increasing the awareness of problem solving within the plant.

d) *A3.4.Rule Y60*

The 60 days rule was dependent of the time spent on the other rules. There were, however, some specific problems related to the closure of the 8D report like the signature process, where a signature was needed by the customer assistance section leader, the quality director and the plant director. By automating this procedure in ERP, a notification was sent to each one to check the submitted 8D report in the system and give a digital signature or sending the 8D report back to the responsible person with comments to edit it if necessary. This ended with the waste on physical transport time of the documents, prevented paper waste and made the reports available to be checked and signed online anytime.

F. Customer complaints management performance

It was observed that there was an initial increase in the response time due to the training and adaptation of the persons involved. After identification and elimination of special causes affecting the process, a random sample of 8D reports was taken and no defects were found. If one failure would have occurred, it would have represented a sigma value of 4.06. The quality of the 8D reports was measured and the mean observed was 70%.

Analysing complaints from 2008, it was verified that if the organization was performing in 2008 at the level it was performing by the end of this project, it could have been possible to save at least 44% of the recurring complaints by providing a quicker reaction to customer complaints, because they were directly associated to the original complaints and could have been prevented by achieving the initial objectives for the response times. For the remaining 66% complaints it was not possible to estimate if they could have been

avoided or not, because some of them appeared at the same time of the initial complaint, while in others the defect was known, but the customer still complained because he/she was not sure if the complaint was originated from the same defect or not.

IV. CONCLUSIONS

This case study describes the problems associated with the customer complaint management process, in a company that uses the 8D methodology. Based on such problems a quality improvement program is put in practice to improve the performance of such process, by studying the problem root causes and describing the changes made to the process.

The performance was assessed by the timeliness and the quality of the responses to customer complaints.

Decision making of the persons involved was improved and an effective use of resources was made. The improvement processes were made more efficient throughout a reply in the right time with the right information, with the right system. The project changed and clarified the role of each person involved in the customer complaints process. It also saved financial costs with the reduction of recurring complaints, thus enhancing organization's competitiveness.

The authors argue that customer loyalty is expected to improve as a direct result of providing a service according to contracts' requirements, as an emphasis was made on tying process improvements to customer needs.

The continuous improving inside this field of research would culminate in a complaint reduction by an efficient and repeatable problem solving process, which represents savings affecting the whole structure of the organization.

Even though one case study is not a motive to generalize, the authors argue that the 8D methodology can be applied to other types of complaints and organizations. More case studies may be useful for drawing lessons for greater generalization. Future research may generate grounded theory research in this field. Delivery and design of training programs should be systemically merged with voice of customers. The 8D is not one-time implementation mechanism but an on-going management choice to reply to customer complaints.

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