

# ***Improvement of a Public Utility Authority Complaint Responding System***

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**Abstract** — *This project will be conducted in the Operations Department of a Public Utility Authority. The project will focus on the improvement of the agency complaints respond service. The Six Sigma DMAIC model was used to conduct this project. After analyzing and calculating the Data Sheets, it was found that 84% of the complaints were received in the Call Center and the other 16% came from External Sources (complaints reported directly to the Operational Areas). It was also found that the Call Center had a Complaints First Pass Yield (FPY) of 30% and the External Sources had a FPY of 55%. By applying Lean Six Sigma methodology a 100% screening by the field inspector before the brigades were assigned and a complaint receiver system to eliminate data entry errors and duplicity were implemented. A 70% reduction in volume of complaints reported for “Salideros” and “Desbordes” in grand total was achieved.*

**Key Terms** — *Customer Satisfaction, Data Accuracy, Operational Costs and Responding Time of Complaints.*

## **PROBLEM STATEMENT**

Inadequate data is not costly to capture, but corrupts the decision making process. Some considerations include: avoid emotional bias relative to targets or tolerances when counting, measuring, or recording digital displays. Each important classification should be recorded along with the data. This information can include: time, machine, auditor, operator, gage, lab, material, target, process change, conditions, etc.

Most Public Utilities are trying to improve the performance of existing processes-through lower cost, improve quality, and shortened response

times-but were not identifying the processes that were truly strategic: those that must be performed exceptionally well for an organization’s strategy to succeed.

In this case, the incorrect information in the complaint respond service is causing:

- Delays in responding time.
- Unsatisfied Customers,
- Increasing the volume of complaints.
- Increasing idle time of workers
- Excessive Inventory.
- Increasing the costs of assigned resources like people, equipment, materials and transportation.

## **Research Description**

This project will be conducted in the Operations Department of a Public Utility Authority. The project will focus on the improvement of the complaints respond service of the agency. This helps Public Utility Authority to determine the real demand of the complaints, and assign resources to solve them in less time than actual respond time, minimizing the associated cost.

Data Accuracy concepts will be applied during the project, Lean Six Sigma DMAIC methodology is going to be used.

## **Research Objectives**

The main objective of this project is to increase the Public Utility Authority performance from four perspectives:

- Financial – a significant reduction in the assigned resources costs like people, equipment, materials and transportation, improve the financial health of the Agency.

- Customer – a significant reduction in the responding time of customers complaints improve the customers satisfaction levels.
- Internal Business Processes – a process improvement mindset to reduce errors, improve efficiency, improve performance and enhance profitability.
- Learning and Growth – training to improve employee and information system capabilities. Enhance motivation, empowerment and alignment of the front line workers.

Design a company's strategy to influence the measures used in each perspective.

### **Research Contributions**

This project supports the Public Utility Authority's goal of performance excellence and customer satisfaction. The customer relationship dimension includes delivery of the product/service to the customer, including the response and delivery time dimension, and how the customer feels about purchasing of the company. Time has become a major competitive weapon in today's competition. Being able to respond rapidly to customers request is often the critical skill for obtaining and retaining valuable customers.

Management also needs continual improvement of the organization's systems and processes to stay competitive or to deal with shrinking resources. The need for systems and process audits may also include:

- Determining effectiveness.
- Identifying inefficiencies.
- Improving business performance.

Public sector organizations are also interested in effectiveness, efficiency and performance so that they can respond to demands to provide more services with fewer resources.

### **LITERATURE REVIEW**

The purpose of this chapter is to present and describe the main concepts associated with this project, to be held on the Operations Areas of San Juan, Bayamón and Carolina. These areas are the

covered areas of the Operations Metro Region of the Authority. These areas are accountable for respond to operational complaints that general public report to the central Complaints Call Center. This Call Center assigns the complaints reported by the public, to the respective operational areas [1]. These complaints include "Salideros", "Desbordes", "Sectores sin Agua" among others. In this project we will focus on the "Salideros" and "Desbordes" complaints. Lean Six Sigma and the DMAIC methodologies will be utilized as tools to improve the effectiveness in this project .

### **Introduction Lean Six Sigma**

What has been occurring for some time (at least for the past several years) is a marriage between lean and six sigma initiatives into a unified approach called Lean Six Sigma [2]. Lean specific projects represent a 6% corporate improvement over time, and six sigma initiatives represent another 6%, then a combination could potentially represent an improvement of 12 % or more.

An increasing number of organizations (manufacturing, service, hospitals, municipalities, military, insurance, etc.) have been unifying their efforts into a lean six sigma approach. The mechanisms of these combinations vary widely. The most effective approaches include management direction and involvement, the use of teamwork, the use of project management, team member training, and the humane treatment of people, an understandable problem solving methodology, and some mechanism to apply the appropriate tool.

### **The problem solving methodology**

The project team should select the approach and tools appropriate to the task. There are various methodologies like PDCA, PDSA, DMAIC, IDEA and the Ford 8D system. These methodologies generally use the seven original quality tools: check sheets, Pareto diagrams, process flow diagrams, scatter diagrams, run (or control) charts, histograms, and fish bones diagrams. In addition, a multitude of lean concepts and basic lean tools (brainstorming, consensus, multivoting, etc.) are

often employed. The use of these basic approaches can solve many problems and complete many projects. In some cases, more powerful tools are necessary. In this project, the team agreed to utilize the DMAIC approach.

### **The DMAIC Process**

Each step in cyclical DMAIC process is required to ensure the best possible results from lean six sigma team projects.

#### **Define**

The initial step of DMAIC problem solving methodology is the define step. Properly defining the problem is the most important part of the solving problem. Define the customer, their critical to quality (CTQ) issues, and the core business process involved. This step includes but is not limited to:

- Define who the customers are.
- Define customer requirements and expectations.
- Define project boundaries – the stop and start of the process.
- Define the process to be improved by mapping the process flow.

#### **Measure**

Measure the performance of the core business process involved. This step includes but is not limited to:

- Develop a data collection plan for the product or process.
- Collect data from many sources to determine the current status.
- Collect customer survey results to determine shortfalls.

#### **Analyze**

Analyze the data collected and process map to determine root cause of defects and opportunities for improvement. This step includes but is not limited to:

- Identify gaps between current performance and goal performance.

- Prioritize opportunities to improve.
- Identify excessive sources of variation.
- Identify objective statistical procedures and confident limits.

#### **Improve**

Improve the target process by designing creative solutions to fix and prevent problems. This step includes but is not limited to:

- Create innovative solutions using technology and discipline.
- Develop and deploy improvement implementation plans.

#### **Control**

Control the improvements to keep the process on the new course. This step includes but is not limited to:

- Prevent reverting back to the “old way”.
- Develop an ongoing monitoring plan.
- Institutionalize the improvements through system modifications.

### **PROJECT METHODOLOGY**

The Six Sigma DMAIC (defines, measure, analyze, improve, control) model will be used to conduct this project. This section presents in details how the DMAIC methodology will be implemented and the specific tools and deliverables for each phase.

#### **Define Phase**

The first step of the define phase will be to generate Project Charter to summarize project scope, goals, team members among other important details. The project charter will be presented and has to be approved and sponsored by the Operations and Continuous Improvement Vice President. A Voice of the Customer (VOC) Analysis and a Critical to Quality (CTQ) tree will be developed to also understand customer requirements which are very important and has to be taken in to consideration through all the project life [3].

### **Measure Phase**

Once the project charter has been approved a SIPOC diagram will be created to understand the main process steps for the complaints respond process including process inputs and outputs. A process Flow Chart of the complete complaints respond process will be generated. The process flow chart will help to further understand the Complaints Respond process, and the Complaints Coordinators areas where the data will be collected. Also it will help to identify non value added activities. A cross functional team will be created to generate a process flow chart. This team must include complaints coordinators, area supervisors and engineers. Results from process flow chart must indicate opportunities areas for process improvements. Data will be collected from the Complaints Respond process (from Calls Center to final field respond) through a designed Random Sampling Plan. Check sheets will be designed to collect data associated to First Pass Yield (FPY) performance metric, and events that produce scrap, idle time, rejects, reworks, and all kind of events that affects FPY.

### **Analyze Phase**

All the data collected from the Random Sampling process will be plotted. The Pareto Chart will be used to determine major offenders that affect the complaints quick respond. A list of significant factors that affects process performance, availability and quality will be the main deliverable of this phase.

### **Improve Phase**

Once the significant factors that affect complaints respond effectiveness has been identified, a list of possible corrective actions to mitigate and/or eliminate these factors will be generated. Project success will be determined by the calculation of the expected results. The implementation of each possible solution will be approved by Public Utility Authority's Senior Management.

### **Control Phase**

A project final report will indicate conclusion of the project. Proposed corrective actions not implemented will be tracked as independent projects. The "Salideros" and "Desbordes" metrics are monitored in the company during the "Governing Board" monthly meetings. In this meeting business performance key metrics are analyzed.

## **PROJECT RESULTS**

The Six Sigma DMAIC (defines, measure, analyze, improve, control) model was used to conduct this project. This section presents in detail the results of the DMAIC methodology implemented and the specific tools and deliverables for each phase.

### **Define Phase**

This section will show the Project Charter, Voice of the Customer (VOC) and the Critical to Quality (CTQ) elements, made to the project.

### **Project Charter**

A critical element in the establishment of an improvement team is the development and acceptance of a charter. A charter is a written document that defines the team's mission, scope of operation, objectives, time frames, and consequences. Shown in Figure 1 the Project Charter carried out for the project.

### **Voice of the Customer (VOC)**

An understanding of the needs of the customer is the critical to the survival of most companies. The pace of change in today's economy mandates that company not rely in past knowledge of the customer. A detailed plan to gather and collect customer needs and customer perceptions can be described as listening to the voice of the customer (VOC).

At the second week of the project, the project team had an interview with the Public Utility Authority's Customer Service Area Director. This

senior executive mentioned (experienced on more than twenty years in the company) that one of the most important aspects of Customer Service for the Public Utility Authority's clients, is the quick respond for the complaints of "Desbordes" (sewer) and "Salideros" (aqueduct).

percent of complaints worked in Time (at most seven days).

**Measure Phase**

This section will show the Process Flow Chart, Random Sampling, Check Sheet, Process Performance and Problems List, made to the project.

**Project Charter**

<b>Project Description</b>		<b>Time Frame</b>										
<p>*The Puerto Rico Aqueduct and Sewer Authority has the need to investigate the precision of the accuracy complaints reported by the company computer system to prevent the duplicity and wrong information of the complaints. It's important to select a sampling plan appropriate for the purpose of the use of the data.</p> <p><b>Project Scope:</b></p> <ul style="list-style-type: none"> <li>Reduce the defects that are present in the complaints.</li> </ul> <p><b>Project Risks and benefits</b></p> <p>*The project risks are data availability and data accuracy</p>		<table border="1"> <tr> <th colspan="2">Start and Completion Date</th> <th>Date</th> </tr> <tr> <td>Start Date</td> <td></td> <td>20 MAR 10</td> </tr> <tr> <td>End Date</td> <td></td> <td>24 MAY 10</td> </tr> </table>		Start and Completion Date		Date	Start Date		20 MAR 10	End Date		24 MAY 10
Start and Completion Date		Date										
Start Date		20 MAR 10										
End Date		24 MAY 10										
		<b>RESOURCES</b>										
		Team members: Sponsor:	Support Team:  <b>Stakeholders:</b> Employees of AAA and general public.									
<b>Baseline Metrics</b>		<b>Objectives</b>										
<p><b>Primary Metrics</b></p> <ul style="list-style-type: none"> <li>First Pass Yield (FPY) = Percent of product or service that passed through each stage of the process only one time, from start to finish.</li> </ul>		<p>The team is leading efforts to improve the classification and precision accuracy of calls to avoid duplication of the complaints made by customers. It intends to improve the company's productivity to 60% level of performance.</p>										

**Figure 1**  
**Project Charter**

**Critical to Quality (CTQ)**

This tool focuses on the key metrics of customer satisfaction. A CTQ will translate the initial customer's requirements to numerical or quantified requirements for the product or service. After the project's presentation to the Operations and Information System Areas, the senior management of both, agreed to include in the new Complaints Receiving Information System, a section capable to collect numerical data for all of the elements of the CTQ, in order to design or establish performance metrics for each one. For example: true number of Complaints (real volume after screening), percent of good Classification (accurate), percent of Precision (exact information),

**Process Flow Chart**

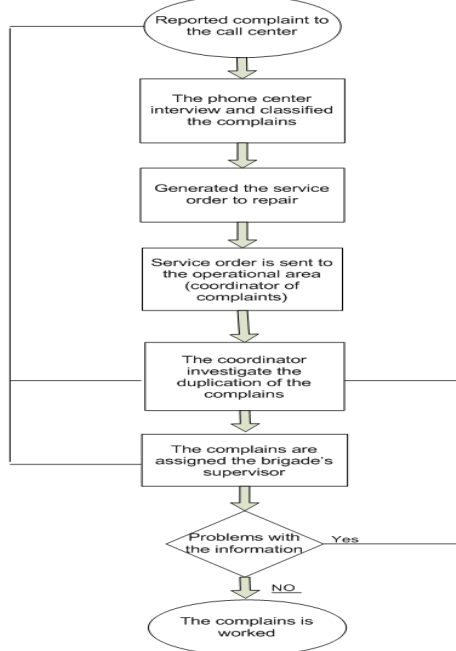
A flow chart is useful to people familiar with a process, as well as, to those that have a need to understand the process. A flow chart will depict the sequence of products containers, paperwork, operator actions or administrative procedures. A flow chart is often the starting point for process improvement. Shown in Figure 2 the Process Flow Chart developed to the project.

The use of a sampling plan requires randomness in a sample selection. Obviously, true random sampling requires giving every part an equal chance of being selected for the sample. The sample must be representative of the lot and not just the product easy to obtain. Sampling without randomness ruins the effectiveness of the Plan.

**Random Sampling**

It was used in this project, the MIL-STD. 105 - E Sampling Plan. The volume of complaints in Public Utility Authority's Metro Region on February 2010 was 1,283. For a General Inspection Level II, the table recommends a sample size of 125. The sample size was stratified in 35 (28%) to Bayamón's Operations Area, 35 (28%) to Carolina's Operations Area and 55 (44%) to San Juan's Operations Area.

This sample stratification is representative of the percent of clients of each Operational Area. Each Operational Area was visited with a list of random numbers generated by computer. These random numbers were used to obtain the samples from the Public Utility Authority's computer data base system and collect the necessary data for the project.



**Figure 2**  
**Process Flow Chart**

### Data Sheets

Data Sheets are great tools for organizing and collecting facts and data. By collecting data, individuals or teams can make better decisions, solve problems faster and earn management support. Shown in Figure 3 the Data Sheet designed for the project.

Sample	# Comp	CT	Origin	Status	OD	SD	ET (days)
01	7240283	SL	Ext Source	Previous Solved	03/01	03/01	0
20	7243930	SL	Call Center	Previous Solved	03/02	03/02	0
49	7246332	SL	Call Center	Cancelled WR	03/01	03/04	3
52	7254098	DE	Call Center	Worked	03/02	03/03	1
53	7255319	SL	Call Center	Wrong Info	03/02	03/05	3
55	72555850	SL	Call Center	Previous Solved	03/02	03/04	2
75	7263555	DE	Call Center	Wrong Info	03/02	03/04	2
88	7268796	SL	Ext Source	Duplicate	03/03	03/04	1
100	7269948	DI	Ext Source	Worked	03/03	03/04	1
109	7273392	DI	Call Center	Wrong Info	03/04	03/08	1
133	7280466	SL	Call Center	Wrong Info	03/05	03/05	0
146	7284390	DI	Call Center	Duplicate	03/06	03/08	2
198	7297026	DI	Call Center	All Normal	03/09	03/10	2
202	7297574	SA	Ext Source	Worked	03/09	03/10	1
204	7297902	SL	Call Center	Worked	03/09	03/16	7

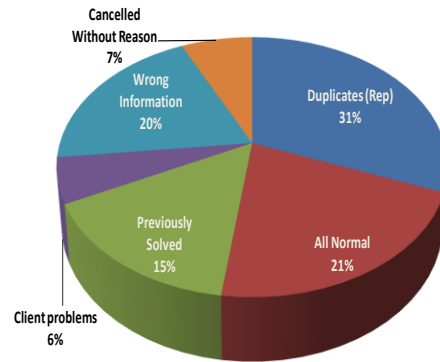
**Figure 3**  
**Data Sheet**

### Process Performance

After analyzing and calculating the data collected in the Data Sheets, it was found that 84% of the complaints were received in the Call Center and the other 16% came from External Sources (complaints reported directly to the Operational Areas). It was also found that the Call Center had a Complaints First Pass Yield (FPY) (see section Project Charter) of 30% and the External Sources had a FPY of 55%.

### Factors that affect Process Performance

After analyzing and calculating the data collected in the Data Sheets. It was found that the Call Center had a 70% of Complaints with Information Problems (IP) and the external sources had a 45% of IP. On this occasion the total Complaints with Information Problems were 71 from a sample of 125. Shown below in Figure 4 a chart of Significant Factors (that affects process performance, availability and quality) with respective percentages.



**Figure 4**  
**Problems Classification Chart**

### Analyze Phase

This section will show the Pareto Analysis made to the project. Pareto analysis is based on the Pareto principle, which suggests that most effects come from relatively few causes. A Pareto Chart consists of a series of bars in descending order. The bar with the highest incidence of failure, cost or other occurrences are on the left side. The miscellaneous category, an exception, always

appears at the far right, regardless of size. Pareto charts display, in order of importance, the contribution to the total effect and the relative rank of the items.

This Pareto Analysis shows that the problem of more frequency is Duplicity (31%), followed by All Normal (21.1%), Incorrect Information (19.7%), Previously Solved (15.5%), Canceled Without Reason (7%) and Client Problem (5.6%). Note that the first three (3) problems had the 71.8 percent of contribution and the last three (3) had the resultant 28.2 percent. Shown below is the Pareto Chart carried out for the project.

This section will show the Corrective Actions recommended to the project.

### Corrective Actions

A corrective action is an action taken to eliminate the cause of a detected nonconformity or other undesirable situation (ISO 9000). Corrective action is reacting to a problem and taking steps to eliminate the cause so the problem never occurs.

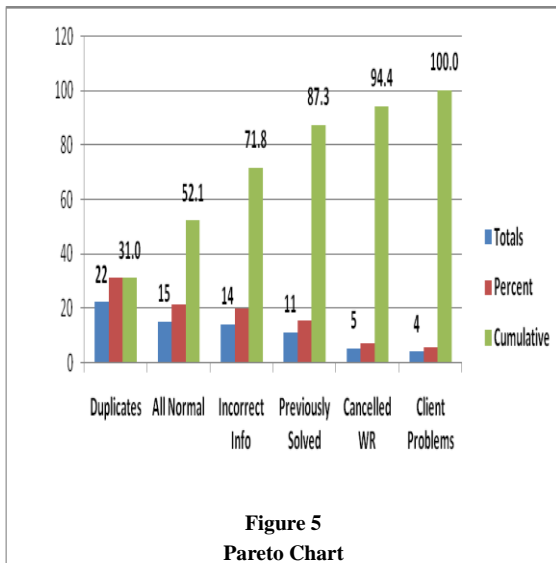


Figure 5  
Pareto Chart

### Improve Phase

Shown in Figure 6 the Corrective Actions recommended for the project. The immediate corrective action should be performed by a complaints Field Inspector in each of the operational areas (San Juan, Bayamón and Carolina). Also, should be performed after the

screening for duplicity, carried out by the Complaints Coordinator and before complaints assignment to brigade's supervisor for repair. The Inspector would be accountable to correct or eliminate, all of the rest of information problems that had the complaint. In this manner the complaints goes to brigades to repair without information problems. In addition, with this corrective action the efficiency, productivity and availability of the brigades increases.

CORRECTIVE ACTION	TERM
Screening, including 100% field inspection of the complaints, before pass them to the brigades for repair.	Immediate
Design a complaints receiver system that minimize the data entry errors and eliminate the duplicity assigning a unique number to them.	Long Term

Figure 6  
Corrective Actions

The long term corrective action should be performed by the Public Utility Authority's Information System Area with the help of external consultants, experts on this matter. As soon the Complaints Receiver System be ready to eliminate the duplicity and others data entry errors, the functions of the complaints coordinator would be eliminate or reduced, leaving only the field inspection for screening. This corrective action reduce or eliminate stages in the complaints responding process, making it more efficient, productive and lean.

### CONCLUSION

This chapter presents a summary of the findings. This section presents the Recommendations developed to the project and the Performance Report (metrics) after the implementation of the immediate Corrective Action.

### Recommendations

In order to control the improvements, to keep the process on the new course and prevent reverting to the old way. Several recommendations were put

forward to the Public Utility Authority's Operations Area senior management. Some of them will be treated as independent improvement future projects. Shown below the Recommendations List carried out for the project.

- After the good results obtained implementing the immediate Corrective Action (see Corrective Actions), its recommended to be included, in the new design for Standard Operation Procedure (SOP) for Complaints Respond, on the Public Utility Authority's Metro Operations Region.
- Public Utility Authority's Information System Area with the help of external consultants, design a Complaints Receiving Information System that minimize the data entry errors and eliminate the duplicity of complaints, assigning a unique number to them.
- Establish Performance Metrics for Complaints, Classification and Precision components of the CTQ tree, on the Call Center (see CTQ Tree). Perform monthly metrics about them.
- Establish a maximum limit, to complaints responding time, of seven (7) labor days on Public Utility Authority's Metro Operations Region. Perform monthly reports for the compliance with that parameter.
- The Call Center should offer incentives (performance bonus, etc.) based on percent of accurate complaints by employee.
- The Call Center needs to elaborate a new series of questions, in order to collect the necessary information to solve efficiently the complaints.

#### **Performance Report of "Salideros" and "Desbordes" Complaints**

The Metro Regional Director decided to implement the immediate corrective action recommended. After the implementation, the monthly volume of reported complaints of "Salideros" and "Desbordes" started to reduce. For the period from February to November the volume of complaints reported (for the Metro Region) suffered a reduction from 1,283 complaints to 374 complaints. Reaching a 70% of reduction in volume

of complaints reported for "Salideros" and "Desbordes" in grand total. This percent of reduction is evidence that the project reached the goal of improve the Public Utility Authority's Complaints Responding System.

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- [2] Quality Council of Indiana (2007). *Lean Six Sigma Premier*
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