iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL
FOR RESEARCH
IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 5 Issue: VII Month of publication: July 2017

DOI:

Optimization of Service Quality in XYZ Industry by Using Six Sigma Tool

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Abstract: Today industrial service organizations are more interested in improving their processes and products by decreasing the variation. Because every customers want error or defect free products and services. We must try our best to deliver the services at the ideal targets demanded by the customers. In this article, I had studied various literatures related with number of defects in the service field. The aim of this paper is to reduce the number of defects of a service provided by XYZ Industry, Nagpur and to increase the customer satisfaction by using six sigma tools. In present studied, I perform identification of the problem and study the literatures. After this stage collecting the voice of customer by visiting the company and identifying the defect opportunities. Further the data will be analyzed to measure the initial six sigma level. By implementing solutions to reduce the defect opportunities final sigma level will be measured with DMAIC process.
Keywords: Six sigma, DMAIC, CTQ, Pareto Chart, cause effect diagram.

I. INTRODUCTION

In today competitive work supplying the quality product with less or competitive price is the biggest challenge in front of all the industry and service organizations. As customers are very much aware and educated to satisfy for long run, there is a need of continuous quality improvement in the process or in the methodology. So that the productivity will be improve with less cost in investment. . Variation is the enemy of quality which is defined and evaluated by the customers. We must deliver products and services at the ideal targets demanded by the customers. The traditional evaluation of quality is based on average measures of the process/product and their deviation from the target value. However, customers judge the quality of process/product not only based on the average. Customers want consistent, reliable and predictable processes that deliver or exceed the best-in-class level of quality. There are various means by which the quality can be improved first is by management practise like Japanese management techniques like Six Sigma, Muda, Kaizen, Taguchi, 5S, Total quality management, Quality Function Deployment etc. In this project I had used Six Sigma method for improving the quality and the productivity of service department in XYZ Industry.

II. SIX SIGMA METHODOLOGIES

Six sigma projects are based on the implementation of two methodologies, as listed below:

A. DMAIC

DMAIC (Define, Measure, Analyse, Improve and Control) methodology is used for an existing products and processes. There are five steps to be considered for this case. The steps are define, measure, analyse, improve and control. It is applied when cause of the problem is unknown or unclear

B. DMADV

DMADV (Define, Measure, Analyse, Design and Verify) methodology is used for new products and processes. The first three steps of DMADV are the same with those of DMAIC but the final two steps are different which focus on designing and verifying the future product or process inputs

III. CASE STUDY

A. Problem Statement

XYZ Company is involved in Manufacture and Marketing of Welding Consumables, Flux Cored Wires, Wear Plates and Regeneration of Critical Components. There is a service department in the company which provides the services to the customer's at their site e.g. cement plant. In Cement Plant the crushing roller had been used for crushing the clinkers. There are two Roller press one is fixed and another is movable, the crushing rollers get wear out after some time depends upon the initial condition and uses of the roller. Because of that the efficiency and the productivity get decreases. So it requires Reconditioning or super-conditioning which provided by XYZ company. We are using DMAIC methodology in service department to calculate the existing sigma level and find out the root cause of the problems. Our aim is to increase the sigma level by reducing the number of defects

Figure 1: Wear out Roller

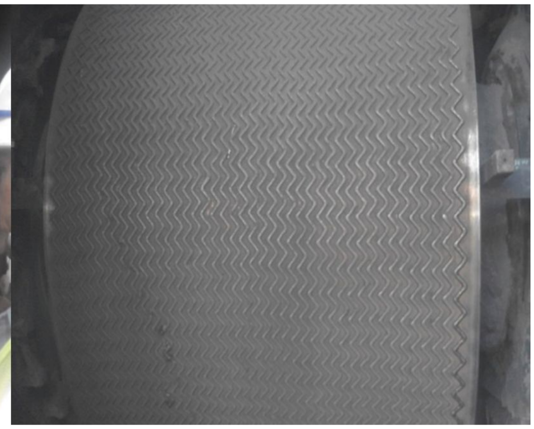

Figure 2: After welding

B. Define Phase

The Define phase of a six Sigma DMAIC model is used to identify the product quality and service characteristics which is critical to customer (called CTQs). The alternative tools for define phase were Process Flow Diagram, SIPOC (supplier, Input, Process, Output, Customer) analysis, Voice of customer analysis etc.

1) *CTQ :* By conducting survey it is found that, the Critical to quality for Customers are timely completion of the work with good quality because time is very important factor for the customers.
2) *Process Flow Diagram:* Process flow diagram is prepared to understand the Service between customer and service. In this process flow diagram we are showing the process from getting order to completion of job.

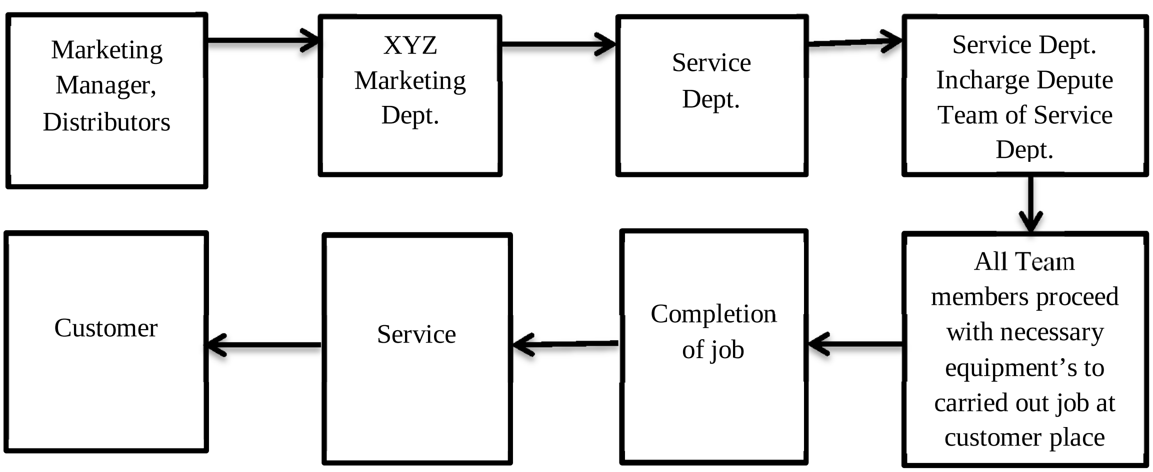

Figure 3: Process Flow Diagram

3) *SIPOC Diagram:* A SIPOC (supplier, Input, Process, Output, Customer) diagram is a tool used by a team to identify all relevant elements of a process improvement project before work begins. Here we prepared a SIPOC diagram to know about the process, input, output and customer which is shown in the table

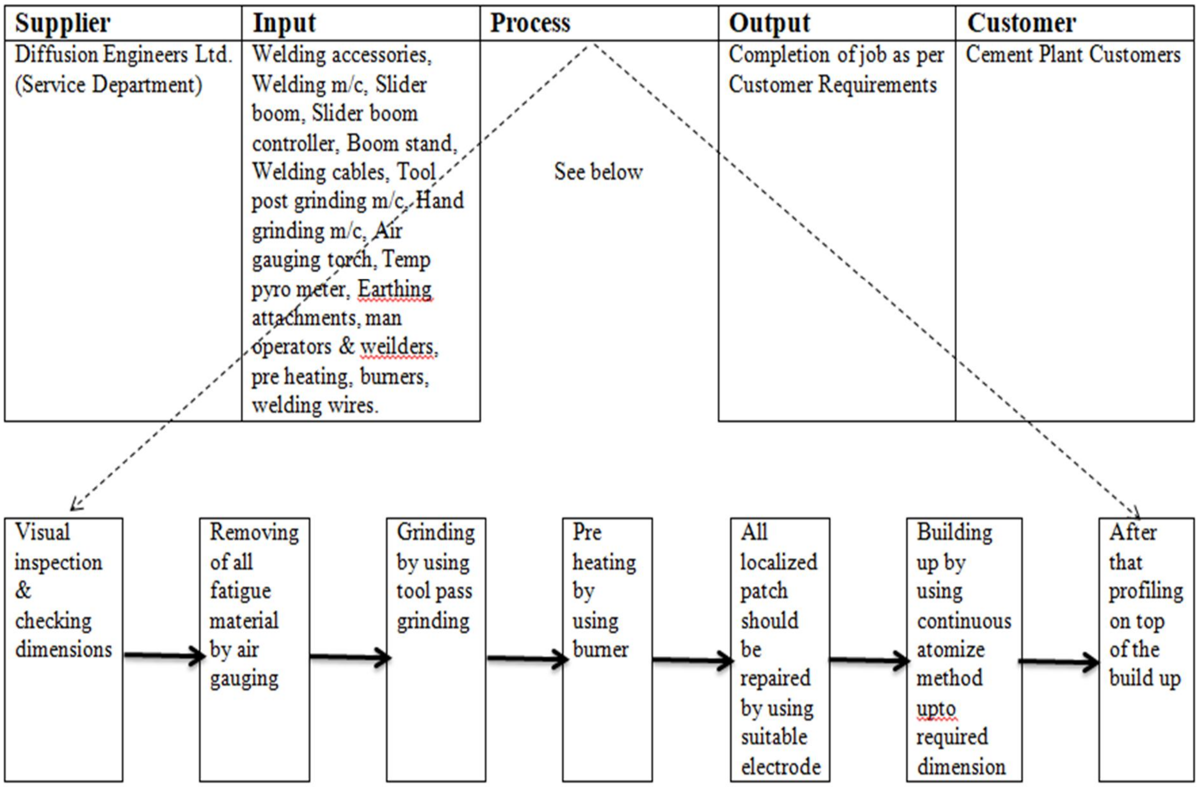

Figure 4: SIPOC Diagram

C. Measure Phase

The objective of the measure phase is to know the current status of the process with the help of data. If the data is already available measure stage may be completed in very short time while at the other extreme, it may take several weeks/months depending on the data to be captured from the process. As there is a previous data is available in the company in the form of feedback form from which we get the voice of customer.

1) Calculation of Initial Six Sigma level:

a) Calculation:

Total no. of feedback form = 30

Opportunities in a feedback form = 8

Total no. of opportunities = 8 ×30 = 240

DPU is calculated by dividing the total number of opportunities with the number of feedback forms

DPU = 168/21 = 8

$$\text{DPMO} = \frac{(\text{Number of Defects} \times 1{,}000{,}000)}{((\text{Number of Defect Opportunities/Unit}) \times \text{Number of Units})}$$

$$\text{DPMO} = \frac{106 \times 1{,}000{,}000}{8 \times 30}$$

b) DPMO = 441667

From the Six Sigma Calculator DPMO and Initial Six Sigma calculated

c) Initial Six Sigma = 1.65

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor:6.887
Volume 5 Issue VII, July 2017- Available at www.ijraset.com

Questions	Positive	Negative	Total negative
Timely supply	12	18	18
After dispatch timely information of all the dispatch detail	17	13	13
Response against queries	20	10	10
Attitude	22	8	8
Expertise level of the team for assigned task	15	15	15
Quality of the work	15	15	15
Satisfaction with service	16	14	14
Overall rating	17	13	13
		Total no. of defects	106

Table 1: Calculation of No. of defects

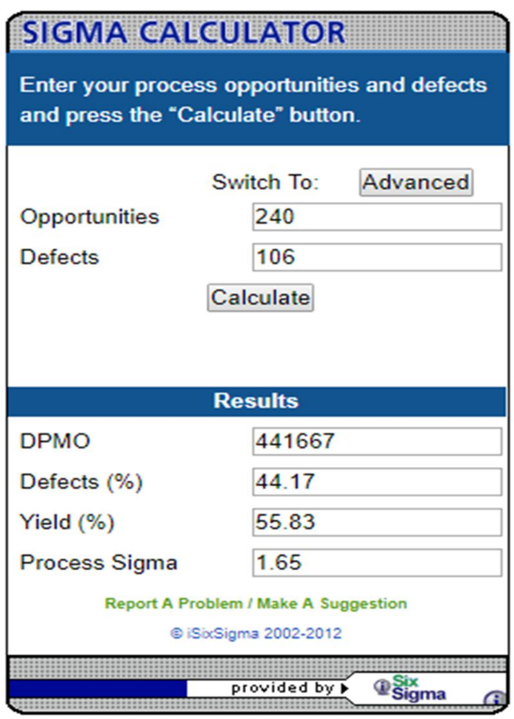

Figure 5: Initial Six Sigma

D. ANALYZE Phase

In this phase various tool like Pareto chart, cause and effect diagram have used to find out the root causes of the problems

1) *Pareto Chart:* The basic principle of Pareto is "80% of any effect are due to 20^ of causes and vice versa". I had analysed the problem with Pareto analysis where I noted down the problems and plotted the percentage of defects in the graph according to the priority of the problem that is the problem having large contribution in defects is plotted first and the later after that. I had plotted the graph of individual percentage and cumulative percentage. The Pareto chart also contains the number of defects in the particular problem.

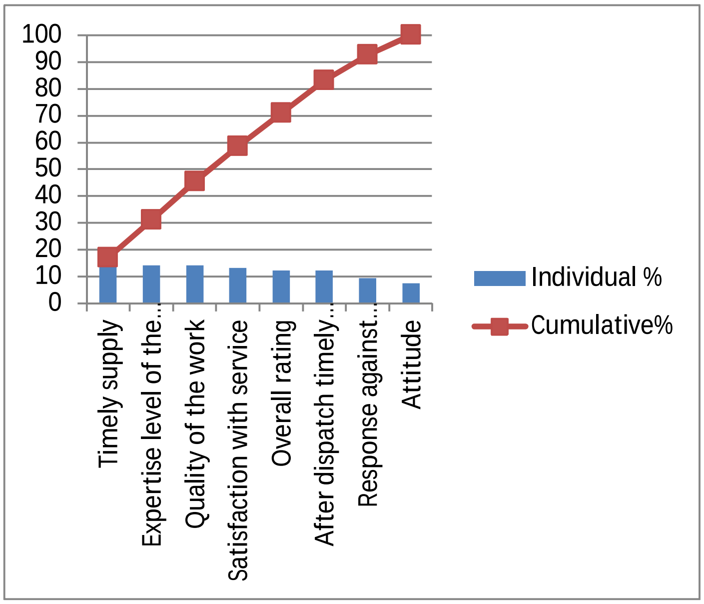

Table 2: Pareto chart

2) *Cause and Effect Diagram:* Ishikawa diagrams (also called fishbone diagrams, herringbone diagrams, cause-and-effect diagrams, or Fishikawa) are causal diagrams created by Kaoru Ishikawa that show the causes of a specific event. The effect is shown as the fish's head, facing to the right, with the causes extending to the left as fish bones; the ribs branch off the backbone for major causes, with sub-branches for root-causes, to as many levels as required.

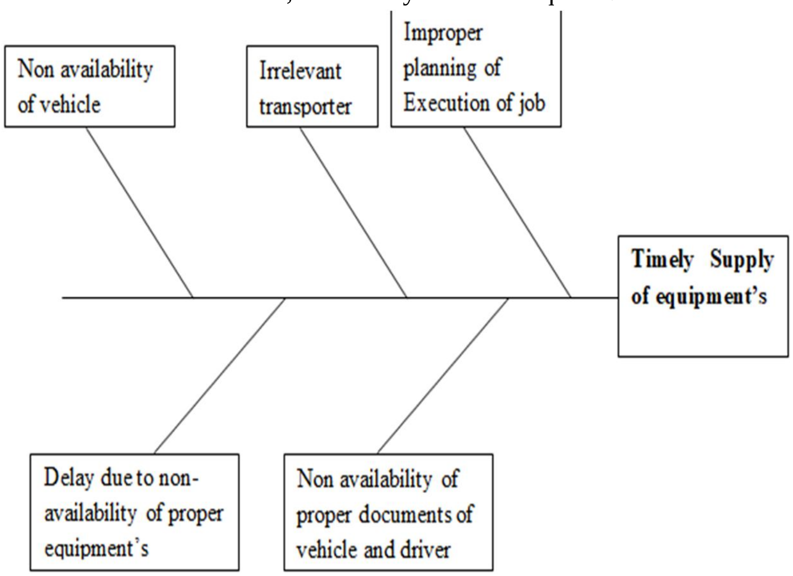

Figure 6: Cause effect diagram for timely supply of equipment's

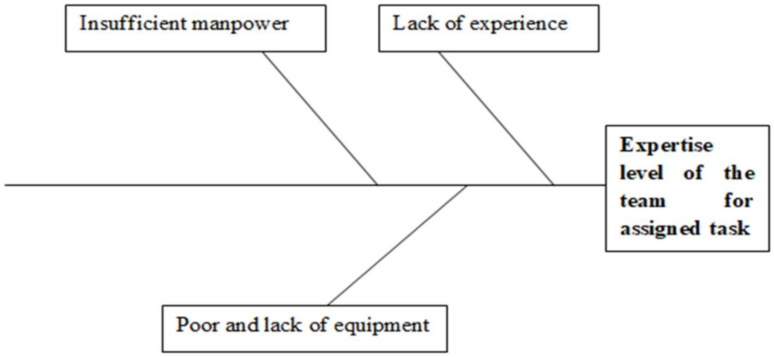

Figure 7: Cause effect diagram for Expertise level of the team for assigned task

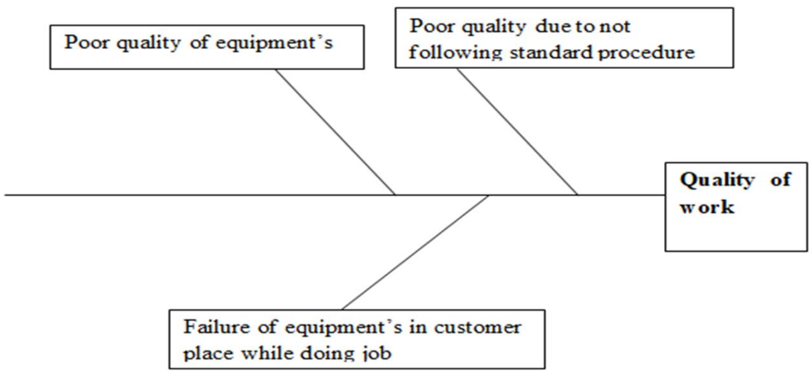

Figure 8: Cause effect diagram for Quality of work

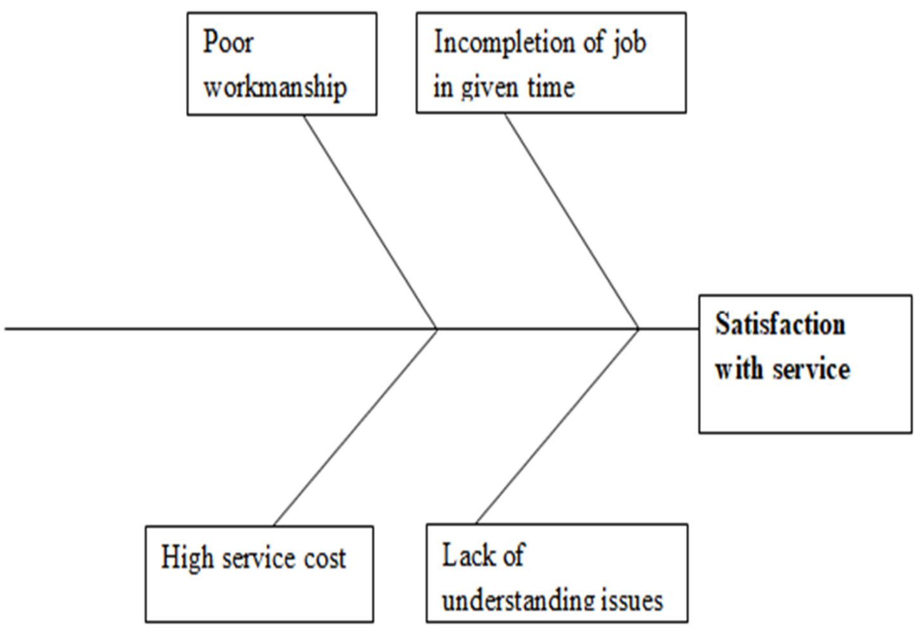

Figure 9: Cause effect diagram for Satisfaction with service

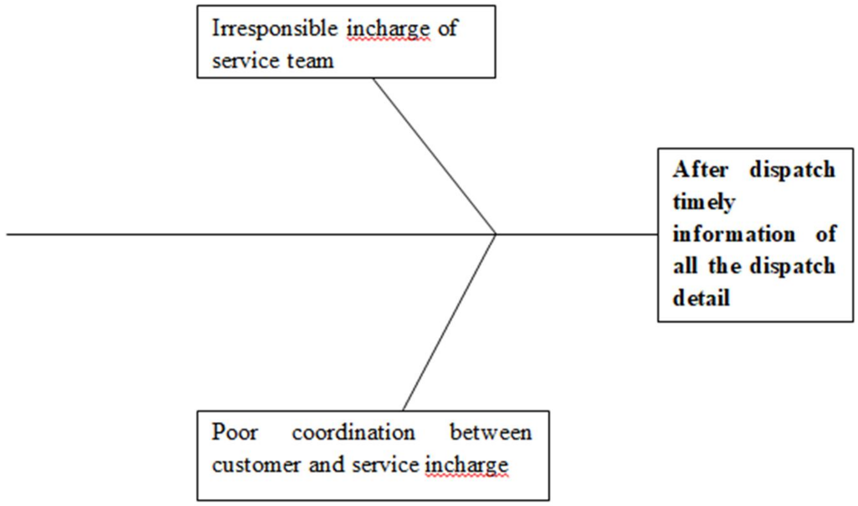

Figure 10: Cause effect diagram for after dispatch timely information of all the dispatch detail

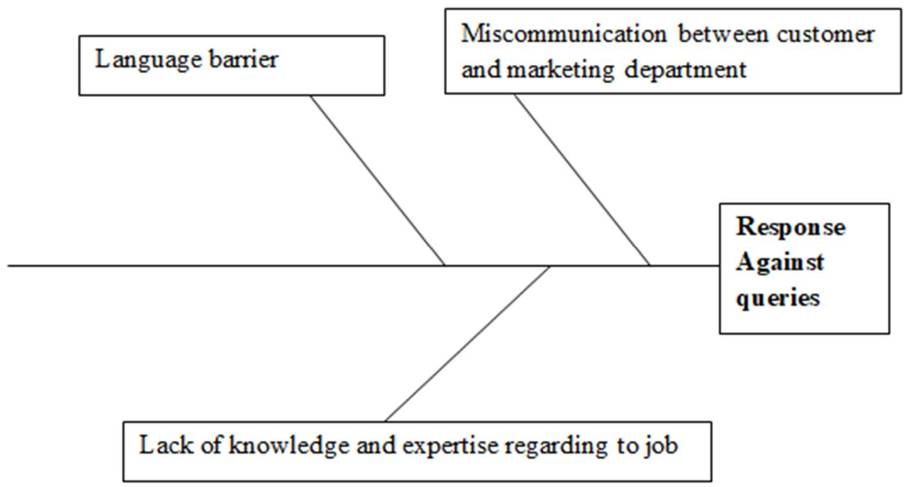

Figure 11: Cause effect diagram for Response against queries

3) *Result of analysis:* On the basis of cause and effect diagram, Pareto chart and VOC. Root causes are identified and recommendation are given which is shown in Improve Phase

E. Improve

In the analysis phase it was noticed after employing Pareto analysis and Cause effect Diagram that the above six defect opportunity from the Pareto Analysis are the main problem for the dissatisfaction of customers. The main goal of this Improve phase is develop optimal solutions of the problems.

1) *Suggestions for Solving the Problems to Reduce the Defects:*

a) *Problem:* Timely supply of Equipment's and Manpower Causes

i) Improper planning of Execution of job

ii) Non availability of proper documents of vehicle and driver

iii) Irrelevant transporter

iv) Non availability of vehicle

v) Delay due to unavailable of proper equipment's

b) *Remedies:*

i) Proper planning should be before Execution of job

ii) Company should have their own vehicle and drivers to carry the equipment's
iii) Reputed transporter should be engage to transport the equipment's to customer place in time
iv) Timely maintenance of equipment's

c) *Problem:* Expertise level of the team for assigned task Causes
i) Lack of experience
ii) Insufficient manpower
iii) Poor and lack of equipment

d) *Remedies:*
i) Appoint qualified technicians related to the job
ii) As per job proper team should be assign
iii) Good quality of equipment's and spare equipment's use

e) *Problem:* Quality of the work Causes
i) Poor quality of equipment's
ii) Poor quality due to not following standard procedure
iii) Failure of equipment's in customer place while doing job

f) *Remedies:*
i) Standard procedure should be adapt
ii) Good quality of equipment's should be used to maintain correct parameter
iii) Spare equipment's should bring in customer site

g) *Problem:* Satisfaction with service Causes:
i) Poor workmanship
ii) Incompletion of job in given time
iii) High service cost
iv) Lack of understanding issues

h) *Remedies:*
i) Qualified technicians should be assign
ii) Job should be completed in given time without any defects as per customer requirements
iii) Comparable cost
iv) Improve understanding of clients issue

i) *Problem:* After dispatch timely information of all the dispatch detail Causes
i) Irresponsible incharge of service team
ii) Poor coordination between customer and service incharge

j) *Remedies:*
i) Incharge should be responsible and aware
ii) Maintain good coordination with customer and good follow up

k) *Problem:* Response against queries Cause-
i) Language barrier
ii) Miscommunication between customer and marketing department
iii) Lack of knowledge and expertise regarding to job

l. Remedies:
i) Assign a localised person with service team
ii) Pay proper ateention while interacting with customer
iii) Qualified and experienced person should be assign

m) *Problem:* Attitude Causes
i) Poor work man ship
ii) Indiscipline way of working
iii) Fatigue

n) *Remedies:*
i) Good coordination with customer with polite
ii) Maintain Discipline in customer site

iii) Better working environment

o) Problem: Overall Rating Causes

i) Cumulative effect of other problems

p) Remedies:

i) Increment in other parameter rating

By implementing these suggestions the sigma level will get increase by reducing the number of defects

F. Control

The final phase of the DMAIC model named control phase which involves avoiding problems in CTQs with risk management and mistake proofing, standardizing successful process changes and controlling the critical CTQs, development the process plan and documentation of the process plan. This solution and continuous improvement process must need to maintain over time. For this purpose continuous training schedule for the worker need to setup along with update new standards of documentation (i.e. procedure, work inspection) must be established. In control phase the primary purpose is to control the activity as if it is done according to preplanned.

IV. RESULT

After adapting the suggestions by the XYZ Company the problem in service department will get reduce, by decreasing the number of defects and on the other side the Sigma level will increases. Also we suggest them a new feedback form, which consist of all satisfaction queries related to the customers view. Therefore in future it will be easy to find out the root cause of the problem by DMAIC methodology

V. CONCLUSION

In this research paper we applied the DMAIC methodology in the Service Department of XYZ Company and find out the root causes, and give remedies to increase the customer satisfaction by reducing the number of defects

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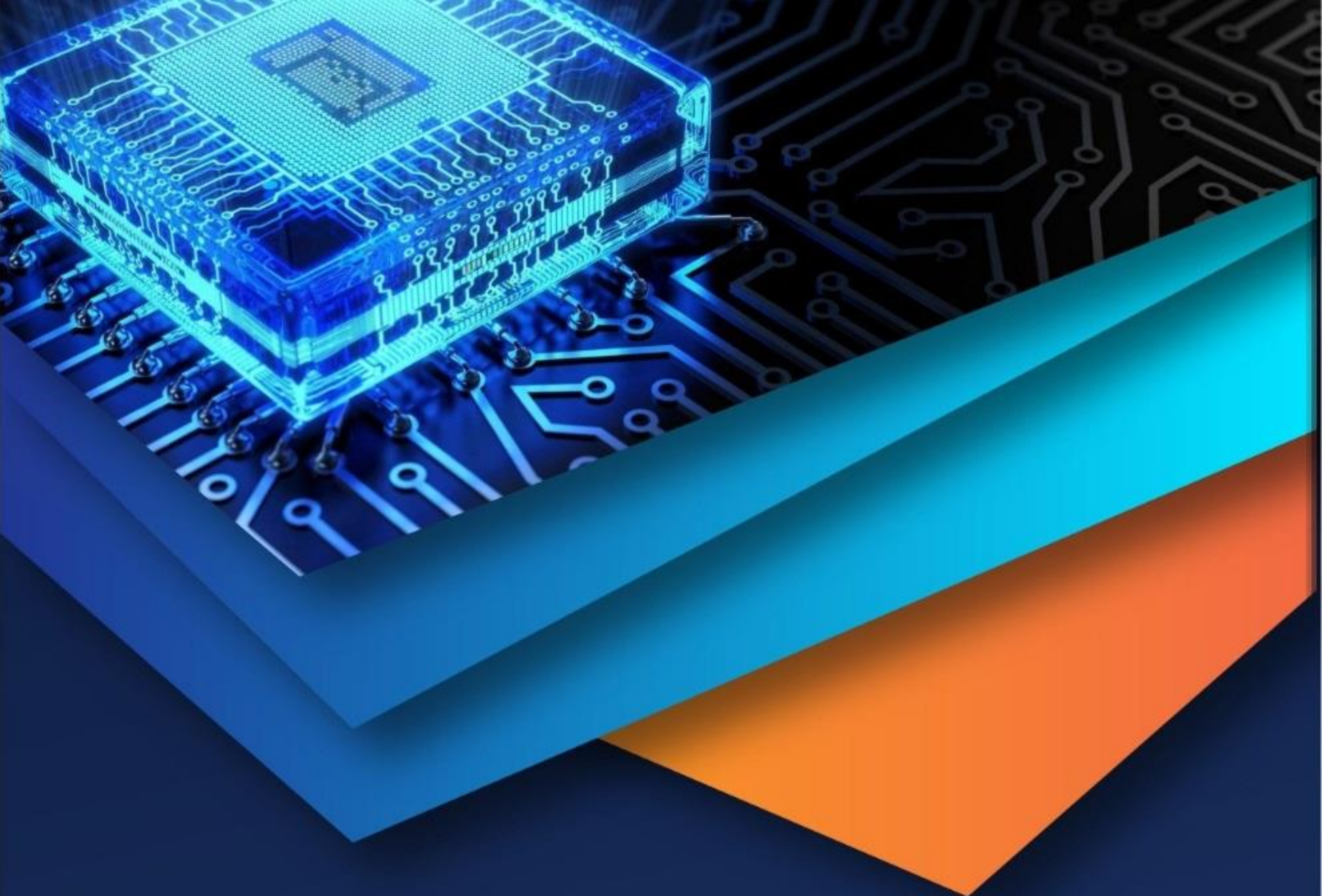

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