International Journal of Research in Advent Technology, Vol.2, No.2, February 2014

E-ISSN: 2321-9637

An Application of Six Sigma in Service Sector-A Case Study

Aditya R. Wankhade[1], Sunil S. Girde[2], Pankaj N. Bandabuche[3],
Mechanical Engg.Department ACE, Wardha1, 2 Mechanical Engg.Department, GHRCET, Amravati 3,
Asst.Professor[1, 2, 3]
Wankhade.aditya@rediffmail.com

Abstract- Industrial, manufacturing and service organizations are interested in improving their products and processes by decreasing the variation, because the competitive environment leaves little room for error. 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.[2]
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, but also by the variance in each transaction with the process or use of the product. Customers want consistent, reliable and predictable processes that deliver or exceed the best-in-class level of quality. This is what the Six Sigma process strives to achieve . Over the last twenty years, Six Sigma has been successfully implemented in many industries, from large manufacturing to small businesses, from financial services, insurance industry to healthcare systems.[3] This paper deals with the implementation of six sigma methodology in service sector.

IndexTerms- **What is six sigma?1, Implementation2, Level 3, Case study4.**

1. WHAT IS SIX SIGMA?

Sigma (σ) is a letter in the Greek alphabet that has become the statistical symbol and metric of process variation. The sigma scale of measure is perfectly correlated to such characteristics as defects-per-unit, parts-per-million defectives, and the probability of a failure. Six is the number of sigma measured in a process, when the variation around the target is such that only 3.4 outputs out of one million are defects under the assumption that the process average may drift over the long term by as much as 1.5 standard deviations. Six Sigma is a quality improvement programmed with a goal to reduce the number of defects to as low as 3.4 parts per million. It relies on the use of normal distribution to predict defective rates. Six Sigma qualities is a benchmark of excellence for product and process quality, popularized by Motorola based on zero defect concept introduced by Philip B .Crosby. It provides a quantitative statistical notion of quality useful in understanding, measuring and reducing variation.[5]

A product is said to be of Six Sigma quality if there are no more than 3.4 non-conformities per million opportunities at the part and process step level. Six Sigma is an overall strategy to accelerate improvement in its processes, products and services. It is also a measurement of total quality to let the company know how effective it is in eliminating defects and variations from its processes. It encompasses tools from all improvement initiatives, including those in operational, technical and customer excellence. It just applies to every function in the company, not just the factory floor. Six Sigma is a statistical measurement, which helps us established our course and gauge our pace in the race for total customer satisfaction. It allows us to draw comparison with other similar or dissimilar product, services and processes. It is business strategy which makes the customer more satisfied. It can greatly help us to gain competitive edge.[6]
Six Sigma is a disciplined quality improvement methodology that focuses on moving every process that touches the customers-every product and service-towards near perfect quality. It is a measure of the company's quality. Six Sigma is more than a quantitative statistical measure of processes. Six Sigma is more than a quantitative statistical measure of processes; it embraces every aspect of work, using a disciplined, fact based approach to problem solving. It is a new way of thinking about work and customer value. It is also powerful force to create one corporate culture; some of it is bureaucracy busting-pushing down decision-making to lowest practical levels, empowering employees. At the other end i.e. more complicated challenges-including lean manufacturing initiatives and variability reduction.[8]

.

2. HOW IS SIX SIGMA IMLEMENTED

A typical process for Six Sigma process improvement has five phases: Define, Measure, Analyze, Improve, and Control, denoted by DMAIC. The DMAIC methodology is central to

Six Sigma process improvement projects. The following phases provide a problem solving

process in which specific tools are employed to turn a practical problem into a statistical problem, generate a statistical solution and then convert that back into a practical solution.

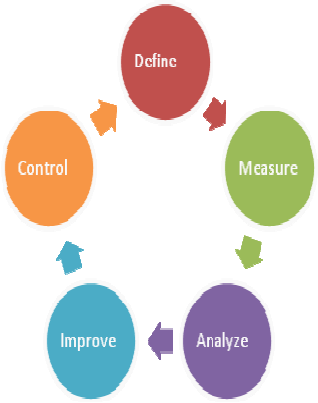

Figure: 1 DMAIC Cycle

2.1Define (D):

The purpose of the define phase is to clearly identify the problem, the requirements of the project and the objectives of the project. The objectives of the project should focus on critical issues which are aligned with the company's business strategy and the customer's requirements. The Define phase includes: define customer requirements as they relate to this project. Explicit customer requirements are called Critical – To- Quality (CTQ)characteristics ;develop defect definitions as precisely as possible; perform a base line study (a general measure of the level of performance before the improvement project commences); create a team character and champion ; estimate the financial impact of the problem ; and obtain senior management approval of the project.[10]

2.2Measure (M):

The purpose of the measure phase is to fully understand the current performance by identifying how to best measure current performance and to start measuring it . The measurements used should be useful and relevant to identifying and measuring the source of variation. This phase includes:

- Identify the specific performance requirements of relevant critical- To-Quality (CTQ) characteristics ;
- Map relevant process with identified input and output so that at each process steps, the relevant outputs and all the potential inputs (X) that might impact each output are connected to each other .
- Generate list of potential measurements.
- Analyze measurement system capability and establish process capability base line.
- Identify where errors in measurements can occur.
- Start measuring the inputs, processes and outputs and collecting the data.
- Validate that the problem exist based on the measurements.
- Refine the problem or objective (from the analysis phase).[6]

2.3Analyze (A):

In the analyze phase the measurements collected in the measure phase are analyzed so that hypotheses about the root causes of variations in the measurements can be generated and the hypotheses subsequently validated. It is at this stage that practical business problems are turned into statistical problems and analyzed as statistical problems. This includes:

- Generate hypotheses about possible root causes of variation and potential critical inputs (X's)
- Identify the vital few root causes and critical inputs that have the most Significant impact and
- Validate these hypotheses by performing multivariate analysis.[8]

2.4 Improve (I):

The improve phase focuses on developing ideas to remove root causes of variation, testing and standardizing those solution. This involves

- Identify ways to remove causes of variation.
- Verify critical inputs.
- Discover relationships between variables.
- Establish operating tolerances which are the upper and lower specifications limits (The engineering or customer requirement) of a process for judging acceptability of a particular characteristic, and if strictly followed will result in defect-free products or services.
- Optimize critical inputs or reconfigure the relevant process.[12]

2.5Control(C):

The control phase aims to establish standard measures to maintain performance and to correct problems as needed, including problems with the measurement system. This includes:

- Validate measurement systems.

- Verify process long – term capability.
- Implement process control with control plan to insure that the same problems don't reoccur by continuously monitoring the process that creates the products or services.[9]

3. THE MAJOR LEVEL OF THE BELTS AND COLORS:

3.1 Six Sigma Green Belt

Here the six sigma green belts operators are given training to operate in the support or under the supervision of a six sigma black belt. Trough this certification the person is trained to analyze and solve quality problems..[12]

3.2 Six Sigma Black belt

The candidates who had undergone six sigma black belt certification is a professional who is capable in the explanation of six sigma philosophies and the principles. His knowledge also includes the supporting systems and the tools. This certification also deals with the training of the candidates in developing the demonstration of the team leadership, understanding team dynamics and assigning team members roles and responsibilities. [12]

3.3Master Black Belt

The professional who had undergone the master black belt certification are considered as a six sigma quality experts and they are responsible for the strategic implementations within an organization. The training is given for the improvement of the responsibilities of a master black belt, which includes training and mentoring of black belts and the green belts. t.[12]

3.4Yellow Belt

Six Sigma Yellow Belt certification provides with the attendees an overall insight to the use age of the six sigma techniques. The training is also given in the field of six sigma metrics and the basic improvement methodologies. The certification helps the trainees to receive an idea about the introduction to the process management and the basic tools of six sigma . Strong understanding of the processes, enabling each individual to provide meaningful assistance is the other characteristics of the six sigma yellow belt certification. The aim of this certification is the achievement of the organizations overall objectives.[12]

3.5Champion (S)

Selected senior executives and managers familiar with basic and advanced statistical tools , who allocate resources and remove barriers for Six Sigma projects ;create the vision of Six Sigma for the company, develop training plan ,select high impact projects , select potential people , construct and improve deployment mechanism , monitor SS project review , recognize people for their efforts and contribution.[12]

4.A CASE STUDY

4.1 Define:

4.1.1Background and Reason for selecting the case:

Sales and service is the key to retain in the market, increasing the business and profitability. IDEA is one of the top company in a telecom sector, having large no. Customer. But it was found that the sales of SIM and Recharge are decreased Due to which Agency is not able to achieve the target given by company. If it is achieve then agency will get commission of 0.5% per month on recharge.

4.1.2Project Charter:

Department: IDEA Telecom Service
Project Title: To increased the sale of IDEA's SIM and Recharge by improving service
Goal statement: To achieve the target by increasing sales.
Business case: This case study will support to achieve the target with respect to sales and to track down the root causes for failure.
Customer's CTQ: Good Service
Scope: It will increased the sales
Opportunity Statement: 1. Improvement in service
2. Increase sales
Direct Benefits: Customer satisfaction, Source of the project: Information gathered and Data collected from Agency. Project Team and Plan.

Table 1 Project plan

Phases	Start	End
Define	15-10-12	31-10-12
Measure	1-11-12	15-11-12
Analyze	16-11-12	30-11-12
Improve	1-12-12	31-12-12
Control	1-1-13	31-1-13

4.1.3Process Flow Diagarm:

Process flow diagram prepared to understand the sales of SIM and recharges.

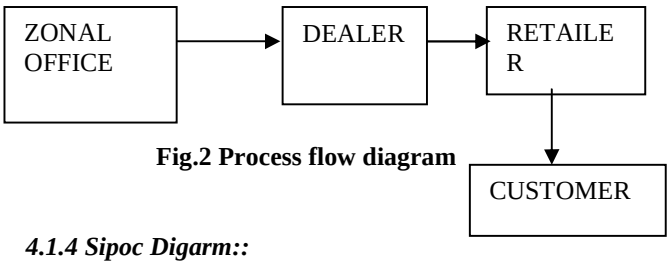

Fig.2 Process flow diagram

4.1.4 Sipoc Digarm::

SIPOC prepared to know about the process, input, output and customer which is shown in table2.

Table 2. SIPOC table

Supplier	Input	Process	output	customer
Zonal office	Sim and Recharge	Sales	Profit	Dealer
Dealer	Sim and Recharge	Sales	Target achievement, Profit,commision	Retailer/users
Retailer	Sim and Recharge	Sales	Profit	customers

4.2Measure:

In this phase data for monthly sale of SIM and recharges since last seven month have been collected .plan for data collection decided by team according to plan data have collected and Bar chart is used to represent the data collected.

Table 3.Data Collection Plan

SR.NO	MONTH	SALES OF SIM	SALES OF RECHARGE(IN LAC.)
1	MAY	390	16
2	JUNE	310	16.30
3	JULY	330	15.50
4	AUG	320	15.70
5	SEPT	300	15.60
6	OCT	340	15.80
7	NOV	310	15.70

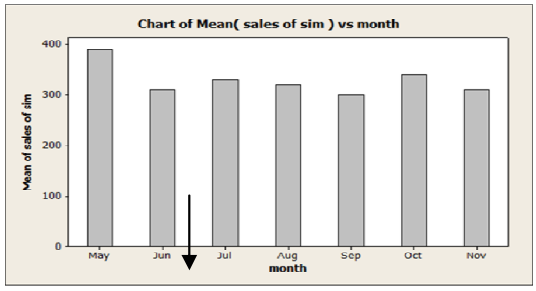

Fig.3 Bar-chart of sales of SIM Vs Month

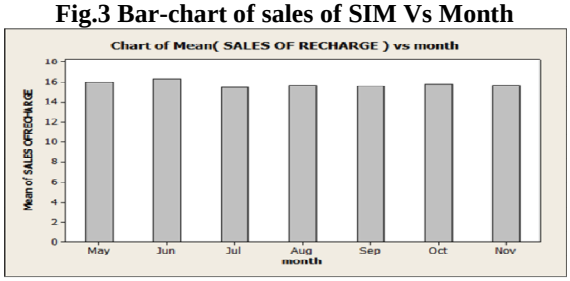

Fig.4 Bar-chart of sales Recharges Vs Month

4.2.1Current Performance:

Annual turnover- more than 1.9 cr. Appr.
Profit margin- 1.3% on Recharge
Profit on sim- 50 Rs./sim
Sales of SIM- 300-400 appr.
sales of Recharge- 16 lack./ month Appr.
Target of SIM- 600/month
Target of recharge- 17 lac./month Appr.
If target achieved agency will get commission of 0.5% on sales of recharge.
profit /month may increased upto 8500p.m.
Sigma Level (FOR SIM):
In this sigma level have been calculated and shown in table 4.

4.2.2sigma level table for SIM:

Table.4 sigma level table for SIM

Sr. No.	Month	Target	Sales of SIM	DPMO (in ppm)	Sigma level
1	May	600	390	350000	1.9
2	June	600	310	500000	1.5
3	July	600	330	450000	1.6
4	Aug	600	320	466666	1.6
5	Sep	600	300	500000	1.5
6	Oct	600	340	433333	1.7
7	Nov	600	310	500000	1.5

4.2.3Sigma Level (FOR RECHARGE):

In this sigma level have been calculated in monthly and shown in table 4.

Table.5 sigma level table for Recharges

Sr. No.	Month	Target(in lac.)	Salesof recharge(Lac)	DPMO (in ppm)	Sigma level
1	May	17	16	4142	4.1
2	June	17	16.30	2900	4.3
3	July	17	15.50	6214	4
4	Aug	17	15.70	5385	4
5	Sep	17	15.60	5800	4
6	Oct	17	15.80	4971	4.1
7	Nov	17	15.70	5385	4

4.3Analyze:

In this phase various tool like voice of customer, pareto chart, cause and effect diagram have used to find out the causes.

4.3.1Voice of Customer:

We have conducted survey to the retailer and customers to find out what customer require as most important to take care of and the response was as under:

- Ranking has been done as per customer's priority:
- Poor network
- high speed internet
- Recharge should be available
- Complaints should solve quickly at dealer
- Fast sim activation within one day
- Good schemes on sim and recharge

4.3.2Pareto chart:

Pareto chart On the Basis of Brainstorming of 100 Customer Who has Change Ser. Provider Using MNP facility. Pareto chart used to find the causes which have more impact on problem shown in fig.5

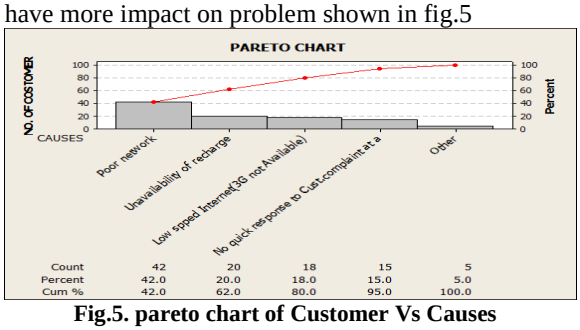

Fig.5. pareto chart of Customer Vs Causes

4.3.3Cause and effect diagram:

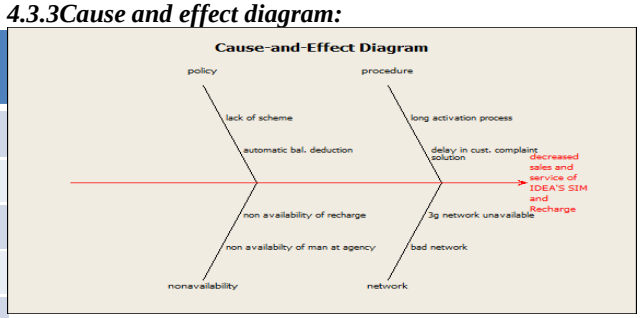

Fig.6 cause and effect diagram

4.3.4 Failure mode and effect analysis (FMEA):

Table.6 FMEA analysis

POTENTIAL FAILURE MODE	POTENTIAL EFFECTS	SEV	POTENTIAL CAUSES
DECREASED SALES AND SERVICE OF IDEA'S SIM AND RECHARGE	DISSATISFIED CUSTOMER	10	POOR NETWORK 3 G NETWORK NOT AVAILABLE UNAVAILABILITY OF RECHARGE UNABLE TO SOLVE CUSTOMER COMPLAINTS AUTOMATIC BALANCE DEDUCTION LONG ACTIVATION PROCESS
	BRAND REPUTATION AFFECTED	8	POOR COMMUNICATION WITH CUSTOMER DECREASE SALES
	GROWTH OF OTHERS BRAND	8	POOR SERVICE FROM IDEA

4.3.5Result of analysis:

On the basis of cause and effect diagram, FMEA, Pareto chart and VOC. Root causes are identified and recommendation are given which is implemented at experimental level.

4.4Improve:

In the pilot Implementation it was decided by the agency to implement the recommendation on Experiment level for 1 month. Dec.12.

Result of pilot implementation:

- sale of SIM in Dec.– 570
- sales of recharge- 16.70 lac.

4.5Control:

It was found in pilot study that the sales of SIM and recharge both increases, therefore it was decided by the agency to continued work with the given recommendation.

4.5.1Result:

After full implementation result are achieved so far i.e.- sales of sim in jan13- 598 sales of recharge- 16.99 lac. Sigma level have been compared before and after DMAIC which shown in table 5.8. In the table it clearly shows that the sigma level of both SIM and recharges of last two month have improved.

Table.9 comparison of Sigma level

Sr, No	Month	Sales of SIM	Sigma Level	Sales of Recharge	Sigma Level
1	May12	390	1.9	16	4.1
2	June12	310	1.5	16.30	4.3
3	July12	330	1.6	15.50	4
4	Aug12	320	1.6	15.70	4
5	Sep12	300	1.5	15.60	4
6	Oct12	340	1.7	15.80	4.1
7	Nov12	310	1.5	15.70	4
8	DEC 12	570	3.2	16.70	4.6
9	JAN 13	598	4.2	16.99	5.5

CONCLUSION

In this we have successfully implemented DMAIC methodology in service sector and improved sigma level. This article attempts to summarize the literature on six sigma application in services. It shows that there is a limitation in the spread of six sigma in services.

FUTURE SCOPE

The sigma level achieved after implementation of DMAIC six sigma methodology can further improved & new performance standards can be realized. Six sigma methodologies expect that the new learning will be validated & evaluated with practice. \

REFERENCES

[1] Desai, Tushar & Shrivastava, Dr. R. L. (2012) 'An effective application of six sigma design of experiment in process industry', Industrial Engineering Journal,Vol.2,

[2] Desai, Tushar & Shrivastava, Dr. R. L. (2010) 'The Origin, History and Definition of Six Sigma: A Literature Review', VNSGU journal of management and Administration, ed. 2. Vol.2.

[3] Desai, Tushar & Shrivastava, Dr. R. L. (2008) ' Six Sigma A New Direction to quality and Productivity Management' , World Conference On Engineering And Computer Science, San Francisco, USA.

[4] Antony, Jiju (2004) 'Six Sigma In The UK Service Organizations: Result From Pilot Survey', Managerial Auditing Journal. ed.8.Vol.19, Emerald Group Publishing Ltd.

[5] Rhodes Jo, Lok Peter, Abe Diamond And Nitin. 'The Six Sigma Approach in Performance Management To Reduce Injury Rate At Work', Institute Of Transport And Logistic.

[6] Zhan Qun , Muhammad Irfan And Aamir Muhammad.(2012) 'Six sigma: a Literature Review', Interdisciplinary Journal of Contemporary Research in Business, ed.10, Vol.3,

[7] Desai, Tushar & Shrivastava, Dr. R. L. (2012) 'An effective application of six sigma design of experiment in process industry', Industrial Engineering Journal,Vol.2,

[8] Desai, Tushar & Shrivastava, Dr. R. L. (2010) 'The Origin, History and Definition of Six Sigma: A Literature Review', VNSGU journal of management and Administration, ed. 2. Vol.2.

[9] Desai, Tushar & Shrivastava, Dr. R. L. (2008) ' Six Sigma A New Direction to quality and Productivity Management' , World Conference On Engineering And Computer Science, San Francisco, USA.

[10] Antony, Jiju (2004) 'Six Sigma In The UK Service Organizations: Result From Pilot Survey', Managerial Auditing Journal. ed.8.Vol.19, Emerald Group Publishing Ltd.

[11] Rhodes Jo, Lok Peter, Abe Diamond And Nitin. 'The Six Sigma Approach in Performance Management To Reduce Injury Rate At Work', Institute Of Transport And Logistic.

[12] Zhan Qun , Muhammad Irfan And Aamir Muhammad.(2012) 'Six sigma: a Literature Review', Interdisciplinary Journal of Contemporary Research in Business, ed.10, Vol.3,