



EFFECT OF 3-SIGMA AND SIX SIGMA IN BANKING SECTOR : A CASE STUDY

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Abstract : Six Sigma is a powerful business strategy, which has been used in service sector for quality improvement. This gives a well structured continuous improvement process to rule out or to eliminate error or variation by using the statistical tools and techniques. In this case study to determine the process standard deviation fix (TL) and process Capability (Cp) apply the value of 6_{σ} in the control limits to get control limit based on Six Sigma for X-bar and R chart. l_{σ} Value can be obtained using $p(z \leq z_{\alpha_1}) = 1 - \alpha_1$, $\alpha_1 = 3.4 \times 10^{-6}$ and Z is standard normal variate. For specified TL and Cp the value of 6_{σ} is calculated

from $C_p = \frac{T_L}{6\sigma}$ for values for TL and Cp, which expresses the effect of 3-sigma & Six sigma.

Key words : 3-sigma, Six Sigma and Process methods, Six Sigma Control Chart, Statistical quality control

1. Introduction

Over past two decades have been observed that Six Sigma has been incorporated in industrial organization to enhance the competitiveness. In 1980's there are many successful evidence of Motorola, GE and Allied Signal, which are related to manufacturing sector to get the expected benefits in the financial sector. But service sectors are lacking behind in applying and realizing the benefits of Six Sigma. Different types of guideline can be applied to various types of services. According to Dhakshayani Kumar (2014) the main objective of this research is to help to widen the scope of Six Sigma in service sector particularly in banking sector. The main approach of Six Sigma is to improve the capability of business process and reducing or eliminating the process variation by using some statistical tools and technique. To meet the customer expectation Citibank is the first bank in the banking sector which has implemented Six Sigma. Some of the Indian Private banks ICICI, HDFC, New York life are using Six Sigma and some Nationalized Indian banks are using partially. Through empirical case study, 3-sigma and Six Sigma comparison can make the point clear whether to implement or not.

2. Review of Literature

In every field, it is necessary to make efforts for continuous improvement and enhancing the performance of the process to meet the customer satisfaction. The quality management technique in flow for many years including Statistical Quality control, zero defects [Sharma and Chowhan (2013)]. While, Six Sigma is one of the recent quality improvement process to gain popularity and acceptance in Industries and many other sectors, out of which one is service sector. It is a technique to reduce waste due to the process inefficiency in different sectors quality improvement in product and service quality. The word sigma is the Greek letter, which shows standard deviation. It also describes dispersion of the sample data from the position of mean [Sharma *et al.* (2013)]. It is used to describe variability, where a classical measurement unit consideration of the program is defect per unit. A Sigma quality offers an indicator of how often defects are likeli to occur, where a higher Sigma quality indicates a reduction in the defects. As in Six Sigma, quality level is said to equal to 3 or 4 defects per million opportunities. In mid 1980s, a company Motorola, which has created

statistical based methodology name Six Sigma to improve the process performance. Recent Six Sigma propagated the use of this business strategy in many banking sector of USA, China and some of the banks from India. But, in India only HDFC, ICICI, Kotak Mahendra are some of the private sector banks, which are engaged in Six Sigma implementation. However, public sector banks like SBI and Central Bank of India are using partially. The main theme of this method is to implement to meet the customer satisfaction level and do get desired level of benefits in financial sector. The two key methodologies used in Six Sigma are DMAIC (Define, Measure, Analyze, Improve, Control and DMADV) Define, Measure Analyze, Design and Verify. DMAIC is used to enhance the existing process DMADV is employed to create the new product design [Radhakrishnan and Balamurugan (2011)]. This article uses the quality control technique and lean Six Sigma to improve the banking process to meet the customer satisfaction level. Algorithm controlled machine (ACM) consists of interacting trade selection algorithms. To measure and improve the performance of ACM, TQM and Lean Six Sigma is implemented. By using control chart technique the effectiveness of this trading machine is measured. X-Bar and R-chart show the process is out of control. Finally, employing lean sigma in banking industries is beneficial as Statistical process control SPC in trading machine. So, it is very essential to improve the existing process in competitive world. After implementing lean Six Sigma the following improvement is made. [Jawaher *et al.* (2012)]. Radhakrishnan and Balamurugan (2011) had developed the limits for Six Sigma control chart for range. And comparison has been made with 3-sigma limits and observed that process is not in control for Six Sigma. As the process is centered with reducing variation most of the points fall outside the 6-sigma limits which indicate the process is not in the expected level. Hence, correction in the process is required to reduce the variation. The constant $E_{6\sigma}$ is introduced in the paper to determine the control limit for range chart on Six Sigma initiatives.

Objective of Case Study

- Objective of the case study is “Banking sector should provide a good quality of service”. It is used to identify the customer satisfaction level in various banking sector.
- It gives the measurable outcome of the process at 3-sigma & Six sigma level.

- It provides the true effects of control charts.
- This case study will help researcher to promote the management to implement in the service sector.

3. Methodology and Data Collection

In this case study questionnaire is distributed personally among 280 customers of various nationalize banking sector from Amravati, Akola, and Khamgaon (Buldhana). Out of which 250 are collected. 10 questionnaires are distributed to each 7 banks from Amravati division. In all 250 questionnaires are collected from three places. The sample size becomes 210. According to survey that is customer satisfaction about banking service is considered. It is studied if customer is satisfied by banking service or not. Only not satisfied response is considered, which represent 75% of respondent. It means out of 250 respondents, 187 respondent are not satisfied with the process. From this division 10 questionnaires are collected from each of 7 banks namely SBI, BOM, CEN, BOI, BOB, PNB, UCO corresponding response rate . But we have considered 210 sample size out of which 126 respondents are not satisfied. After classification and tabulation of of the questionnaire the data can be represented by control chart technique by using Minitab 17 software.

Control Limits of Six Sigma Control Chart

X- Bar Chart & R-Chart

$$CL = \bar{\bar{x}} \text{ and } CL = \bar{R}$$

$$UCL = \bar{\bar{x}} + 1.66\sigma_{6\sigma} \text{ and } UCL = \bar{R} + E_{6\sigma} 6_{6\sigma}$$

$$LCL = \bar{\bar{x}} - 1.66\sigma_{6\sigma} \text{ and } LCL = \bar{R} - E_{6\sigma} 6_{6\sigma}$$

$$\sigma_{6\sigma} \text{ can be calculated as } Cp = 2.5$$

To determine the process standard deviation fix (TL) and process Capability (Cp) apply the value of $6_{6\sigma}$ in the control limits to get control limit based on Six Sigma for X-bar and R chart. $l_{6\sigma}$ Value can be obtained using $p(z \leq z_{6\sigma}) = 1 - \alpha_1$, $\alpha_1 = 3.4 \times 10^{-6}$ and Z is standard normal variate. For specified TL and Cp the value of $6_{6\sigma}$ is calculated from $C_p = \frac{TL}{6\sigma}$ for values for TL and Cp.

From Chart 1 (X-bar and R-chart) all the sample points fall under the control limits. It means that the

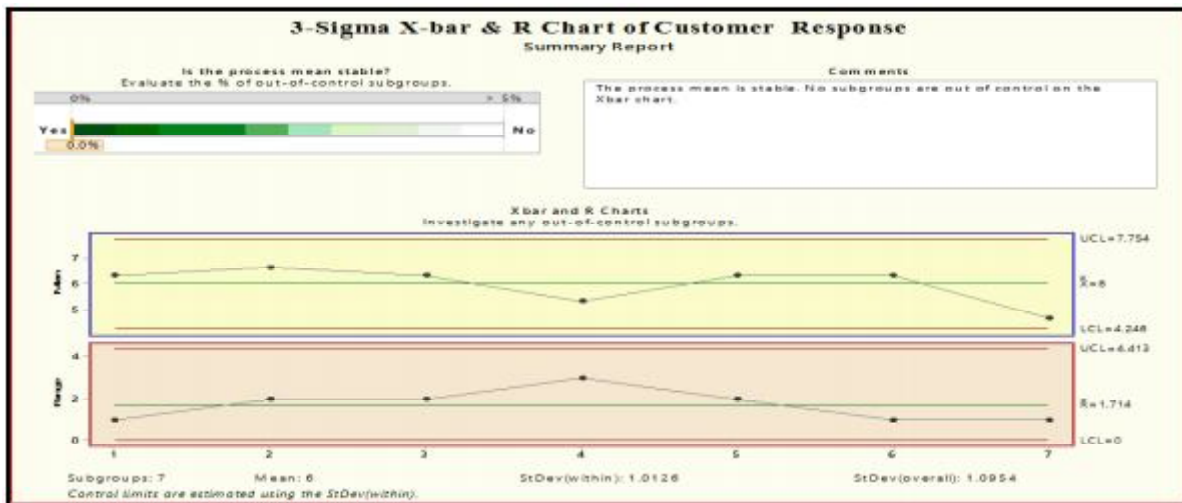


Chart 1 : Summary Report of 3-Sigma X-bar and R- Chart.

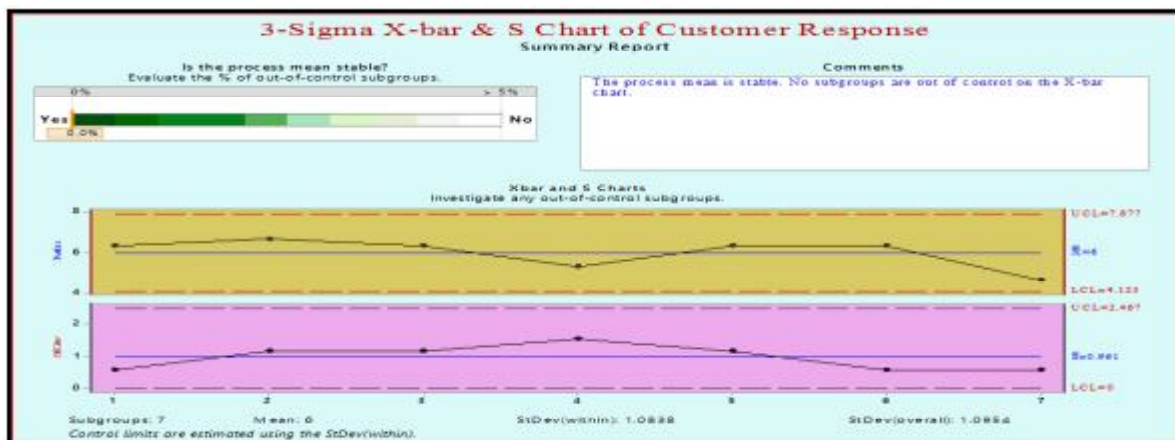


Chart 2 : Summary Report of X-bar and S-Chart

process is under control from the point of consumers risk. In X-bar chart mean is 6 that is called as central line, Upper control limit is 7.75 and Lower control limit is 4.24. It indicates that most of the sample points are dispersed, which are away from central line whereas sample point 7 is closed to LCL. It indicates the poor quality of service. Whereas in R-chart, \bar{R} is 1.71 which is Central line of the control chart, Upper control limit is 4.413, which is the upper line of the control chart, and Lower control limit is 0, which represents lower line of the control chart. It also shows that the non satisfied data is dispersed, it shows that satisfaction level of the customer does not meet though control chart which is under control. So, there is variation in the banking process which does not provide good quality of service to meet the customer requirement. Since, process is stable as all the sample point falls within the control limits. Since standard deviation is better measure of dispersion, than range it is better to have control chart of mean along with the control chart of standard

deviation that is S-chart or sigma chart.

According to consumer risk point of view (Chart 2) sample points are in the specification limit. Here, central line of S chart is 0.961, upper control limit is 2.467 and lower control limit is 0. Hence, from sample data, it observed that the process is under control, it does not mean that there is no variation in the process. Here, as sample point does not exhibit the particular pattern point 1 and point 7 which provide the same quality of service and rest of the Banks exhibits the different patterns. We can say that there is variation in the quality service and that should be enhanced to meet the customer expectation.

So, it is very essential to improve the process and reduce the cycle time of the various service process to meet the customer specification limit.

From Six Sigma X- bar Control chart (Chart 3), it is observed that CL = 5.353, UCL = 6.644, LCL = 5.355, it indicates that the process is out of control and the

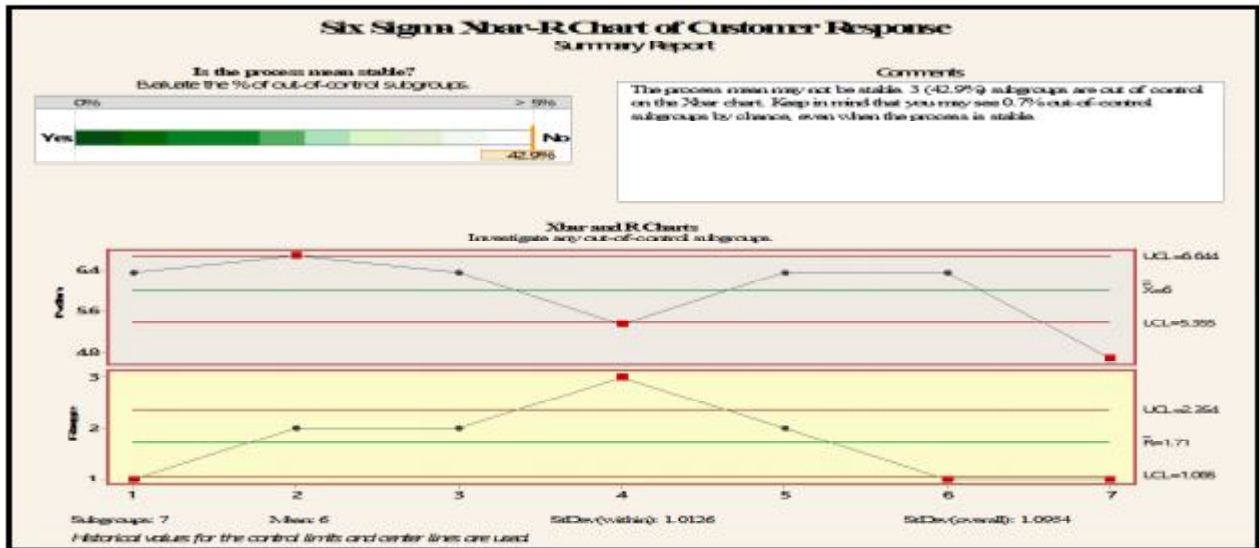


Chart 3 : Summary Report of Six Sigma X-bar and R- Chart.

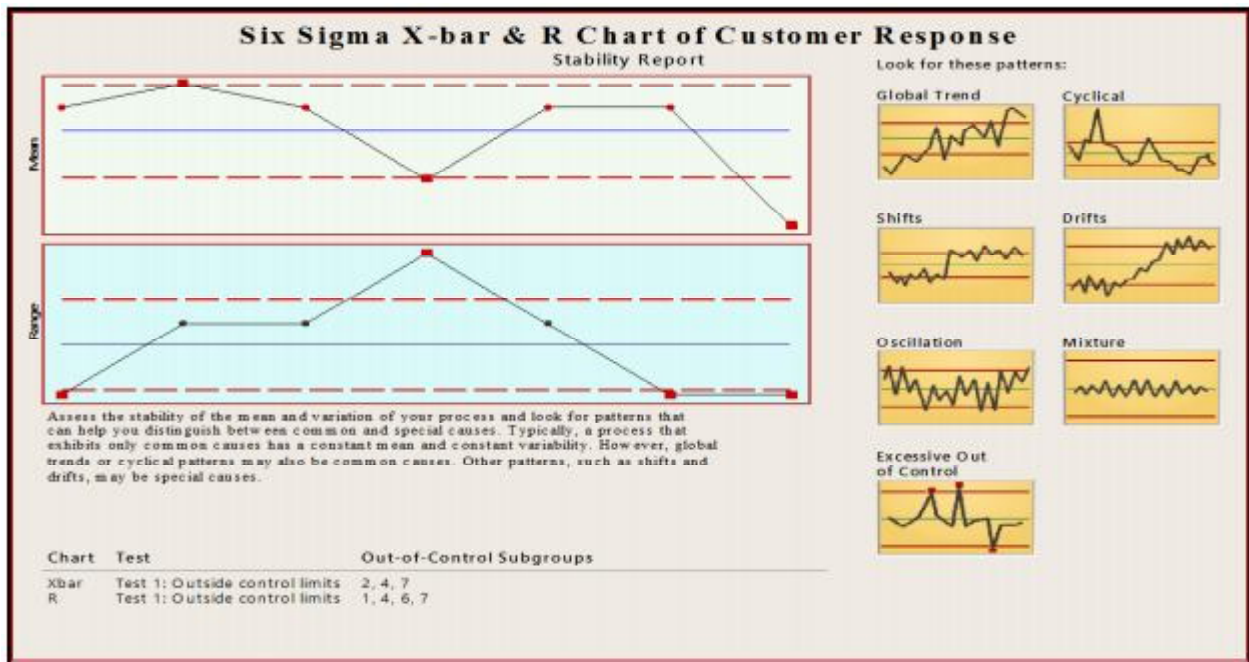


Chart 4 : Stability report of Six Sigma X-bar and R-chart.

sample points are 2, 4, 7 that lay outside the control limits.

For R-chart, it is observed that CL = 1.71, UCL = 2.354, LCL = 1.065. It indicates that the sample points 1, 4, 6, 7 are found outside the control limits. It means that there is variation in the service quality of banking sector. Consequently, the customers are not satisfied by the existing service quality. Thus, it is very essential to improve the quality service of banking sector by implementing Six Sigma to meet the deserved level. According to Chart 4 an excessive number of point falls outside the control limits. It indicates that there is

an underlying problem such as global, cyclical and many more patterns exist in the data.

But the same data is applied to Six Sigma control chart. Then, it is also observed that some sample points of X-bar and R-chart falls outside the control limits. Six Sigma X-bar control limit is, UCL = 6.644, LCL = 5.355, CL = 6 and Six Sigma R- control chart limit is UCL= 2.354 LCL= 1.065 and CL= 6. As some sample points fall outside the limit, the process is out of control. It means that some variation is found out to be bound in the service quality. As data is related to not satisfy customers response related to banking service,

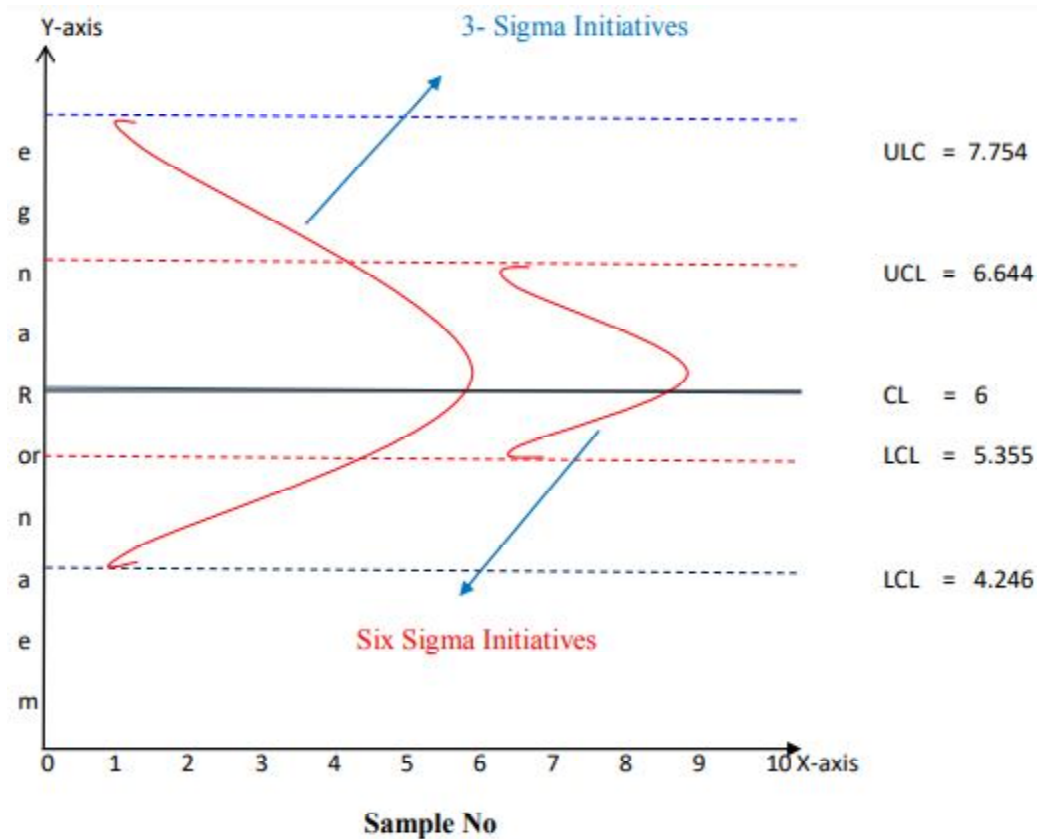


Chart 5 : Effect of 3-sigma and Six Sigma Control chart in banking sector
3- Sigma X-bar and Six Sigma X-bar control Limits.

it clearly indicates that the service, which is provided by the banks does not meet the customers expectation. So, to overcome this difficulty the existing process needs to be improved. Some common causes of variation are present in the process as well as special causes of variation are also identified by different types of trends. So by using Six Sigma method such types of variation is removed. In addition, the process is improved to meet customer expectation level.

Suggestion

- Provide good quality of additional training of new concept and their implementation
- Create team work and improve process of design and providing service.
- To improve the process by giving them training for quality method and tools which would help them to solve the problem easily?
- Employee should be guided by foreign expert in the related field.
- Provide time and other resources for achieving quality goal.
- Management should support to implement new

concept in the organization.

For real measurement of a process, analysis and improvement, banks will have to change existing informational system with a new one based on new process model. From consumer risk point of new, the bank which does not give you proper and qualitative service should not be selected. The major strength of Six Sigma is a Planned framework. So it is suggested to all service sectors to implement the Six Sigma Methodology for upgrading of the banks and real satisfaction of the customer in the vast technologically growing modern age.

It is very clear that from Chart 5, 3 sigma control limit of X-bar is $UCL = 7.75$ and $LCL = 4.24$ and to Six Sigma control limit is $UCL = 6.64$ and $LCL = 5.35$. In Six Sigma control chart when the process is centered with reducing variation too many points fall outside the control limits, it means that variation is to be bound in the existing service process as it does not satisfy the customer expectation at their level. Variation may be in any phase or it may be due to internal service process or it may be due to some lack of understanding between employee and Employer. Good co-ordination should be

in between employee, employer and management. In this research, it is observed that employees are unknown about the Six Sigma method. As it is the service quality process, it does not affect as good as industrial level but definitely it improves the service process and reduce the variation. So a correction in the process is necessary to reduce the variation through implementing the application of Six Sigma process.

4. Conclusion

This is the empirical study on Six Sigma application to housing loan in banking processes. None of the nationalized banks have implemented Six Sigma application. It is found that SBI is using partially. So, a little work has been done in applying Six Sigma in banking sector. In this strategy it is identified that a number of CTQ's and KPI's, which are beneficial to service sector. This shows that it is entirely possible to tailor a range of Six Sigma tools to various services. From the control charts, it is observed that most of the sample points are dispersed from central line that shows the deviation in the process. Comparison of 3-sigma and Six Sigma control charts shows that upper limits and lower limits of X-bar and R-chart should be reduced

to improve the quality process up to the expectation of the customers. So, to overcome this difficulty, it is necessary to improve the existing service process of banking sectors. Thus, it is quite clear that is very essential to implement Six Sigma in service sectors.

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