SIX SIGMA METHODOLOGIES IN BANKING INDUSTRY FOR QUALITY IMPROVEMENT

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Abstract: Design for Six Sigma: Designing to meet customer needs and process capability" Six Sigma at many organizations simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving toward six standard deviations between the mean and the nearest specification limit) in any process – from manufacturing to transactional and from product to service. However, with the development of new concepts and methodologies, Six Sigma is now being used in the service sector as well. It helps to improve the quality of the services rendered. The Six Sigma methodology used in the banking industry is referred to as the DMAIC process. It denotes: define, measure, analyze, improve and control.

Keywords: Six sigma, data driven approach,

Findings & objectives:  
To identify the factors influence that methods, tools and techniques of six sigma strategy have greater impact quality improvements performance.  
To determine the most important factor that quality improvement.  
To Increase Customer Satisfaction.  
To analyze performance and avoid banking errors.  
To Increase Customer Satisfaction & Profitability.  
To determine the customer service satisfaction and retention.

Introduction:  
Financial institutions in present competitive environment need to be innovative as well as build quality products and services. Six Sigma was developed in the 1980's to reduce defects that were quite common in the manufacturing industry. However, with the development of new concepts and methodologies, Six Sigma is now being used in the service sector as well. It helps to improve the quality of the services rendered. Six Sigma, It is a rigorous and disciplined methodology that uses data and statistical analysis to measure and improve a company's operational performance by identifying and eliminating "defects." Six Sigma proves to be perfectly suited to the needs of the service industry, which is in constant contact with customers and has customer delight as its top priority. In the ‘define’ phase of DMAIC, Six Sigma professionals define the objectives and boundaries of a particular business process, in consultation with the employees and senior management. In most banks, customer satisfaction is the main objective, making it necessary to define all the processes that involve customer interactions and directly affect customer satisfaction. Some of the processes that involve customer interaction include address change request processing, new account openings, teller window transactions. Many studies have discussed the meanings, concepts and value of Six Sigma in today’s competitive business
environment (Brady & Allen, 2006; Folaron, 2003; Nonthaleerak & Hendry, 2006). Six Sigma applications involve more customer focused approach. As (Goh, 2002) identified that in comparison with other quality assurance strategies like of ISO or QS, Six Sigma is a lot more receptive to client satisfaction.

**Six Sigma Developments in Banking Sector:**

Citibank was the first in banking industry who implemented Six Sigma strategy to meet customers’ requirements and attain client’s satisfaction and reliability (Rochelle, 2000). Bank of America is also one of the leading adopter of Six Sigma and has experienced significant impact on bank’s performance and reducing defect rates (Daniel and James, 2005; Roberts, 2004). Among Indian companies, Benchmark Six Sigma has had participation from good number of financial sector participants in 2010, ICICI Bank, ABN AMRO, IDBI, Cholamandalam Financial Services, MetlifeMax, New York Life, HDFC Bank. Now Indian banks sector using six sigma methodologies.

**Literature review:**

The banking sector has found the benefits to be reduced cycle times, better cash management, reductions in complaints due to defects and overall customer satisfaction from improved performance. The Six Sigma methodology used in the banking industry is referred to as the DMAIC process. It denotes: define, measure, analyze, improve and control.

**Applicable DMAIC Methodology for Banking** is as per below:

**Define:**
Customer satisfaction & loyalty are the deciding factor to bank employee’s efforts to achieve higher profits. Six Sigma projects involve defining objectives and opportunities in consultation with bank employees, as well as senior management. There may be an opportunity to improve, based on customers’ feedback, complaints or escalation received at management level.

**Measure:**

In the ‘measure’ phase of DMAIC, Six Sigma professionals deploy quantitative procedures to collect statistical data in consultation with the business managers and top management. The statistical data is then used for measuring the impact of the various business processes on customer satisfaction. Different processes have different impact on customer satisfaction. It is financially not viable to improve every business process. The measurement of impact of the individual processes helps the banks to concentrate on improving the processes that have the maximum impact on customer satisfaction. In the banking industry, wait times are said to have the maximum impact on customer satisfaction. Banks can employ observers at their different branches to measure the average wait time, under different work conditions.

**Analyze:**

In the ‘analyze’ phase of DMAIC, Six Sigma professionals analyze the collected data according to predefined parameters to identify the processes that can be improved at minimum costs. The analysis covers every aspect of a business process that directly affects customer satisfaction. For example, a check cashing transaction involves the customer coming to the teller window, the teller receiving the customer’s request and the teller seeking a manager’s approval for processing the request. These three
different, single transactions need to be analyzed individually to ascertain which one has the maximum impact on the overall transaction time. Steps that are time-consuming and need reconsideration or rearrangement are identified and sent for approval.

**Improve:**

In the ‘improve’ phase of DMAIC, Six Sigma professionals apply corrective measures to improve processes that cause problems in consultation with the bank staff and the branch manager. All improvement measures are based on facts and statistics. Advanced simulation tools can also be employed to study the impact of the proposed improvement initiative on business processes. These measures are taken based on the data collected according to the guidelines from top management. Before the changes are finally made, tests are undertaken to ensure that any changes do not affect customers adversely for any reason. A pilot project may be run for testing of results.

**Control**

In the control phase of DMAIC, control systems are put in place to monitor the impact of the improvement initiatives. If a business process is still not performing in accordance to the desired Six Sigma levels, the process is referred back to the ‘define’ phase. However, if a small problem is affecting the performance, then corrective measures are taken and the whole process is not referred back.

To ensure processes do not have drawbacks leading to errors, some measures, such as mistake proofing of the process can be taken, using electronic applications. This ensures that the data’s entered or provided are correct in the first place. If awareness is created among customers about the provision of correct data, then every time they approach the bank, it makes it simpler to provide faster service.

**Research methodology:**

Like its predecessors, Six Sigma doctrines assert that:

Continuous efforts to achieve stable and predictable process results (i.e., reduce process variation) are of vital importance to Quality management services success. Banking and Services processes have characteristics that can be measured, analyzed, improved and controlled. Achieving sustained quality improvement requires commitment from the entire organization, particularly from top-level management.

**Features that set Six Sigma apart from previous quality improvement initiatives include:**

A clear focus on achieving measurable and quantifiable financial returns from any Six Sigma project. An increased emphasis on strong and passionate management leadership and support. A special infrastructure of "Champions", "Master Black Belts", "Black Belts", "Green Belts", etc. to lead and implement the Six Sigma approach. A clear commitment to making decisions on the basis of verifiable data and statistical methods, rather than assumptions and guesswork.

The term "Six Sigma" comes from a field of statistics known as process capability studies. Originally, it referred to the ability of manufacturing processes to produce a very high proportion of output within specification. Processes that operate with "six sigma quality" over the short term are assumed to produce long-term defect levels below 3.4 defects per million opportunities (DPMO). Six Sigma's
Implicit goal is to improve all processes to that level of quality or better.

**Methods**

Six Sigma projects follow two project methodologies inspired by Deming's Plan-Do-Check-Act Cycle. These methodologies, composed of five phases each, bear the acronyms DMAIC and DMADV. DMAIC is used for projects aimed at improving an existing business process. DMAIC is pronounced as "duh-may-ick" (<ˌdʌˈmeɪkk>). DMADV is used for projects aimed at creating new product or process designs. DMADV is pronounced as "duh-mad-vee" (<ˌdʌˈmæd vi>).

The DMAIC project methodology has five phases:

**Define** the problem, the voice of the customer, and the project goals, specifically. Identify the main steps in the process that is to be improved, particularly where it starts and ends, the customer and suppliers. Investigate the needs and expectations of the customers and other stakeholder and translate them into specific measures.

**Measure** key aspects of the current process and collect relevant data.

**Analyze** the data to investigate and verify cause-and-effect relationships. Determine what the relationships are, and attempt to ensure that all factors have been considered. Seek out root cause of the defect under investigation.

**Improve** or optimize the current process based upon data analysis using techniques such as design of experiments, poka yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to establish process capability. Use the understanding of the factors identified in the analyze stage to come up with possible improvements and solution.

**Control** the future state process to ensure that any deviations from target are corrected before they result in defects. Implement control systems such as statistical process control, production boards, visual workplaces, and continuously monitor the process. Put in place monitoring and control systems to lock in the improvements and make sure that the process performance will not slip back. Hand the process back to process owner.

**DMADV OR DFSS**

The DMADV project methodology, known as DFSS ("Design for Six Sigma"), features five phases:

**Define** design goals that are consistent with customer demands and the enterprise strategy.

**Measure** and identify CTQs (characteristics that are Critical To Quality), product capabilities, production process capability, and risks.

**Analyze** to develop and design alternatives, create a high-level design and evaluate design capability to select the best design.

**Design** details, optimize the design, and plan for design verification. This phase may require simulations.

**Verify** the design, set up pilot runs, implement the production process and hand it over to the process owner(s).

Six sigma revolves around a few key concepts:

**Critical to Quality**: Attributes most important to the customer

**Defect**: Failing to deliver what the customer wants

**Process Capability**: What your process can deliver

**Variation**: What the customer sees and feels
Stable Operations: Ensuring consistent, predictable processes to improve what the customer sees and feels

Design for Six Sigma: Designing to meet customer needs and process capability...

Six Sigma Dmaic and Dmaict Process Elements
D - Define opportunity
M - Measure performance
A - Analyse opportunity
I - Improve performance
C - Control performance, and optionally:
T - Transfer best practice (to spread the learning to other areas of the organization)

Implementation Roles
One key innovation of Six Sigma involves the "professionalizing" of quality management functions. Prior to Six Sigma, quality management in practice was largely relegated to the production floor and to statisticians in a separate quality department. Formal Six Sigma programs adopt a ranking terminology to define a hierarchy that cuts across all business functions.

Six Sigma identifies several key roles for its successful implementation:

Executive Leadership includes the CEO and other members of top management. They are responsible for setting up a vision for Six Sigma implementation. They also empower the other role holders with the freedom and resources to explore new ideas for breakthrough improvements.

Champions take responsibility for Six Sigma implementation across the organization in an integrated manner. The Executive Leadership draws them from upper management. Champions also act as mentors to Black Belts.

Master Black Belts, identified by champions, act as in-house coaches on Six Sigma. They devote 100% of their time to Six Sigma. They assist champions and guide Black Belts and Green Belts. Apart from statistical tasks, they spend their time on ensuring consistent application of Six Sigma across various functions and departments.

Black Belts operate under Master Black Belts to apply Six Sigma methodology to specific projects. They devote 100% of their time to Six Sigma. They primarily focus on Six Sigma project execution, whereas Champions and Master Black Belts focus on identifying projects/functions for Six Sigma.

Green Belts are the employees who take up Six Sigma implementation along with their other job responsibilities, operating under the guidance of Black Belts.

Some organizations use additional belt colours, such as Yellow Belts, for employees that have basic training in Six Sigma tools and generally participate in projects and 'white belts' for those locally trained in the concepts but do not participate in the project team.

Normal distribution Six Sigma model. The Greek letter σ (sigma) marks the distance on the horizontal axis between the mean, µ, and the curve's inflection point. For the green curve shown above, µ = 0 and σ = 1. The upper and lower specification limits (USL and LSL, respectively) are at a distance of 6σ from the mean. Because of the properties of the normal distribution, values lying that far away from the mean are extremely unlikely. Even if the mean were to move right or left by 1.5σ at some point in the future (1.5 sigma shift, coloured red and blue), there is still a good safety cushion. This is why Six Sigma aims to have processes where the mean is at least 6σ away from the nearest specification limit.
Problem Solving Methodology - Flow Chart:

Start

- Develop New Product or Service?
  - Yes
  - No

- Current Product or Service to Improve?
  - Yes
  - No

- Is Innovation or an Invention Required?
  - Yes
  - No

- Are System Interactions a Concern?
  - Yes
  - No

- Difficult to Select Optimal Design Concept?
  - Yes
  - No

**Innovation Breakthrough**

- Characterization: Technical Contradictions, No Known Solution, Changing Need
- Methodology: TRIZ, IDEO

**Design Architecture**

- Characterization: Coupled Design, Design Complexity, Unintended Consequences
- Methodology: Axiomatic Design

**Decision Analysis**

- Characterization: Technical Tradeoffs, Conflicting Requirements, Many Alternatives
- Methodology: High Concept Selection, Analytical Hierarchy Process, Kepner Tregoe

**Design for Six Sigma**

- Characterization: Designing a New Product or Process
- Methodology: DFSS

No

- Customer Interested in Time Reduction?
  - Yes

- Customer Concerned About Defects?
  - Yes

**Lean Project**

- Characterization: Waste, Non-value Added Steps
- Methodology: Lean Six Sigma

No

- Is the Scope Narrow and are the Solutions Simple?
  - Yes

- Is the Solution Known?
  - Yes

**Rapid Improvement Event**

- Characterization: Known Root Cause, Simple Solution
- Methodology: Kaizen, Quick Value

No

**Implement**

- Characterization: Known Root Cause, Known Solution
- Methodology: DMAIC

No

- Do You Have Data to Support?
  - Yes

**Basic Quality Tools**

- Characterization: Understand Product or Process
- Methodology: Brainstorming, FMEA, C&E Diagram, etc.
## SIX SIGMA VALUES AND DIAGRAM

<table>
<thead>
<tr>
<th>Sigma level</th>
<th>DPMO</th>
<th>Percent defective</th>
<th>Percentage yield</th>
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<tbody>
<tr>
<td>1</td>
<td>691,462</td>
<td>69%</td>
<td>31%</td>
</tr>
<tr>
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<td>308,538</td>
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<td>3</td>
<td>66,807</td>
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<td>6,210</td>
<td>0.62%</td>
<td>99.38%</td>
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<tr>
<td>5</td>
<td>233</td>
<td>0.023%</td>
<td>99.977%</td>
</tr>
<tr>
<td>6</td>
<td>3.4</td>
<td>0.00034%</td>
<td>99.99966%</td>
</tr>
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![Six Sigma Diagram](image.png)
The “six sigma” approach uses the “Sigma Value” to measure the number of DPMO (Defects per million Opportunities). The Calculation assumes the process mean is 1.5 standard deviations from the target.

**Results & outcomes:**
Six Sigma methodologies have been successfully implemented by banks in the last few decades to improve service delivery and customer satisfaction. While handling financial matters, it becomes essential to be 100% accurate. Leaving a small room for error can be financially devastating. This is certainly true in case of banks and financial institutions. Unlike manufacturing companies, banks cannot make their customers happy with returns and exchanges of products. A banking sector needs to be fully committed to offer complete customer satisfaction, and operate efficiently to ensure 100% perfect results. This is where lean 6 sigma (lean six sigma) can add value. Following are top 5 applications of lean six sigma for banks to get better results.

**Increase Customer Satisfaction:**
Due to the existence of several banks, customers have various options to choose banking facilities. By using lean 6 sigma applications, a bank can enhance customer satisfaction, reduce waiting time for services and provide better and faster services. Lean performance assures that customer problems are addressed timely and possible solutions are sought to resolve their issues and grievances. Proper use of lean six sigma applications assists banks in providing superior services and products that result in higher customer satisfaction.

**Increase Profitability and Decrease Costs:**
Since the needs and requirements of customers vary greatly, it becomes essential to identify and measure the requirements of customers. By applying lean six sigma approach, banks are able to identify specific needs of each customer eliminating process inefficiencies, and errors and enhance customer satisfaction while offering quality services at the same time. Better services and facilities increase customer retention rate which pays in the long run in terms of increased profitability and reduced cost.

**Monitor performance:**
The data pertaining to performance of the bank is collected to track how processes within a bank are initiated. The customer waiting time, the services offered, the satisfaction level of customers are measured. The cost associated with customer services and facilities are measured to find out the amount spent on each customer. If the performance level dips down considerably, the root cause of the process problem is identified and solved with possible steps using lean sigma approach.

**Eliminate processing delays:** Whenever a bank faces any problem, they are improved and implemented. Problems such as delays in providing any facility such as loan or mortgages have a great impact on the level of customer satisfaction and rate of retention of customers. In order to avoid all these problems, banks employ lean 6 sigma applications to offer better customer services to enjoy better retention rate and increase inflow of regular customers, new as well as existing ones.

**Analyze performance and avoid banking errors:**
In order to ascertain that improvements are generating efficiencies at all levels within a bank, it becomes important to measure and conduct an assessment of the processes before and after implementation of key measures. In such a case, customer satisfaction level can
be measured before implementing lean sigma approach and after taking corrective measures. Besides this, lean performance is employed to eliminate mistakes in calculations, errors in order to provide efficient and up to date banking services to customers. Many banks have applied lean 6 sigma applications and have achieved big success. ICICI Bank HDFC Bank etc are some of the major banks that have attained huge success through lean six sigma applications.

**Quality Improvements of Banking Industry in India by using Six Sigma methods are listed below:**
- Improving customer feedback and response processes
- Reducing documentation errors & improving accuracy
- Improving the reconciliation processes.
- Reducing response delays.
- Reducing or eliminating invoicing errors
- Eliminating the possibility of erroneous data entry
- Reducing audit non conformities.
- Reducing turn around time (TAT) for various processes,
- Reduction of waiting & service time
- Reduce electronic financial transaction costs.
- Reducing complaints by (First Time Resolution) for complaints/ queries,
- Enhancing (internal or external) customer satisfaction
- Improved customer experience for Net Banking, Mobile Banking & Phone Banking
- Increased business in terms of new customers

**In the Asset side**
- Reducing the cycle time to Process a Loan Application (both Mortgage & Personal loans).
- Improving the Customer Information gathering processes.
- Improving the Credit Evaluation Process
- Improving Productivity of loan processing agents

**Account Opening**
- Reducing the time to open an account
- Reducing errors in account opening process.
- Reducing rework in processing customer applications

**Other Projects in Retail Banking**
- Reducing the Credit Card Delivery time.
- Reducing Bank Statements Processing & Delivery time.
- Reducing the errors in money transfer
- Improving accuracy, timeliness and completeness of customer communication.
- Developing new products (timeliness, business potential)
- Improving Market Share of existing banking products.
- Improving the Branch Banking Processes
- FD mobilization

**Suggestions:**
There are certain benefits which are a result of using Six Sigma strategy or methods in production and supply chain quality control. These benefits are mostly felt by the client, as well as the business itself.
These methods are not easy to apply. The companies and professionals that employ them need dedication and strictness.
The main concepts in Six Sigma include identifying defects and trying to eliminate them to less than 3.4 DPMO or defects per million opportunities. This method has many benefits despite its complexity, but before benefits can be achieved, the client has to dedicate and provide full support to the process. The process may involve retrenching some workers or hiring some more.
In order to achieve the set goals, a firm must be willing to hire professionals or train and certify their own employees as
Six Sigma Professionals. These methods involve professionals who are experienced, trained, certified, and highly qualified in the field. These individuals are given different titles, or certifications, according to the level of knowledge obtained and mastered through training. Some of these terms used are; Champion, Black Belt, Green Belt, Yellow Belt, Master Black Belt, and Sponsor among others.

Due to the highly organizational aspect of this process, the customer will be able to notice changes. Some of the changes are felt economically. The method tries to eliminate wastes in the production process. This makes maximum use of raw materials. When raw materials are fully utilized, the cost of production will definitely go down.

Another crucial thing that is fully observed is time. The method tries to eliminate time wastage in all chains and levels of a business. When products and services are delivered fast, there is a possibility to produce double the amount within the same time frame used previously. Again the client will feel the difference when more profit income is experienced.

Because this process is so deeply rooted in customer satisfaction, clients are often consulted during the DMAIC stages of Six Sigma Projects (Define, Measure, Analyze, Improve, and Control). They are able to give the company feedback according to what they really want and need from products or services and what they are willing to pay for them. It is then up to the company to deliver to that client a quality product or service at a competitive price.

**Conclusion**

The use of lean 6 sigma applications has proved to be a boon to many banks in offering top quality services to their customers in an efficient and enhanced manner. Banks that employ lean 6 sigma applications enjoy an edge over their competitors and mark a huge success even in highly competitive banking world. Banks that don’t apply lean sigma approach fail to make significant progress and lag behind in competition. The big advantages of the Six Sigma approach are:

- concentration on Customer satisfaction;
- massive Culture Change from believing in opinions to knowing reliable facts, based on applying Statistics in an easy and understandable way, resulting in good reporting structure, structured development methodology, enormous reduction of Cost of Poor Quality, Creation of a learning organization.

Concentration on Customer satisfaction, statistical thinking, reducing Cost of Poor Quality, Six Sigma are very powerful quality improvement tools, but they will only work if they are implemented appropriately. Certain factors will determine the outcome of Six Sigma efforts. Support and commitment of the executive management team for Six Sigma efforts Understanding what resources are available prior to the start of the project The amount of training received by the staff. Staff acceptance of Six Sigma concepts The size and scope of the projects Ability for management to communicate the importance of projects to staff Only when an entire organization is committed Six Sigma becomes an organization's philosophical approach to quality improvement.

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