# Six Sigma Step by Step Guide

## UNIT 1: INTRODUCTION TO SIX SIGMA

### CHAPTER 1 - WHAT IS SIX SIGMA?

#### Define -

- Six Sigma is a methodology for **process improvement** involving a vast library of tools & knowledge and a **statistical concept that seeks to define the variation** inherent in any process.
- It is a statistical representation for what many experts call a **"perfect process"**. Technically, in a Six Sigma process, there are only 3.4 defects per million opportunities i.e. **99.99966 %**.

#### Assumption -

- **Variation in a process leads to opportunities for error**; opportunities for error then lead to risks for product defects. Product defects-whether in a tangible process or a service-lead to poor customer satisfaction.
- At very **low levels of sigma, any process is unlikely to be profitable**. The **higher the sigma level, the better the bottom line** is likely to be.

#### Foundations -

- Based on **measurement and metrics**.
- **Historically, decisions were based on intuition or experience**. Six Sigma doesn't remove the need for experienced leadership, and intuition, instead, **works along and provides a mathematical and statistical foundation for decision making**.
- The Six Sigma method lets organisations **identify problems, validate assumptions, brainstorm solutions, and plan for implementation to avoid unintended consequences**. By applying tools such as statistical analysis and process mapping to problems and solutions, teams can visualise and predict outcomes with a high-level of accuracy, letting leadership make decisions with less financial risk.

#### Principles -

1. **Customer Focused Improvement -** We'll look at the Voice of the Customer (Voc) and ways for establishing what the customer really wants from a product or process. By combining that knowledge with measurements, statistics, and process improvement methods, organisations increase customer satisfaction, ultimately bolstering profits, customer retention, and loyalty.
2. **Continuous Process Improvement -** Inherent in the Six Sigma method is continuous process improvement. An organisation that completely adopts a Six Sigma methodology never stops improving. It identifies and prioritises areas of opportunity on a continuous basis. Once one area is improved upon, the organisation moves on to improving another area.
3. **Variation -** One of the ways to continuously improve a process is to reduce the variation in the process.
4. **Removing Waste -** Removing waste-items, actions, or people that are unnecessary to the outcome of a process-reduces processing time, opportunities for errors, and overall costs. While waste is a major concern in the Six Sigma methodology, the concept of waste comes from a methodology known as Lean Process Management.
5. **Equipping People -** Implementing improved processes is a temporary measure unless organisations equip their employees working with processes to monitor and maintain improvements.
6. **Controlling the process -** The goal of improvement is to bring a process back within a state of statistical control. Then, after improvements are implemented, measurements, statistics, and other Six Sigma tools are used to ensure the process remains in control.

## Aim -

- By working to reduce variation and opportunities for error, the Six Sigma method **ultimately reduces process costs and increases customer satisfaction.**

## Challenges -

- Six Sigma is often viewed as an expensive or unnecessary process, especially for small or mid-sized organisations.
- **Lack of support -** Six Sigma requires support and buy-in at all levels of an organisation. Leaders and executives must be willing to back initiatives with resources-financial and labour related. Subject-matter experts must be open to sharing information about their processes with project teams, and employees at all levels must embrace the idea of change and improvement and participate in training.
- **Lack of resources, or knowledge -** Lack of resources can be a challenge to Six Sigma initiatives, but they don't have to be a barrier. Lack of knowledge about how to use and implement Six Sigma is one of the first issues small- and mid-sized companies face. Smaller businesses can't always afford to hire dedicated resources to handle continuous process improvement, but the availability of resources and Six Sigma training makes it increasingly possible for organisations to use some of the tools without an expert or to send in-house staff to be certified in Six Sigma.
- **Poor execution of projects -** Teams can help avoid poor project performance by taking extreme care to execute every phase of the project correctly. By choosing low-risk, high-reward improvements, teams can also stack the deck in their favour with first-time projects.
- **Data Access Issue -** Data and analytics issues are a common challenge for organisations of all sizes. Gaining access to consistent and accurate data streams-and applying statistical analysis to that data in an appropriate manner-is difficult.
- **Concerns about using the methodology in new industries -** Six Sigma originated in the manufacturing industry, some believe it's difficult to implement in other industries. In reality, Six Sigma can be customised to any industry.

## Advantages -

- Some time organisation use Beta testing, the **disadvantage of launching ideas into beta**-or to an entire population--without going through a Six Sigma methodology is that **organisations can experience unintended consequences** from changes, spend money on ideas that don't end up working out as planned, and impact customer perceptions through trial-and-error periods rife with opportunities for error. This issue can be handled when Six Sigma is used.

## Happy Path -

- After the analysis of x factors, we should work on the factors in increasing order of sigma level assigned to them. **No**, Sigma levels provide an organisation with a high-level look at how a process is performing, but comparing sigma levels between multiple processes doesn't always point to the particular process an organisation should improve first. Leadership **should also consider costs, resources, and the estimated impact of improvements.** Six Sigma is all about continuous improvement.

## How to calculate sigma level -

- Using yield percentage, as each level of sigma is associated with a certain percentage.

**Yield % =** (# no. of opportunities - # no. of defects) / # no. of opportunities * 100

# CHAPTER 2 - SIX SIGMA HISTORY AND APPLICATION

## History -

- The **roots of statistical process control**, which provide a **backbone for Six Sigma methods**, began with the development of the normal curve by Carl Friedrich Gauss in the 19th century.
- In the early part of the 20th century, **statistical process control received another big boost** thanks to Walter Shewhart. Shewhart's.
    - He was the first person to **closely relate sigma level and quality**. Errors and costs exponentially increase as sigma level decreases.
    - Second, Shewhart is considered the father of control charts, which are a critical component of statistical process control that lets organisations maintain improved performance after a Six Sigma initiative.
- One of W. Edwards Deming's idea is called the **PDCA cycle, or plan-do-check-act cycle**. The idea is that improvement comes when you recognize there is a need and make a plan then test your ideas. Using the results of the check or verify that your improvements are working. Then you act, bringing your improvements to a production environment or scaling improvements outside of the test environment. This is a core tenet of Six Sigma.
- The principles driving Toyota's system, and later, the foundation of **Lean Process Management** (highly concerned with removing waste from any process) or Lean Six Sigma, include:
    - Defining customer values
    - Identifying the value stream for customer needs and desires
    - Identifying waste in the process
    - Creation of a continuous process flow
    - Continually working to reduce the number of steps and time it takes to reach customer satisfaction
- At the time, departments across Motorola measured defects as a ratio of a thousand opportunities. The team realised that measuring errors against a thousand opportunities didn't provide the level of detail needed for true statistical process control. Instead, the engineers wanted to measure defects against a million opportunities. We know that sigma levels were already defined and the idea of using sigma levels as a measure of quality began with Shewhart. **It wasn't a long jump for the Motorola engineers to make from their desire for more accurate data to the basic concepts of Six Sigma as both a goal and methodology.** Throughout the next two decades, Motorola worked to perfect its Six Sigma methodology, seeing positive results along the way. Galvin directed his team to share Six Sigma with the world. Motorola and its team published articles and books on the Six Sigma method and implemented efforts to train others.
- Following the success of corporations such as GE and Motorola, companies across the country rushed to implement Six Sigma. Unfortunately, in the **rush to implement the process, many organisations executed improvements poorly or failed to gain an adequate understanding of statistical process** control before moving forward with improvements. That bad taste has resulted in the following **misconceptions and myths** that are still prevalent today in many industries:
    - Six Sigma is solely concerned with metrics and ignores common sense.
    - Six Sigma is too expensive.
    - Six Sigma can fix anything.

## The Development of Statistical Process Control in Six Sigma -

- Six Sigma teams usually use methodologies known as DMAIC or DMADV to accomplish improvements and develop controls for processes. DMAIC stands for **Define, Measure,  Analyse, Improve, and Control**. These are the five phases of a Six Sigma project to improve a process that already exists.
- When developing a new process, teams use DMADV, which stands for **Define, Measure, Analyse, Design, and Verify**.

## Applying Six Sigma Knowledge

- Six Sigma is **applied via a controlled project selection and management process**. Once areas of concern are identified, leaders usually turn to analysts, Six Sigma experts, and subject matter-experts for cost-benefit analyses.
- Six Sigma teams **attempt to quantify how broken a process** is (by calculating sigma level, costs of defects, downtime, and other metrics) and how much it might cost to address the problem.
- Problems are then **prioritised according to severity** as well as an organisation's ability to address the issue. Teams begin working through the priority list, returning to the analysis from time to time to ensure the list has not changed.

## Difference between Traditional & Modern Quality Management Process -

- Traditional processes like Total Quality Management are **concerned with achieving a specific goal**. Six Sigma seeks to instil a culture of continuous improvement and quality that optimises performance of an organisation from the inside out.
- Traditional methods were based on experience & intuitions, whereas modern methods based on **experience & intuitions + statistical explanation**.

# CHAPTER 3 - OTHER PROCESS IMPROVEMENT AND QUALITY METHODS

## Lean Process Management

- Lean principles often go hand-in-hand with Six Sigma principles. While Lean originally developed as a **concept for reducing waste** in a manufacturing environment, the ideas of Lean Process Management can be applied to any process that involves the movement or creation of goods or services.
- This is true even if those services are virtual or digital, such as in a computerised workflow process.
- One of the ways that **Lean is similar to Six Sigma is that it is concerned with continuous improvements**; like Six Sigma, Lean provides waste-removal tools so daily control and improvements can be made to processes.
- In fact, one of **Lean's continuous improvement tools is called Kaizen**, a Japanese word that translates loosely to "change for the better". The purpose of every change in a Kaizen environment is to eliminate waste and/or create more value for the customer on a continuous basis.

## Business process reengineering

- BPR, which is also called business process redesign, is most often **concerned with the technical processes that occur throughout an organisation**. Those processes might include systems, software, data storage, cloud and web processes, and computer-based workflows operated and maintained by human users.
- As you can probably imagine, BPR initiatives can be costly, which is why they are often deployed only when an organisation expects exponential gain or has determined that current processes are obsolete or badly broken.
- BPR projects **tend to follow a common map, though there isn't a defined set of principles as there is with Six Sigma.** Most projects go through planning, design, and implementation phases. During planning, teams use process mapping and process architecture principles to define enterprise-wide processes in their current state. Teams look for opportunities for improvement and brainstorm new architectures for processes throughout the organisation.

- Finally, organisations implement the changes they have made. Since changes are often programmatic in nature, implementation usually includes a rigorous change management and testing procedure. Testing in technical environments includes steps such as: Sandbox testing, Quality assurance testing, Beta testing, etc.

## Scrum

- Scrum is a project development method **specific to Agile programming** endeavours in technical departments. Scrum is used when teams want to create new technical products or integrate new developments on existing products within a short time frame.
- Scrum was developed as **programming and development teams needed a way to meet continuous technical design and improvement needs from other departments** without substantially increasing programming, testing employee hours, or hiring more technical staff.
- Scrum projects feature three main phases:
    - **The pregame -** Development teams analyse available data and business requirements. They use this information to come up with the concept for the new product or upgrade. Often, this involves translating business and process concepts into computer and technical concepts.
    - **The game -** Teams begin to develop the product via programming sprints. Sprints are smaller phases of development that are completed in sequence, usually with a review and validation of the work before moving on to the next sprint. By validating work during development, teams are able to create working products faster.
    - **The postgame -** Even though validation occurs during development, teams still have to follow quality assurance, testing, and change management procedures. Quality preparation for product release is handled in the final phase.

## Total Quality Management

- Total Quality Management, or TQM focuses on quality. **This method was an essential stepping point to current improvement and quality methods** such as Six Sigma. Some requirements for a successful TQM program include:
    - A strict quality commitment at all levels of the organisation, especially among leaders
    - Empowered employees who can make quality decisions while working within the process without constantly seeking leadership approval for those decisions
    - A reward and recognition structure to promote quality work so that employees have a reason to make quality-making decisions
    - Strategic planning that takes quality and quality improvement goals into account when making long-term decisions
    - Systems that let organisations make improvements and monitor quality
- Successful TQM initiatives **require eight key elements: ethics, integrity, trust, training, teamwork, leadership, recognition, and communication**.
- One of the biggest advantages of the TQM mentality is that it began to **force organisations to see themselves as one entity** rather than a number of loosely related entities or departments.
- Organisations using TQM often experienced benefits such as:
    - Improved employee engagement and morale
    - A reduction in production or product costs
    - Decreased cycle times
    - More satisfied customers

## Rummler-Brache

- As process improvement methods became increasingly popular in the 1980s and later, **individuals often took portions of one method or another and integrated it into new improvement or quality programs**. One such program is known as Rummler-Brache.
- One of the foundational components of Rummler-Brache is known as the Nine Boxes Model. The model is created by a matrix of three performance levels and three performance dimensions. Performance levels are the **performer, the process, and the organisation**. Dimensions are **management, design, and goal**. When placed on a grid, the levels and dimensions form nine boxes.
- Rummler-Brache approaches improvement in six phases:
    - Improvement planning. During the first phase, leadership and subject-matter-experts commit to making improvements and begin to identify opportunities for change.
    - Definition. During the second phase, project goals and scopes are defined and teams are formed to create improvements.
    - Analysis and Design. Teams use analysis to understand the current problem and to define and validate workable solutions.
    - Implementation. Teams implement process changes. Depending on the type of change, this might include programming changes, retraining staff, changes in machinery or equipment, or policy changes.
    - Management of process. Teams monitor the process during and immediately following the change to ensure improvements function as planned.

## The Customer Experience Management Method (CEM)

- CEM Method was created by process improvement consultants to **address needs in organisations outside of manufacturing**. CEM combines improvement tools with customer relations management.
- The primary purpose of CEM is to align processes throughout an organisation with **customer satisfaction goals**.
- Like Six Sigma, CEM **relies heavily on data**. Organisations can't make determinations about customer goals and the success of processes without collecting and analysing customer feedback.
- The **advantage of CEM** is that organisations are able to deploy customer-facing tactics across the enterprise, which often results in enormous gains in customer satisfaction, loyalty, and spending.
- A **disadvantage of this method** is that traditionally inward-facing departments, such as human resources, legal, and accounting, often have a difficult time implementing customer-focused cultural change.

## JumpStart

- JumpStart is a **fast-paced method** for identifying problems and solutions in a single session.
- JumpStart can be used within almost all of the other methods to spark discussion regarding processes or to identify possible solutions. It can also be used as a management tool for helping teams come to tenable solutions outside of project environments or in the absence of project resources.
- Because JumpStart **doesn't take the time for rigorous verification or statistical analysis** on its own, teams should not use this method to enact sweeping changes or attempt to improve processes that could seriously impact customer experience or the bottom line.
- One **disadvantage** of using JumpStart alone is that **changes are sometimes made on a wait-and-see mentality**, which is safe for many inner-team changes but often dangerous for department or enterprise-wide processes, or for making changes to processes that are closely tied to regulatory or compliance rules.
- JumpStart usually **begins when leaders at some level identify an area of concern or opportunity**. The manager, supervisor, or other delegate identifies a team of employees who they believe would offer appropriate insight on the issue at hand. In most cases, JumpStart doesn't work to define the problem: the group is close enough to the issue that they already know what is wrong.
- Instead, the group spends several hours **brainstorming root causes for the problem** and coming up with possible solutions.
- The **benefit of JumpStart is that it lets teams create and implement small-scale solutions quickly**, often providing problem resolution the same day. It also lets teams identify issues that need to be addressed in a more comprehensive project environment.

## When to Use Six Sigma

- **When facing the unknown -** In some cases, teams aren't even sure what the exact problem is; they only know some metric is not performing as desired.
- **When problems are widespread and not defined -** Even when a problem is understood, if it is wide in scope and not well defined, improvement projects that are not tightly managed can escalate in scope to a point that they become unmanageable.
- **When solving complex problems -** If processes are complex and feature many variables, it is difficult to determine how to approach a solution, much less define and measure success. Knowledge of statistical analysis and process control lets teams approach problems that involve enormous amounts of data and many variables. Through analysis and graphical representation, complex ideas can be distilled to specific hypotheses, premises, and conclusions.
- **When costs are closely tied to processes -** Because Six Sigma's statistical process control component lets teams make more accurate assumptions than almost any other method, it is very appropriate for situations that are closely tied to revenue or cost.

# CHAPTER 4 - LEAN CONCEPTS

## To Note -

- Both defects and waste cost money.

## The Seven Muda

- **Overproduction -** Overproduction is one of the easiest forms of muda to spot, as it tends to result in what we commonly think of as waste. Overproduction means a product, part, or service was produced too fast, at the wrong time, or in too much quantity for the process.
- **Correction -** Also known as muda of rework, this form of waste. In a desire to eliminate defects from the end product, organisations institute in-process quality checks that route work with defects back for correction. To eliminate rework or correction, organisations must use a twofold approach. First, the root cause of the rework-that which is causing the errors-must be addressed. Second, organisations should create quality steps that reduce rework waste.
- **Inventory -** Muda of inventory is similar to muda of overproduction; in fact, overproduction can cause a waste of inventory. Muda inventory occurs when materials or inputs stack up before a step in the process; this phenomenon is also called a bottleneck. While inventory waste can occur in any process, it is especially common in processes that operate in batches.
- **Motion -** Muda of motion has to do with how employees themselves move during a process. This type of waste is often relevant to people-powered processes in manufacturing, warehousing, shipping, delivery, or industrial fields, but waste of motion can even crop up in processes that are computerised. A Common tool used in manufacturing and similar environments to track movement is known as a spaghetti diagram.
- **Conveyance -** Muda of conveyance is similar to muda of movement except conveyance involves the movement of outputs, products, or resources. It is sometimes also referred to as muda of transportation. Conveyance can relate to physical movement of items or digital movement of data or workflow. Email strings, which are present in many work environments, often present muda of digital conveyance. A CEO might email a director with a request for data.
- **Over processing -** Over-processing occurs when an employee or process inputs more resources into a product or service than is valued by the customer. This could occur because of ignorance, a desire for perfection, or even excitement. Sometimes over-processing occurs because the employee hasn't had training on the most efficient way to handle a task. Other times, it occurs because an employee or process is more thorough than is worthwhile. A goal of any process should be to do just enough useful and necessary work to ensure that customer or end-user expectations are met.
- **Waiting -** Muda of waiting refers to any idle time in a process, whether that idle time is for machinery or people. In other words, an employee or machine is working below capacity or is not working at all due to waiting on inputs from another part of the process. Waiting occurs when steps in the process are not properly coordinated, when processes are unreliable, when work is batched too large, during rework, and during long changeovers between staff or machines.

## Other Wastes -

- **Talent -** Talent can be wasted when a process doesn't make the most use of the labour or staff available. Hiring the wrong person, putting staff in the wrong position, or ignoring a staff member's growth potential could all be instances of this muda.
- **Ideas -** Muda of ideas occurs when the thoughts and ideas of people are discounted, not sought out, or misappropriated in a way that doesn't make sense.
- **Capital / Cash -** The right decision. Muda of capital or cash occurs when leadership decides not to invest in upgrades or improvements that would create additional cash flow. This type of waste is very similar to waiting, except the cash itself is waiting, often for a time when leadership feels safe enough to spend it.

## Two types of Muda -

- **Type I -** Type I muda are non-value-added tasks that might actually be essential or required by circumstances. Inspection of products during a process might be required if the process is known to produce defects.
- **Type II -** Type II muda are non-value-added tasks that are not essential and can be immediately removed from a process. For example, if a product is carried to and from several workstations while it is being completed, its likely type II muda of conveyance exists. By rearranging the workflow, teams might be able to reduce the muda by a substantial amount without making any actual changes to how the product is put together.

## 5S for Lean approach -

- **Sort (Seiri) -** During the sort phase, all items or materials in a workspace are reviewed, removing unneeded items and keeping necessary resources. The sort step lets you take inventory of an area, discover unused or wasted resources, and make room for reorganisation. Sort can also be applied with computerised processes.
- **Straighten (Seiton) -** Once excess is removed from the work area, teams must provide a streamlined and easy-to-use location for everything necessary to the workspace. During the straighten phase, every item, tool, or material is given a home. To facilitate ongoing organisation, the location of resources should be labelled clearly.
- **Shine (Seiso) -** The third phase in the methodology is targeted to keeping the workplace clean and neat. The goal is to shine the work space by cleaning it, maintaining equipment, and returning items to the proper place after use. In a computerised environment, the shine phase can be accomplished by naming files in a manner that makes them easy to locate, keeping folder structures intact, and deleting or archiving files that are no longer necessary. Shine can be applied to any environment, physical or digital.
- **Standardise (Seiketsu) -** The standardised phase is used to maintain the progress achieved in all previous phases. By keeping high standards of orderliness in place, the benefits of the 5S methodology can be long-term. The stress and speed of a daily workday can make it hard to keep up with the 5S standards. If everyone is committed to working together, the benefits can be ongoing.
- **Sustain (Shitsuke) -** 5S only works if everyone on the team or within the organisation commits to the process. Employees must follow the rules that are set up for standardising and sustaining the organisation. Otherwise, the team enters a cycle of cleaning up after a period of failing to keep up with the standards of 5S.

## Just-in-Time Manufacturing

- Just-in-Time manufacturing, or JIT, is **another Lean concept** that originated with Toyota Originally, JIT took a literal meaning. The goal of JIT manufacturing was to **produce an output "just in time," or "as needed" by the customer**. The customer was the person or process that required the output; sometimes, that meant the end customers, and, other times, the customer was a different employee or process within the organisation.
- Today, **JIT mentalities are less about the literal idea of providing the product just in time**; rather, it has become a more general concept of Lean manufacturing that helps organisations eliminate waste in the process.

# CHAPTER 5 - BASIC SIX SIGMA CONCEPTS

## Major Concepts of the Six Sigma methodology -

- **Standard Deviation -** The statistical measure used by teams to understand variation in a process is known as standard deviation. It measures the distance between data points and the mean of all data. It gives you an idea of how much variation actually exists in a process while taking outliers somewhat into account.
- **The Pareto Principle -** The Pareto principle, also called the 80/20 rule, says that 20 percent of the causes lead to 80 percent of the effects. The principle is critical to six Sigma not because causes and effects line up nicely via an 80/20 breakdown, but because it almost universally applies that a few inputs create more impact than all of the other inputs. The Pareto principle is best displayed using a Pareto chart, which is a graphical representation of data elements-usually inputs or causes-in a ranked bar chart. Pareto charts are helpful analytical tools when you need to analyse frequencies or causes of problems. They also help narrow an approach for a problem that has many causes or is too broad to address in a single improvement project.
- **Voice of the Customer -** The goal of quality is to make a better, more consistent product. One of the ways you know you've reached this goal is that your customers will be more consistently satisfied. The only way to reach this goal is to seek feedback from the customer, making VOC data critical to collect before, during, and after improvement projects. Some methods for capturing feedback include:
    - Surveys via telephone, mail, email, or online
    - Focus groups in person or online
    - Interviews
    - Beta or user testing
    - Feedback forms
    - Customer complaints
    - Social media or site interaction
    - Reviews
    - Forums

## Basic Metrics of Six Sigma methodology -

- **Defects per Million Opportunities -** Many Six Sigma metrics come with an equation, just like standard deviation. For example, the equation for DPM0 is:

  (number of defects in a sample / opportunities for a defect in the sample) * 1,000,000

- **Defects per Unit -** DPU is a measure of how many defects there are in relation to the number of units tested. DPU is concerned with total defects, and one unit could have more than one defect. The formula for DPU is:

  number of defects found / number of units in the sample

- **First Time Yield (FTY) -** First time yield is the ratio of units produced to units attempted to produce.

  number of good units produced / number of units entering the process

- **Rolled Throughput Yield (RTY) -** The RTY, provides a probability that a unit will be generated by a process with no defects. One of the main differences between RTY and basic yield or first time yield is that RTY Considers whether rework was needed to generate the number of final units. This is a valuable concern, because organisations don't always think about the rework that is inherent in a process, which means they often measure a process and deem it successful even if muda is present. RTY is calculated in a similar manner to FTY, but it takes rework into account.

  (Number of units entering - (scrap+ rework)) / number of units entering process

# CHAPTER 6 - APPROACHING THE PROBLEM

## How to define and validate the problem statement -

- **Problem Functions: y = f(x)**
  Because Six Sigma approaches things with a statistical mindset, it considers all problems as a function. Y, the problem is,'f' is the function of x and x, the cause(s) or input (s).
- **Data analysis is one of the best ways to validate a y=f(x) assumption**, but teams who are familiar with processes can often arrive at some basic relationships through a process known as the 5 Whys. This is a brainstorming tool that asks increasingly granular questions about a problem or process, seeking to understand the root cause or actual problem. The 5 Whys can be used to define a problem or to begin seeking causes.
- In a Six Sigma project environment, **5 Whys** is usually deployed when processes involve human interactions or people-powered inputs, though it can be an effective start to brainstorming on any process.
- **A Six Sigma improvement project usually starts with a formal project statement**. This is different from the basic statements used to launch a 5 Whys session. A strong problem statement, like that pitch, provides enough information that a busy executive can understand what the issue is and why there is a need for an improvement effort.
- Project statements should include:
  - Where and when the problem was recorded or was occurring
  - A measurement of magnitude for the problem, preferably with some tie to cost
  - A brief description of the problem that could be understood by professionals not closely aligned with the process (avoid too many niche words and acronyms you will be presenting information to non-niche professionals)
  - A brief notation about the metric used to measure or describe the problem
- Example of a **Strong Problem Statement** :
  - In the first quarter, the California distribution centre sent 108,000 packages. Of those packages, 15,000 were returned, resulting in a 13.8 percent return rate. The rate of return is above the accepted 7 percent rate and cost the company an additional $372,000 for the quarter. Over the course of the year, the current process could result in additional costs of over S1.4 million.
- Example of a **Weak Problem Statement** :
  - The Canton, Ohio bakery is producing undercooked bread. Customer dissatisfaction with the bread is resulting in returns and bad word of mouth. The bread is supposed to be baked at 350 degrees for 40 minutes.
- Another way to tell you have a strong problem statement is that you can create an **overall project objective statement or goal directly from the problem statement**.

# Glossary -

1. **Beta testing -** Act of implementing a new idea, system, or product with a select group of people or processes in as controlled an environment as possible. After beta testers identify problems, potential and those problems are corrected. The purpose of beta testing is to reduce the risks and costs inherent in launching an unproven product or system to a widespread audience.

2. **Voice of the Customer -** Voice of the Customer (VoC) is a term that describes your customer's feedback about their experiences with and expectations for your products or services. It focuses on customer needs, expectations, understandings, and product improvement.

3. **Lean Process Management -** Lean process management is a method for building a company culture that supports continuous improvement. It involves a long-term approach to daily work that encourages small, incremental changes in process operations to improve quality and efficiency.

4. **Muda -** It is a Japanese word that translates to waste. It describes a concept of being useless, unnecessary, or idle.
5. **Value Streams -** The value stream is the sequence of all items, events, and people required to produce an end result. The purpose for determining a value stream for a process is that you can identify areas of concern, waste, and improvement.

6. **Spaghetti diagram -** A spaghetti plot is a method of viewing data to visualise possible flows through systems.