

The Cost of Poorly Performing Processes

Prior to the introduction of Six Sigma philosophy, there was a debate as to whether Six Sigma is a goal worth pursuing. **Many experts in the area of quality believed that wastage was a way of life. Trying to eliminate wastage would cause more wastage.** They believed that it was possible to eliminate waste but the endeavour would cost too much and the benefits would not be worthwhile. Hence the then current state of affairs, according to them was the best state of affairs. However as Juran, who was to become a breakthrough quality leader later pointed out the costs of poorly performing processes (COPPP), the argument shifted heavily in favour of Six Sigma way of life.

Here is a **representation of the typical costs that a poorly performing process incurs:**

Appraisal Costs

Appraisal costs are costs incurred to find out deficiencies before external customers are affected by them. These do not include routine quality checks that need to be carried, but to the excessive quality checks that lead in the wastage of resources. Examples of such costs would be:

- Testing products before shipping
- Inspecting purchased supplies
- Auditing every bill that is sent out

Double checking our activities to ensure that there are no errors may be a good thing to do. However, Juran was of the opinion that it leads to considerable wastage of resources. Juran believed that there should be a mechanism which alerts in case of an error. Hence instead of double checking everything, resources will be used to make good the errors pointed out by the system. The idea was to develop a continuous measurement system and make quality checks process driven rather than people driven.

Internal Process Deficiency Costs

Internal process deficiency costs are the ones that are incurred to repair, replace or discard effective work. They are called internal deficiency costs because the customer will not know what has happened. However, more often than not, as one of these costs happen, the delivery time is also delayed. As a result customer service levels also take a beating. Examples of such costs include:

- Overtime costs
- Replacement
- Rework
- Human Time Lost

External Process Deficiency Costs

External process deficiency costs are the costs that are incurred on failures that happen when the product or services is being delivered to the final customer. These are the mistakes that occur in front of everyone and has a huge impact on the public opinion of the firm. Usually the firm has to spend an additional amount to regain the customers lost confidence. Examples of such costs include:

- Warranty costs
- Giving extra rebates to affected customers

- Correcting billing errors leading to delayed receipts

After Juran's analysis was well accepted by the management world at that time, Six Sigma became a rage. The costs of poorly performing processes were too high if all the hidden costs would be considered and hence organizations worldwide began implementing Six Sigma to become more cost effective and hence more competitive.

The Motorola Six Sigma Story

No understanding of Six Sigma is complete without truly understanding where it came from - Motorola. The backdrop of the story shows how Six Sigma implementations changed the way Multi-National Corporations conducted operations worldwide.

It started in 1981. Motorola like most American companies was reeling under the threat of Japanese competition. Recovering from World War-2, the Japanese had built such a remarkable quality initiative that they were way ahead of any American company and were undercutting them on prices causing grave losses in terms of profitability and market share. Motorola was compelled into action. But the management at Motorola made an ambitious plan. They decided to give the Japanese a taste of their own medicine and beat them at their own game i.e quality.

For this reason, the management summoned the top engineers in Motorola and told them to combine all the best quality management practises known till that time and make an aggregated methodology which would be the base of Motorola's competitive quality improvement program. Thus was developed the first Six Sigma program.

Motorola immediately took up a loft goal. They already were a respected manufacturing firm and had stringent quality measures. However, analysis had revealed that they were lagging way behind the Japanese and to be competitive they had to improve their quality goals by a 1000% in five years. Thus an ambitious goal of a 10:1 quality improvement came into picture.

Most experts thought it was suicidal for Motorola to attempt to do so, especially given the fact that Motorola was making huge investments in the quality initiative. Media criticised Motorola for using shareholder funds for goals that can be compared to fantasies. However the management did not pay heed. At the end of 5 years, almost every business unit functioning inside Motorola Inc. had achieved the 10:1 goal, boosting the morale of the workforce and silencing the critics.

However, Motorola realised that the Japanese were once again way ahead of them. This is because the Japanese had also launched a similar program. Even though their program was not as good as Motorola, they were ahead because of their previous lead. The Motorola Management became even more ambitious and launched another 1000% improvement drive. This time the goal had to be achieved in two years. The stream of criticisms started once again as to how success had shot to Motorola's head and how the management was pursuing impossible programs. But to everyone's surprise Motorola had triumphed once again.

Thus a third program was launched with the same 1000% or 10:1 improvement in quality program. This time, when the program ended in 1991, Motorola failed. They reached a target of 8:1 when measured on a company wide basis even though some individual units had met the target.

When all these results were done Motorola had achieved a target of 800:1 improvement in their quality. Even the critics were full of applauses. Motorola had defeated the Japanese threat and Six Sigma became the biggest buzzword on the management scene with companies left, right and centre jumping to implement it, trying to reap the same benefits that Motorola did.

This is how Six Sigma was born!

Operational Benefits of Six Sigma

Six Sigma Project initiatives help the organization in a wide variety of ways and at very different levels. **This article describes the immediate operational benefits that an organization derives as the result of implementing a Six Sigma project.**

Makes The Organization Systems Driven

Six-Sigma efficiency is impossible to achieve if the mode of production used by the organization is craft production. To be efficient enough to run processes that have less than 3.4 defects per million, organizations need to be systems dependant. Thus Six Sigma mind set helps transform a people driven organization into a process driven one!

Reduces Personnel Time and Skill Required

Six Sigma results in massive cost savings to the organization involved. These cost savings are highlighted by the fact that after a Six Sigma project any organization has considerably less requirement for labour hours. Also the requirement of skilled labourers is also reduced. Hence, both these factors combined have an effect of drastically reducing the labour bill of the organization.

Reduces Wastage

Six Sigma projects realise a large amount of their financial value from their ability to eliminate or at least reduce wastage. Since the process is critically analysed for costs and corresponding value addition, measures are taken to eliminate wastage to a large extent.

Reduces Inventory Needs

An ancillary benefit of Six Sigma projects is that it creates a system which is much more efficient than the earlier one. Hence the organization can implement systems like Just In Time Inventory practices and cut still more costs.

Reduces Reworks and Defects

Organizations are plagued with defective processes which result in the manufacturing of defective products. Each defect has costs attached. The costs include material, time, overheads and loss of reputation for the firm. Implementing Six Sigma projects often pays for itself in the long run by providing the financial benefits of near zero defects to the firm that implements it.

Increases Customer Satisfaction

Customers do not like unreliable products or organizations. This can be verified by the fact that many companies that have implemented Six Sigma have not only found their costs reduced but their market share increased considerably. Hence, Six Sigma is also capable of positively impacting the marketing of the firm.

All of the sources mentioned above can be seen as the revenue model of the Six Sigma project. In the financial evaluation of a project, the revenue (cost reduction) from various sources must be considered before deciding whether the project is worth the effort or not. The idea is to find scenarios that the firm will be in with the project and without it.

Six Sigma as a Strategic Tool

As mentioned in the earlier articles, **Six Sigma helps the organization develop at various levels viz. operational, tactical and strategic.** While the operational and tactical goals of cost reduction and increased customer satisfaction

are well understood and appreciated, the strategic intent behind Six Sigma is not well recognized. It is the pivotal factor, however in the success or failure of any Six Sigma initiative in the organization. Here is an explanation of the same:

Efficient Processes Have Become a Business Imperative

When Six Sigma was introduced by Motorola, it became a strategic advantage for them. Since, not many of their competitors had the efficiency of Six Sigma tools, they were leading these corporations and the marketplace. However, with the passage of time, every major corporation on the planet has developed a Six Sigma program. Efficiency is now the name of the game. Hence, from a strategic standpoint, there are now Six Sigma programs competing against other Six Sigma programs and the better ones win!

Isolated Efforts are Not as Effective as Co-ordinated Ones

Over the course of time, there have been numerous studies that have been conducted about the efficiency of these Six Sigma programs. It has been found out that companies that follow Six Sigma projects sporadically do not stand to gain as much from it as do companies that have a well co-ordinated effort. Today's marketplace requires using Six Sigma processes to execute the companywide strategies.

Process Improvement Opportunities are Many and Varied

An organization that is truly dedicated to Six Sigma philosophy will find many and varied projects that can be executed. Even an already Six Sigma organization needs to be developed over time. This is because technological changes unleash better ways of doing work and the organization must continuously adapt.

Hence, the challenge lies in prioritizing between the different Six Sigma projects and executing the correct ones. Projects must be checked for strategic fit i.e. how do they help meet the long term goal of the organization in question.

Example: A company like Facebook that relies on intimate knowledge of its customers to place ads, must execute Six Sigma projects related to Customer Relationship Management (CRM) first and then if resources are left must consider alternative projects. Facebook would not want to be operationally efficient at the cost of being misdirected from its long term strategy.

Alignment between Strategy and Six Sigma Operations

It is for this reason that Six Sigma has been tied up with a process called Hoshin Kanri by the Japanese. Roughly translated into English, it means management of direction. Six Sigma efforts, therefore need to be well directed.

What is Six Sigma Plus?

Most of us would have heard of the revolutionary quality management methodology and framework, Six Sigma. For quality professionals and people in manufacturing and operations, Six Sigma is a buzzword for effective quality management and rigorous application of defect prevention and reducing wastage in the organizational processes.

However, in recent years, there has been movement towards a new model of quality excellence called Six Sigma Plus. This model of quality excellence goes beyond the methodology employed by Six Sigma and is aimed at aligning people and processes not to mention the management focus towards accomplishing the goals of effective quality management.

What is Six Sigma Plus?

The preceding section gave a brief introduction to “**Six Sigma Plus**”. Though Six Sigma is universally known for over two decades now, it is only in the recent past that Six Sigma Plus has become popular among the quality professionals.

To put it simply, **Six Sigma Plus is more than Six Sigma and the “Plus” is used to denote the “synergies” that are achieved by integrating people, processes and strategy.**

For instance, Six Sigma aims reducing the defects in a million parts to 3.4. Likewise, Six Sigma plus uses the same metrics for defect prevention. So, one might be tempted to ask, what is it that is so different about Six Sigma Plus? The answer lies in looking at the scope of a typical Six Sigma Plus implementation as compared to a Six Sigma implementation.

A Six Sigma Plus initiative aims to “integrate” the three cornerstones of an organization i.e. systems, processes and people and melding them together with the underlying business strategy.

This means that unlike Six Sigma that concentrates on processes and reducing the defects, Six Sigma Plus goes beyond the statistics and instead aims at a “holistic” approach that takes into account the customer focus and customer centric strategy.

Further, Six Sigma Plus is a “proactive” approach that anticipates future trends and acts in the present to capitalize on them when they become the standard. In this way, Six Sigma Plus hopes to go beyond Six Sigma in its scope.

Now that we have defined what Six Sigma Plus is, it is useful to look at the areas covered in a typical Six Sigma Plus implementation. Traditionally Six Sigma implementations covered the production processes and aimed at defect reduction and defect prevention in those processes.

However, Six Sigma Plus implementations typically cover all the departments including the functional areas and the product development functions as well. This ensures a comprehensive coverage of all the processes in an organization and not only the production processes.

Further, Six Sigma Plus implementations are typically customer focused which means that these implementations anticipate customer trends and act decisively to integrate customer needs and expectations into the implementations.

Difference between Six Sigma Plus and TQM

As the preceding sections have shown, Six Sigma Plus is a holistic approach when compared with standard quality management approaches like TQM or Total Quality Management. The “plus” in Six Sigma is the alignment of quality initiatives with that of the business goals and this is what differentiates Six Sigma Plus from TQM.

Where TQM takes a narrow approach towards defect prevention and quality control with the ultimate goal of customer satisfaction, Six Sigma Plus takes the whole notion of quality management to a new level by starting with the customer and then aligning the business strategy with that of the quality processes.

The point here is that TQM is more of an internally focused measure that aims to reduce defects and hence satisfy the customer whereas Six Sigma Plus takes the customer as the starting point and works the quality processes from this perspective.

The other differences between TQM and Six Sigma Plus include the “change” aspect of Six Sigma Plus where the objective of the latter is to proactively seek measures to improve quality as opposed to that of the TQM methodology which concentrates on doing the same process to the quality norms prescribed for the process.

The difference here is one of continuous improvement and change with each iteration as opposed to merely reducing the incidence of defects. The operative term here is “change” and the practitioners of Six Sigma Plus tend to call themselves as “change agents” as opposed to calling themselves as “quality champions” in TQM implementations.

Further, Six Sigma Plus focuses on driving change through the organization by identifying areas in the processes that can be improved and being customer focused as well as extending the process improvement to all functional areas. In short, Six Sigma Plus covers the entire organization whereas standard quality management methodologies like TQM confine themselves to quality control and quality management of the production processes.

The difference here is that Six Sigma aims to identify process improvements in all functional areas and build on them proactively whereas TQM usually contends itself to preventing defects in selected processes and areas in the company.

Differences between Six Sigma Plus and Six Sigma

This section focuses on the differences between Six Sigma Plus and Six Sigma. As mentioned in the previous sections, Six Sigma Plus goes “beyond” the normal implementation of Six Sigma and has the added advantage of Customer focus, Process Improvement and Productivity growth as the cornerstones of its implementation.

Though, the differences between Six Sigma Plus and Six Sigma appear superficial on first glance, there are indeed significant differences in the way these methodologies are implemented.

The Six Sigma framework posits an acceptance of two defects per billion samples tested. Though this might seem impossible to attain particularly in the manufacturing sector where quality slippages are common, it is indeed the case that several companies like GE, Dow Chemical, The TATA group and banking institutions like JPMC, Citigroup and Bank of America have successfully adopted the Six Sigma framework.

The adoption of Six Sigma by these companies came about as a result of a focus on quality that was both top-down and bottom-up and the combined efforts of all the stakeholders ensured that the exercise was a success.

However, it needs to be mentioned that adoption of the framework is the first step in the process of attaining quality excellence as the companies need to adhere to the framework in their every day operations in order to claim that they are indeed Six Sigma compliant.

As many experts have put it, Six Sigma Plus takes the Six Sigma methodology and adds the aspects of leading change to strategy, coaching leaders to people development, a practical approach to theory, implementation of customer focused projects to training, enhanced tools through components (as discussed in the section related to Six Sigma Plus) and using a mix of soft skills and hard skills to make the company more competitive with regards to its competitors.

Conclusion

This article has discussed the differences between Six Sigma Plus and Six Sigma as well as TQM. The emphasis in this article has been on finding the added advantage that companies get when they embrace Six Sigma Plus as opposed to traditional methodologies like TQM. As can be seen from the preceding discussion, the alignment of people, processes and systems with that of business strategy in a holistic manner and achieving synergies in the interaction of the components is a hallmark of Six Sigma Plus implementations.

Further, Six Sigma Plus seeks to drive change and focus on leadership as opposed to merely training people in the methodology. The key term here is the ability to conceive of a different mindset when it concerns quality and hence Six Sigma Plus can be thought of a philosophy of quality as opposed to implementation of statistical measures of quality.

In conclusion, Six Sigma Plus is an emerging model of quality excellence that goes beyond traditional conceptions of quality and gives an entirely new meaning to the concept of quality control. It remains to be seen how many companies adopt the Six Sigma Plus methodology and how successful this addition to the existing pantheon of quality initiatives would be.

The Purpose, Scope and Value of a Six Sigma Project

Before the Project Begins

Six Sigma projects are meant to make the organization efficient. It is for this reason that one must ensure that the projects are efficient in themselves. One of the main criteria for a project to be efficient is that it must have well defined goals. Only once the goals are defined with clear articulation can plans be laid out to achieve them. Six Sigma projects have guidelines on defining the objectives of the project. There are three essential characteristics that the objective must possess. They are as follows:

Defining the Objectives

- **Valuable:** The objective must be valuable. There are many things that are going on inside a mega corporation. There may be many places where there might be scope for improvement as well. However the organization has limited resources and needs to take only the most important projects first. Which projects are important are defined by the strategy of the organization. Hence one must ensure that the six sigma project is aligned towards the strategy of the organization and is hence valuable.
- **Understandable:** Six sigma projects are never executed in silos. The key stakeholders in every project are identified. Then the objectives of the project are communicated to the key stakeholders and an agreement is reached with them. It is critical that the team undertaking the six sigma project be able to clearly define what they intend to do in front of stakeholders like the people who actually implement the process. Hence the objectives must be defined in as simple terms as possible so that articulation is easy.
- **Achievable:** A good sigma project is not far-fetched. It is important to understand the range of the organizations capability. The project objectives must lie just beyond the current range. This will stretch the organization and make it more efficient. However, if you place the objectives of the project too far outside the limit of the organization, it is bound to fail. Failure in a six sigma project demoralizes the people who have been instrumental in implementing them. This jeopardizes the entire quality initiative. Make the objectives achievable at the start of the project to avoid turmoil at later stages.

The Five Step Procedure for Defining the Scope, Purpose and Value of a Six Sigma Project

1. **Step 1:** Review Preliminary Information
2. **Step 2:** Develop the Project Scope (Scope)
3. **Step 3:** Develop the Problem and Goal Statement (Purpose)
4. **Step 4:** Develop the Business Case (Value)
5. **Step 5:** Develop the Project Charter which is the Central Document In any Six Sigma Project

The details regarding how to perform each step are provided in the subsequent articles to make your six sigma journey easier.

Deliverables at the end of the Define Phase

- **Well Defined Scope of the Project:** A well-defined scope of the project is perhaps the most important deliverable of the Define phase. Scope document goes a long way in finding the solution. A lot of organizations resources have been wasted and no substantial results have been obtained because of the failure to correctly scope a project.

- **Well Defined Team with Allocated Responsibilities:** Six Sigma projects are usually started by one person who sees the opportunity and therefore champions the project. In the beginning there may be one or two people who are working on the elementary documents like scope, financial benefits plan etc.

However before the end of the define phase a complete team for Six Sigma project emerges. Their roles are clearly defined and responsibilities are allocated to ensure smooth functioning of the project at later stages.

- **Financial Benefits:** It is the financial benefits which turn the Six Sigma plan into an organizational resource. Financial benefits add value to the firm. This is because they either increase the revenues of the firm or they reduce the costs of the firm involved. However since there are multiple six sigma projects being identified, however the resources for the projects are very limited. It is for this reason that the financial benefits need to be listed and debated upon for validity. The define phase ensures that this information does reach the top management and they have the tools at hand to decide whether this project should be continued.
- **Risk Identification and Mitigation Plan:** As a part of the Define Phase, the team not only thinks what can go right with the project. They also consider what can go wrong with the Project involved and the extent to which things can go wrong. It is deep thinking at the define stage and the ability to out-think potential problems that ensures Six Sigma projects run smoothly and are a success. If these exercises did not exist a lot many Six Sigma teams would have got on to the ground far less prepared and wasting far more organizational resources.

Project Schedule: It is in the “Define” phase that the team gives an appropriate end date to each of the stages in the DMAIC Six Sigma methodology process. Also the end date of the project is decided and the criterion for judging the project as a success or a failure is also decided.

Well-begun is half done, they say. Six Sigma DMAIC methodology ensures that you begin the project well. It is for this reason that an exhaustive define phase has been created with many deliverable documents that force you to think in different ways about your project. The end result of the Define phase is a considerably insightful team working dedicatedly towards a solution.

Step 1: Collect and Review Primary Information

The project begins when the top management assigns responsibility to the Project Champion. The Project Champion usually delegates the task of preparing the Project Charter to another team member. **It is important for both the Project Champion as well as the team member to understand what information is required. Here are tips on how to collect and review primary information from the management.**

Where Do Six Sigma Projects Come From ?

Six Sigma projects do not suddenly appear. They are the result of conscious planning by the top management when they map the capabilities of an organization to the deliverables they foresee and find gaps. Alternatively Six Sigma projects are suggested by employees who are in the best position to suggest improvements. In either case it is a business problem which is driving the Six Sigma project. Hence information regarding the problem that is being solved is required.

What Information should be received before embarking on the Project ?

Before beginning work on the project, there is a bare minimum amount of information which is required. This information pertains to the objectives of the project which are nothing but extensions of the business problem identified earlier. Also the time frame which is expected out of the six sigma team must be made clear.

What needs to be done with this Information ?

Most of the times management does not give the Project Champion precise Six Sigma Project Statements. The information provided is vague and too broad to be specifically meaningful. For instance it could mean “preventing bad debts on accounts receivables”.

Obviously such a statement is a symptom and not the real cause. There is a considerable amount of digging down that needs to be done with this information provided by the management. It is for this reason that the Project Champion must:

- Store all the information he/she receives
- Clarify if the project objectives are too broad
- Start conducting analysis that reveal the real issues

Why is this stage critical ?

The project team undertakes the project in the light of the data it has received. It is therefore essential that there be no ambiguity when it comes to storing this information. At a later stage of the project, this lack of data can be detrimental. It can cause the team to work either with the absence of critical data or engage in expensive time wasting data collection.

It is also possible that a misinterpretation may lead the team to start working on a completely wrong track. Therefore the activities pertaining to this stage should be conducted very carefully.

Step 2: Defining a Scope for Your Project

Immediately after receiving the initial information about the Six Sigma Project, scoping begins. Scoping is usually the first task done while executing any project. Here is what exactly Project Scoping is and how to use it.

What is Project Scope ?

A Project scope defines exactly what is in the process. Processes are usually continuous i.e. where one process ends the other one starts immediately. Hence in the absence of scoping, work will not be focussed. Consider the accounting cycle for instance. It starts when raw materials are purchased and ends when cash is received for the goods sold. It begins with cash and ends with cash. In between there are many steps like converting raw materials to Work in Progress, Converting Work In Progress to Finished Goods, Transferring Finished Goods To Inventory, Selling The Inventory On Credit etc. In the absence of scope it is likely that the project will not be able to focus. Hence while implementing a six sigma project one must know that they are trying to improve the process which starts when Work In Progress is turned into finished goods and ends when the sale is completed.

What information should be included in the project scope document ?

The most important information that a project scope document conveys is the boundaries of a process. The scope document must define with zero ambiguity what is the start point and the end point of the process.

Project Scoping is usually done with high level processes. This means that many activities in the process may have their own sub processes involved. In such cases the project scoping document must explicitly state what nested processes are a part of the scope of the project.

Why is it important ?

The Project scope is of vital importance to the execution of the project. This is because it becomes the basis for the requirements of the project and the resources that need to be deployed in the project. Some of the important information contained in the Project Scope is as follows:

- What processes or activities are not included
- What are the material resources required?
- What is the human resource required?
- What is the expertise required?
- What are the technological resources that are required?

Reviewing Project Scope

Once the project scope document is completed it must be sent for immediate review. The points that must be considered in the review process are as follows. The project scope is checked for:

- Overlap with any other current project or proposed project
- The Project scope must not involve multiple functions
- The Project scope must not involve multiple products
- The Project scope must not involve multiple regions

In case the project scope does not meet any of these requirements, it is a red flag. A well-defined project scope is essential. If the project scope is too broad, Pareto analysis is used to identify the key issues and narrow the project scope and make it manageable.

Defining a Project Problem Statement

The next step in the Six Sigma journey is to have a clearly defined problem statement that will guide the team throughout the execution of the project. Here are a few tips which give us an insight into how a project problem statement must be developed.

What is a Problem ?

As per a layman's definition a problem is a difference between the expected state of affairs and the actual state of affairs. In organizations problems can come in many forms and can have many causes. In fact most of the times problems are hidden and what we think of as problems are only symptoms of the problem.

The Problem with “Problems”

While it may sound fairly simple that there is a business problem that needs to be solved, in reality it is not so. This is because business problems have various dimensions and people tend to interpret some of these dimensions

separately. The common problems that occur because the problem was not accurately understood in the first place are as follows:

- **Hasty Decisions:** Many organizations have suffered from the consequences of taking hasty decisions. The organization ends up making resource commitments which may not be required and prove a drain in the long run.
- **Assumed Common Understanding:** The problem must be explicitly stated down and discussed with the team in question. The Project Champion must question the team members to ensure that they have the correct knowledge regarding the problem to avoid this.
- **Assumed Causes or Solutions:** It is human tendency to jump to conclusions. However, often we jump to the wrong conclusions. It is important not to be judgemental while defining a problem. This often narrows our thinking and we are not able to think of the best solution.

Convert Your Regular Problem to a Six Sigma Problem

To prevent this problem from happening, a regular problem must be converted to a Six Sigma Problem. The Six Sigma Problem, like the regular problem is a difference between the desired and actual state of affairs. However, it answers some questions explicitly and leaves no room for ambiguity. The questions that are normally answered are as follows:

- Who is affected by the problem?
- What are the causes of the problem?
- When does the problem occur?
- Where does the problem occur?
- What is the business impact of the problem i.e. the amount of revenue lost, the amount of time lost, employee inconvenience, customer inconvenience, etc.

This Six Sigma problem provides a concrete goal statement to the project execution team that can be worked upon. An example will make the contrast between a normal problem and a six sigma defined problem statement more clear.

Example

Normal Problem: Employees usually turn in late to work causing loss in productivity.

Six Sigma Problem: At the New Jersey factory, 45% of the employees report to work within 15 minutes after the time that they were supposed to report to during the beginning of the shift causing a fall in daily productivity by 5%

Develop a Goal Statement corresponding to the Problem Statement

A six sigma team is meant to concentrate on the solutions and not on the problems. It is for this reason that once the problem has been identified, it must be quickly turned in to a goal statement that will guide the execution of the project.

What is a Goal Statement?

The Problem statement helps us identify and zero down to the problem at a very narrow level. The Six Sigma problem gives structure to our thinking. The details and measurements presented in the problem must be noted. The

ideal state of affairs must be thought about. Then the ideal state of affairs must be written down containing the same details and measurements as in the original goal statement. Here is a method to do so

How to Create Goal Statements from Problem Statements?

- **Focus on the Numbers:** The numbers in the problem are the information that remove subjectivity. For instance if it is known that 40% of the employees are reporting up to 15 minutes late, the goal statement must also be written in the same parlance. The goal must be to bring down the number of employees that report up to 15 minutes late to 10%, 5% and then 0% in three months.
- **Start with Action Verb:** While this may sound semantic in nature, it is not so. The word that is used in the beginning of the Goal statement has profound implications. For instance if the word reduce is used in the above goal statement then it will imply that late coming employees are a part and parcel of the business and the number has to be minimised to reach a certain level. However, at the same time if the statement says gradually eliminate the number of late comers, it conveys the message the late comers are only a temporary phenomenon and within 3 months they have to be eliminated. It sets the tone for policy making and action taking.
- **Completion Date:** A goal without a completion date is a wish. Considering the resources at hand, the goal statement must have a reasonable goal completion date. There must also be penalties imposed on missing that date.

SMART Goals

There is an acronym for setting goals that work. It is called SMART goals. Research has shown that goals with SMART characteristics tend to succeed more than others. Here is what it means:

- **Specific:** This refers to the scope of the goal. A vague goal has less chance of being achieved. The more specific, the better.
- **Measurable:** This refers to the numbers that we have illustrated earlier. Numbers make the goal measurable. They provide direction as to whether the goals are on track or not.
- **Actionable:** There are some events which are within the control of the organization, others which are not. The goals mentioned in the goal statement must be within the organizations control and hence actionable.
- **Relevant:** The goals must be aligned to a greater strategy and hence must be relevant
- **Time-Bound:** As discussed earlier, the goal statement must contain goals and not mere wishes. Dates put on wishes make them goals.

Tips for Writing Effective Problem and Goals Statement

Although the Six Sigma process has tried to make the process of developing problem and goal statements into a science, however in reality it still remains an art. This combined with the fact that goal and problem statements go a long way into the execution of the project make it important to understand what are the components that make some statements better than the other. Here are a few tips in this regard:

Consider the Customers Point of View

Problem and goal statements that are effective are written from the customers point of view. It is important to understand that the customer here is not the customer like marketing would refer to. There are internal customers within the organization. Anyone who receives the output of the process is a customer. Project Champions that spend time in understanding the customers real needs and planning goal and problem statements accordingly do better than others.

Consider Critical To Quality Measures

The Customers point of view is important. However it is also important to understand that the customer assigns varying degree of priorities to the various needs. Hence the needs need to be prioritised and segregated. The needs that are critical to quality (CTQ) must be paid more attention to while preparing the problem and goal statements.

Use Measurements To Remove Ambiguity

Numbers tell you a story. This statement is true when it comes to six sigma. Words can be subjective. Using numbers to express the problem ensures that everyone has a similar understanding of the problem and it is not prone to numerous interpretations. Also numbers hold the key link of transitioning from the problem to the goal. The Problem is a level of the number, when it reaches another desired level it becomes a goal.

Be Concise

Problem and goal statements must be written in as few words as possible. It is common practise to write long statements full of business jargons. However, the Project champion must ensure that both these statements have the least possible jargons and are written in the fewest number of words possible.

Don't Jump To Conclusions

A good problem statement does not imply causes, does not point fingers and does not suggest solutions. It is a problem statement, its job is to define a problem as accurately as possible. Similar is the case with goal statements. Goal statements are not meant to suggest solutions or causes. They must suggest what the state of affairs would be in ideal conditions.

Inculcating these measures will make both your problem as well as your goal statement robust and help you effectively define the purpose of your project.

Step 4: Develop a Business Case for your Project

Now that we have the problem as well as the goal statement handy, it is time to ensure that these statements are well articulated in the business case. The management has to choose amongst several possible six sigma projects while granting its resources. The ones that do succeed in getting the resources from the management are ones that have clear cases of compelling value proposition. Here is more about the business case:

What is a Business Case?

A business case is a document that uses the problem and the goal statements and converts it into a statement of business value. The management might understand that there is a problem and that you have a goal after reading your problem and goal statements. However, is your project solving one of the most urgent problems confronting the organization is what the business case is supposed to convey.

What makes a Business Case Compelling?

- *Strategic Linkage:* Think at the organizational level. The top management has to make a choice between several strategies which may be good for the firm. While all of the m may be good, the management has to choose which will be best in the long run and follow it. There is nothing which makes a better business case

than the ability to make the organization believe that the Six Sigma project will make it reach closer to its strategic objectives

- **Benefits:** The management is not very concerned about the problems unless they are significant. In huge organizations small problems are present in almost every department. However they need to be solved by the lower level management. The Six Sigma project is managed by the top management who are concerned with the benefits that your project will provide to the organization. The project must include benefits like cost savings, increased service levels, increased efficiency and the like.
- **Link to Problem and Goal Statement:** A business case must tell the loss that is happening because of the problems identified in the problem statement. It must also talk about the benefits that will be gained by achieving the goals mentioned in the goal statement. The difference between the two numbers is the business value of the Six Sigma project that is being proposed to be undertaken.
- **Brief:** A verbose business case can mar a well identified problem and well selected goals. Although the management must be capable to sift through the language and come to the point, they seldom are. It is the initiative of the process owner that he/she must come up with a case that is easy to understand. This will make it most compelling to the management.

Example: The loss in productivity as a result of employees coming late is \$5 per minute per employee. Hence for a 1000 employees (40% of the workforce), the management is losing \$5000 per minute for 15 minutes i.e. \$75,000 every day.

If the organization thinks saving \$75,000 going down the drain is their priority, they will buy in the business case.

Project Charter - Meaning, Importance and its Elements

What is a Project Charter?

A Project charter is a 5 to 6 page document which collects all the information that has been developed in the previous steps and puts it in a central location. The Project charter serves as the constitution which governs the working of the project and disputes if any that may arise during the execution of the project.

Importance of the Project Charter

The project charter is the final deliverable document that is required at the end of the first step of the Define Phase. This document serves as a proof of the activities that have been performed up to this stage and the agreement that has been reached amongst the members of the team, the stakeholders as well as the management.

This charter is constantly used to see whether the project is doing what it was expected to do, within the time frame it was expected to do, so on and so forth. At the end of the project the actual benefits are compared with the forecasted benefits to declare the project a success or a failure. The Project Charter plays a vital role in the control of the project.

Elements of the Project Charter

A Project charter usually has 5 - 6 elements. They can be more or less depending upon the nature of the project and its requirements. However the usual elements of most Six Sigma project charters are as follows:

- **Purpose:** To be assembled from Problem and Goal Statements
- **Value:** To be assembled from the Business Case
- **Scope:** To be assembled from the high level business flow
- **Team:** To be decided as per the roles before beginning the project.

- **Schedule:** To be prepared as per the time frame provided at the beginning of the project
- **CTQ Measures:** To be assembled from the information collected during the problem and goal definition

Accessibility and Modification

The Project Charter must be stored in a shared location and must be accessible to all at any time. This is because this document and its interpretation is critical to ensuring that the project progresses in the right direction.

However, the Project Charter is like the Bible of the Project. Modifications must not be allowed under normal circumstances. However, if material information needs to be included or corrected in the project charter, then it must be done after due diligence and everyone must be informed about the change. This will ensure that all the people working on the project have the exact same information all the time.

What are Metrics and Why are they Important?

What are Metrics?

Metrics are numbers that tell you important information about a process under question. They tell you accurate measurements about how the process is functioning and provide base for you to suggest improvements.

It is said that only when one can express their understanding in terms of numbers is the understanding satisfactory and meaningful.

Usually measuring results with one metric is not a good enough strategy. A combination of metrics is used to measure the effectiveness of the process.

Types of Metrics

1. **Operational:** Operational metrics are the ones that are represented by performance on the shop floor or service levels in case of service industry. Common example of these metrics include turnaround time, production time, number of defects etc. These metrics measure the performance of the people in operations function and can help identify where the discrepancy has its roots, if a discrepancy has risen.
2. **Financial:** Financial metrics judge the ability of an organization to convert operational performance into financial goals. Such metrics include profitability ratios, sales figure comparisons so on and so forth.

In the end it is only an understanding of both types of metrics and what they suggest can meaningful decisions be made about the process is question.

Here are some important functions that metrics fulfil in an organization.

- **Control and Feedback Loop is Driven by Metrics:** Once the ideal state of the process is decided through analytics, it has to be expressed in terms of metrics. This is because metrics are the numbers that are being measured on a daily basis. Management philosophy also believes that what is measured gets managed.

Hence metrics suggest whether the process is in order or needs external interference. They therefore form the basis of control in any organization.

- **Metrics Make the Process Objective:** Processes have to be designed as per the customer's critical to quality requirement. Metrics help transform the vague requirements that a customer gives into a series of numbers that can be used to accurately map the process for its efficiency. Metrics tell us whether a process is good enough to meet the customer's requirements or whether it needs to be better.
- **Improvement Goals are in Terms of Metrics:** For the improvement goals to be objective, it is essential that they are measured in terms of numbers. Words like good quality, bad quality and acceptable quality are vague and may depend on the personal opinion of the person expressing them. Therefore metrics play an important role since they transform both the customer requirements as well as operational performance to numbers which can be compared. As a result management can objectively state whether the customer's needs are being met or not.

The Need for Operational Definitions of Metrics

While coming up with operational metrics one must not forget to begin by first clarifying and defining what they mean. This is because there is a good chance that there may be ambiguity regarding what the metric really means. To better understand how to come up with operational definitions, the following procedure must be followed.

Same Vocabulary: The same vocabulary must be followed all across the organization. This ensures consistency in what is being communicated by people from different facilities or locations.

Consider an automobile dealer with 4 branches. Three branches state that they deliver the car 2 days after the customer placing the order while one branch states that it takes 3 days to deliver the car. One may be led to believe that this dealership has a broken process. On closer inspection it is possible that a difference in vocabulary is the real cause.

It is possible that the three dealership call the day the customer placed the order as day 0 while the fourth one called it as day one. Therefore the time taken by both of them to deliver the car was same i.e. 72 hours. It is just that the vocabulary used was different. Such inconsistency can mislead the management and make them take wrong decisions. Hence while defining the metrics the relevant vocabulary must be defined as well.

How Data Is Collected? There is also a possibility that there could be discrepancy in how different dealerships collect data. Let's assume that one used random sampling to collect data while the other used stratified sampling. The results are obviously not comparable because the methods used are not the same. Hence data collection methods must be specified with no ambiguity.

How Calculations are Done? Different departments are also likely to do calculations in different ways. This is also likely to create discrepancy in the value of the metrics being used. One department may round off the decimals while others may not and in some case it may produce significant difference in the values. To prevent this standard ways of calculating must be prescribed. It possible the data collection and calculation must be automated.

Develop the Range: Metrics do not always fall in the same line. They have approximately the same value, however not exactly the same value. Hence the range within which they normally fall in must be designed. This is usually done by creating control charts. If the metrics lie within the given range, then the process is working fine, if it is not then someone senior is alerted.

Classify what Happens if Variables go Beyond Range: Even when variable go out of range there are classifications. If the variable crosses the upper limit, it means one thing and if it crosses the lower limit, it means another. Also the magnitude by which it crosses the upper and lower limits can lead to the variables being classified separately.

Metrics will only be effective if the management has complete control over how they are created. The numbers should be comparable and mean exactly what they are supposed to mean.

Primary Metric(s) - Meaning and its Characteristics

In order to truly control a process, one must understand the inputs as well as outputs of the process. These inputs and outputs are displayed through numbers which are called “metrics”. The primary metric is a way to say with numbers how well your process is performing. Here are a few pointers that will help understand the concept of primary metrics in detail.

What is a Primary Metric?

Any process can be defined as $Y = f(x)$ where X's are the critical inputs. The output here is Y. The primary metric of a process is the Y of that process, meaning an output of the process under consideration. The state of the output needs to be consistently measured, errors must be spotted and correction must be immediately made. It is therefore of vital importance for a Six Sigma project to identify the correct primary metrics. This ensures that the project is in control. Choosing the wrong primary metrics will create a situation wherein the wrong thing is being measured. This focuses the organization in the wrong area creating colossal losses in the long run.

Traceable to Critical to Quality Measures

The primary metric does not appear in this stage. It has been present in the project since the first step. The primary metrics have their roots in the critical to quality measures defined by the customer. They get recorded in the problem statement, goal statement and business case. Then they are formally chosen as the primary metric if the project is being correctly executed.

What are the Characteristics of an Appropriate Primary Metric?

- **Accurately describes the desired condition:** Metrics describe a condition in the process. For example in an automobile factory, the number of cars being produced per hour is a measure of how efficient the assembly line is. Let's assume that the number of workers present in the factory was chosen as a metric, it would cloud the judgement of the management. This is because it is possible for all the workers to be present and not produce a single car. Hence it is a bad metric for efficiency. The metric must accurately describe the state of affairs.
- **Time lag should be minimum:** Metrics need to be seen by the management to take corrective action if the project is going off track. The sooner the management finds out this information the better it is. If the metric takes a considerable time to calculate, it does not solve the purpose very well. By the time the management finds out that the process is out of control, considerable damage may have already been done.
- **Not open to manipulation:** Supervisors usually have their own agenda. They are likely to manipulate the metrics to get the additional bonus or get shielded from the punishment. If the metric allows people to behave in such a manner, it has not been efficiently chosen. A good metric is non-human i.e. automatically records and transmits information minimizing corruption.

Secondary Metric(s) - Meaning, Purpose and its Identification

A process driven by primary metric alone is not fool proof. Operations managers always know that they face trade-offs. With everything that is desired, there is a chance that something that is not desired will come in too. Hence to prevent these secondary metrics are required. **Here is how to use secondary metrics to ensure that the Six Sigma Project is seamlessly executed.**

What is a Secondary Metric?

While a primary metric measures what needs to be fixed, the secondary metric measures what must not be broken. This concept can be better explained with the help of an example. For instance the number of cars produced per hour is the primary metric in the factory, workers may start working haphazardly on each car to maximise the primary metric. This will obviously be detrimental to the business. On the other hand, if a secondary metric that measures the number of defects is introduced then the workers cannot get away with haphazard production.

What Purposes does the Secondary Metric Solve?

Holistic Picture: The secondary metrics help the management gain a more holistic view into the state of operations. The primary metric just conveys information about one of the Y's (outputs) of the process. Information about the other outputs is obtained by the management through secondary metrics.

Problem Shifting: Most importantly, secondary metrics ensure that workers are not able to shift problems in the name of six sigma projects. If huge amount of resources are spent on making the assembly line more productive, but at the end we have a faster but more defects producing assembly line, we may be worse off than we started. While trade-offs are a part of the picture, something needs to be lost to make the process more efficient, it must be monitored explicitly. This is what the secondary metrics help us to do.

How to Identify Secondary Metrics in the Process?

The process could be full of secondary metrics. The goal is to tell the management a complete story with as few numbers as possible. If a large amount of secondary metrics are chosen, it may become difficult for the management to keep track of them. Here is how to choose the best secondary metrics for the smooth functioning of the process.

Other Critical to Quality Measures: The most important critical to quality measure usually becomes the Primary Metric. The other critical to quality measures are good candidates for secondary metrics. This is because since they are critical, their value needs to be controlled. Hence the top few metrics which determine the quality of output should be made secondary metrics.

Assume Future Problems: Another method of finding out secondary metrics is to figure out what can possibly go wrong with the Six Sigma project. Anything which has a plausible chance of negating the positive effects created by the Six Sigma project is a secondary metric and needs the attention of the management.

Measuring the Financial Benefits of a Six Sigma Project

The final step in the metrics is to measure the financial benefits that are accruing to the firm because of the Six Sigma project being undertaken. This is important and is also an area of concern. Most criticisms of Six Sigma say

that the benefits that are presented in such analysis are incorrect and actually do not accrue to the firm. They claim that the true picture of the projects is often different.

However, to get the resources sanctioned from the finance department, it is essential that the Net Present Value (NPV) of the project be presented to them. The most common category of gains that accrue to an organization because of six sigma projects is as follows:

Increased Revenue: The most obvious benefits of the six sigma project would be an increase in revenue. This could be driven by many factors. With more efficient processes, the firm may be able to produce goods more cheaply than others and hence sell more increasing revenues. Or with the help of six sigma projects, the firm could increase the quality of its products increasing customer loyalty and adding to revenues.

Avoided Costs: The firm can avoid many costs in the form of regulatory penalties, expansion costs etc, if its processes are efficient. Let's assume that a factory manufactures 100 cars. If by efficiently redesigning the processes, the factory can now manufacture 120 cars, then the fixed costs of manufacturing those 20 cars have been avoided. Governments sometimes penalise inefficient behaviour in companies. For instance if the company does not pay its taxes on time, it has to pay penalties. Six sigma projects can make these processes efficient and avoid such costs for the management.

Reduced Costs: The operational costs of the firm can be drastically reduced with the help of six sigma projects. With the help of Six Sigma, Motorola was able to offer pagers which were much better in features than the competitors at a price which was much less than that of the competitors.

Non-Monetary Benefits: There are several non-monetary benefits that accrue to the firms as well. In many cases these translate into indirect monetary benefits. However since they cannot be precisely measured they must be called non-monetary. Common examples of such benefits are as follows:

- Increased customer satisfaction
- Increased employee satisfaction
- Improvement in the reputation of the firm etc

Critics of six sigma say that analysts use fuzzy numbers and double counting to increase the NPV of the projects in question. However there is no doubt about the fact that efficiency has never harmed an organization. Undertaking six sigma projects and completing them efficiently will only make the organization better off.

What is Project Risk?

What is Risk?

Having the best people execute the plan does not guarantee success. There are a host of external factors which may play a role in determining the outcome regarding whether a project has been successful or not. These are called Project risks. The formal definition of a risk is an event or occurrence that may negatively impact the project.

Risks can be mitigated and even prevented. However this requires a good amount of understanding of the risks and advance planning. It is for this reason that DMAIC methodology in Six Sigma has risk assessment as an inbuilt step. You cannot ignore it if you truly follow the DMAIC philosophy.

To better understand risks, it is essential that we understand that risks fall into categories. The major categories of risk are as follows:

- **Stakeholder Risk:** Stakeholders are people who have any kind of vested interest in the performance of the project. Common examples of stakeholders are as regulators, customers, suppliers, managers, customers etc. Stakeholder risk arises from the fact that stakeholders may not have the inclination or the capabilities required to execute the project.

- **Regulatory Risk:** An organization faces several kinds of regulations. It faces rules from the local and state government where they operate. It faces rules of the national government where it operates. It also faces rules of international trade bodies. To add to all this there are internal regulations which have been put into place for better internal governance and avoiding fraud. The Six Sigma team has to ensure that the project does not adversely affect the compliance towards these risks in any way whatsoever.
- **Technology Risk:** Many times the solution proposed by the project requires implementation of a new technology. However the organization may not be in a position to acquire these technologies due to financial or operational constraints. This poses obvious risks to the project as it can adversely affect the implementation of the proposed solution.
- **External Risk:** The execution of a project requires help and support from several outside vendors as well. The dependence on these vendors poses obvious risk to the execution of the project. These vendors lie outside the direct control of any organization. The organization may have very little ways to predict issues arising from external sources.
- **Execution Risk:** The project also faces risk of not receiving continued support from the organization. This is because the organization may discover better use of their resources in the additional time. It is also likely that the project may be poorly scoped causing it to spill over leading to wastage of resources prompting the management to abandon the project.

An experienced six sigma team will usually give the risk assessment part to its most capable member. The better prepared the risk assessment plans, the better chance the organization has of successfully implementing that project.

How to Prepare the Project Risk Assessment Matrix?

The Project Risk Assessment Matrix is one of the required documents to complete the Define phase of the DMAIC methodology. The procedure has been designed in such a way to ensure that people implementing the project have given a thought to what can possibly go wrong and begin thinking of mitigation plans. **Here is a step by step review of how to prepare the Project Risk Assessment Matrix:**

Step 1: List down the Risks

The first step in the process begins with the listing down of all the risks that the participants can think of. This is usually done in a brainstorming session. Participants are typically given a list which contains common categories of risks. The participants are then advised to think of whatever risk they can foresee in the project category by category. This is done over and over again to ensure that the list is exhaustive.

Step 2: Rate for Probability and Impact

Once the list of the possible risks that a project may face is available, the next step is to rate the risks. The risks are rated on two parameters viz. probability of occurring and impact of occurring. In both cases the score is given out of 5, with 5 being certainty that the risk will occur or have a very high impact if they do occur. The scores are then multiplied and then arranged in a descending order.

Step 3: Classify the Risks

All risks are not equally important from the six sigma project point of view. Hence they need to be classified and efforts need to be focussed only on the ones that are priority. There is usually a standard matrix that classifies the risks into the following 4 categories based on the parameters:

- **High Probability & High Impact:** These risks are considered show-stoppers and are the priority of any mitigation plan.

- **High Probability & Low Impact:** These are standard risks, mitigation plans are advised because of high frequency but the impact is low and manageable
- **Low Probability & High Impact:** These are called the black swans. The chances of these events occurring are almost zero. However if these events do occur, they have a huge impact on operations. Mitigation plans must be in place. Prevention must be the first option.
- **Low Probability & Low Impact:** These risks are considered insignificant. This is because it is unlikely that they will occur. Even if they do occur, the damage done is minimal. Hence they are not the focus of mitigation plans.

Step 4: Decide on Mitigation Planning

There are three basic strategies which help mitigate risks successfully. They are:

- **Prevention:** These plans try to ensure that the risk event cannot take place. This is advisable for the high impact risks.
- **Correction:** These plans try to catch the risks early before too much damage has been done. Early signalling is the crux of these plans. However the characteristic difference is the attempt to minimize the impact.
- **Warning:** Here too the emphasis is on detecting the risk as early as possible. However the element of correction is not present.

What is a Project Schedule?

What is a Project Schedule?

A Project schedule is a document that contains vital information about the beginning and ending of the each of the five phases of the DMIAC Six Sigma methodology. The project schedule is an important document because it contains information about the project team, risks that have been identified and most importantly the approval status.

After each stage of the project that has been completed there is usually a meeting which focuses on the work done in that stage in the light of what was planned.

The project schedule contains information about the dates of these meetings and their agenda. Project schedules are often displayed graphically on the shop floors to remind the team members about the current status and what should have been achieved by then

Factors to Consider Before Deciding a Project Schedule

Choosing an arbitrary project date can lead to the Project schedule not being followed and make the entire process meaningless. It is therefore important that the Project schedule be created by a senior person on the team like a Project Champion, a Project Lead or someone with a similar level of authority. Here is the information that they are usually required to consider:

Historical Six Sigma Information: In most cases, the project in question is usually not the first six sigma project being taken. Many similar projects have been undertaken in the past. The time taken while completion of these projects and the issues faced are usually documented. This information should be referred to before deciding the project schedule.

Constraints: A project team seldom has all the resources it needs. However many times resources are present with the parent organization and just need to be transferred to the project team. In such cases the time taken will generally be less. However in many cases, the organization has to acquire resources for the project team to execute. Not only

are there usual bureaucratic hitches involved but also whether the organization is willing to spend the additional amount on the project. Time should be given for convincing the management.

Assumptions: Many times there are assumptions regarding the project requirements which may be unrealistic. For instance the project may require the services of a certain expert who obviously has other commitments to. Experts usually arrive at the project just at the time that they are required to. Expecting them to understand the project and start delivering immediately is incorrect. In many cases training is given to newer members to carry out six sigma project tasks. Expecting them to be well versed immediately after training without any hands-on experience is also an unrealistic expectation.

Risks: The risks assessment document provides a good estimate about the characteristic of setbacks that a project is likely to suffer. Hence this document must be carefully studied before arriving at a schedule.

The idea is to stretch the project team just beyond its capabilities. This will keep them on their toes. Giving them targets they can never meet is a demoralizer.