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APPLICATION OF LEAN SIX SIGMA IN INFORMATION TECHNOLOGY SUPPORT SERVICES: A CASE STUDY

1. INTRODUCTION

The last two decades have witnessed an increased pressure from customers and competitors for greater value from their purchase whether based on superior quality, faster delivery, or lower cost (or a combination of all) in both manufacturing and service sectors (Antony *et al.*, 2018a). A number of studies have explicitly shown that Lean and Six Sigma are two popular and dominant process excellence methodologies widely adopted by a number of manufacturing and service organisations for achieving process efficiency and effectiveness, which results in superior customer service experience, superior product and service quality, enhanced business profitability, and sustainable competitive advantage (Antony *et al.* 2017a).

Lean is a western adaptation of the Toyota Production System (TPS), which seeks to reduce or eliminate overburden (*muri*), inconsistency (*mura*), and waste (*muda*) in all operational processes and industries (Shah and Ward, 2007). Lean addresses different types of waste and uses specific tools and techniques from the Lean toolbox to reduce such waste in processes. Waste in this context is defined as anything that increases cost without adding value in the eyes of the customer (Cudney *et al.*, 2014). The eight types of waste defined as Transport, Inventory, Motion, Waiting, Over-production, Over-processing, Defects and Non-utilized skills.

Six Sigma has its roots in manufacturing and has been widely accepted by many world-class manufacturing and service organisations such as General Electric, Honeywell, ABB, Bank of America, to name a few, resulting in significant bottom-line results (Montgomery and Woodall, 2008). Six Sigma utilises a powerful problem solving methodology to define, measure, analyse, improve and control processes and implement cost-effective solutions leading to significant financial savings.

Lean does not address variation within a process; rather it addresses variation between end-to-end processes which appears in the form of waste due to waiting time, excessive motion, rework, over processing to name but a few. One of the major limitations of Lean is that it cannot be used to tackle problems related to process stability and capability. Six Sigma does

not address process streamlining and process speed /flow. For these reasons, an integrated approach of Lean and Six Sigma (also called Lean Six Sigma - LSS) may be pursued according to various practitioners (George, 2002).

LSS is defined by Snee (2010) as ‘a business strategy and methodology that increases process performance resulting in enhanced customer satisfaction and improved bottom line results’. Bendell (2006) showed that LSS as an integrated methodology can be applied to reduce waste, process variability and errors while contributing to improvements in process yield and capability in the business processes. Many organizations implement LSS strategy in the current time to improve their business performance, improve product quality, enhance customer satisfaction and operational efficiency, especially with the growth of global markets (Hilton and Sohal, 2012).

Although Lean Six Sigma has its roots in manufacturing, it is proven to be a well-established process excellence (PE) methodology in almost every sector despite of its size and nature. This includes sectors like healthcare (Gijo and Antony, 2014), higher education (Antony *et al.*, 2018b), Police Force (Antony *et al.*, 2017b), Food industry (Dora and Gellynck, 2015). Moreover, a number of small and medium sized enterprises have shown some remarkable results from the adoption of LSS as a business process excellence methodology (Antony *et al.*, 2016).

Lean Six Sigma can be used as a catalyst for small and large scale improvements in any business in the form of continual improvement projects which leads to sustainable bottom-line results. The case study organisation in this project has been constantly receiving customer complaints and the root causes were never addressed right first time. LSS is a powerful choice in situations like this where the solutions are unknown or root causes are not understood

The rest of this paper is organized as follows: Section 2 explains the literature review on LSS in services with a greater focus on IT services, followed by a research methodology adopted for the study in Section 3. Section 4 demonstrates the application of LSS DMAIC methodology highlighting the five stages of the methodology. Section 5 discusses the lessons learned, managerial implications and limitations of the study. This article ends with concluding remarks and future research directions in Section 6.

2. LITERATURE REVIEW

In the current competitive landscape of the service sector, organisations feel the need to consistently generate high value output to the customers at a lower cost. The ever-changing customer needs makes this immense task ever more complex. Though quality management has offered directions to handle this complexity, the value of an organization's output includes not just quality, but other key customer-centric metrics like availability, reliability, delivery performance, and after-market service. Hence undoubtedly, service firms have a compelling need to constantly look for ways to improve their processes with dynamism. Literature shows many process excellence (PE) methodologies and practices towards this cause. Among many, Six Sigma and Lean have been the most accepted and applied PE practices (Albliwi *et al.*, 2015). Both Lean and Six Sigma have been in the corporate application since their beginnings. Similarities could be obvious between Lean and Six Sigma as they both strive to improve processes towards building a culture of continuous improvement in organisations. However, their approaches are different. Lean is a bottom-up strategy empowering front line staff to ideate and implement the improvements, whereas Six Sigma is more a top-down approach where management engages a few niche skilled belts to bring in process transformations (Snee, 2010). The belt system includes, Master Black Belt, Black Belt, Green Belt, Yellow Belt etc. Depends on the complexity of the problem under investigation, appropriate Belts are selected for the project team.

Arnheiter and Maleyeff (2005) argued that the companies which practice Lean management or Six Sigma in isolation would reach a saturation point of diminishing returns after a few years from the inception of its deployment. Another drawback of deploying Lean and Six Sigma in isolation is the conflicting sub-cultures that would often emerge leading to lower or sometimes negative returns on investment (Bendell, 2006). According to Bhamu and Sangwan (2014), a structured cross-fertilisation of LSS methodology can be used in a wide range of projects to tackle specific problems. Six Sigma complements the Lean philosophy by providing the tools to tackle specific problems that are identified along the PE journey focusing on reducing defects and process variation (Wheat *et al.*, 2003; Sunder and Antony, 2015). Similarly, Lean supports Six Sigma by levelling the empowerment and education in the organisation to identify and eliminate non-value adding activities (Pepper and Spedding, 2010). The amalgamation of Lean and Six Sigma as Lean Six Sigma overcomes their individual shortcomings and helps strengthen the PE practice by building synergies among

them. Lean Six Sigma works better than previous approaches because it integrates the human and process aspects of process improvement (Snee, 2000).

George (2002) in his book “Lean Six Sigma: Combining Six Sigma Quality with Lean Speed” introduced the term Lean Six Sigma (LSS), and since its inception, LSS has been proved to be successful in both manufacturing and services sectors as a management strategy for PE. According to Antony (2015), today, LSS has been acknowledged by more than 70 per cent of Fortune 500 companies across various services. Literature shows evidence of various action research and case study papers on application of LSS in firms. A few examples include: Kumar *et al.*, (2006) presented a case study featuring the implementation of LSS in Indian small and medium enterprises. Chen and Lyu (2009) highlighted a study featuring the implementation of LSS approach in touch panel quality improvement. Sunder (2016) presented a case study of successful application of LSS in banking sector to reduce rejects in customer services. Gijo and Antony (2014) improved patient waiting time in the out-patient department of a super specialty hospital using LSS. Laureani *et al.*, (2010), increased the first-call resolution ratio of a call centre using LSS. Gijo and Sarkar (2013) discuss application of Six Sigma in road construction.

From a project management perspective, LSS adopts Define-Measure-Analyse-Improve-Control (DMAIC) and Define-Measure-Analyse-Design-Validate (DMADV) roadmaps from its predecessor Six Sigma. However different variations of these roadmaps exist based on case wise customisations. The DMAIC methodology is most popular as it synergises the Six Sigma and the Lean tools and techniques at the appropriate stages for process improvement, while the latter focuses on process (or product) design or redesign (George, 2002; Snee, 2010). As per Thomas *et al.*, (2008), DMAIC methodology is considered as the most effective for implementation of LSS in organisational context for process improvement. Commonly used DMAIC tools include project charter, value stream maps, swim lane process maps, Gemba study, waste analysis, process capability analysis, Gauge R-R, Cause-Effect diagram, five-why analysis, statistical tests (like correlation, ANOVA), graphical tests (like Pareto charts, multi-vari charts) etc., The structured problem solving approach of LSS DMAIC questions the process status quo by making some fundamental assertions like:

- Define – What is the problem? Does it exist?
- Measure – How is the process measured? How is it performing?

- Analyse – What are the most important causes of defects?
- Improve – How do we remove the causes of the defects?
- Control – How can we maintain the improvements?

Though the applicability of LSS in services has been evident, research in applying LSS in the subsector of Information technology (IT) services has been scarce. A deeper look at the literature shows a study conducted by Byrne *et al.*, (2007) highlights a software firm, Caterpillar's success using LSS for innovation, by growing revenues by 80% in five years. Though this study has not offered the LSS project management aspects in detail, it explained the LSS deployment through a longitudinal study and subsequent implications in IT services. Through another case study, a total of 30% of the business processes were found to be LSS conducive in an IT-based company by Duarte *et al.*, (2012). Even recently, Nicoletti (2013) demonstrated how LSS method can be applied to information technology and communication systems. Though these examples confirm the applicability of LSS in IT sector, the body of knowledge supporting this claim needs further validation.

3. METHODOLOGY

The methodology adopted for this research is discussed in this section. Researchers have used the case study research methodology for many years across a variety of disciplines including business management. Case studies aim to analyze specific issues within the boundaries of a specific environment, situation or organization. The primary advantage of using case study methodology is that one can collect data and perform analysis within the context of study and the ability to capture complexities of real-life situations so that the phenomenon can be studied in greater levels of depth (Hamel *et al.*, 1993). A number of social scientists have adopted case study methodology as it can help them by illustrating what has worked well in the case study scenarios and what have been the major issues or stumbling blocks. Yin (2009) describes a case study as an empirical inquiry that investigates a contemporary phenomenon within its real-life context. The authors utilize a single case study approach as there is only organisation involved in the investigation and moreover the case study is applied to a single function, i.e., IT services. Although multiple-case studies on many occasions provide more robust and valid conclusions, the single case study could be considered acceptable provided it meets the established objectives set by the researchers. A study from Welsh and Lyons (2001) showed that the outcomes from single case studies are not statistically generalizable.

The case study methodology is preferred over other research methodologies due to the following reasons (Merriam and Tisdell, 2015):

- Case study methodology offers flexibility in design and application which are more sensitive to the complexities of social phenomena than quantitative methods
- The case study approach offers a means of investigating complex social programmes, consisting of multiple variables of potential importance in understanding the phenomenon
- Because of its in-depth approach, case study methodology often sheds light in aspects of human thinking and behaviour that would be impractical to study in other ways.
- Case study approach confirms the researchers' pre-conceived notions at the outset of the investigation, especially in problem solving scenarios.

The authors have followed an adapted six stage process for carrying out the case study methodology (Stake, 1995; Simons, 1980). These steps are briefly outlined below.

1. *Define the problem to be studied within the case study organisation:*
2. *Determine the most suited problem solving methodology to be adopted for the given problem*
3. *Execute the methodology and collect all the necessary data which are pertinent to the problem under investigation*
4. *Perform analysis on the data using appropriate statistical software and interpret the key findings from the analysis*
5. *Report the key findings from the case study*
6. *Disseminate and communicate the key lessons learned to key stakeholders and the focus must be on what worked best and what did not*

During this research, an attempt was made to study the application of Lean Six Sigma DMAIC (Define-Measure-Analyze-Improve-Control) methodology in an IT services department of a large electrical equipment manufacturing company in India. For that purpose, it was highly desirable for the authors to choose a problem with high impact on customers so that the benefits from the use of LSS methodology could be demonstrated to all parties involved in the case study. The extent to which generality can be claimed from a single case study is limited, but by documenting case experiences in the light of existing literature, each

case adds to the sum of knowledge available for future practitioners and researchers (Antony *et al.*, 2012). During this research, the processes were studied, data were recorded and various statistical tools and techniques were utilized to make inferences regarding the root causes. The lessons learned from the initiative and the problems faced during implementation were recorded during this study, which will be helpful for all future research in this area.

4. CASE STUDY

The company described in this article is a large electrical equipment manufacturing company with a work force of around 12,000 people based in India. They are involved in manufacturing and commissioning of power stations and associated utilities, with a client base in various countries across the world. The management of this organization is very good in adapting all latest technology related to their field of operations. In the quality system and certification front, they were certified to ISO 9001, ISO 14001 and ISO 18001 standards. They had a history of implementing total quality management (TQM) and quality circle concepts for improving the processes for more than a decade. Most of the employees in the organization was trained in the tools and techniques of statistical process control and allied topics. But, most of the training and implementation of all these concepts were generally limited to the core manufacturing and engineering processes.

They had an enterprise resource planning (ERP) system implemented throughout the organization for all its activities. The day-to-day activities were performed with the help of this ERP system. Now-a-days as most of the organizations are moving towards a paperless office, the significance of the ERP system increases. Starting from ordering of material to payment of salaries to the employees is performed with the help of this ERP system. Hence there is constant interaction with the system at various usage points in different departments. Because of the large size of the organization and nature of its activities, the computer and network usage is very high. Also, simultaneously large number of users was logged into the system, the connectivity and other related problems were very high. There was an IT support department to take care of the computer, network and software related issues in the organization. Whenever the users face any problem related to hardware/ software/ network, they used to report the matter immediately to the IT department either through email, phone or by entering a complaint in the register kept with the department. After receiving the complaint, the system department allocates the work to one of its engineers and the problem is addressed. There used to be frequent complaints from the users regarding delay in

resolving these complaints. Further, the organization was implementing Lean Six Sigma (LSS) in all their manufacturing process. Hence the management of the company decided to address this problem through LSS methodology, because a reduction in average and standard deviation in the lead time of complaint resolution is necessary in this case. The management thought it would be a challenging problem due to the nature of the problem and scope of the activities. The remaining part of this section discusses the activities performed in various stages of the LSS project.

4.1 The define phase

The define phase of the Six Sigma methodology aims to define the scope and goals of the improvement project in terms of customer requirements and identify the underlying process that needs improvement. A team of five persons was formed with Manager - Systems Department as team leader to address this problem. The other members of the team were Engineer – System Maintenance, Engineer – Networking, Engineer – Software Maintenance and Manager - Purchase. The team leader is responsible for ensuring the completion of the project within the stipulated time with expected results by involving the team members (Antony *et al.*, 2016).

The first step in the project was to develop a project charter with all necessary details of the project including team composition and schedule for the project (Refer annexure - 1). For having a better understanding of the process, a SIPOC (Supplier-Input-Process-Output-Customer) mapping was prepared for the complaint resolution process and the same is presented in Annexure - 2.

The critical to quality (CTQ) characteristic selected for this study was the ‘complaint resolution time’ measured in hours. As this was the first attempt to address the service process related problems using LSS in this organisation, it was decided by the team to define the target for the CTQ as resolution within 5 hours irrespective of the type of complaint. Any complaint resolution that takes more than 5 hours is considered as a defect.

4.2 The measure phase

Collecting data, understanding the current process in detail and evaluating the baseline performance of the process is the objective of the measure phase (Gijo and Scaria, 2014). Before collecting the data, a data collection plan was prepared which explains the type of

data, method of sampling, duration of data collection etc. The data on Resolution Time in days were collected for past six months from the system. Data regarding a total of 4265 complaints during the past six months were recorded. The data were tested for normality and the p-value was found to be less than 0.05, confirming that the data is from a population that is not normally distributed (refer Figure 1).

<Insert Figure 1 about here>

As the data was not normally distributed, Box-Cox transformation and Johnson transformations were tried to convert the data to normality. But, these transformations didn't work for the data. The details of Johnson transformations are presented in figure 2.

<Insert Figure 2 about here>

Further, to understand the baseline performance of the process based on the selected CTQ, the summary statistics were calculated (Refer figure 3). This data shows an average of 12.49 hours with standard deviation of 28.01 hours. This is considered as a baseline performance of the process.

<Insert Figure 3 about here>

As the target for the CTQ (resolution time) was 5 hours, the baseline performance shows that there is lot of scope for further improvement in the process.

4.3 The analyze phase

During the analyse phase, the causes for delay in complaint resolution were investigated through the process door and data door analysis. For performing the process analysis, an activity flow chart was prepared for the complaint resolution process. This flowchart will help to understand the complexity of the process and identify the value added and non-value added activities. All the steps in the process were investigated to identify which one of them is value adding or non-value adding. After studying all such details, the team identified and listed the non-value added (NVA) activities. The decision about these NVAs was taken by the team in consultation with the project champion and customers of the process. The NVAs thus identified are presented in table 1.

<Insert Table 1 about here>

As a result of these NVAs, the process was getting delayed and on time closing of the complaint was getting affected. Hence, the team decided to plan for actions to address these NVAs during the improve phase of the study. These actions can be for eliminating or minimising the effect of these NVAs influencing resolution time.

Further, to identify the potential causes for delay in complaint resolution process, a brainstorming session was conducted with the project team along with some of the user department personal. During this brainstorming session, the members came out with quite a few potential causes that can create delay in complaint rectification and closing. The identified potential causes during the brainstorming session are presented in a cause and effect diagram (figure 4).

<Insert Figure 4 about here>

After studying the potential causes listed in the cause and effect diagram, the team performed a Gemba investigation in the process to understand the status of each of the listed potential causes (Womack, 2011). Gemba means ‘work place’ and Gemba investigation help us to understand the current situation of the process. During the study, Gemba investigation will assist the team to select the root causes from the identified potential causes based on the information from the workplace. Hence Gemba has a significant role to play during root cause analysis. The process was investigated for a period of one month and the status of the potential causes was observed. The following were the Gemba observations:

1. All the computer related items were supplied by different manufactures. The maintenance contract was awarded to four different agencies and each of their representatives was inside the premises of the organisation for taking care of the respective computer systems/ items supplied by them.
2. All the complaints have to be entered in the intranet platform for record purpose and evaluation. At present complaints are being gathered through various modes – letter, telephone, in-person and lastly through the intranet application.
3. It was found that in some of the cases ‘supplier of the item’ was not correctly mentioned. This resulted in delay in complaint resolution.
4. Existing service engineers are well aware of the plant layout as they keep visiting various office/ shop floor buildings and user departments.

5. 'Non availability of spare parts' would be the major constraint for complaint resolution.
6. The service engineer try to gather the complaints in the morning and as well as during the day. But after resolution they do not close the complaint immediately. The usual practice is to close the entire bunch of complaints at the end of the day. This greatly disturbs the resolution time.

The summary of all these observations collected from GEMBA investigation is presented in table 2.

<Insert Table 2 about here>

The team along with the service providers had a detailed discussion about the GEMBA observations presented in table 2 to identify the root causes from the potential causes that can reduce the resolution time. Based on these discussion and in some cases by multi-voting, the root causes were selected from the potential causes listed in cause and effect diagram. The root causes identified are presented in table 3.

<Insert Table 3 about here>

Thus, the root causes in this study were identified from two sources. One set of root causes based on the process flow chart and NVAs and other set based on the potential causes from cause and effect diagram. Solutions to these root causes, is expected to remove all complexity of the process so that the flow becomes smooth. This will in turn result in lesser resolution time for the process.

4.4 The improve phase

The objective of the improve phase is to identify solutions for the selected root causes, implement them and observe the results so that the process can be improved (Gijo *et al.*, 2018). After studying the details of the selected root causes and discussing with all the concerned personnel of the process, the team identified the solutions for the selected root causes (Gijo *et al.*, 2014).The selected solutions for the root causes from cause and effect diagram and NVAs are presented in tables 4 and 5 respectively.

<Insert Table 4 about here>

<Insert Table 5 about here>

After identifying the solutions, it is the responsibility of the team to implement all the solutions in the process. Prior to implementation of the solution, the team had a discussion

with the respective process owners and the people working on the process to understand their concerns, if any, about the suggested solutions. All such concerns expressed by the process people are discussed in detail and were addressed. Further, a detailed implementation plan was prepared for implementing these solutions. The implementation plan with responsibility and action steps is presented in table 6.

<Insert Table 6 about here>

All these solutions were implemented as per the plan and results were observed. The data were collected for a sample of size 460 after implementation of the solutions. Figure 5 represents the graphical summary of the data after improvement. The mean and standard deviation of the process now are 8.47 and 17.368 respectively.

<Insert Figure 5 about here>

4.5 The control phase

In most of the processes, making improvements are relatively easy, but sustaining the achieved results are more challenging (Gijo, 2011). This is true in the service processes also. As most of the service processes are human dominant processes, the challenge of sustenance of the results increases. The sustainability of results in such service processes can be achieved by employing methods like, standardisation, training, motivating the employees etc.

As a part of these actions, the IT service procedures are documented and provided to all engineers. All the users were provided with details of ‘complaint registration’ process. For monitoring the results, a run chart for resolution time was prepared by the team. The system department personnel were given the responsibility of plotting the data on run chart on a daily basis to study the performance of the process. A sample run chart is provided in figure 6.

<Insert Figure 6 about here>

As a result of this study, the resolution time reduced from 12.49 hours to 8.47 hours. The corresponding standard deviation was reduced from 28.01 days to 17.368 days. The dot plot in figure 7 represents a graphical comparison of resolution time before and after the study.

<Insert Figure 7 about here>

5. KEY LESSONS LEARNED, MANAGERIAL IMPLICATIONS AND LIMITATIONS

This study was aimed at improving the performance of IT service process through the application of LSS methodology. From the case study, it is evident that the power of synergetic LSS approach can bring bottom line benefits to the organisation, alongside bringing process improvements. The importance of continuous improvement, total employee engagement and process thinking were apparent from the success of the project. The project was well recognised by the top management team and the project team got appreciation from various levels in the organization.

The IT Service industry is still in the early stages of evolution with regard to LSS. Therefore, successful execution of simple projects in service processes can enable practitioners to tackle tougher initiatives in the future. Integrating the LSS culture into entire organizations by the commitment and involvement of top management can multiply the positive effects and make a significant impact at all levels. High level of internal communication is also necessary to facilitate the implementation of LSS. Appropriately implemented, LSS clearly produces benefits in terms of better operational efficiency, cost-effectiveness and higher process quality.

The results published in this article are based on a single case study. Also, it is based on the IT service process of a large manufacturing company. Hence, there are limitations in extending these results to other type of industry segments. Further studies need to be conducted in other type of industries including small and medium sized industries to generalise these results. The authors are planning to come out with such studies at a later stage.

6. CONCLUSION AND FUTURE RESEARCH DIRECTIONS

The recent emergence of LSS as a synergetic approach to PE is catching fire across both manufacturing and services sectors. LSS has made a significant impact on how firms handle process-related problems by its structured problem solving approach. LSS becomes more helpful in software firms, IT and IT enabled services as every defect could have a significant financial impact leading to customer dissatisfaction, damaging the overall reputation of the firm. Hence LSS leads building and retaining customer relationships for IT firms by

delivering a defect-free practice. Alongside improving processes by LSS projects, LSS as a management strategy also helps in building a culture of continuous process improvement. It promotes total employee participation from both top-down and bottom-up as a win-win practice to both management and staff members. The IT operations such as transaction-based back offices, call centres, software development teams, testing and bug-fixing operations, research, transcription services etc., has the obligation to maintain the service levels by improving the key performance indicators at optimum levels, to maintain the brand value and subsequently create parodies in the minds of the customers.

The case study presented is a classic example to demonstrate the power of LSS methodology which could transform a process as well the mindset of staff and management. In the case study, the project was directed on three important attributes. The first attribute is management commitment and leadership participation. The second was the customer centricity, and the third is the bottom-line impact and cultural change. Alongside building the improvement mind-set across the IT operations the project brought in tangible benefits viz., the reduction of the resolution time from 12.49 hours to 8.47 hours and the corresponding standard deviation from 28.01 days to 17.36 days. This has resulted in reduction of turn-around-time of other critical processes. The indirect financial savings estimated as a result of this overall impact was around INR 2.5 million. Hence, it is recommended to implement LSS in IT operations, and relevant IT support processes.

This case study provides a systematic problem solving methodology to tackle a real-world problem through the effective implementation of LSS. The case study highlights the significance of data collection and how data can be useful to engineers and managers in an organisation for making reliable decisions. The authors firmly believe that the case study can be used to teach students in various courses as well as it can assist LSS consultants and trainers to showcase the application of LSS in a non-manufacturing function within a large manufacturing company. The authors would expect to pursue more such case studies in other departments such as Human Resources, Finance and Customer Services in the case study organisation.

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Annexure -1: Project Charter

Project Title: Reduction in complaint resolution time		
Background and reasons for selecting the project: The average complaint resolution time was about 12.5 hours with standard deviation of 28 hours. Since the resolution of complaints takes longer duration, the users (the employees working in different departments of the company) were very unhappy and it was affecting the performance of the people working in different departments because, every activity in the organization was to be routed through system.		
Aim of the project: To reduce the customer complaint resolution time to less than 5 hours.		
Project Champion:	General Manager – Information Technology	
Project Leader:	Manager – Systems Department	
Team Members:	Engineer – System Maintenance Engineer – Networking Engineer – Software Maintenance Manager - Purchase	
Characteristics of product/process output and its measure		
CTQ	Measure & Specification	Defect Definition
Resolution time	Time in hours and specification is within 5 hours	More than 5 hours
Expected customer benefits:	The system is restored faster so that the customers are able to meet their deadlines faster. An increased customer satisfaction (all the customers are employees working in different departments of the company – Internal customers).	
Schedule:	Define: 2 Weeks, Measure: 3 weeks, Analyse: 6 weeks, Improve: 4 weeks, Control: 4 weeks	

Annexure – 2: SIPOC

Supplier	Input	Process	Output	Customer
User dept Service Providers	Complaints Service Engineers, Spare parts, Software Packages	Resolution of Complaints	Rectified/ Repaired PCs, Printers and Plotters	User Departments

Process Steps

