Improving Performance in A Service Company

Using Project Management and Six Sigma

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Abstract

Over the last few years, the number of organizations that deliver information technology services is increased. These organizations always need to improve service quality level for optimizing the customer's interaction, satisfaction and enhances the efficiency of the business operation. Thus, service quality continues to be a challenging topic in contemporary quality management theory and practice. Unlike products, services are not easily measured, tested or controlled for quality. This paper concentrates on improving the quality of service in a telecommunications technical support Call Center (CC) through the integration framework of Project Management (PM) and Six Sigma (SS) to control the attribute data.

Keywords: Six Sigma (SS); Integrated Project Management and Six Sigma (IPMSS); improving the service in Call Center (CC).

1. Introduction

Managing performance and quality of service became a significant challenge as telecommunications move into the next generation. The computer and the telephone are two of the major and most familiar tools of technology that have converged to make CCs more efficient and productive, when used properly along with software technology that assists operators to assimilate and analyze customer's data to respond knowledgeably to customer's inquiries for benefits to both the customer and the organization.

Organizations began the journey of processing improvement for many different reasons. Some realized the need for improvement when their products fail after release and must be repaired. Others are driven by mandates and regulatory requirements, such as the need to achieve a Capability Maturity Model Integration (CMMI®).Significant business issues, such as a lost contract or a new market opportunity, can also draw attention to process improvement. Whether an organization’s improvement is focused on the performance of a product, project, or process, its purpose should be to close the gap between actual and desired performance—where “desired” is driven by factors such as customer's requirements and the needs of the business [12, 17].

Many organization are taking advantage of quality management methodologies (such as six sigma) to improve productivity, efficiency, and customer satisfaction. These methodologies require employees to perform set of tasks & adhere to structured processes, involving changes to work habits that can sometimes be disruptive to organizations.

In many organizations, SS means a business management process that provides tangible business results to the bottom line by continuous process of improvement and variations of reduction. As a data-driven, statistically-based approach, SS aims to deliver near-zero defects (as defined by the customers) for every product, process, and transaction within an organization [7-8, 10, 16]. In this study, it is illustrated how two techniques such as the PM and SS can complete each other to improve the performance of service companies.

A well-planned CC implementation involving the integration of computer and telephone technologies and human resources that will provide several specific benefits to organizations, including increasing timely access to information, enabling the sharing of current and new information, more effectively communicating and presenting that information to customers and allowing more timely response to information requested by customers**.**

This paper illustrates how the methodology of the combination of PM & SS as hybrid technologies to control the attribute data (The attribute data is resulted from counting the number of occurrences, these count of data may be expressed as pass / fail, yes / no, or presence / absence of defect) in a service company like CC to improve its performance.

2. Methodology

2.1. Project management

Projects differ from other types of work. A project defined as a temporary endeavor undertaken to create a unique product, service, or result. These temporary and unique characteristics determine if a particular endeavor is a project (PMBOK definition of a project**).** PM also defined as application of knowledge, skills, tools, and techniques to project activities to meet project requirements. PM is accomplished through the appropriate application and integration of the PM process groups. These process groups consist of Initiating, Planning, Executing, Monitoring and Controlling, and Closing mapping PM knowledge areas as in PM matrix [9, 14, 17, 20].

2.1.1 Gantt chart, Critical Path Analysis and PERT

A Gantt chart is a graphical representation of the duration of tasks against the progression of time. Critical Path Method (CPM) is a deterministic method that uses a fixed time to estimate for each activity. While CPM is easy to understand and use, it does not consider the time variations that can have a great impact on the completion time of a complex project. The Program Evaluation and Review Technique (PERT) is a network model that allows for randomness in activity completion times [19].

Optimistic time (O) Pessimistic time (P); Most likely time (M) and Expected time (T_E) [19].

$$T_E = (O + 4M + P)/ 6$$

Float or Slack is the amount of time that a task in a project network can be delayed without causing a delay. Critical Path is the longest possible continuous pathway taken from the initial event to the terminal event. It determines the total time required for the project; and, therefore, any time delays along the critical path will delay reaching of the terminal event by at least the same amount [19].

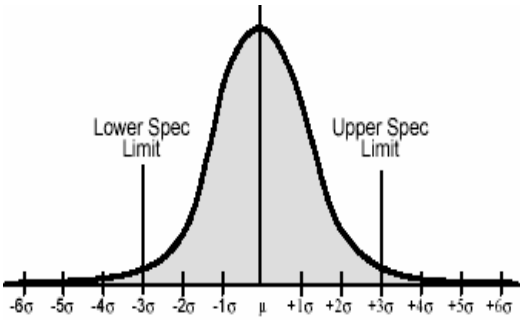
Resource leveling is a process used to examine unbalanced use of resources (usually people or equipments) over time, and for resolving over-allocations or conflicts. When performing project planning activities, the manager will attempt to schedule certain tasks simultaneously. When more resources such as machines or people are needed than what are available, the tasks will have to be rescheduled to manage the constraint. Project planning resource leveling is the process of resolving these conflicts. It can also be used to balance the workload of primary resources over the course of the project, usually at the expense of one of the traditional triple constraints (time, cost, scope) [19].

2.2 Six Sigma

SS has been gaining considerable attention in recent years. SS defined as a business management strategy, originally developed by Motorola that now has a wide-spread application in many sectors of industry. Many organizations are taking advantage of Quality Management methodologies (such as SS) to improve productivity, efficiency, and customer satisfaction. These methodologies require employees to perform set tasks and adhere to structured processes, involving changes to work habits that can sometimes be disruptive to organizations. The primary reason for the success of SS is that it

provides a systematic approach for quality and process improvement, and it is not just a collection of tools [2-8].

SS seeks to identify and remove the causes of defects and errors in manufacturing and/or service delivery and business processes. It is a management philosophy based on meeting business objectives by striving for perfection. It uses a set of management methods, including statistical methods, and creates a dedicated infrastructure of people within the organization who are experts in these methods. Fig. 1 Shows for instance, a 99.4% yields equates to 6,210 defects, which is a 4.0 sigma level. While a 99.98% might look great which it yields the 5.0 sigma level on the process but still leaves room for substantial improvement and so on [8].



Sigma Level	Yield	DPMO
1.0	30.9%	690,000
2.0	69.2%	308,000
3.0	93.3%	66,800
4.0	99.4%	6,210
5.0	99.98%	320
6.0	99.9997%	3.4

Fig. 1 Normal Distribution, 3σ Design &Converting
Sigma level to Expected Defects per Million

There are two SS methodologies: DMAIC (Define-Measure-Analyze-Improve-Control) and DMADV (Define-Measure-Analyze-Design-Verify). Both DMAIC and DMADV inspired by Deming's Plan-Do- Check-Act Cycle. DMAIC is used to focus on reducing the process variation to improve an existing business process; DMADV is used to create new product or process designs [17].

In this paper, SS DMAIC methodology is used and the primary objective of the five steps process is to recognize critical customer's requirement, identify and validate the improvement opportunity, and upgrade the business processes. The optimized “to-be” model combined PM.

2.3 Integrated Six Sigma and Project Management to improve the quality of the Call Center

CCs provide a single contact for customers who may try to reach a company via multiple channels: e-mail, Web chat, fax, phone, or VOIP (Voice Over Internet Protocol). CCs often called contact centers to reflect the multiple points of access providing staff with consistent information throughout an integrated system. The centers capture data from across the

enterprise and consolidate customer-related information into a central database. This integration improves the customer's satisfaction and enhances the efficiency of the business operation. Businesses have several issues to consider in their daily relationships with customers:

- Keeping customers satisfied before and after sale.
- Managing customer data scattered all over the enterprises.
- Planning and budgeting resources to invest in customer retention

Quality Monitoring for CC assure that the calls responded by Customer Service Representatives (CSRs) as follows:

- The standard of customer service.
- Give accurate and complete information with the right troubleshooting for customer's problem.
- Achieve resolution for customer's problem from the first time.
- Assure that the customer receives enough information regardless of the CSR answered him or not to achieve customer satisfaction.
- Assure that the call is in an appropriate duration so it becomes more cost efficient.

To assure that the CSR achieve all the previous goals, a quality scoring sheet is created to measure the performance of the CSRs in every criteria of the above and based on this criteria the call can be deemed pass or fail according to its type of error made by CSR as follows:

Fatal Errors defined as “Inaccuracies that cause an entire transaction to be deemed defective. Typically, these are errors that will cause the end user to contact the CC again and will cause an unnecessary expense for the company and the end user.

Non-Fatal Errors defined as “Inaccuracies that do not cause an entire transaction to be deemed defective". There are many examples include errors in professionalism, software skills, and some input data errors**.**

There are many challenges facing project managers: data gathering and analysis, problem solving, understanding and evaluating existing processes, developing and tracking measurements in a standardized manner, and making quantitative evaluations. Too many PM methods have been failed not because they weren't adding value but because they couldn't measure the effectiveness of the methodology or quantify the value added by process changes. SS provides a structured data-driven methodology with tools and techniques that companies can use to measure their performance both before and after SS projects. Thus, SS helps managers to be successful in all of these challenges.

This success is accomplished by means of understanding what the methodology is, how it is applied, and how it is used. So; Using SS, management can measure the baseline performance of their processes and determine the root causes of variations so they can improve their processes to meet the desired performance levels.

The combination of PM and SS rely on that the two strategies, it seems to be complemented to each other where SS framework can extend its functionalities through the integrations with other applications such as PM tool. Thus, this integration provides the flexibility to SS. It also helps SS to overcome its drawback the lack of ways of collecting data from the current process. So, PM tool can provide the sources of data which are required during SS projects. Overall, this integration for two strategies enables organization to get the maximum benefit from quality management techniques at lower risk.

The proposed integrated framework is shown as in Fig. 2 and that figure is as the same as of Puri & Singh (2009) mentioned in [15] with a small modification in phase 1 and of course we apply different tools according to the following case study.

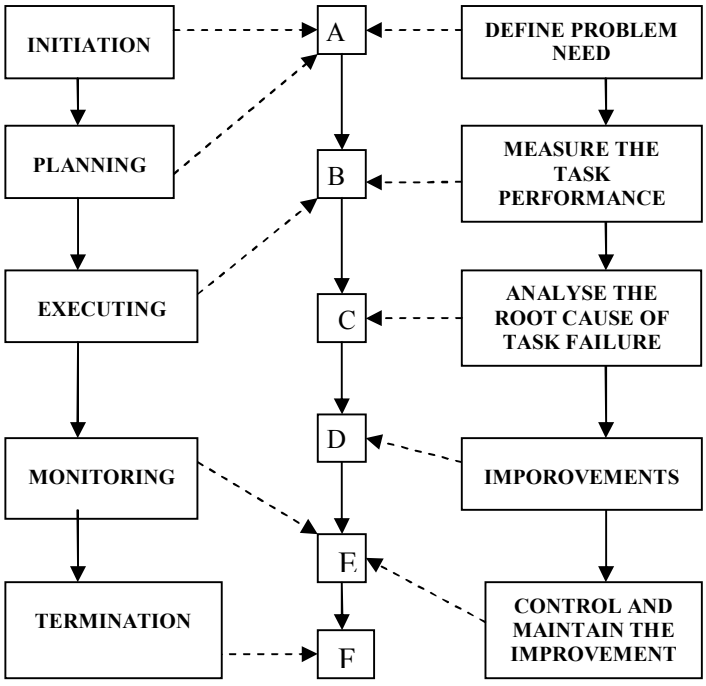


Fig. 2 An Integrated Framework: Combining PM and SS

3. Case study

The following case study is for CC which its quality monitoring takes the randomized sample of data sheet (attribute data) to assure that the calls responded by CSR have the standard of customer service and the result of the monitoring process reflects the reality of the process. Note that there is a cost associated with each process according to the errors. The chart in Fig. 3 represents the actual performance in the first 15 weeks of the year 2010 which shows that the problem indicators as follows:

1- The average weekly performance of service process is approximately 64% which mean that the company operates at 1.8 Sigma Level.
2- The 36% defect calls contribute about 45% of repeated calls (no added value to calls).

As a result of these points

1- The cost per call increases to 5.37 LE with a volume of 200000 calls per month.
2- The service level decreased to range between 28-50%.
3- The customer waiting time in a queue ranged from 6 to 15 min.

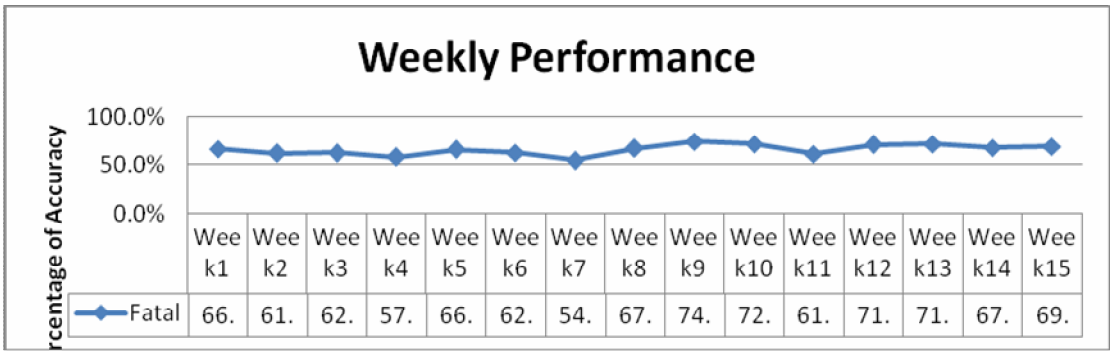


Fig. 3 The actual performance in the first 15 weeks of the year 2010

Project definition

The main problem of CC is not achieving the desired benchmark of process (98%) where the quality performance is low and the system does not operate at full capacity due to major bottlenecks and problems in services processes.

The project scope

The project scope is to improve the quality of telecommunications technical support CC using the integrated PM and SS to optimize its processes so it can raise the performance to 98% which equal to 3.5 SS level.

Project plan

Project plan is based on the integrated model combining the principles of both SS and PM where both methods have their own steps and phases to follow; the integrated model merges the concepts of both of them to form one single model.

Methodology used

Applying the integrated framework as in Fig. 2 which contains six phases and the results of these phases as follows:

Results and Discussion

Phase A **"Identifying the project objectives**": this phase is similar in both methodologies (PM & SS) where the project initiation and planning phase in PM process are integrated with the defined phase of SS to determine the nature and scope of the project to ensure that all the individual system, processes and platform requirements are understood and incorporated into the project. Thus, this phase includes a cohesive plan that encompasses the following areas; (developing the project charter, capturing the customer's voice and identifying critical success factors). The basic consideration in project planning is the work breakdown structure (WBS) that divides the overall project into work elements and identifies the project sub-systems interfaces to be managed. Notice that, the Plan is based on the DMAIC methodology phases. Thus, WBS depends on DMAIC process.

Applying PM on data including (Pessimistic, optimistic and most likely) by using PERT analysis to estimate durations. The data are shown in the excel sheet as in Table 1. Also, The Gantt chart of project baseline and tracking is conducted using **MS Project software ver. 2010** showing the critical path analysis. Besides, resource assignment and cost are also applied to the case study using the same Package and it found that due to the over allocations of project manager, the project leveling is done to reallocate the tasks to avoid the resources overload which increase the project total duration from 132 days to 140 Days.

Table 1 PERT analysis in Call Center

PERT Analysis							
Project		Improving Call center quality					
Project Manager		N. Y					
ID	**Task**	**Most Likely (M)**	**Min (O)**	**Max (P)**	**PERT Est (T_E)**	**Std-Dev.**	**Variance**
1	***DMAIC Project Plan***						
1.1	**Define Phase**						
1.1.1	**Assign the team members**	**2.00**	**1.00**	**5.00**	**2.33**	**0.67**	**0.44**
1.1.2	**Define Key processes**	**10.00**	**5.00**	**15.00**	**10.00**	**1.67**	**2.78**
1.1.3	**Develop the Project Charter**	**2.00**	**1.00**	**4.00**	**2.17**	**0.50**	**0.25**
1.1.4	**Review deliverables**	**3.00**	**2.00**	**5.00**	**3.17**	**0.50**	**0.25**
1.1.5	**Tollgate complete**	**2.00**	**1.00**	**3.00**	**2.00**	**0.33**	**0.11**
1.2	**Measure Phase**						
1.2.1	**Define the Key Metrics**	**10.00**	**8.00**	**15.00**	**10.50**	**1.17**	**1.36**
1.2.2	**Measure Process Baseline (Control Charts)**	**30.00**	**25.00**	**45.00**	**31.67**	**3.33**	**11.11**
1.2.3	**Measurement system Analysis**	**10.00**	**5.00**	**15.00**	**10.00**	**1.67**	**2.78**
1.2.4	**Define the Benchmarks**	**5.00**	**3.00**	**10.00**	**5.50**	**1.17**	**1.36**
1.2.5	**Tollgate Complete**	**2.00**	**1.00**	**3.00**	**2.00**	**0.33**	**0.11**
1.3	**Analyze Phase**						
1.3.1	**Perform Gap Analysis**	**10.00**	**8.00**	**15.00**	**10.50**	**1.17**	**1.36**
1.3.2	**Define performance objectives**	**4.00**	**3.00**	**8.00**	**4.50**	**0.83**	**0.69**
1.3.3	**Identify Variation Source**	**10.00**	**5.00**	**15.00**	**10.00**	**1.67**	**2.78**
1.3.4	**Tollgate Complete**	**2.00**	**1.00**	**3.00**	**2.00**	**0.33**	**0.11**
1.4	**Improve Phase**						
1.4.1	**Failure mode effect Analysis**	**3.00**	**2.00**	**5.00**	**3.17**	**0.50**	**0.25**
1.4.2	**Establish the Action Plan**	**3.00**	**2.00**	**5.00**	**3.17**	**0.50**	**0.25**
1.4.3	**Deploy the Action plan**	**30.00**	**20.00**	**45.00**	**30.83**	**4.17**	**17.36**
1.4.4	**Tollgate Complete**	**2.00**	**1.00**	**3.00**	**2.00**	**0.33**	**0.11**
1.5	**Control Phase**						
1.5.1	**Monitor the achievements**	**30.00**	**20.00**	**45.00**	**30.83**	**4.17**	**17.36**
1.5.2	**Document Lesson Learned**	**4.00**	**3.00**	**8.00**	**4.50**	**0.83**	**0.69**
1.5.3	**Review deliverables**	**3.00**	**2.00**	**5.00**	**3.17**	**0.50**	**0.25**
1.5.4	**Tollgate complete**	**2.00**	**1.00**	**3.00**	**2.00**	**0.33**	**0.11**
1.6	**DMAIC Cycle Complete**				**0.00**	**0.00**	**0.00**

Then, developing the project charter which provides a preliminary delineation of roles and responsibilities besides, outlines the project objectives, identifies the main stockholders, and defines the authority of the project manager. It is used as a reference of authority for the future of the project.

So, the project's purpose and scope is defined during this phase. One of the key success factors of SS and one aspect that will almost guarantee success is to start with an understanding of what business processes are critical to an organization in achieving its objectives. These are called the Critical to

Quality (CTQ) processes and are defined in terms of how they affect customers. Clearly, any service improvement activities that are applied to these CTQ processes will likely yield the greatest return financially.

This phase does not only involve the use of techniques like PERT/CPM for project scheduling but it involves a much wider scope of a project. It begins by setting the project goals, identifying bottlenecks in the project tasks, cost estimating / budgeting, risk management, resource usage estimating and the milestones to be covered to ensure that project is going to be completed successfully.

Voice of Customer (VOC) is the process of gathering customer comments in the form of surveys. VOC statements are translated into quantitative specifications for the process. Those specifications determine what CTQ will be towards the customer believes in the process, product, service, etc. are meeting his or her quality expectations. In the presented case study, based on customer survey and analyzing their comments **using Minitab 16 statistical software**, it shows that long waiting time, agent information and attitude are the main reasons of dissatisfaction in quality of CC services see Fig. 3

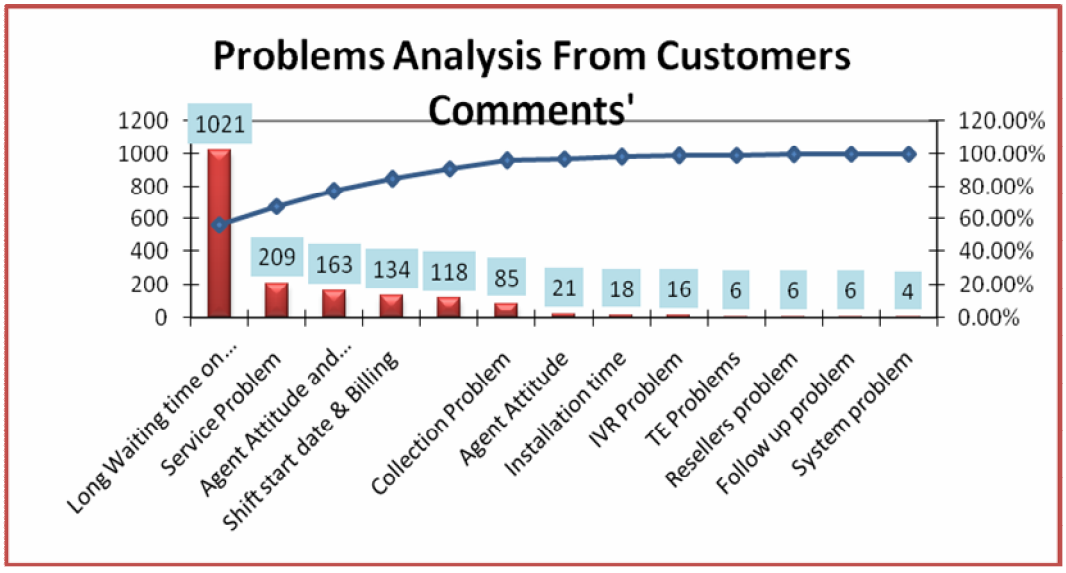


Fig. 3 problem analysis from customers' comments

”: this phase is similar in both methodologies (PM & SS) where the project initiation and planning phase in PM process are integrated with the defined phase of SS to determine the nature and scope of the project to ensure that all the individual system, processes and platform requirements are understood and incorporated into the project.

Phase B "**Integrated the execution stage of PM discipline with the measuring stage of SS methodology**": In the execution stage, the PM team directs the performance of the planned activities within the project. Deliverables are produced as outcomes associated with a project scope in this phase and measuring the deliverables applying SS methodology will help the project manager to visualize the things that are hard to see. This step uses a variety of statistical tools like Histogram or scatter plot or quality control graph depending upon the needs to read the current situation. The measure's goal is to pinpoint the location or source of the problems as precisely as you can by building a factual understanding of existing process conditions and problems. Thus, the data is gathered from the daily monitoring process (Daily sized sample of calls) and analyzed using P chart for defect rates of calls. The call considered defective if contains one fatal error or 3 non-fatal errors. There are 25 sub group are collected and the data is tested for normality. U**sing Minitab 16 statistical software,** It is found that the data set is "normal with P value more than 0.05" as in Fig. 4.

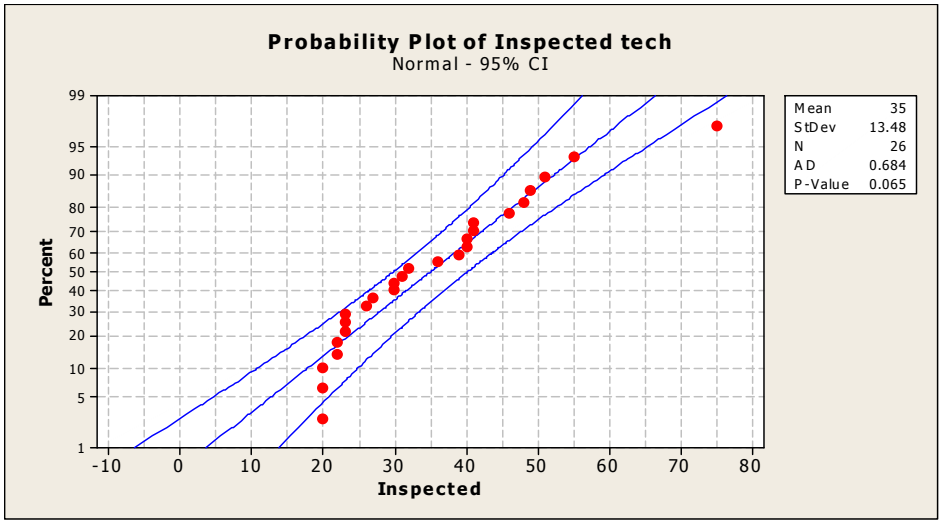


Fig. 4 Normality test for the collected data

P Control Chart

Using Minitab 16 statistical software, the result of applying P Control Chart on the data shows that the process is in statistical control with capability of 36.8% defect rate, which considered unacceptable rate of quality of CC operations and far away of specification (2% defect rate) which indicate that the process is incapable as in Fig. 5

One of the SS tools that it can be used to focus on the critical inputs Failure Mode Effect Analysis (FMEA) which its purpose is to establish project priorities and draws attention on the interrelationship between inputs and

outputs therefore it helps project team to avoid spending time collecting data on non critical aspects of the project

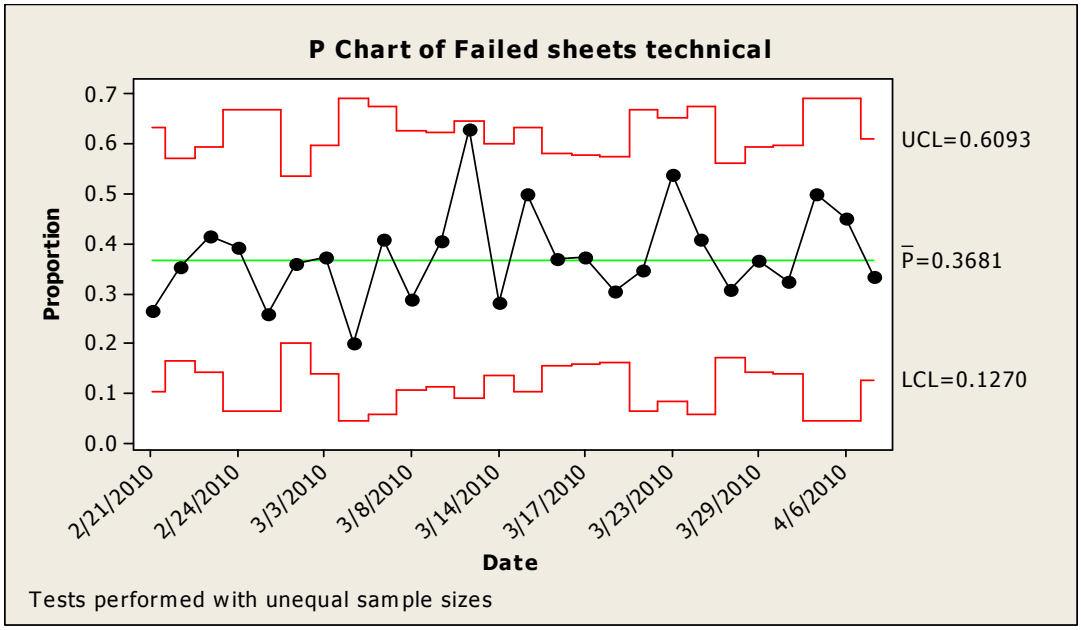


Fig. 5 P Chart before improvement

Phase (C) "**Determine the performance of project**": In this phase, SS methodology is applied to determine the performance of project aiming to achieve the project goals and it is followed by an analysis in finding the root that causes of a problem if the performance of the tasks lags behind or not within the control limits are defined by the customer. Analyzing techniques such as Pareto charts that allows pinpoint the location or source of the problems and then, the team will develop theories of root causes, confirm these theories with data, and finally identify the actual root causing the problem. Applying Pareto Analysis on case study of CC, the defect reasons are analyzed for 3 months and the result as shown below in Fig. 6 using Minitab 16 statistical software. It is notice that the most reason of errors in CCR is professionalism and knowledge accuracy which indicate the main areas that need developments in improvement phase. Then, Cause and effect analysis is applied as in Fig. 7.

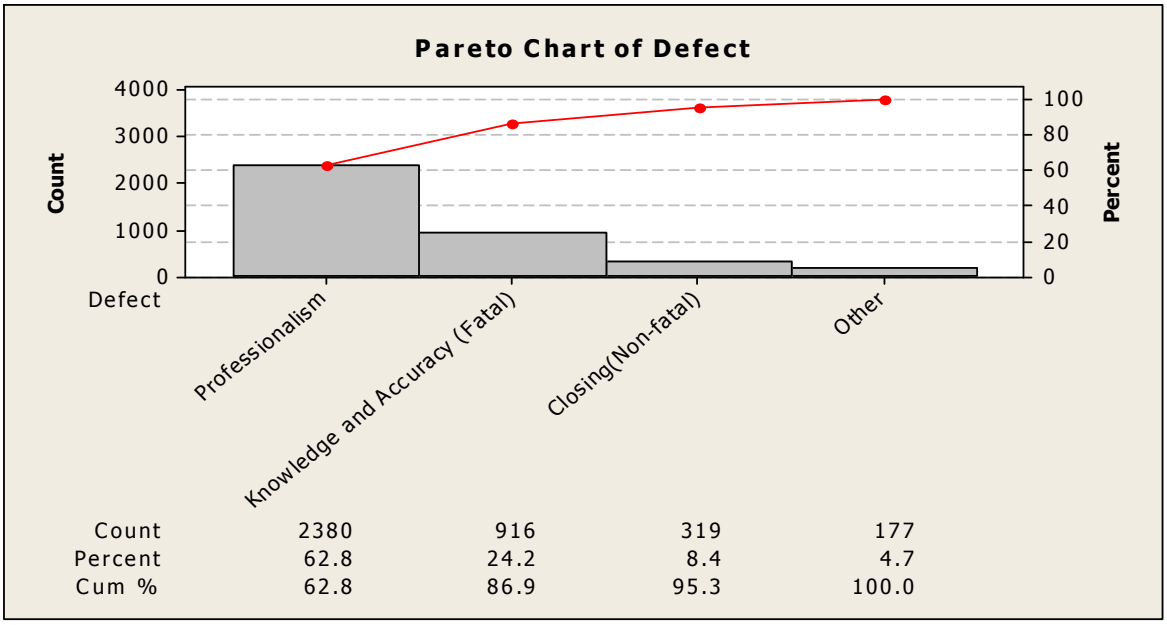


Fig. 6 Pareto Chart

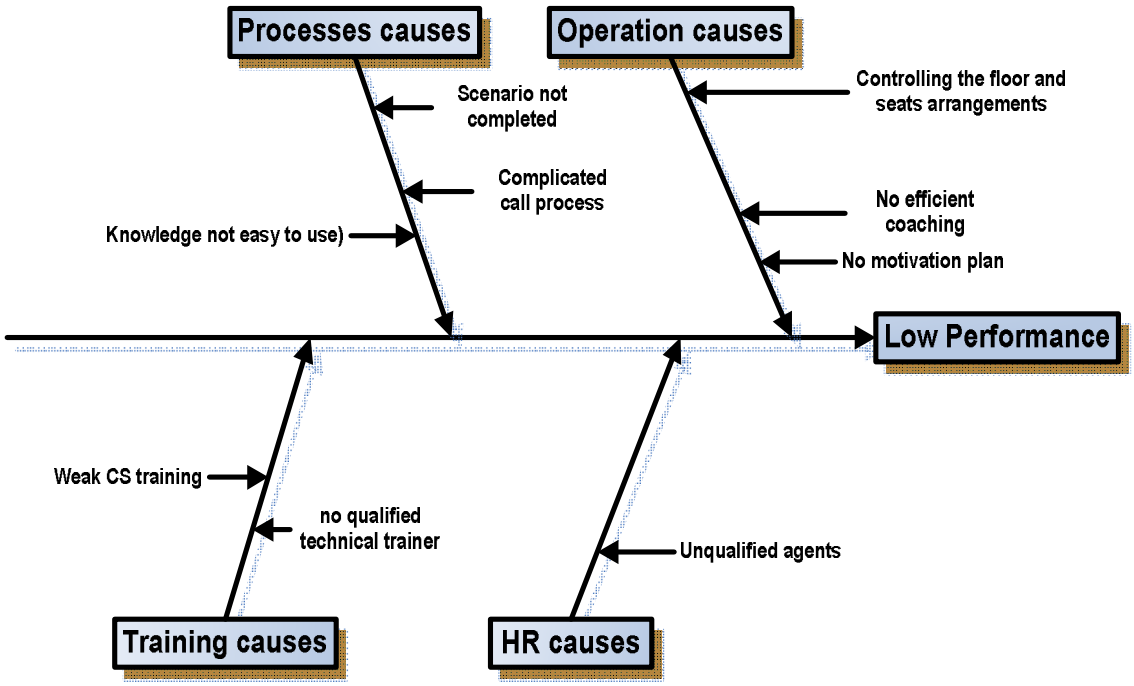


Fig. 7 Cause and effect analysis

In Phase (D) "**The suggested solutions lead to a measurable improvement**": in this phase, SS strategies are applied using various technical and statistical techniques like brainstorming, FMEA……etc. The goal of this phase is to demonstrate with data that suggested solutions to solve the problem and will lead to a measurable improvement. In fact, any improvement really

depends on the skills of the practitioner to reconfigure or redesign a service. Once all the improvements and alternatives are pilot tested, evaluated for failure resistance and their impact on CTQ it will be justified and the ideas are then simulated in the final effort to implement the best solution to improve service levels.

FMEA is conducted in our case to determine the root causes the quality problem and its risk factor which called Risk Priority Number (RPN). So, FMEA allows users to establish the priority of each failure mode based on its occurrence. Also, FMEA is demonstrated the recommended action plans needed to remove the cause of problem.

Phase E **"Monitoring and controlling phase":** In this phase, the monitoring stage of PM discipline is combined with the controlling stage of SS methodology to ensure that the improvement/changes which are made in the previous phases are supported by the entire project without any delay in project duration, cost overruns and quality issues. Besides, keeping monitor the project variables and measuring the project activities after improvement to ensure that it stays within specified control limits. One of the SS tools that can be used at this phase to monitor the process performance and provide feedback on solution performance is control charts. It helps to audit the improvements and assures that the modifications made in the project activities run the project to a successful end. In our case, after implementing the monitoring plan and corrective actions take place by communicating the process changes, documentation of work flow, monitoring and corrective actions with control plans charts.

After implementing the above changes, SS is applied to ensure the new changes are supported and substantiated by proper employee training and continuous monitoring. Thus, the quality monitoring team takes another randomized sample of data sheet as it done before phase A to assure that the calls responded by CSR have the standard of customer service and it notice there's an improvement of the process that achieved 90% yield which indicate that the process is improved significantly reaching the benchmark. The control chart is also conducted by taking 50 sample calls per day for 25 sequential days after the solution is implemented as in Fig 8 which shows that the capability of the process is improved to approximate 2.2% defect rate which represents significant improvement compared to the previous situation 36% at the beginning of the project as in Fig.5

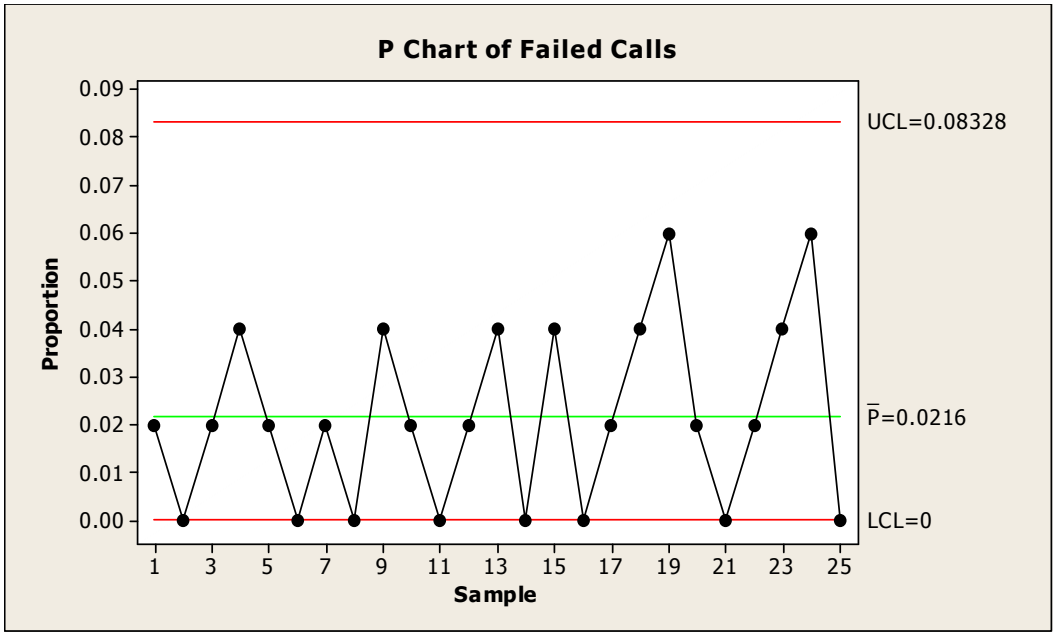


Fig. 8 P Chart after improvement

Phase F **"Termination the project":** the final phase of the integrated framework is taken from last stage of PM discipline where project is terminated through the project charter. It includes the successes during the project, lessons learned and analysis of the gains from the project outcome. The review should be presented to management to determine how well the project output integrated with missions, strategies, customer requirements and objectives of the organization.

The case study shows that there are many factors affect on the service's quality of CC the most important factors are professionalism and knowledge accuracy which indicate the main areas that need developments in improvement phase. After communicating the process changes, documentation of work flow, monitoring with corrective actions and controlled plans then analyzing the process of call, it is observed a significant improvement in a quality of calls due to decrease the errors by following the troubleshooting process providing faster solution besides, enhancing the overall customer experience. Thus, unifying the source of knowledge and controlling the knowledge updates process eliminate the conflict that occurs by using outdated and contradicting knowledge among CCRs so the rate of customer satisfaction and the company performance are increased.

Training and coaching activities also contribute with a significant amount in increasing CC quality by quickly fixing the daily errors before it

can have impact on the overall CC performance and periodically assess the CCRs knowledge and understanding of the process to avoid any conflict and misuse of the call process.

Motivation of the CCRs is also a vital issue in improving quality. It connects the agents with the company vision and mission providing the positive energy that produce self improvements initiatives among CCRs.

So, the quality of CC can be achieved by improving the above issues and sustain that improvement which is typically can be done using DMAIC methodology where an organization can use the Define, Measure, Analyze, Control and Improvement to define an improvement project portfolio that serves the organization mission.

Overall, the integrated framework is made by combining management aspects of PM and engineering aspects of SS. Specifically, for the companies that use only PM within their system, SS provides the prospective of targeting the customer needs and performance measures during the stages of project process using various technical and statistical tools. The methodology of PM could benefit from the data and techniques of SS in decision making process that promotes more scientific approach to factors that are critical to service's quality and for the customers. Thus, SS improves the financial performance of a business through the improvement of quality and the elimination of waste.

4. Conclusion

Facing competitive market, all firms must make changes to improve their operations. In this paper, integrating PM and SS speed the desired process improvement significantly by using the standards of project tracking and control with the statistical tools of SS.

Increased understanding of customer needs and expectations which belongs to the critical quality service performance will have the greatest impact on customer satisfaction and loyalty. Besides, the efficient and reliable internal operations lead to greater market share and satisfied shareholders.

Thus, the integrated framework of PM and SS proves that it can be used to optimize the customer's interaction, satisfaction and enhances the efficiency of the business operation in the CC and all other service company.

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