Improving Volume of Customer Issues for IT Infrastructure Using Six Sigma DMAIC Approach

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Abstract. In the IT Service Management (ITSM) business nowadays, companies are struggling with ways to handle and align IT services with business needs and underpin the business core process. Since these IT companies are relying on customers to generate their profits, there has been increasing need to take care of customer complaints and issues effectively. Proper processes and procedures need to be implemented according to certain compliance standards so that customer welfare will still be their top most priority while at the same time help to facilitate business change, transformation and growth against company vision. Looking at trends of customer issues volume, there is increasing needs to address these numerous daily activities to ensure effective customer support being practiced by the organization. This paper discusses on the improvement carried out to reduce the number of IT infrastructure support issues using Six Sigma DMAIC approach in MIMOS. The tools and techniques taken as well as key steps that led to sustainable improvement are explained according to five phases of Six Sigma DMAIC in the later section. With this study, it is hoped that this paper would be a useful guide to companies out there that are facing the same issues and intend to improve total customer related support in their organization.

Keywords: Six Sigma DMAIC, ITIL, ITSM, Cost to Quality (CTQ)

1. Introduction

MIMOS IT Department has been implementing ITIL framework for their organization for nearly five years now. This has been a continuous effort and the implementation has helped us to strategize and properly align our IT business core process according to management vision and mission as well as customer needs. However, looking at the trends of customer complaints and request, there is urgent need for the management to pause and start analyzing the current situation to ensure that we do not astray from the right track. Appropriate problem solving methodology needs to be introduced in order to investigate the root cause of the current issues and carry out the improvement plan based on the findings.

One of the most popular and effective problem solving methodologies apart from TRIZ [1] and PDCA [2] is Six Sigma DMAIC. First developed by Motorola in 1980's, it contained a set of practice designed to improve manufacturing processes and eliminate defects. Its application was subsequently extended to improve existing business processes such as in IT, banking, and healthcare business [3]. The power of Six Sigma DMAIC methodology lie on its systematic approach that governed by rigorous steps in its five phases – Define (D), Measure (M), Analyze (A), Improve (I) and Control (C); hence the acronym.

Six Sigma DMAIC was chosen among other methodologies due to its ability to improve certain process by eliminating defects in the existing process and the probability for defects to happen in near future is nearly impossible. The goal is not 99%, not even 99.9%, but 99.999996% statistically free from defects [3]. Normally, this methodology is used by organization when dealing with bottom line benefits or customer satisfaction [4]. In another words, this methodology can help us to deliver sustained defect-free performance with highly competitive quality costs over the long run [3]. This was actually backed up by former General Electric (GE) CEO, Jack Welch in 90's through astounding dramatic improvement in the company after implementing the Six Sigma DMAIC methodology [5].

In Section 2, this paper discusses in detail the key tools, techniques used as well as steps taken in every phase of Six Sigma DMAIC. The last two sections describe briefly our conclusion and future work based on this study.

2. Approach to Six Sigma DMAIC

2.1. Define Phase

The focus of this phase was defining the problem that requires solution and ended with clear understanding of scope and evidence of management support in order to guarantee the commitment from stakeholders involved [6]. Apart from that, we identified customer requirement that consisted both internal and external stakeholders. This information was noted in Project Charter for proof of requirement and commitment [7]. SIPOC on other hand was used to define project boundary and scope to ensure that we could put focus on the real problem [8].

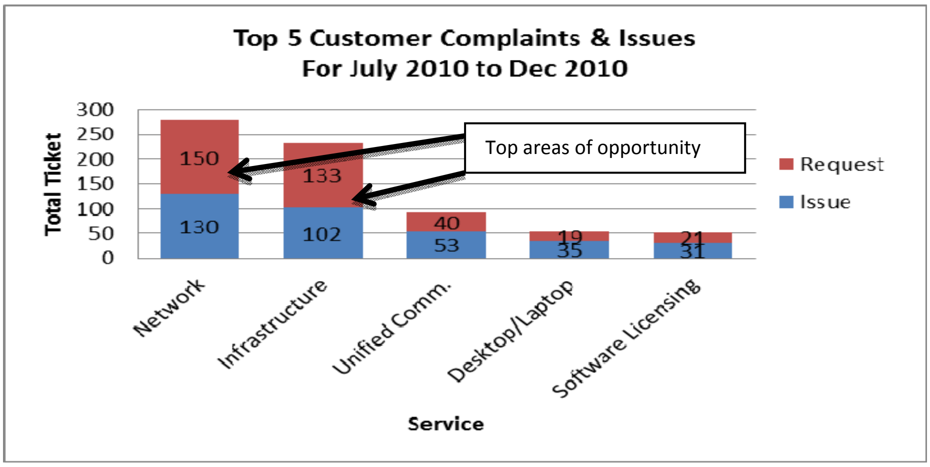


Chart 1. Top 5 Customer Complaints for July 2010 to Dec 2010

From Pareto Chart 1, we concluded that Network and IT Infrastructure were the top two services of customer complaints and requests. However, as Network had been identified for the next improvement project, we put focus on IT Infrastructure tickets that constituted about 235 issues in about 6 months period, with an average of ~39 issues per months which translate to average of 9 issues per week. By reducing 25% of overall tickets, estimated cost savings contributed from Full-Time Equivalent (FTE) staffs and project support effort is RM6.8K and RM7K respectively per year. Thus, total cost savings from these two areas was RM13.8K per year.

Though the cost saving was not huge, this improvement was crucial in a way that technical personnel could put focus on their time and effort to manage other bigger impact improvement projects rather than keep putting effort in repeated daily activities. In addition, IT organization would have more time to put focus in other tactical and strategic activities that provides higher impact to their business.

2.2. Measure Phase

During measure phase, we understood how the current processes were performing by using process mapping technique such as Top Down Charting that was further derived from SIPOC. Through this process, we identified critical processes that affected our Project Y (performance measure) so that data collection was planned to quantify their actual performance.

As listed in Table 2, operation definition is a clear and concise guide of what and how properties are measured and their linkage to critical business requirements and as well as goal of this project [9].

Table 2. CTQ Specification Table

CTQ (Project Y)	Operation Definition	Goal
Weekly average number of issues for complaints and request	Issues raised and captured from Helpdesk System for IT Infrastructure	Reduce weekly average number of issues for complaint and request by 25%

The initial performance before improvement is depicted in Chart 3. We concluded that the baseline performance of issues ticket volume raised was average of ~9 issues per week versus the improvement goal average of ~7 issues per week (25% improvement).

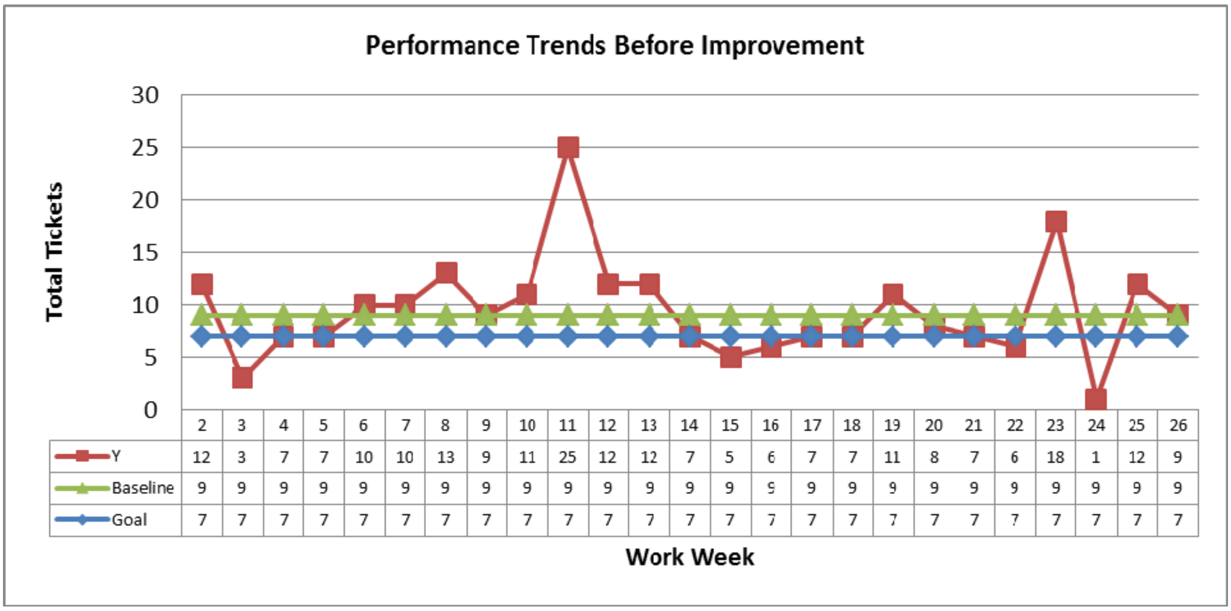


Chart 3. Performance Trend – Before Improvement

2.3. Analyze Phase

Process Mapping is carried out to construct a firm foundation of overall process. We started with SIPOC to show key elements that involved in our ticketing process e.g. input, process, output indicator and etc. The SIPOC that we have constructed is shown in Chart 4. Then, we came out with Top Down Chart to identify the high-level activities that are important to the overall process and demonstrate how the process will look like after streamlining it by removing the unnecessary and inefficient steps that currently exist as shown in Chart 5.

Supplier	Input	Process	Output	Customer
User Network/Infra Engineer User	False ticket Unsupported services Duplicate ticket Expertise	Create ticket Investigate issue / request Seek expertise Work on the solution Confirm ticket resolved Update Knowledge Base (KB)	Knowledge Base (KB) Created ticket Solution Workaround	User Engineer

Chart 4. SIPOC Diagram

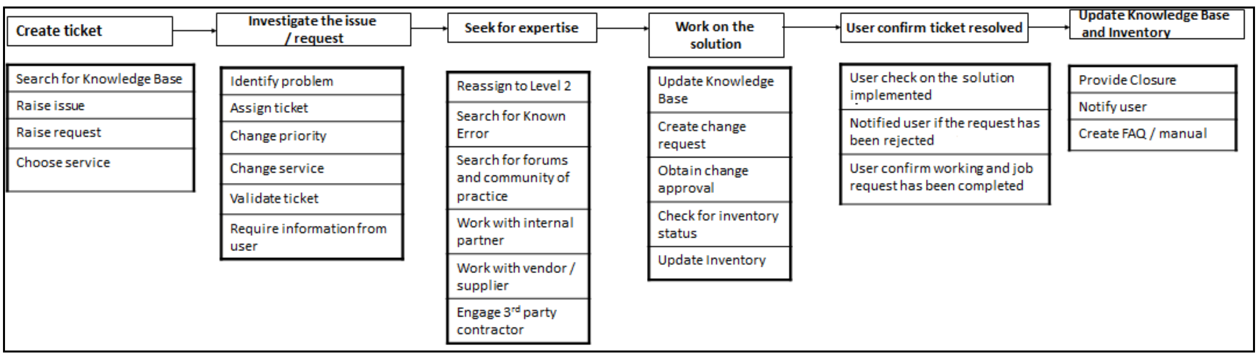


Chart 5. Top Down Chart

Cause and Effect Analysis was conducted to find and shortlist the critical causes (X's) that potentially given impact to Project Y. These activities were carried out through Cause and Effect Diagram (Fishbone) and then proceeded to generate Cause and Effect Matrix as shown in Table 5.

Table 5. Cause and Effect Matrix

Selected X's

----- Input/Process Indicators -----	count of ticket 10 Correlation of Input to Output	<<<<Output Indicators <<<<<<<<Importance --------- Total ---------
service unavailability	9	90
inefficient process	7	70
poor service catalogue	6	60
Lack of knowledge	6	60
work culture	6	60
Knowledge base (manuals)	5	50
false ticket	5	50
incomplete resolution	5	50
Lack of policy enforcement	5	50
different users with same issues	4	40
response time	4	40
unsupported issue	4	40
duplicate ticket	3	30
permission	3	30
policy enforcement	3	30
poor SLA	3	30

As continuation from Cause and Effect Analysis, 5-Why Analysis was constructed for every selected X's. These validation activities are carried out over and over again through peer review as well as subject matter expert (SME) session until absolute root cause have been selected and verified. This activity ensured that we break down the cause into more explicit elements thus obtained the correct and absolute root cause for the improvement rather than taking actions that were merely band-aids [10]. Our 5-Why analysis is shown in Table 6 below.

Table 6. 5-Why Analysis

Shortlisted Root Cause	Why1	Why2	Why3	Why4	Actionable
Poor service catalogue	User are not aware of CE supported services	Service Catalogue are not properly communicate	Catalogue is not updated, reviewed validated	N/A	Defined & validate CE Service catalogue. Proper communication need to be done to user.
Service unavailability	Machine down	Hardware failure	Maintenance issue	Out of budget	No.
	Service down	Service malfunction	Wrong configuration	User not well-trained	Provided configuration training to users
User Knowledge of specific area	User has insufficient knowledge	Ignorance	No training provided	N/A	Provided configuration training to users
	Lack of documentation / manual	Process is not standard	Process is not well-defined	N/A	Defined & validate CE core processes.
Inefficient process	Too many process in place	Process is not suitable for certain cases	No standard process in place	Process is not well-defined and validated	Defined & validate CE core processes.

2.4. Improve Phase

In response to root causes found, various set of corrective actions (solutions) were considered and selected for implementation. It was expected the selected solutions would eliminate or at least minimize the impact of root cause to the problem. To assess effectiveness of solutions implemented, a pilot run was planned. The finding was plotted in a control chart as depicted in Chart 7. We can see that there are positive improvement showed after solution has been carried out i.e. center line before and after improvement is 9.4 and 7.05 respectively.

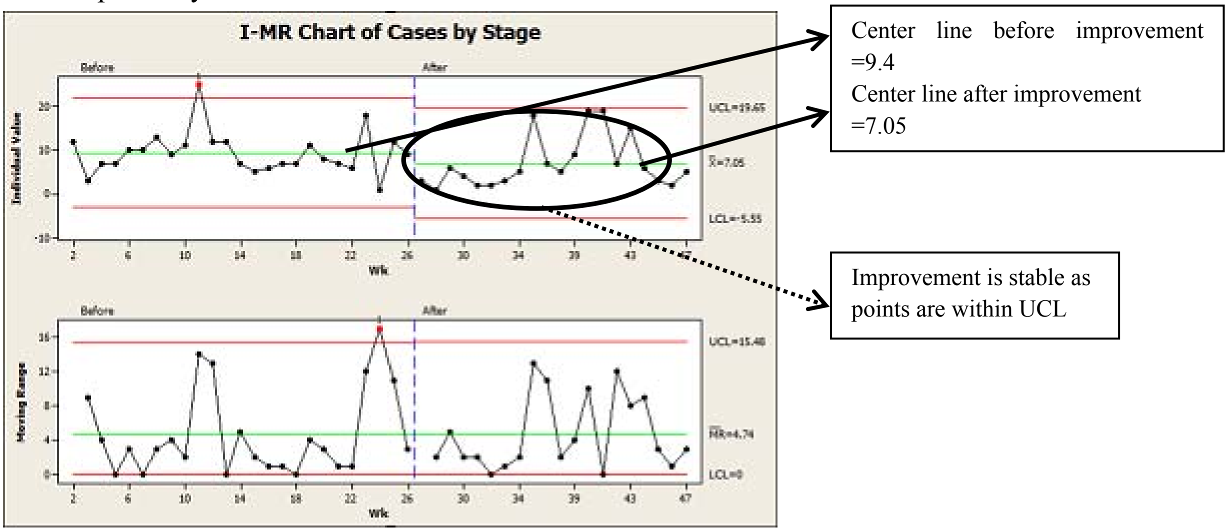


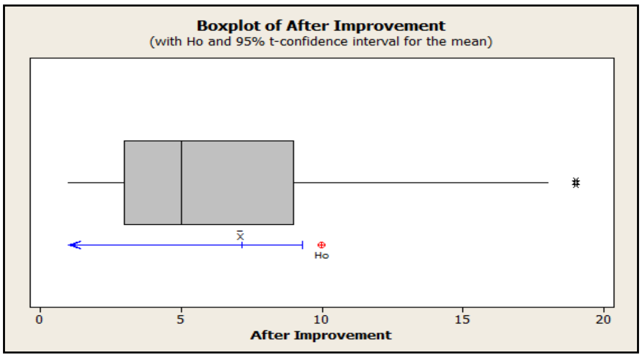
Chart 7. Performance Trends (Before & After Improvement)

One-Sample-T Test was performed to statistically validate the improvement results against the project goal that was first defined in Project Charter. Chart 8 below shows the statistical analysis result of One-Sample T Test. The practical conclusion as derived from statistical conclusion is that the weekly average number of complaints and requests was significantly reduced as targeted; as p-value is less than 0.05.

One-Sample T: After Improvement

Test mu = 10 < 10

Variable	N	Mean	StdDev	SE Mean	95% Upper Bound	T	P
After improvement	21	2.74	5.76	1.26	9.31	-2.27	0.017



1 sample t-Test:

Ho p > 0.05: μ_{after} = 10

Ho p > 0.05: μ_{after} < 10

P value =0.017	**Reject Null Hypothesis**
Conclusion	**The improved processes performance was significantly lower than 10 cases/weel. That means the project goal was met and exceeded.**

Chart 8. One-Sample T: Improvement Validation

2.5. Control Phase

In order to ensure the gain is maintained over the long term, a control plan was generated and handed over to process owners for implementation as listed in Table 9. Generally, the plan outlined the significant factors/parameters, the responsibilities personnel and how they were controlled and monitored by means of a set of control methods such as standard procedures, control charts and mistake proofing. Also, it detailed down the contingency plan for each significant factor/parameter should an out of control situation occurred [9].

Sample of storage utilization that are used in monthly review are depicted in Chart 10. These are currently used to derive plans for capacity management so that we can predict utilization of storage in future. Hence this would help in minimizing count of storage issues in the future.

Table 9. Some of the items in Control Plan

Parameter	Control Method	Control Limit	Frequency	Responsibilities	Contingency Action Plan
IT Infrastructure Ticket Count	I-MR charts	Max 13 issues per week (UCL)	Weekly	Nashriq / Hadi	Perform RCA if exceed.
Storage Utilization Reviews	Trend charts for storage utilization	50% of storage is more than 3 years old	Monthly	Hadi	Reclaim unused storage / buy additional storage

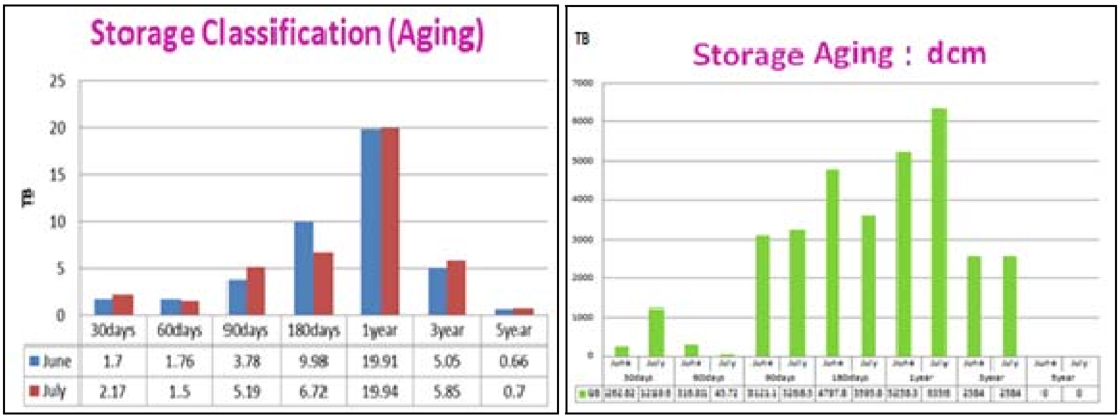


Chart 10.Samples of storage utilization charts.

3. Conclusion & Future Work

Through this improvement project, we found that volume of customer complaints and requests had been successfully reduced to 75% of initial performance of IT Infrastructure ticket. This result proved that our Six Sigma DMAIC approach had effectively improved our overall process by finding the root cause and selecting the best solutions for high volume IT Infrastructure issues that we faced previously. However, we understand that continuous monitoring need to carry out from time to time to ensure that any deviations from control targets are identified and corrected before they result in defects and subsequently negatively affecting improvement effort that took place.

We plan to continue implementing Six Sigma DMAIC to other areas of services as well. Through this initiative, we can ensure that we cover all improvement areas needed that are related to issues tickets volumes that may affect our overall customer satisfaction in future.

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