

INTRODUCTION

This project is neither imaginary nor live. We select this project based upon the working experience in Celestica. One of our group members has been worked in Celestica Incorporation; a one of the best electronics manufacturing company of the world.

Celestica is a world leader in the delivery of innovative electronics manufacturing services (EMS). Celestica operates a highly sophisticated global manufacturing network with operations in Asia, Europe and the Americas, providing a broad range of integrated services to leading original equipment manufacturers (OEMs) across a variety of industries. Celestica's expertise in quality, technology and supply chain management, enable the company to provide competitive advantage to our customers by improving time-to-market, scalability and manufacturing efficiency. Celestica's global solutions provide unparalleled business value to our diverse original equipment manufacturer (OEM) customers – improving time-to-market, profitability and competitive edge.



There are many competitors in the global market of Celestica Inc., such as Sony, Kingston, Solectron, Flextrons, Sanmina, etc., all build memory cards, other electronic systems and subsystems for computers, consumer electronics, motor vehicles, semiconductor manufacturing equipment, and telecommunications and networking gear. Their services include product design, prototyping, repair, and distribution.

For the data, we have sufficient amount of data including types of defects, types of products, number of defects occurring, diagrams and drawings of the memory cards as well as other components. Secondly using past working experience, we can note the cycle time of the procurement process from the difference in days between the inquiry generations (material requisition from suppliers) to the final delivery (shipping to the customers). We have used the data for the quantitative analysis of this process. We assume two quarters data for this project.

In our project, we select only one product (one type of memory card) from MSBU department of Celestica and focus to its whole life cycle (from assembling to shipping) and find the causes of defects and eliminate them in order to improve the efficiency and productivity of manufacturing department of MSBU of Celestica. We used in this project DMAIC approach of Six Sigma methodology to decrease the process variation of manufacturing department of MSBU of Celestica.

The goal of this six sigma project is to move from “current state” to the, so-called, “future state” of optimal performance at which all activity adds only value to the product and truly meets customer requirements in terms of quality, delivery and cost. In this project we focus on continuous improvement and quality of memory cards and simplify internal processes and reduce operational inefficiencies through the elimination of non-value-added activities.

Cost of the Six-Sigma Project

Assumptions are:

- 1) We have to invest some money in hardware purchasing
- 2) We are 4 team members are being paid for this project

Hardware Cost

The cost of purchasing of 4 computers & one printer dedicated for this project and it comes out to be \$4800.

Software Cost

The cost of purchasing one Microsoft Office Suit for this project and it comes out to be \$190.

Man-Hour Cost:

2 team members are working as full time in day shift and getting \$30/hr

2 team members are working as full time in night shift and getting \$30/hr + \$5 overnight allowance.

Cost comes out to be: $2 \times 8\text{hr} \times 5 \text{ days} / \text{week} = \$1200/\text{week}$

$2 \times 8\text{hr} \times 5 \text{ nights} / \text{week} = \$1400/\text{week}$

= \$2600/week

Total

The project last for 6 weeks so the cost comes out to be $\$2600 \times 6 = \15600

Total project cost comes out to be: Hardware cost + Software cost + Man-hour cost

$4800 + 190 + 15600 = \$20590$

Total Project Cost = \$20590

Define Phase

In the Define phase of DMAIC approach of Six Sigma, we have describe the project charter in which we have mention briefly about the business case, problem and goal statement, project scope and stake holders of the project. Further in the define phase, on the basis of the available data, we have done the Pareto analysis for all the identified CTQ's of the process. We also define in our project Voice of Customer (VOC), in which we did survey of 117 corporate customers (IBM, SUN, Nortel, etc) of the memory cards from which we got 88 replies, the detailed are in the VOC phase. In our project we also represent graphical view (process mapping) of the whole manufacturing process of the memory cards and also we define SIPOC diagram, where we identify all relevant elements of a process improvement project before work begins and at the end we compare the two benchmarking processes of the memory card. The details of each phases are as under:-

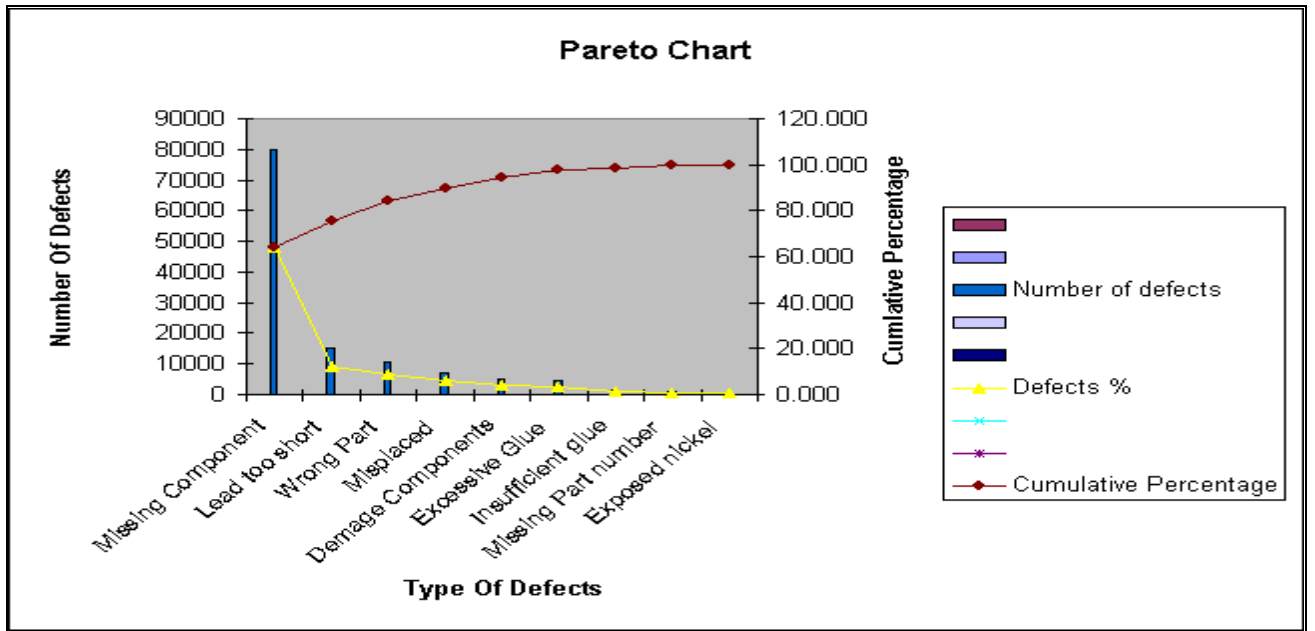
1. Project Charter (Annexure-A)
2. We have identified the following CTQ's, affecting the quality of memory cards.
 - 1) **Missing Components** : During the process of assembling of components (i.e. memory chip, microchip, etc), sometimes the machine is not placing the parts into the raw card.
 - 2) **Lead too short** : There are different types of cards, some are 90 pins and some are 180 pins, the height of the pin is called lead. This defect usually occurs by the mistake of operators due to mishandling of the cards.
 - 3) **Wrong part** : This type of defect occurs by the machines, there are various different types of components machine is placing into the main raw card, sometimes machine is picking wrong components from the tray.
 - 4) **Misplaced** : Misplacing of the components is the common error, usually occurs by the machines due to non-maintenance or it can be occurred by the negligence of the operators.
 - 5) **Damaged Component** : This type of errors mostly occurs by the operators due to mishandling of the memory card.
 - 6) **Excess soldering** : This is very common defect in manufacturing department of memory cards of Celestica. This defect occurs by the wave soldering machines and also operators are also responsible for excessive soldering, due to not focus of their work, Excessive soldering is the main cause of bridging.
 - 7) **Insufficient soldering** : This is also same defect but it mostly occurs by the operators due to finish the solder into the trays.
 - 8) **Exposed copper** : These defects are occurring into the gold tab memory cards, it is supplier defect because in the raw cards, every pin point has been layered by the gold water, It is severe defect can be make shots and burn the whole memory card.

Graphical view of the CTQ in details is as follows :-

Type of Defects	Number of defects	Defects %	Cumulative Percentage
Missing Component	80030	63.758	63.758
Lead too short	15030	11.974	75.732
Wrong Part	10600	8.445	84.177
Misplaced	7307	5.821	89.998
Damage Components	5098	4.061	94.060
Excessive soldering	4450	3.545	97.605
Insufficient soldering	1300	1.036	98.641
Missing Part number	1250	0.996	99.637
Exposed copper	456	0.363	100.000

Total

125521



VOC

Once a memory card has been assembled, passed and shipped to the customers, the next step is to plan how to capture customer's view regarding the products. This includes determining how to identify customers thinking, which customers to contact in order to get criticism, what mechanisms to use to collect their views, and a schedule and estimate of resources to capture the voice of the customer. To get the feedback from the customers, we did a simple survey to know how the customers think about the memory cards of Celestica.

Survey method we use

This survey was made upon 117 corporate customers (IBM, SUN, Nortel, etc) of the memory cards from which we got 88 replies. The customers were given 3 months time to return their responses. This survey papers were given to them at the time of purchase which included returning postal stamps throughout North America. To avoid having misleading responses, the survey papers were given to only those customers who were doing business with Celestica for at least 6 months.

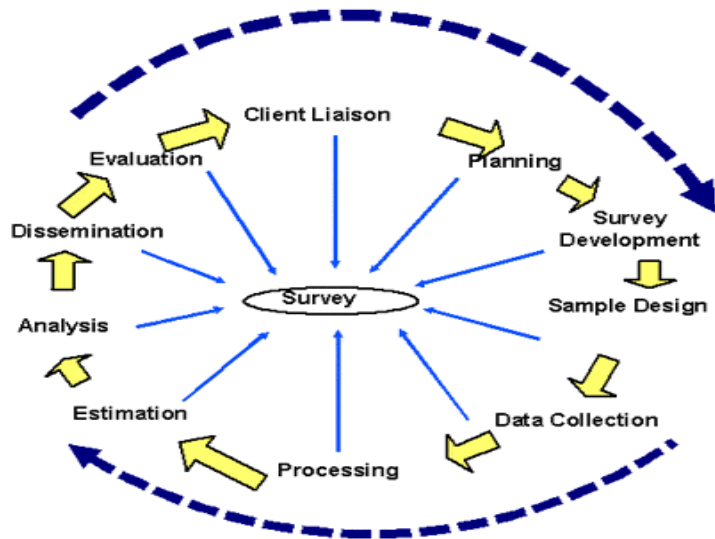
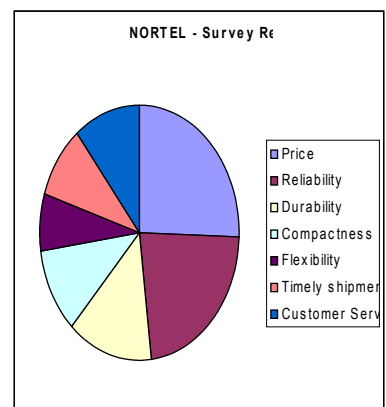
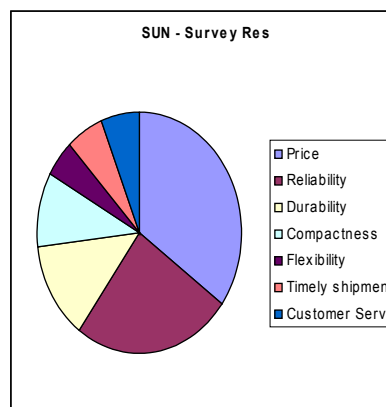
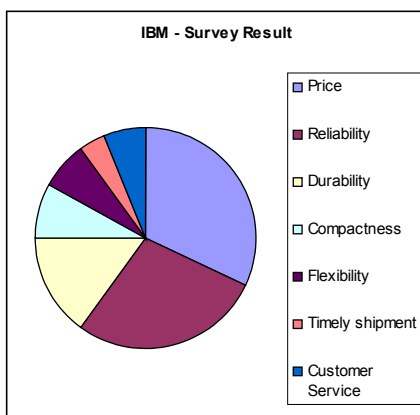


Fig: Survey Cycle

Survey Questionnaire format is attached herewith (Annexure-B)

Survey Result

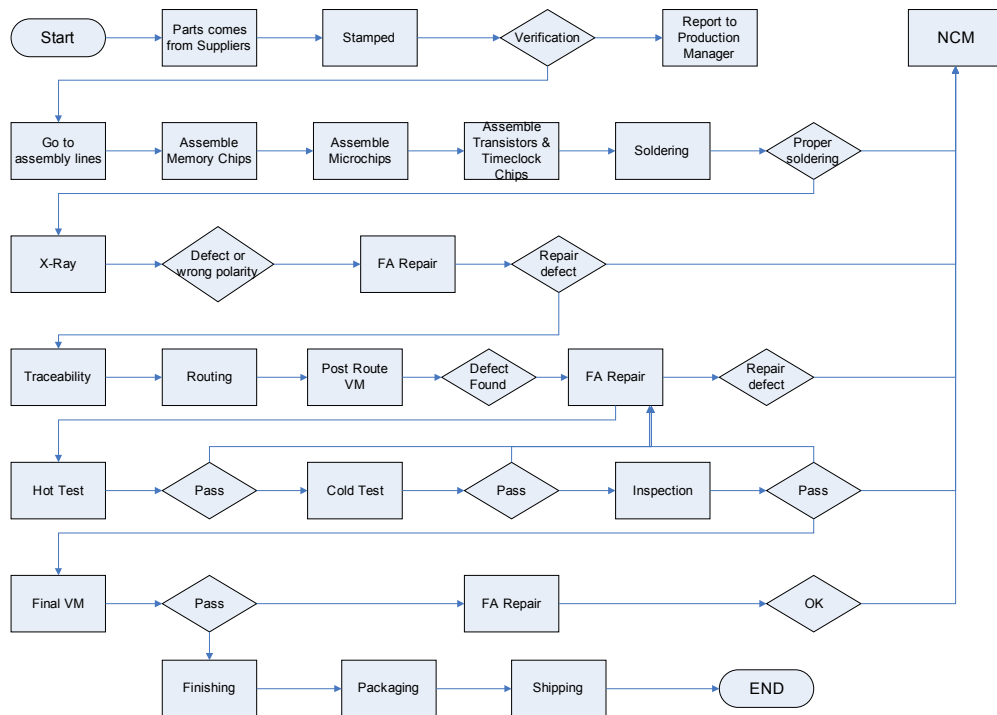
We found survey results of our memory card from our different customers, which is graphically represented as follows :-



Process Mapping

By the process mapping, we provide the visual representation of whole procedure of memory cards from assembling of parts to shipping and assist in providing a better understanding of how processes are organized and performed. It is a workflow diagram of memory cards, which providing clear understanding of a process or series of parallel processes, in which we analyze and focus every step and find out that where is actually problem occur in the manufacturing process.

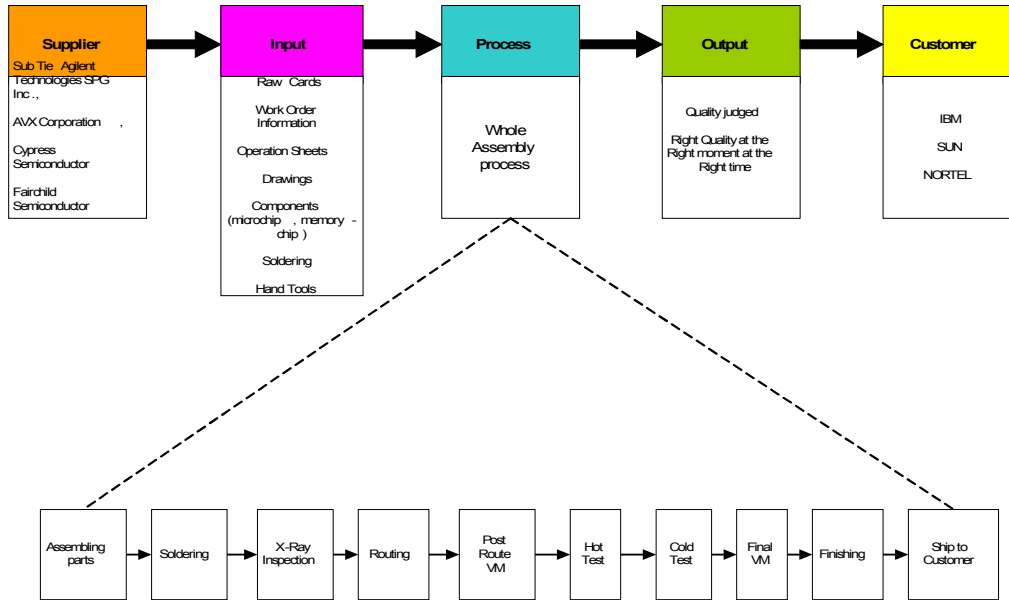
Following vision diagram of process mapping, clearly identify and eliminate inefficiencies in the way a process is organized and performed.



SIPOC

In the next phase of Define phase of DMAIC methodology, we designed the following SIPOC table, which identify all relevant elements of a process improvement project before work begins, it is similar to process mapping, which we described earlier.

SIPOC FOR MEMORY CARDS



Benchmarking

In our project we compare the two whole life cycle processes of the memory cards from assembling to shipping and find the huge difference between both processes.

	Defects found before implementing Six Sigma					Defects found after implementing Six Sigma				
	X-Ray Inspection	Post Route VM	Hot Test	Cold Test	Final VM	X-Ray Inspection	Post Route VM	Hot Test	Cold Test	Final VM
Missing Component	1	4	10	2	1	0	0	1	0	0
Lead too short	0	2	8	1	1	0	0	0	0	0
Wrong Part	0	2	6	1	1	0	0	0	0	0
Misplaced	0	5	4	1	2	0	0	0	0	0
Damage Components	0	8	6	2	3	0	0	1	0	0
Excessive soldering	0	3	4	0	3	0	0	0	0	0
Insufficient soldering	0	4	2	0	4	0	0	0	0	0
Exposed copper	1	3	2	1	3	0	0	0	0	0

Annexure – A

PROJECT CHARTER		
PROJECT TITLE: Implement six sigma methodology to eliminate causes of defects, reduce cycle times & cost of operations & improve productivity.		
Project Leader	Team Members: Dileep Kumar Oad Sanallah Soomro Raj Beer Kur Tanveer Khan	
Business Case: The main target of every business is to maximize the profit or in other words to safeguard the interest of all stakeholders (IBM,SUN,NORTEL). This could be obtained by increasing the market share by gaining the reputation of the business in the market, making new customers and satisfying the existing customer's need. All these things are possible only if the process with in the business delivers well. If there is any problem in any of the process or if any of the process is not delivering to the full capacity to the next process, then over all target of business is not achieved. Similarly, if the processes are working to its optima. The over all picture is in the favor of the business. Similarly the same strategic planning of our project for the company is to increase the market share, explore new markets and maximize the profit increase productivity. For these plans to materialize, we need the manufacturing department to be functioning at maximum efficiency. The procurement department can play a big role in providing the manufacturing and repair departments with timely deliveries thereby helping them achieve their targets.		
Problem Statement This project will evaluate the defects in the memory cards and eliminates these defects to save the process time and improve productivity of Celestica Inc. The problem arises in the complaints within the company (Internal customers) that the requested items are defected. This ultimately affects the process quality from both ends, i.e the process of procurement itself and the other related business process depending on procurement like manufacturing or maintenance departments. We will look to the problem / defect in the assembling processes of the manufacturing department. The problems are the various defects in memory card. It affects the product quality and deadlines.	Goal Statement Implement six sigma methodologies to eliminate causes of defects, reduce cycle times & cost of operations & improve productivity.	
Project Scope The scope of this project is to implement Six Sigma methodology into the Celestica Incorporation, an electronic manufacturing company and seeks to find and eliminate causes of defects and errors, reduce cycle times and cost of operations, improve productivity, better meet customer expectations and achieve higher asset utilization and returns on investment in manufacturing and service processes. This scope was taken as a Six Sigma project and we tried to use all or most of the tools learned in this course in their practical applicability.	Stake Holders Internal Customers External Customers Project Team Management	
TIME LINE	TARGET DATE	ACTUAL DATE
Project Start	Feb 15 2007	Feb 17 2007
Define	Feb 19 2007	Feb 21 2007

Measure	Feb 23 2007	Feb 27 2007
Analyze	March 02 2007	March 08 2007
Improve	March 11 2007	March 16 2007
Control	March 18 2007	March 22 2007
Project Complete	March 29 2007	March 30 2007

Annexure - B

Survey questions

- 1) 128MB memory card of Celestica is compacted with all hardwares / softwares.
a) Strongly agree b) agree c) disagree d) Strongly disagree
- 2) The price of 128MB memory cards of Celestica are competitive compared to those of other marketing the same quality products.
a) Strongly agree b) agree c) disagree d) Strongly disagree
- 3) Which makes you buy Celestica memory cards?
a) Durability b) low price c) credit payment option for 1 year d) Improved features e) hassle-free business improvement
- 4) The top management is thinking to outsource the production of memory cards to other countries which will surely allow them to sell cards at a lower price but may be with lower level of quality as well. Do you think you will compromise price over quality?
a) Strongly agree b) agree c) disagree d) Strongly disagree
- 5) If you had any problem after purchase within your warranty period, you had mentioned the defect to the customer service of Celestica and your product was replaced at their earlier convenience.
a) Strongly agree b) agree c) disagree d) Strongly disagree e) Never had any problem
- 6) If you had stopped buying from Celestica before and started buying from a competitor, what was the driving factor behind that?
a) High price b) Lower than expected quality c) Less number of features d) Never switched to an another organization

In case the reason is not listed above, please give us feedback in writing:

- 7) Celestica should give life time warranty for the memory cards.
a) Strongly agree b) agree c) Nice to have
- 8) Which shipment service should Celestica use to have on time delivery of the product?
a) DHL b) FedEx c) Canada Post d) US postal services (USPC) e) Other:

Please specify _____.

- 9) Which sector of Celestica do you think needs to be improved the most:
a) Design and Engineering Services b) Manufacturing and Systems Integration Services c) Fulfillment Services d) After-Market Services
- 9) Having 5 the best of the scale and 1 the worst, how would you judge the overall customer service of Celestica:
a. 5 b) 4 c) 3 d) 2 e) 1

ISO Certified

The **ISO 9000** series of international standards for quality management and quality assurance has been adopted in more than 90 countries and is being implemented by thousands of manufacturing or service organizations in both public and private sectors.

Our Quality Policy : We are committed to being the No#1 ranked electronics manufacturing service provider to our customers by providing industry leading quality products and services through innovation and continual improvement in all we do.

ISO 9001:2000 : We are proudly announce that after implementing Six Sigma, we got the ISO 9001:2000 standard, ISO 9001 is an internationally quality management system standard that describes what fundamentals an organization must have in order to produce a quality products or service and ISO 9001:2000 Standard employs a Process Approach. The focus is on Customer Communication, Customer Satisfaction and the use of Measurable Objectives in all areas. There is also substantial focus on Continual Improvement and Prevention Action.