Total Quality Management

Mechanical Technology Chapter 7 Notes

By

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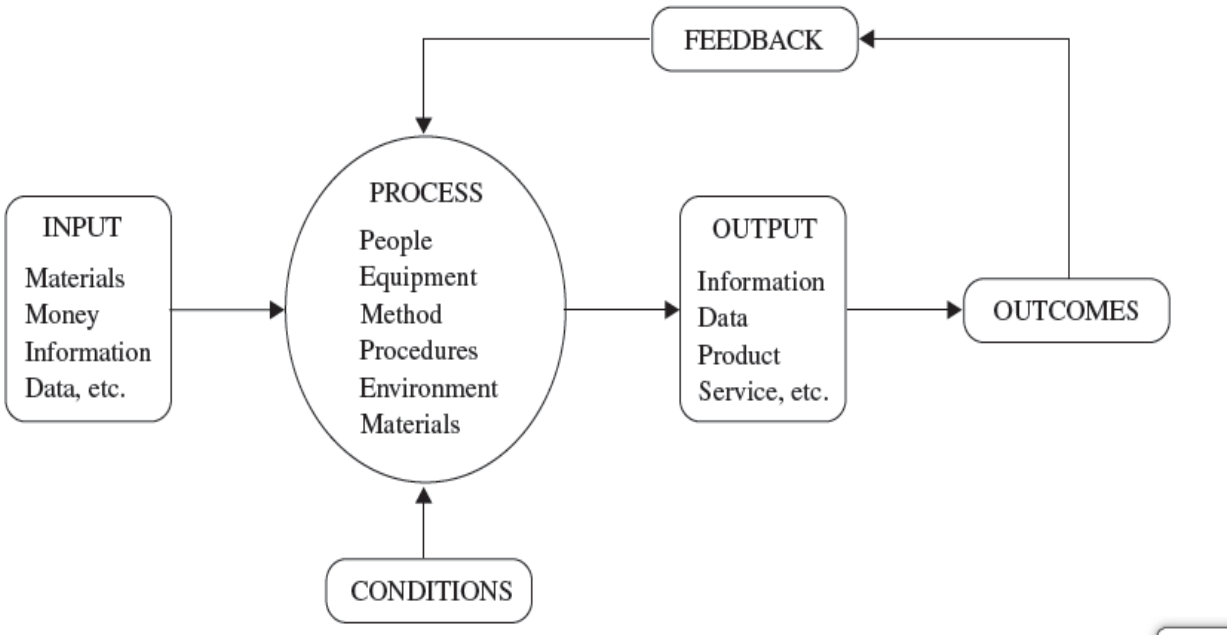
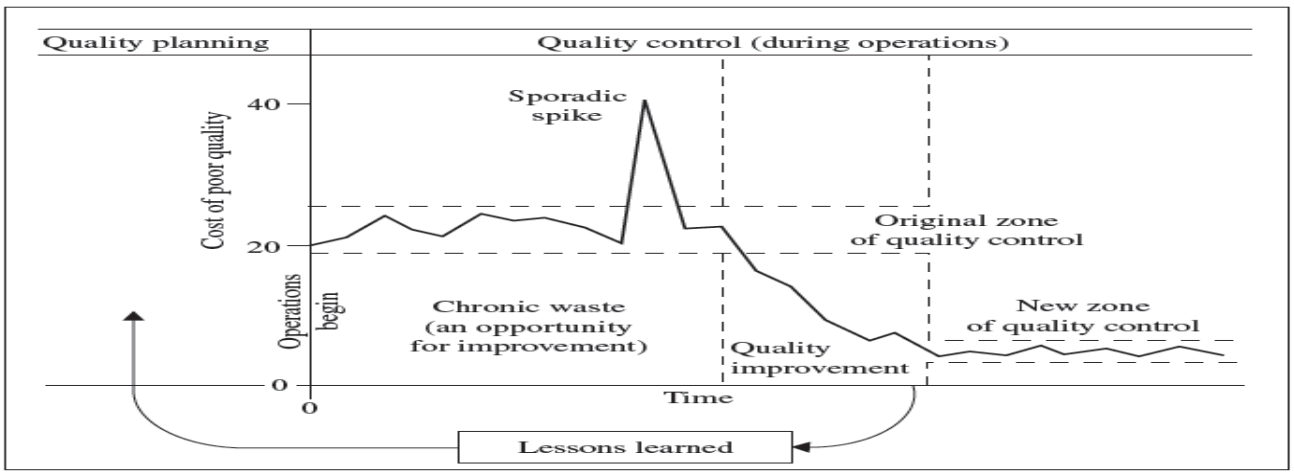
Chapter 7

Continuous Improvements

1. Input / Output Process Model



2. The Juran Trilogy



I. Planning
   i. Identify customers and their needs
   ii. Develop products and features that respond to the customer needs using Quality Function Deployment, Taguchi's Quality Engineering, Quality by Design, Design for Six Sigma could be some of the approaches
   iii. Develop the processes capable of producing the product and/or service features
   iv. Transferring plans to operations: process validation

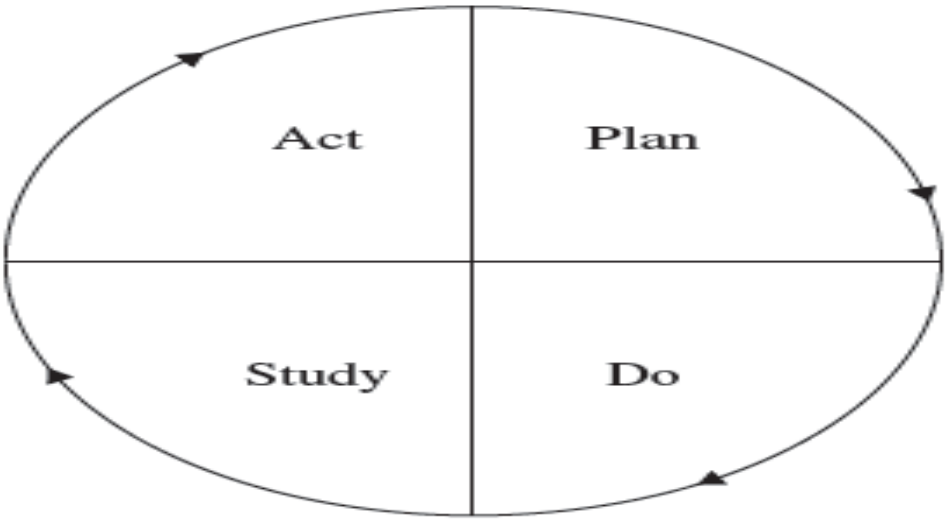
II. Control
   i. Determine items/subjects to be controlled and their units of measure.
   ii. Set goals for the controls and determine what sensors need to be put in place to measure the product, process, or service.
   iii. Measure actual performance.
   iv. Compare actual performance to goals.
   v. Act on the difference.

III. Improvement
   i. Identify projects and teams to use structured problem solving process
   ii. Process improvement can be incremental or breakthrough

3. Improvement Strategies in Juran Trilogy

- Repair:
  - Fix anything that is broken!
- Refinement:
  - Improvements to processes, products, and services are accomplished on an incremental basis
- Renovation
  - This strategy results in major or breakthrough improvements
- Reinvention
  - A new product, service, process, or activity is developed using teams based on a complete understanding of the customer's requirements and expectations

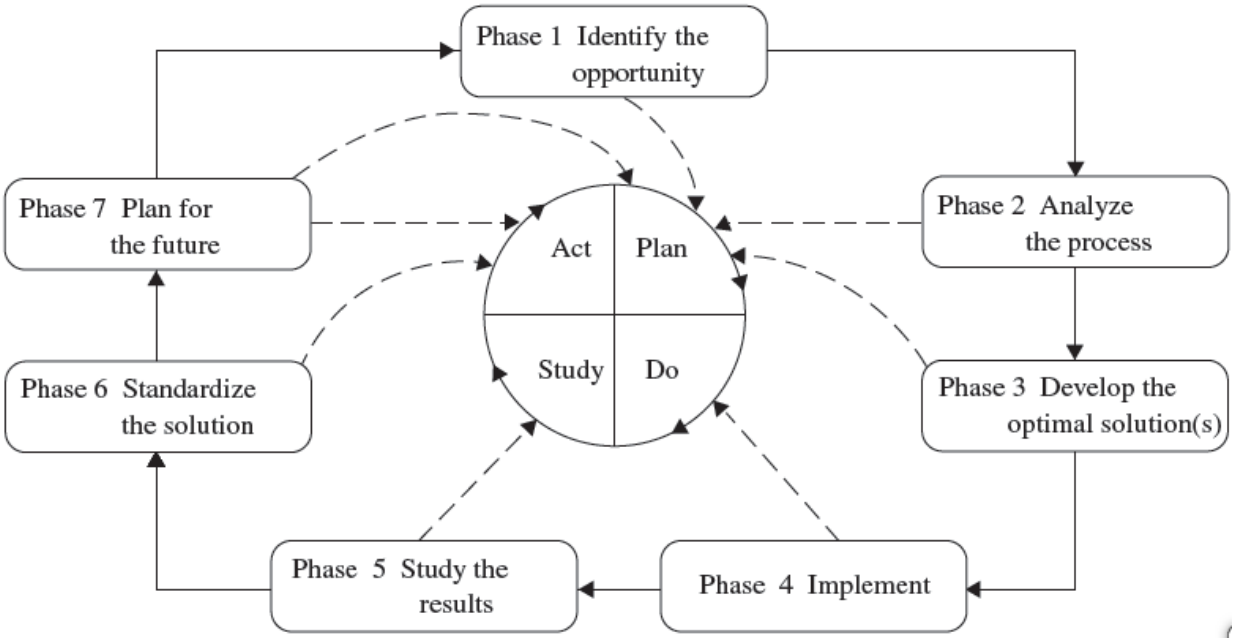
4. The PDSA Cycle



5. Problem-Solving Method with PDSA Cycle

- Phase 1: Identify the Opportunity
- Phase 2: Analyze the Current Process
- Phase 3: Develop the Optimal Solution(s)
- Phase 4: Implement Changes
- Phase 5: Study the Results
- Phase 6: Standardize the Solution
- Phase 7: Plan for the Future

6. Continuous Process Improvement Cycle



7. Kaizen

- *Kaizen* is a Japanese word for the philosophy that defines management's role in continuously encouraging and implementing small improvements involving everyone.
- Improvements are usually accomplished at little or no expense, without sophisticated techniques or expensive equipment.
- It focuses on simplification by breaking down complex processes into their sub-processes and then improving them.

8. Kaizen improvement focus

The Kaizen improvement focuses on the use of

i. **Value-added and non-value-added** work activities.

ii. **Muda, which refers to the seven classes of waste**—over-production, delay, transportation, processing, inventory, wasted motion, and defective parts.

iii. Principles of **motion study** and the use of **cell technology**.

iv. Principles of materials handling and use of **one-piece flow**.

v. Documentation of **standard operating procedures**.

vi. **The five S's** for workplace organization, which are five Japanese words that mean proper arrangement (*seiko*), orderliness (*seiton*), personal cleanliness (*seiketso*), cleanup (*seiso*), and discipline (*shitsuke*).

vii. **Visual management** by means of visual displays that everyone in the plant can use for better communications.

viii. **Just-in-time** principles to produce only the units in the right quantities, at the right time, and with the

ix. Right resources.

x. **Poka-yoke** to prevent or detect errors.

xi. **Team dynamics**, which include problem solving, communication skills, and conflict resolution.

9. Technical Terms in TQM

- **Value Added activities**: These activities are those which adds value to a business process or product and for which customer is willing to pay. Value Added activities help in converting a product from a state of raw material to a finished product in the least possible time, at minimum costs. It aims at completing a business activity correctly the very first time, and helping the business to deliver the product or service while fully conforming to customer requirements or specifications.
- **Non-Value Added activities**: These are those which do not add any value to the product or service but are an inherent part of the process. Customers are not willing to pay for such services. These activities prove to be a burden on the organization and affect its efficiency. Valuable resources in the organization are engaged in completing these activities despite the fact that such activity is slowing the progress of the organization.

  There are several **examples of Non-Value Added activities** found commonly among different organizations. Some of the most commonly found are:

i. Process steps which are not needed

ii. Unnecessary movement of goods or resources within or outside the organization

iii. Unnecessary paper work within or in between departments which is not required

iv. Rework due to defects found in products

v. Corrections or rechecking done due to important process steps not completed properly

vi. Services to customers(inside and outside) not properly delivered leading to customer dissatisfaction

vii. Unnecessary storage of raw materials or finished goods or storing more than required

viii. Important Organization resources such as expensive machinery or labor lying idle or waiting for work as inputs not delivered on time

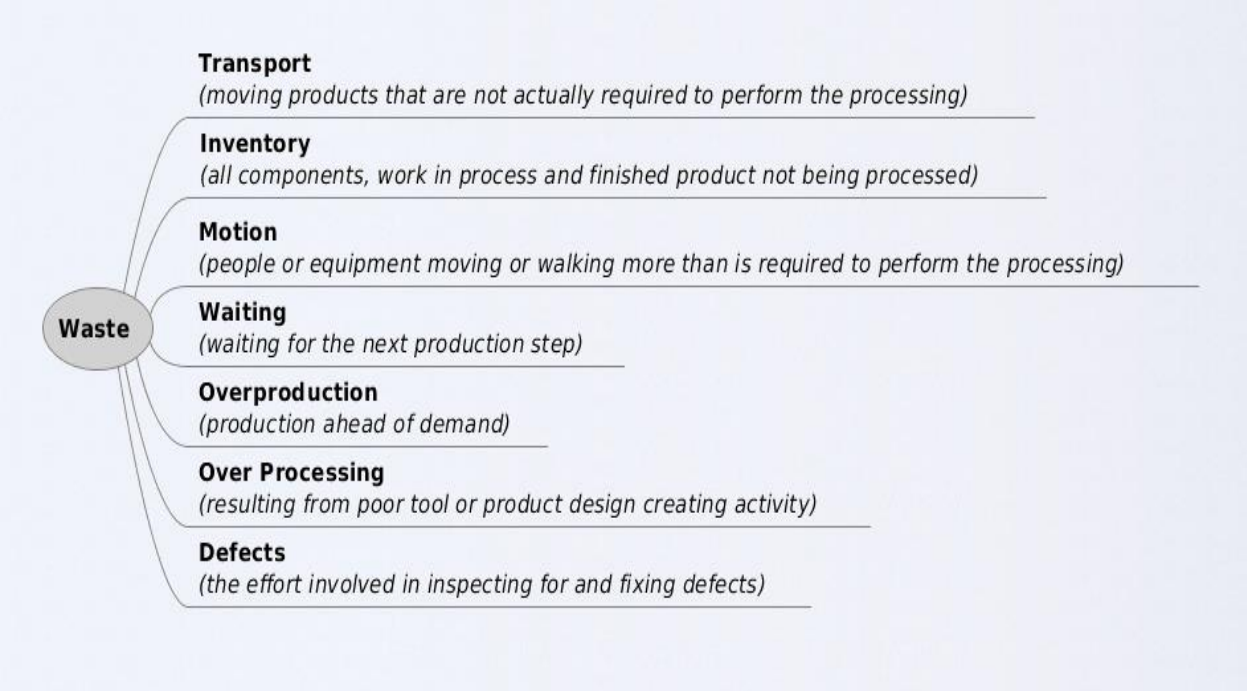
ix. Delay in delivery to customers (inside and outside) due to unnecessary waiting time

- ***Muda*** (無駄) is a Japanese word meaning "futility; uselessness; wastefulness".

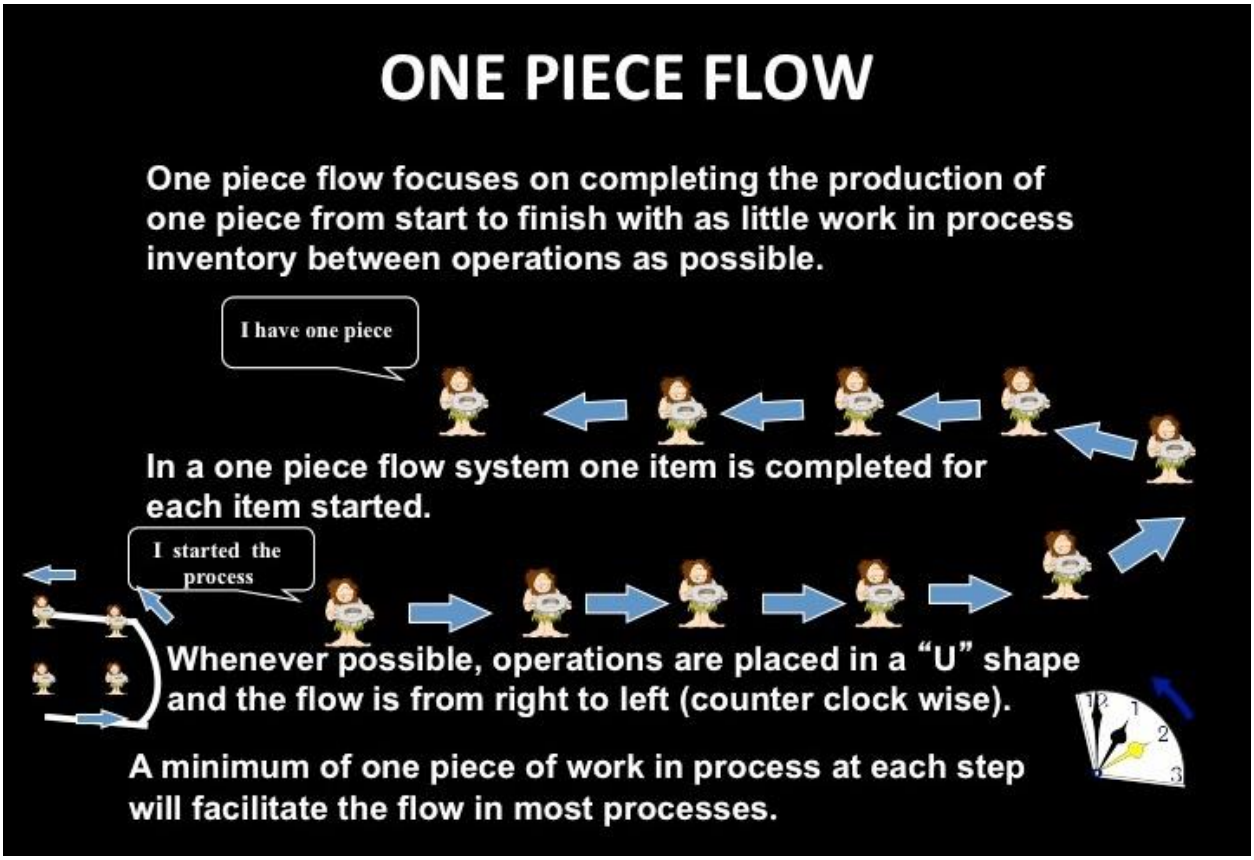
  One of the key steps in lean process and TPS is to identify which activities add value and which do not, then to progressively work to improve or eliminate them.

  Taiichi Ohno, "father" of the Toyota Production System, originally identified seven forms of *muda* or waste

Seven forms of *Muda* or waste in Toyota Production System



- **One Piece Flow**



- **Visual Management** is the ability to manage everything in your factory (and support areas) visually. Managing visually is the ability of a system to quickly show the current status to anyone that stands and observes, within 30 seconds.
- A **poka-yoke** is any mechanism in any process that helps an equipment operator avoid (*yokeru*) mistakes (*poka*). Its purpose is to eliminate product defects by preventing, correcting, or drawing attention to human errors as they occur.

10.Reengineering

- Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical measures of performance
  - Hammer and Champy
- Continuous improvement refers to both incremental and "breakthrough" improvement
- In 1997, EM Jorgensen Company applied reengineering using a five-phased problem solving approach that
- ultimately reduced operating costs by 12%. The focus of the project was to identify and eliminate non-valueadded work and reduce corresponding costs while maintaining quality.

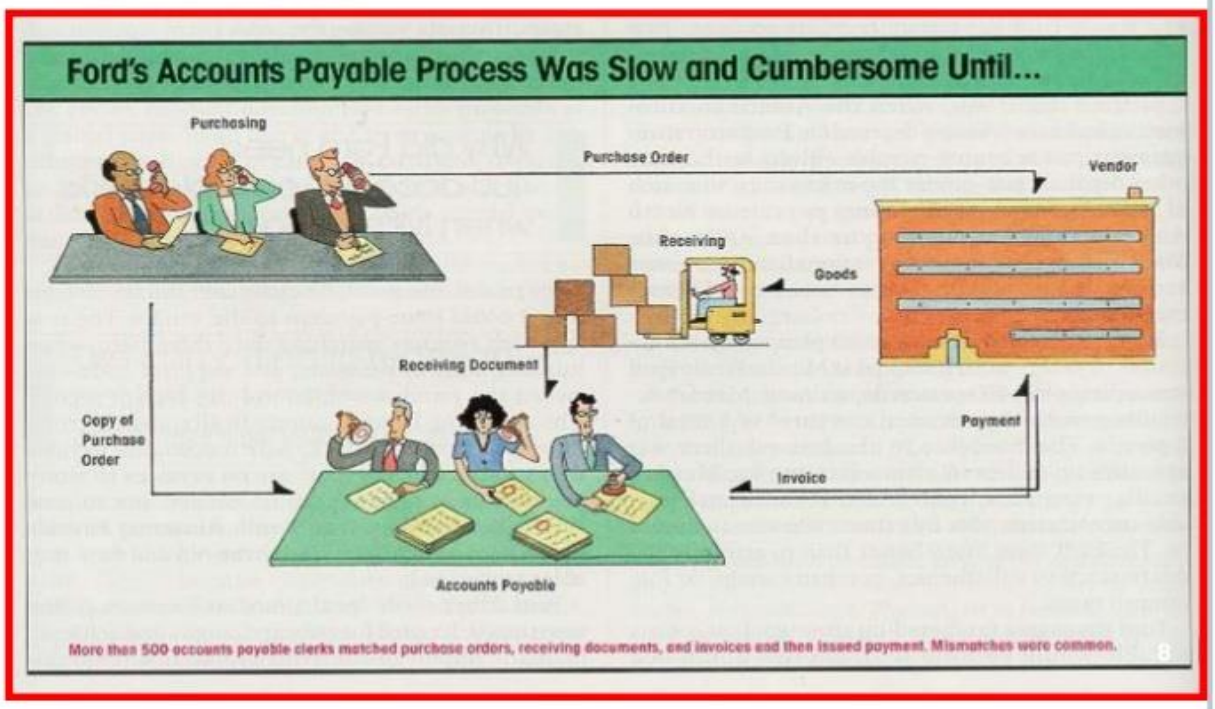
11.Examples of Reengineering

1. Company selling commemorative (یادگاری)cards

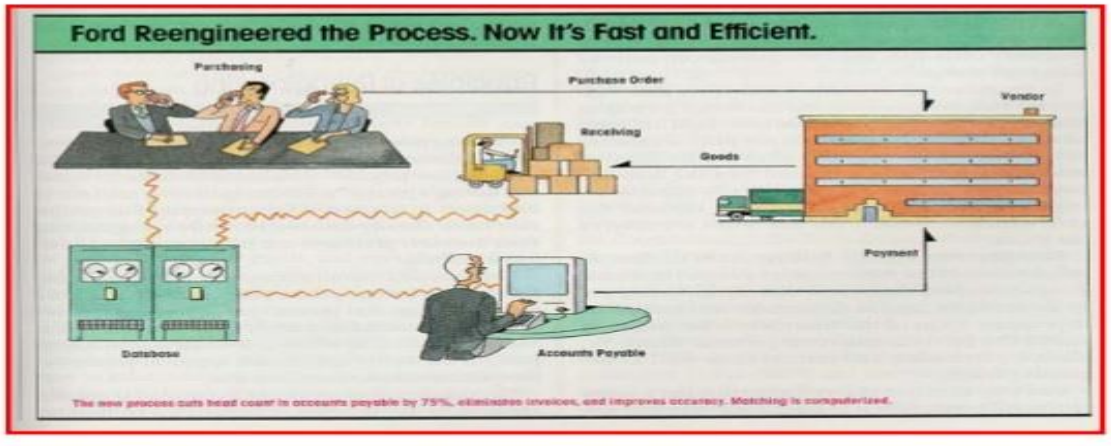
- In a company that offers products such as Christmas, anniversary, commemorative cards, etc., renewing the stock and changing the design of the cards is constantly fundamental.
- On average, it takes three months for new items to reach the shelves. Across market research, it's possible to realize that there would ideally be new products every month.
- At first glance, it's easy to say that the delay was at the production stage. When analyzing and mapping the process, it's verified that the creation stage was the most time consuming.
- Oftentimes the creative team receives the concept and several employees begin to perform the same task (duplicate actions), or an idea takes days to get off the paper. With this information, we can redesign the process completely, defining a cross-functional team from concept and creation, with incredible results in speed, costs and effectiveness.

2. Example of Ford Company

EXAMPLES



Ford (cont)



12.Six Sigma

- Six Sigma Approach was developed at Motorola in 1987 by Bill Smith
- Six Sigma Level of performance corresponds to a very low defect level of 3.4 parts per million (ppm)
- A popular roadmap of Six Sigma approach is DMAIC:

1. **Define**. Define the problem, the voice of the customer, and the project goals, specifically.
2. **Measure.** Measure key aspects of the current process and collect relevant data.
3. **Analyze.** Analyze the data to investigate and verify cause-and-effect relationships. Determine what the relationships are, and attempt to ensure that all factors have been considered. Seek out root cause of the defect under investigation.
4. **Improve.** Improve or optimize the current process based upon data analysis using techniques such as design of experiments, poka yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to establish process capability.
5. **Control.** Control the future state process to ensure that any deviations from target are corrected before they result in defects. Control systems are implemented such as statistical process control, production boards, and visual workplaces and the process is continuously monitored.