

Link the concepts of SCM, lean thinking + Six Sigma

↓

lean production + Six Sigma quality, two NB operating philosophies  
that are integral to the success of SCM,

seek to achieve these strategic initiatives

while @ the same time resolve the trade-offs that exist

when simultaneously pursuing the goals of

- high quality
- fast response
- low cost



## STAGES OF SCM evolution

### STAGE 1: INTERNAL FOCUSED

- Functional Silos
- Top-down Management
- Internal measures (used) to monitor progress
- Reactive, Short-term planning
- No internal integration

### STAGE 2: FUNCTIONAL INTEGRATION

- Focus on Internal flow of goods
- Emphasis on cost reduction
- Realisation of efficiencies gained by internal integration.

### STAGE 3: INTERNAL INTEGRATION

- Realisation of integration of goods flow throughout the firm
- Focus on logistics + lean prodn. activities to manage flow of goods + information
- Measurement of supplier performance & customer performance.

### STAGE 4: EXTERNAL INTEGRATION

- Extending integrative efforts 2 suppliers + customers
- Realisation of next 2 core'd goods links to 2nd + 3rd tier suppliers, customers
- Emphasis on alliance development + communication capabilities



ELEMENTS OF LEAN

1 Waste Reduction

Eliminating waste = the primary concern of the lean philosophy

It involves reducing:

- excess inventories
- material movement
- process steps
- scrap losses
- rejects + rework

(b) Waste reduction uses the 'Five S's'

4 The Seven wastes:

- 1 Overproducing → Proth of unnecessary items that maintain high utilizations
- 2 Waiting → Excess idle machine or operator time; materials experiencing excess waiting time for processing
- 3 Transportation → Excess movement of materials between processing steps; transporting items long distances using multiple handling steps
- 4 Overprocessing → Non-value-adding manufacturing, handling, packing or inspection activities
- 5 Excess Inventory → Storage of excess raw materials, WIP + finished goods
- 6 Excess movement → Unnecessary movements of employees + clutter on foot
- 7 Scrap + Rework → Scrap materials + unnecessary rework costs due to poor-quality materials or processes

- 1 Seiri → Organization (Sort)
- 2 Seiton → Tidiness (Set in order)
- 3 Seiso → Purity (Sweep)
- 4 Seiketsu → Cleanliness (Standardize)
- 5 Shitsuke → Discipline (Self-discipline)



# LEAN THINKING AND SCM

## Elements of lean

### ② Lean SC Relationships

- Firms work with buyers & customers with the mutual goal of
  - eliminating waste
  - improving speed
  - improving quality
- Key suppliers are considered partners
- close customer relationships or supply
- Mutual dependencies + mutual benefits occur among all lean SC relationships resulting in increased product value & competitiveness for all of the partners

### ③ Lean layouts

- WIP inventories are positioned close 2 each process
- layouts designed where possible 2 reduce movement of people and materials
- Processes are positioned to allow smooth flow of work through the facility

### ④ Inventory Setup Times Reduction

- Inventories reduced by reducing
  - setup time
  - batch sizes
  - safety stocks
- Firms tend to uncover / create problems for which non-managed + controlled.

### ⑤ Small batch scheduling

- Firms produce frequent small batches of products with frequent product changes to enable a level production schedule.
- Smaller, more frequent purchase orders or communicated 2 suppliers & more frequent deliveries or scheduled 2 customers
- Kanbans are used to pull WIP through the system.

### ① Continuous Improvement

- As queues + lead times are reduced, problems surface more quickly causing the need for continuous attention 2 problem-solving + process improvement.
- with lower safety stocks, quality levels must be high 2 avoid process shutdowns.
- Attention 2 supplier quality levels ↑ high.

### ③ Workforce Empowerment

- Employees ↑ cross-trained 2 total processing flexibility & 2 increase the workforce's ability 2 solve problems.
- Employees are trained 2 provide quality input so parts enter a process area.
- Employee roles are expanded & employees are given top management support & resources 2 identify + solve problems.



## LEAN SYSTEMS & THE ENVIRONMENT

Lean systems have a + impact on the environment

- reduces <sup>waste</sup> ~~waste~~
- reduces the cost of environmental management
- leads to improved environmental performance

Firms minimizing inventory + adopting quality standards

are more likely to practice pollution prevention

also have lower toxic chemical <sup>emissions</sup>

Credible lean processes are practicing continuous <sup>quality</sup> improvement

are necessary elements in successful SCM

## ORIGINS OF SIX SIGMA QUALITY [SYS]

### Six Sigma Defined

Six Sigma was developed by Motorola in 1987.

It is a statistics-based <sup>significant</sup> decision-making framework designed to make quality improvements in value-adding processes.

Six Sigma is a broad improvement strategy

that includes:

- the concepts/ideas of TQM
- a focus on the customer
- performance measurement
- formal quality control methods.

Defects per million opportunities

$\frac{\text{nr of defects}}{\text{COPK unit}}$

$$\text{DPMO} = \frac{\text{nr of defects}}{\text{COPK unit}} \times 1,000,000$$

CFO = opportunities for a defect to occur.



## Comparing Six Sigma & LEAN

For lean process to be successful

- pushed parts + overburden
- WIP
- Finished goods

must all MEET / EXCEED quality requirements.

1 of the demands of lean = continuous improvement

lean or one area where the principles of Six Sigma can be put to good use in a lean system

- Reorganizing floor layouts
- reducing batch sizes + setup times
- will reduce mid lead times + inventory levels
- providing better delivery performance + lower cost

Lean prodn = all about reducing waste ↓

Six Sigma = all about improving quality ✓

The term used to describe the relationship of lean prodn

& Six Sigma quality processes → lean Six Sigma / Lean Six.



Deming's Contributions

- W. Edwards Deming's theory of management states that:
  - since managers are responsible for creating the systems that make org's work, they (the managers) should be held responsible for the org's problems.

Deming's 14 Points for management:

- 1 Create consistency of purpose for improvement of product + service.
- 2 Adopt the new Philosophy.
- 3 Create dependence on mass wage
- 4 End the practice of awarding business based on the basis of price tag only.
- 5 Consistently improve product + service systems
- 6 Institute training
- 7 Adopt + Institute leadership.

Crosby's Contributions

- Phillip Crosby emphasized commitment 2:
  - quality improvements by top management
  - development of a prevention system
  - employee education + training
  - continuous assessment.

Crosby's 4 Absolutes of Quality

- 1 The definition of quality = conformance to requirements. do it ✓ the first time.
- 2 The system of quality = Prevention. we SPC as part of the prevention system
- 3 The performance standard = Zero defects. insist on zero defects. education + training will eliminate defects.
- 4 The measure of quality = the cost of nonconformance. ∴ cost of poor quality. ∴ implement a prevention program.

- 8 Drive out fear
- 9 Break barriers down defects
- 10 Eliminate slogans, exhortations and targets for the workforce. Remove extraneous barriers that rob people of pride of workmanship.
- 11 Remove numerical quotas for managers + workers
- 12 Encourage education + self-improvement for everyone
- 13 Take action to accomplish the transformation.



## Elements of Six Sigma

→ The Malcolm Baldrige National Quality Awards

→ The objectives of the award (only given to US firms) are:

- 2 stimulate firms to improve quality + productivity
- 2 recognize firms for their quality achievements
- 2 establish criteria + guidelines so that (eg) an independently evaluate their quality efforts
- 2 provide examples of quality & best (pract) working & learn (how) & merge and improve quality + productivity.

→ Joseph Juran's recommendations

Juran's Contributions:

Joseph Juran's recommendations were focused on his Quality Trilogy.

### ① Quality Planning

- The process of planning & meet quality goals.
- Identify ~~the~~ internal + external customer's, determine their needs & develop products that satisfy those needs.

### ② Quality Control

- The process of meeting quality goals during operations.
- Determine what is control, measure performance etc.

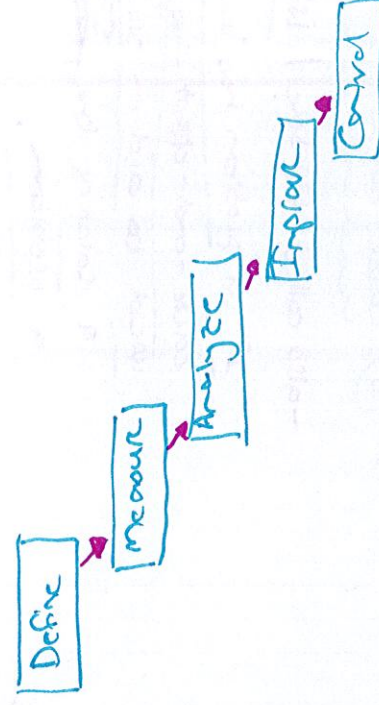
### ③ Quality Improvement

- The process of breaking through & unprecedented levels of performance.
- Show the need for improvement.
- Identify projects for improvement.



## The DMAIC Improvement Cycle

5 Steps:



① Define:

Identify customers and their service/product requirements (critical & achieving customer satisfaction characteristics).

② Measure:

Prepare or data collection plan & quantify process performance.

③ Analyze:

Perform a process analysis using the performance data collected.

④ Improve:

Design or implement plan; then remove the causes of process variation by implementing the improvement plan.

⑤ Control:

Monitor the process & assure that performance levels are maintained.

The ISO 9000 + 14000 Families of Management Standards.

→ ISO Standards are:

- Voluntary
- developed in response to market demand
- based on consensus among the member countries.

→ ISO considers evolving technology + member interests by requiring a review of its standards at least every 5 years. To decide whether they should be maintained, updated or withdrawn.

→ ISO standards or technical agreements

that provide the framework

for compatible technology worldwide.



# THE STATISTICAL TOOLS OF SIX SIGMA.

## ① Flow Diagrams.

- Also called process diagrams | process maps
- Flow diagrams use annotated boxes representing process activity elements
- ovals representing wait periods
- connected by arrows
- 2. Show the flow of products | customers through the process.

## ② Check Sheets

- Check sheets allow users to determine frequencies for specific problems.

## ③ Pareto Charts

- Pareto charts are useful for presenting data in an organized fashion indicating problems from most to least severe.

## ⑤ Statistical Process Control. (SPC)

- SPC allows firms to
  - o usually monitor process performance
  - o compare the performance to the desired levels | standards.
  - o take corrective steps quickly before process variables get out of control or damage products, services or customer relationships.

## ④ Cause-and-Effect Diagrams

- also called fishbone | Ishikawa diagram
- If a problem has been identified cause-and-effect diagrams can be used to aid in brainstorming & isolating the causes of a problem.