Lean Manufacturing:

An overview of how it can help a business

Food, Fibre & Timber Industry Lean Manufacturing Overview

By

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Biography

Qualifications:

Tradesman Fitter Machinist
Professional Mechanical Engineer (1st Class Honours)
Project Engineer
Maintenance Engineer
Master Business Administration
Maintenance Manager

Engineering and Business Work History:

Nova Machinery – *Manufacturer Press Brakes & Guillotines*
Swan Brewery – *Beverage*
Riverton Engineering – *Sheet Metal Fabrication*
Coogee Chemicals – *Mining & Agricultural Chemicals Manufacture*
Lifetime Reliability Solutions – *Lean, Asset Management, ISO 9001 Quality Consulting, and Competitive Manufacturing – Central Inst of Technology*

- Three universal problems in business…

1. ***Wasted effort and wasted resources***
2. ***Using wrong business processes for the purpose***
3. ***Wide and out-of-control process variation***

- Lean Manufacturing provides tools and solutions to address them.

Need to Achieve Process Control and Capability

In control and capable

In control but not capable

Out of control

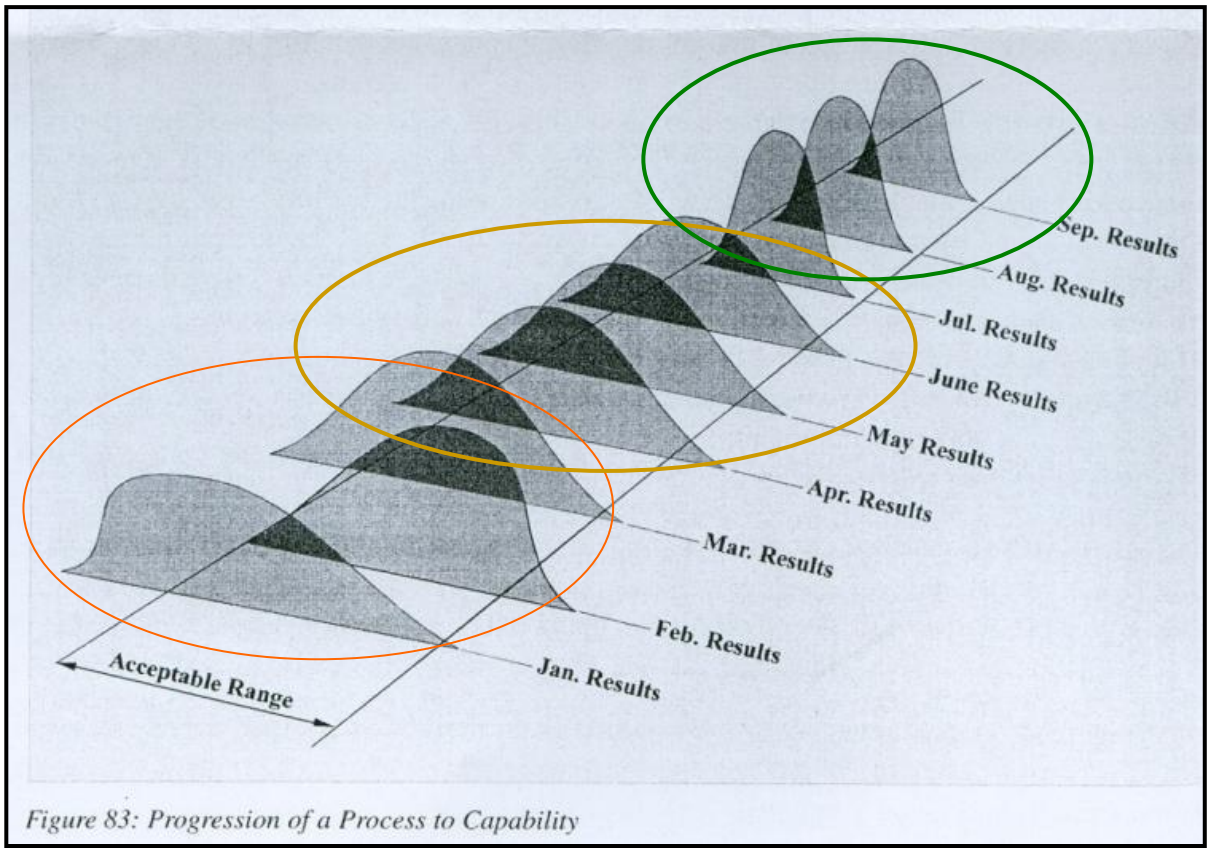


Figure 83: Progression of a Process to Capability

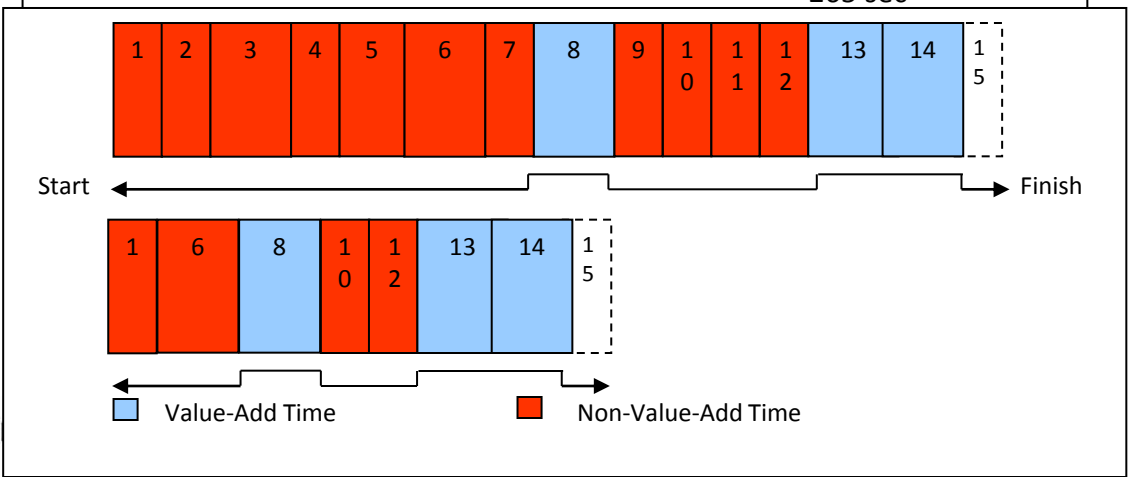
Wasted Effort and Resources

Waste when Mounting a Part on a Truck Chassis

1 Drop carton of components at assembly line	Start
2 Walk 8 meters to pick-up components	10 sec
3 Remove carton wrap to expose components	60 sec
4 Reach into carton and grab components	20 sec
5 Orient components so they can be picked up	60 sec
6 Pick up bolts for component	15 sec
7 Walk 8 meters to the chassis on the assembly line	10 sec
8 Position components on the chassis	**20 sec**
9 Walk to power tool	5 sec
10 Reach for power tool	5 sec
11 Walk and pull tool to component on the chassis	10 sec
12 Bring power tool down to component	5 sec
13 Place bolts in the component	**20 sec**
14 Tighten bolts to the chassis with power tool	**15 sec**
15 Place power tool on bench	10 sec
16 Walk 8 meters to pick-up next components	
	265 sec

Value Added

"Would the Customer be less satisfied with the product if this step were left out?"



The 7 Wastes

***1** Overproduction*: Producing items for which there are no orders.

***2** Waiting Time*: Employees standing about. Inventory at stand-still.

***3** Unnecessary Transport*: Moving material unnecessarily or long distances.

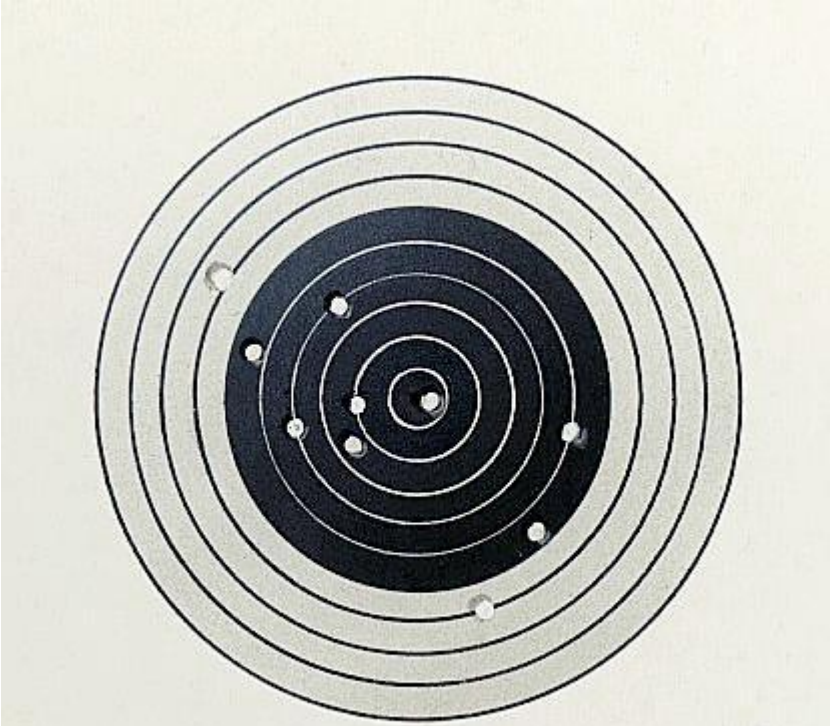
***4** Over-processing*: Using more steps to produce a product than necessary.

***5** Excess Inventory*: Retaining unnecessary inventory between process steps.

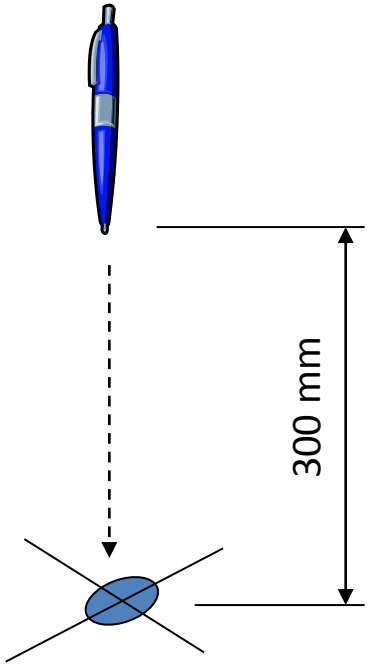
***6** Unnecessary Movement*: Any wasted motion by man or machine.

***7** Defect*: Making incorrect product.

Wrong Business Processes for the Job



How do you hit the bulls-eye every time?

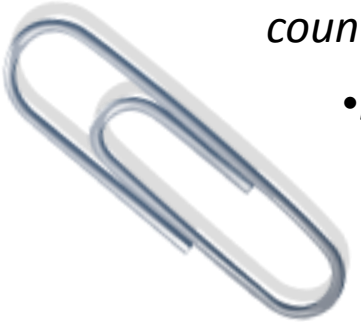


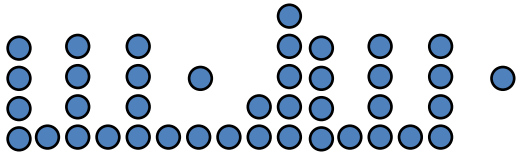
Cross-hairs and 5 mm diameter circle

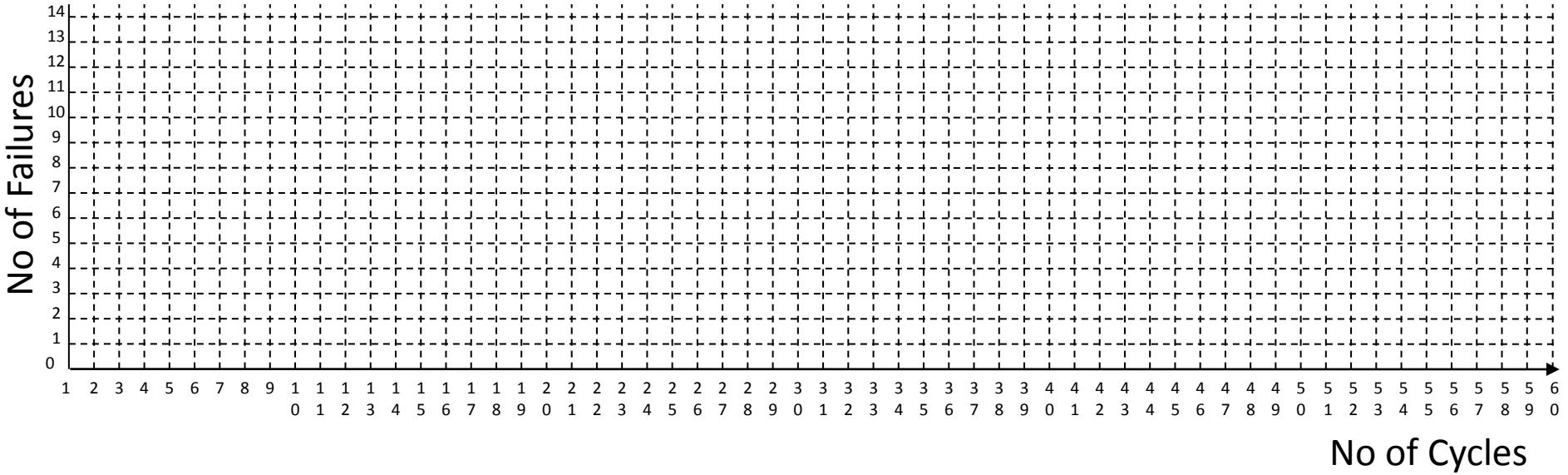
Wide Process Outcome Variation

Distribution Curve of Variation in a Process

- *Uncoil a paper clip and bend it as instructed by the Presenter. Carefully count the number of cycles until it breaks.*
- *Develop a distribution of the count of the number of cycles to failure.*

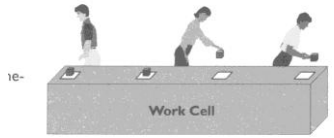






The Basic Lean Concepts

- **Be customer focused**: Downstream Customer's want defines value. Be on-time, responsive, flexible, and fast.
- **Standardise and level workflows**: Mimic continuous one-piece flow, minimise WIP, use visible measures.
- **Manage capacity**: Increase process uptime, reduce set-up times, find 'lost' capacity.
- **Eliminate waste**: Identify non-value add activity, then modify, combine, eliminate those tasks.
- **JIT production and delivery** : Not too early - never late; always done right first time; equipment always works when needed.



ıs and batch production versus one-piece flow

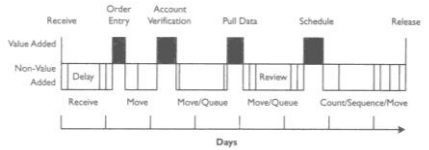
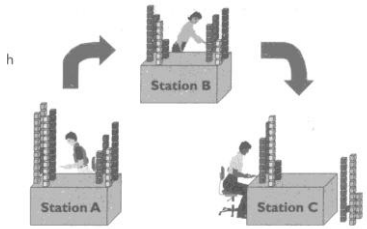
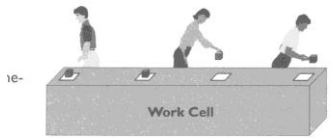


Figure 21-1. A non-lean flow in an account verification process



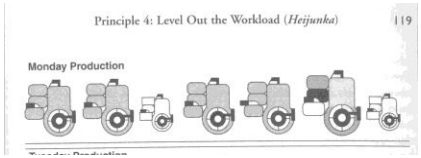


ıs and batch production versus one-piece flow

Source: Liker, Jeffery K., 'The Toyota Way 14 Management Principles from the World's Greatest Manufacturer', McGraw Hill, 2004

To Be Lean = Eliminate Non-Value

- **Match lot sizes to customer demands**: Use kanbans; end WIP (no stock).
- **Use pull scheduling** instead of push scheduling. (Takt time)
- **Schedule to the rate-determining step** (the bottleneck) then debottleneck process.
- **Facilitate fast feedback**: Arrange sequential operations next to each other for fast feedback from ‘customer’ to ‘supplier’ operation if something in-process is wrong.
- **Value-stream map** to locate waste (non-value) and design it out.



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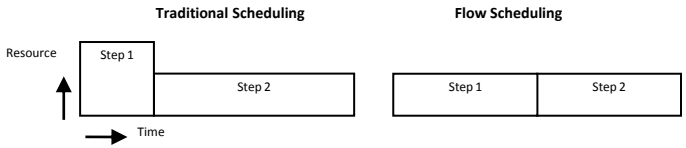

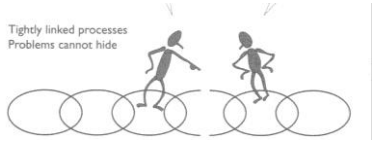

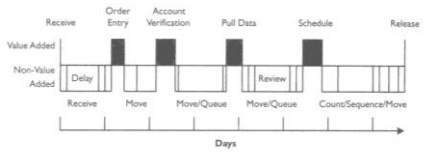

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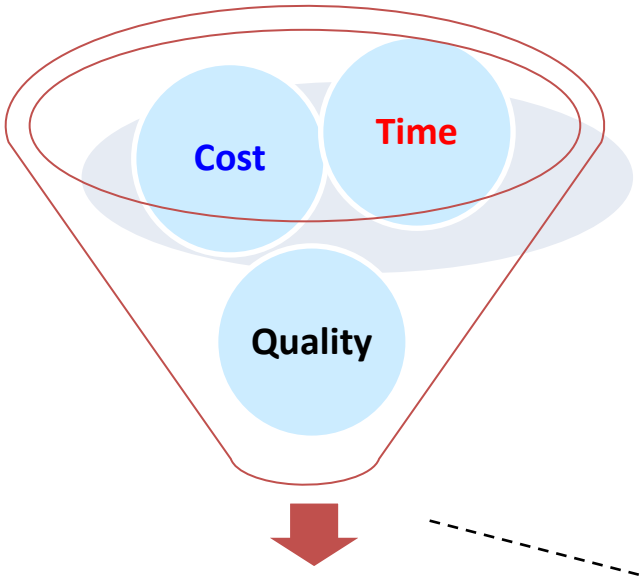
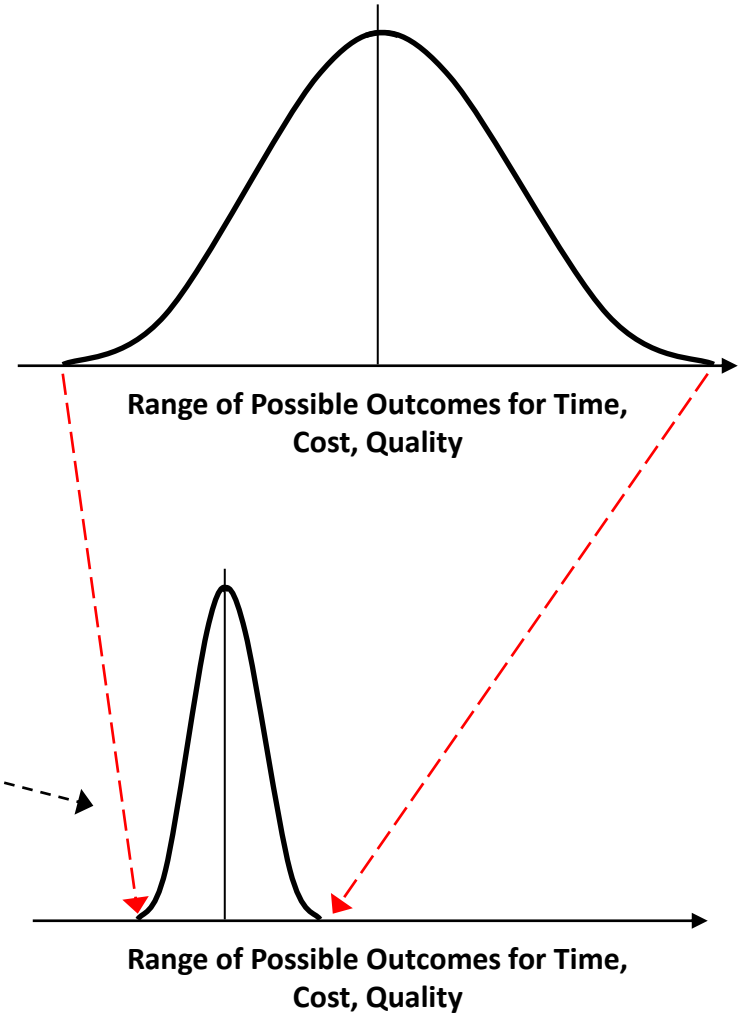
Standardised Work Limits Variability



Standardised Work means…

'developing the one best way'



Lifetime Reliability • Solutions

Competitive Manufacturing Companies bring useful Lean Six Sigma practices into the business

- Lean
  - Used to improve Effectiveness : are we doing the right things!
    - 7 Wastes
    - The 'Hidden Factory'
    - Lean Thinking/Practices
    - Lean Tools
      - Value Stream Mapping
      - 5S: Workplace Management
      - Kaizen

- Six Sigma
  - Used to improve Efficiency: are we doing things right!
    - 6σ accuracy
    - Sigma Levels
    - The Variation Problem
    - Six Sigma Tools
      - DMAIC Process
      - 7 QC Analysis Methods
      - Visual Management