Application of Lean principles to improve performance

HOSPITALITY OPERATIONS MANAGEMENT

Themes

- This Week:
  - Business Process Improvement
  - The Lean (Just In Time) Approach
  - Reprise (Le)Agility
  - Time-based Competition

What is performance improvement?

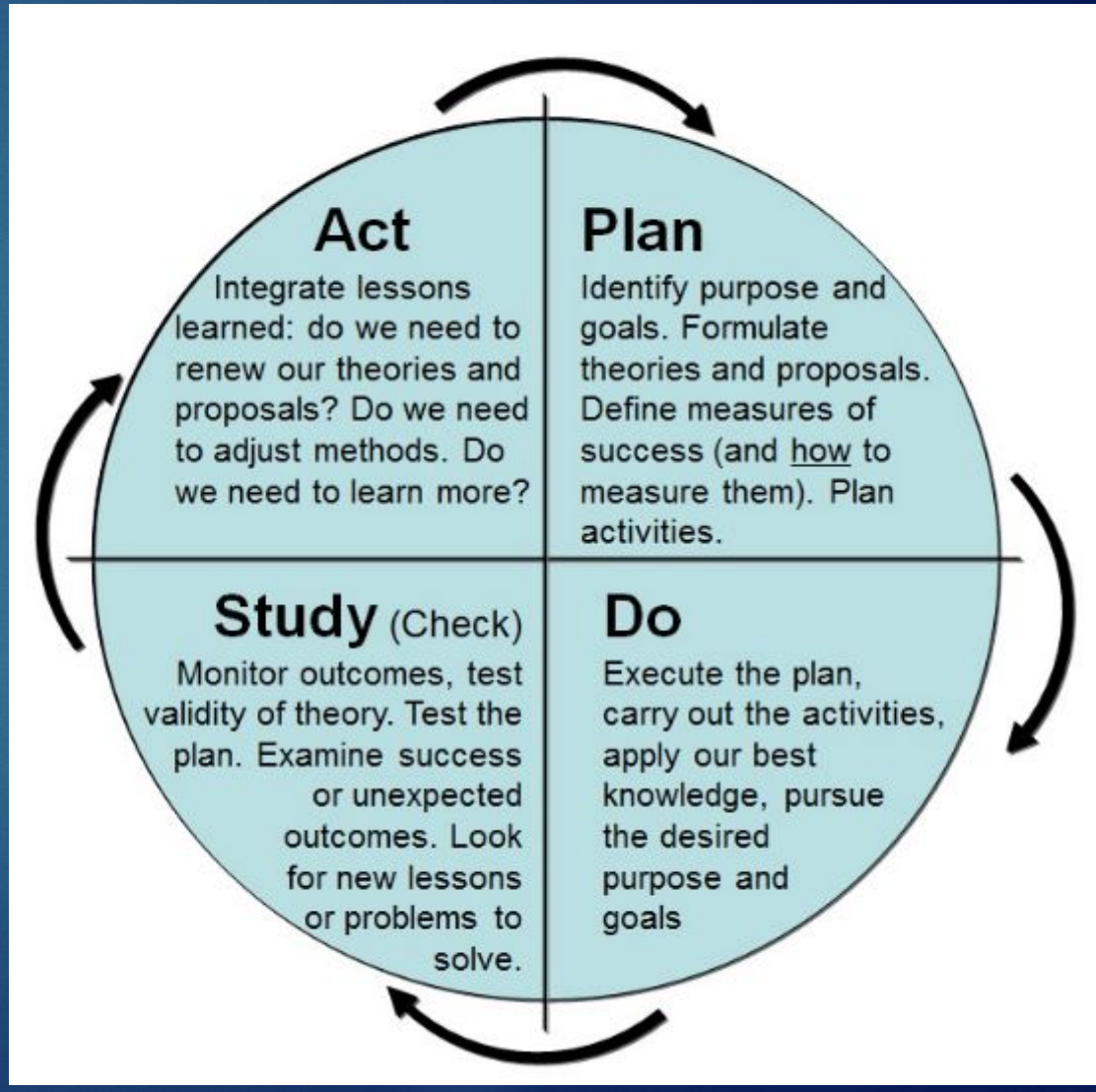
- Performance Improvement:
  - A change that moves the operation towards achieving its performance objectives.
- Generally two broad areas:
  - Productivity & efficiency:
    - Mainly cost & speed (increasing difference between inputs and outputs).
  - Effectiveness:
    - Cost, speed, flexibility, dependability & quality (achieving closer alignment between performance and market requirements).

Common Themes of Business Improvement Approaches

- Aligning processes and people with the strategic aims of the organisation.
- Emphasising the importance of striving for zero defects (consistent conformance).
- Emphasising improvements to productivity and profitability.
- A continuous journey of improvement.
- Utilising various tools to help analyse, choose, implement and monitor decisions.

Problem solving steps based on Deming's PDCA cycle

1. Recognise the problem and establish priorities.
2. Form quality improvement teams.
3. Define the problem.
4. Develop performance measures.
5. Analyse the problem / process.
6. Determining possible causes.
7. Select and implement the solution.
8. Evaluate the solution: Follow-up.
9. Ensure permanence.
10. Continuous improvement.



Fitzsimmons & Fitzsimmons, 2014

Lean Synchronization

- "aims to meet demand instantaneously, with perfect quality and no waste. This involves providing products and services in perfect synchronization with the demand for them."
  - Slack et al (2010:429)
- To be instantaneous means to be?
- To have perfect quality means?
- To have no waste means?

Lean Operations

'The key principle of **lean operations** is relatively straightforward to understand: it means moving towards the elimination of all waste in order to develop an operation that is faster and more dependable, produces higher quality products and services and, above all, operates at low cost.'

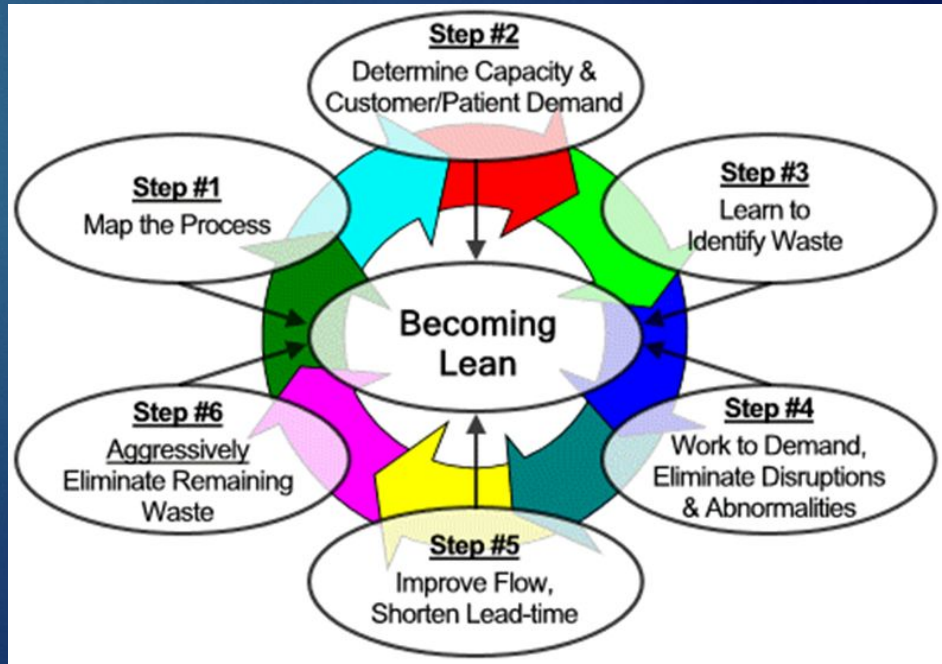
Slack (2010)

Lean Manufacturing Philosophy

- The main objective of Lean manufacturing is to reduce throughput times by eliminating waste and reducing in process time variability to allow the fast production of customised products at high (but not maximum) capacity utilisation.
  - Note variability increases average throughput time and reduces effective capacity. See earlier lectures.
- Also requires a smooth even flow – reduce variability. http://youtu.be/U86bTrsdShg (Smooth Flow)
- The result is a smooth, uninterrupted flow of small batches of products through the production system.

Lean Manufacturing as Performance Improvement

- Origins:
  - Manufacturing, especially the Toyota Production System (TPS).
    - See Womack, J.P. et al (1990) The machine that changed the world.
    - http://youtu.be/qcWEr2gh0Sg
    - http://youtu.be/KtTQff7Uf_w
  - Lean also includes Just In Time (JIT) inventory.
- Aims:
  - Eliminate waste (adds cost and time).
  - Continuous improvement.
  - Involve everyone.



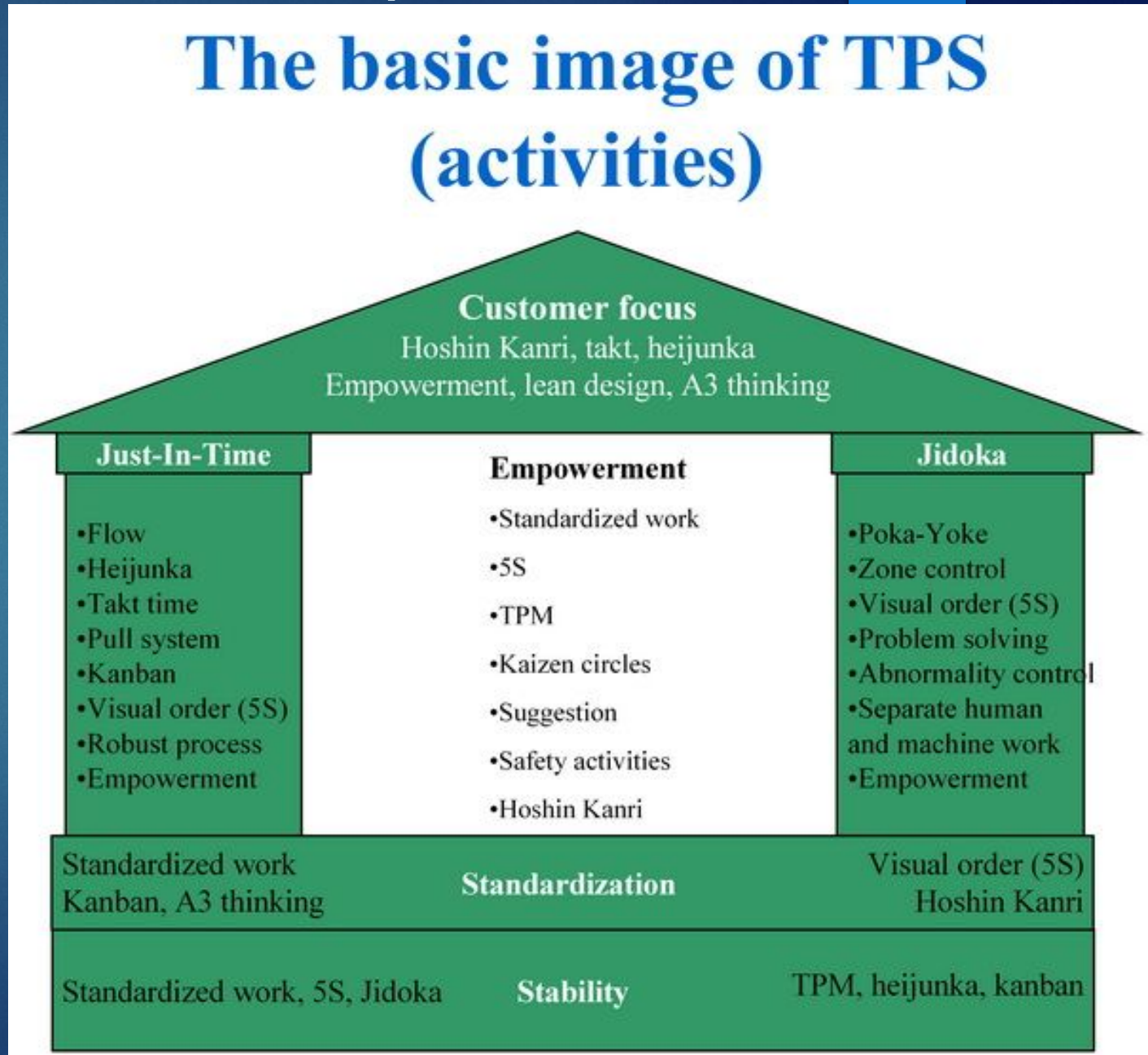
The ideal production situation

- Instantaneous order fulfilment:
  - No need for forecasting
  - No need for inventory
  - Zero defects
- What about a smooth flow?
  - Predictable demand and inventory
  - No variability in production time so high capacity utilisation

Lean operations (Continued)

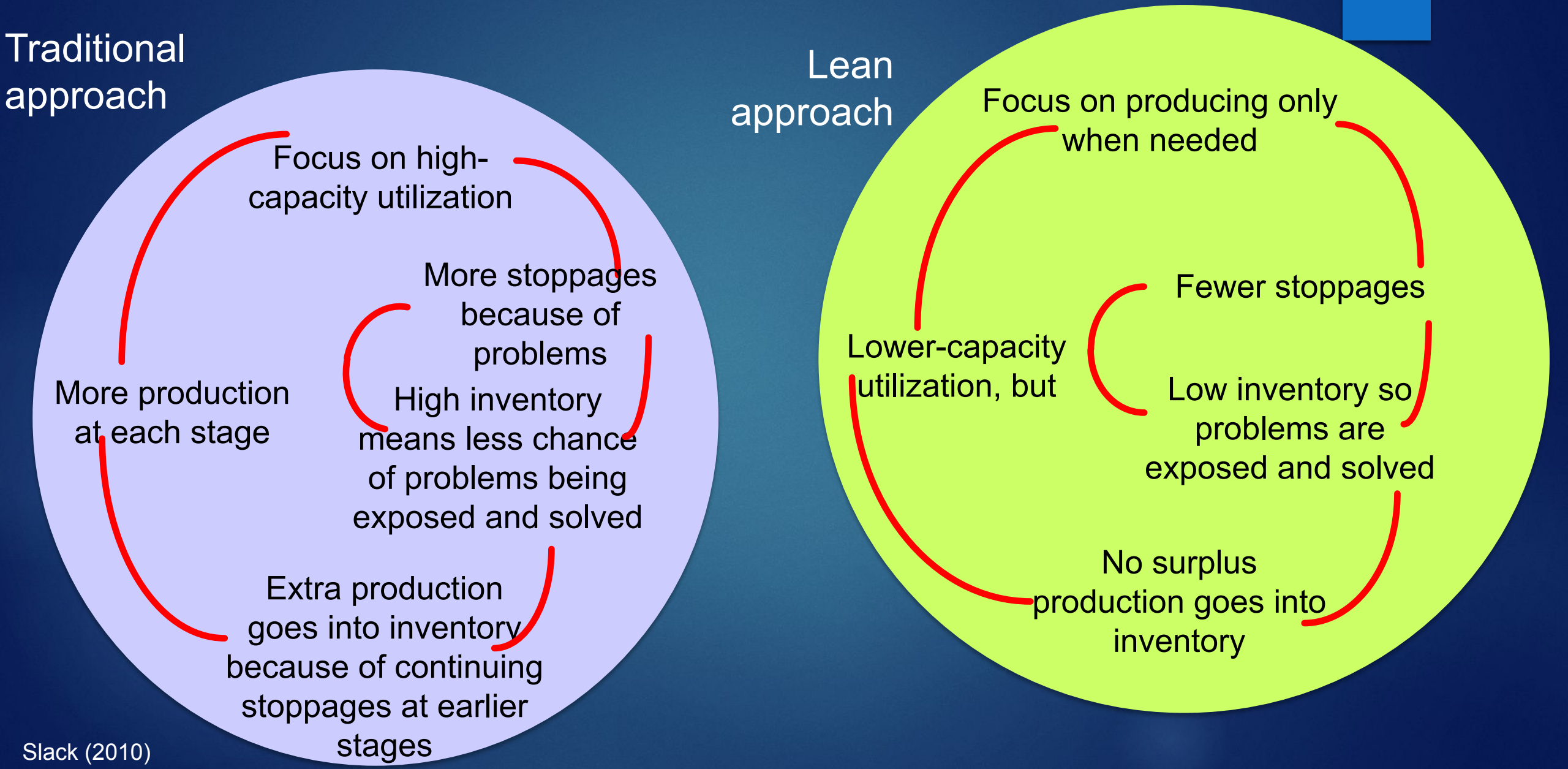
Synonyms

- Continuous flow manufacture
- High value-added manufacture
- Stockless production
- Low-inventory production
- Fast-throughput manufacturing
- Lean manufacturing
- Toyota production system
- Short-cycle time manufacturing.



Slack (2010)

Lean operations (Continued)



Slack (2010)

Inventories of materials. Information or customers have similar characteristics

	Inventory		
	Of material (queue of material)	**Of information (queue of information)**	**Of customers (queue of people)**
Cost	Ties up working capital	Less current information and so worth less	Wastes customers' time
Space	Needs storage space	Needs memory capacity	Need waiting area
Quality	Defects hidden, possible damage	Defects hidden, possible data corruption	Gives negative perception
Decoupling	Makes stages independent	Makes stages independent	Promotes job specialization/ fragmentation
Utilization	Stages kept busy by work-in-progress	Stages kept busy by work in data queues	Servers kept busy by waiting customers
Coordination	Avoids need for synchronization	Avoids need for straight-through processing	Avoids having to match supply and demand

Source: Adapted from Fitzsimmons, J.A.

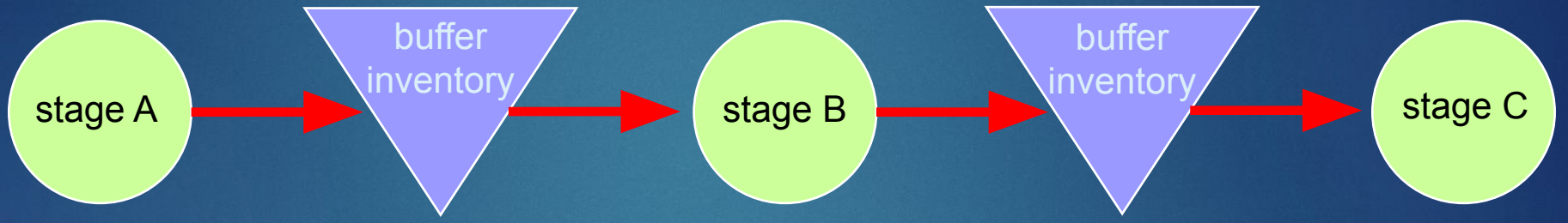
Slack (2010)

Push & Pull Scheduling

- Conventional production is reliant upon push scheduling:
  - Production in response to forecast demand and hope of selling stock.
- Pull scheduling is practised by JIT / Lean. Goods are produced in response to a demand trigger for the finished product:
  - Meals cooked in response to order?
  - Must have short throughput time (fast production).

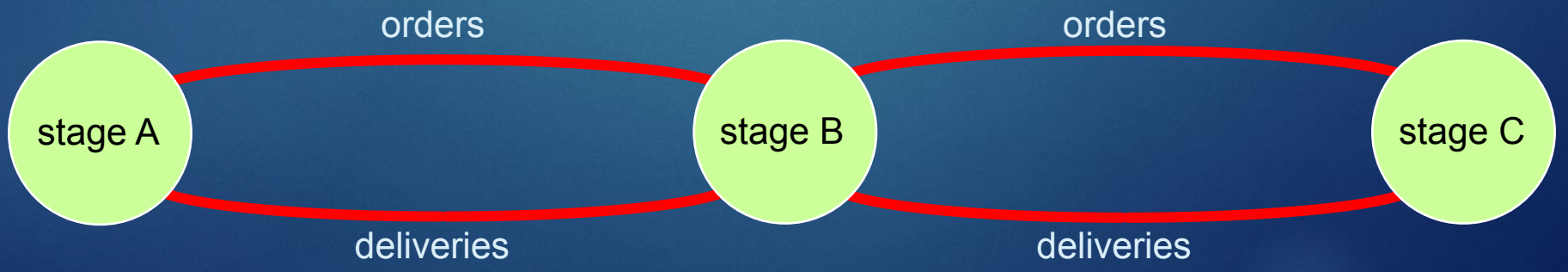
Just In Time (Lean) material flow

Traditional approach



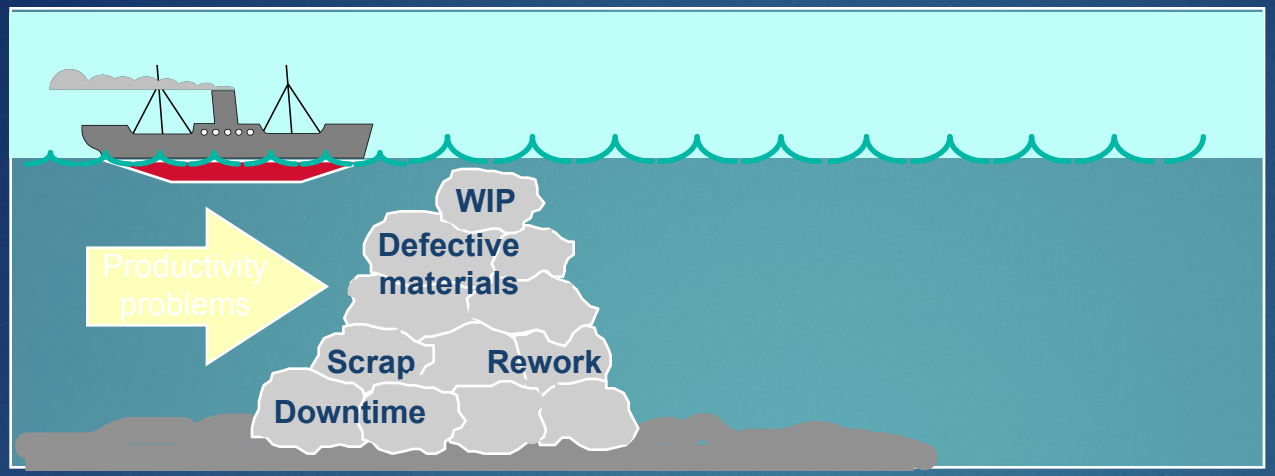
Because of FIFO buffer inventories slow the progress of an order through the system, essentially items queue between each value adding production stage

JIT approach

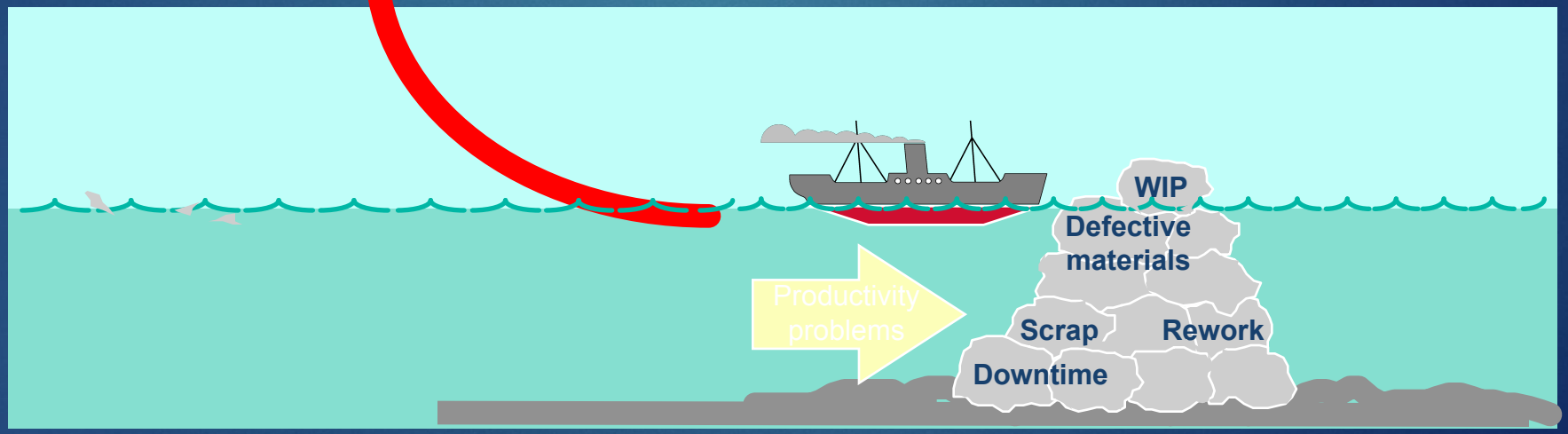


Slack (2007)

The problem with inventory

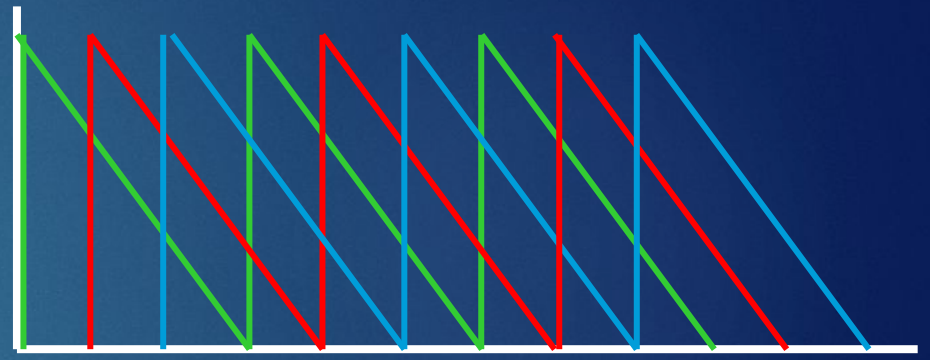


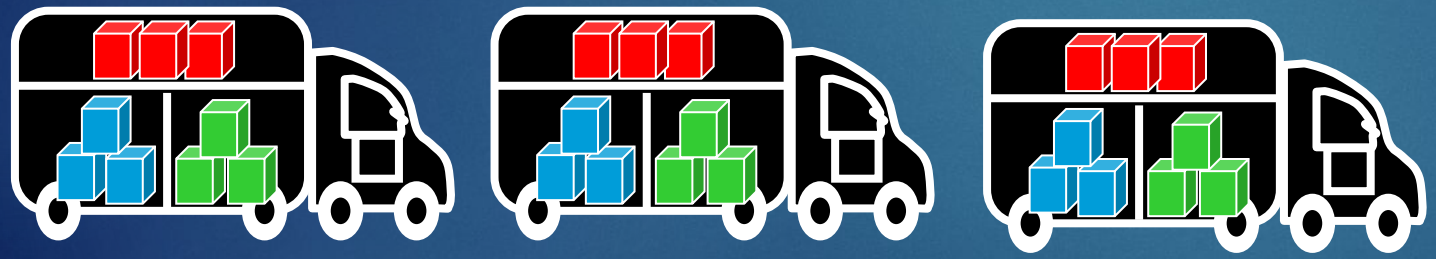
Reduce the level of inventory (water) to reveal the operations' problems

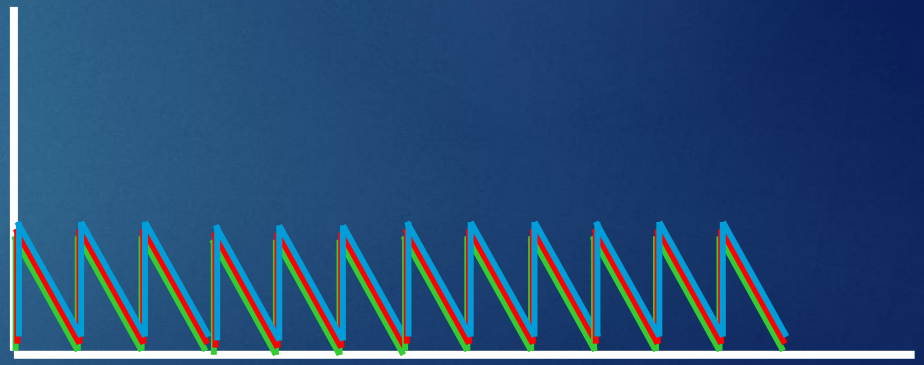


Slack (2010)

Delivering smaller quantities more often can reduce inventory levels







Slack (2010)

Buffers in Service

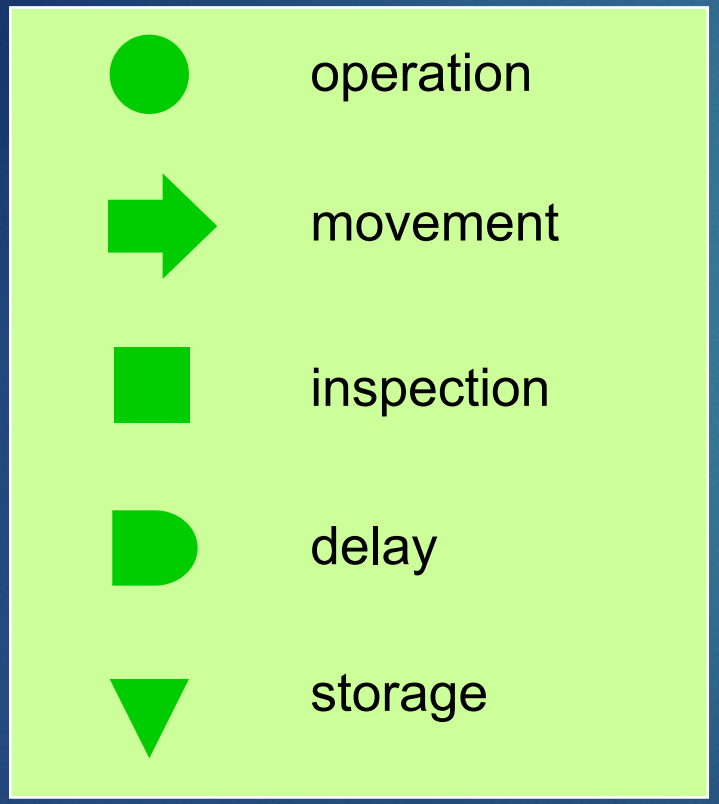
- Variable arrival and processing rates mean that buffers (queues) are inevitable as capacity utilisation increases. Look back to earlier lecture:
  - People experience time and don't like time that does not add value.
  - Look back at process design and queuing lectures.
  - Material inventory buffers?

Eliminate Waste.

- Eliminate Waste:
  - Waste can be defined as any activity which does not add value.
  - Identifying waste is the first step towards eliminating it.
- What types of waste might occur in service operations ?

Waste (*muda*)

Activities:



Types of waste:

- over-production
- waiting time
- transport
- process
- inventory
- motion
- defective goods

 influencing the throughput efficiency

http://www.youtube.com/watch?v=XukxCM57xfU

Slack (2010)

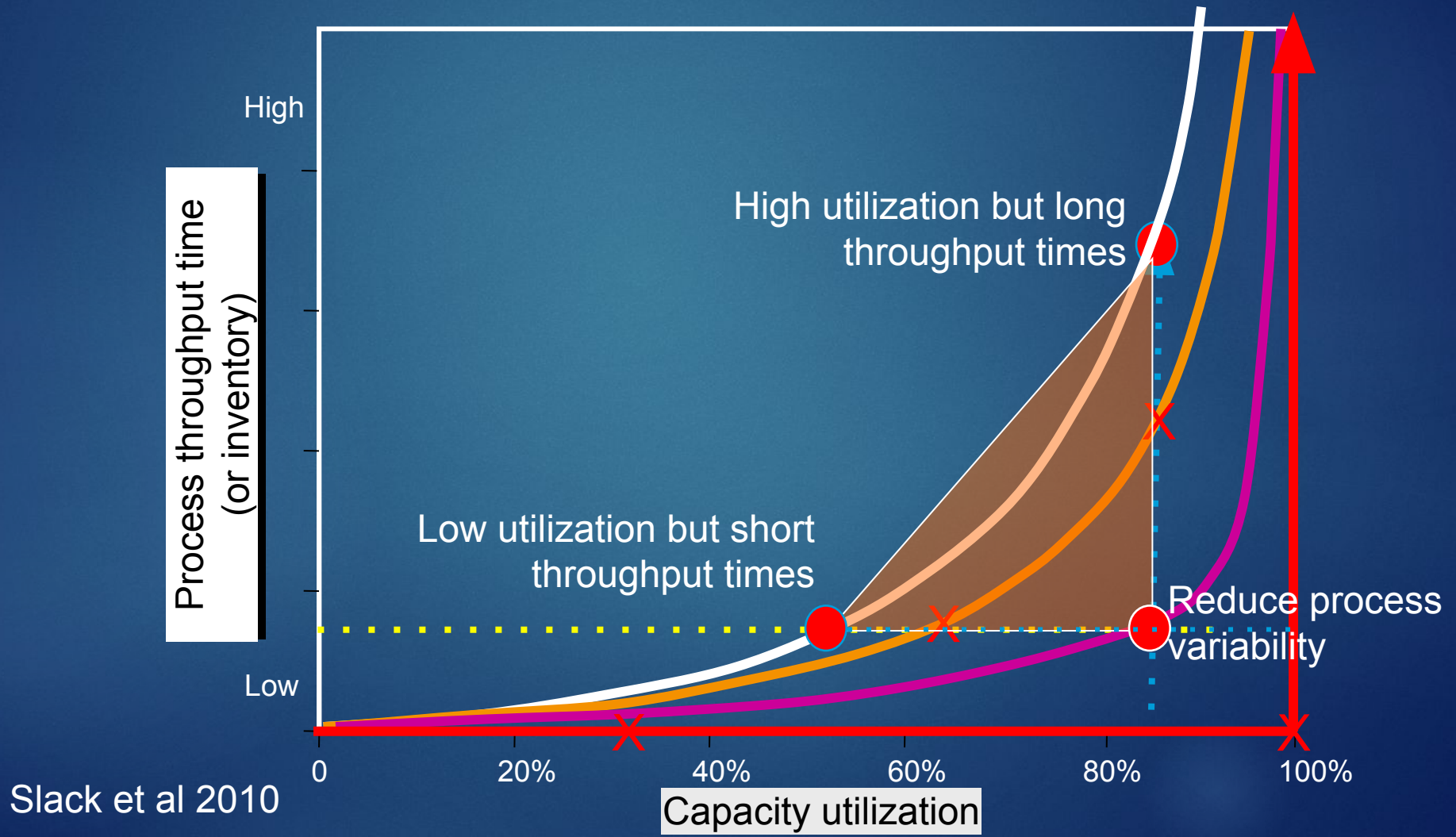
Eliminating Waste (Manuf)

- Make only what is needed now.
- Reduce waiting by coordinating flows and balancing loads among resources (queues & bottlenecks).
- Reduce or eliminate material handling and shipping.
- Eliminate all unneeded production steps.
- Simplify products and speed processes.
- Eliminate unnecessary human motions.
- Eliminate defects and inspection.

Lean Capacity utilisation

- A key objective used to be to fully utilise production capacity so that more products were produced with fewer workers and machines.
- This thinking led to large queues of work in process waiting at work centres.
  - Large in-process inventories in case of previous process machine breakdown.
  - Keep making it, hope to sell it (end up discounting).
  - Out of date (fashion) stock (scrap)

Capacity Utilization



Slack et al 2010

Its about time!

- ‘Lean thinking’ is largely about reducing material and time waste so that capacity utilisation can be increased and total cost of production reduced.
- Improved speed of production aims to permit some customisation of products with shorter waiting times. It also reduces production process variability.
- Removal of part-finished and finished goods allows a waste-less and quick change of product for the market.

Kaizen

- *Continuous improvement* - usually, but not always, applied to improving manufacturing performance through the elimination of waste.
- *The philosophy of kaizen is to make gradual improvements at little or no cost* - use your knowledge, not your money.
- Those who do the job are best placed to identify improvements. Encourage all employees to find ways to improve performance.
  - http://www.youtube.com/watch?v=Q89qAbAAR3Q (the ten commandments of continuous improvement).

The Five S's

- Sort (Seiri) Eliminate what is not needed and keep what is needed.
- Straighten (Seiton) Position things in such a way that they can be easily reached whenever they are needed.
- Shine (Seiso) Keep things clean and tidy; no refuse or dirt in the work area.
- Standardize (Seiketsu) Maintain cleanliness and order – perpetual neatness.
- Sustain (Shitsuke) Develop a commitment and pride in keeping to standards.
  - http://youtu.be/cNb28wpi-Nw
  - http://youtu.be/Ui-Lk6gK7m8

Slack (2010)

Six Sigma

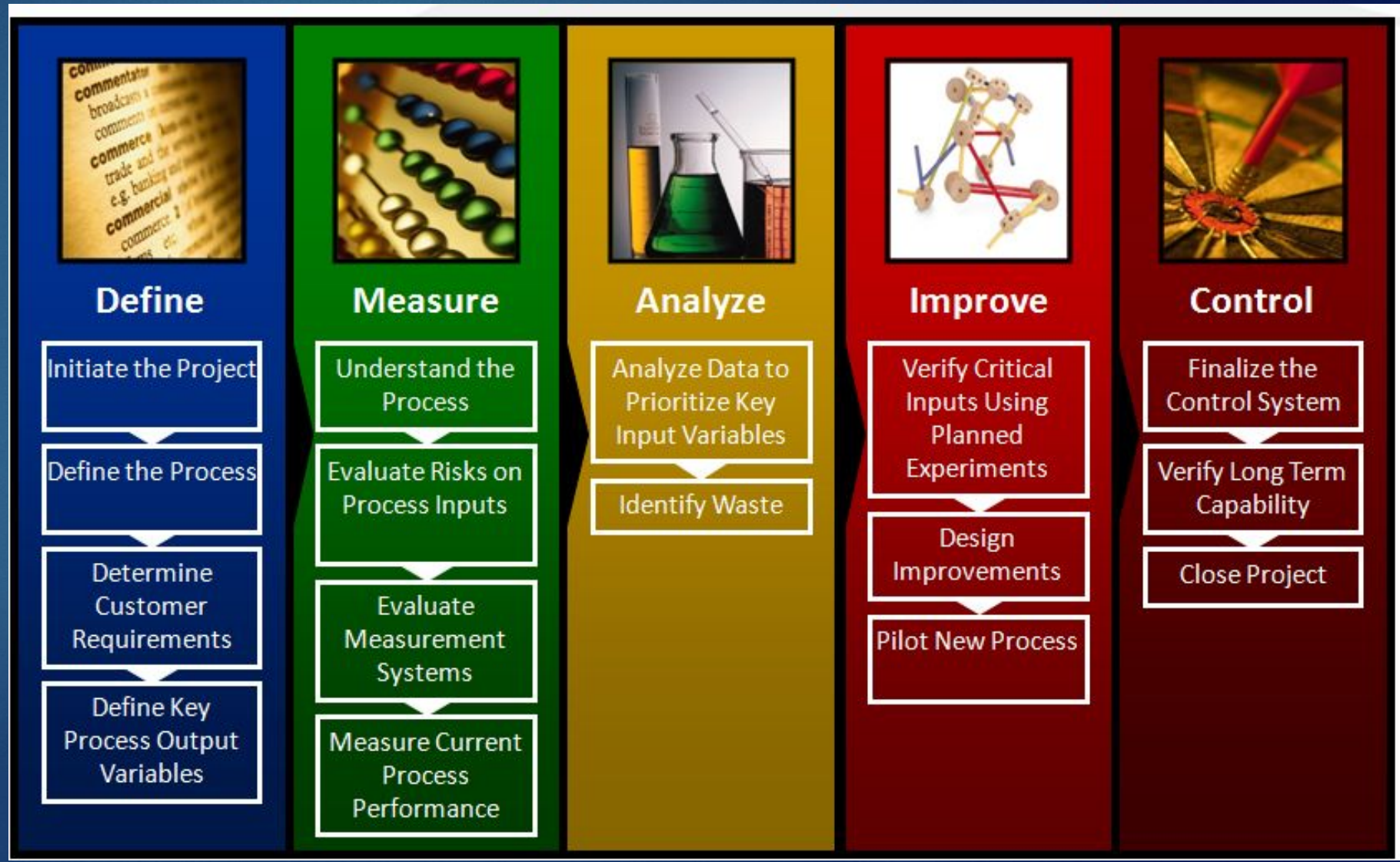
- "The primary means to achieving six sigma quality level is to eliminate the causes of quality or process related problems **before** they are transformed into defects. The focus of "six sigma" is not on counting the defects in processes, but the number of opportunities within a process that could result in defects."
  - JIJU, A. (2006) Six Sigma for Service Processes Business Process Management Journal Vol. 12 No. 2 pp. 234 - 248

Six Sigma

- Developed in 1980's and Copyrighted by Motorola (www.motorola.com/motorolauniversity.jsp)
  - Disciplined data driven approach and methodology for **eliminating defects** in a process
  - Defect is anything outside of customer expectations
  - Focuses on **process improvement**
  - Uses two sub-methodologies, DMAIC & DMADV
    - www.isixsigma.com

Sub-methodologies

- DMAIC
  - Define, Measure, Analyse, Improve, Control



DMAIC Tool Examples

- **Define**: Brainstorming, Importance Performance matrix, Pareto.
- **Measure**: Data collection.
- **Analyse**: Data analysis, 5-whys, cause and effect diagrams, process map.
- **Improve**: Process redesign.
- **Control**: SOPs and performance objectives.

Lean or Six Sigma?

- Lean:
  - Waste elimination, quality improvements are a factor here.
  - Immediate benefits, not copyrighted.
- Six Sigma:
  - Defect identification and minimisation.
  - Involves significant upfront training of ‘guru’ staff.
- Approaches are being combined by some to create Lean Six Sigma.
  - http://youtu.be/LnE8_V8jT00 (Summary of all three).

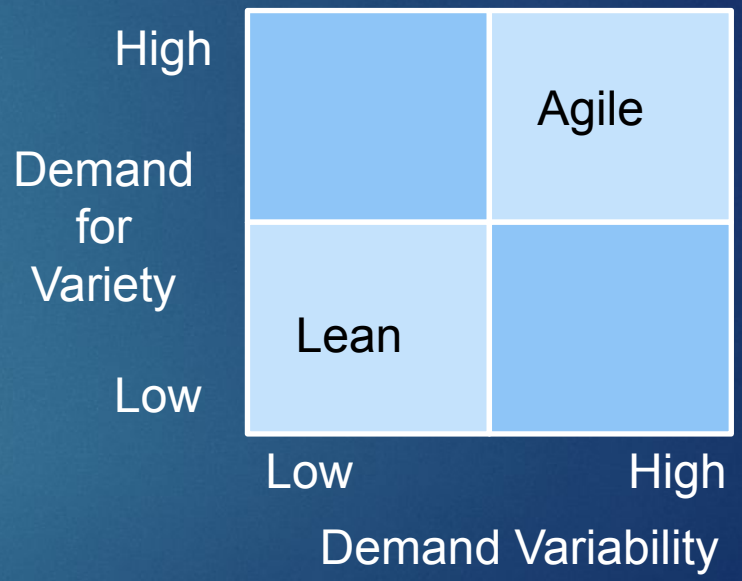
Developments from Lean

LEAN / AGILE MANUFACTURING

QUICK RESPONSE MANUFACTURING

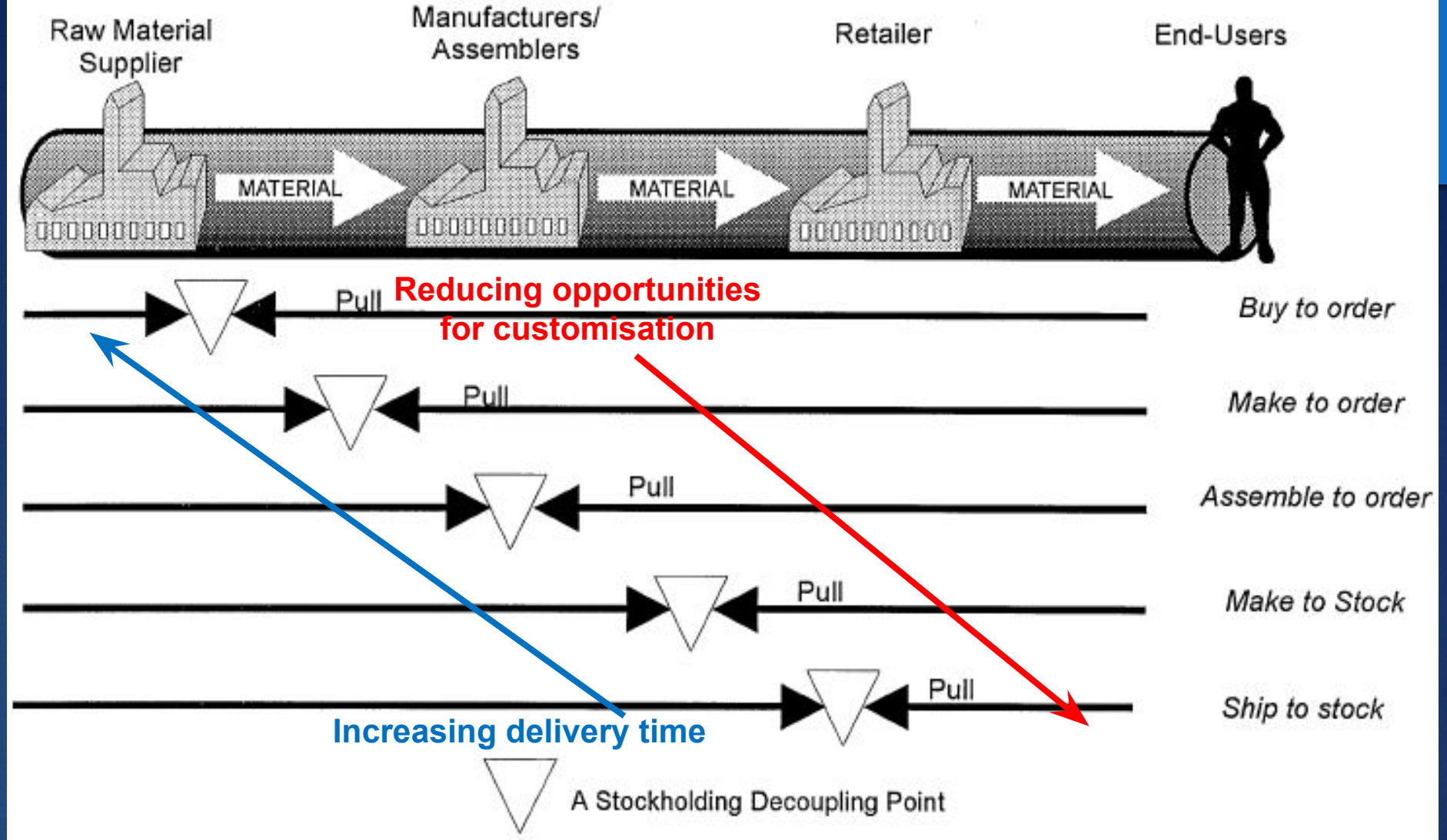
(Le)Agile Manufacturing

- Lean expects a smooth flow and level production schedule. Frequently demand is variable or difficult to predict and customers request variety or customisation in products. How do we manage this?



Agile Manufacturing (a variant of Lean)

- To remain agile (responsive) some waste is inevitable – labour, stock and other resources held, "Just In Case"
- The scope of choice for customers (generally) reduces as production (assembly) moves towards the customer in the supply chain.
- Product customisation needs very short throughput times:
  - Fast preparation from limited stock or assembly of limited ready made modules.
- NAYLOR, J.B. et al (1999) Leagility: Integrating the lean and agile manufacturing paradigms in the total supply chain International Journal of Production Economics Vol. 62 , pp. 107 -118



- The decoupling point represents the point of differentiation , where raw materials or part finished goods are assembled. The idea is to think of ways to postpone decoupling as long as possible IF product demand is variable / difficult to forecast. Easier to do for simple products with short production time. Burgers assembled to order?

http://youtu.be/nCljs9Bx6Zg

Time-based Competition / Manufacturing (TBC/M) & QRM

- Derives from / builds on Lean, also called Quick Response Manufacturing (QRM):
  - Claims Lean not ideal for small batch sizes, high customisation, variability in process time.
  - Costing activities ignores the "white space" of inactivity as it is hidden in overhead costs.
  - Suggests "capacity slack" to maintain short throughput times where process times are variable (see queuing lecture).
  - Primary aim is throughput time reduction / order fulfilment speed, this may increase manufacturing cost but reduce costs overall due to lower costs for overheads (e.g. admin staff and warehousing).
    - See Tu, Q., et al (2001) The impact of time-based manufacturing practices on mass customisation and value to customer Journal of Operations Management Vol. 19 pp. 201-217