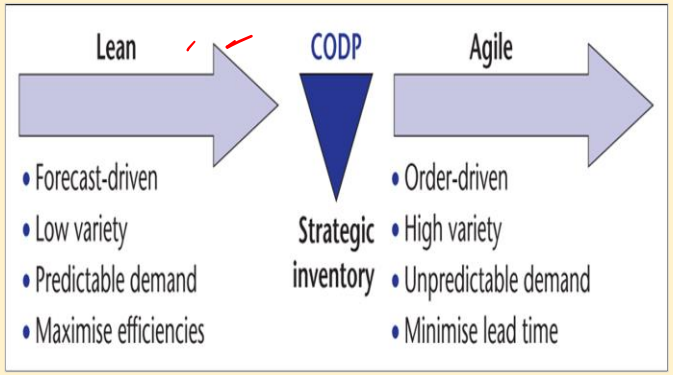
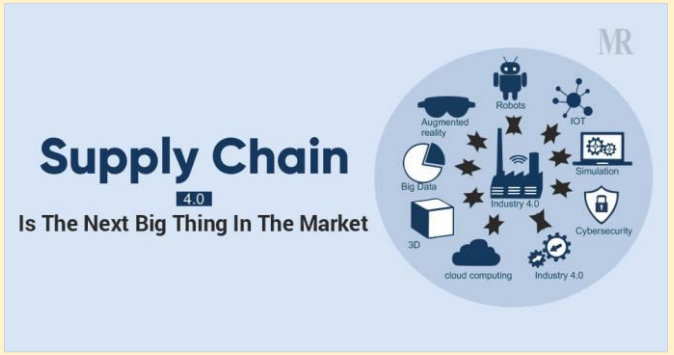
Lecture 6- Lean and Agile Strategies

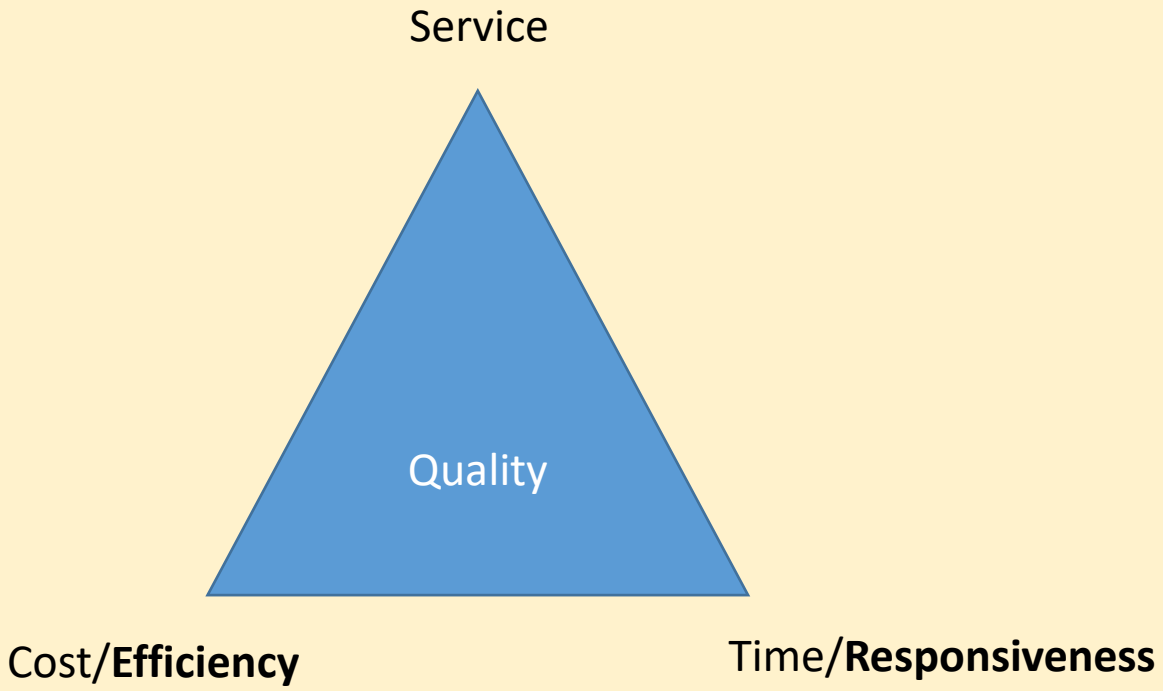




Dr Andre Samuel andre.samuel@sam.edu.tt http://samuellearning.org/scm.html

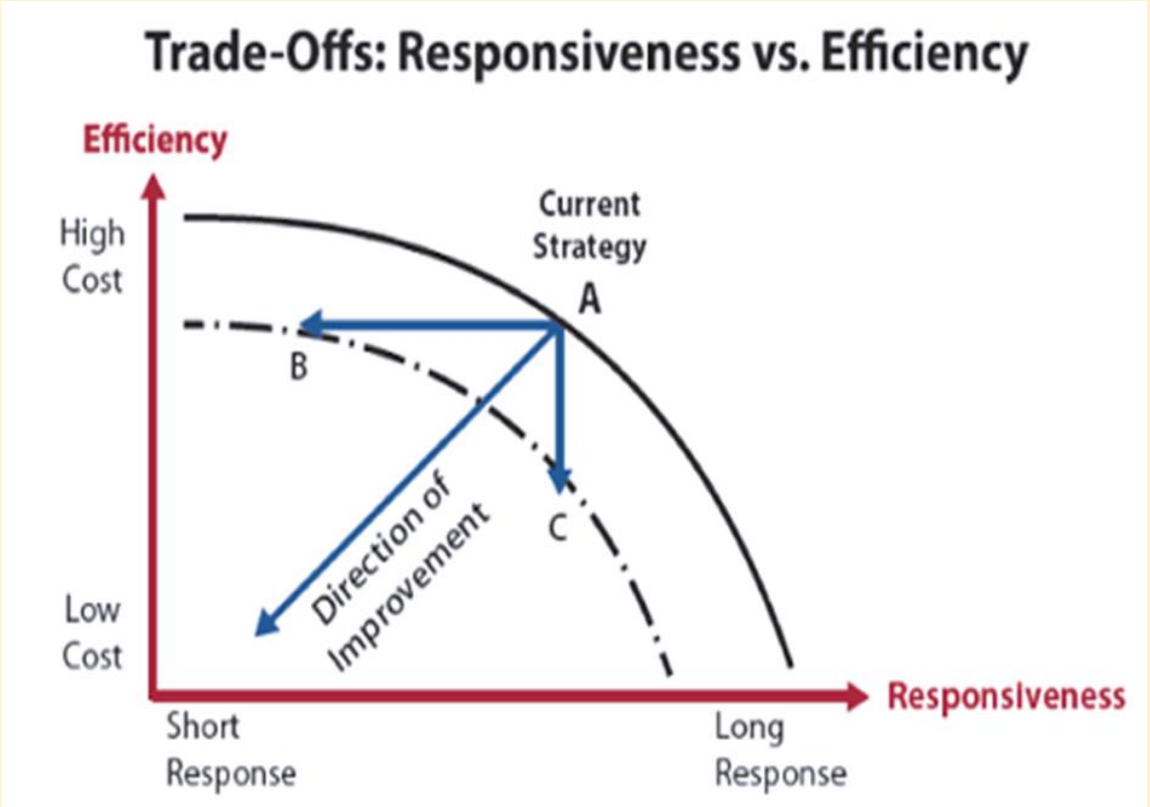
Recap

SC Strategy affect three measures of performance



SC Trade Off- In Summary

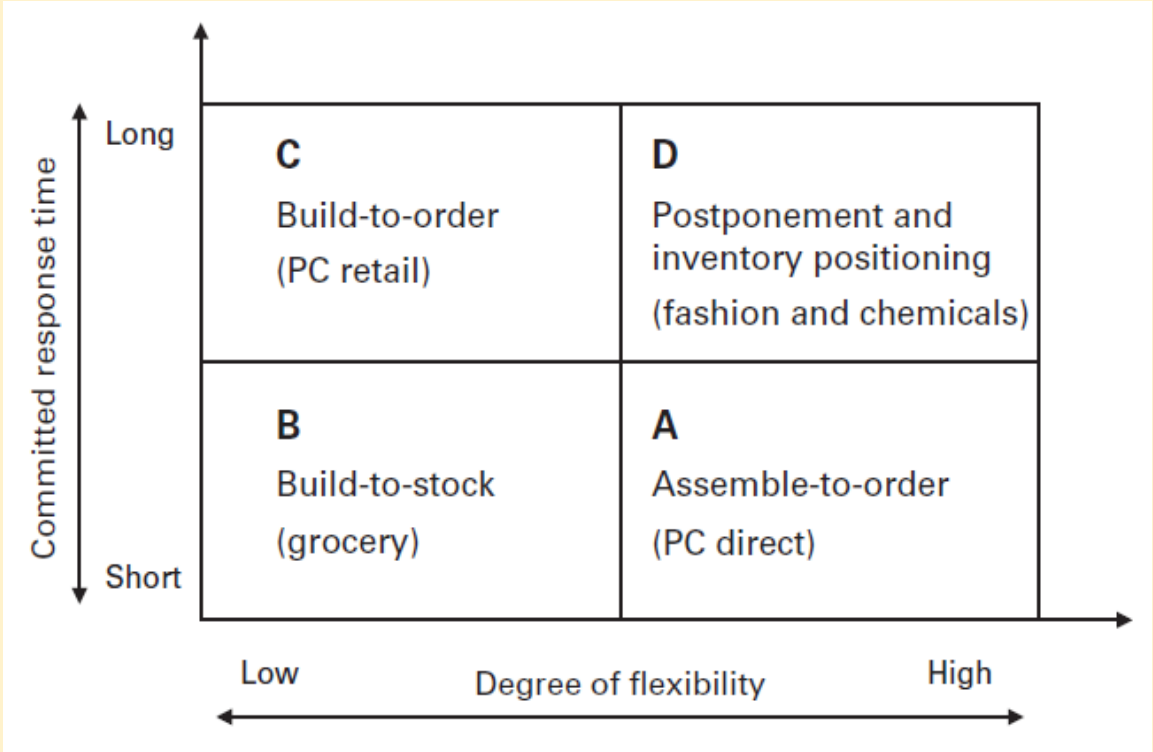
- A firm can improve both its responsiveness and its cost performance by moving the efficient frontier downwards
- A firm on the efficient frontier can improve its responsiveness only by increasing cost and becoming less efficient.
- Such a firm must then make a trade-off between efficiency and responsiveness



Simchi-Levi (2012)

Flexibility and the manufacturing strategy

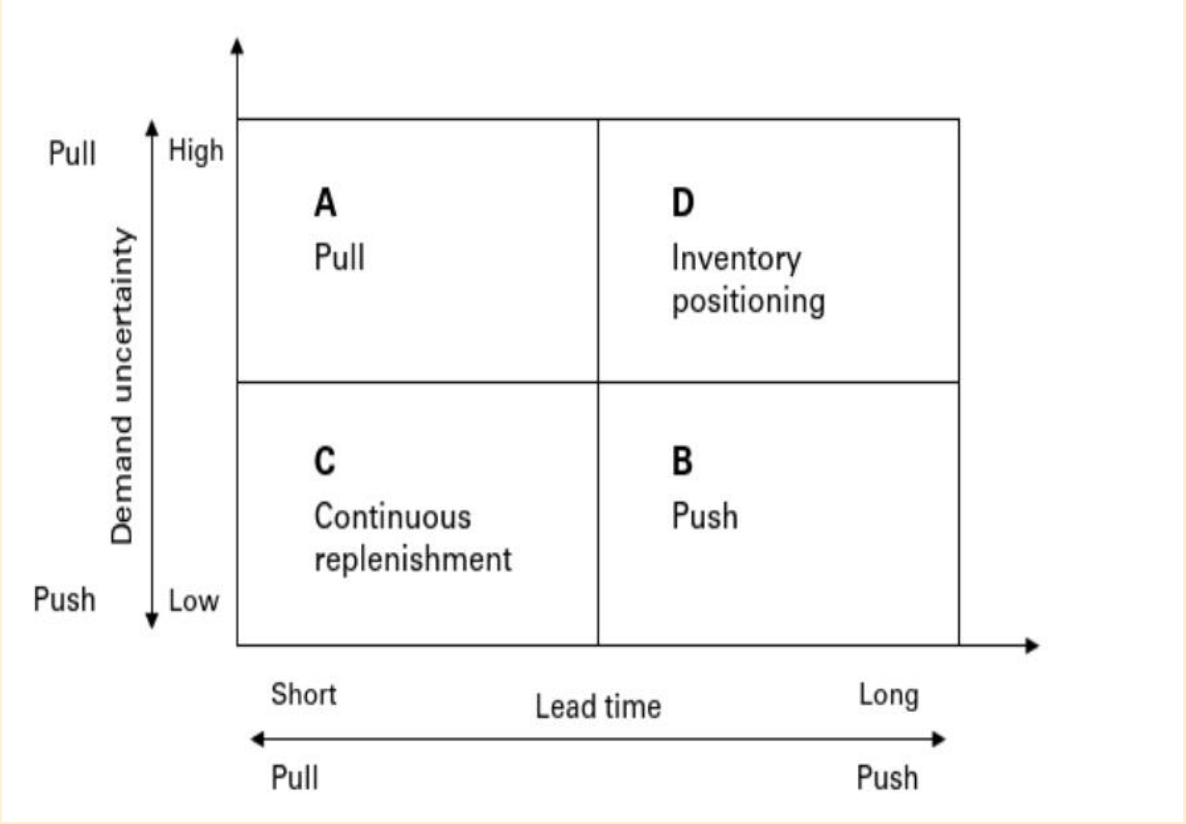
- **Build-to-stock strategy-**
  - inventory is built based on forecast-
  - Push strategy.
  - Focus on cost reduction and effective forecast
- **Assemble-to-order strategy-**
  - individual products are assembled based on customer configuration
  - Pull strategy
- **Build-to-order strategy-**
  - Pull strategy
  - lot sizes are produced after receiving a customer order
  - focuses on efficiency or cost reduction through economies of scale



Simchi-Levi (2010)

Matching SC Strategies with Products-
Effect of Lead Time and Demand Uncertainty

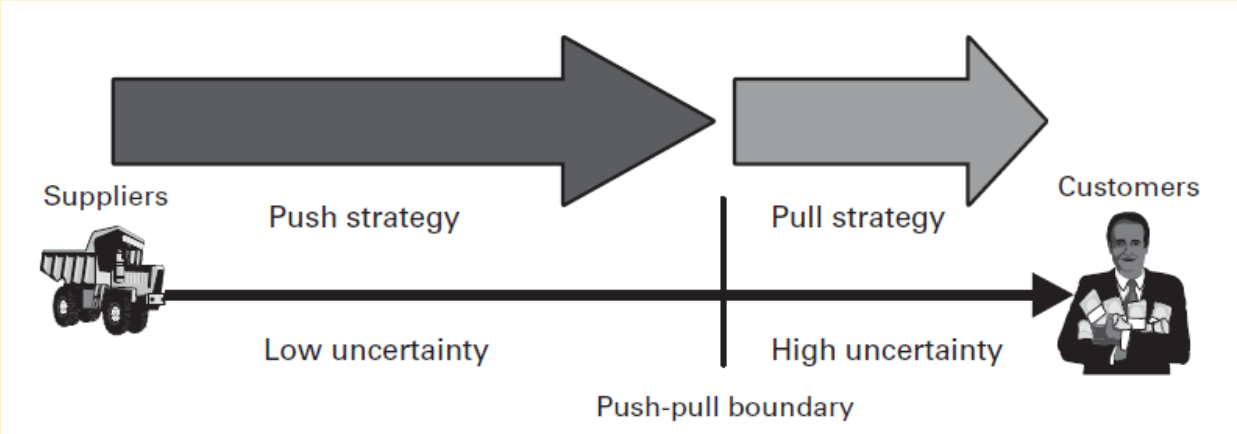
- Intuitively, the longer the lead time, the more important it is to implement a push-based strategy.



Simchi-Levi (2010)

Implementing a Hybrid- Push Pull Strategy

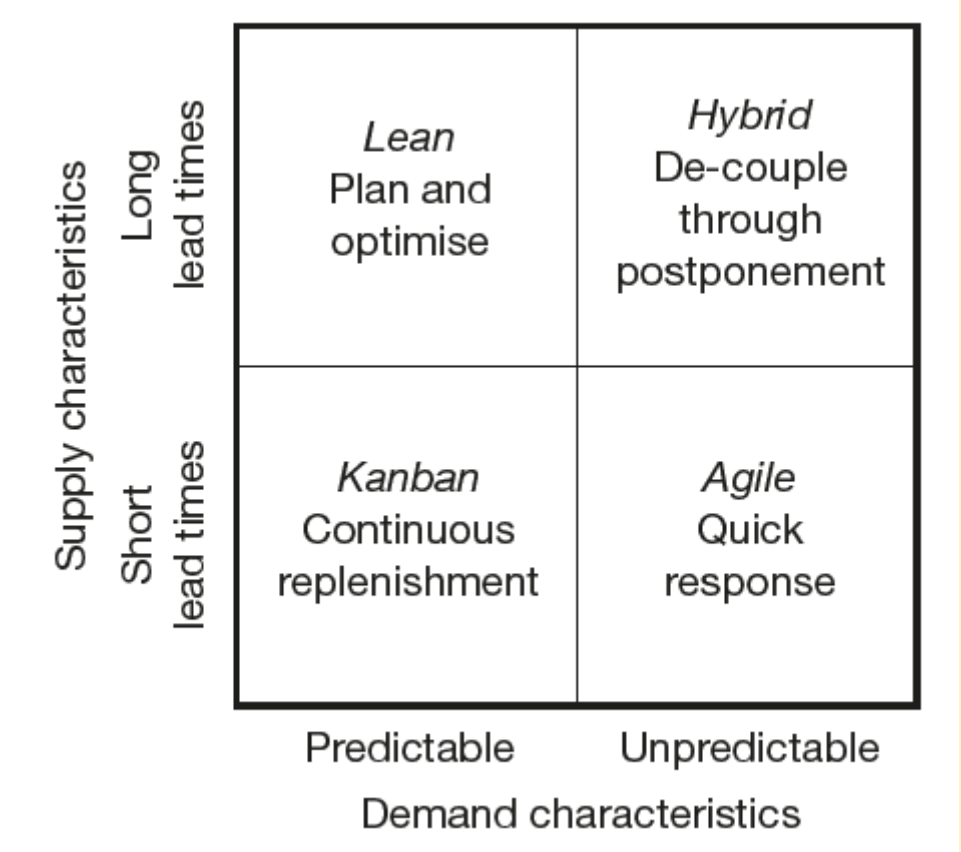
- In a push-pull strategy , some stages of the supply chain, typically **the initial stages, are operated in a push-based** manner while the **remaining stages employ a pull-based strategy**
- The interface between the push-based stages and the pull-based stages is known as the **push-pull boundary**



Simchi-Levi (2010)

Effect of Demand and Supply Characteristics

- **'Kanban' Continuous replenishment** - as each product is sold or used it is replaced.
- **Lean-** Materials, components or products can be ordered ahead of demand, cost reduction
- **Agile-** enabling quick response
- **Hybrid lean/agile solution-** holding strategic inventory in some generic or unfinished form, with final configuration being completed rapidly once real demand is known



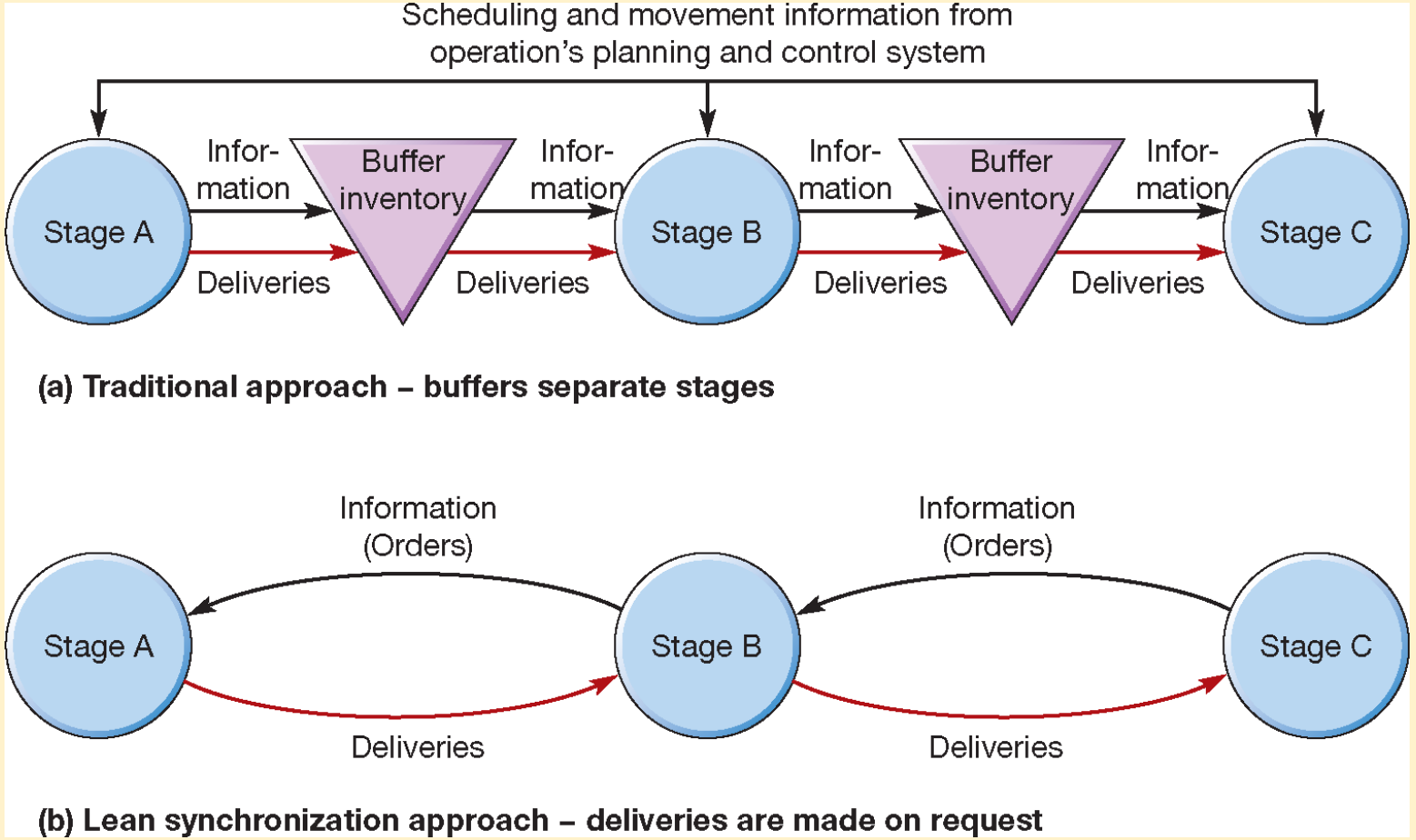
Source: Christopher (2016)

Lean Thinking

Lean approach to manufacturing

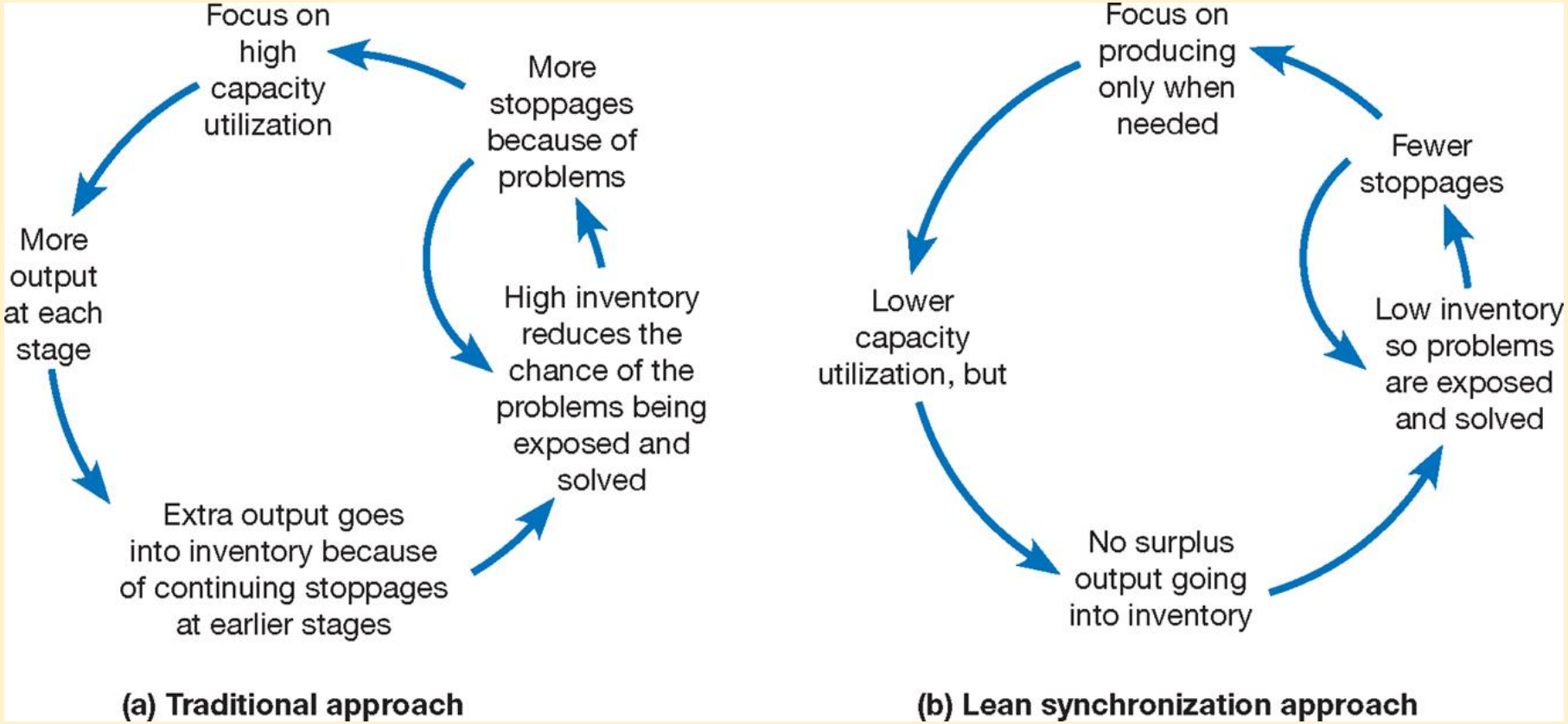
- Seeks to minimize inventory of components and work-in-progress
- Originally called ‘JIT’
- Doing more with less
- It owes its origins to the Toyota Production System (TPS)
  - **elimination of waste (muda)**

Traditional flow versus Lean flow between stages



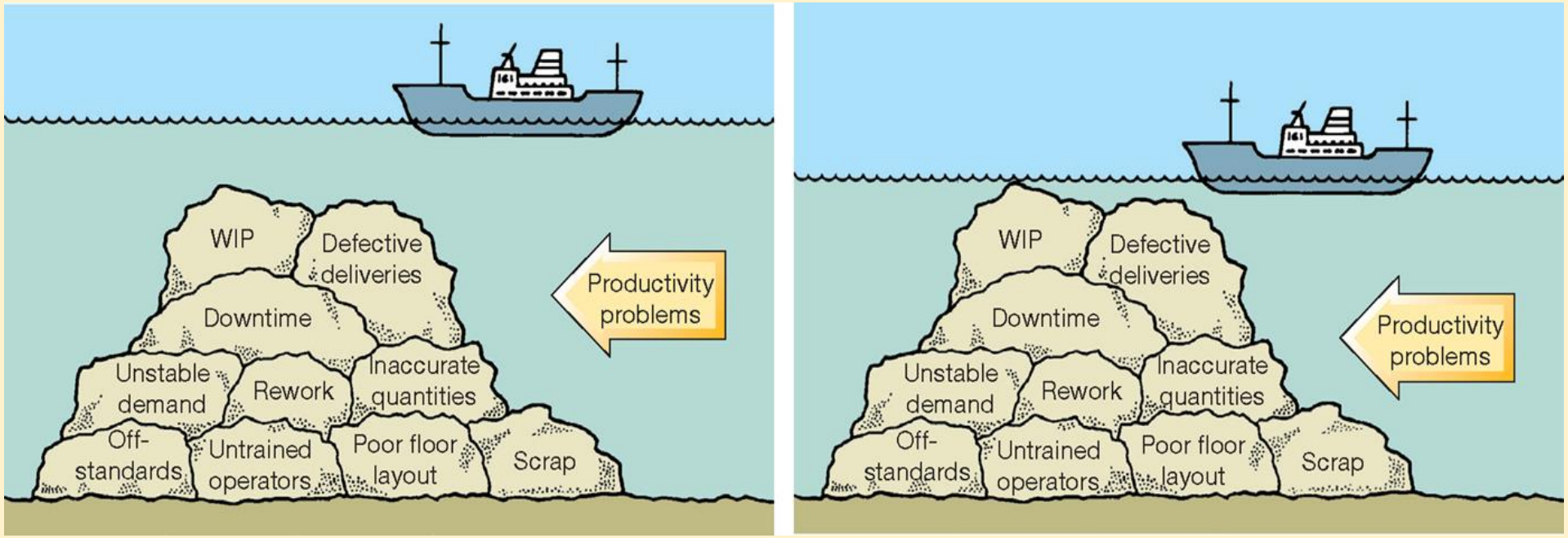
Slack et al (2015)

Capacity Utilization in (a) traditional and (b) lean approaches to operations



Slack et al (2015)

Reducing the level of inventory (water) allows operations management (the ship) to see the problems in the operation (the rocks) and work to reduce them

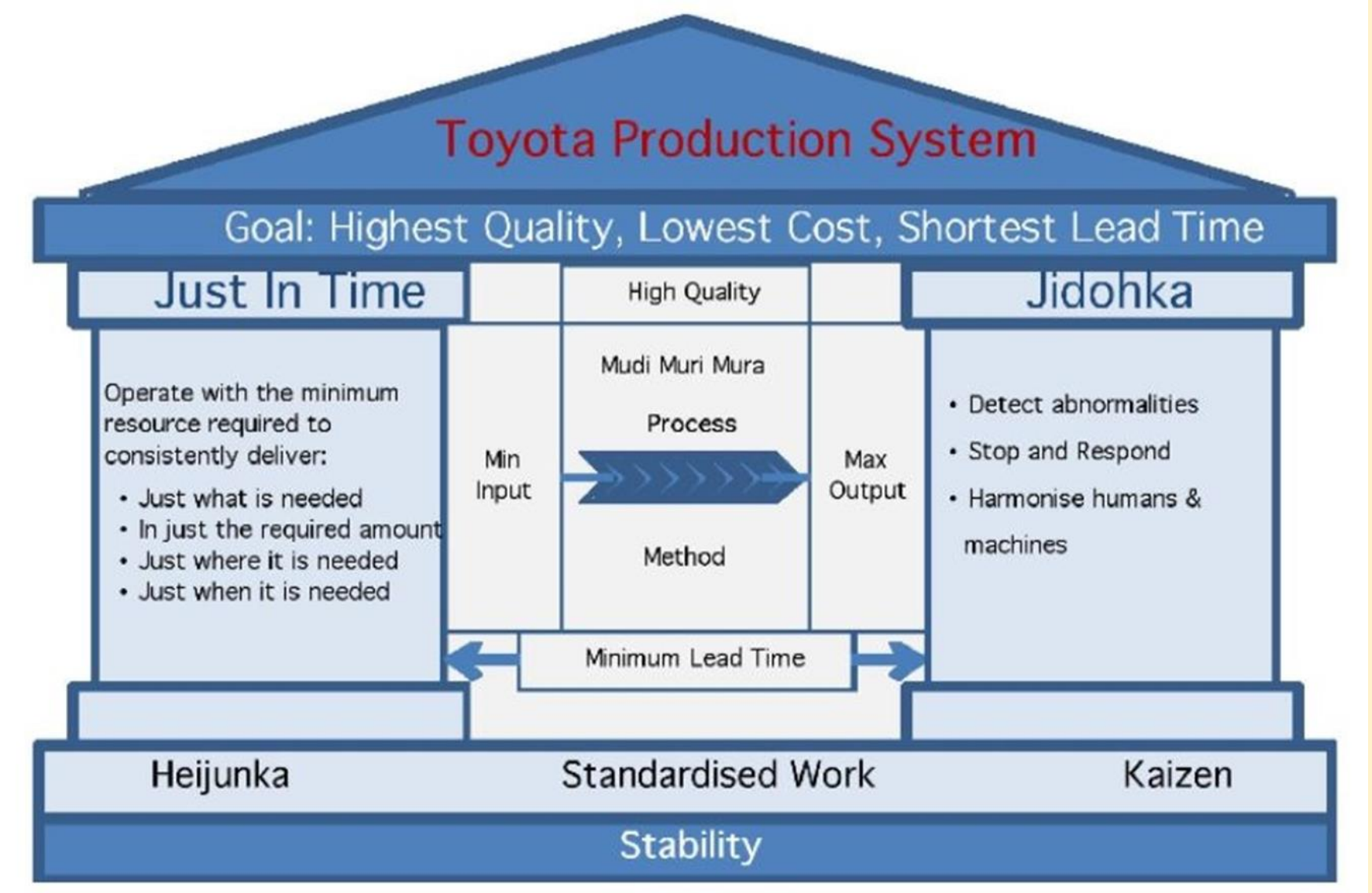


Slack et al (2015)

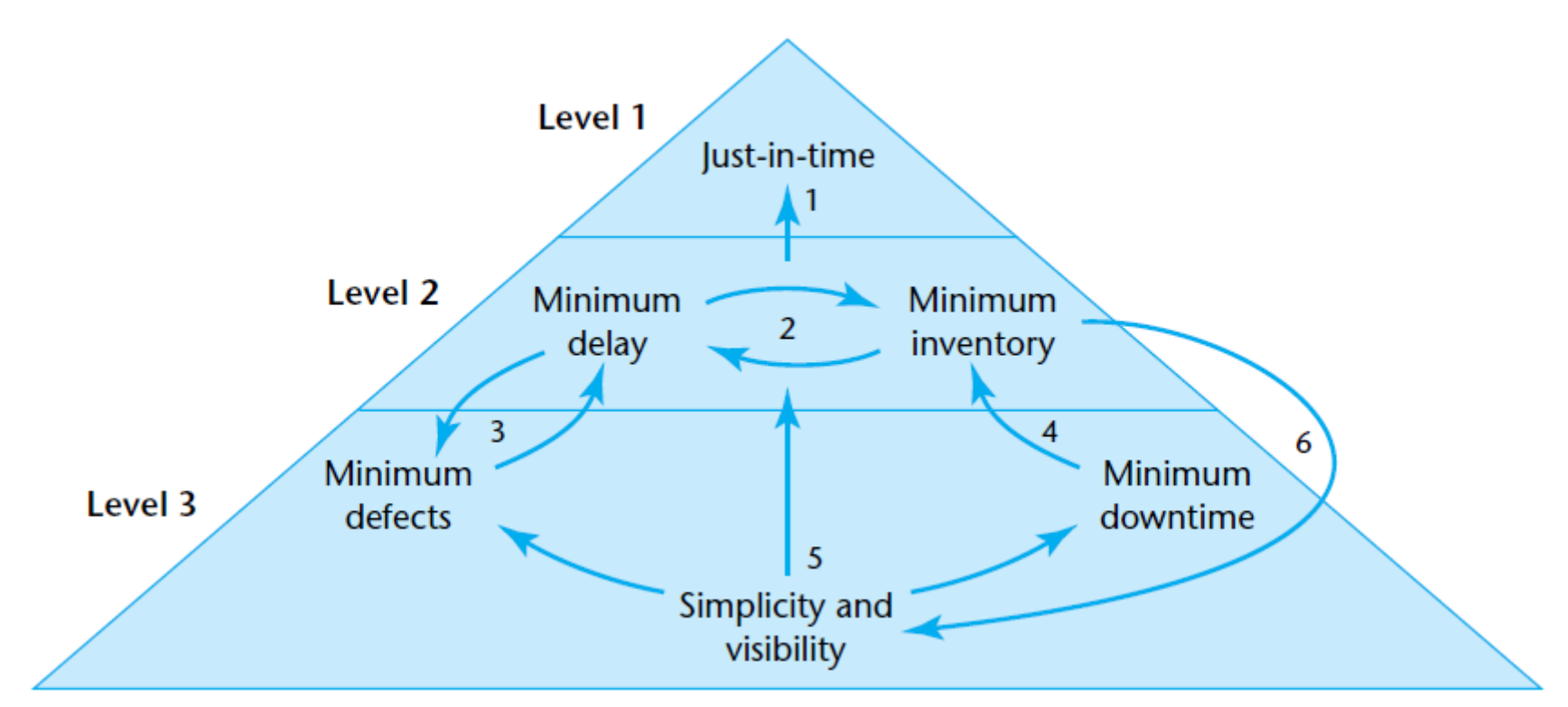
Toyota Production System 5S Just, Just in Time, Kaisen

https://www.youtube.com/watch?v=jYI7QvU99dw

Toyota Production System



The pyramid of key factors that underpin JIT

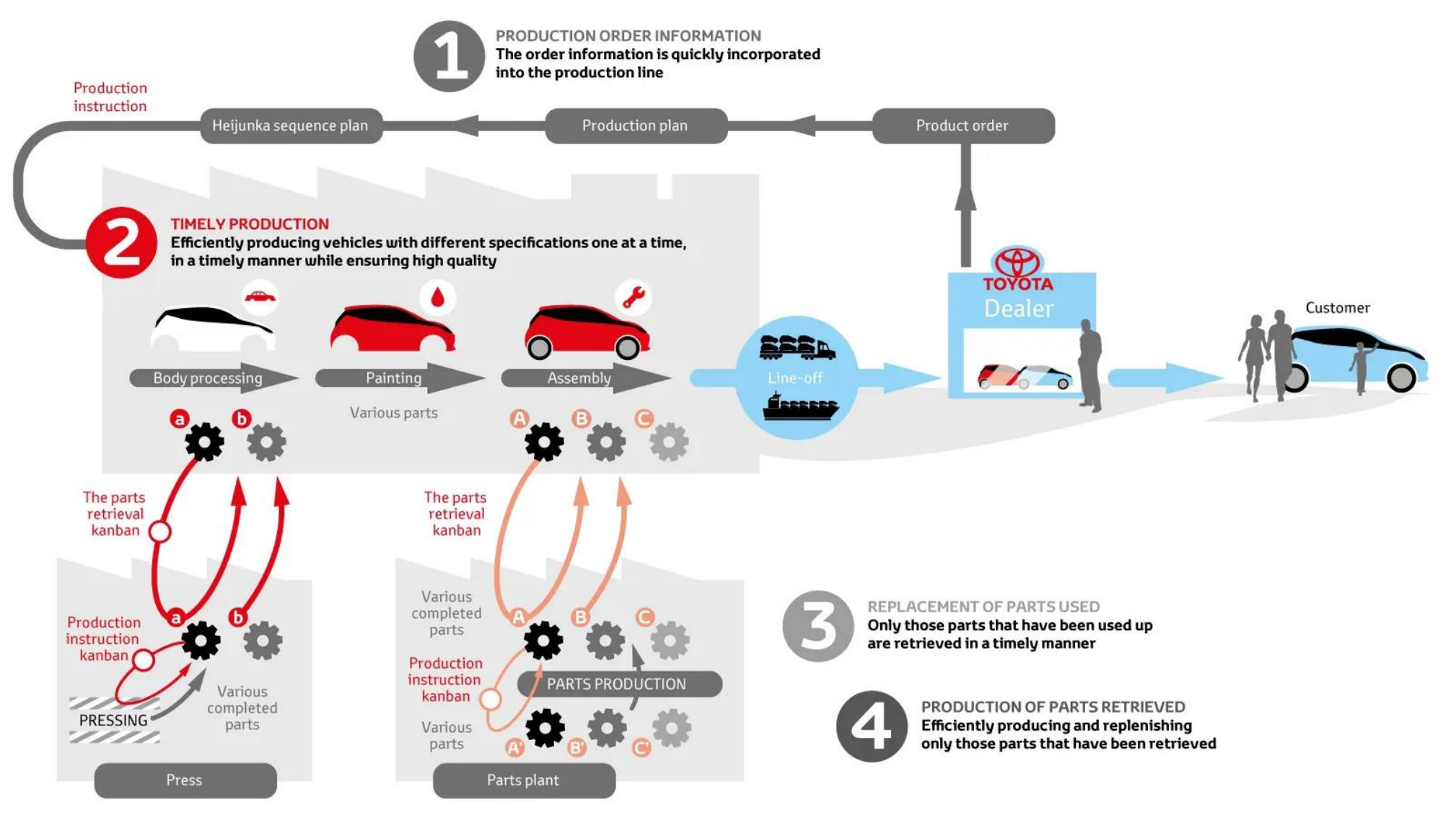


Harrison et al (2015)

Kanban- Lowering inventory

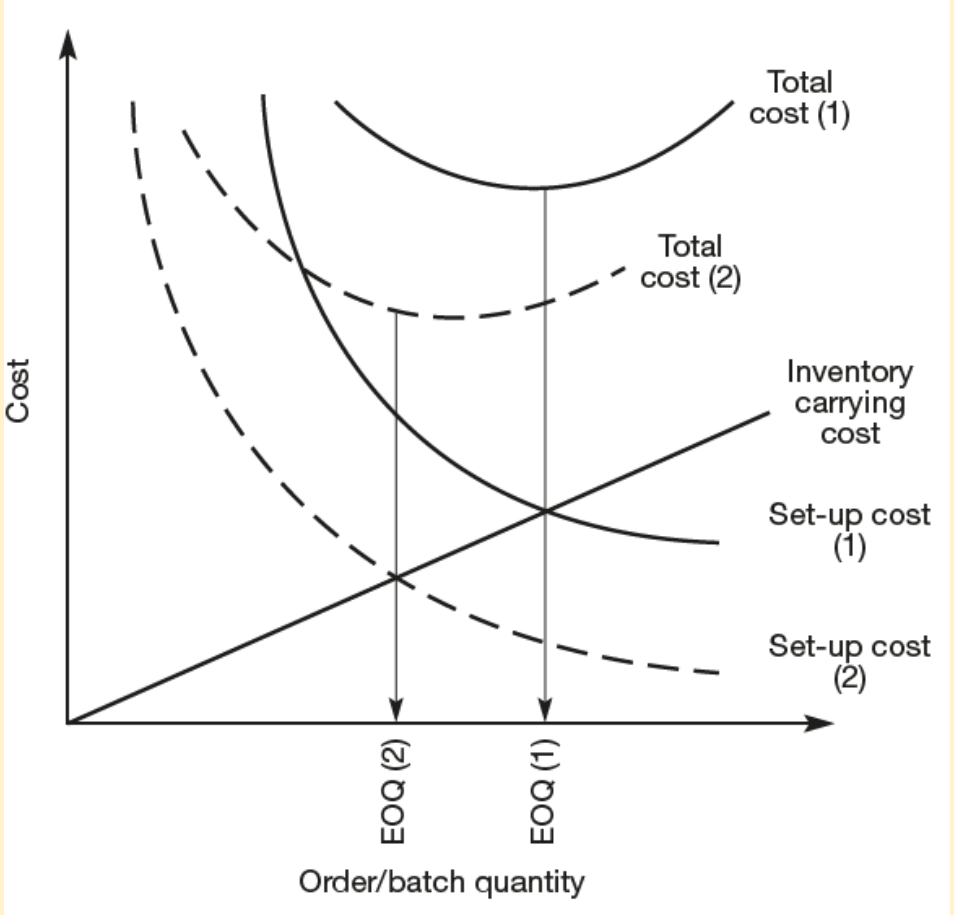
- A **type of card** that was used in early systems to signal to the upstream supply point that a certain quantity of material could be released
- The aim would be to produce only that quantity needed for immediate demand.
- When parts are needed on the assembly line, they are fed from the next stage up the chain in just the quantity needed at the time they are needed.
- Likewise this movement now triggers demand at the next work station in the chain, and so on.

Toyota-Europe



Aim of Kanban

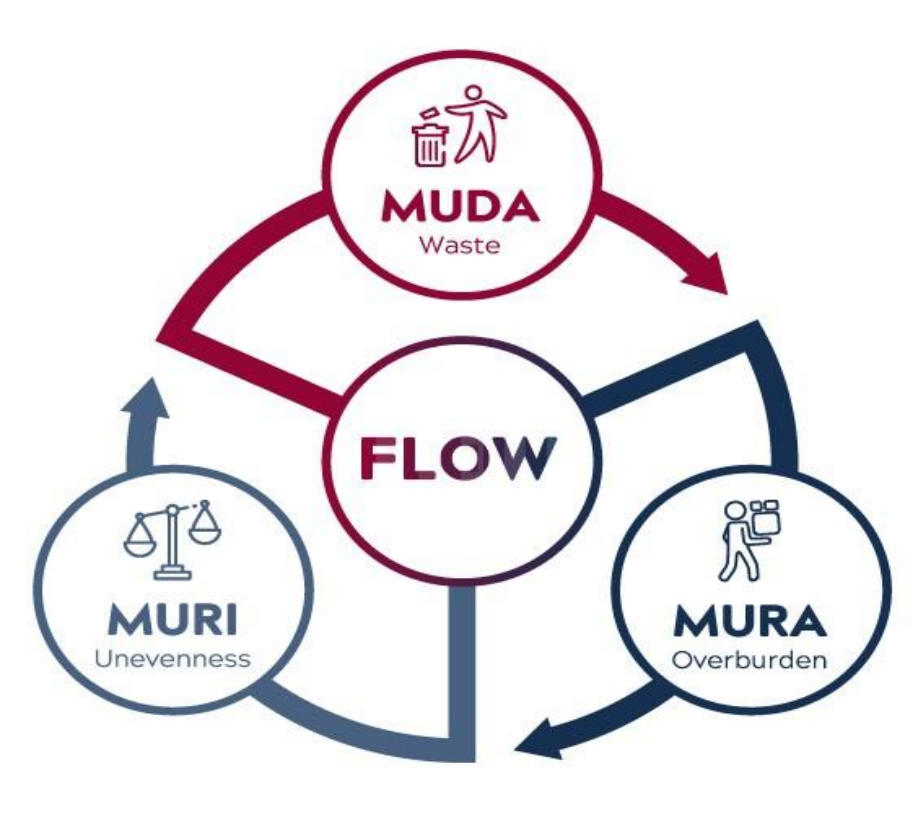
- Minimal inventory at every stage and where the process and transit quantities of materials and stock are reduced to the lowest possible amount.
- The ultimate aim should be the ‘economic batch quantity of 1’!
- Seek to minimise the batch quantity by shifting the curve that represents the cost of ordering or the cost of set-ups to the left
- Therefore reduce, total cost



Source: Christopher (2016)

7 Types of Waste (Muda)

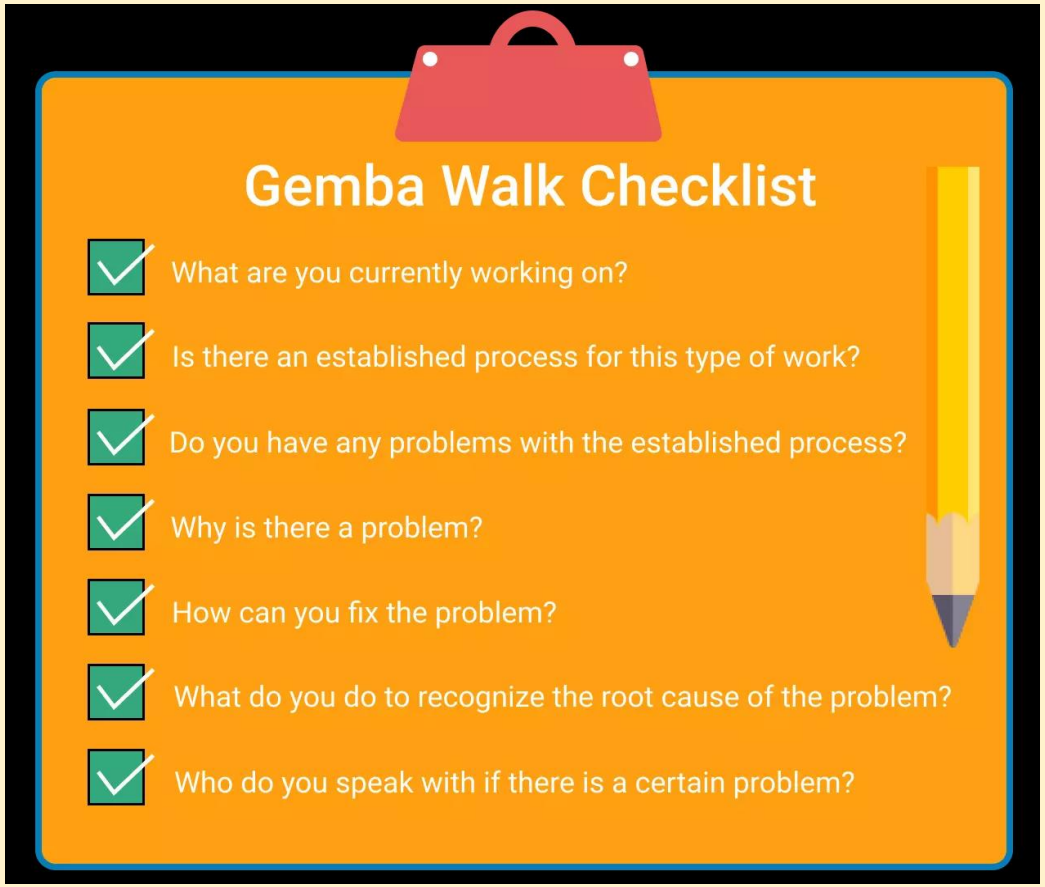
How to Eliminate Waste?

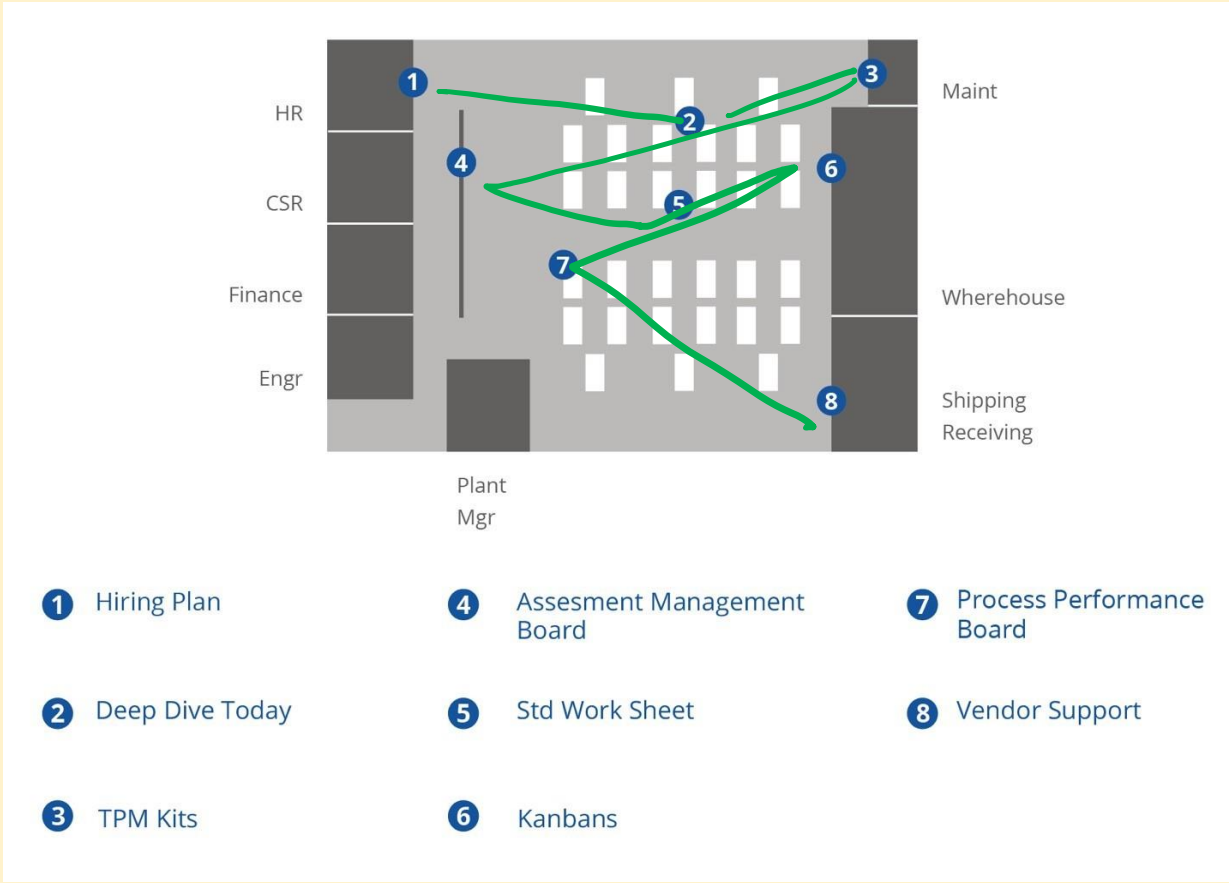


- When a process is inconsistent (mura),
- it can lead to the overburdening of equipment and people (muri)
- which, in turn, will cause all kinds of non-value-adding activities (muda)

Slack et al (2015)

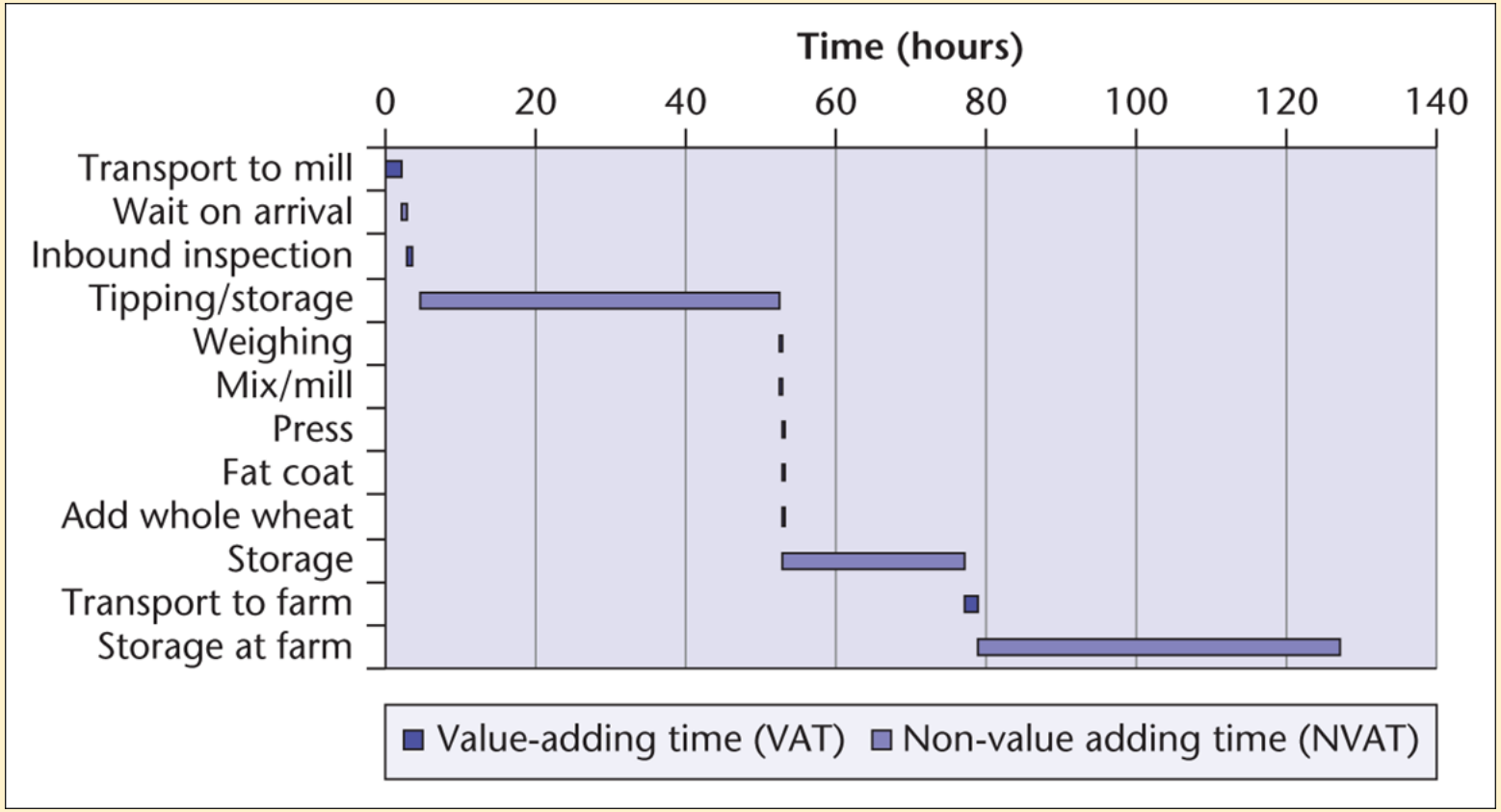
Looking for waste - Gemba





Typical Gemba Walk manager plan at Toyota
Liker (2018) https://theleadershipnetwork.com/

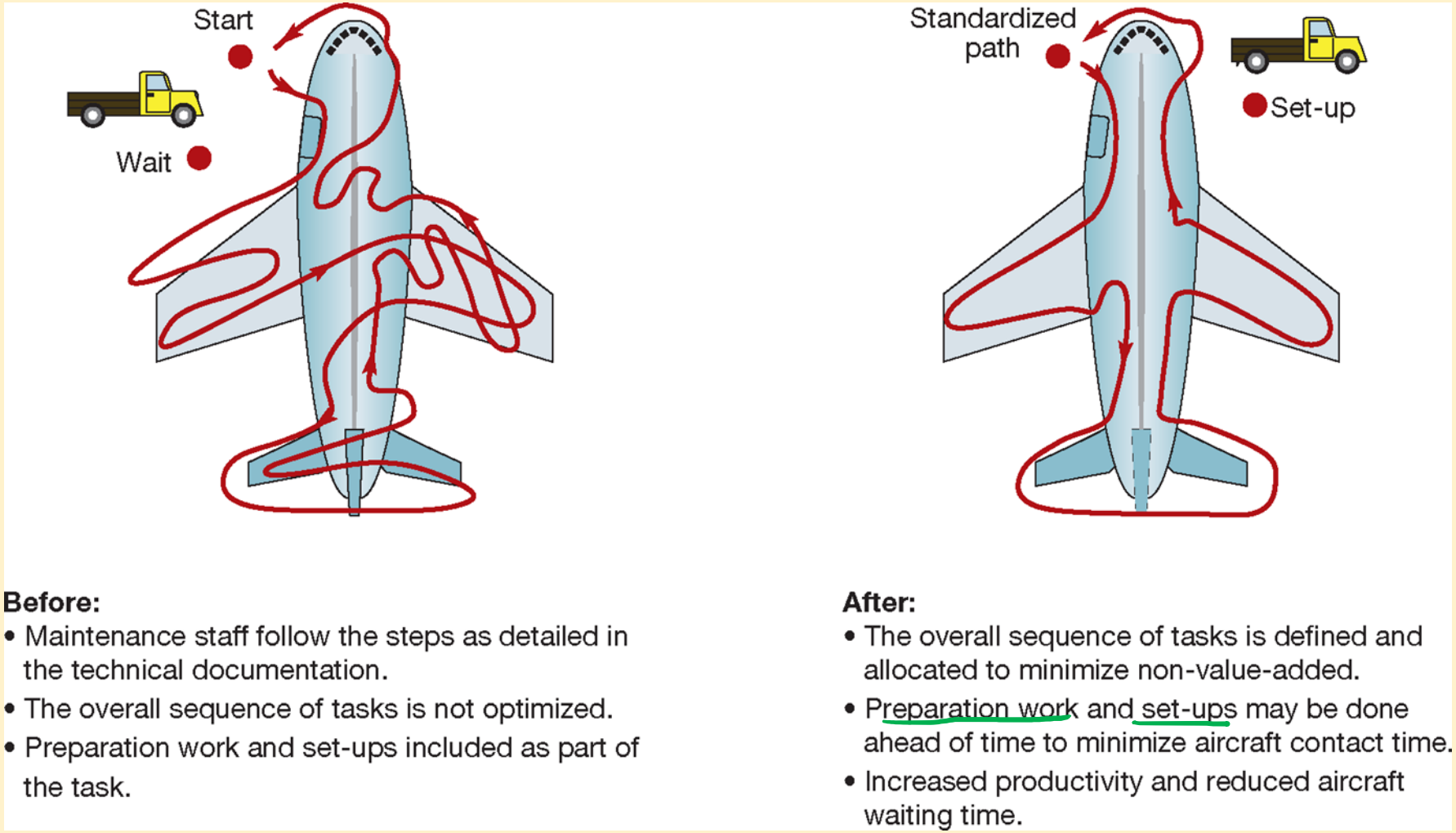
Looking for Waste- Value stream mapping



Agricultural transport to Poultry farm

Harrison et al (2015)

Aircraft maintenance procedures subject to waste reduction analysis



Before:

- Maintenance staff follow the steps as detailed in the technical documentation.
- The overall sequence of tasks is not optimized.
- Preparation work and set-ups included as part of the task.

After:

- The overall sequence of tasks is defined and allocated to minimize non-value-added.
- Preparation work and set-ups may be done ahead of time to minimize aircraft contact time.
- Increased productivity and reduced aircraft waiting time.

Slack et al (2015)

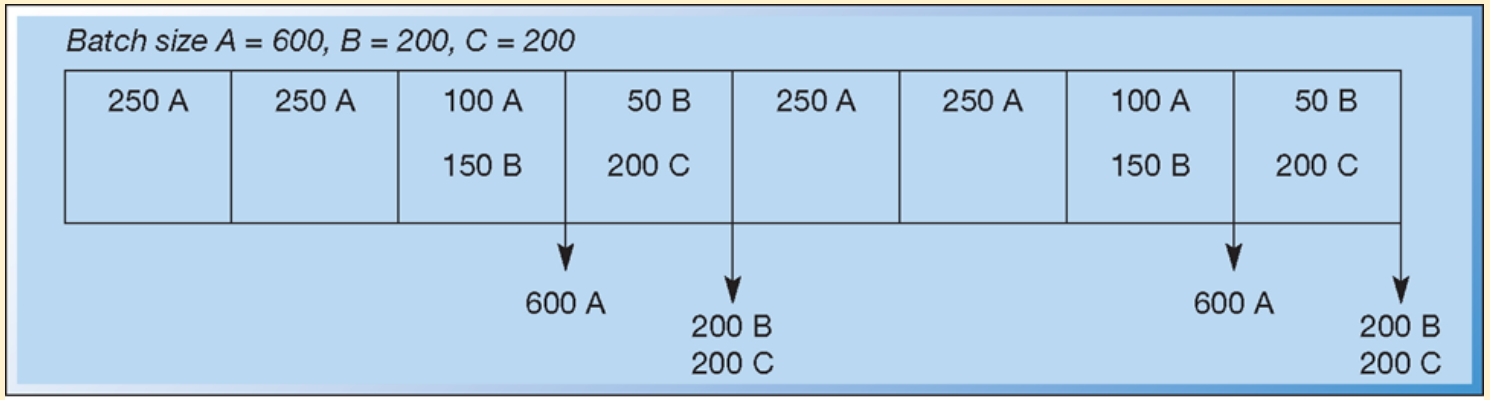
Eliminate waste through minimizing variability

- One of the biggest causes of the variability that will disrupt flow and prevent lean is variation in the quality of items
- So, quality conformance is ensured within processes, what was referred to as ‘mura’
- Achieved through:
  - **Levelled scheduling (or heijunka)**
  - **Level delivery schedules**

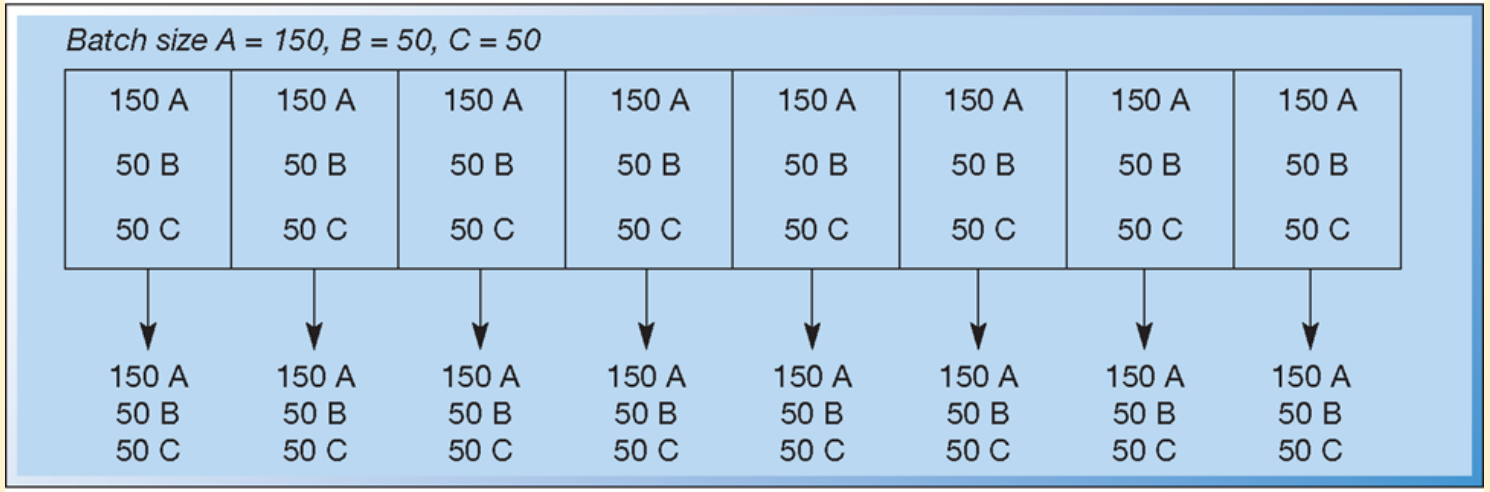
Levelled scheduling

- The consequence of **using large batches** is that relatively large amounts of **inventory accumulate** within and between the units
- The idea is keeping the mix and volume of flow between stages at an **even rate over time**
- For example, instead of producing 500 items in one batch to cover the needs for the next three months
- Using **Smaller batches** of inventory moving between each stage, this **will reduce the overall level of work-in-progress** in the operation

Levelled scheduling equalizes the mix of items made each day



(a) Scheduling in large batches



(b) Levelled scheduling

Slack et al (2015)

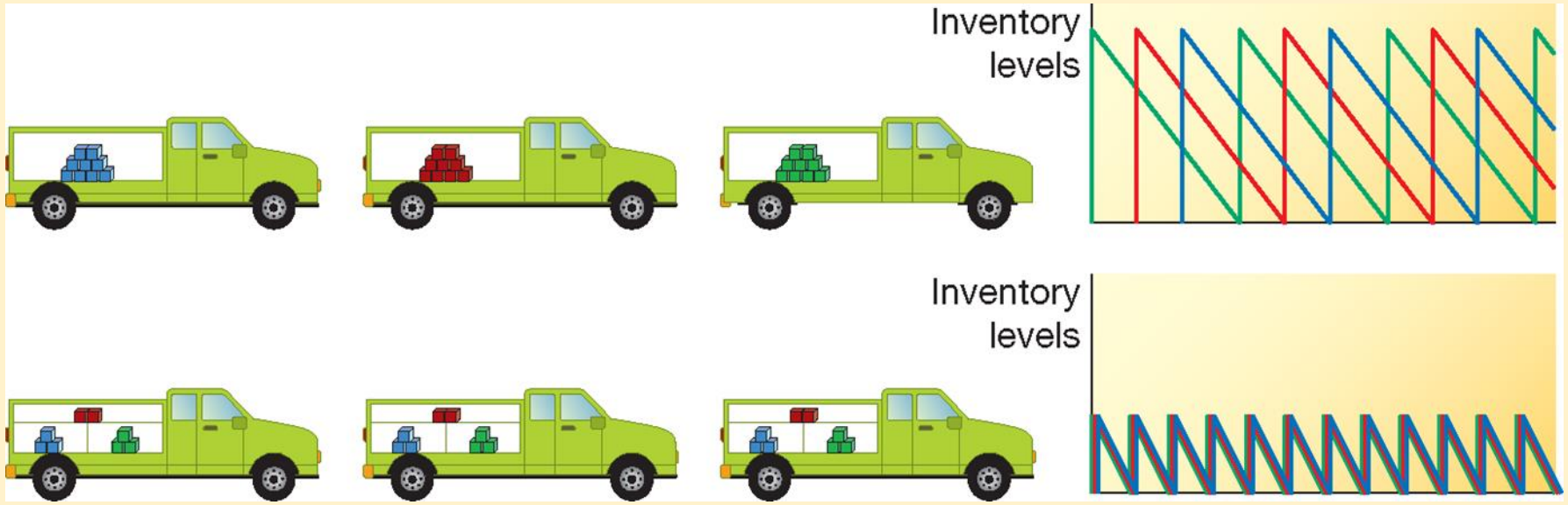
- Just as significant, however, is the effect on the regularity and rhythm of production at the unit.
- This makes planning and control of each stage in the operation much easier
- **Levelled scheduling would require the process to produce items on a regular basis that satisfied demand**.
- Thus, the principle of levelled scheduling is very straightforward; however, the requirements to put it into practice are quite severe, although the benefits resulting from it can be substantial.

Level delivery schedules

- Instead of dispatching a truck loaded with one particular product to all its stores, **use smaller delivery batches of a mix of products**

- With smaller deliveries more frequently:
  - store would receive smaller deliveries more frequently
  - inventory levels would be lower
  - the system could respond to trends in demand more readily
  - more deliveries means more opportunity to change the quantity delivered to a store

Delivering smaller quantities more often can reduce inventory levels

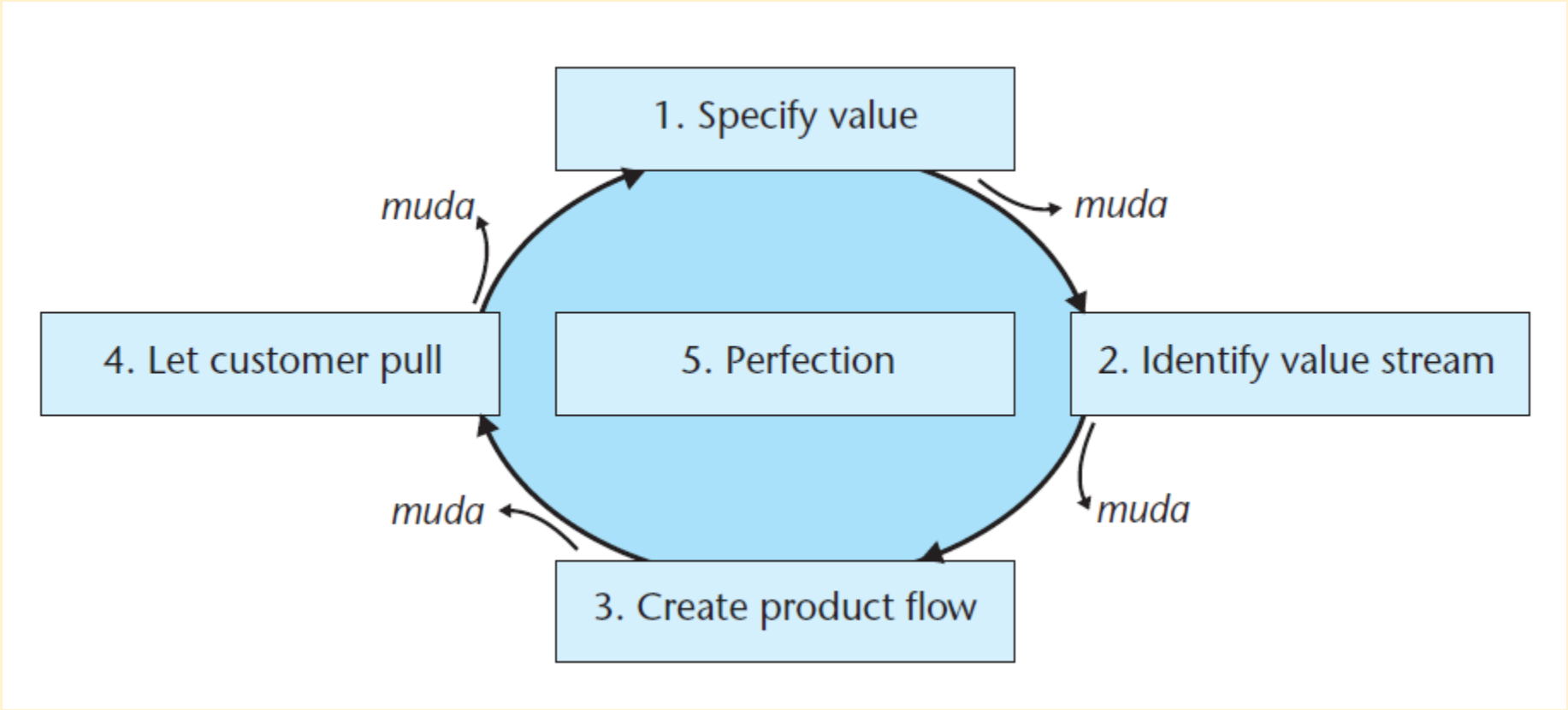


Slack et al (2015)

Lean Synchronization

- A philosophy, a method of operations planning and control and an approach to improvement.
- Lean manufacturing aims to **meet demand instantaneously**
- Always delivers:
  - exactly what customers want (perfect quality),
  - in exact quantities (neither too much nor too little),
  - exactly when needed (not too early or too late),
  - exactly where required (not to the wrong location)
- At the **lowest possible cost**

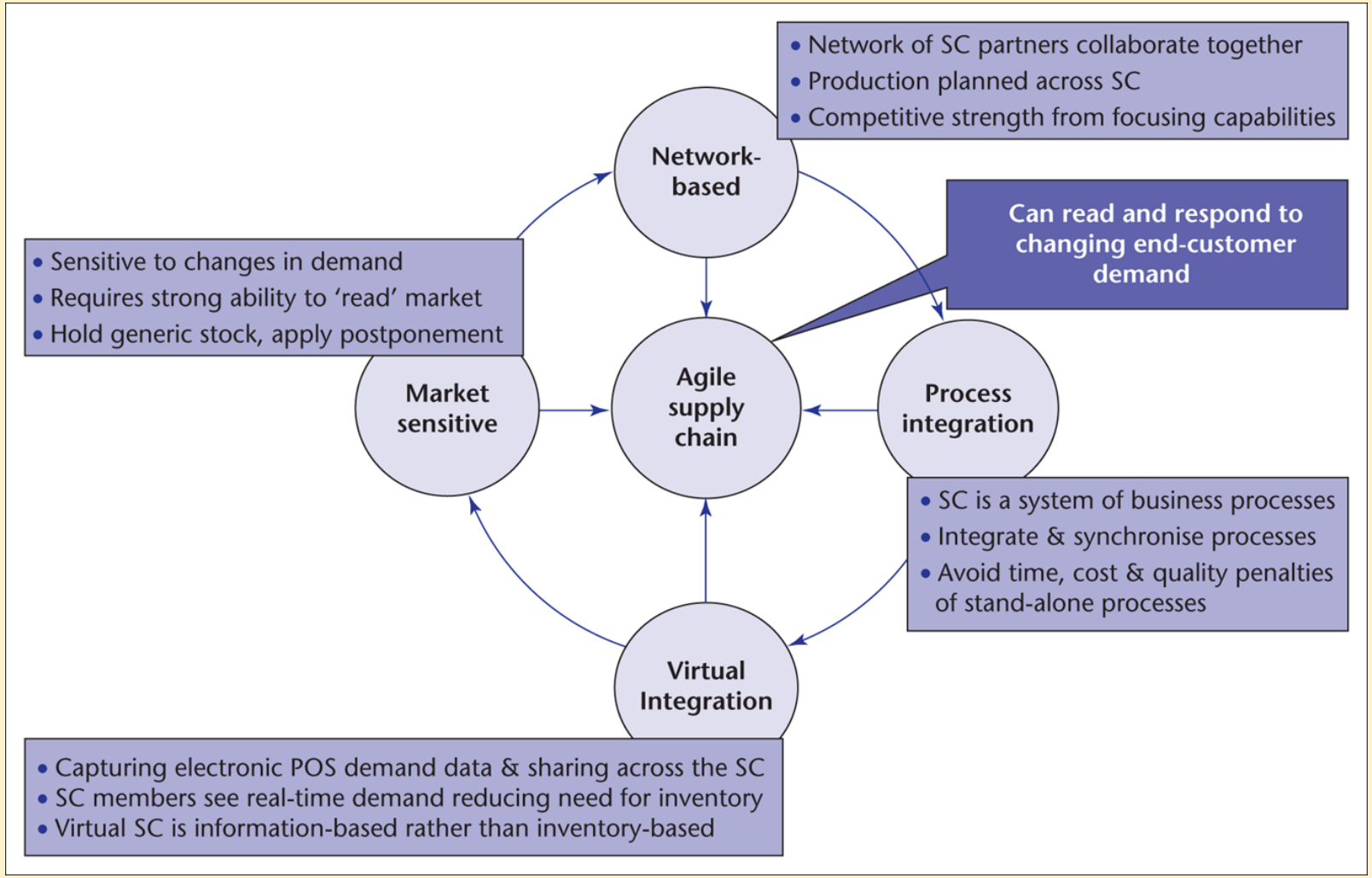
Summary- Principles of Lean thinking



Harrison et al (2015)

Agile Supply Chain

Model of Agile capabilities



Harrison et al (2015)

Foundations of Agile SC

Partner with suppliers to reduce in-bound lead-times

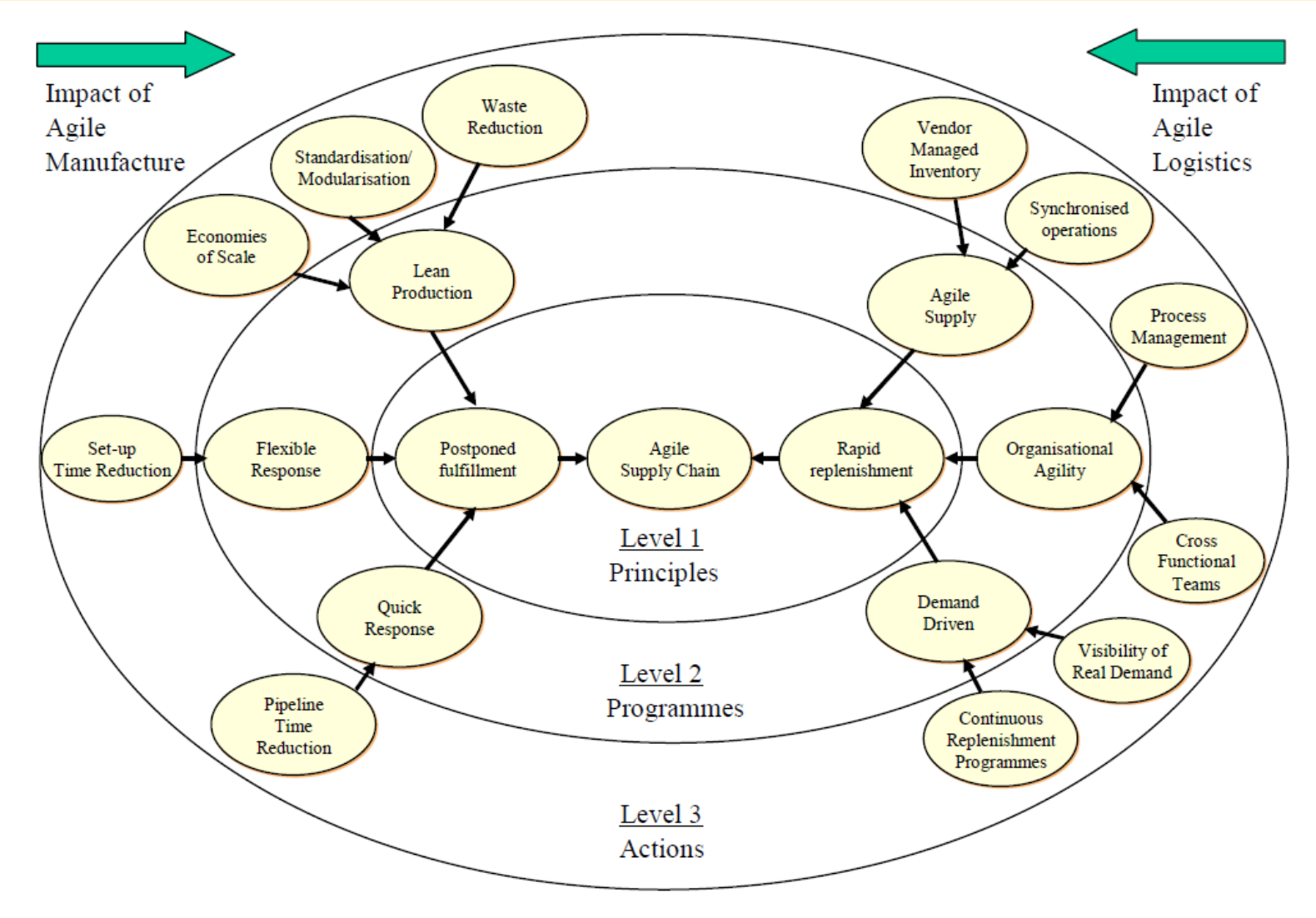
Synchronise activities through shared information

Postpone the final configuration/assembly/distribution of products

Work smarter, not harder

Utilise appropriate performance metrics

Integrated Model for Enabling the Agile Supply Chain



Christopher and Towhill (2001)

Comparison of lean supply with agile supply: the distinguishing attributes

Distinguishing attributes	Lean supply	Agile supply
Typical products	Commodities	Fashion goods
Marketplace demand	Predictable	Volatile
Product variety	Low	High
Product life cycle	Long	Short
Customer drivers	Cost	Availability
Profit margin	Low	High
Dominant costs	Physical costs	Marketability costs
Stockout penalites	Long-term contractual	Immediate and volatile
Purchasing policy	Buy materials	Assign capacity
Information enrichment	Highly desirable	Obligatory
Forecasting mechanism	Algorithmic	Consultative

Source: Mason-Jones, Naylor and Towill (2000)]

Comparison of characteristics of lean and agile supply

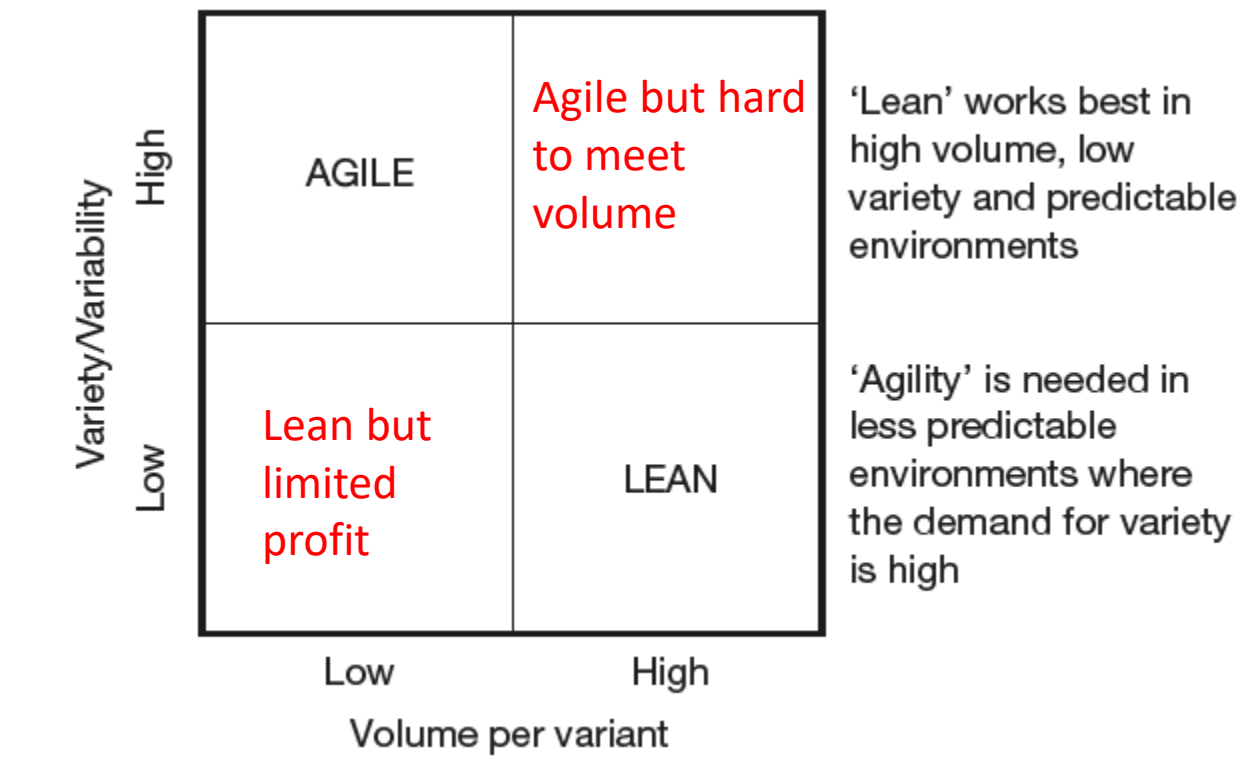
Naylor et al. (1999) cited in Christopher and Towhill (2001)

“Agility means using market knowledge and a virtual corporation to exploit profitable opportunities in a volatile marketplace.”

“Leanness means developing a value stream to eliminate all waste including time, and to enable a level schedule.”

Characteristic	Lean	Agile
Logistics focus	Eliminate waste	Customers and markets
Partnerships	Long-term, stable	Fluid clusters
Key measures	Output measures like productivity and cost	Measure capabilities, and focus on customer satisfaction
Process focus	Work standardisation, conformance to standards	Focus on operator self-management to maximise autonomy
Logistics planning	Stable, fixed periods	Instantaneous response

When Agile and Lean will work best, considering Volume/Variety



Source: Christopher (2016)

Crucial differences in focus between the lean and agile paradigm depending upon the market qualifiers and the market winners

	Market Qualifiers	Market Winners
Agile Supply	1. Quality 2. Cost 3. Lead Time	1. Service Level
Lean Supply	1. Quality 2. Lead Time 3. Service Level	1. Cost

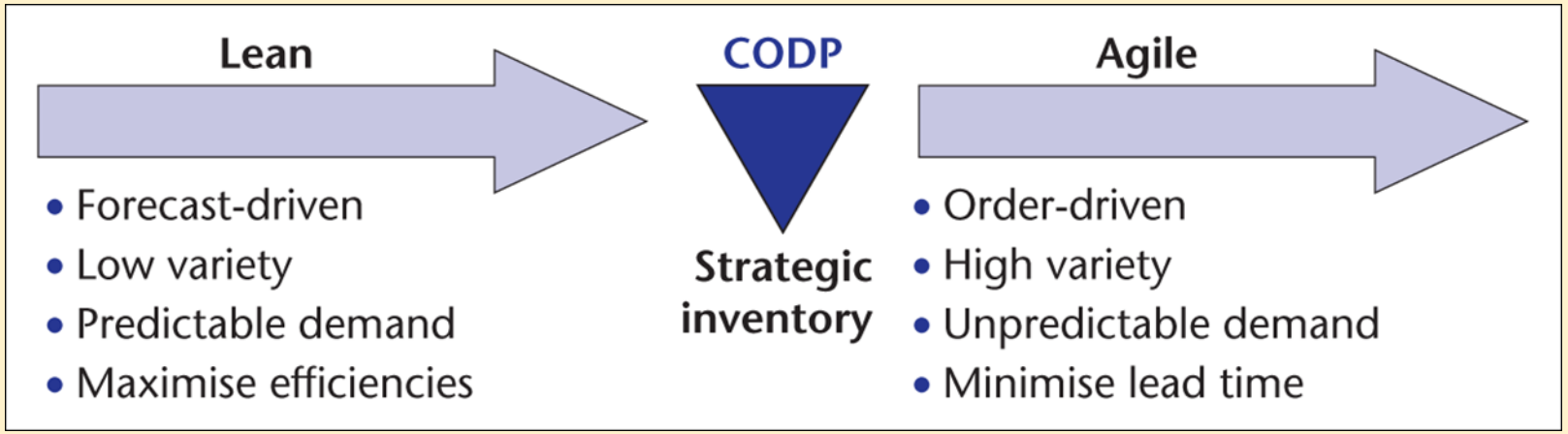
Market Winners - Market Qualifiers Matrix for Agile Versus Lean Supply
[Source: Mason-Jones, Naylor, and Towill (2000)]

Hybrid Lean Agile- Approaches

‘Leagility’ (Naylor et al., 1999)

- There is no reason why there should be an “either or” approach to SC strategies
- Thus, many supply chains can adopt a ‘lean’ capability up to a given downstream process
- Then adopt an ‘agile’ capability thereafter.
- This enables high-productivity, low-cost processes to start with, followed by responsive processes to allow high levels of customisation thereafter.
- combines the benefits of both supply capabilities.

Combination of lean and agile using a customer order decoupling point (CODP)



Harrison et al (2015)

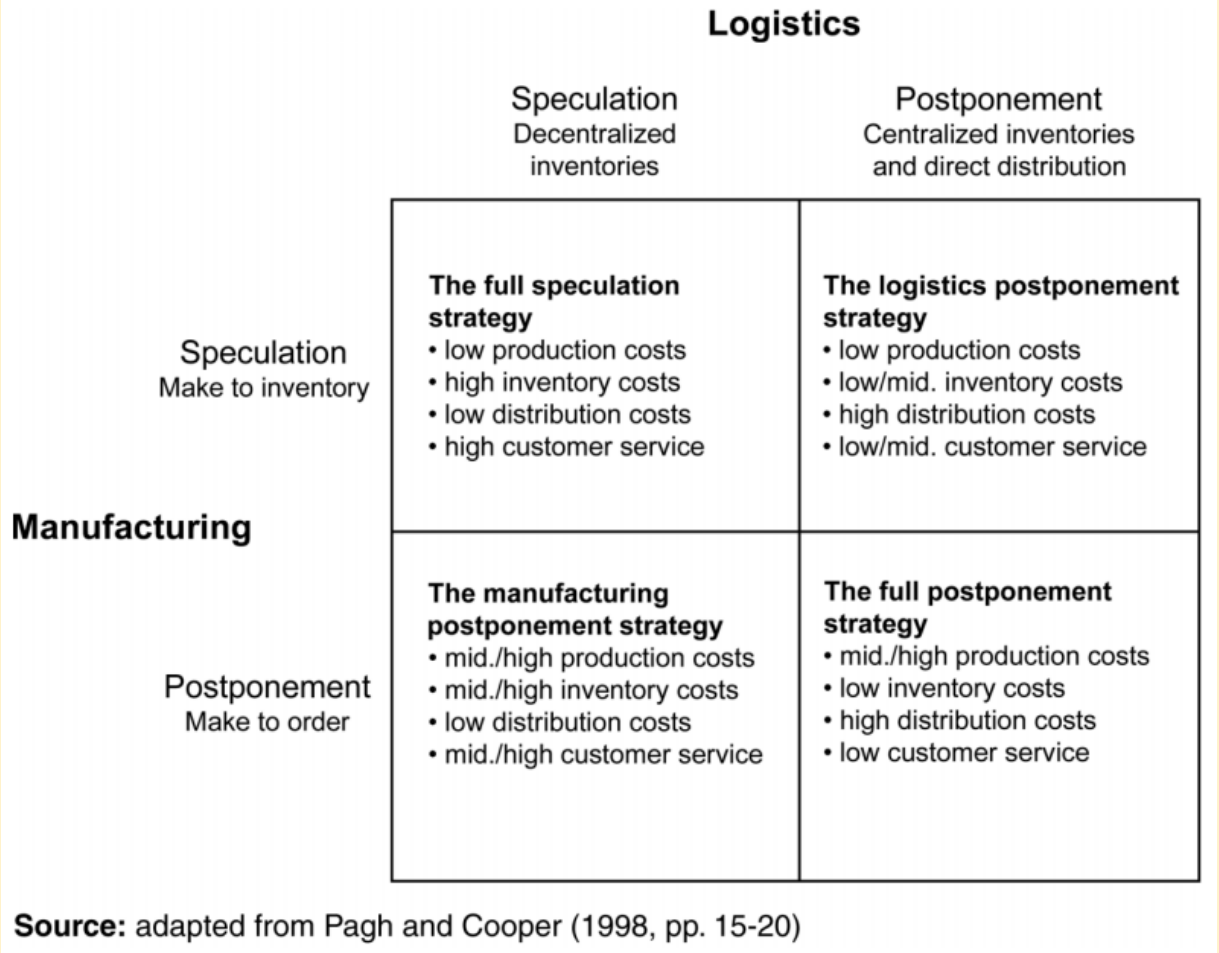
1. Postponement

- Postponement, or delayed configuration, aims at delaying certain supply chain activities:
  - assembly,
  - packaging,
  - labelling,
  - distribution,
- until more accurate information regarding customer order is realized

The P/S Matrix and Generic SC Strategies

Pagh and Cooper (1998)

- **Full Speculation-** products are stocked in a decentralized distribution system close to customer
- **Manufacturing Postponement-** final manufacturing operations are carried out after customer order
- **Logistics Postponement-** manufacturing is based on speculation and logistics is based on postponement. Finalized products are distributed from centralized inventory directly to customer
- **Full Postponement-** manufacturing and logistics operations are performed after the customer order



Source: adapted from Pagh and Cooper (1998, pp. 15-20)

ILLUSTRATION OF THE MANUFACTURING POSTPONEMENT STRATEGY

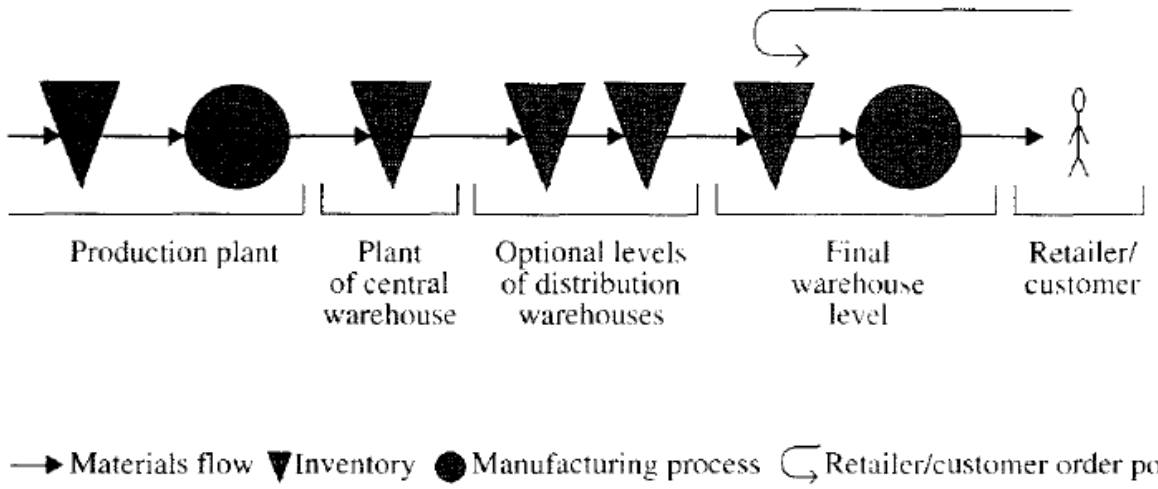
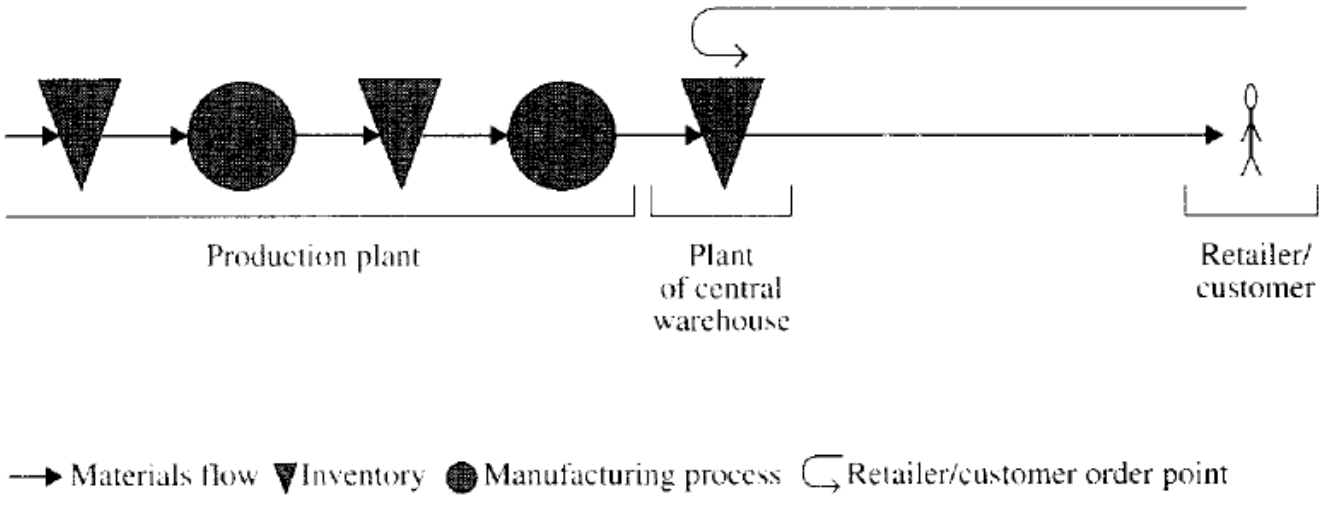
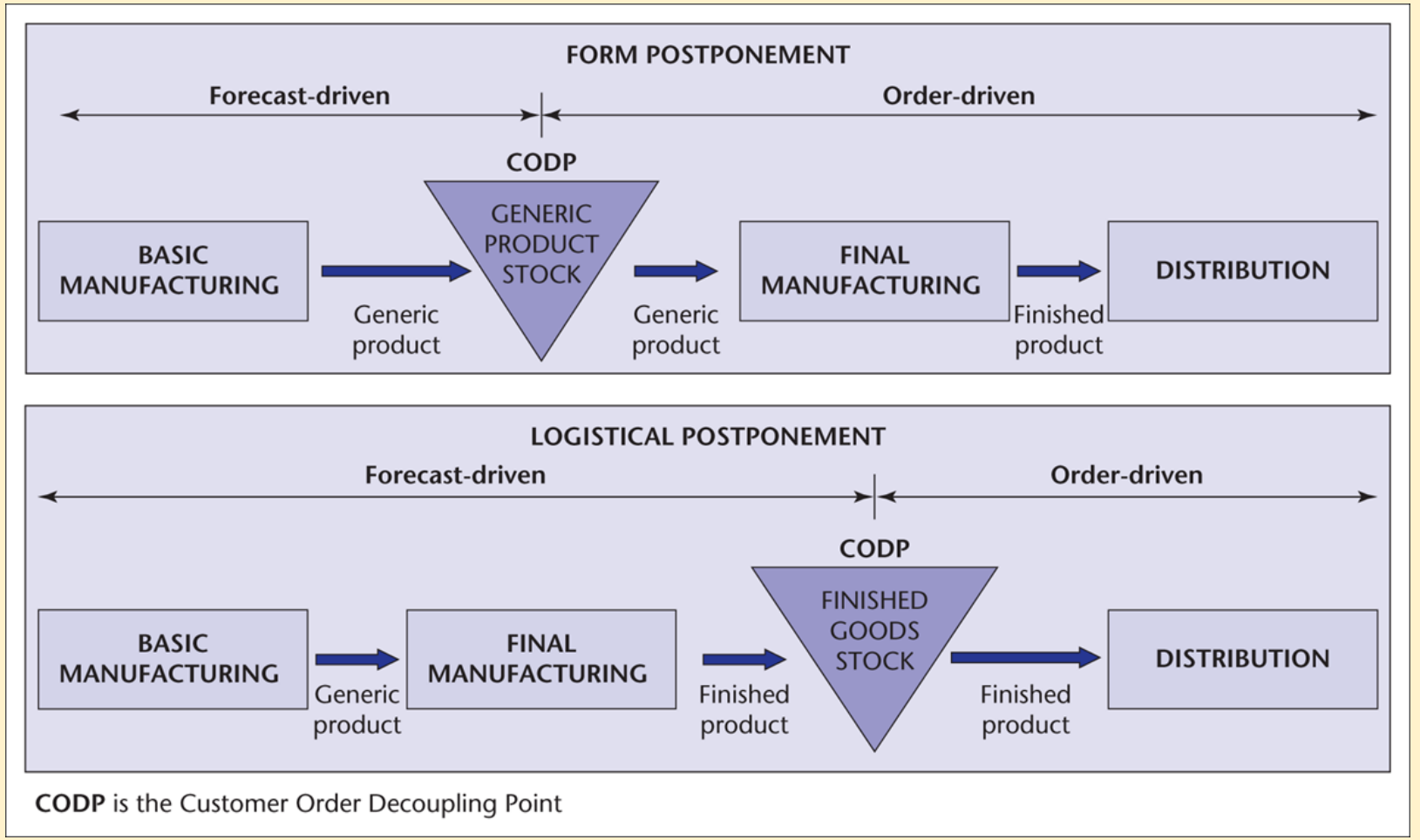


ILLUSTRATION OF THE LOGISTICS POSTPONEMENT STRATEGY



Pagh and Cooper (1998)

Form and Logistical Postponement



Harrison et al (2015)

Zara Masters the Art of Retail

https://www.youtube.com/watch?v=qhCM0F81vEg

Activity- Discuss in your groups

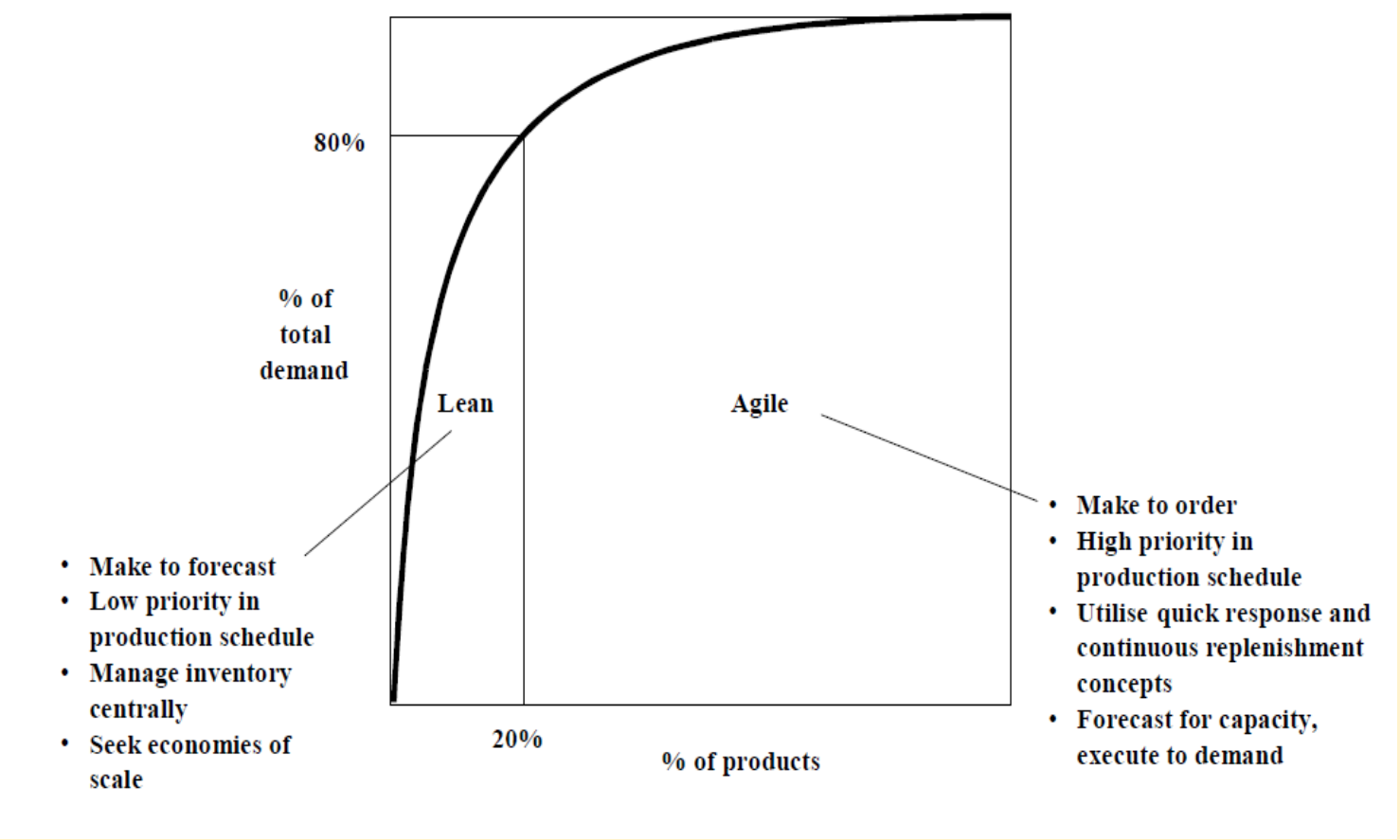
- Which type of postponement does Zara use?
  - Form/Manufacturing Postponement
  - Inventory/Logistics Postponement
- Where is the decoupling point located?

2. The Pareto Curve Approach

- 80% of total volume will be generated from just 20% of the total
- product line.
- The way in which these 20% are managed should probably be quite different from the way the remaining 80% are managed.

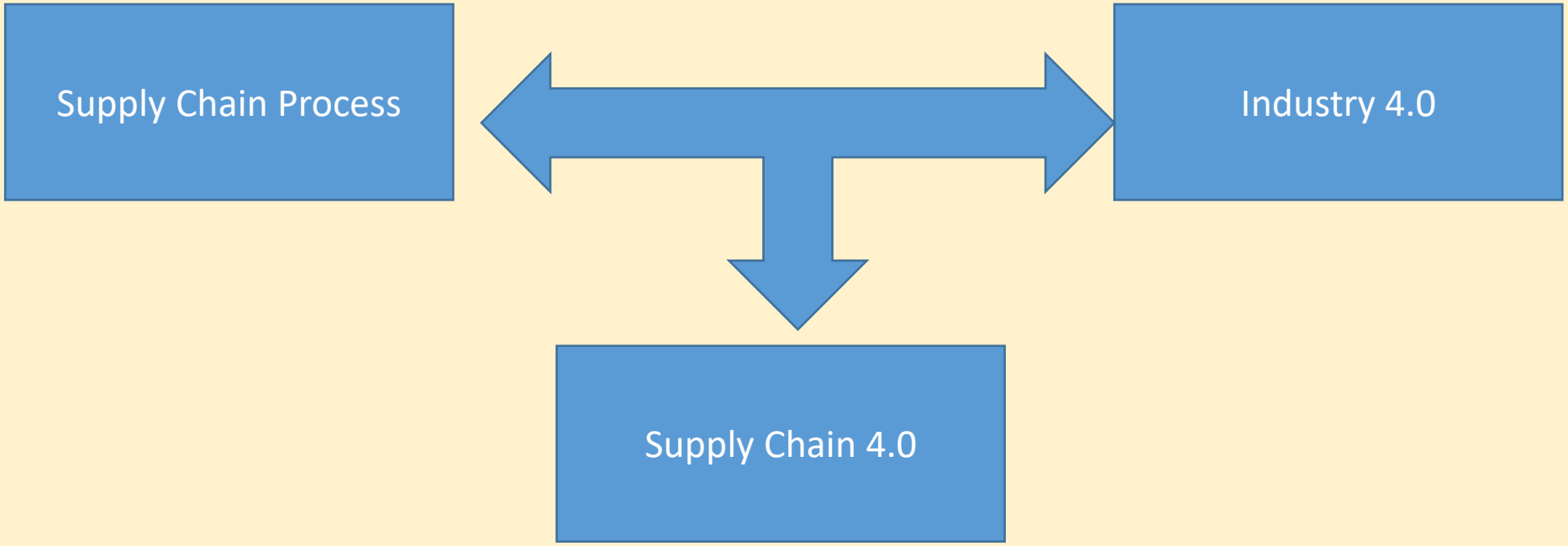
80/20 (or similar) rule holds

- For example it could be argued that:
  - the top 20% of products by volume are likely to be more predictable and hence they lend themselves to lean principles of manufacturing and distribution.
  - The slow moving 80% on the other hand will typically be less predictable and will require a more agile mode of management.



Christopher and Towhill (2001)

Supply Chain 4.0


Supply Chain Process
Industry 4.0
Supply Chain 4.0

Inside The Worlds Largest Semiconductor Factory - BBC Click

https://www.youtube.com/watch?v=Hb1WDxSoSec

How Attabotics is competing with Amazon to create the warehouse of the future | CNBC

https://www.youtube.com/watch?v=WLtEBaHkNJc

How many robots does it take to run a grocery store?

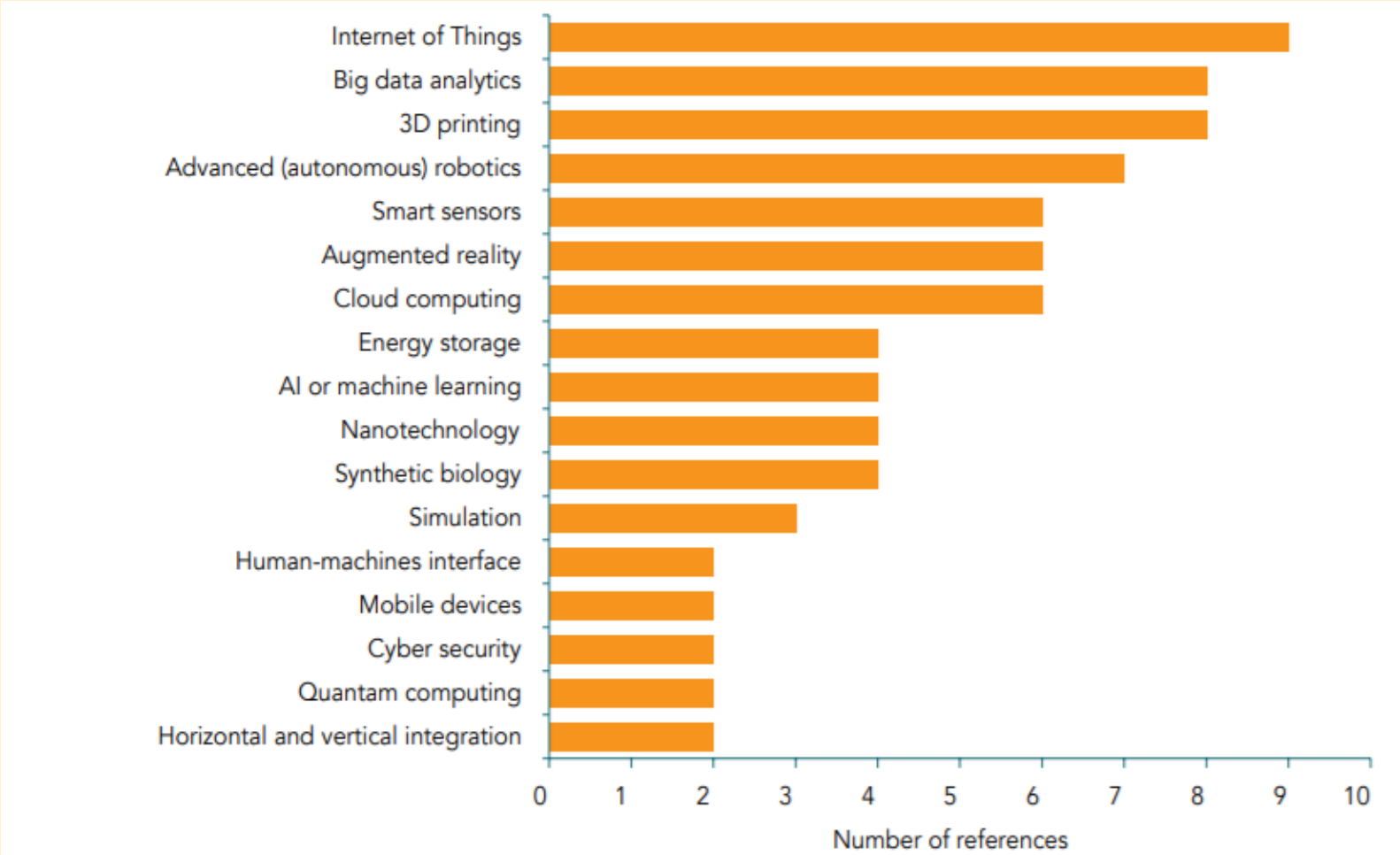
https://www.youtube.com/watch?v=ssZ_8cqfBlE

Supply Chain 4.0

McKinsey (2016)

- the application of the Internet of Things
- the use of advanced robotics
- application of advanced analytics of big data in supply chain management
- Place sensors in everything, create networks everywhere, automate anything
- analyze everything to significantly improve performance and customer satisfaction

Industry 4.0 technologies



Source: Graphic from Hallward-Driemeier and Nayyar (2017).

Industry 4.0 - Digital Bosch plant in Blaichach, Germany

https://www.youtube.com/watch?v=m6sl8KMsm5Q

By applying Supply Chain 4.0 levers, huge potential can be unlocked