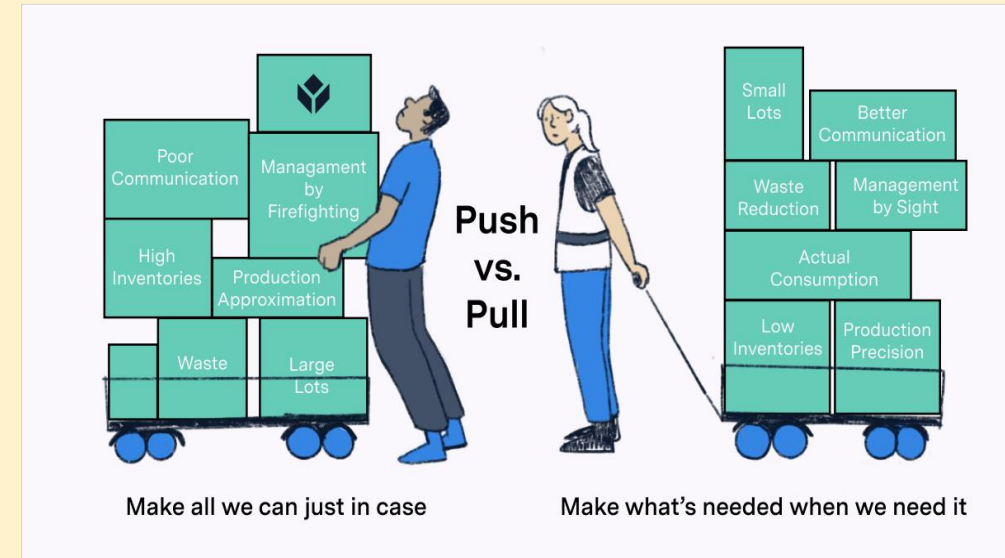
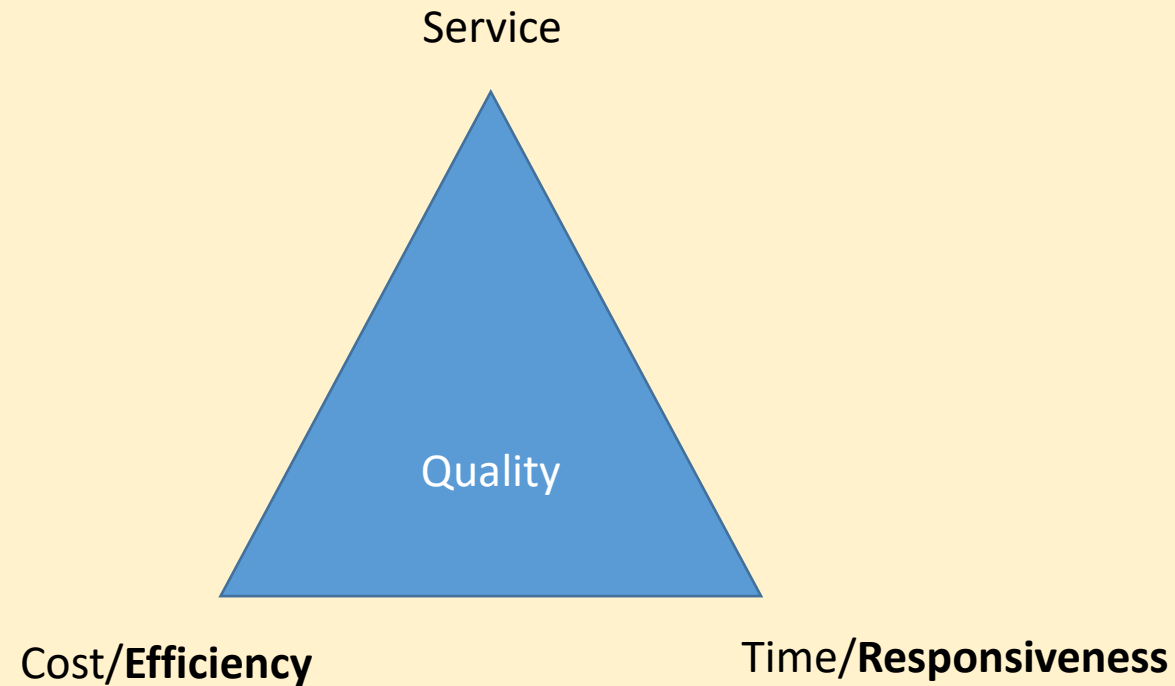


Lecture 4- Supply Chain Strategy



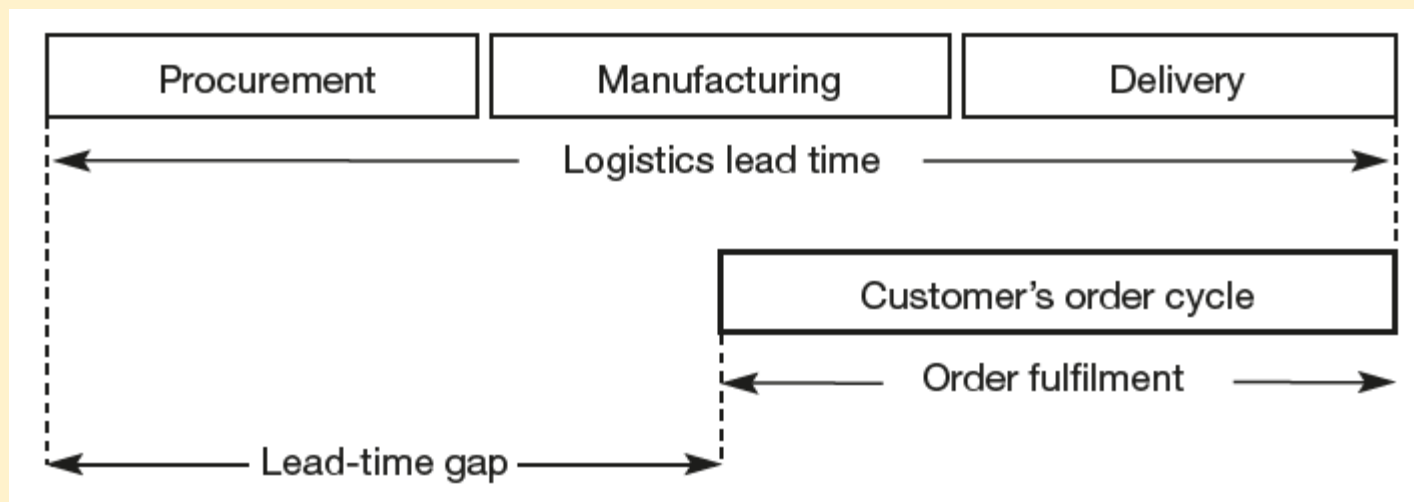
Recap

SC Strategy affect three measures of performance



The lead-time Gap Problem

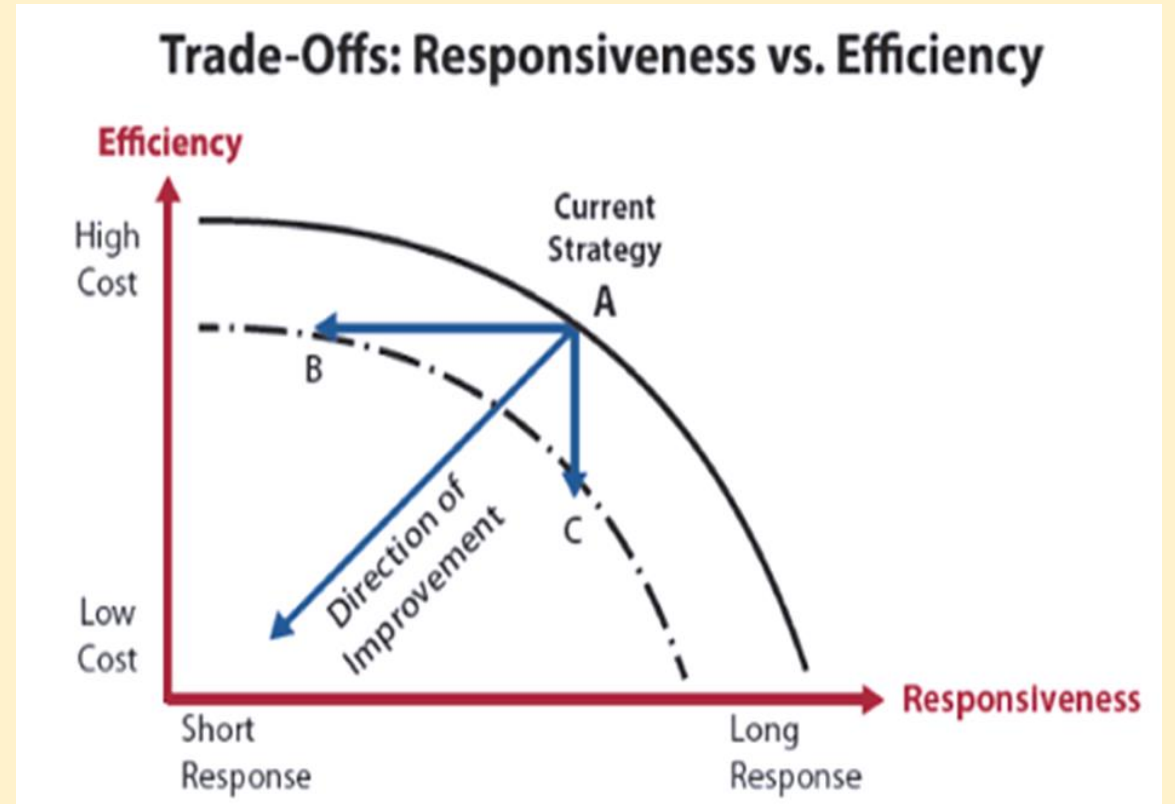
- The time it takes to procure, make and deliver the finished product to a customer is longer than the time the customer is prepared to wait for it.



Source: Christopher (2016)

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)

Why Making Apple iPhones in America Is So Hard | WSJ



<https://www.youtube.com/watch?v=GP7QF3rEII>

Comparison of Efficient and Responsive Supply Chains

Push.

Pull.

	Efficient Supply Chains	Responsive Supply Chains
Primary goal	Supply demand at the lowest cost	Respond quickly to demand
Product design strategy	Maximize performance at a minimum product cost	Create <i>modularity</i> to allow postponement of product differentiation
Pricing strategy	Lower margins because price is a prime customer driver	Higher margins because price is not a prime customer driver
Manufacturing strategy	Lower costs through high utilization	Maintain capacity flexibility to buffer against demand/supply uncertainty
Inventory strategy	Minimize inventory to lower cost	Maintain <i>buffer inventory</i> to deal with demand/supply uncertainty
Lead-time strategy	Reduce, but not at the expense of costs	Reduce aggressively, even if the costs are significant
Supplier strategy	Select based on cost and quality	Select based on speed, flexibility, reliability, and quality

Source: Adapted from “What Is the Right Supply Chain for Your Product?” Marshall L. Fisher, *Harvard Business Review* (March–April 1997), 83–93.

Source: Chopra and Meindl (2013)

Defying the Odds- Firing on all cylinders

- Generic Drugs (Gx) Companies

- Inventory levels 25% lower than Rx
- Conversion cost 40% lower than Rx
- Higher Outsourcing
- More Responsive Supply Chain

- Tech Companies

- Amazon-
- Apple
- Dell

- FMCG Companies

- operates with one-third to one-fifth of the inventory of Gx companies
- forecast accuracy is ten percentage points higher
- perform at 98.6 percent service level

Triple A Supply chain (Lee 2004)

- Efficiency is necessary, but it isn't enough
- Great supply chains are:
 - **Agile**- They react speedily to sudden changes in demand or supply.
 - **Adaptable**- over time as market structures and strategies evolve.
 - **Align**- the interests of all the firms in the supply network so that companies optimize the chain's performance when they maximize their interests.

Push and Pull view of Supply Chain

Suppliers "push" products to their customers by marketing

Customers "pull" products from suppliers by placing orders

Push/Pull View of Supply Chain Processes

- Supply chain processes fall into one of two categories depending on the timing of their execution relative to customer demand
- **Push:**
 - Execution is initiated in anticipation of customer orders (**speculative**)
 - Push processes operate in an uncertain environment because customer demand is not yet known
- **Pull:**
 - Execution is initiated in response to a customer order (**reactive**)
 - Pull processes operate in an environment in which customer demand is known

Push Strategy

- Production and distribution decisions are **based on long-term forecasts**.
- Typically, the manufacturer bases its demand forecasts on orders received from the retailer 's warehouses.
- A push-based supply chain therefore is **slow to react to the changing marketplace**, which can lead to:
 - An inability to meet changing demand patterns, and
 - The obsolescence of supply chain inventory as demand for certain products disappears.

- In addition, **variability of orders received from retailers is typically much higher** than variability in customer demand
- This increase in variability propagates upstream in the supply chain.
- This is the so-called **bullwhip effect**
- This **increase in variability leads to:**
 - Excessive inventories due to the need for large safety stocks,
 - Larger and more variable production batches,
 - Unacceptable service levels, and
 - Product obsolescence.

Push supply chain example

Supply Chain Integration – Push Strategies

- Classical manufacturing supply chain strategy
- Manufacturing forecasts are long-range
 - Orders from retailers' warehouses
- Longer response time to react to marketplace changes
 - Unable to meet changing demand patterns
 - Supply chain inventory becomes obsolete as demand for certain products disappears
- Increased variability (Bullwhip effect) leading to:
 - Large inventory safety stocks
 - Larger and more variably sized production batches
 - Unacceptable service levels
 - Inventory obsolescence
- Inefficient use of production facilities (factories)
 - How is demand determined? Peak? Average?
 - How is transportation capacity determined?
- Examples: Auto industry, large appliances, others?



Pull Strategy

- Production and distribution are **demand driven** so that they are **coordinated with true customer demand** rather than forecast demand.
- In a pure pull system, the firm **does not hold any inventory** and **responds only to specific orders**
- This is **enabled by fast information flow** mechanisms that transfer information about customer demand, e.g., point-of-sale (POS) data, to the various supply chain participants.

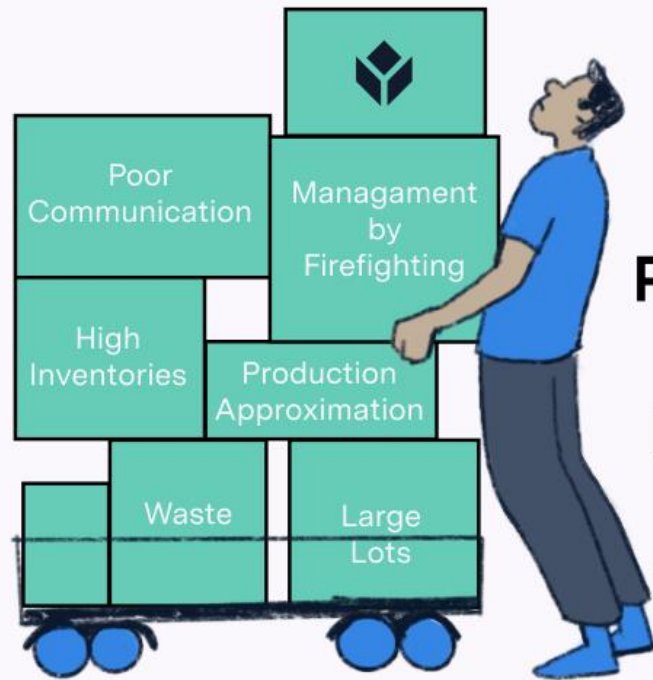
Pull supply chain example

Supply Chain Integration – Pull Strategies

- Production and distribution are demand-driven
 - Coordinated with true customer demand
- None or little inventory held
 - Only in response to specific orders
- Fast information flow mechanisms
 - POS data
- Decreased lead times
- Decreased retailer inventory
- Decreased variability in the supply chain and especially at manufacturers
- Decreased manufacturer inventory
- More efficient use of resources
- More difficult to take advantage of scale opportunities
- Examples: Dell, Amazon

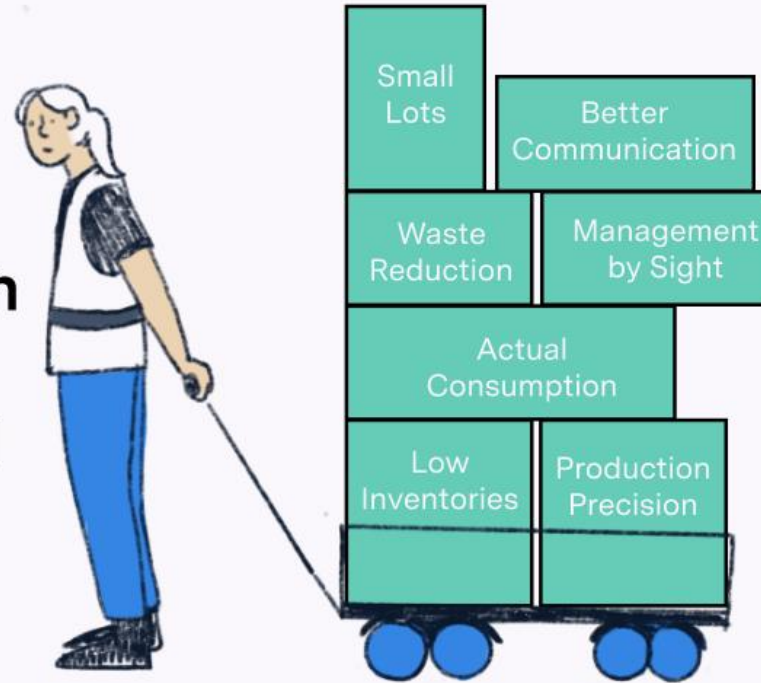


Push vs Pull



Make all we can just in case

**Push
vs.
Pull**



Make what's needed when we need it

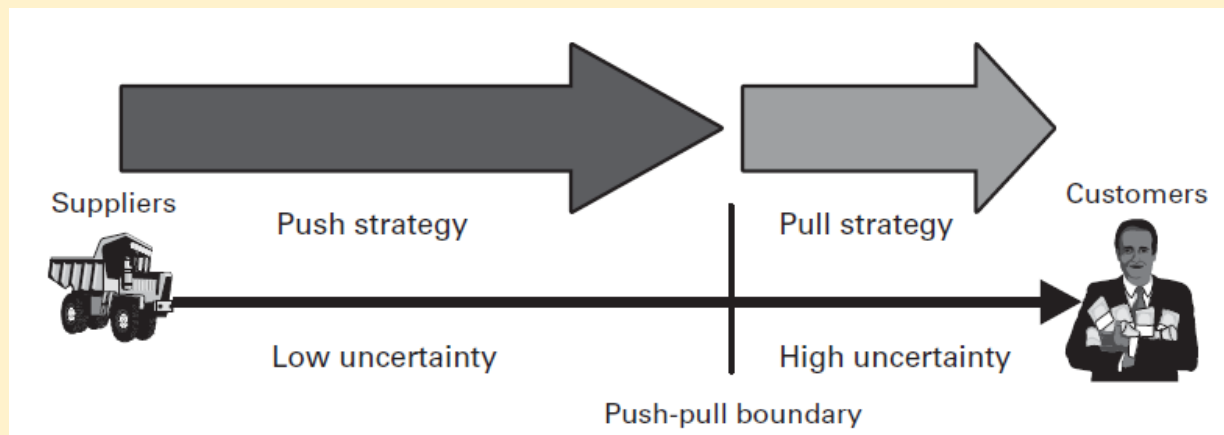
Characteristics of the push and pull portions of the supply chain

Portion	Push	Pull
Objective	Minimize cost.	Maximize service level.
Complexity	High	Low
Focus	Resource allocation	Responsiveness
Lead time	Long	Short
Processes	Supply chain planning	Order fulfillment

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)

Demand penetration point and Strategic Inventory

- Also known as Order Penetration Point (OPP), Decoupling Point
- **The demand penetration point occurs at that point in the chain where real demand meets the forecast/plan**
 - Upstream from this point everything is driven by a forecast and/or a plan.
 - Downstream of that point we can respond to actual customer demand

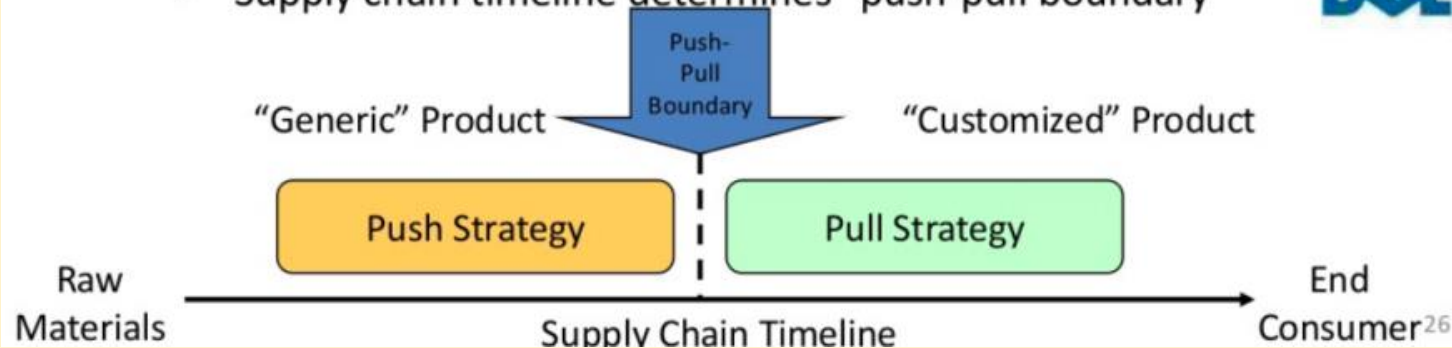
Aka Customer Order De-Coupling Point (CODP)

- The de-coupling point can be defined as that point in the supply chain where the business ceases to be 'forecast-driven' and becomes 'demand-driven'.
- In other words, up until this point all actions are planned ahead against a forecast, e.g. production volumes, inventory levels and so on.
- After that point, actions are triggered by the 'pull' of market demand
- As such, ideally at this point in the supply chain, **strategic inventory is held**

Push/Pull Strategies example

Supply Chain Integration – Push/Pull Strategies

- Hybrid of “push” and “pull” strategies to overcome disadvantages of each
- Early stages of product assembly are done in a “push” manner
 - Partial assembly of product based on aggregate demand forecasts (which are more accurate than individual product demand forecasts)
 - Uncertainty is reduced so safety stock inventory is lower
- Final product assembly is done based on customer demand for specific product configurations
- Supply chain timeline determines “push-pull boundary”

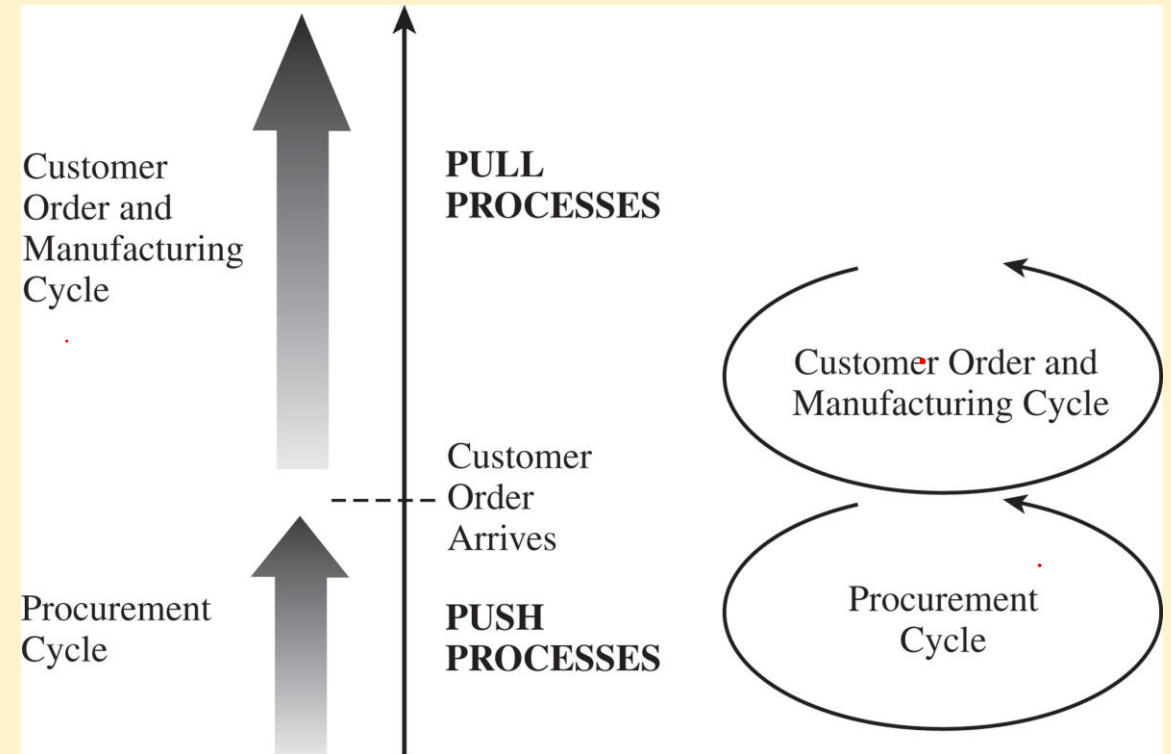


Where to locate the CODP?

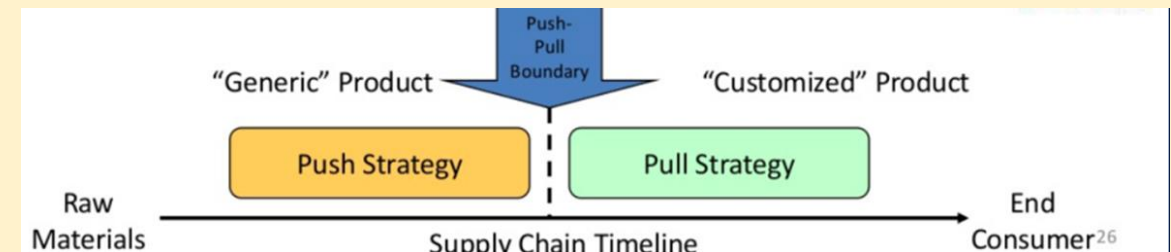
- To implement a push-pull strategy, **determine the location of the push-pull boundary.**
- For instance:
 - Dell locates the push-pull boundary at the **assembly point**,
 - While furniture manufacturers locate the boundary at the **production point**

Push/Pull View – Dell

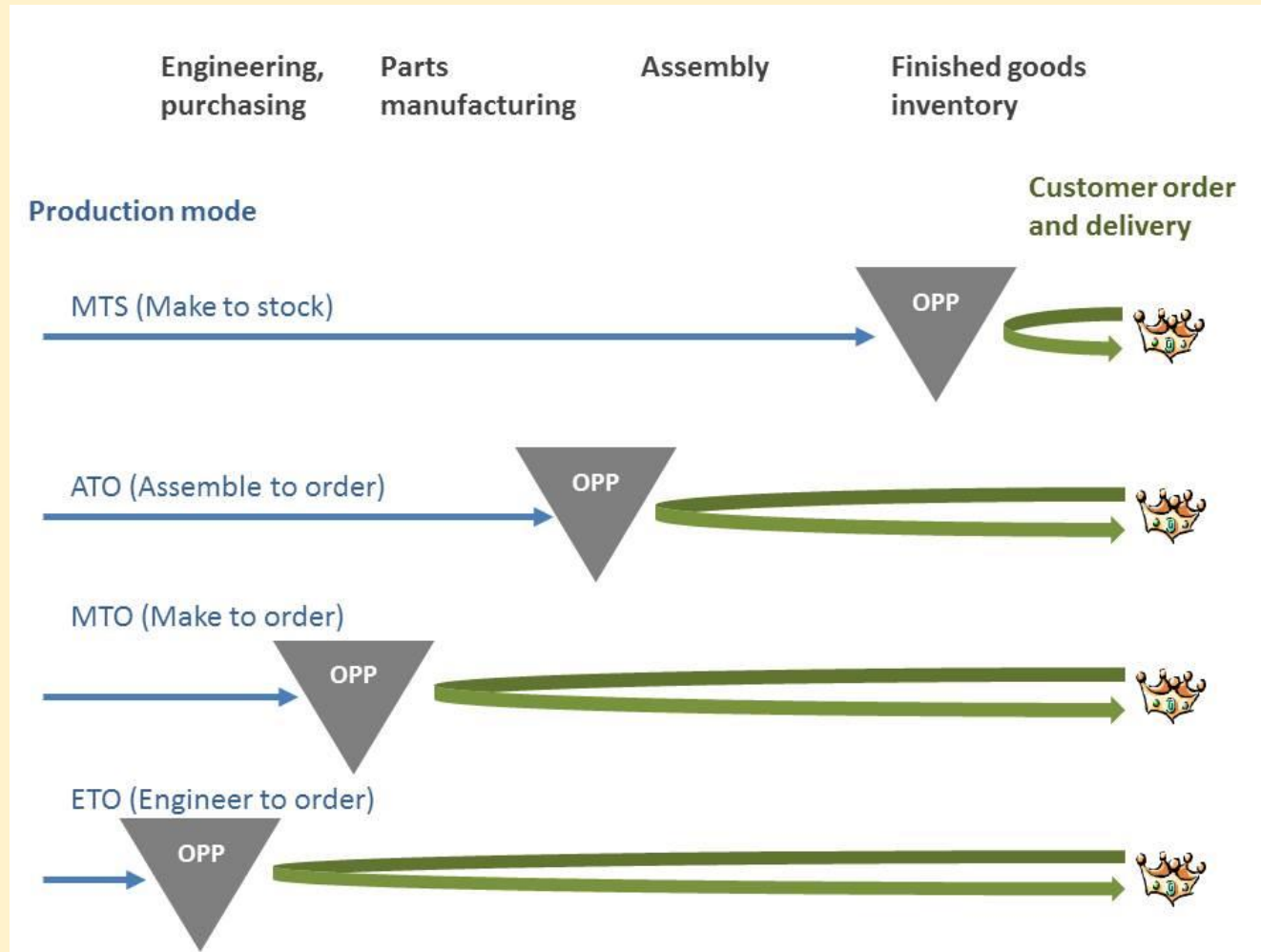
- Dell builds customized computers to order for its customers
- In this case, the arrival of a customer order triggers production of the product
- The manufacturing cycle is thus part of the customer order fulfillment process in the customer order cycle- **PULL**
- Dell, however, does not place component orders in response to a customer order. Inventory is replenished in anticipation of demand- **PUSH**



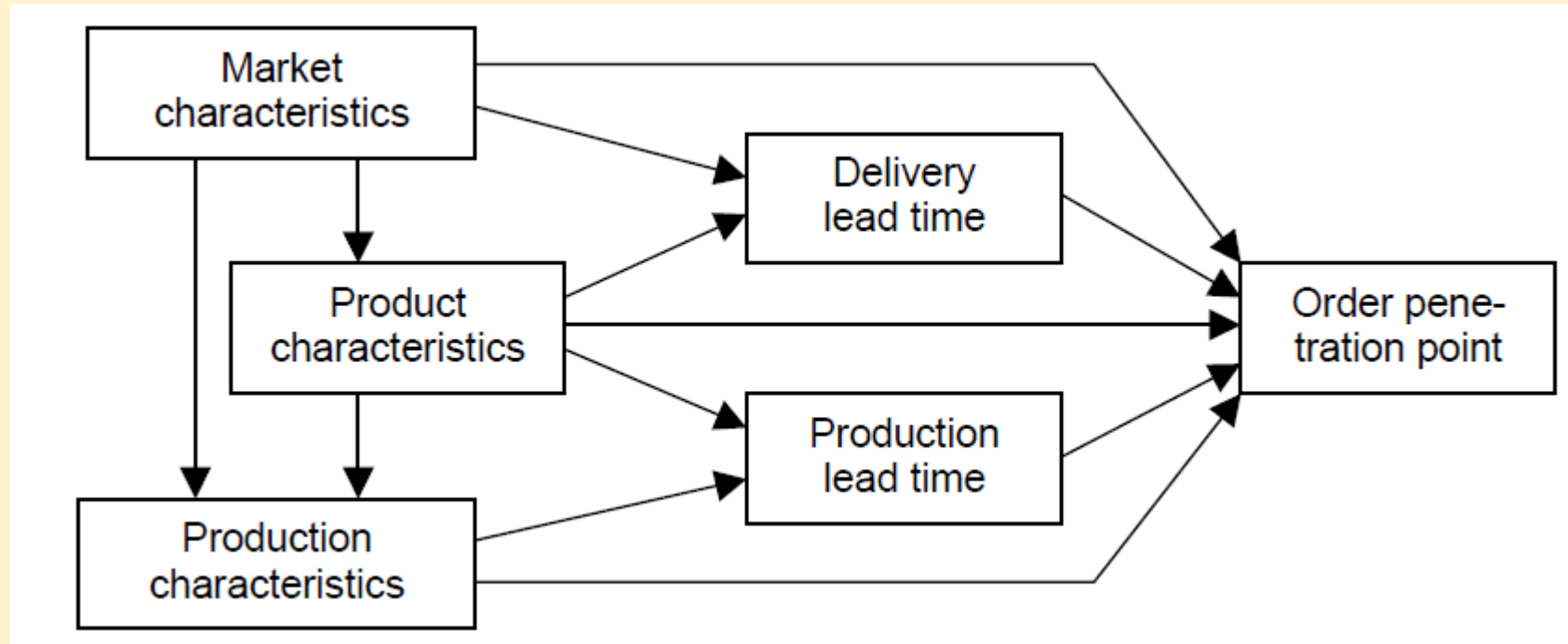
Chopra and Meindl (2013)



Manufacturing Strategy and OPP/CODP



Factors affecting the positioning of the CODP



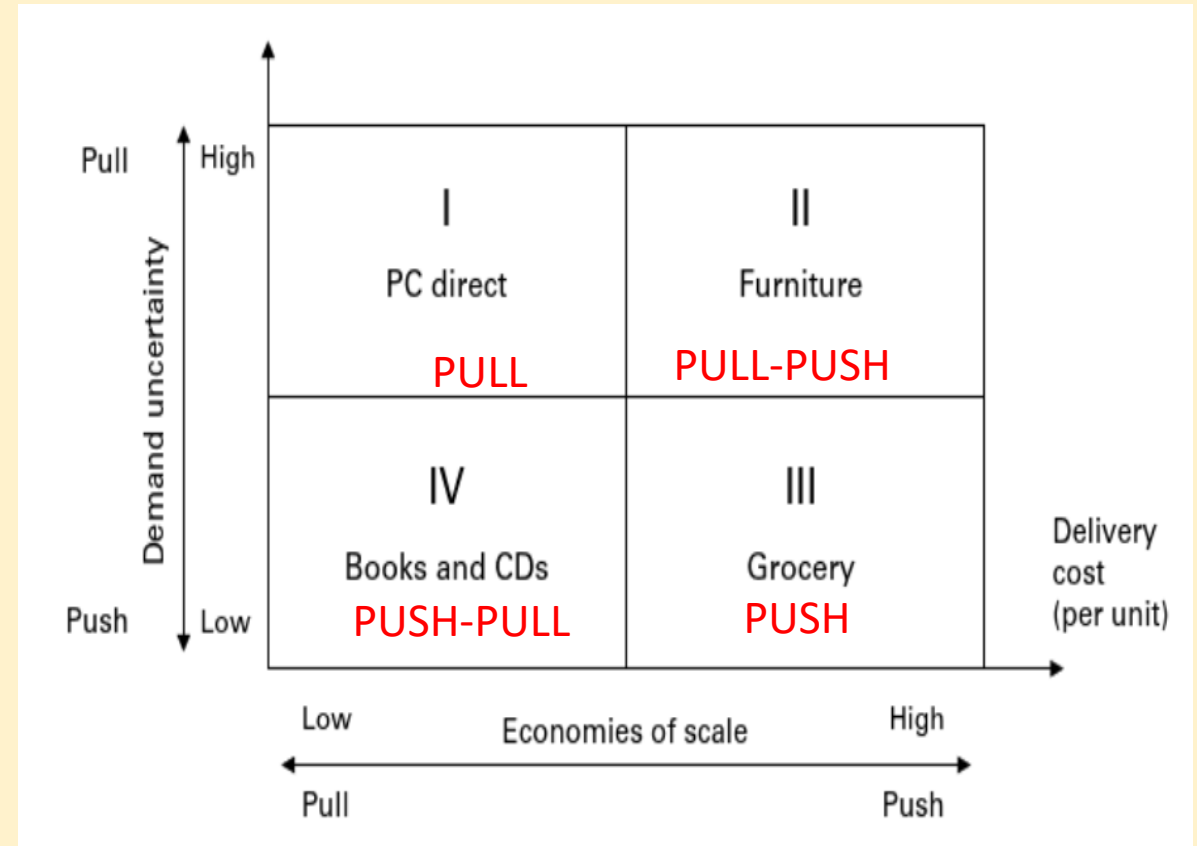
Olhager (2003)

Which Strategy to Select?

- Should the firm use:
 - a Push-based supply chain strategy
 - a Pull-based strategy or
 - a Push-Pull strategy

Matching SC Strategies with Products- Effect of demand uncertainty and economies of scale

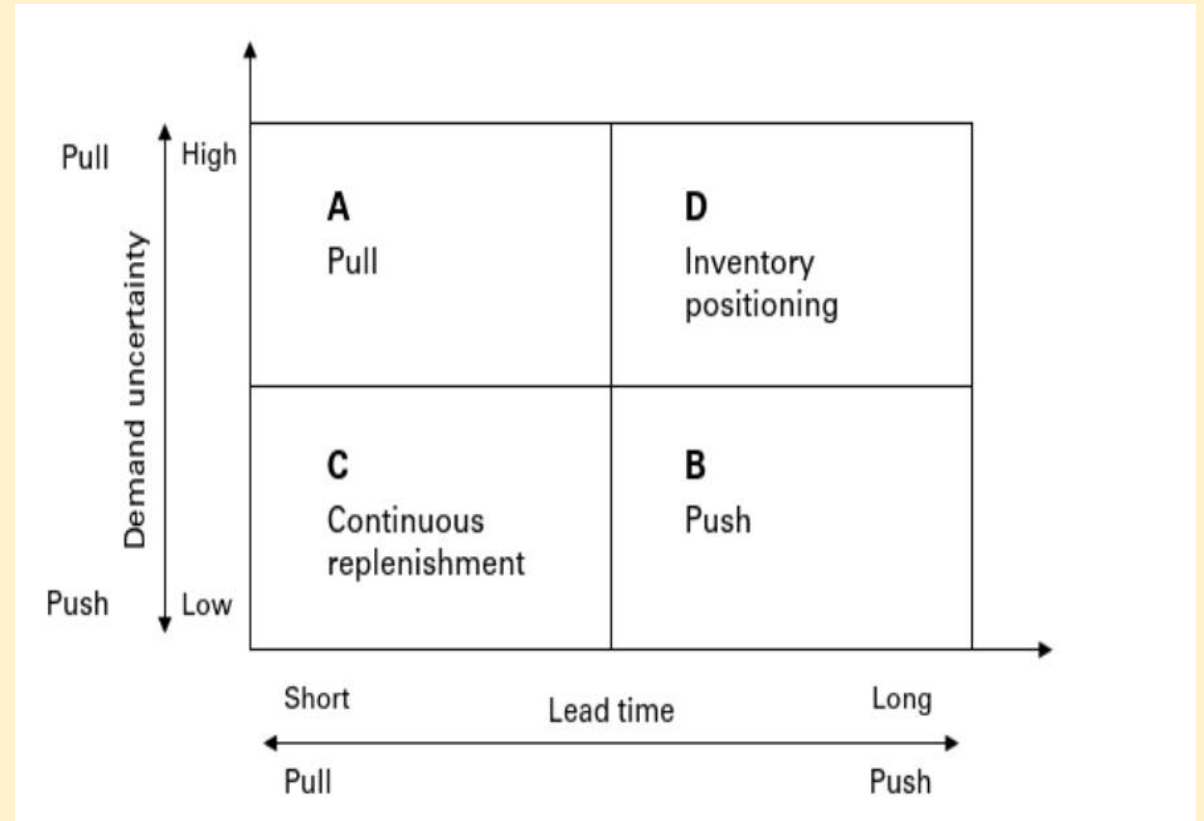
- **Box 1-** Pull-based SC Strategy
- **Box 3-** Push-based SC Strategy
- **Box 2 and 4-** Push-Pull SC Strategy



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)

Strategies for Innovative and Functional Products

- **Functional Products-**

Push Strategy

- where the focus is on efficiency, cost reduction, and supply chain planning

- **Innovative Products-**

Pull Strategy

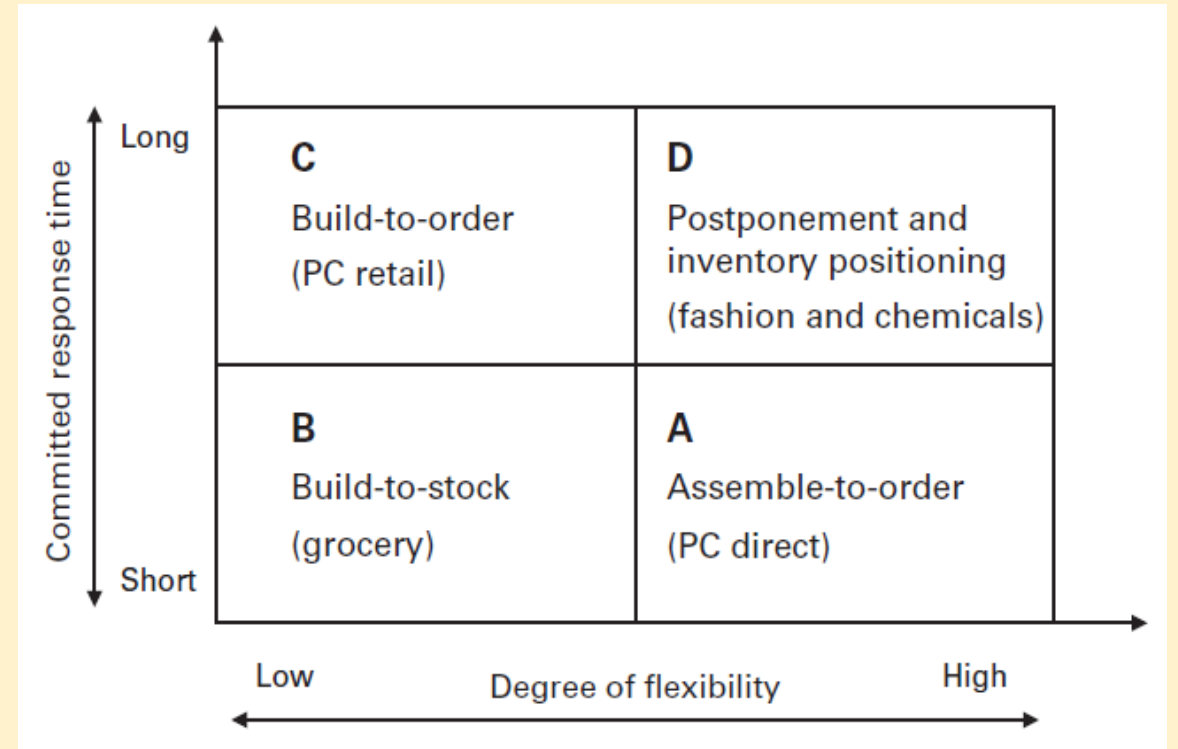
- focus is on responsiveness - time, service level, and order fulfillment

	Functional products	Innovative products
Efficient supply chain (push)	Match	Mismatch
Responsive supply chain (pull)	Mismatch	Match

From M. L. Fisher, "What Is the Right Supply Chain for Your Product?," Harvard Business Review (March – April 1997): 105 – 117.

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-Push strategy
 - lot sizes are produced after receiving a customer order
 - focuses on efficiency or cost reduction through economies of scale



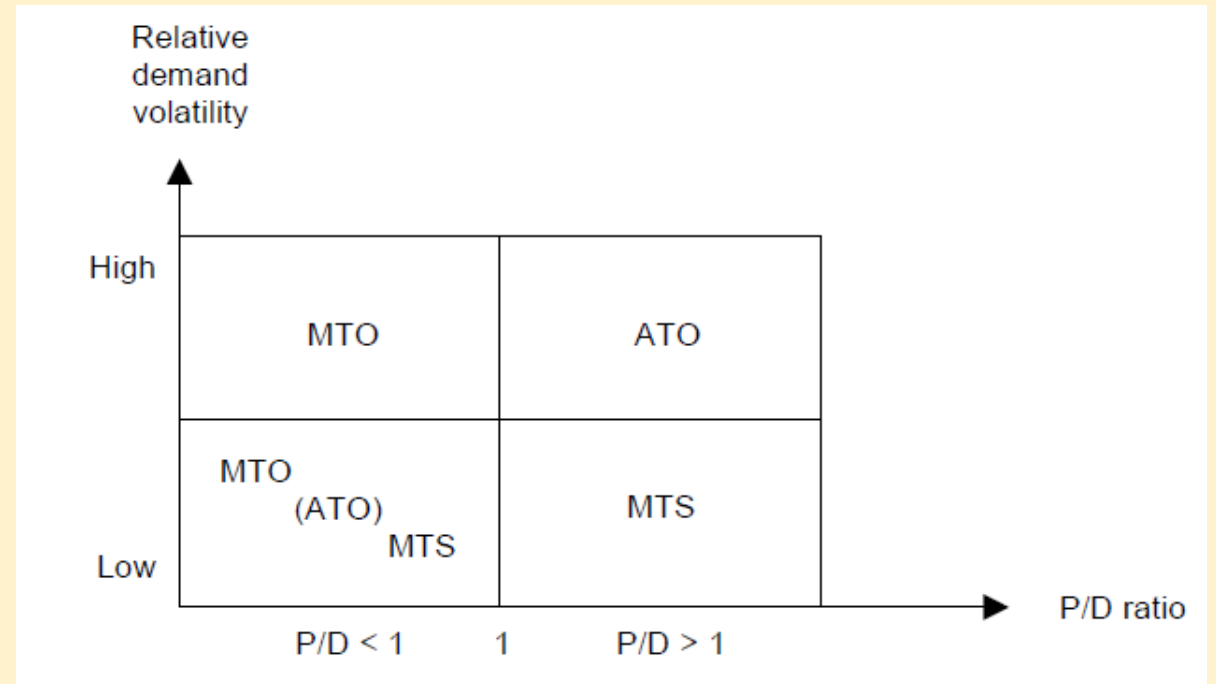
Simchi-Levi (2010)

A model for choosing the right Product Delivery Strategy

- P/D ratio is the production lead time to delivery lead time ratio
- RDV is the coefficient of variation

Generally:

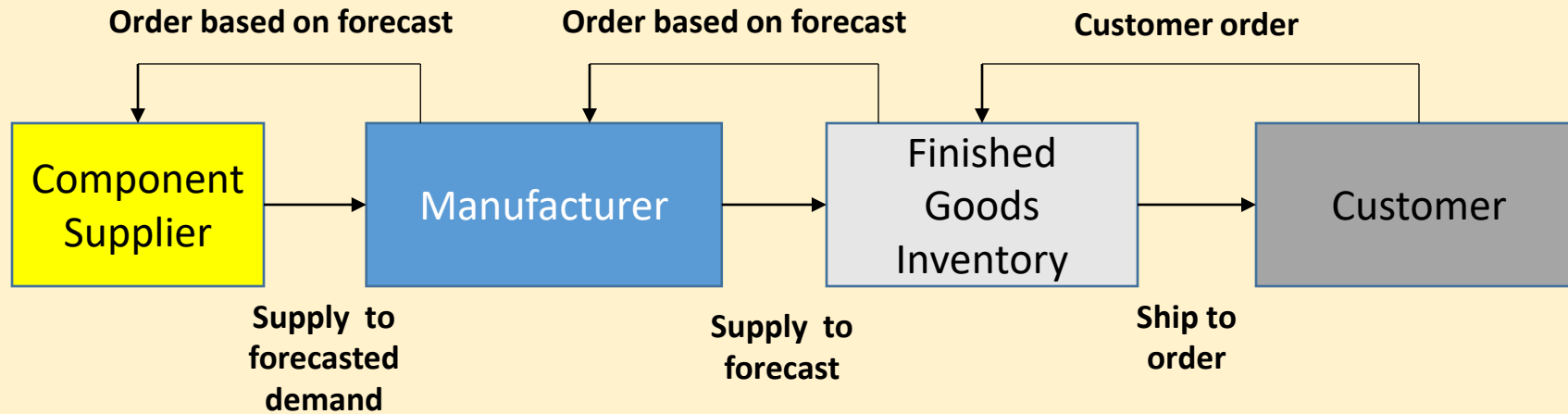
- IF $P:D > 1$ - Push/MTS
- IF $P:D < 1$ - Pull/MTO/ATO



Olhager (2003)

Supply Chain Designs

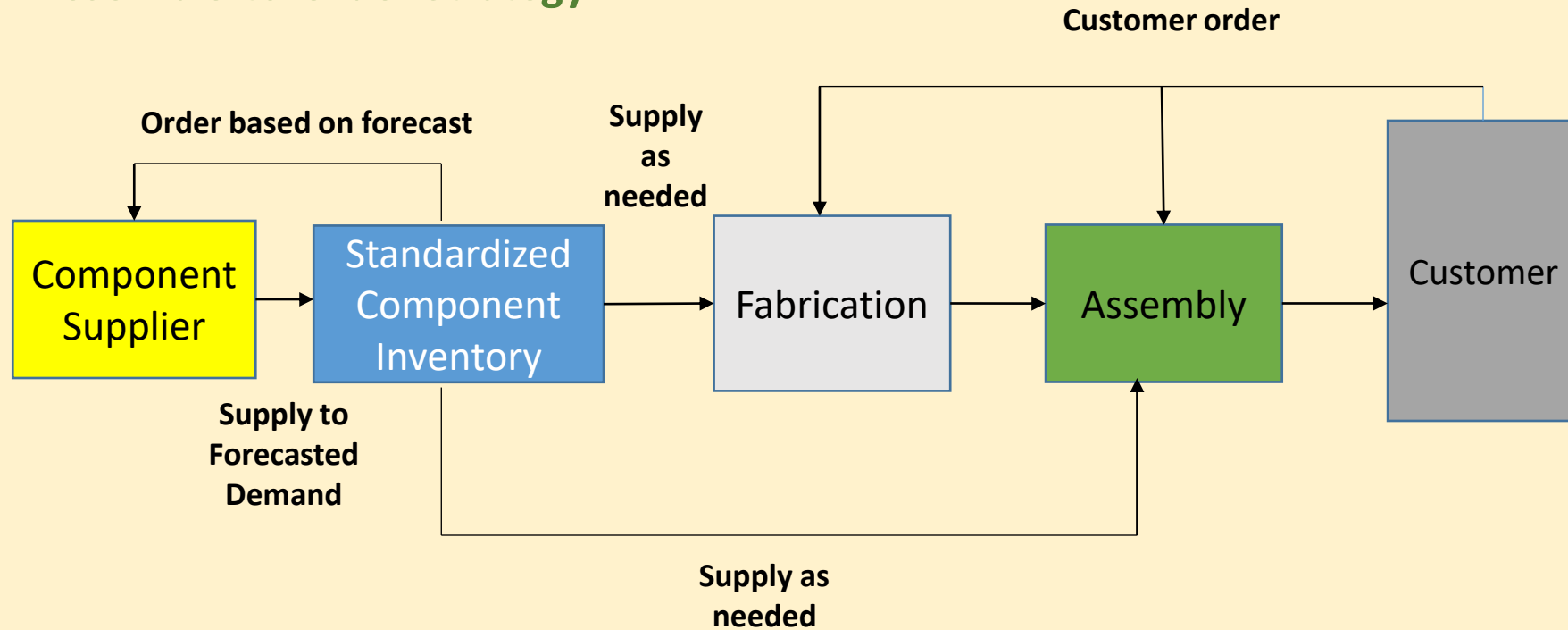
Make-to-Stock Strategy



Krajewski et al (2016)

Supply Chain Designs

Assemble-to-Order Strategy



Krajewski et al (2016)

Appropriate Supply Chain Strategies

Right Supply Chain Strategy in total

- Use of a menu of tactics that include:
 - Manufacturing strategy
 - Push/Pull Strategy
 - Optimizing push-pull boundaries
 - Postponement strategies
 - Strategic inventory
 - Agile/Lean Strategy
 - Hybrid of Lean and Agile

Contemporary Supply Chain Strategies

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

Supply characteristics	Long lead times	<i>Lean</i> Plan and optimise	<i>Hybrid</i> De-couple through postponement
	Short lead times	<i>Kanban</i> Continuous replenishment	<i>Agile</i> Quick response
		Predictable	Unpredictable
		Demand characteristics	

Source: Christopher (2016)

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



miembros del equipo son invitados a dar sus opiniones

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