



ΧΑΡΟΚΟΠΕΙΟ ΠΑΝΕΠΙΣΤΗΜΙΟ
HAROKOPIO UNIVERSITY

Supply Chain Management

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Σκοπός

Σκοπός του μαθήματος είναι οι φοιτητές να αποκτήσουν γνώση και εμπειρία σε θέματα διαχείρισης της εφοδιαστικής αλυσίδας. Δίνεται έμφαση στη **χρήση των τεχνολογιών πληροφορικής και επικοινωνιών (ΤΠΕ)** για τη βελτίωση και τον **ψηφιακό μετασχηματισμό** των διαδικασιών και την **υποστήριξη λήψης αποφάσεων** στην εφοδιαστική αλυσίδα.

Μαθησιακά αποτελέσματα

- Κατανόηση των βασικών διαδικασιών της εφοδιαστικής αλυσίδας
- Κατανόηση των στόχων διαχείρισης της αλυσίδας αξίας και των παραγόντων κόστους
- Κατανόηση των επιπτώσεων της πανδημίας στην εφοδιαστική αλυσίδα
- Κατανόηση της σημασίας της ποιοτικής εξυπηρέτησης και της δημιουργίας αξίας για τον πελάτη
- Κατανόηση των διαδικασιών διαχείρισης αποθηκών, των συστημάτων διαχείρισης αποθήκευσης και του οφέλους από λύσεις αυτοματοποίησης/ ρομποτικής
- Κατανόηση και αποτίμηση οφέλους της εφαρμογής ΤΠΕ στην εφοδιαστική αλυσίδα
- Κατανόηση, Αξιολόγηση και εφαρμογή μεθόδων πρόβλεψης ζήτησης στην εφοδιαστική αλυσίδα
- Κατανόηση του ρόλου του αποθέματος στην εφοδιαστική αλυσίδα και των μοντέλων αποθέματος
- Επιλογή στρατηγικών διαχείρισης αποθέματος στην εφοδιαστική αλυσίδα
- Κατανόηση των στρατηγικών διανομής της εφοδιαστικής αλυσίδας με τα υπέρ και τα κατά τους.
- Διατύπωση πρότασης υιοθέτησης IoT (Internet of Things) λύσεων στην εφοδιαστική αλυσίδα εκτιμώντας το υπό εξέταση πρόβλημα
- Διατύπωση πρότασης υιοθέτησης λύσεων επιχειρηματικής αναλυτικής στην εφοδιαστική αλυσίδα εκτιμώντας το υπό εξέταση πρόβλημα
- Κατανόηση των πρακτικών βιωσιμότητας και της σημασίας τους για την εφοδιαστική αλυσίδα

Περιεχόμενα

- ❑ Εισαγωγή στις βασικές έννοιες της διαχείρισης της εφοδιαστικής αλυσίδας
- ❑ Βασικές λειτουργίες/ διαδικασίες της εφοδιαστικής αλυσίδας, Στρατηγικός σχεδιασμός,
- ❑ Εξυπηρέτηση πελατών - Διαδικασίες εξυπηρέτησης, παράγοντες ποιοτικής εξυπηρέτησης, δημιουργία αξίας για τον πελάτη, δείκτες αξιολόγησης
- ❑ Διαχείριση αποθηκών - Χωροταξικοί παράγοντες, συστήματα αποθήκευσης (οργάνωση θέσεων αποθήκευσης)
- ❑ Διαχείριση αποθηκών – Διαδικασίες, συστήματα διαχείρισης αποθηκών, εφαρμογές ρομποτικής και αυτοματοποίησης
- ❑ Πληροφοριακά συστήματα στην εφοδιαστική αλυσίδα
- ❑ Στρατηγικές διανομής προϊόντων - Υπέρ και κατά, διανομή μέσα στην πόλη, μελέτες περίπτωσης
- ❑ Πρόβλεψη ζήτησης στην εφοδιαστική αλυσίδα – Εναλλακτικά μοντέλα πρόβλεψης, μετρικές αξιολόγησης, χρήση εφαρμογής λογιστικών φύλλων για πρόβλεψη ζήτησης
- ❑ Διαχείριση αποθέματος - Τύποι αποθέματος, κόστη αποθεματοποίησης, μοντέλα και πρακτικές αποθέματος, χρήση εφαρμογής λογιστικών φύλλων για διατύπωση παραγγελίας σύμφωνα με την πρόβλεψη ζήτησης και το επιλεγμένο μοντέλο αποθέματος
- ❑ Χρήση τεχνολογιών IoT (Internet of Things) στην αλυσίδα αξίας - Οφέλη, υποστήριξη λήψης αποφάσεων, μελέτες περίπτωσης (Industry 4.0)
- ❑ Χρήση επιχειρηματικής αναλυτικής (Business Analytics) στην αλυσίδα αξίας –Οφέλη, υποστήριξη λήψης αποφάσεων, μελέτες περίπτωσης
- ❑ Βιώσιμη αλυσίδα αξίας - Πρακτικές, μελέτες περίπτωσης

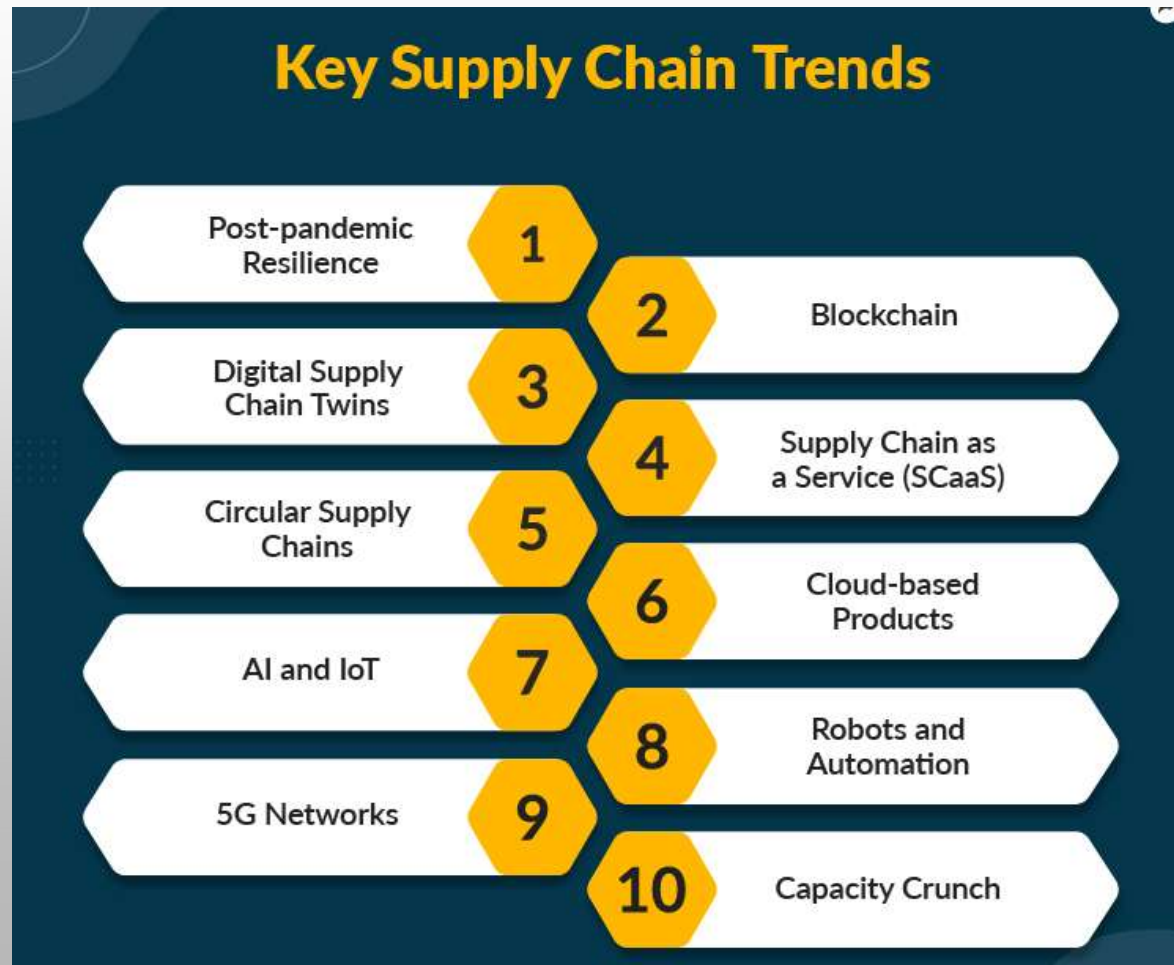
Αξιολόγηση

- ❑ Εξετάσεις (65%)
- ❑ Μελέτη + Κατανόηση άρθρου (paper) (35%)
 - ❑ 1 άτομο ανά άρθρο

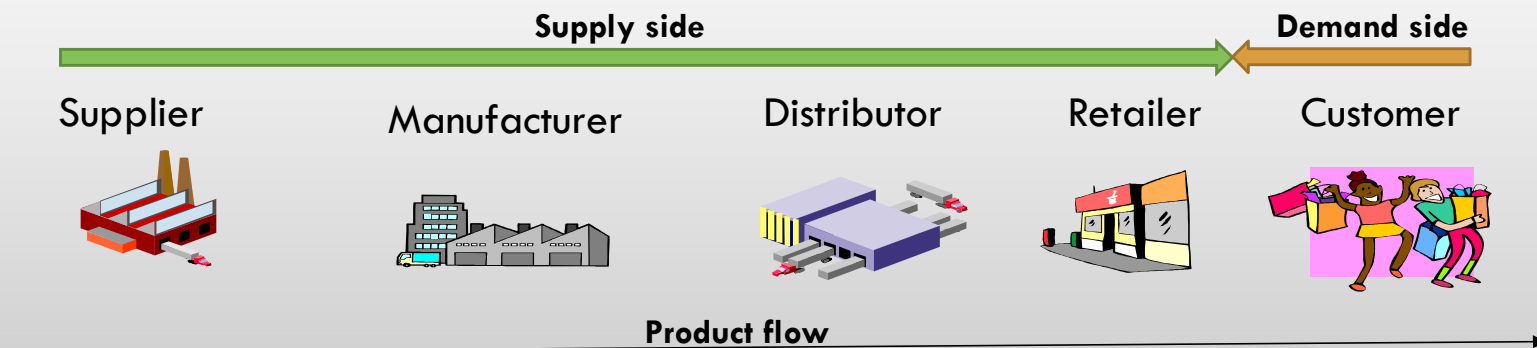
άρθρα πέρυσι

- ❑ Digital twin for sustainable manufacturing supply chains: Current trends, future perspectives, and an implementation framework
- ❑ Stock visibility for retail using an RFID robot
- ❑

Όραμα/ Στόχος πίσω από τη μελέτη των άρθρων

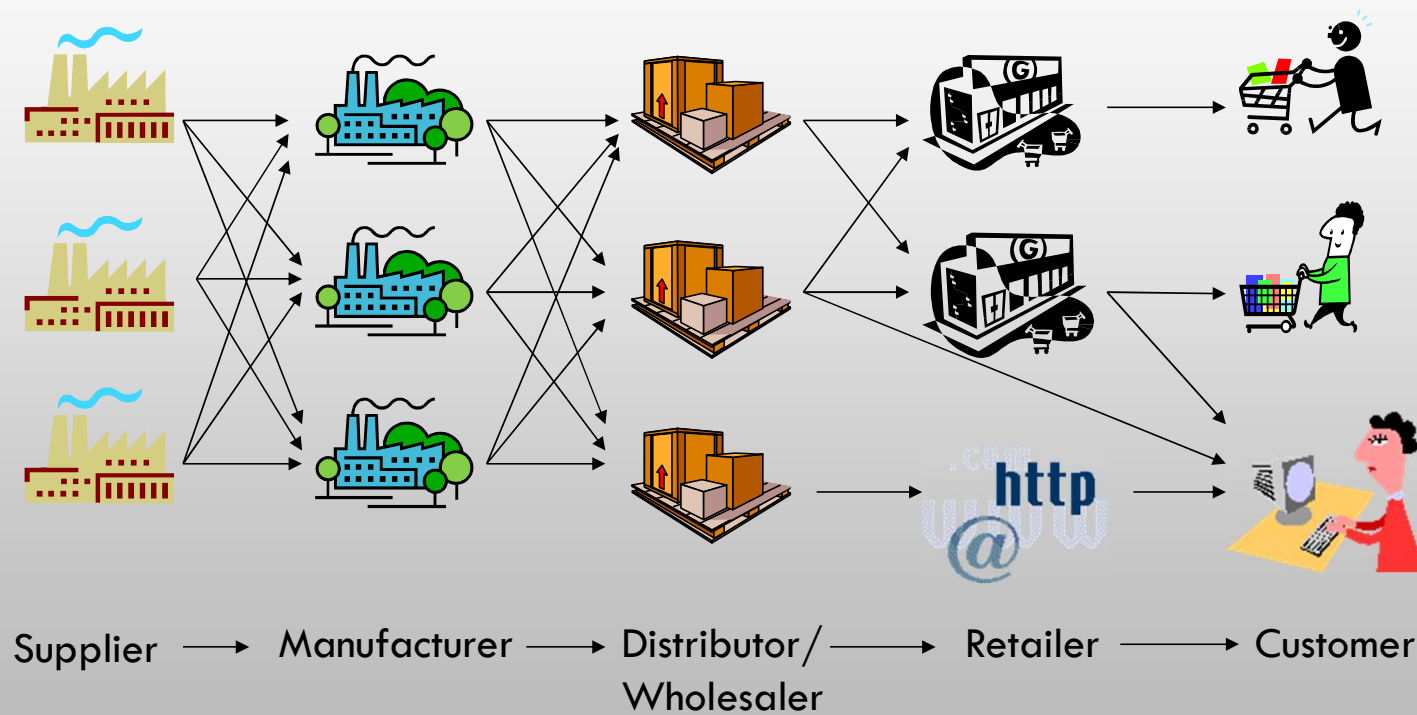


A Typical Supply Chain



In a basic supply chain, raw materials are procured from suppliers and product items are produced at the manufacturers' factories, shipped to warehouses and distributions centers, and then shipped to retailers to reach the customers.

Supply Network



Supply Chain Flows



A SC is dynamic and the supply chain stages are connected through the flow of products, information, and funds. These flows often occur in both directions and may be managed by one of the stages or an intermediary.

Supply Chain's Objective

SC Main Objective: Maximization of the overall Value generated

SC Value: the difference between what the final product is worth to the customer and the costs the supply chain incurs in filling the customer's request.

In other words, **SC Value = SC Profitability/ Surplus**, namely the difference between the revenue generated from the customer and the overall cost across the supply chain.

SC value ought to be shared across all supply chain stages and intermediaries and it should be measured across the entire value chain and not in terms of the profits at an individual stage. The focus on profitability at individual stages may lead to a reduction in the overall supply chain profits.



Supply Chain Management

Successful, Profitable SC Management achieves:

right **Product/ Service**,

for the right **Customer**,

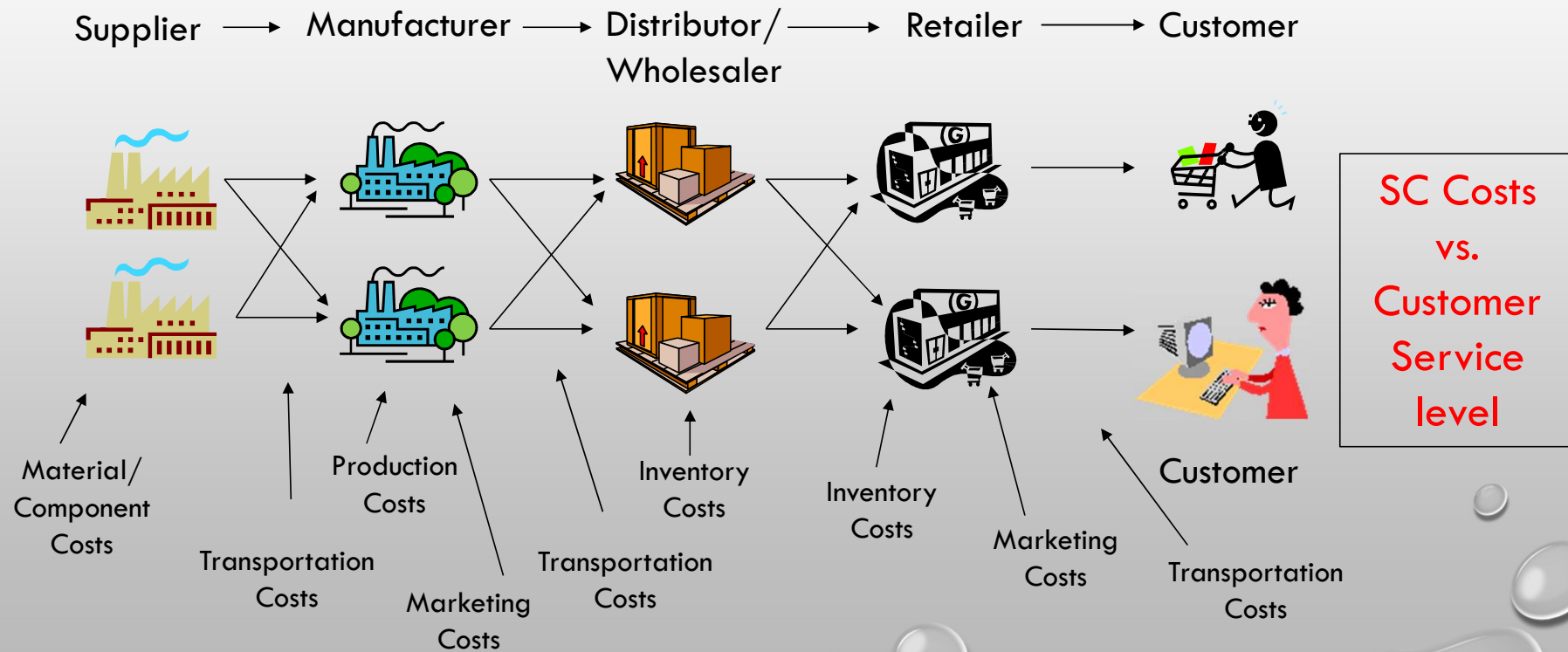
at the right **Quantity**,

the right **Location**, and

at the right **Price**.



Supply Chain Management



SCM is difficult

BMW recently suffered production stoppage of its 3-Series sedan in Germany, China, and South Africa, due to Bosch's failure to supply the necessary steering gears. Aside from its 3-Series sedan, production of BMW's 1-, 2-, and 4-Series were also affected. While the financial impact of the stoppage has yet to be measured, BMW is seeking compensation from Bosch for the disruption. (source <https://www.liaison.com/blog/2017/09/18/key-issues-supply-chain-management-overcome/>)

Japan Earthquake and Tsunami of 2011 costed Japan about \$210 billion. It shook SC all over the world. Electronics and auto manufacturing facilities were flooded, and in some cases, destroyed. Toyota, Nissan, and G.M. were forced to temporarily shut down some of their facilities in the U.S. and Japan because they could not ship or receive required components.

Supply Chain Decisions

SCM that intends to raise the supply chain surplus requires many SC decisions.

Each SC decision is effective when it contributes to the raising of the SC profitability.

3 types of SC decisions with

- different frequency
- different time phase during which a decision has an impact.



Supply Chain Decisions

3 types of SC decisions that concern

- **SC Strategy/ Design**
- **SC Planning**
- **SC Operation**

SC Strategy/Design Decisions

SC design (strategic-level) decisions have a long lasting effect on the firms.

These decisions consider the structure of the SC over the next several years, namely

- resources allocation
- the processes each SC stage will perform
- the number, the location and the capacities of production and warehousing facilities
- the products to be manufactured or stored at various locations
- the transportation modes
- the Information Systems utilized
- outsourcing SC functions
- offshoring.

SC Strategy/Design Decisions

More SC strategic decisions

- new product design
- strategic partnerships
- supply contracts

SC design decisions are very expensive to alter on short notice.

When companies make such decisions, they must take into account uncertainty in anticipated market conditions over the next few years.

SC Planning Decisions

SC planning decisions (tactical-level decisions) are typically updated between once every quarter and once every year.

The strategic SC configuration has already been determined and it establishes constraints that planning must respect.

SC planning is used to take into account a demand forecast for the coming year (or a comparable time frame) in the different markets.

SC Planning Decisions

SC planning decisions include

- which markets will be supplied from which locations
- subcontracting of manufacturing
- inventory policies to be followed
- the frequency, the timing and the size of marketing and price promotions

Such decisions must consider demand uncertainty, exchange rates, and competition over the decisions' time horizon.

SC planning decisions define a set of operating policies that govern short-term operations.

SC Operation Decisions

SC operation decisions (operational-level decisions) refer to day-to-day or weekly decisions and they concern individual customer orders.

With an already fixed SC configuration and defined planning policies, SC operations aim to handle incoming customer orders in the best possible manner.

Such decisions face less demand uncertainty, because they are being made in the short term (minutes, hours, or days). Thus, SC operation phase aims to exploit the reduction of uncertainty and optimize performance.

SC Operation Decisions

SC operation decisions include

- inventory or production allocation to individual orders
- setting order fulfillment dates
- generating pick lists at warehouses
- generating shelves replenishment lists in stores
- order allocation to a particular shipping mode and shipment
- setting orders' delivery schedules of trucks
- trucks loading
- placing stores' replenishment orders

Process Views of a Sc

A SC is a sequence of processes and flows within and between different stages/ players that combine to fill a customer need for a product.

- **Cycle View** of SC processes

The processes are divided into a series of cycles, each performed between two successive stages of a SC.

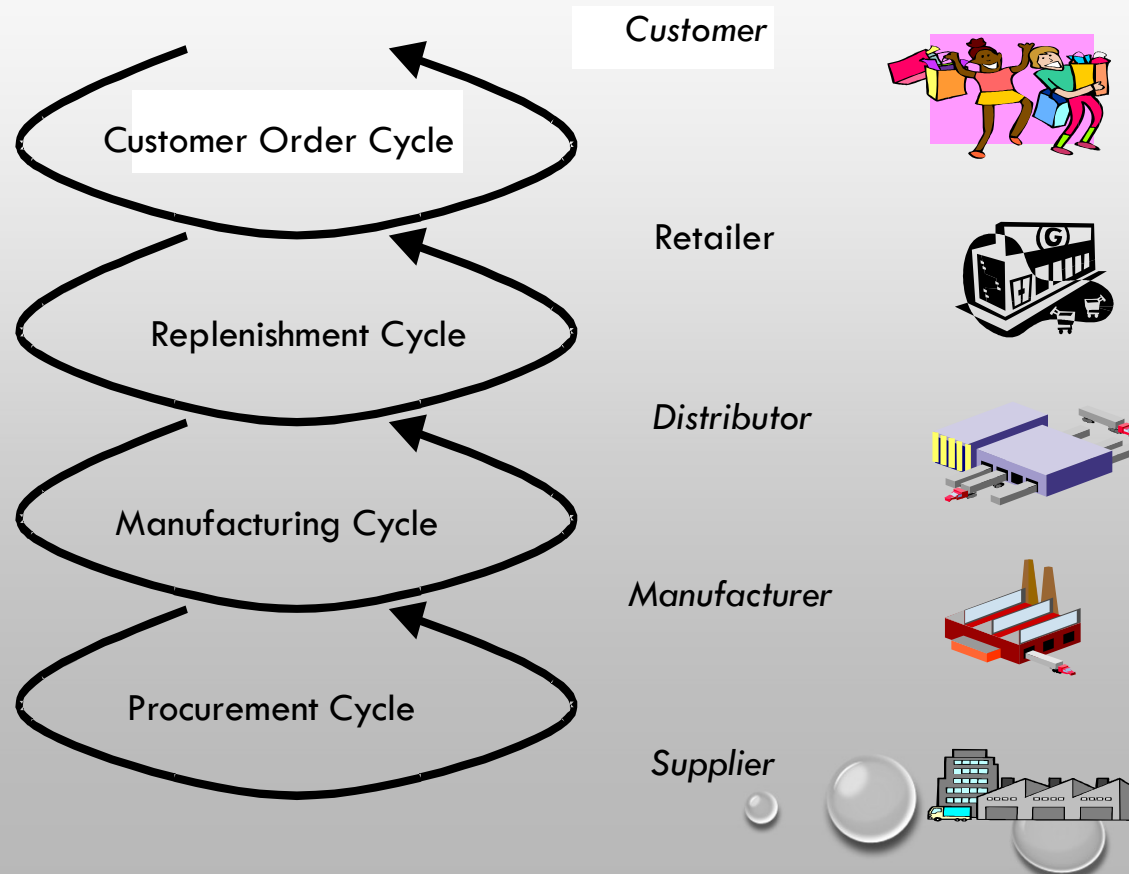
- **Push/Pull View** of SC processes

The processes of a SC are “pull” or “push” ones depending on whether they are executed in response to a customer order or in anticipation of customer orders.

Pull processes are initiated by a customer order.

Push processes are initiated and performed in anticipation of customer orders.

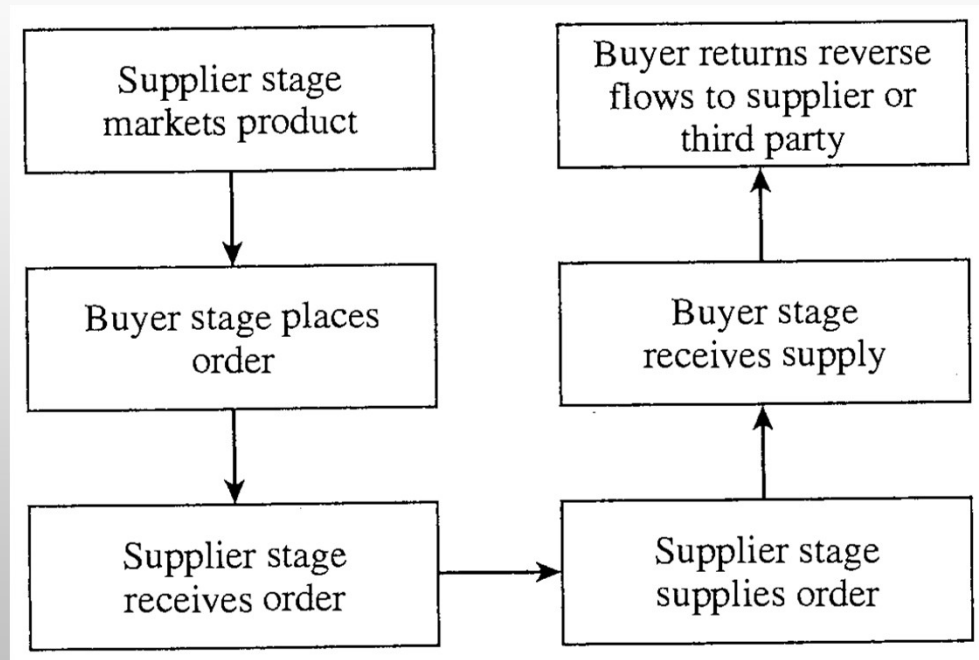
Cycle View of SC Processes



Cycle View of SC Processes

- 5 SC stages -> 4 SC process cycles
- Each process cycle occurs at the interface between two successive SC stages.
- Not every SC will have all four cycles clearly separated, e.g. firms that bypass the retailer and sell directly to customers via their e-shops.
- As we move downwards from the customer to the supplier, the number of individual orders declines and the size of each order increases. Thus, sharing of information and operating policies across SC stages becomes more important.
- The cycle view of a SC clearly defines the SC processes and their owners. It is very useful for operational decisions because it specifies the roles and responsibilities of each SC member and the desired outcome for each process.
- Each cycle = 6 sub-processes

Sub-processes in each SC Cycle



Sub-processes in each SC Cycle

- When customers shop online from e-shops (e.g. Amazon.com, Asos.com), the customer order cycle is executed. A customer is a buyer and an e-shop is the supplier.
- When a retail store orders products from a wholesaler, the replenishment cycle is applied. The retailer is a buyer and the wholesaler is the supplier.
- Within each cycle,
 - a buyer aims to ensure product availability, to achieve economies of scale in ordering and reduce the receiving costs.
 - a supplier needs to forecast the customer demand/orders, reduce the order receiving costs, fill the order on time and, overall, improve the efficiency and accuracy of the order fulfillment process.



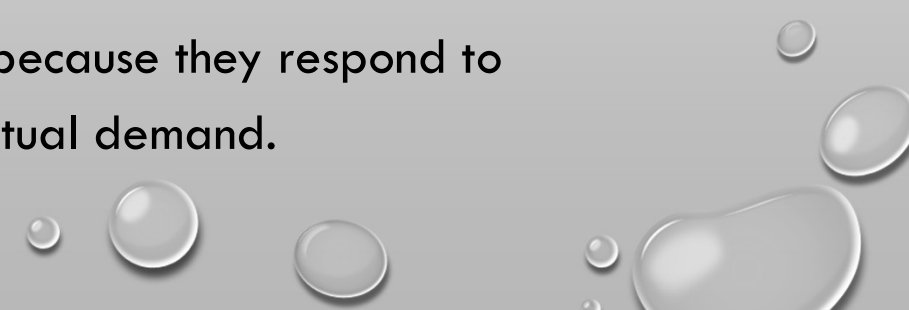
Push/Pull View of SC processes

Pull processes – execution is initiated in response to a customer order.

Pull processes – **reactive** processes because they react to customer demand.

Push processes – execution is initiated in anticipation of customer orders.

Push processes – **speculative** processes because they respond to speculated (or forecasted) rather than actual demand.

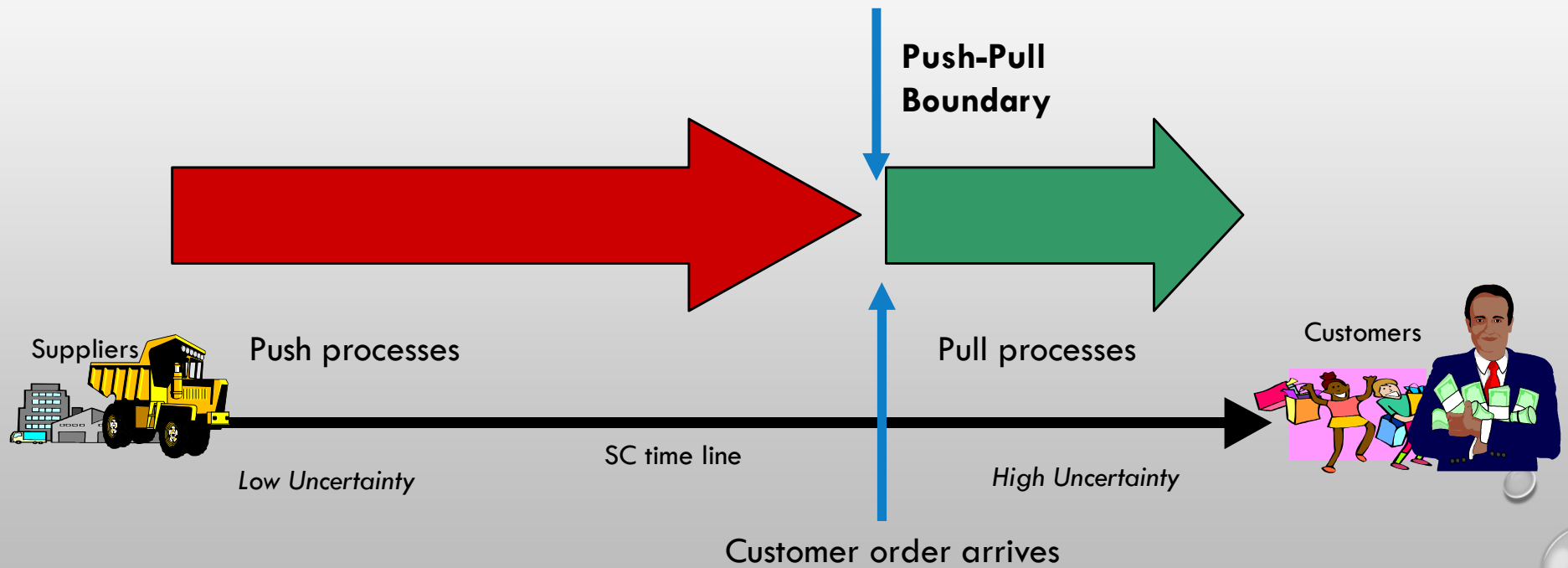


New SC Paradigm

Push-Pull SC

- some SC stages (typically the initial ones) are operated in a push-based manner, while the remaining stages apply pull-based strategy.
- The **Push-Pull boundary** separates push processes from pull processes.
- Push-Pull boundary is the interface between the push and pull processes.

Push-Pull SC



Characteristics of Push SC

- Low uncertainty
- Need for long-term forecasts.
- Economies of scale-> cost minimization
- Short lead time
- Longer reaction time to changes
- Harder to satisfy changing demand patterns
- Obsolete products inventory as demand for certain products disappears.
- Need for large safety inventory
- Unacceptable service levels

*order lead time is the latency between the placement of an order and delivery of the product.

Characteristics of Pull SC

- High responsiveness
- Reduced lead times
- Decreased inventory levels at retailers and manufacturers
- Decreased system variability
- Better response to changing markets
- High Uncertainty
- Hard to achieve economies of scale
- Not for every SC

Traditional vs Dell PC Manufacturer

Push SC

Build/ Make to Stock

Demand forecasting

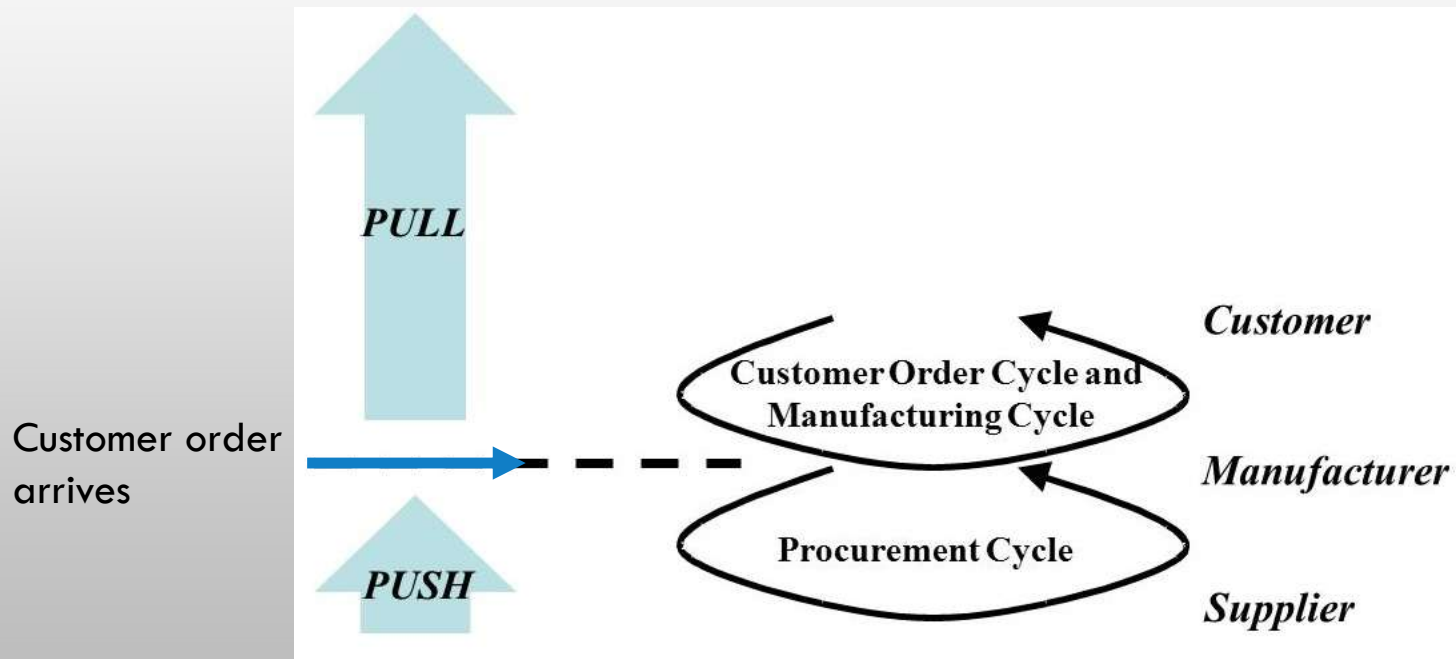
order and purchase
components

assemble computers

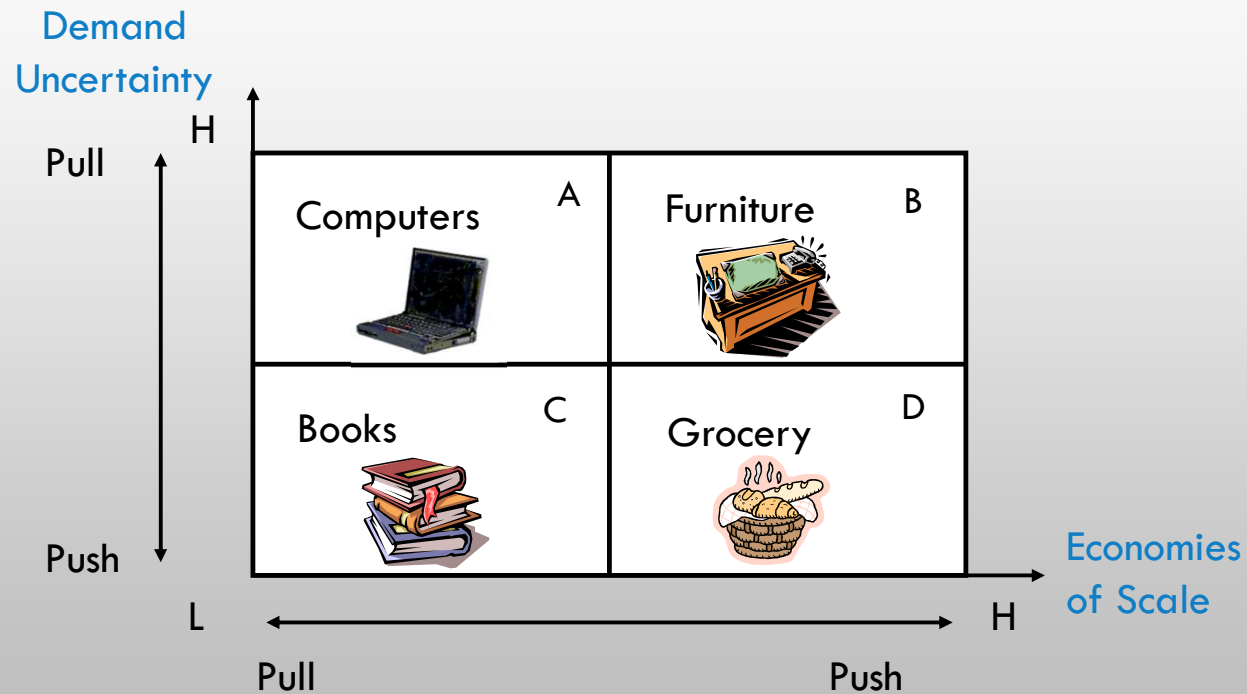
meet demand if possible

- Push-Pull SC
- **Build/ Make to Order**
- Demand forecasting
- Order and purchase components
- Receive orders + assemble computers
- Satisfy demand

Push-Pull Dell SC



What is the Best for the Product?



What is the Best for the Product?

A: Higher demand uncertainty + economies of scale (production and distribution costs) are not that important (e.g. computer industry) -> **Pull**

D: Low demand uncertainty + economies of scale are very important (e.g. FMCG/ grocery industry) -> **Push**

- Demand is quite stable
- Delivery cost reduction matters

The longer the lead time, the harder to react to demand -> **Push**

Simple SC structure -> **Pull**, Complex SC structure -> **Push**

Short life cycle -> Pull

*product life cycle describes the stages a product goes through from when it was first thought of until it finally is removed from the market.

What is the Best for the Product?

C: Lower demand uncertainty + economies of scale are not that important (e.g. fast-moving books)

- Low demand uncertainty -> Push (e.g. traditional bookstores)
- Not economies of scale -> Pull
- ? -> Push-Pull

Example: Amazon.com

- At the beginning: Pull SC, no warehouses, no stock
- As volume and demand increased -> could not meet service level goals + dependent on distributor's capacity -> **Push-Pull** (take the best of both)
- Now: Amazon owns warehouses -> **Inventory management adopts Push strategy, while customer demand is satisfied based on a Pull strategy.**

What is the Best for the Product?

B: High demand uncertainty + economies of scale

Example: Furniture industry

- High demand uncertainty
- High distribution cost due to high transportation cost.
- Solution: **Push-Pull**

Production adopts Pull strategy and starts when there is a customer order. **Distribution is conducted based on a Push strategy**, namely there is a fixed delivery schedule according to which many orders are delivered in the same region.

Specifying the Push-Pull Boundary

	Push SC Part	Pull SC Part
Acting	Proactive	Reactive
Objective	Minimize cost	Maximize service level
Complexity	High	Low
Focus	Resource allocation	Responsiveness
Lead time	Long	Short
Processes	Supply chain planning	Order fulfillment

Communication Between Pull and Push SC Part

Only at the Push-Pull boundary

Through **buffer inventory**

Push SC part: buffer inventory is part of the output generated by the tactical planning process

Pull SC part: the input to the order fulfillment process.

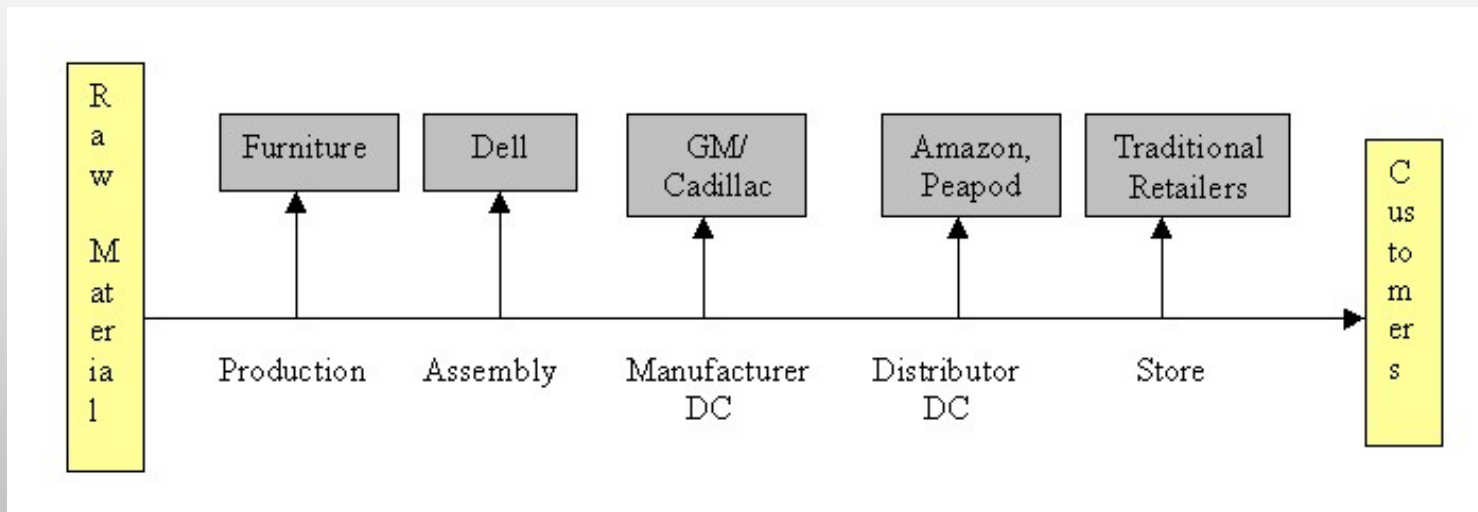
Role of Demand forecast:

takes place based on historical data obtained from the pull part

drives the supply chain planning decisions in the push part and

determines the buffer inventory.

Specifying Push-Pull Boundary - Examples

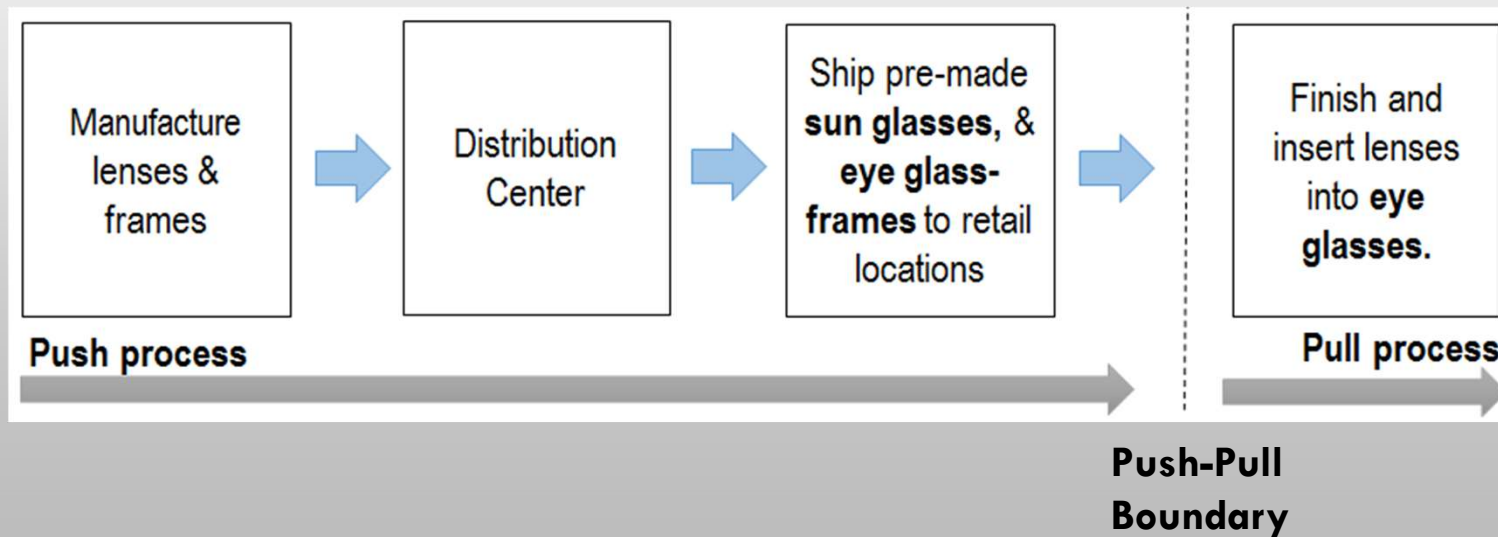


Location of P-P boundary in various companies and industries.

The more left the boundary is, the more will reduce inventory holding cost.

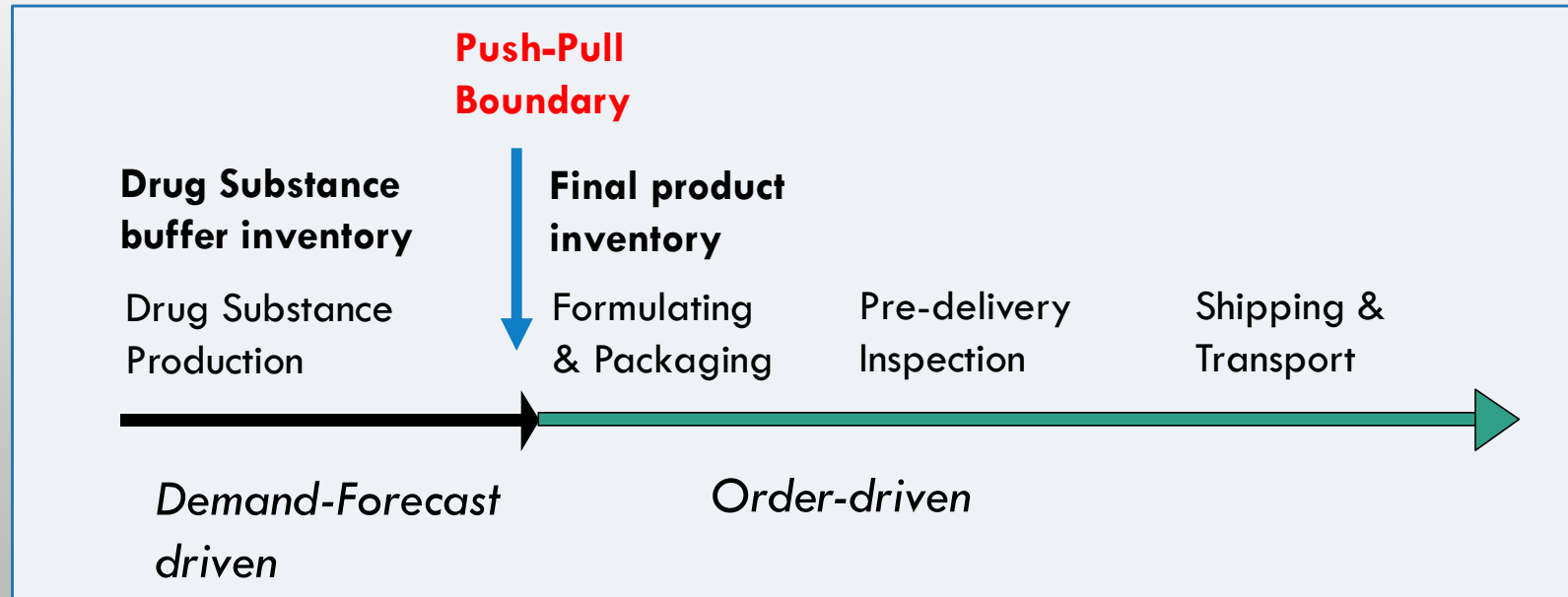
Specifying Push-Pull Boundary - Example

Eye Glasses Manufacturer



Specifying Push-Pull Boundary - Example

Drug Manufacturer



Competitive Strategy

A firm's Competitive Strategy **defines the set of customer needs a firm seeks to satisfy** through its products and services.

It should be devised based on how the targeted customers prioritize product price, delivery time, variety and quality.

Competitive Strategy - examples

LIDL retailer: low prices with low perceived product quality/ service, focus on price sensitive customer segment.

Wal-Mart retailer: high availability of a variety of products, lower price than competitors at reasonable product quality.

easyJet: lower prices with low service quality in the plane.

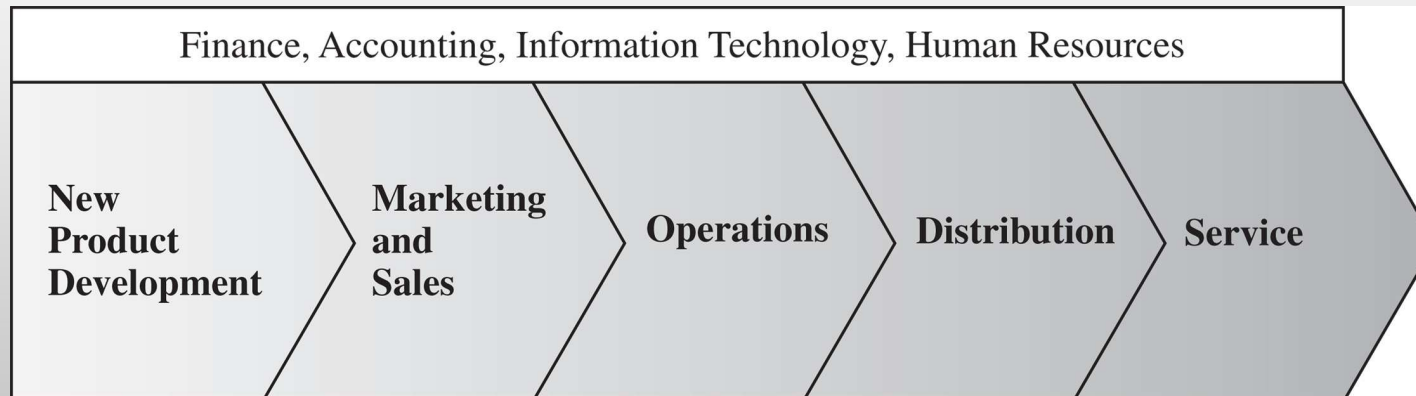


The Value Chain of a Company

A firm's Competitive Strategy aims to provide **superior Value to the customers** profitably.

A firm's Value Chain disaggregates a firm into strategically relevant functions/processes in order to understand the firm's cost position and create a basis for product/ service differentiation.

The Value Chain of a Company



The Value Chain Processes

New Product Development processes create product specifications.

Marketing and Sales processes:

- ✓ generate demand by publicizing the customer needs that the products and services will satisfy.
- ✓ bring customer input back to new product development.

Operations processes transform inputs to outputs to create the products (based on the product specifications)

Distribution processes either take the product to the customer or bring the customer to the product.

Service processes respond to customer requests during or after the sale.

Finance, Accounting, IT, and HR (human resources) support and facilitate these functions.

The Value Chain Processes

All functions/ processes of the value chain contribute to the execution of the company's competitive strategy.

Each function plays a crucial role to the company's competitive strategy i.e. to the satisfaction of customer needs profitably.

Each function develops its own strategy, namely defines what will be its main focus, what will try to do particularly well.

All functional strategies must support one another and the competitive strategy.

The Value Chain Processes Strategy

Product development strategy specifies the portfolio of new products that a company aims to develop.

Marketing and sales strategy specifies how the market will be segmented and how the product will be positioned, priced, and promoted.

Operations + Distribution + Service strategy = *Supply Chain strategy*

Supply Chain Strategy

Supply chain (SC) Strategy determines

- ✓ the nature of material procurement, transportation of materials, manufacture of product or operation to provide the service,
- ✓ distribution of product to the customer, follow up customer service and
- ✓ whether these processes will be performed in-house or outsourced.

SC strategy specifies which processes should perform particularly well + the role of each supply chain entity.

Examples:

- ✓ Dell's retail direct strategy where orders are processed direct from customers and the computers are built based on customers specification.
- ✓ Amazon decides to operate its own warehouses.
- ✓ Walmart mandates its suppliers to put RFID tags on pallets and cases of products, in order to improve inventory accuracy.

Strategic Fit

Strategic fit leads to a company's success.

Strategic fit means

- ✓ competitive and supply chain strategies have aligned goals.
- ✓ consistency between the customer priorities that the competitive strategy hopes to satisfy and the SC capabilities that the SC strategy aims to build.

A company may fail because of a lack of strategic fit or because its processes and resources do not provide the capabilities to execute the desired strategy.

Failure at any one value chain's process may lead to failure of the overall chain.

Achieving Strategic Fit

3 keys for a company's success or failure:

1. The competitive strategy and all functional strategies must fit together to form a coordinated overall strategy.
2. The different functions in a company must appropriately structure their processes and resources to be able to execute these strategies successfully.
3. The design of the overall SC and the role of each stage must be aligned to support the SC strategy.

Achieving Strategic Fit - Examples

Pasta manufacturer

- Relatively stable customer demand -> low demand uncertainty
- Supply is also quite predictable.
- option: produce custom-made pasta in very small batches, in response to customer orders, and shipped via a rapid transportation means -> very expensive pasta -> customers' loss.
- Better option: mass production -> efficient SC + cost reduction.

Efficient vs Responsive Supply Chains

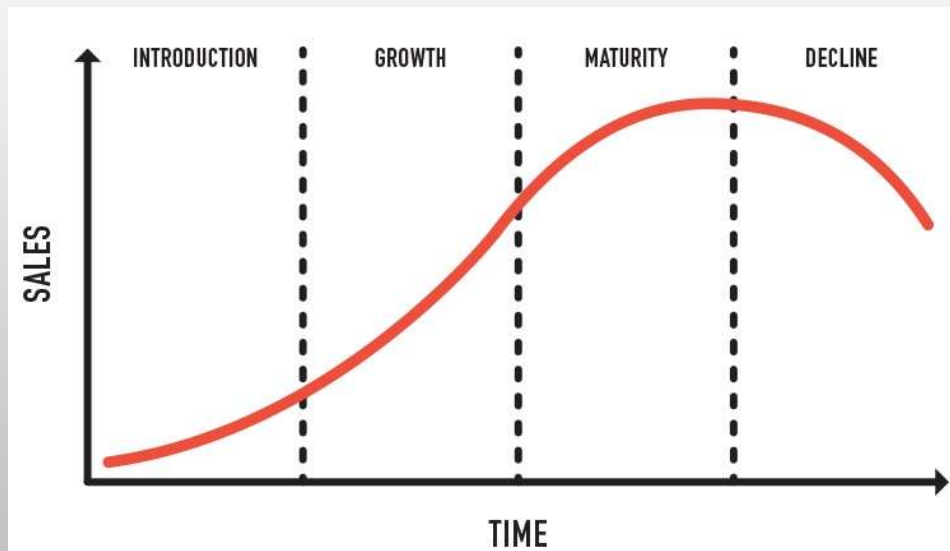
	Efficient Supply Chains	Responsive Supply Chains
Primary goal	Supply demand at the lowest cost	Respond quickly to demand
Product design strategy	Maximize performance at a minimum product cost.	Create modularity to allow postponement of product differentiation.
Pricing strategy	Lower margins because price 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 buffer inventory 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.



MORE ISSUES AFFECTING STRATEGIC FIT

- Multiple products and customer segments
 - Product life cycle
 - Globalization and Competitive Changes over time
 - Growing SC uncertainty
 - Environment and Sustainability
- 

PRODUCT LIFE CYCLE



- *Product life cycle*: the stages a product goes through from when it was first thought of until it finally is removed from the market.
- As products go through their life cycle, the targeted customer segments' needs and demand change. -> a SC strategy must evolve as products enter different phases of their life cycle.

PRODUCT LIFE CYCLE

Changes in Demand and Supply Characteristics over the Product Life Cycle

Beginning stages of a product's life cycle

- Demand is very uncertain, and supply may be unpredictable.
- Margins are often high, and time is crucial to gaining sales.
- Product availability is crucial to capturing the market.
- Cost is often a secondary consideration.

Responsiveness is the most important characteristic of the supply chain.

Later stages of a product's life cycle (a product tends to become a commodity product)

- Demand is more certain, and supply is predictable.
- Margins are lower due to an increase in competitive pressure.
- Price is significant factor in customer choice.
- Production technologies is well developed.

Efficiency is the most important characteristic of the supply chain.

Supply Chain Performance Drivers

SC drivers interact with each other to **determine a SC's performance in terms of responsiveness and efficiency.**

The structure, the performance of SC drivers determines if and how strategic fit is achieved across the SC.

Good SC management makes the appropriate trade-offs between these drivers to accomplish the desired level of responsiveness.

Supply Chain Performance Drivers

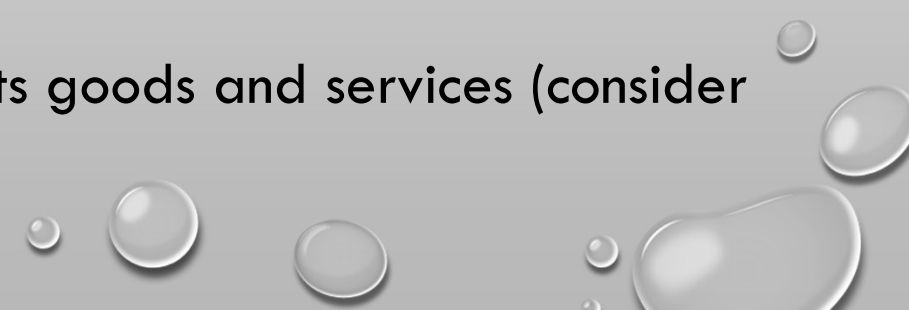
Σας ακούω

Supply Chain Performance Drivers

1. *Facilities/ Υποδομές*: physical locations in the SC where product is stored, assembled, or fabricated.
2. *Inventory/ Απόθεμα*: all raw materials, work in process, and finished goods within a SC.
3. *Transportation*: moving inventory from point to point in the SC via many combinations of modes and routes.



Supply Chain Performance Drivers

- 4. *Information*: data and data analysis concerning facilities, inventory, transportation, costs, prices, and customers throughout the SC (consider Big Data, data analytics)
 - 5. *Sourcing*: who performs each SC activity such as production, storage, transportation, or the management of information -> in-house or outsource activities
 - 6. *Pricing*: how much a firm charges for its goods and services (consider differential pricing, dynamic pricing)
- 



Καλή συνέχεια

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