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.

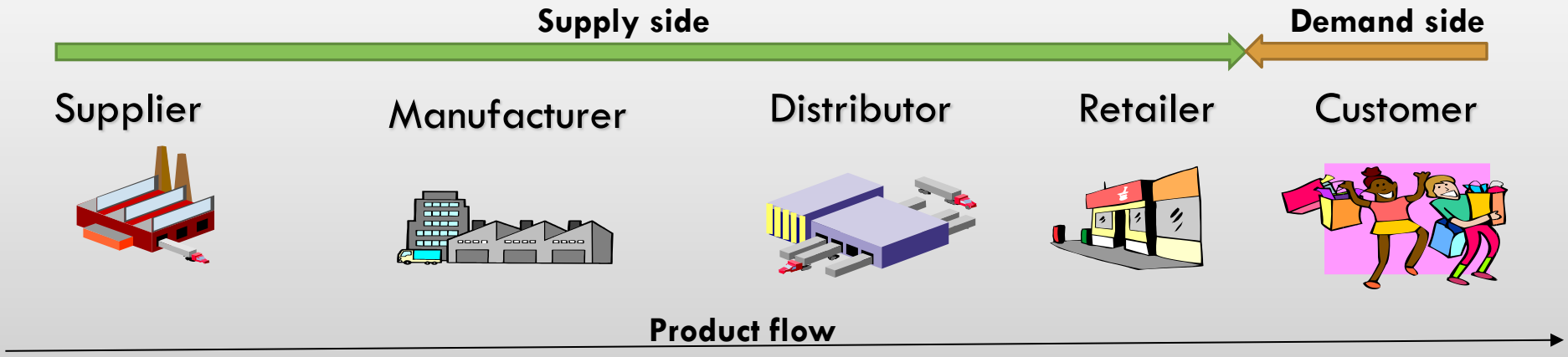
Μαθησιακά αποτελέσματα

- 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

Αξιολόγηση

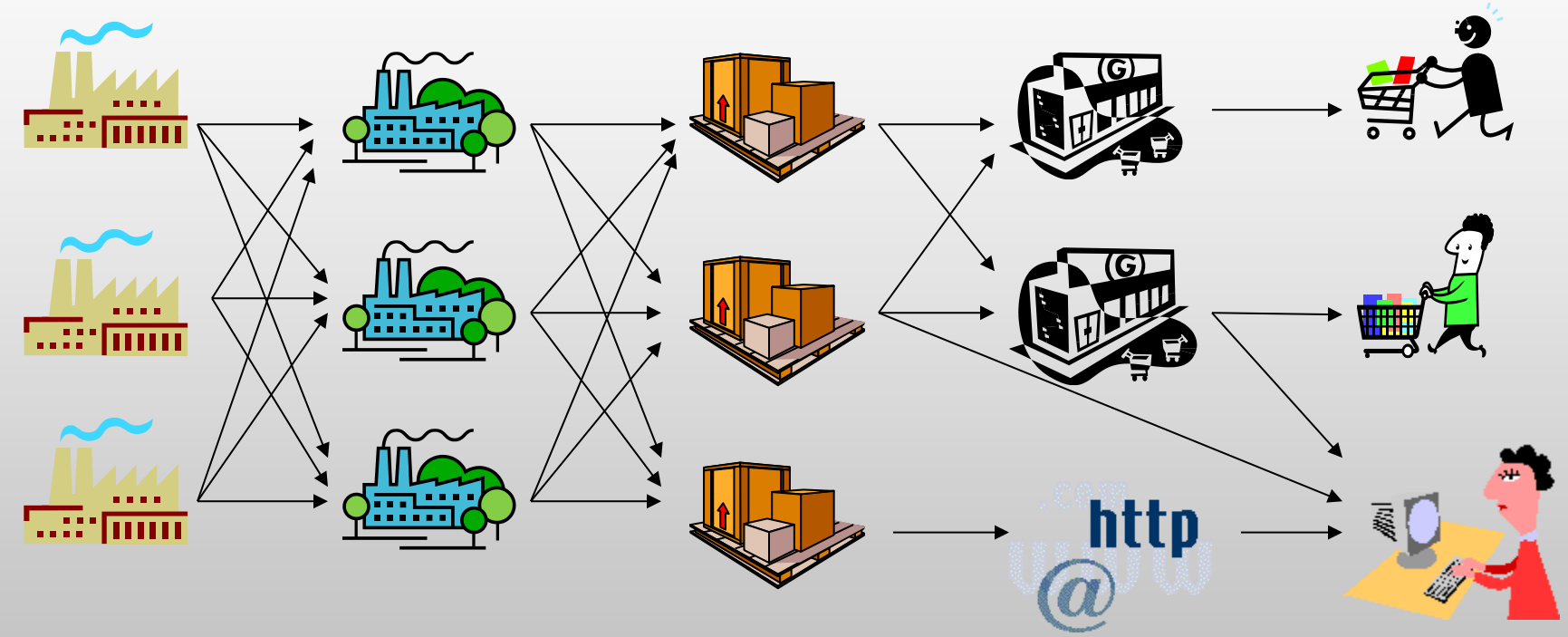
- Εξετάσεις (65%)
- Μελέτη + Κατανόηση άρθρου (paper) (35%)
  - 1-2 άτομα ανά άρθρο

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



Supplier → Manufacturer → Distributor/ Wholesaler → Retailer → Customer

Supply Chain Flows

Flow of information, material/ product and funds

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,**

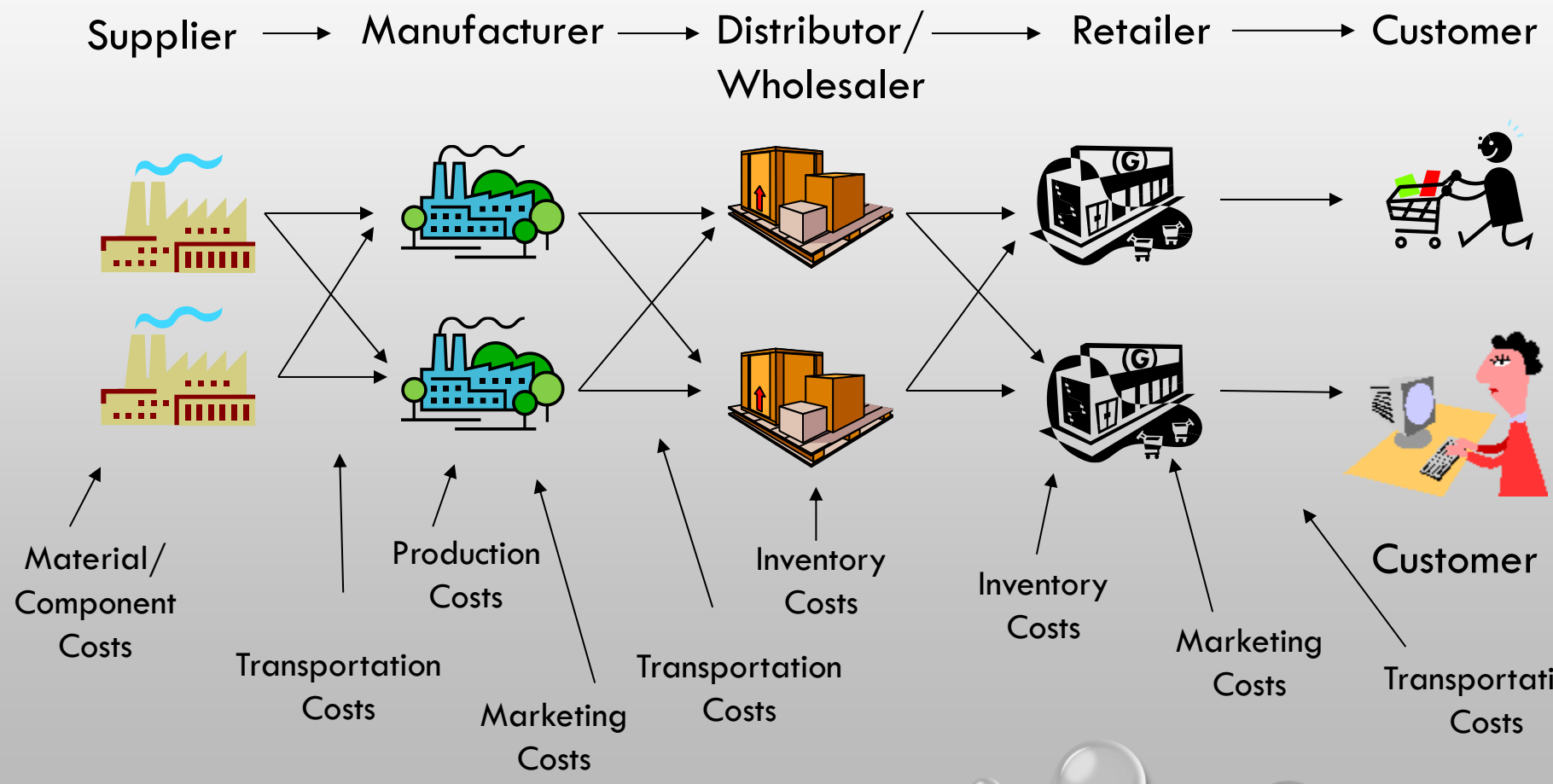
for the right **Customer,**

at the right **Quantity,**

the right **Location,** and

at the right **Price.**

Supply Chain Management



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)

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.

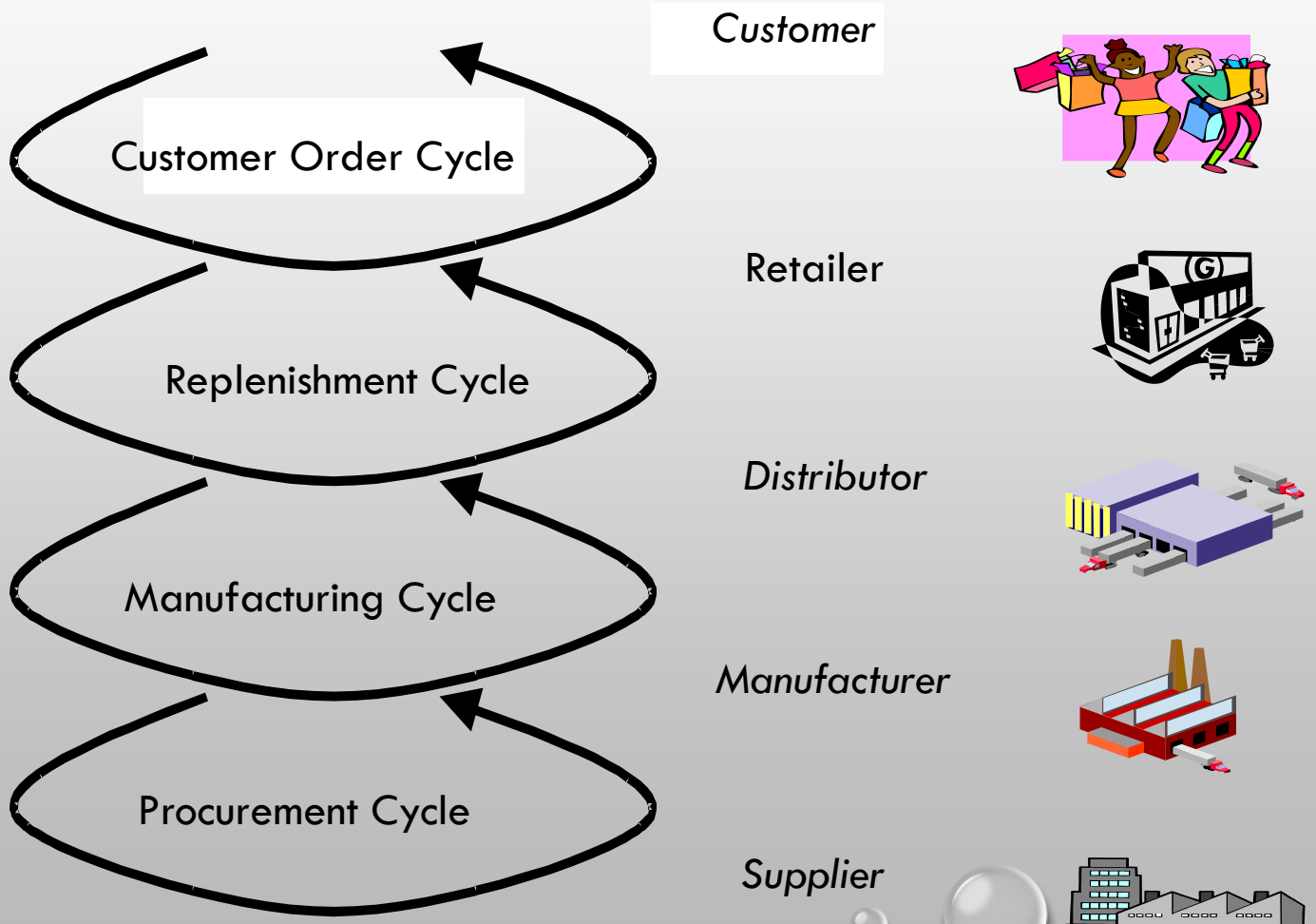
- **Push/Pull View** of SC processes

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.

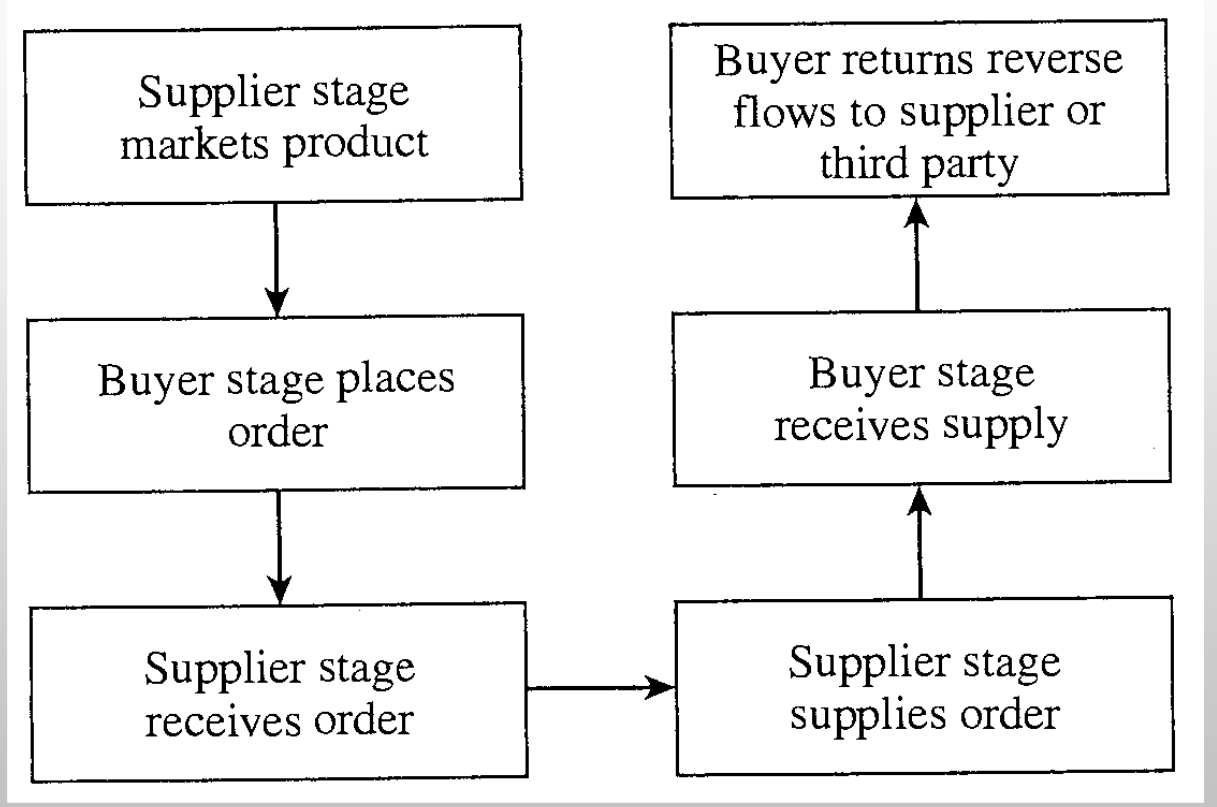
Cycle View of SC Processes



Cycle View of SC Processes

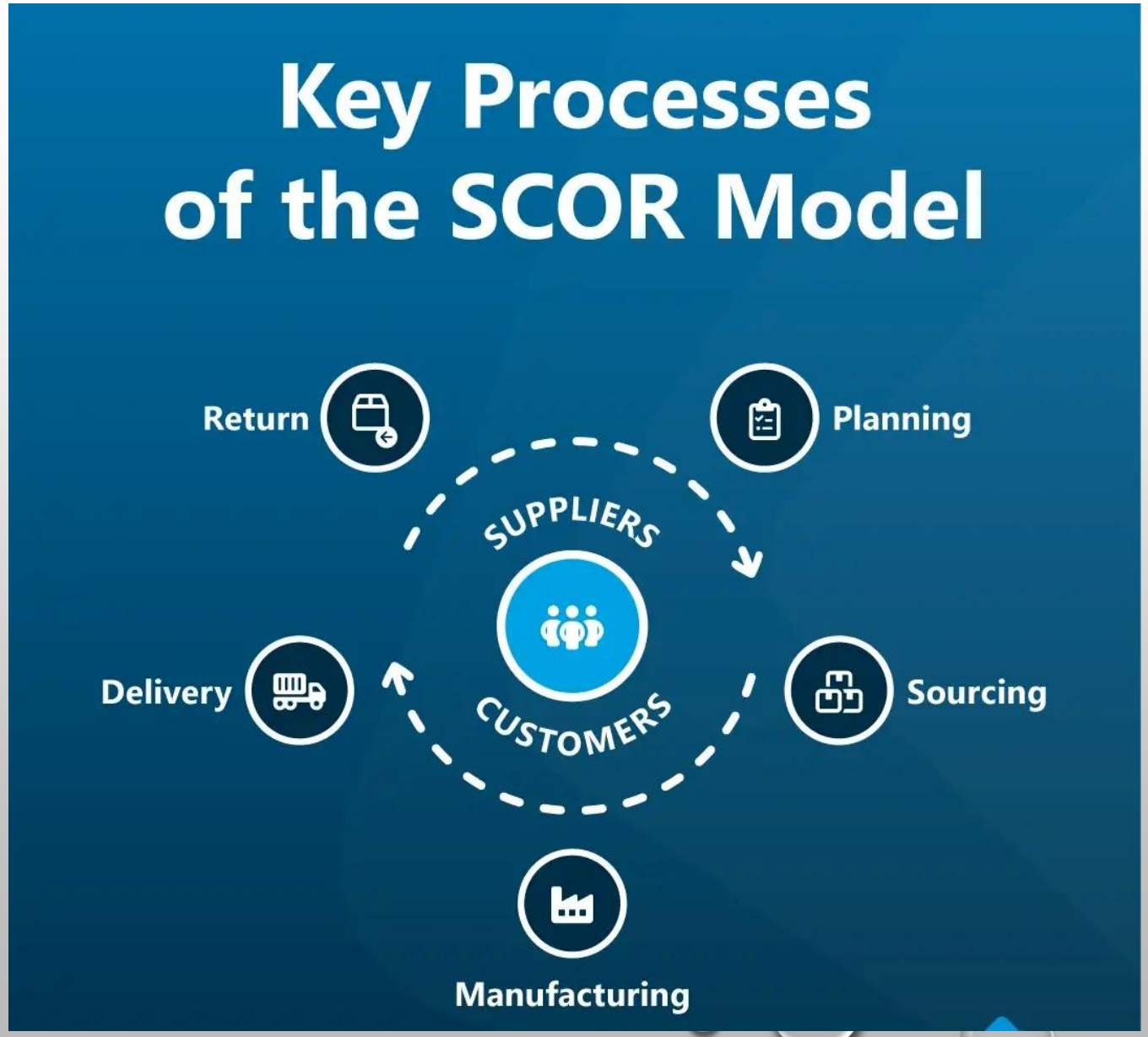
- 5 SC stages -> 4 SC process cycles
- Each process cycle occurs at the interface between two successive SC stages.
- Not every SC will have all four cycles clearly separated, e.g. firms that bypass the retailer and sell directly to customers via their e-shops.
- As we move downwards from the customer 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.


Key Processes of the SCOR Model
Return
Planning
SUPPLIERS
CUSTOMERS
Delivery
Sourcing
Manufacturing

SUPPLY CHAIN OPERATIONS REFERENCE MODEL

- A structured approach to enhance end-to-end SC performance
- Introduced in 1996 by Pittiglio, Rabin, Todd and McGrath - Supply-Chain Council, Association for Supply Chain Management.
- Standardizes **metrics** and **process language** from order to payment.
- It aids organizations in assessing maturity, setting goals, and achieving operational excellence.
- ASCM's SCOR 12.0 update introduced features like metadata standards, blockchain traceability, ….

SCOR MODEL

Six 6 key processes:

- Plan,
- Source,
- Make,
- Deliver,
- Return
- Enable.

SCOR MODEL

Plan Balancing supply and demand, forecasting, and planning inventory and production.

- inventory policy, asset utilization, and transportation planning.
- ensures regulatory compliance. It fosters clear communication among finance, operations, and sales.

Source Procurement of raw materials, supplier management, and inbound logistics.

- purchase orders, receipt, inspection, and material staging.
- quality, on-time delivery, and cost controls. meet planned or actual demand.

Make Production and manufacturing processes.

- manages schedules, routings, and bills of materials.
- ensures equipment readiness and facility constraints.
- stable throughput and consistent quality. It aims for quality at the target cost.

SCOR MODEL

Deliver Distribution, transportation, order fulfillment, and logistics.

- executes order capture and orchestration
- coordinates warehouse operations and carrier selection
- ensures transportation and distribution meet service levels

Return Reverse logistics (returns, repairs, recycling)

- for customer and supplier returns
- defines authorization, disposition, repair, and refurbishment paths.
- post-delivery support safeguards recovery value and speeds credit issuance.

Enable Supporting processes such as data management, performance management, compliance, and infrastructure.

- provides rules, master data, contracts, and risk controls
- tracks facilities performance, cybersecurity, and compliance records
- these capabilities stabilize **Plan Source Make Deliver Return Enable** at enterprise scale.

SCOR MODEL

Evaluates performance through five 5 attributes:

reliability,

responsiveness,

agility,

cost, and

asset management efficiency.

SCOR model – 5 attributes

Reliability - focuses on perfect order and quality, deliver the correct product on time.

Responsiveness - tracks cycle times from order to delivery, speed of fulfilling orders.

Agility - measures speed and adaptability to changes in demand and supply

Cost - operating expenses and total cost.

Asset management efficiency - evaluates inventory turns, capacity use, and cash-to-cash days, effective use of inventory and assets.

These attributes help set targets and reveal trade-offs among service, cost, and capital.

Case

A **regional public hospital SC network** manages the supply chain for medical supplies (gloves, syringes, masks, medicines).

Current problems reported by hospital managers:

- Hospitals frequently run **out of critical supplies.**
- Deliveries from suppliers are **often delayed.**
- Some products expire in storage because **inventory is not monitored properly.**
- Procurement processes are slow and involve **manual approvals.**
- Logistics costs have increased significantly.

Improve supply chain efficiency using better performance measurement and digital systems???? **Use the SCOR model**

Case – Activities, SCOR

- Demand forecasting for hospital supplies
- Manufacturing medical masks
- Delivering supplies to hospitals
- Handling expired or returned medicines
- Ordering gloves from suppliers

Core KPIs

- Service Level (Order Fulfillment)

ability of the supply chain to meet customer demand (on-time delivery)

- Lead Time

the time required for a product or order to move through the supply chain

procurement lead time, production lead time

order fulfillment lead time

Shorter lead times generally mean **higher responsiveness and operational efficiency.**

- Inventory turnover

how frequently inventory is sold or replaced during a period.

Core KPIs

Cost-to-serve

measures the total cost of delivering products to customers, including:

- Transportation
- Warehousing
- inventory holding
- order processing
- last-mile delivery

Organizations often analyze cost-to-serve by customer, channel, or product category to identify unprofitable segments.

KPI – SCOR

Service level (on-time delivery rate)

Supplier lead time

Inventory turnover

Order fulfillment cycle time

Return processing time

Forecast accuracy

KPI – SCOR

Plan → Forecast accuracy

Source → Supplier lead time

Make → Production cycle time

Deliver → Service level / order fulfillment

Return → Return processing time

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.

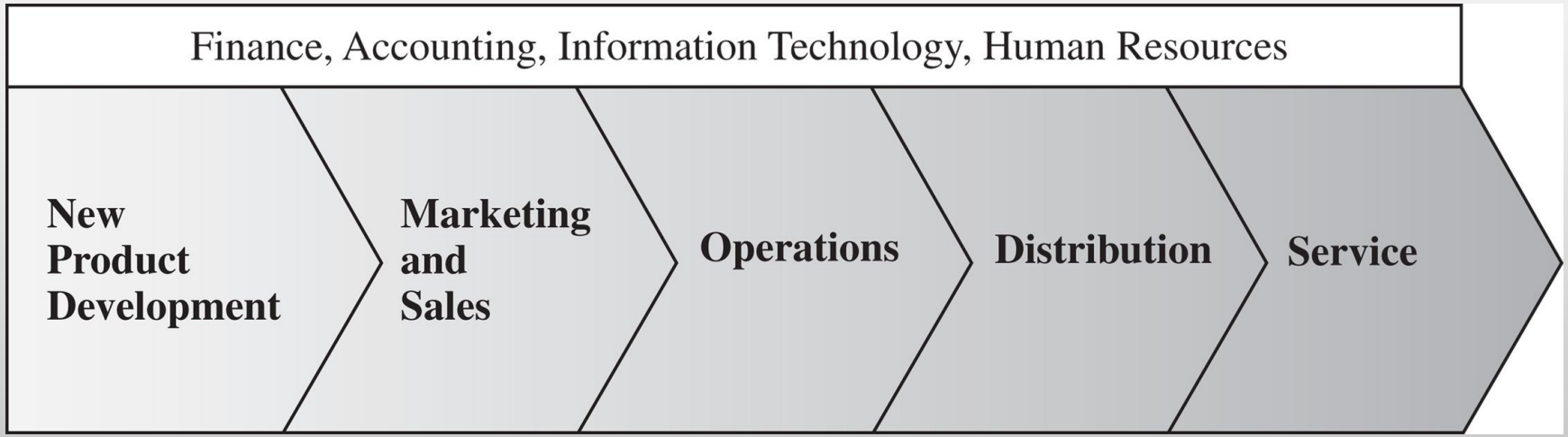
easyJet: lower prices with low service quality in the plane.

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) Strat*egy 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.

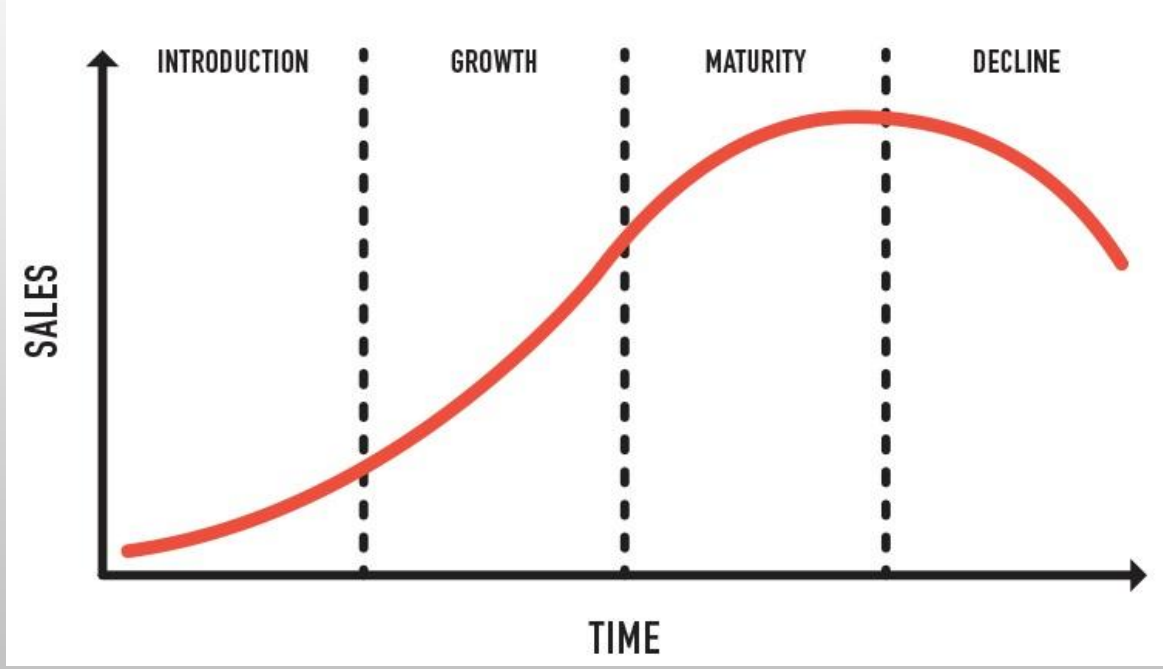
Efficient vs Responsive Supply Chains

	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	Later stages of a product's life cycle (a product tends to become a commodity product)
• 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.	• 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.
Responsiveness is the most important characteristic of the supply chain.	Efficiency is the most important characteristic of the supply chain.

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Demand Forecasting in SCM

WHAT IS FORECASTING?

Procedure to predict future events.

- ✓ Historical data + mathematical model
- ✓ Intuition (e.g. this new version of the game will sell 30% more than the old one.)
- ✓ Managers' judgement
- ✓ Combination of the above.

DEMAND FORECASTING IN SC: WHY?

Effective supply chain planning depends on demand forecasting of the firm's products and services.

Essential for all strategic and planning business decisions (production, supplies, inventory, human resources, facilities etc.

Key for push and pull processes:

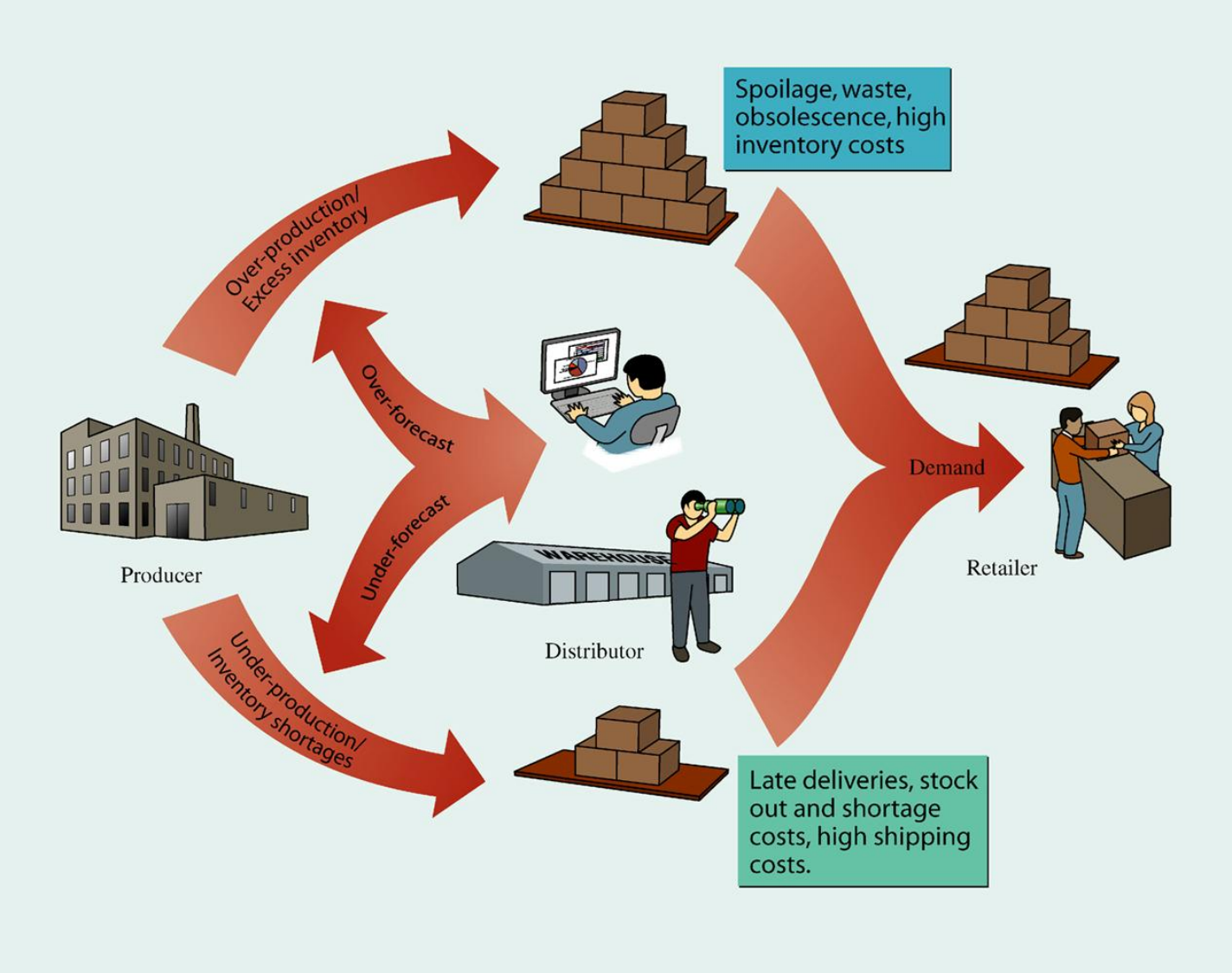
- ✓ Pull processes: act in response to customer demand -> demand forecast to determine the available inventory level of material/ parts to produce the ordered products.
- ✓ Push processes: act in anticipation of customer demand -> demand forecast to plan distribution, production etc.

DEMAND FORECASTING IN SC: WHY?

Demand Driven leaders have:
15% less inventory
17% stronger order fulfillment

Which translates to: 60% better profit margins

EFFECT OF INACCURATE DEMAND FORECASTING IN SCM



Source: Russell and Taylor, 2011. Operations Management, 7th edition, John Wiley & Sons - Chapter 12.

EFFECT OF INACCURATE DEMAND FORECASTING IN SCM

- United Airlines
  - ✓ April, 2017
  - ✓ Overbooked flight
  - ✓ Airlines usually oversell, betting on the number of passengers who will miss their flights.
  - ✓ Result: a passenger being blooded was dragged from his seat.
  - ✓ Social media -> customers call for a boycott of United Airlines
  - ✓ Market capitalization dropped by more than $250 million.
- Nike, 2001
  - ✓ new demand planning system
  - ✓ Inadequate system testing
  - ✓ excess stock of low selling shoes & not enough shoes of fast moving shoes
  - ✓ Sales loss: $100 million.

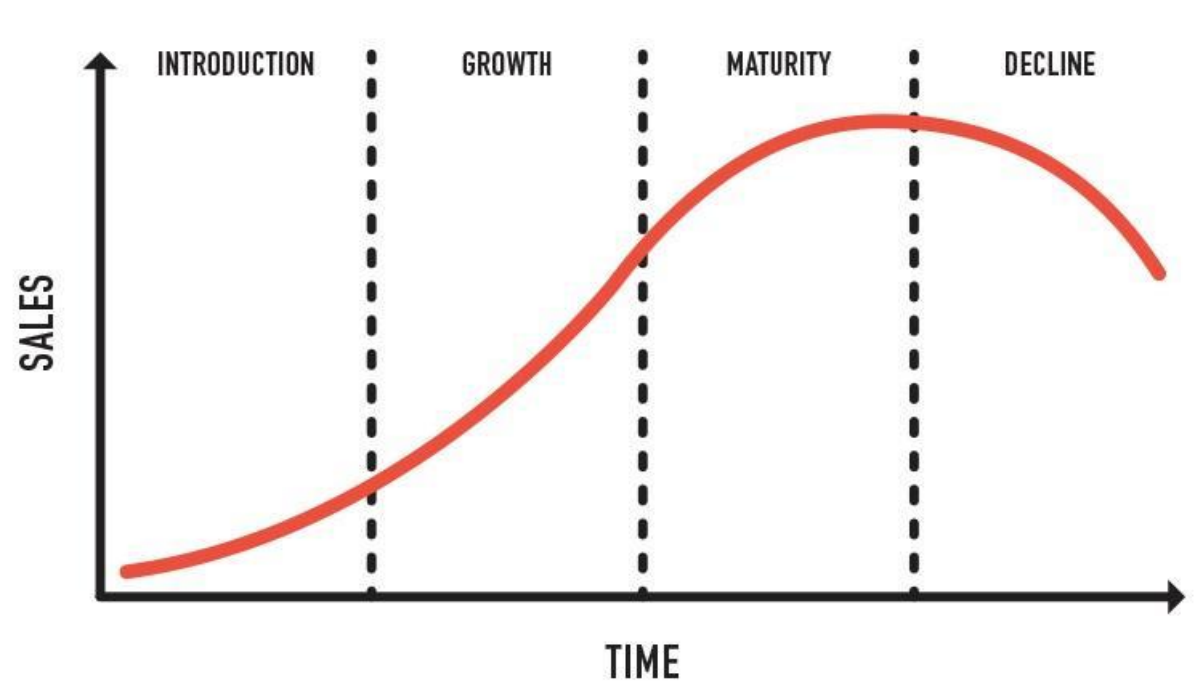
Forecasting: Facts

- Forecasts are always inaccurate.
- Forecasts should always include measures of forecast errors.
- Long-term forecasts are usually less accurate than short-term forecasts.
- There is seldom one superior forecasting method.
- Forecasts may be influenced by:
  - ✓ unpredictable outside factors (e.g. weather changes, unpredicted political events)
  - ✓ product life cycle
  - ✓ demand of related products (e.g. sales of navigation systems and cars)

Forecasting: Facts

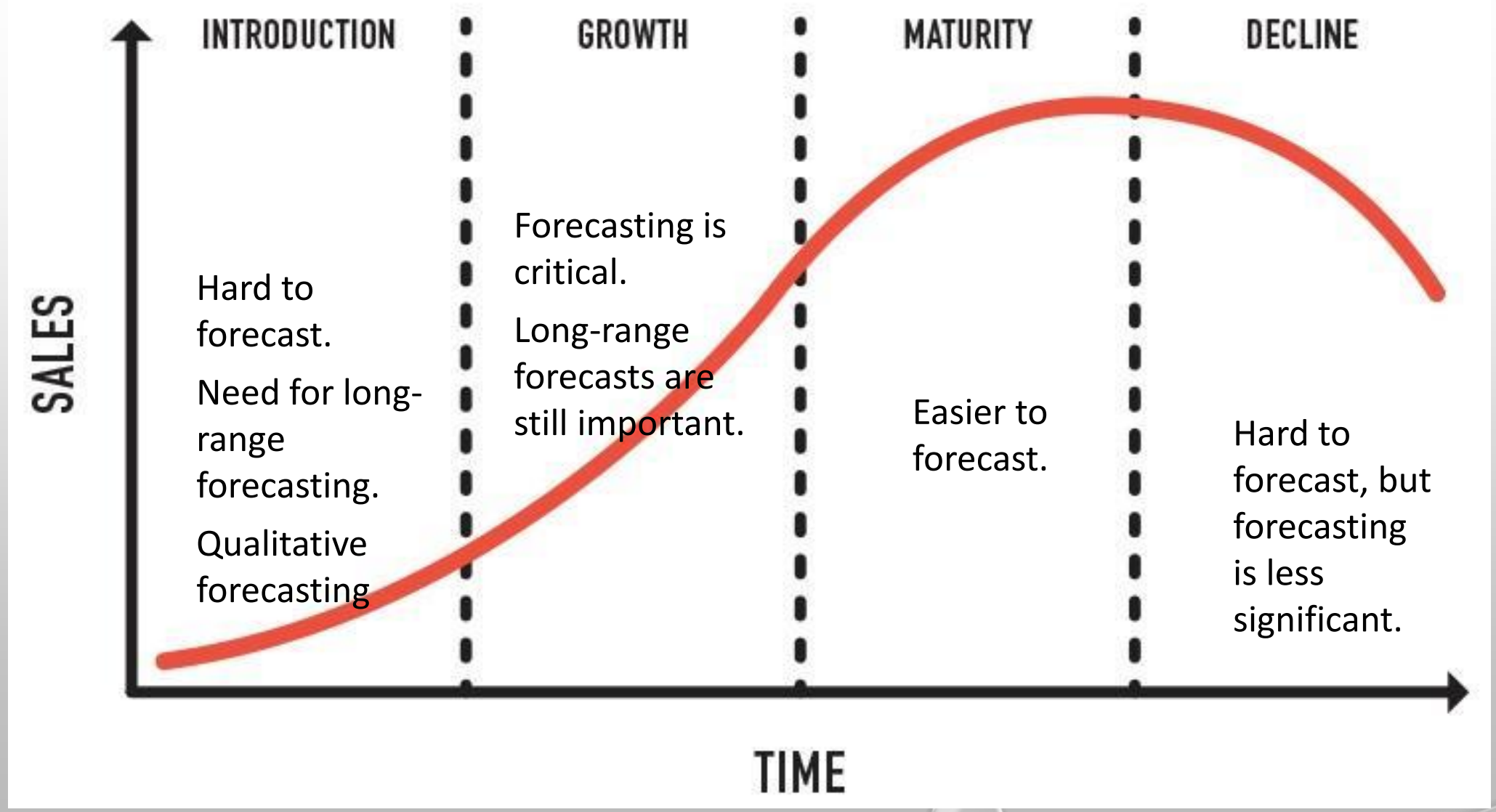
- Aggregated and product family forecasts are more accurate.
- The farther a supply chain partner is from the consumers, the less accurate the demand forecasts.
- Balanced mix of quantitative forecasts + human intuition (managers take the final decision).
- Competitors' actions, state of the economy, pricing strategy, marketing activities should be considered when generating demand forecasts.
- Forecasts must be updated regularly to maintain their accuracy and integrity.

PRODUCT LIFE CYCLE EFFECT ON FORECASTING



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

- Product introduction and growth require longer forecasts than maturity and decline.
- Forecasting is critical for introduction and maturity stages.
- As products go through their life cycle and reach maturity and decline, forecasts are useful for production capacity and inventory planning.


INTRODUCTION
GROWTH
MATURITY
DECLINE
SALES
TIME
Hard to forecast.
Need for long-range forecasting.
Qualitative forecasting
Forecasting is critical.
Long-range forecasts are still important.
Easier to forecast.
Hard to forecast, but forecasting is less significant.

FORECASTING TIME HORIZON

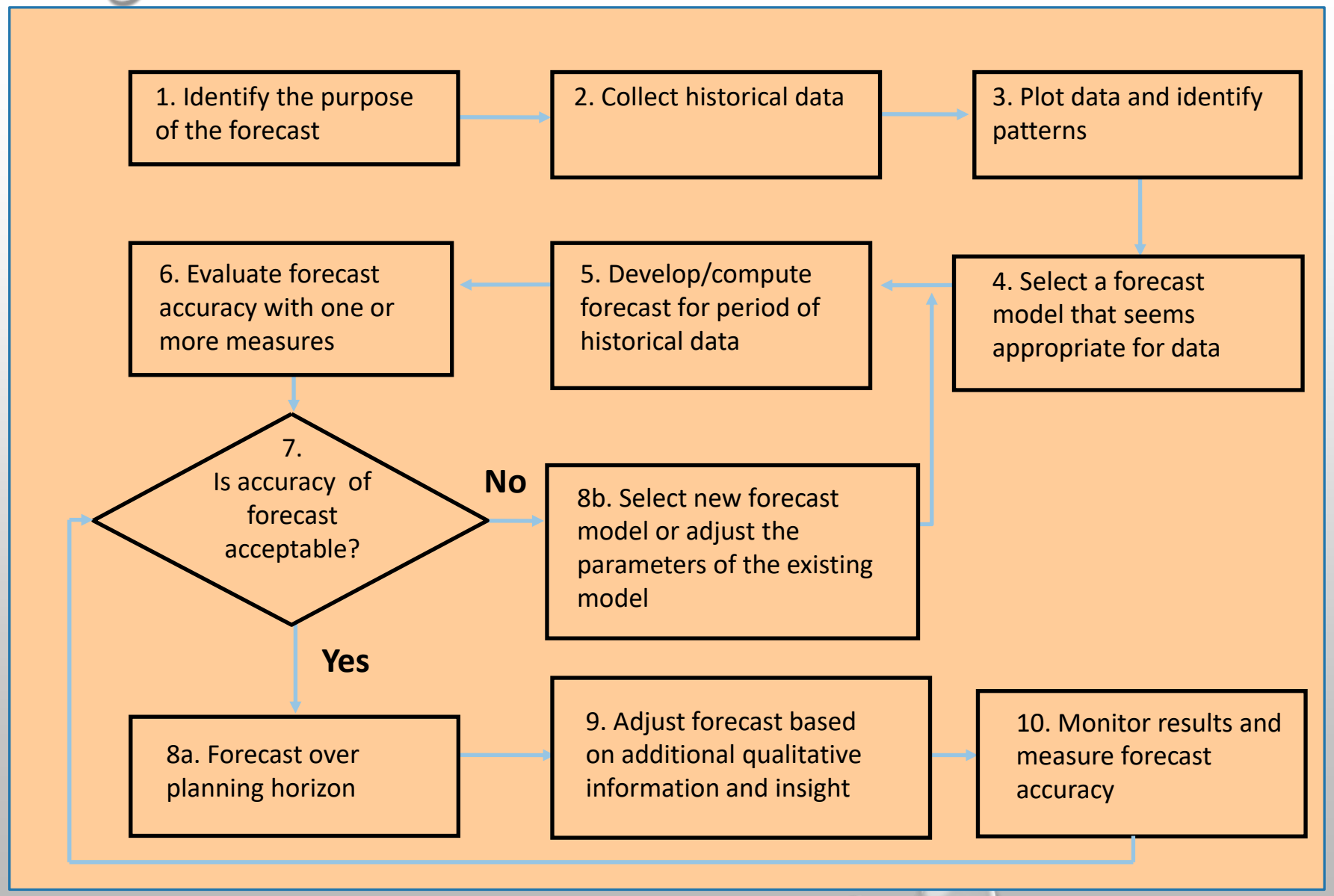
	Short-range	Medium (Intermediate)-range	Long-range
Time horizon	Usually <3 months and, < 1 year	> 3 months and < 3 years	≥ 3 years
Suitable for	Planning purchasing, job scheduling, workforce levels, job assignments and production levels.	Sales and Production planning, budgeting, operations planning.	Planning new products and facilities locations, research and development.

FORECASTING TIME HORIZON

Short-range	Medium-range	Long-range
• Utilizing quantitative approaches. • More accurate than long-range forecasts.	• Utilizing combinations of qualitative and quantitative approaches e.g. launching a new product may require a market survey, a focus group etc. • Necessary to decide on more comprehensive issues e.g. a firm's decision to buy a small, national production facility to expand to a new market. Such decisions may take years of study and they are multi-criteria problems.	

Forecasting: FACTORS INFLUENCING THE CUSTOMER DEMAND LIFE CYCLE

- Seasonality
- Competition
- Type of product / service
- Geography



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