DS3000: Entrepreneurship & Management functions

Session 9

https://sites.google.com/a/iiitdm.ac.in/sudhirvs/courses/entrepreneurship-management

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, DESIGN AND MANUFACTURING, KANCHEEPURAM

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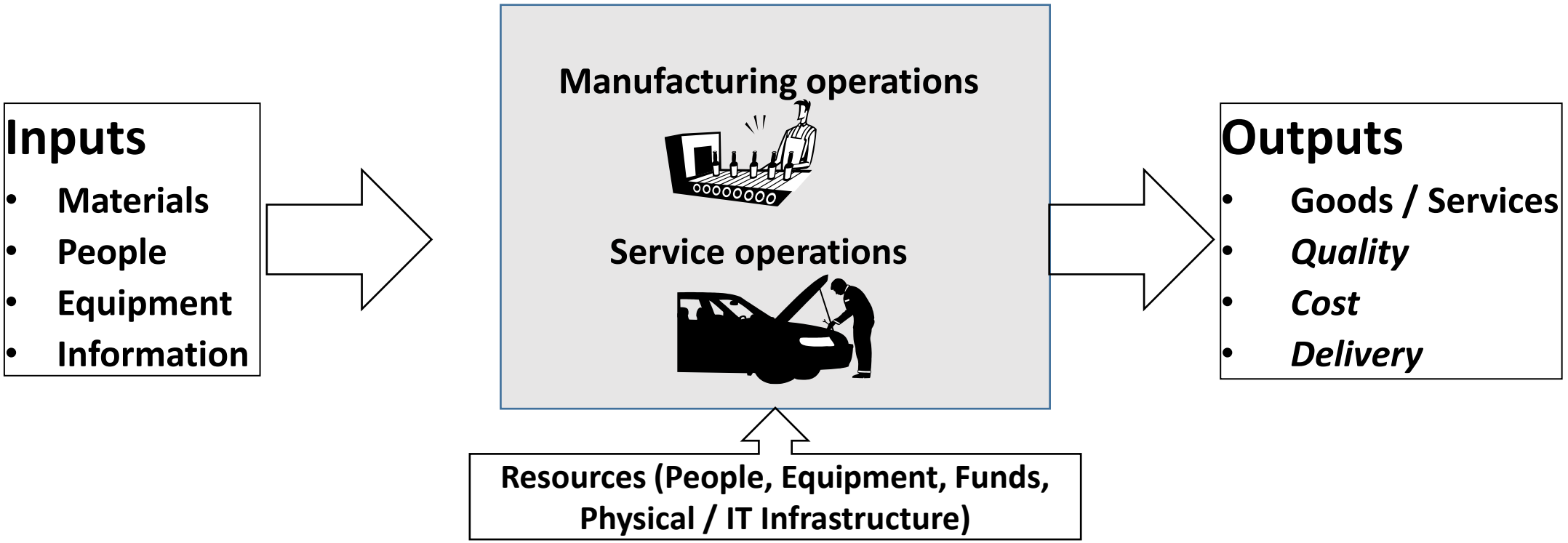
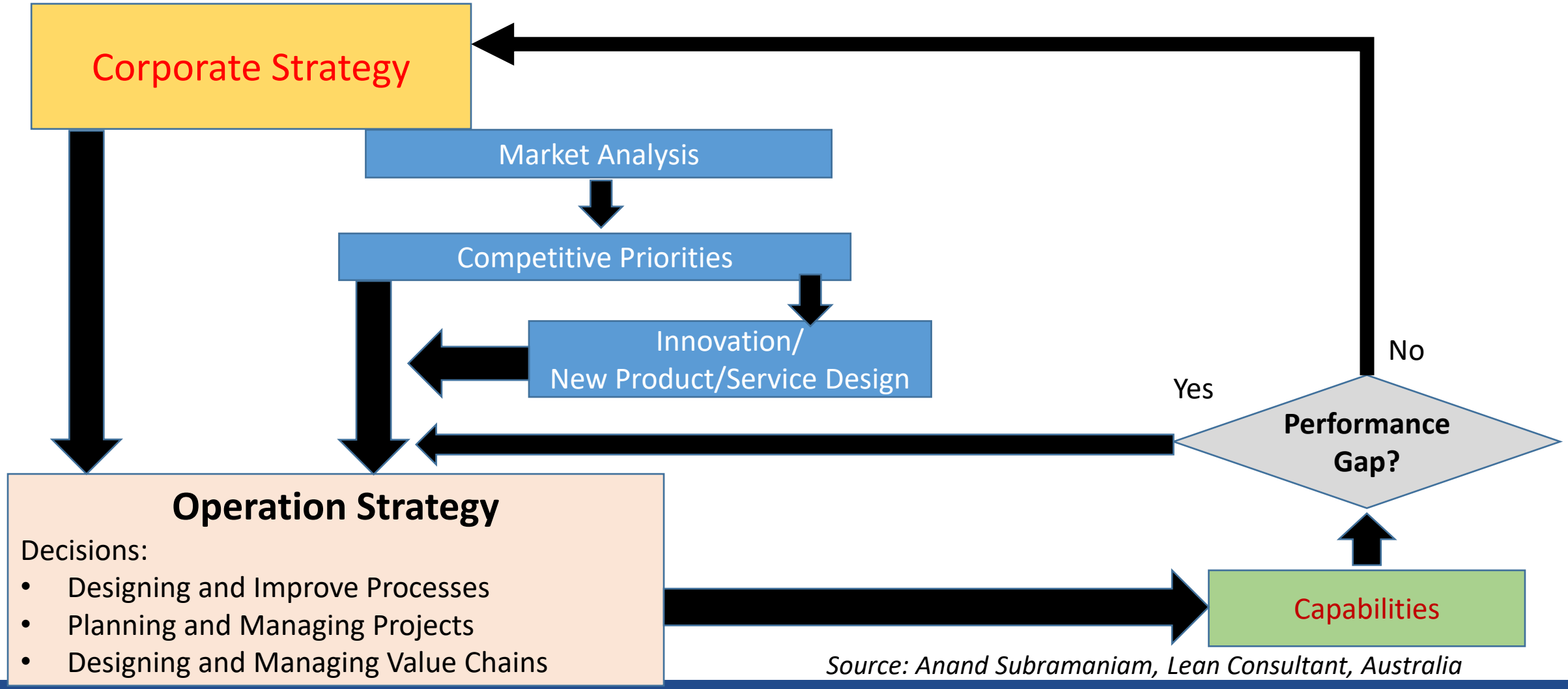
Contents

Operations Management



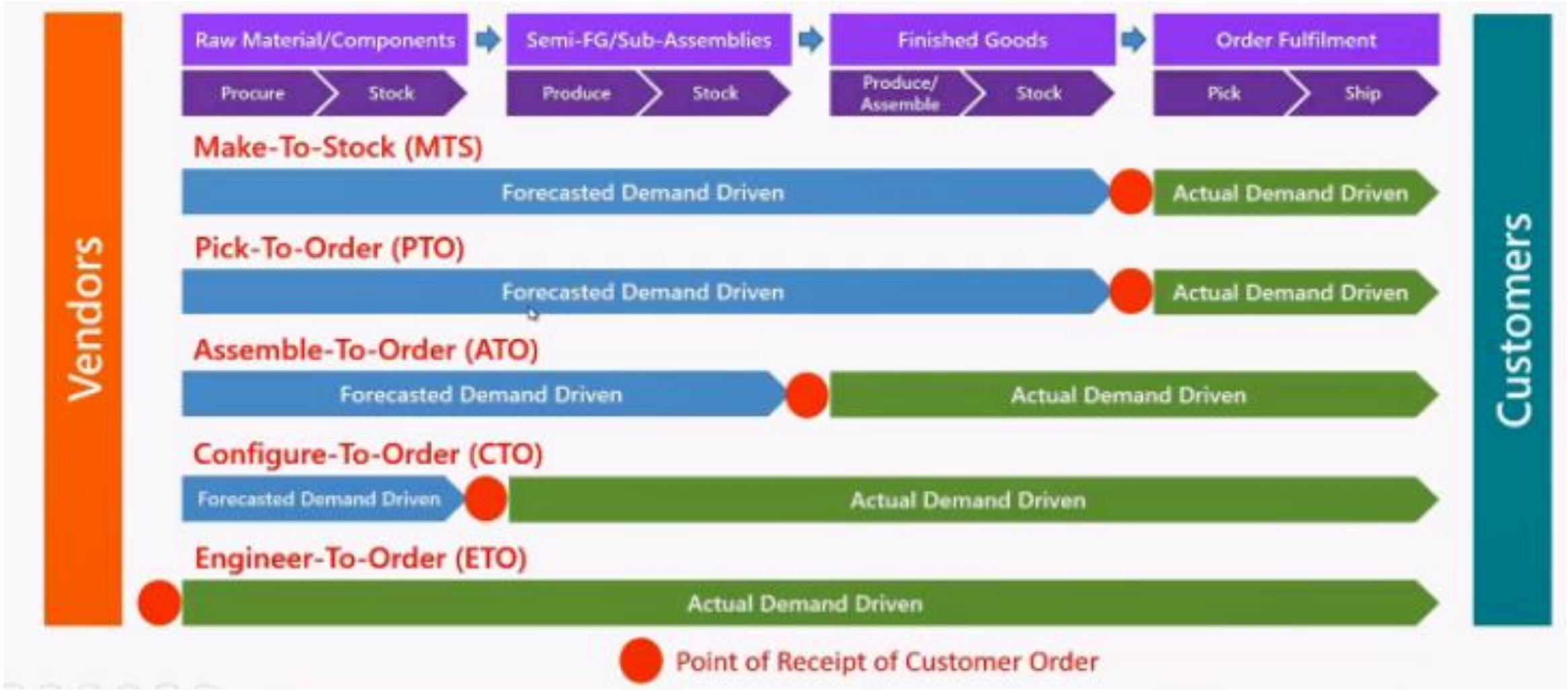
Operations management (OM) is the administration of business practices to create the highest level of efficiency possible within an organization. It is concerned with converting materials and labor into goods and services as efficiently as possible to maximize the profit of an organization.)

Corporate and Operations Strategy Linkage



Source: Anand Subramaniam, Lean Consultant, Australia

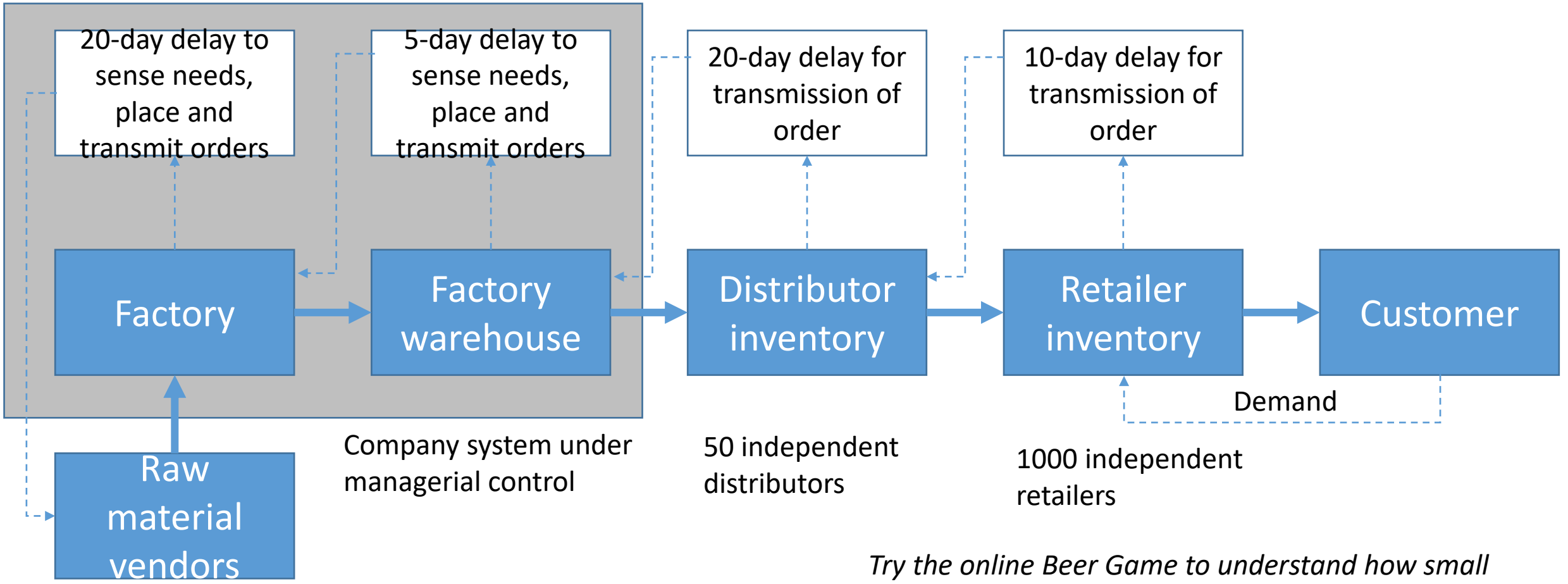
Manufacturing Strategies : Conceptual Overview



Types of Operations/Production Systems

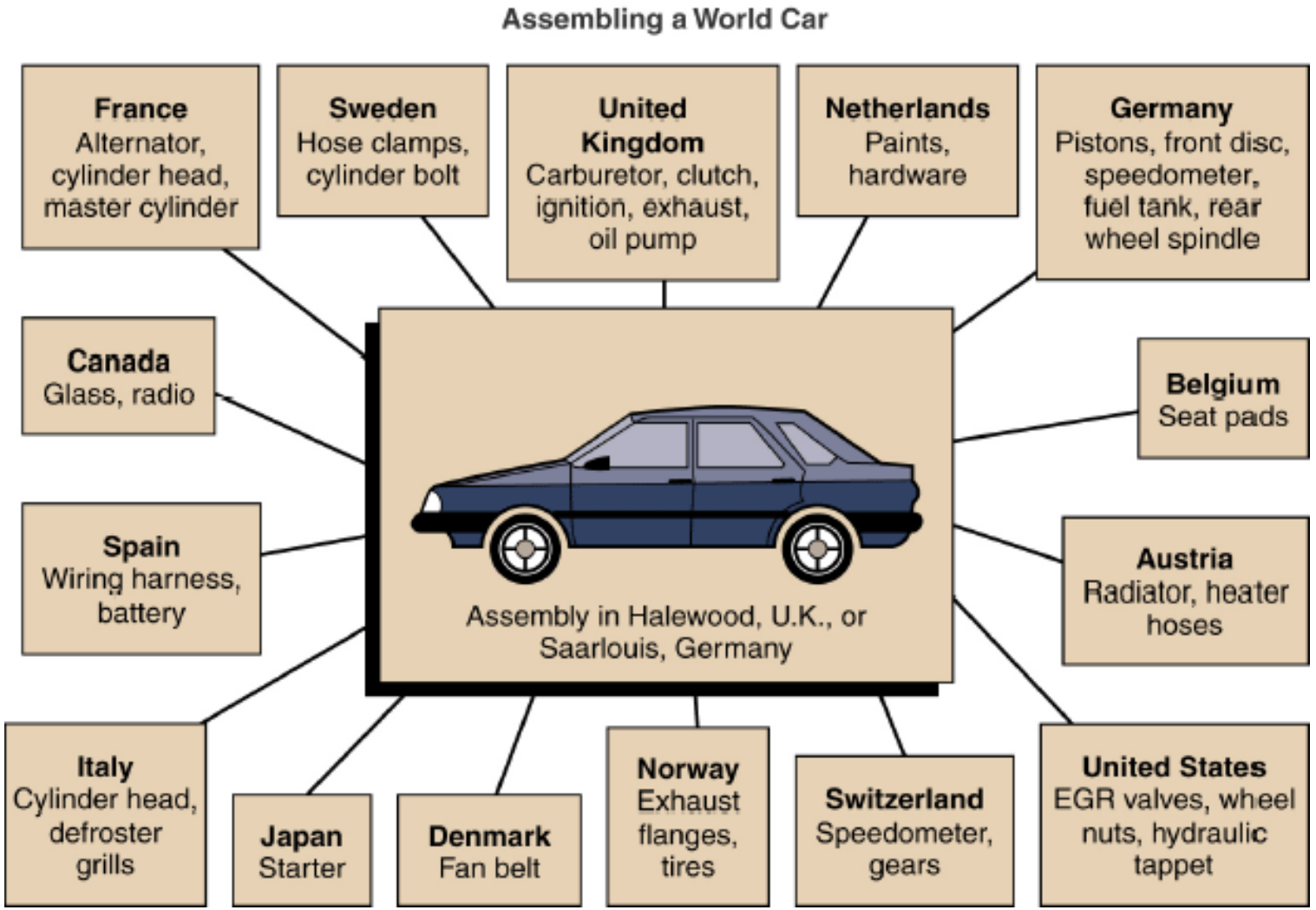
- Classified by the nature of demand
  - Continuous & High Volume (product-focused systems). Example, Industrial Fabrication and Assembly Lines, Oil refining, Mass food services, Driver's license processing, Passport processing
  - Intermittent & High Product Variety (process-focused / batch systems). Example, machine shop, medical clinic, Municipal offices, large scale projects
  - Mass customization (High Volume and Product Variety)

A typical production-distribution system

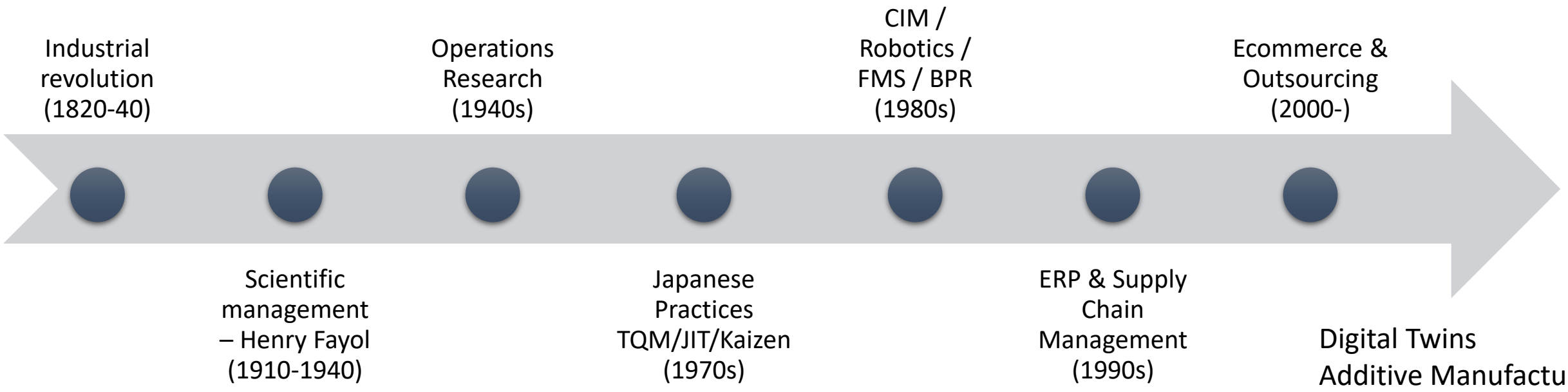


Try the online Beer Game to understand how small variations create the bull-whip effect in the supply chain

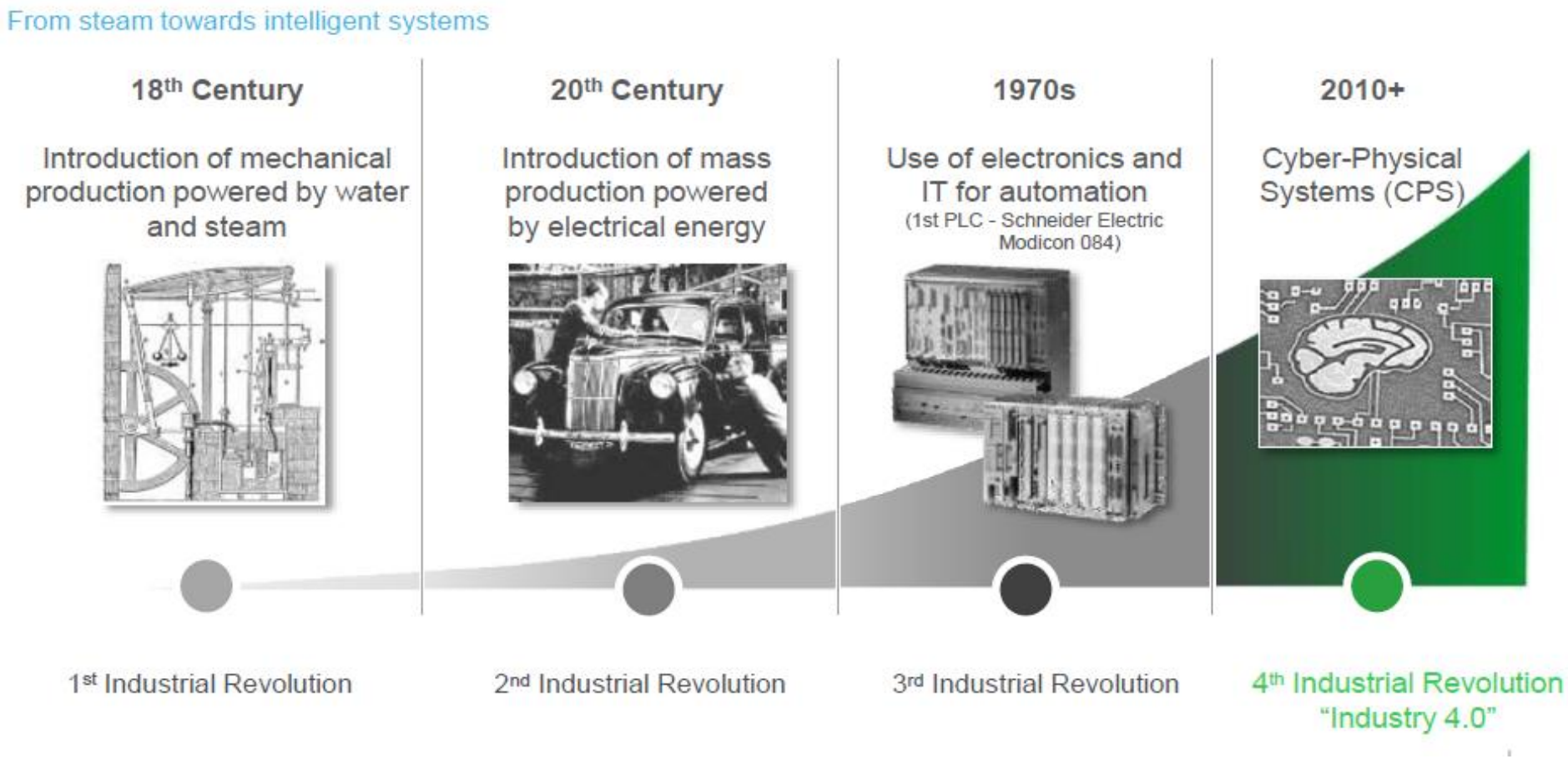
Operations & Global Supply Chains



Evolution of Operations Management Practices



Industry 4.0 –Smart Manufacturing: Evolution



Source: Schneider Electric

Contents

Key Activities in Operations Management

Demand Forecasting & Prediction

Capacity & Location planning for capital and resource levels

Selection of equipment and processes

Inventory & materials management

Planning and control for work scheduling

Purchasing and managing supplier relationships

Production Planning and Scheduling

Logistics or acquisition and distribution

Quality and Reliability Management

Maintenance and Facilities Management

Customer Service

Field Service

Demand Forecasting and Prediction

- The forecast is the single most useful and important database for operations management decisions. It affects decisions on capacity, plant locations, manpower distribution systems and inventory levels
- We need to make plans that range from a day-to-day to a year-to-year basis. The planning horizon depends on the particular application, but is relatively short
- “Forecasting” depends on having enough historical data to be able to describe the record in statistical terms and on reasonably stable market generating factors
- “Prediction” methods are used when we have little experience on which to base estimates of the future (uses subjective and objective information)

Methods of Forecasting

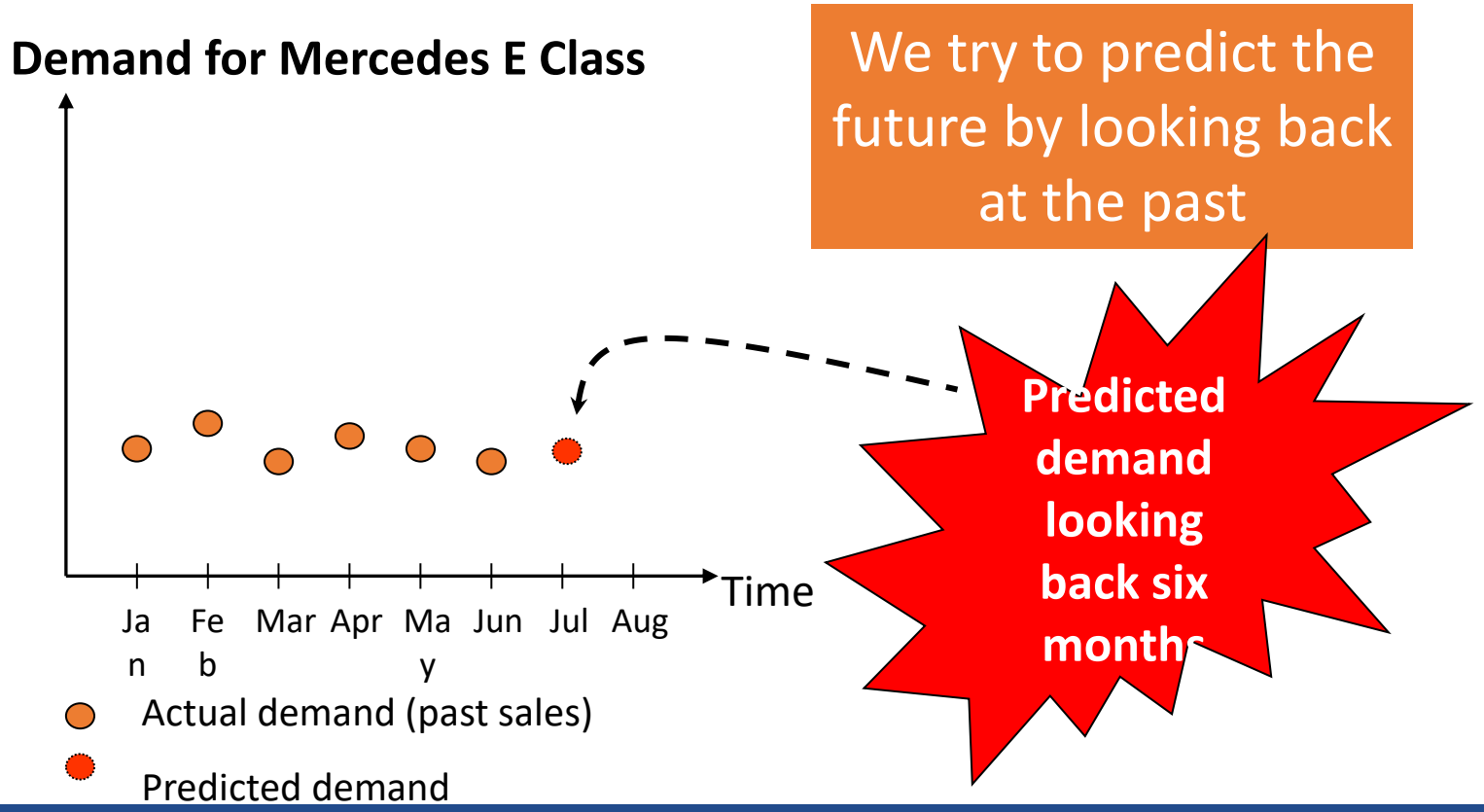
- Time series forecasting models (moving averages, exponential moving averages)
- Causal forecasting methods (Regression analysis, Econometric models)

Predictive Methods

- Delphi (expert panel, long-range predictions, NPD)
- Market surveys (testing market with questionnaires, tests of trial products)
- Historical analogy and life cycle analysis

What is forecasting all about?

Forecasting is a process of predicting future demand which based on past demand information.



Underlying basis of all business decisions

- Production
- Inventory
- Personnel
- Facilities

Role Of Forecasting

- Forecasting is a vital function and affects every significant management decision.
  - Finance and accounting use forecasts as the basis for budgeting and cost control.
  - Marketing relies on forecasts to make key decisions such as new product planning and personnel compensation.
  - Production uses forecasts to select suppliers; determine capacity requirements; and drive decisions about purchasing, staffing, and inventory.

- Different roles require different forecasting approaches.
  - Decisions about overall directions require strategic forecasts.
  - Tactical forecasts are used to guide day-to-day decisions

Forecasting Time Horizons

1. *Short-range forecast*
   - Up to 1 year, generally less than 3 months
   - Purchasing, job scheduling, workforce levels, job assignments, production levels
2. *Medium-range forecast*
   - 3 months to 3 years
   - Sales and production planning, budgeting
3. *Long-range forecast*
   - More Than 3 years
   - New product planning, facility location, research and development

Forecasts- General Characteristics

- Forecasts are seldom perfect, unpredictable outside factors may impact the forecast
- Most techniques assume an underlying stability in the system
- Product family and aggregated forecasts are more accurate than individual product forecasts
- Forecasts are more accurate for shorter time periods
- Every forecast should include an error estimate
- Forecasts are no substitute for calculated demand.

Forecasting Steps

1. Determine the use of the forecast
2. Select the items to be forecasted
3. Determine the time horizon of the forecast
4. Select the forecasting model(s)
5. Gather the data needed to make the forecast
6. Make the forecast
7. Validate and implement results

Forecasting Approaches

Qualitative Methods

- Used when situation is vague and little data exist
  - New Products
  - New Technology
- Involves intuition and experience
  - For example forecasting sales on internet

Quantitative Methods

- Used when situation is ‘stable’ and historical data exist
  - Existing products
  - Current technology
- Involves mathematical techniques
  - e.g., forecasting sales of color televisions

Forecasting : Qualitative Methods

- ***Grass Roots***: deriving future demand by asking the person closest to the customer.
- ***Market Research***: trying to identify customer habits; new product ideas.
- ***Panel Consensus***: deriving future estimations from the synergy of a panel of experts in the area.
- ***Historical Analogy***: identifying another similar market.
- ***Delphi Method***: similar to the panel consensus but with concealed identities.

Qualitative Methods: Market Research

- Ask customers about purchasing plans
- Useful for demand and product design and planning
- What consumers say, and what they actually do may be different
- May be overly optimistic

Qualitative Methods- Comparison

Type	Characteristics	Strengths	Weaknesses
Executive opinion	A group of managers meet & come up with a forecast	Good for strategic or new-product forecasting	One person's opinion can dominate the forecast
Market research	Uses surveys & interviews to identify customer preferences	Good determinant of customer preferences	It can be difficult to develop a good questionnaire
Delphi method	Seeks to develop a consensus among a group of experts	Excellent for forecasting long-term product demand, technological	Time consuming to develop

Forecasting : Quantitative Methods

- ***Time Series***: models that predict future demand based on past history trends. Here the performance with respect to time is considered. Time is the independent variable.
- ***Causal Relationship***: models that use statistical techniques to establish relationships between various items and demand
- ***Simulation***: models that can incorporate some randomness and non-linear effects

Capacity Planning

Capacity is the limiting capability of a productive unit to produce within a stated time period, normally expressed in terms of output units per unit of time

- Capacity Planning is the process of establishing the output rate that can be achieved at a facility
- Measures of capacity vary by the nature of output
  - When the output are relatively homogeneous, the capacity units are obvious – number of automobiles (auto plant), megawatts of electricity (power plant)
  - When the units of output are diverse, it is common to use a measure of the availability of the limiting resource as the capacity measure. Ex: Available seat miles (airlines), Available bed-days (hospital)
- Steps in capacity planning
  - Estimate future demand->Translate into physical capacity requirements->Generate alternate capacity plans related to requirements->Analyze economic effects of alternate plans->Identify risks

Capacity Planning Decisions: Why are they Important?

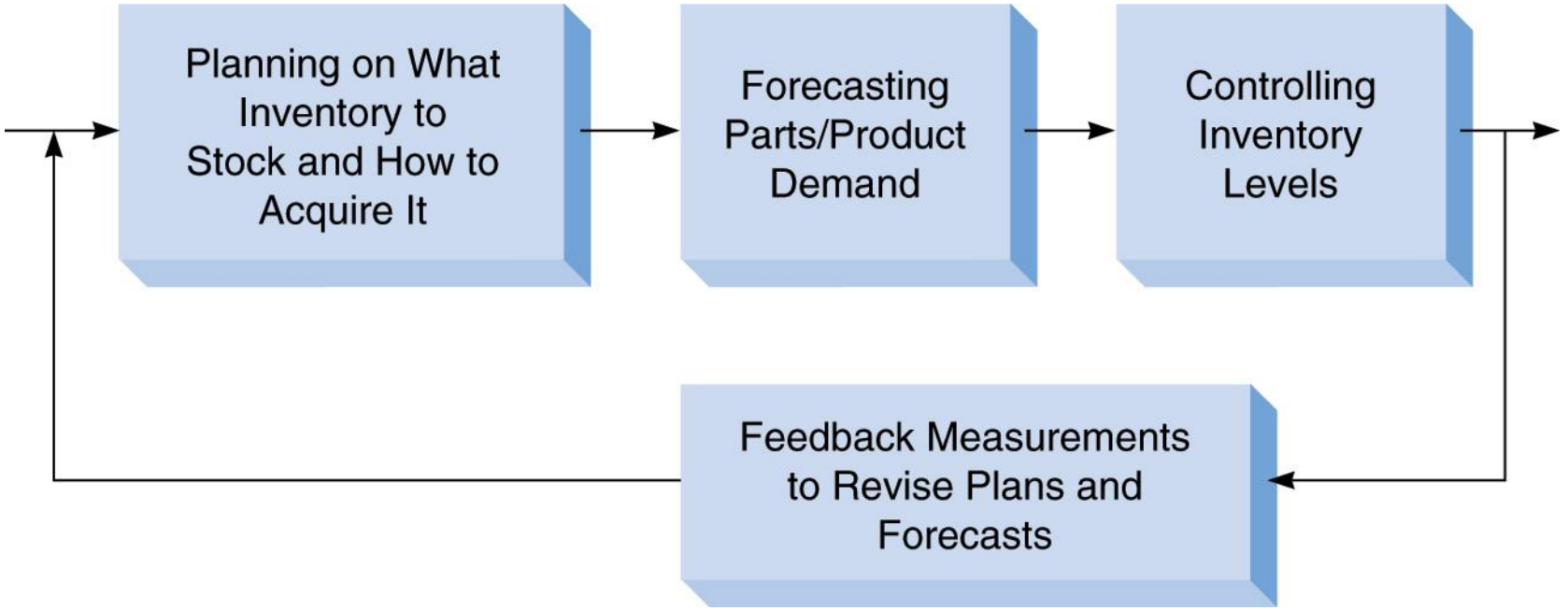
- Impacts the ability to meet future demands
- Affects operating costs
- Major determinant of initial costs
- Involves long term commitment
- Affects competitiveness

Inventory Management

The objective of inventory management is to strike a balance between inventory investment and customer service

Inventory Planning and Control

For maintaining the right balance between high and low inventory to minimize cost



Inventory Control Decisions

Objective: Minimize total inventory cost

Decisions:

- How much to order?
- When to order?
- How much to carry to protect against Supply /Demand variations

Inventory Control

Control of inventory is exercised by controlling individual items, which is called stock keeping units (SKUs). In controlling inventory, four questions must be answered:

1. What is the importance of the inventory item?
2. How are they to be controlled?
3. How much should be ordered at one time?
4. When should an order be placed?

Inventory Types and Inventory Costs

- Types of Inventory Items
  - Raw materials and purchased parts from outside suppliers
  - Components: subassemblies that are awaiting final assembly
  - Work in process: all materials or components on the production floor in various stages
  - Finished goods: final products waiting for purchase or to be sent to customers
  - Supplies: all items needed but that are not part of the finished product, such as paper clips, duplicating machine toner, and tools

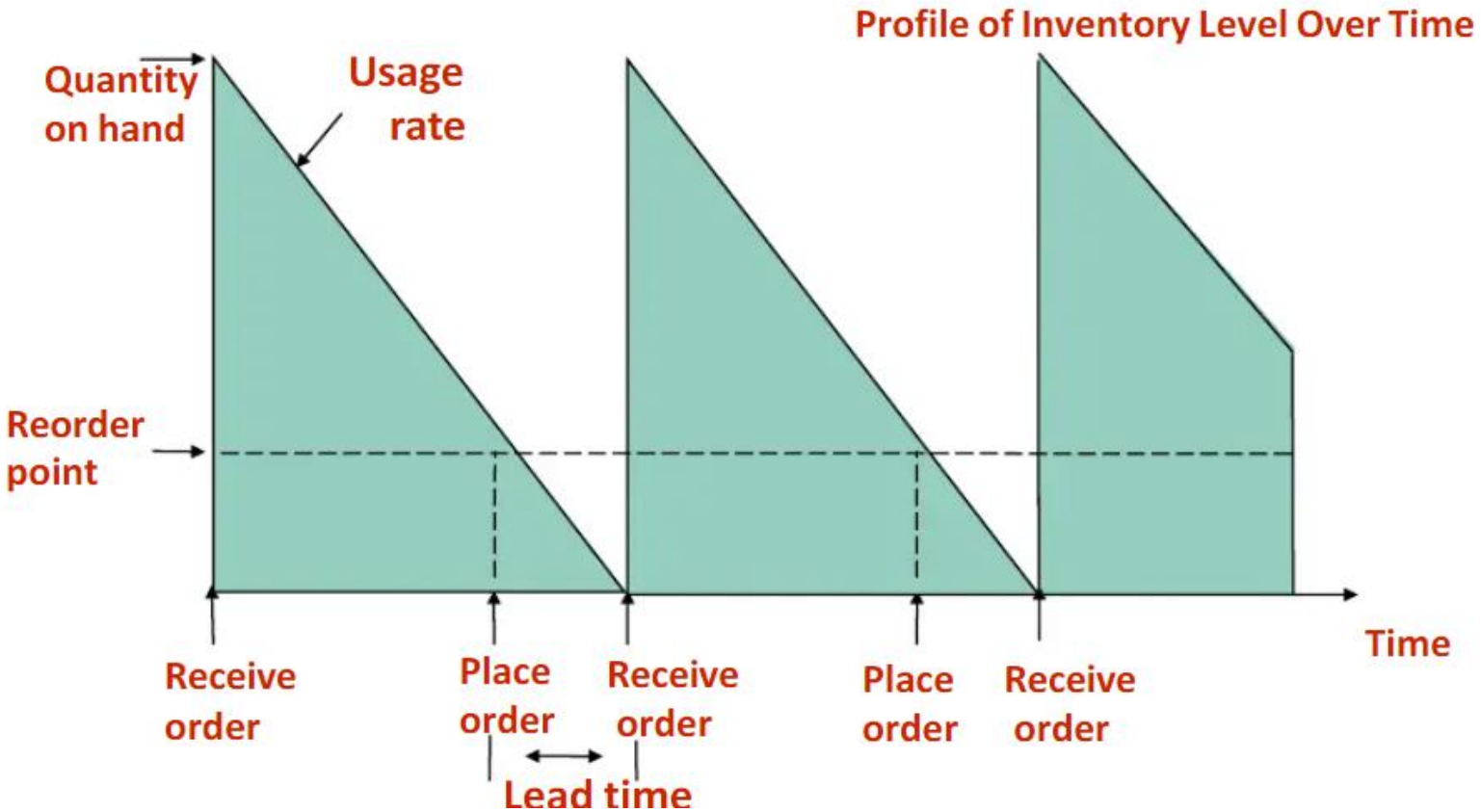
- Ordering (Setup) Costs
  - The costs, usually fixed, of placing an order or setting up machines for a production run
- Acquisition Costs
  - The total costs of all units bought to fill an order, usually varying with the size of the order
- Inventory-Holding (Carrying) Costs
  - All the costs associated with carrying parts or materials in inventory
- Stockout Costs
  - The costs associated with running out of raw materials, parts, or finished-goods inventory
- Risk Costs
  - Obsolescence, damage, deterioration, theft, insurance and taxes

Inventory Classification : ABC Analysis

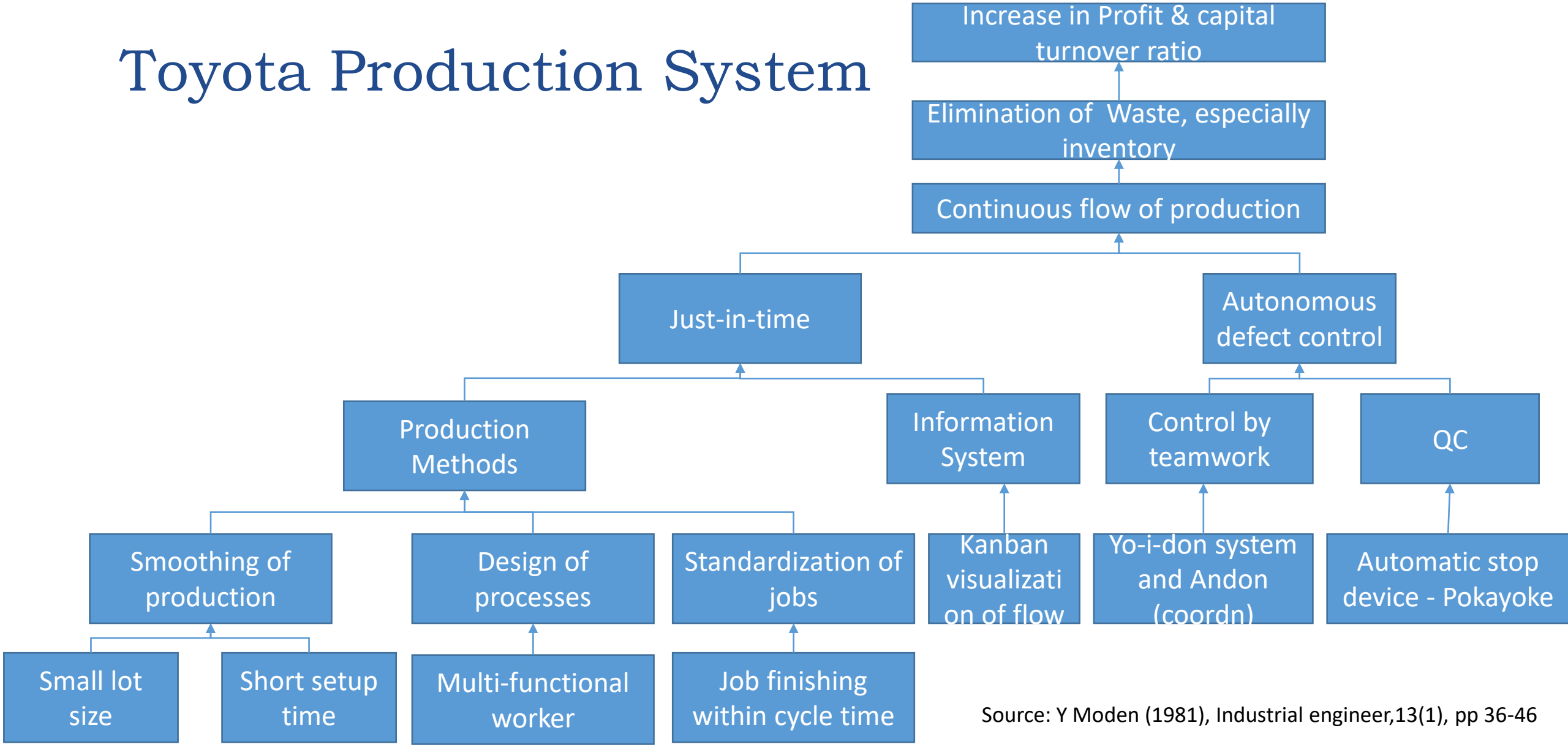
ABC classification is a method for determining level of control and frequency of review of inventory items

- A Pareto analysis can be done to segment items into value categories depending on annual dollar volume
  - **A Items** – typically 20% of the items accounting for 80% of the inventory value
  - **B Items** – typically an additional 30% of the items accounting for 15% of the inventory value
  - **C Items** – Typically the remaining 50% of the items accounting for only 5% of the inventory value

Inventory Cycle



Toyota Production System



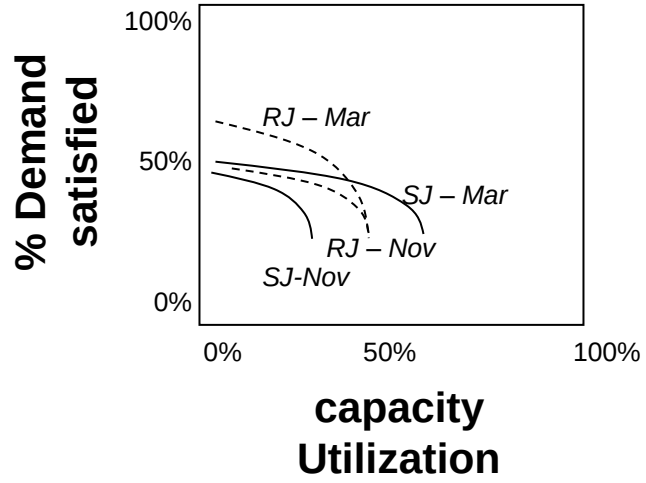
Source: Y Moden (1981), Industrial engineer,13(1), pp 36-46

The Experience Curve Phenomenon

- As experience in gained through production (cumulative units produced), unit costs are reduced

- The cost improvement may happen due to learning by workers, changes in production methods and tools, improved product design from the point of view of manufacturability, improved flow and economies of scale

- The experience curve is particularly important in the rapid developmental and mature phases of the product life cycle and for continuous production systems



End Of Session

Appendix

Appendix- 1

Inventory Management : ABC Analysis

Objectives of Inventory control (Expansion of Slide#

- To avoid both over-stocking and under-stocking of inventory.
- To minimize losses due to deterioration, pilferage, wastages and damages.
- Toensureperpetualinventorycontrolsothatmaterialsshowninstockledgersshouldbeactuallylying in the stores.
- To ensure right quality goods at reasonable prices.
- To maintain investments in inventories at the optimum level as required by the operational and sales activities.
- To meet unforeseen future demand due to variation in forecast figures and actual figures. This is possible with the knowledge of safety stock.
- To reduce loss due to changes in prices of inventory items.
- To balance various costs of inventory such as order cost or setup cost and inventory carrying cost.
- To balance the stockout cost/opportunity cost due to loss of sales against the costs of inventory

Relevant Inventory Costs…….(1/2)

Item Cost Includes price paid for the item plus other direct costs associated with the purchase

Holding Costs Include the variable expenses incurred by the plant related to the volume of inventory held (15-25%)

Capital Costs The higher of the cost of capital or the opportunity cost for the company

Relevant Inventory Costs…….(2/2)

Ordering Cost	Fixed, constant dollar amount incurred for each order placed
Shortage Costs	Loss of customer goodwill, back order handling, and lost sales
Risk costs	Obsolescence, damage, deterioration, theft, insurance and taxes
Storage costs	Included the variable expenses for space, workers, and equipment related to the volume of inventory held

Determining Order Quantities

Lot-for-lot	Order exactly what is needed
Fixed-order quantity	Specifies the number of units to order whenever an order is placed
Min-max system	Places a replenishment order when the on-hand inventory falls below the predetermined minimum level.
Order *n periods*	Order quantity is determined by total demand for the item for the next ***n*** periods

Steps in making ABC analysis

1. Establish the item characteristics that influence the results of inventory management. This is usually annual Value (dollar usage) but may be other criteria, such as scarcity of material.

2. Classify items into groups based on the established criteria.

3. Apply a degree of control in proportion to the importance of the group.

Detailed Steps based on Value (Annual Dollar usage)

Determine the annual usage for each item.

Multiply the annual usage of each item by its cost to get its total annual dollar usage.

List the items according to their annual dollar usage.

Calculate the cumulative annual dollar usage and the cumulative percentage of items.

Examine the annual usage distribution and group the items into A, B, and C groups based on percentage of annual usage.

Appendix- 2

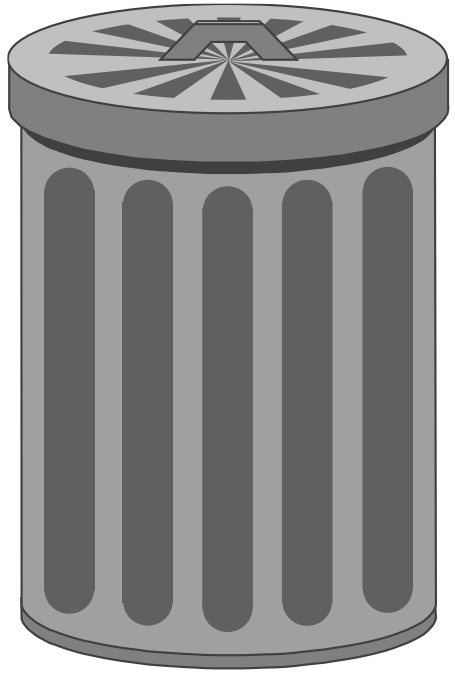
Just In Time /Lean Manufacturing

Just In Time (JIT/Lean Production)

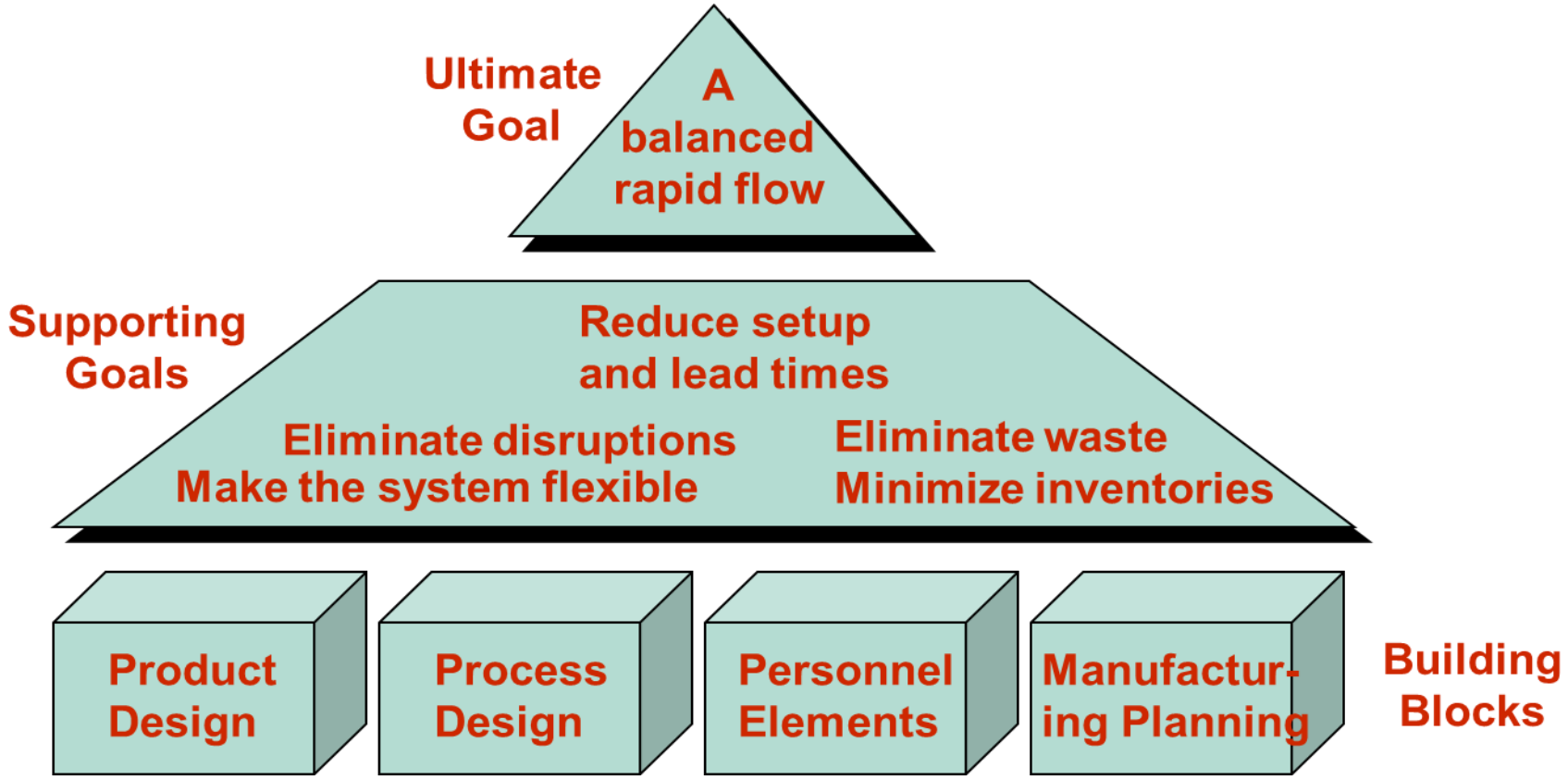
- *Just-in-time*: Repetitive production system in which processing and movement of materials and goods occur just as they are needed, usually in small batches
- JIT is characteristic of lean production systems
- JIT operates with very little “fat”

Sources of Waste

- Overproduction
- Waiting time
- Unnecessary transportation
- Processing waste
- Inefficient work methods
- Product defects



JIT Goals and Building Blocks



Appendix- 3

Automotive Supply chain

OEMs, Tier 1, 2 & 3 - The Automotive Industry Supply Chain Explained

https://www.amatechinc.com/resources/blog/returnable-packaging/tier-1-2-3-automotive-industry-supply-chain-explained