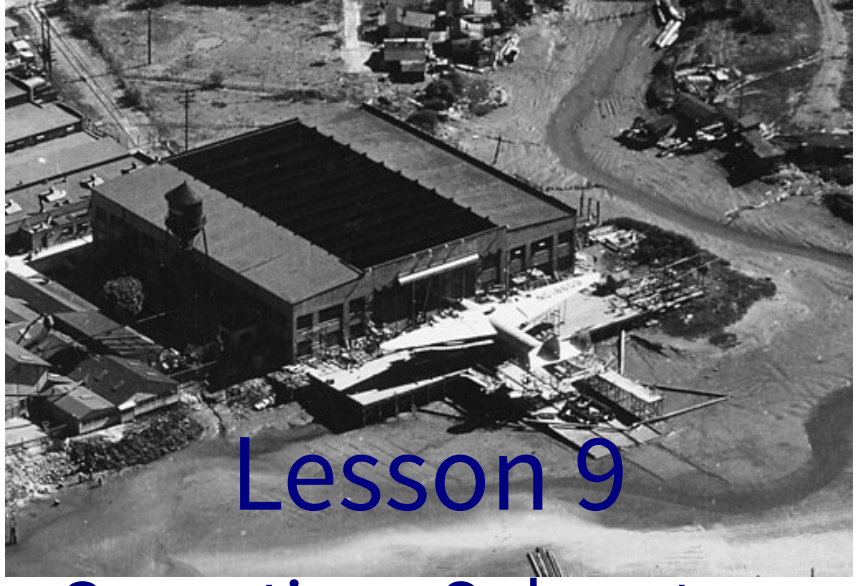


Lesson 9

Operations Subsystem

Structure

1. Concept of operations
2. Objective of the operations subsystem
3. Decision making
4. Strategic decisions
5. Operational decisions

1. Concept of operations

- In a purely manufacturing context they used words such as production and production function
- Because they produced material goods, products
- But as economy evolves services and intangibles become more important
- So the terminology changes from production system (subsystem) to operations subsystem

Production function:

To buy raw materials

To store materials

To manufacture

To determine location of premises

To determine production capacity

To determine how to produce

…

2. Objective of the operations subsystem

- Main goal: to improve efficiency
- Secondary goals:
  - To reduce costs
  - To meet delivery time
  - To improve quality
  - To increase flexibility
  - To improve customer service

Efficiency

- Technical efficiency: physical units < 1
- Economic efficiency: monetary units > 1

$$\text{Technical Efficiency} = \frac{Computers + Monitors + Printers + Cellphones}{\text{Working hours} + \text{electricity kw} + processors + \ldots} \quad (1$$

$$\text{Economic Efficiency} = \frac{p_{computers} \cdot Computers + p_{monitors} \cdot Monitors + p_{printers} \cdot P}{p_w \cdot \text{Working hours} + p_e \cdot electricitykw + p_p \cdot}$$

Cost reduction

- To increase results (profits, EBIT, …)

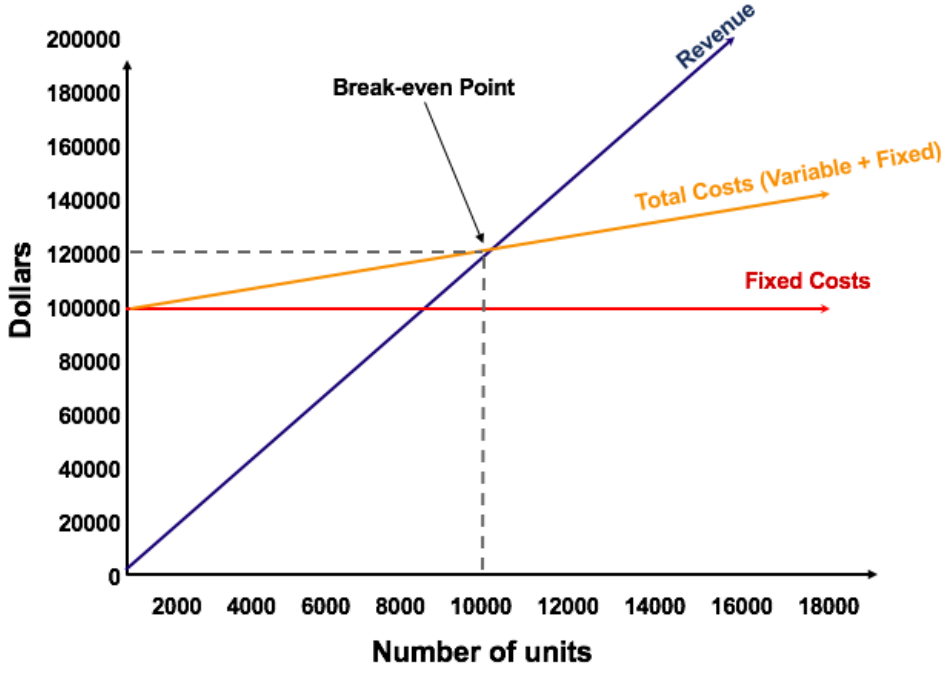
$$\text{Profits} = 0$$

$$\text{Revenue} = \text{Expenses}$$

$$p \cdot x = F + v \cdot x$$

$$x = \frac{F}{p - v}$$

Break-even point



Cost Volume Profit plot

load factor in airlines

3. Decision making

- Strategic decisions
- Operational (tactical) decisions

Decision classification

STRATEGIC DECISIONS (long term)

- Product selection and design
- Process selection and design
- Work design
- Capacity
- Location
- Plant layout

OPERATIONAL DECISIONS

- Production planning
- Production programming
- Execution and control
- Inventory management

4. Strategic decisions

- Decisions to help achieve company's goals
  - Product selection and design
  - Process selection and design
  - Work design
  - Capacity
  - Location
  - Plant layout

Product selection and design

- Global and key decision:
  - Type of product
  - Product characteristics
  - Goal market
  - Production volume
  - …
- Decision comes from customer need and R+D+I activities
- Idea –> Assessment (technical, commercial and financial viability)

Product selection and design II

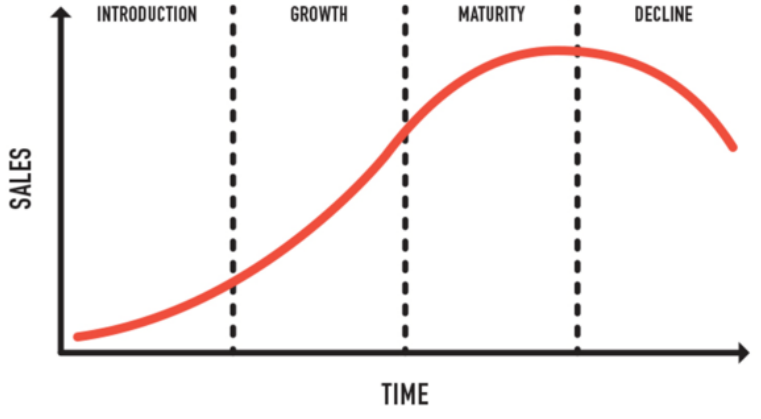
- Determines the company's competitiveness
- Competitiveness: competence of an organization or country to produce and sell products/services that meet the quality of the markets at the same or lower prices and maximize returns on the resources consumed in producing them.
- Ability of organizations to produce goods or services with a favorable quality-price ratio that guarantees good profitability while achieving customer preference over other competitors. Competitiveness ensures that the company is sustainable and durable.

Product selection and design III

- It determines cost, quality, delivery time
- Bad designs can cause economic losses
- It determines the production process
- Many manufacturing problems are caused by the product design
- It allows differentiating from competitors

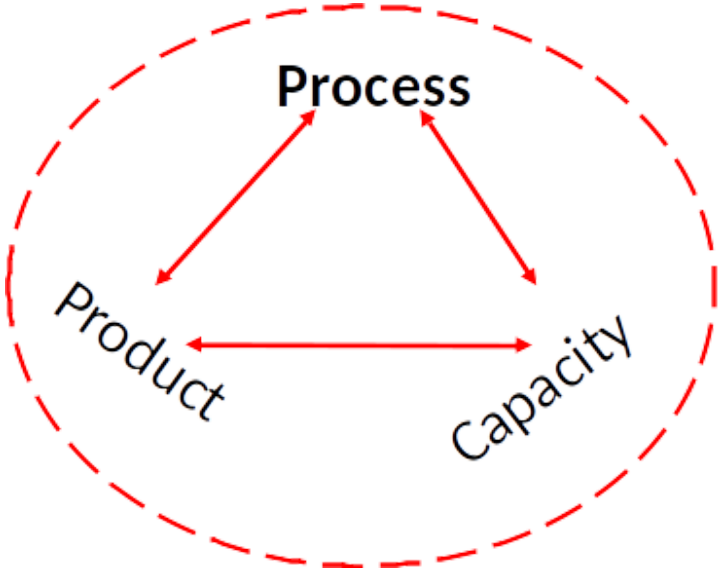
Product selection and design IV

- Product life cycle: Evolution pattern of sales
- Each stage may need different strategies and decisions



Process selection and design V

- How to develop production activities
- Technology
- Resources
- Process definition is linked with the product and with the production capacity



Work design

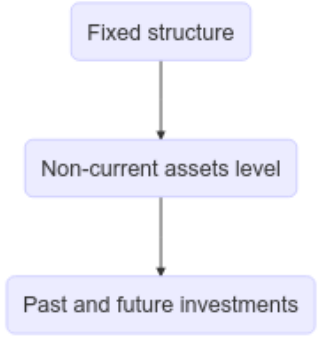
- To define:
  - Positions needed in the production process
  - Tasks to carry out in each position
- To take into account:
  - Specialisation
    - more efficiency
    - more burn-out
  - Technology

Production Capacity

- Long-term capacity
  - quantity of products or services that can be produced for a given period under normal conditions
- Production volume: actual quantity of products produce by a production unit for a given period
  - Usually capacity > volume
  - Sometimes capacity < volume
    - extraordinary conditions, double-shift, extratime, …

Production Capacity II

- Long-term capacity depends on the fixed structure of the company

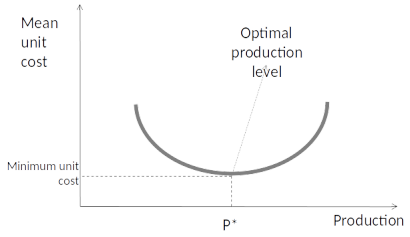


- To change capacity is strategic decision
  - It implies big investments
  - Hard to go back

Production Capacity III

- Capacity affects the competitiveness of the company:
  - Low capacity: bad service, diminishing market share
  - Excessive capacity: idle resources, low returns, lower prices to increase demand, increasing inventory
  - Which is the right point? Production optimum

Production Capacity IV



Production volume < P*

- Resource underutilization: more operation expenses
- Fixed costs split up among a lower number of produced units

Production volume > P*

- More operation costs
- Extratime, premises overutilisation
- In the long-term need to expand

Location

- Where to place production plant, headquarters,…

Factors to consider:

- Raw materials sources
- Markets
- Transport means
- Transport costs
- Labour availability
- Climate conditions
- Laws
- Fiscal pressure
- Land availability
- Currency
- Political stability

Plant layout

- Physical arrangement of industrial facilities i.e arrangement of machines, processing equipment and service departments to achieve greatest co-ordination and efficiency of peopla, materials, machines and methods in a plant
- Factors:
  - Available area
  - Machinery type
  - Work conditions
  - Type of product and process
- Everything about an aircraft manufacturing and assembly building must be driven by the manufacturing process link

About plant layout

5. Operational decisions

- Decisions that are adjusted more frequently in correspondence to the current external and internal conditions, which usually have impacts for no longer than a year or even a day
- Operational managers and other staff members make operational decisions. An operational decision influences day-to-day activities and only has a short-term impact on a business. These include scheduling employees or equipment use, what products to purchase from suppliers, determining how much inventory to keep, etc.
- Production planning
- Production programming
- Execution and control
- Inventory management

Production planning

- Decisions on:
  - quantity of products and type
  - resources to use
  - capacity adjustments
- Time horizon: from 6 months to 3 years
- A production planning needs:
  - Bill of materials (BOM) link
  - Stock level (inventory)
  - Cost of resources
  - Lot sizes
  - Manufacturing lead time

Airbus production

Job position add (entry level) link

Production scheduling

More detailed than production planning

It deals with:

- Identifying and assigning the appropriate number of workers
- Identifying and allocating the appropriate raw materials
- Identifying and assigning appropriate machinery and equipment
- Synchronizing all the resources to define priorities and fulfill customer needs

Execution and control

- Decisions on workloads for every section
- To adjust production when there is any production incident (stock breaking, strikes, machinery failures, process delays, etc)
- Control or monitoring to check deviations from plans and adjustments results

Inventory management

- In the storehouse till needed
- Raw materials, materials, spare parts, WIP, finished products
- They need space
- They have economic value
- Inventory is not one of the company goals
- To manage inventories imply costs
- They are an asset –> they diminished return on assets why?

ERP

- Enterprise Resource Planning
- Software system
- It helps company run their entire business
- Automation and processes in finance, human resources, manufacturing, supply chain, services, etc

video ERP

ERP companies

Exercise 9.1

The following data come from the income statement of Ryan Air for 2020.

Operation expenses	Million €	fixed or variable?
Fuel and oil	2,762	
Staff costs	1,107	fixed
Airport and handling charges	1,140	
Maintenance, materials and other	256	
Route charges	736	
Aircraft rentals	38	
Depreciation	749	

1. Fill in the table, stating if each cost is fixed or variable.

2. If the number of passengers was 149 million, work out the minimum average rate to obtain profits

3. If the revenue was 8,494 million Euros, draw the break-even plot (Euros in Y axis, passengers in the X axis). Indicate the value of the main points