
BUSI4496

**Supply Chain
Planning &
Management**


Prof Bart MacCarthy
Division of Operations
Management and
Information Systems


Lecture 2

Self-Study Session

Capacity basics

Review questions





Nottingham University
Business School

UNITED KINGDOM • CHINA • MALAYSIA

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Outline

1. Why do we need operations and supply chain planning processes?
 - Defining planning, scheduling and control
 - The Hierarchical Planning Model
2. Forecasting for operations planning and control
 - What is forecasting? Why forecast?
 - Overview of forecasting methods and techniques
 - Subjective (qualitative) methods
 - Forecasting as a management process
3. Inventory basics
 - Inventory forms
 - Inventory functions

.....

Pre-Recorded Self Study Session on Moodle
4. Capacity basics
 - Capacity definitions
 - Capacity utilisation and capacity losses
5. Review questions
 - The Group Assignment

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1. Why do we need operations and supply chain planning processes?

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Operations and Supply Chain Planning and Control

1. Meet demand in a manner that **satisfies customers and generates repeat orders**
 - Offer competitive **lead times**, delivery **accuracy**, **reliability** and **flexibility**
2. Be **responsive** – react to changes in the 'environment'



Customers

3. **Be ready to meet future demand**
 - Plan in **appropriate detail** for future demand
 - Use supply chain **resources efficiently**
4. Maintain some **stability** in production operations

Resources



5. Provide **information** needed for **production planning**
6. Provide **information** needed for **supplier planning**
7. Provide **information** needed for **performance monitoring**
8. Highlight **future** resource, capacity, inventory **problems**

Information



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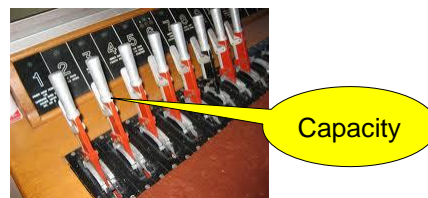
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Inventory and Capacity are key 'tools' in operations and supply chain planning

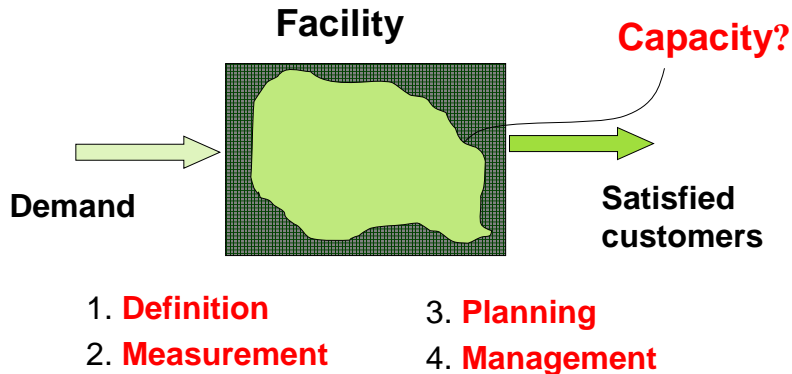
3. Inventory basics



Capacity – what is it?



What is Capacity?



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Defining capacity

- Refers to the **upper limit** on the rate at which the combined elements of an operational system can transform inputs into outputs

Definition:

Capacity is the maximum output or throughput achievable by an operating system over a period of time

- Planning and managing capacity management has a **major effect on costs, delivery** and responsiveness in operations

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Design Capacity and Effective Capacity

1. Design or rated capacity

- The highest output or throughput rate that can be achieved with the **planned** product specifications, product mix, workforce, supply network, facilities, equipment and infrastructure, under reasonable operating conditions

2. Effective capacity – reflects the **here and now**

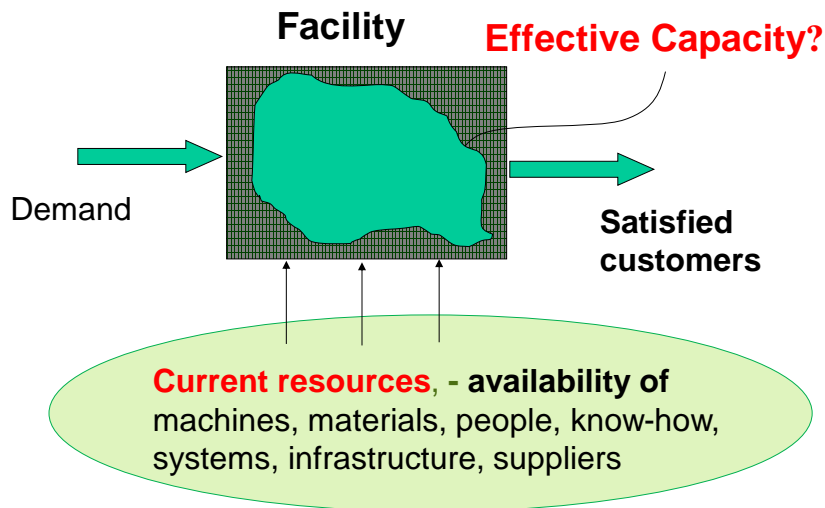
Based on all the factors noted for design capacity **but**

1. Takes account of **current resource availability and constraints**
2. **Assumes** normal/typical operating conditions and utilisation

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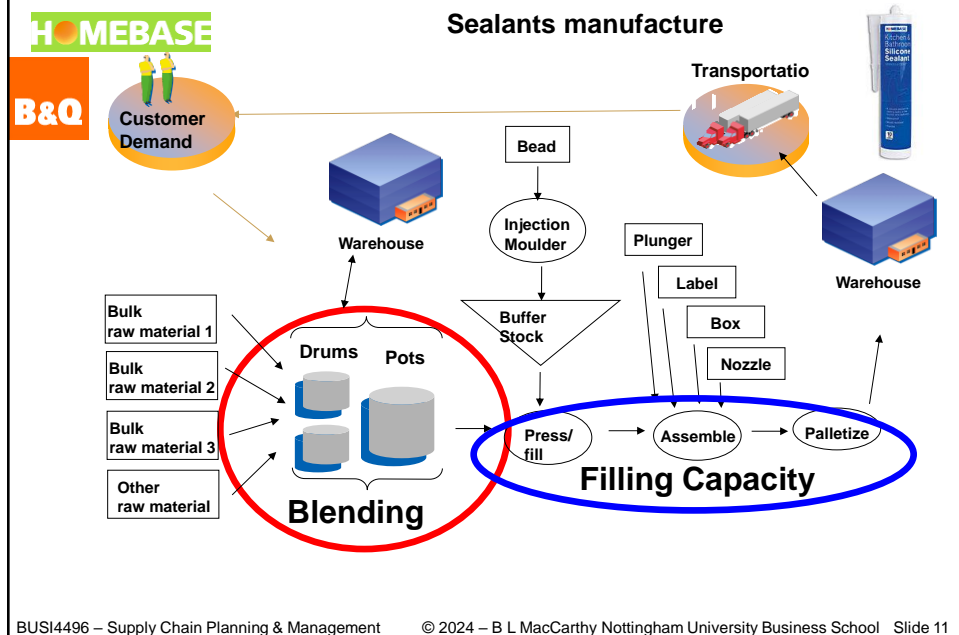
Effective Capacity – here and now



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Identifying critical determinants of capacity



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Capacity utilisation and yield

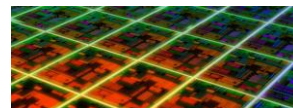
- **Utilisation** is the percentage of effective capacity used over some time period

- may vary across shifts, across seasons, products...
- human factors often important in addressing low utilisation levels (e.g. learning curves)



- **Yield** is the percentage of conforming product output for a given level of input

- important in difficult to control processes/industries - **semi-conductors**, optical chips and speciality materials..



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Capacity losses

Design Capacity

Assumes ideal conditions e.g. perfect performance, ideal product mix etc...

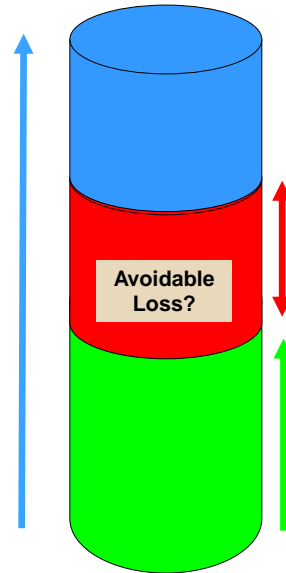
Effective Capacity

Capacity lost through maintenance, shift patterns, current mix, supply chain constraints etc..

Utilised Capacity

Capacity lost due to order sizes, quality problems, breakdowns, poor work flow or allocation of resources

Managerial policies and planning and scheduling decisions affect capacity losses



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Managing capacity

- **Effective capacity** relates to current, typical operating conditions and constraints
- **Capacity not utilised can't be recovered** - but capacity cushions may be useful (if costly)!
- **Capacity can't be switched on instantaneously** – must be planned
- **Useful capacity results from the interaction** of resources **but losses** here also
- **Capacity** represents a significant proportion of a **firm's costs** - how it is used affects a **firm's cash flow**
- **Many performance issues** in operations and supply chain can be traced back to **poor capacity planning** and/or management

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Key learning points ₃

Major planning lever - **Capacity**

- **Capacity definitions** – **design capacity** and **effective capacity**
- **Capacity utilisation** is a key issue for managing operational systems
- **Yield** is an important issue in some production systems
- Capacity must be **planned ahead of need!** – Aggregate and Sales & Operations Planning
- Session 3



Aggregate Planning/
Sales & Operations
Planning



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5. Review questions and the examination

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Assessment

Type	Weight	Length	Assessed In
In Person Exam	65%	2 hours	January
Coursework	35%	3500 words	Autumn

■ Examination:

Three sections in the exam A, B, C

- Each section is equally weighted
- **Section A** – 4 compulsory short questions (2 quantitative, 2 descriptive)
- **Section B** – two longer quantitative questions (do 1)
- **Section C** – two longer descriptive/essay questions (do 1)
- We will give you **full details of what we expect** as we teach the module and in the review

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Lecture 2 Review Questions

These questions and answers should help you to think about, revise and consolidate the material covered in the lecture.

- 1. What should an effective Supply Chain Planning and Control System seek to achieve?**
- 2. Why do we need to forecast for supply chain and operations planning?**
- 3. Explain the difference between qualitative (subjective) forecasting methods and quantitative (objective) forecasting methods.**
- 4. Outline two qualitative forecasting approaches.**
- 5. Inventory may be held for economic reasons and/or as a buffer against uncertainty in supply or demand. Explain why and give examples of each case.**

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Lecture 2 Review Questions

- 6. What do we mean by ABC classification of inventory items and why is it important?**
- 7. Define what is meant by the capacity of an operational system.**
- 8. What is the difference between design capacity and effective capacity?**
- 9. What is meant by utilisation of capacity and why is it important?**

- 5. Inventory may be held for economic reasons and/or as a buffer against uncertainty in supply or demand. Explain why and give examples of each case.**

Q7. Sample answer

Inventory may be held in a supply chain to exploit economies of scale, which occur in several ways.

Economies of scale may occur in purchasing where an organisation may purchase large volumes of a commodity product that it needs in its pipeline (e.g. standard screws used in the assembly of products) to benefit from a low unit price. Although beneficial economically, it results in stock levels being higher than immediately needed.

Production systems also benefit from economies of scale - large production batches reduce the unit production cost of each item because production facilities can run more smoothly with fewer stoppages and changeovers (e.g. furniture products). This may result in a build-up of more stock than immediately needed to satisfy demand.

Similarly, inventory levels may rise because of economies of scale from transporting large volumes of products (e.g. it may be cheaper for a clothing retailer to transport a large batch by ship from Bangladesh to the UK than many smaller batches by air).

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Q7. Sample answer continued

Inventory may be held to provide a buffer against uncertainty in supply, e.g. a medical equipment company may stockpile titanium because it believes there may be future problems in sourcing of this material. Inventories may be held to buffer against the variable time required to transport inventory from the source to the point of use or sale, e.g. imported steel products may take a long variable time to be transported from one country to another.

Inventory may be held to provide a buffer against uncertainty in demand, e.g. cold weather products such as de-icers and snow shovels may be held in storage to meet demand when cold weather events occur. Finished products may be produced and stored over a long period to meet predicted demand in a future period e.g. children's toys are produced and held in inventory in anticipation of demand at Christmas period.

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**Now try one of the questions for
yourself**

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Assignment handout

- Please read the assignment document on Moodle before the first seminar session on 17th of October

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