Chapter 1

Overview of Production and Operations Management

Basic Functions of Organisations

Most businesses have three basic functional areas:

- Finance/accounting – secure, allocate and manage financial resources.
- Marketing – assess consumer needs, generate demand, sell, promote and distribute solutions (i.e. products)
- Operation – manage the production process. Linked to supply chain, also vital for all firms.

Levels of OM

Strategic level - Strategic issues such as determining size and location of manufacturing plants; the structure and designing supply chains, etc.

Tactical level - Tactical issues such as plant layout and structure, project management methods, equipment selection and replacement etc.

Operational level - Operational issues such as production scheduling and control, inventory management, quality control and inspection, traffic and materials handling, equipment and maintenance policies etc.

Supply Chain

Supply chain - the sequence of organizations' facilities and production and distribution functions.

Why manage supply chain?

- To handle complex challenges in improving performance
- To avoid unwanted inventory oscillations and quality problems by streamlining the marketing, production and inventory functions.
- To adjust to emerging practices such as lean operation, JIT and TQM which improve quality and reduce costs.

Why manage supply chain?

- To deal with increasing levels of outsourcing - which increase time and money spent on supply-related activities (e.g. wrapping, packaging, moving, loading, unloading and sorting).
- To reduce increasing freight and haulage costs through proper planning
- To deal with competition related challenges of incessant new products, shorter product development cycles and increased demand for customization
- To deal with the emerging vast expanse of the supply chain playing field due to globalization.

Why manage supply chain?

- To deal with the challenges of the emerging all-important ‘e-business’.
- To ensure optimal inventory levels at all times (i.e. no shortages; no excesses).
- To deal with numerous supply chain related challenges such as: late deliveries, inaccurate forecasts, substandard quality equipment or machine breakdowns, power failure and cancelled or changed orders etc.

Essential Activities in OM

- **Forecasting** – Estimating demand, and required operational conditions to achieve set goals.
- **Capacity planning** – Estimating optimal operating levels with adequate cash flow and revenue projections.
- **Scheduling** – setting time schedules for production schedules to meet estimated demands.
- **Managing inventory** – Maintaining optimal stock levels; EOQ; right quality; storage facilities; material handling systems, supplier relations etc.

Essential Activities in OM

- **Assuring quality** – Ensuring reliable quality control measure to meet customer expectations.
- **Motivating employees** – Training and motivating employees to meet production targets
- **Locating facilities** – Deciding location of operations units and distribution points.

OM Defined

- Set of activities that creates value in the form of goods and services by transforming input into out output.
- The organizing and controlling of the fundamental business activity of producing goods and services to customers.
- The management of processes or systems that create goods and/or provide services.
- The maintenance, control, and improvement of organizational activities that are required to produce goods and services for customers.

Production Management

The facilitation of activities involved in the creation of goods and services.

Goods - physical items (e.g. mobile phone including its components)

Services - activities that provide a combination of time, location or psychological value.

Importance of Operating Systems

Operation Systems - An operating system is a configuration (design, pattern) of resources for the conversion of inputs into outputs to satisfy customer wants and needs.

Importance of Operations - An effective and efficient operating system enables organizations to:

- **Compete on Cost** – eliminate waste by analysing activities and value and tightening production standards
- **Competing on Quality** - minimizing defect rate; conforming to design specification and meeting customers expectation of quality
- **Competing on Flexibility** - produce variety of products; introduce new products; modify existing products; respond quickly to customer needs
- **Competing on speed** – making fast moves; adapting fast and maintaining tight linkages with suppliers

Why Study OM?

- For strong business intelligence, strategic inititiatives and international competitive advantage in today's fast paced global market.
- The OM function permeates all other business functions. 50% or more jobs in OM–related areas—e.g. customer service, Q-assurance, prodn. planning & control, job design, scheduling, inventory management etc. - all intertwined.
- OM knowledge required to improve technology (procedures and equipment) used in accounting, finance, administration, HR, logistics, MIS, marketing, purchasing etc.
- Work is interrelated – Accountants need OM knowledge e.g. (inventory management, work measurement and processing systems) to estimate costs, conduct audits, and prepare financial reports. Also, finance – for 'make-or-buy' decisions.

Why Study OM?

- To ensure steady growth and expansion of establishments, entrepreneurs need OM knowledge to guarantee customers value for their money.
- OM spells effective management and thus all managers need some knowledge in all aspects of it.
- OM is a costly facet of an organization and knowledge enhances managerial judgments and decision making.

Careers in Operations Management

Opportunities abound in both service and manufacturing establishments

- Technology/methods - Professional institutions, e.g. ICA Ghana, ACCA
- Facilities/space utilization - Consultancy firms
- Strategic issues - Production and Inventory Control or management departments
- Response time – Parcel delivery and restaurant services
- People/team development - Religious bodies, societies etc,
- Customer service and Quality control and assurance units

Careers in Operations Management

- Procurement or National Association of Purchasing and supply Management
- Management information systems units
- Banking and Financial Services institutions
- Operations research and statistical service institutes
- Cost reduction/productivity improvement - manufacturing companies
- Project management sections of constructions companies, etc.

- Job titles include plant manager, operations analyst, quality manager, supply chain manager and planner, process improvement consultants, etc.

What Operations Managers Do

In addition to the basic management functions of: Planning; Organizing; Staffing; Leading and Controlling

Ten Critical Decisions

- Designing of goods and services
- Managing quality
- Process and capacity design
- Location strategy
- Layout strategy

What Operations Managers Do

Ten Critical Decisions (cont'd)

- Human resources and job design
- Supply chain management
- Inventory, material requirements planning and JIT
- Intermediate and short-term scheduling
- Maintenance

Major Inputs Used in Production

- **Materials** - physical inputs - include land, buildings, raw materials, fuel, indirect materials etc.
- **Plant and machinery** - Tools and equipment, vehicles, etc.
- **Labour** - Human efforts (mental and physical) – without them, even machines cannot be effectively utilized.
- **Information/knowledge (**IT) – 'know-how' – regarded lately as the most crucial resource – particularly with regards to innovation

Functions of Operating Systems

- **Manufacture** – Tangible transformation which converts resources (inputs) into outputs which differ in form, content and use compared to their inputs.
- **Transport** – A Change in the location of a resource without altering the form or content.
- Supply – A change in possession or ownership without a physical transformation.
- Service – A treatment or accommodation of something or someone which alters the output or satisfaction obtained from a resource.

Functions of OS - Manufacturing

Manufacturing - It is the principal functional category of operating systems.

Types of Manufacturing Systems

Two traditional ways of grouping / classifying manufacturing systems.

First approach - to identify:

a) continuous
b) repetitive
c) intermittent manufacture.

Functions of OS - Manufacturing

Continuous process

Non-stop (24/7; 52 weeks / year) process – usually single product manufactured in very large quantities. E.g. cement factory, petroleum refinery, stone quarry

Advantages

- Standardization of product and process sequence
- Higher rate of production with reduced cycle time
- Higher capacity utilization due to line balancing
- Manpower is not required for material handling as it is completely automatic
- Unit cost is lower due to high volume of production
- Persons with limited skills can be used on the production line.

Functions of OS - Manufacturing

Continuous Process - Limitations

- Product differentiation is limited
- Very high investment for setting flow lines
- Flexibility to accommodate and process number of products does not exist

Repetitive process – Applying the same sequence of operations to product(s) (or products) manufactured in lots. E.g. Assembly plant for cars or computers.

Intermittent process – Production activities tailored towards individual customers' specific requirements. E.g. carpenter working on a customer's living room furniture.

Functions of OS - Manufacturing

Second approach - process (or mass), batch and jobbing.

- **Process manufacture** – A continuous production system of a commodity in bulk or large quantities, often by chemical rather than mechanical means.

- **Mass production** – Single or small range of related items manufactured in large quantities. similar to process - just that items are discrete. E.g. mobile phones, pens.

Functions of OS - Manufacturing

Mass Production - Advantages

- Higher rate of production with reduced cycle time
- Higher capacity utilisation due to line balancing
- Less skilled operators required
- Low process inventory (W.I.P)
- Manufacturing/ production cost per unit is low

Limitations

- Breakdown of one machine will stop an entire production line
- Line layout needs major change with a change in product design
- High investment in production facilities
- The cycle time is determined by the slowest operation

Functions of OS - Manufacturing

Batch Production

Similar items (usually fewer compared to mass production) are manufactured together in batches.

Advantages

- Better utilization of plant and machinery
- Promotes functional specialization
- Cost per unit is lower as compared to job order production
- Lower investment in plant and machinery
- Flexibility to accommodate and process number of products
- Job satisfaction exists for operators

Functions of OS - Manufacturing

Batch Production - Limitations

- Material handling is complex because of irregular and longer flows
- Production planning and control is complex
- Work in process inventory is higher compared to continuous production
- Higher set up costs due to frequent change in set up

Functions of OS - Manufacturing

Jobbing / Job Shop Production

The manufacture of different products in unit quantities, which is technically in consonance with the intermittent process mentioned above.

Advantages

- Because of general purpose machines and facilities, variety of products can be produced
- Enhanced skills and competence by learning from each job
- Full potential of operators can be utilized
- Opportunity exists for creative methods and innovative ideas

Functions of OS - Manufacturing

Jobbing - Limitations

- Higher cost due to frequent set up changes
- Higher level of inventory at all levels and hence higher inventory cost
- Production planning is complicated
- Larger space requirement

Functions of OS - Manufacturing

Transport

- Examples - Taxi or bus services, ambulance services, refuse disposal systems.
- In manufacturing – movement of raw materials, W.I.P between manufacturing depts. Removal of waste materials, etc.

Supply

- Examples - As an organization, suppliers include: retail shops, warehouse, petrol dump/station etc.
- Within organizations, e.g. internal stores etc.

Service

- Examples: Hospital wards, Fire service, hotels, etc.
- Within organizations - welfare department, counseling, etc.

OM Contributions to Society

OM promotes:

- Higher standard of living
- Ability to increase productivity
- Lower cost of goods and services
- Better quality goods and services
- Healthy competition geared towards quality improvement
- Concern for the environment
- Recycling and concern for renewable natural resources
- Improved working conditions
- Better job design that captures employee and end user participation

The Transformation Process

Inputs, e.g. (material, labour, capital and information) are transformed (e.g. heat, force, storing, transporting, repairing etc.) into goods and services.

Measures are taken at various points (i.e. feedback) and compared with standards for corrective action (i.e. control) to be taken where necessary

The Nature of OM

- ✓ Nature/Problems of OM manager's job – function of nature of OS/OS structure.
- ✓ OM managers' strategies - influenced by OM objectives structure of OS.
- ✓ OM is central to any form of enterprise, private/public.
- ✓ OM - concerned with design & operations of systems for manufacture, transport, supply and service.
- ✓ OM managers' job, strategies and ways of tackling problems vary with activities of each organisation.

Design & Management of OS

Factors include the degree:

1. of involvement of customers in the creation process. The greater the involvement, the more challenging the design n' management.
2. to which technology is employed to produce and/or deliver a product or service – choice of technology can impact productivity, costs, flexibility and quality and customer satisfaction.
3. others

Exciting New Trends & challenges in OM

From:	To:
• Local or national focus	Global focus
• Batch shipments	Just-in-time
• Low bid purchasing	Supply chain partnering
• Lengthy product dev't	Rapid product dev't alliances
• Standard product	Mass customization
• Job specialization	Empowered employee teams

The heritage of OM

Legends whose theories and knowledge have contributed immensely to the promotion of OM

Originator	**Contribution/Concept**
• Adam Smith 1776	Division of labour
• Whitney Eli 1790	Interchangeable or Standardized parts
• F. W. Taylor 1911	Principles of scientific management
• Henry Ford 1913	Moving or coordinated assembly line
• Henry Gantt 1916	Chart for scheduling activities (Gantt Chart)

The heritage of OM

Originator	**Contribution/Concept**
Frank and Lillian Gilbreth 1911	Motion study, use of industrial psychology
Elton Mayo 1930	Hawthorne studies on worker motivation
W. Edwards Deming 1980s	Emphasis on quality control
Numerous 1950s	Automation
Numerous 1990s	Internet, supply chain management
Numerous 2000s	Applications service providers and outsourcing

The heritage of OM

Division of labour - Adam Smith, 1776

- Break up production process into small (narrow) - each worker - small portion of overall job – virtually no skills required
- Under craft production - each worker - many tasks thus skills are required

Interchangeable or standardised parts - Whitney Eli, 1790

- Rationale - standardize parts so any parts in a batch-of-parts would fit any automobile coming down the assembly line. Under craft production – parts had to be custom fitted.

The heritage of OM

Moving or coordinated assembly line for mass production - Henry Ford 1913

- To improve efficiency of operations, Ford adopted FW Taylor's scientific management principles - introduced moving assembly line which had tremendous impact on production methods in many industries.
- Ford also introduction mass production - large volumes of standardized goods produced by low skilled or semi-skilled workers using highly specialized and often costly equipment.

The heritage of OM

Scientific management principles - F. W. Taylor 1911

Management should take more responsibility for:

- Matching employees to right job
- Providing the proper training
- Providing proper work methods and tools
- Establishing legitimate incentives for work to be accomplished

What is Value Added

- Value-added – The difference between the cost of inputs and the value or price of outputs.
- OM increases value during transformation processes.
- **Profit Organizations -** value of outputs is price customers are willing to pay for products
- **Nonprofit Organizations – (e.g.** police, fire services, etc.) value placed on output by society's which reflects effectiveness of operations.

Sustainability of Value Added

Organizations use money generated by value-added for:

- Research and development,
- Investment in new facilities and equipment,
- Workers salaries - to improve performance and profits.
- Thus, greater value-addition means more funds reserved for these important operational activities.

How OM Managers Can Add Value

By operating to:

- reduce how much products cost to customers
- make the product more readily available
- provide faster service
- provide customers with additional relevant information
- customize the product to the customer's specific needs

Goods Prodn. v Services Provision

- Production of goods - tangible outputs. E.g. refrigerator.
- Delivery of service – output can be felt rather than seen or touched.

Points of comparison

- Degree of customer contact
- Labour content of job
- Uniformity of inputs
- Measurement of productivity
- Quality assurance
- Inventory
- Wages
- Ability to patent

Similarities – Goods & Services

- Entail customer satisfaction as the major measure of effectiveness and or value
- Include common measures of satisfaction (e.g. quality, speed, flexibility etc.)
- Require demand forecasting
- Can involve routing the product through more than one process
- Are subject to automation
- Are shaped by production and operation strategy

Similarities – Goods & Services

- Depend on location and arrangement of resources for success
- Forecasting and capacity planning to match supply and demand
- Process management
- Managing variations
- Monitoring and controlling costs and productivity
- Supply chain management
- Location planning, inventory management, quality control and scheduling.

Similarities – Goods & Services

Many service activities are essentially roped in goods-producing companies. Examples:

- Training
- HRM
- Customer services
- Equipment repair
- Procurement
- Administrative services.

X'tics of Goods

- Tangible products
- Can be Stored or inventoried
- Have consistent product definition
- Production is usually separate from consumption
- Have low customer interaction
- Goods are transformed from other goods

X'tics of Services

- Intangible
- Always produced and consumed at the same time
- Often unique
- Have high degree of customer interactions
- Have inconsistent product definition
- Often knowledge based
- Frequently dispersed
- Are such that, sometimes, the clients themselves are transformed.

Self Assessment Questions

1. Briefly describe OM
2. Identify the three major functional areas of business organsations and briefly describe how they interrelate.
3. List four important difference between goods production and service operations
4. Discuss the importance of the following:

a) managing supply chain

b) matching supply and demand

Self Assessment Questions

- Explain the term *value added*
- One way that organisations compete is through technological innovation. However, there can be downsides for both the organization and the consumer. Explain.
- Define Operations Management and explain how transformation activities "add value"