

Introduction

- What is Operations Management?
- Historical Development of OM
- Production system
- Production management
- Operating system
- Operations management
- Productivity measurement

What is Production/Operations Management?

- **Production/operations management** is the process, which combines and transforms various resources used in the production/operations subsystem of the organization into value added product/services in a controlled manner as per the policies of the organization.
 - Therefore, it is that part of an organization, which is concerned with the transformation of a range of inputs into the required (products/services) having the requisite quality level.

What is Production/Operations Management?

- The set of interrelated management activities, which are involved in **manufacturing certain products**, is called as **production management**. If the same concept is extended to **services management**, then the corresponding set of management activities is called as **operations management**.
- Operations management is defined as the **design, operation, and improvement** of the production system that creates the firm's primary products (goods and/or services).
- is the set of activities that creates goods and services through the transformation of inputs into outputs.

Historical evolution of production and operations management

- Important factor in a **country's economic growth**.
- **Manufacturing management** began in eighteenth century when **Adam Smith** recognized the economic benefits of **specialization of labor**.
 - He recommended **breaking of jobs down into subtasks** and recognizes workers to specialized tasks in which they would become highly skilled and efficient.

Historical evolution of production and operations management

- In the early twentieth century, **F.W. Taylor** implemented Smith's theories and developed **scientific management**.
- **Production management** becomes the acceptable term from 1930s to 1950s.
 - As F.W. Taylor's works become more widely known, managers developed techniques that focused on **economic efficiency in manufacturing**.
 - Workers were studied in great detail to **eliminate wasteful efforts and achieve greater efficiency**.

Historical evolution of production and operations management

- At the same time, **psychologists, socialists and other social scientists** began to study **people and human behavior in the working environment**.
- In addition, **economists, mathematicians, and computer socialists** contributed newer, more sophisticated analytical approaches.

Historical evolution of production and operations management

- With the 1970s emerges two distinct changes in OM.
 - **First, operations management** was a shift in the service and manufacturing sectors of the economy.
 - As service sector became more prominent, the change from **‘production’** to **‘operations’** emphasized the broadening of our field to service organizations.
 - **The second**, more suitable change was the beginning of an emphasis on **synthesis**, rather than just **analysis**, in management practices.

The Heritage of OM

- Division of labor (Adam Smith 1776; Charles Babbage 1852)
- Standardized parts (Whitney 1800)
- Scientific Management (Taylor 1881)
- Coordinated assembly line (Ford/ Sorenson 1913)
- Gantt charts (Gantt 1916)
- Motion study (Frank and Lillian Gilbreth 1922)
- Quality control (Shewhart 1924; Deming 1950)

Concept of production

- **Production function** is that part of an organization, which is concerned with the transformation of a range of inputs into the required outputs (products) having the requisite quality level.
- **Production** is defined as *“the step-by-step conversion of one form of material into another form through chemical or mechanical process to create or enhance the utility of the product to the user.”*
 - Thus production is a value addition process. At each stage of processing, there will be value addition.

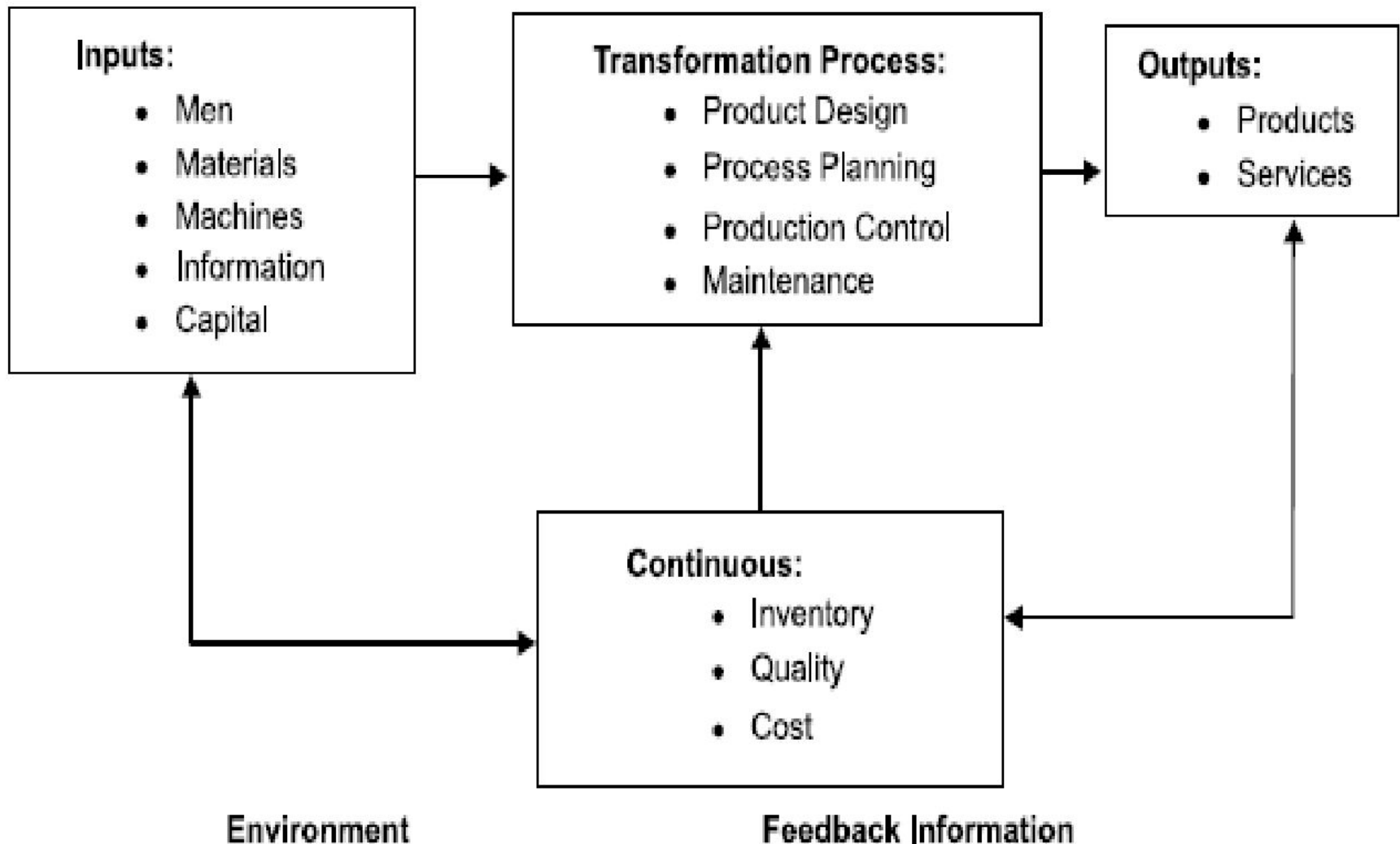
Concept of production

- Edwood Buffa defines **production** as '*a process by which goods and services are created*'.
 - Some examples of production are: manufacturing custom-made products like, boilers with a specific capacity, constructing flats, some structural fabrication works for selected customers, etc., and manufacturing standardized products like, car, bus, motor cycle, radio, television, etc.

Production system

- **The production system** of an organization is that part, which produces products of an organization. It is that activity whereby resources, flowing within a defined system, are combined and transformed in a controlled manner to add value in accordance with the policies communicated by management.

Production system



Production system

- The production system has the following characteristics:
 1. Production is an organized activity, so every production system has an **objective**.
 2. The system transforms the various **inputs to useful outputs**.
 3. It does **not operate in isolation** from the other organization system.
 4. There exists a **feedback about the activities**, which is essential to control and improve system performance.

Components of transformation model

1. Inputs

- Some inputs are used up in the process of creation of goods and services, while others play a part in the creation process but are not used up. To distinguish between these inputs resources, usually classified as
 - Transformed resources for example material, information
 - Transforming resource example staffs, land, building, machines, and equipments.

Components of transformation model

2. Out puts

Goods and services resulting from the transformation process.

In these OM is responsible for minimizing wastes, protecting the health and safety of the employees and ethical behavior in relation to social impact of transformation process.

Components of transformation model

3. Transformation process

- Is any activity or group of activities that takes one or more inputs and transform and add values to them and provides out puts for customers and clients.
- Transformation process includes

- Change in physical characteristics of materials
- Change in location of materials, information, and customers

Example Airline service, information exchange and etc.

- Change in ownership of materials or information
- Storage and accommodation of materials or customers
- Change in the process or form of information
- Change in physiological or psychological state of customers

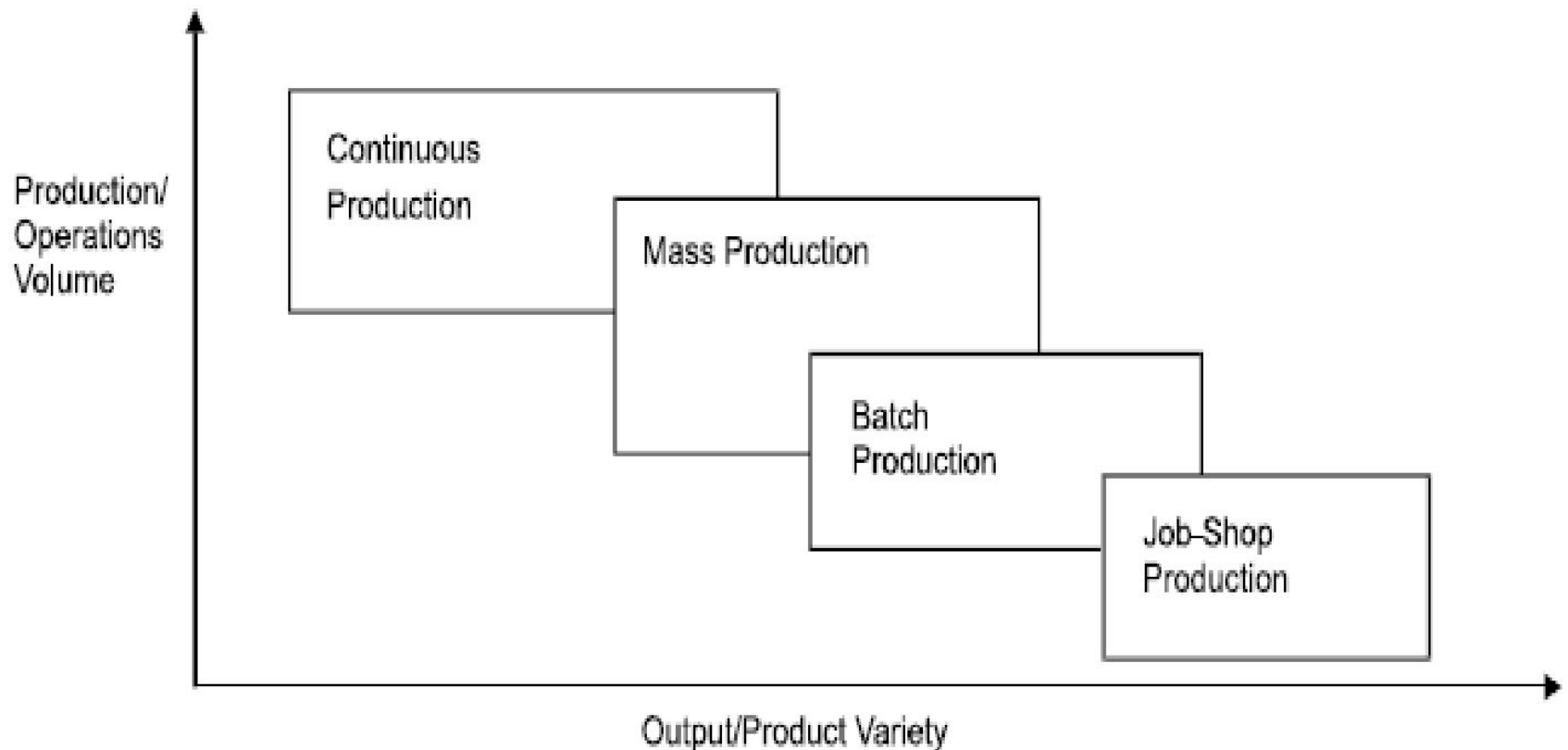
Components of transformation model

4. Feedback

- Information used to control the operation process by adjusting the inputs and transformation process that are used to achieve desired out comes. It can come from both internal and external sources
- **Internal sources:** like testing, evaluation, and continuously improving production process
- **External source:** it includes those who supply raw materials, customers, government and other

Classification of Production System

- Production systems can be classified as Job Shop, Batch, Mass and Continuous Production systems.



Classification of Production System

- **Job shop production**
 - Job shop production are characterized by manufacturing of one or few quantity of products designed and produced as per the specification of customers within prefixed time and cost.
 - The distinguishing feature of this is **low volume and high variety of products**. A job shop comprises of general purpose machines arranged into different departments. Each job demands unique technological requirements, demands processing on machines in a certain sequence.

Classification of Production System

- **Batch production**

- Batch production is defined by American Production and Inventory Control Society (APICS) *“as a form of manufacturing in which the job passes through the functional departments in lots or batches and each lot may have a different routing.”* It is characterized by the **manufacture of limited number of products produced at regular intervals and stocked awaiting sales.**

Classification of Production System

- **Mass production**

- Manufacture of discrete parts or assemblies using a continuous process are called mass production.
- This production system is justified by very large volume of production. The machines are arranged in a line or product layout. Product and process standardization exists and all outputs follow the same path.

Classification of Production System

- **Continuous production**
- Production facilities are arranged as per the sequence of production operations from the first operations to the finished product. The items are made to flow through the sequence of operations through material handling devices such as conveyors, transfer devices, etc.

Production management

- **Production management** is a process of planning, organizing, directing and controlling the activities of the production function.
- It combines and transforms various resources used in the production subsystem of the organization into value added product in a controlled manner as per the policies of the organization.

Production management

- ***E.S. Buffa*** defines production management as, “**Production management** *deals with decision making related to production processes so that the resulting goods or services are produced according to specifications, in the amount and by the schedule demanded and out of minimum cost.*”

Objectives of Production Management

- The objective of the production management is **‘to produce goods services of right quality, quantity, at the right time and right manufacturing cost’**.

1. Right quality

- The quality of product is established based upon the customers needs. The right quality is not necessarily best quality. It is determined by the cost of the product and the technical characteristics as suited to the specific requirements.

2. Right quantity

- The manufacturing organization should produce the products in right number. If they are produced in excess of demand the capital will block up in the form of inventory and if the quantity is produced in short of demand, leads to shortage of products.

Objectives of Production Management

3. Right time

- **Timeliness of delivery** is one of the important parameter to judge the effectiveness of production department. So, the production department has to make the optimal utilization of input resources to achieve its objective.

4. Right manufacturing cost

- Manufacturing costs are established before the product is actually manufactured. Hence, all attempts should be made to produce the products at pre-established cost, so as to reduce the variation between actual and the standard (pre-established) cost.

Operating system

- **Operating system** converts inputs in order to provide outputs which are required by a **customer**.
- It converts physical resources into outputs, the function of which is to satisfy customer wants *i.e.*, to provide some utility for the customer.
- In some of the organization the product is a physical **good** (hotels) while in others it is a **service** (hospitals). Bus and taxi services, tailors, hospital and builders are the examples of an operating system.

Operating system

- **Everett E. Adam & Ronald J. Ebert** define operating system as,
 - *“An operating system (function) of an organization is the part of an organization that produces the organization’s physical **goods and services**.”*
- **Ray Wild** defines operating system as,
 - *“An operating system is a combined for the provision of goods or services.” configuration of resources*

Concept of Operations

- An **operation** is defined in terms of the mission it serves for the organization, technology it employs and the human and managerial processes it involves.
- **Operations in an organization can be categorized into manufacturing operations and service operations.**
 - **Manufacturing operations** is a conversion process that includes manufacturing yields a tangible output: a product,
 - **Service operations**, is a conversion process that includes **service** yields an intangible output: a deed, a performance, an effort.

Distinction between Manufacturing Operations and Service Operations

- Following characteristics can be considered for distinguishing manufacturing operations with service operations:
 1. Tangible/Intangible nature of output
 2. Consumption of output
 3. Nature of work (job)
 4. Degree of customer contact
 5. Customer participation in conversion
 6. Measurement of performance.

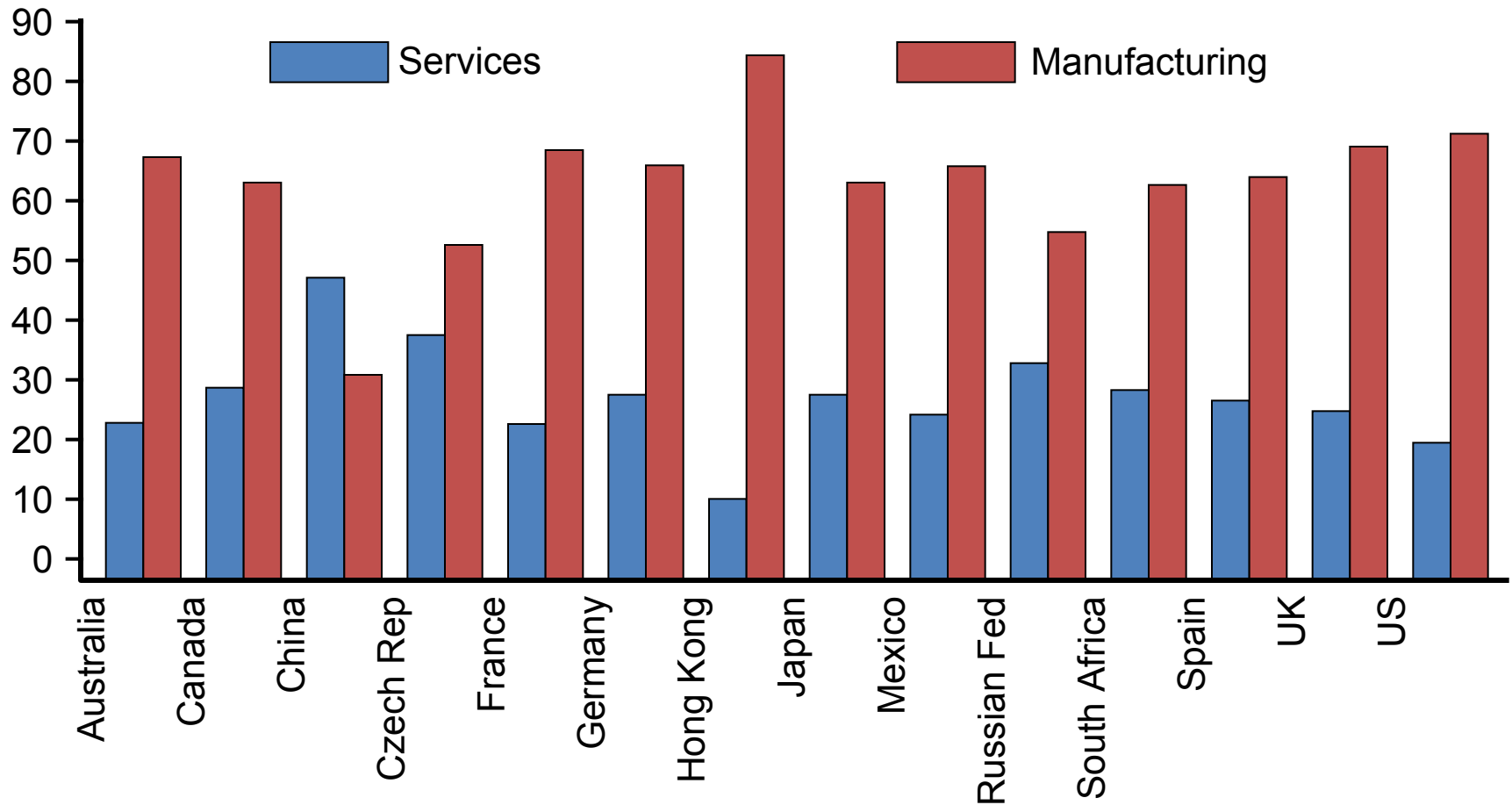
Distinction between Manufacturing Operations and Service Operations

- **Manufacturing** is characterized by tangible outputs (products), outputs that customers consume overtime, jobs that use less labor and more equipment, little customer contact, no customer participation in the conversion process (in production), and sophisticated methods for measuring production activities and resource consumption as product are made.

Distinction between Manufacturing Operations and Service Operations

- **Service** is characterized by intangible outputs, outputs that customers consumes immediately, jobs that use more labor and less equipment, direct consumer contact, frequent customer participation in the conversion process, and elementary methods for measuring conversion activities and resource consumption.
- Some services are **equipment based** namely rail-road services, telephone services and some are **people based** namely tax consultant services, hair styling.

Industry and Services as Percentage of GDP



Goods Versus Services

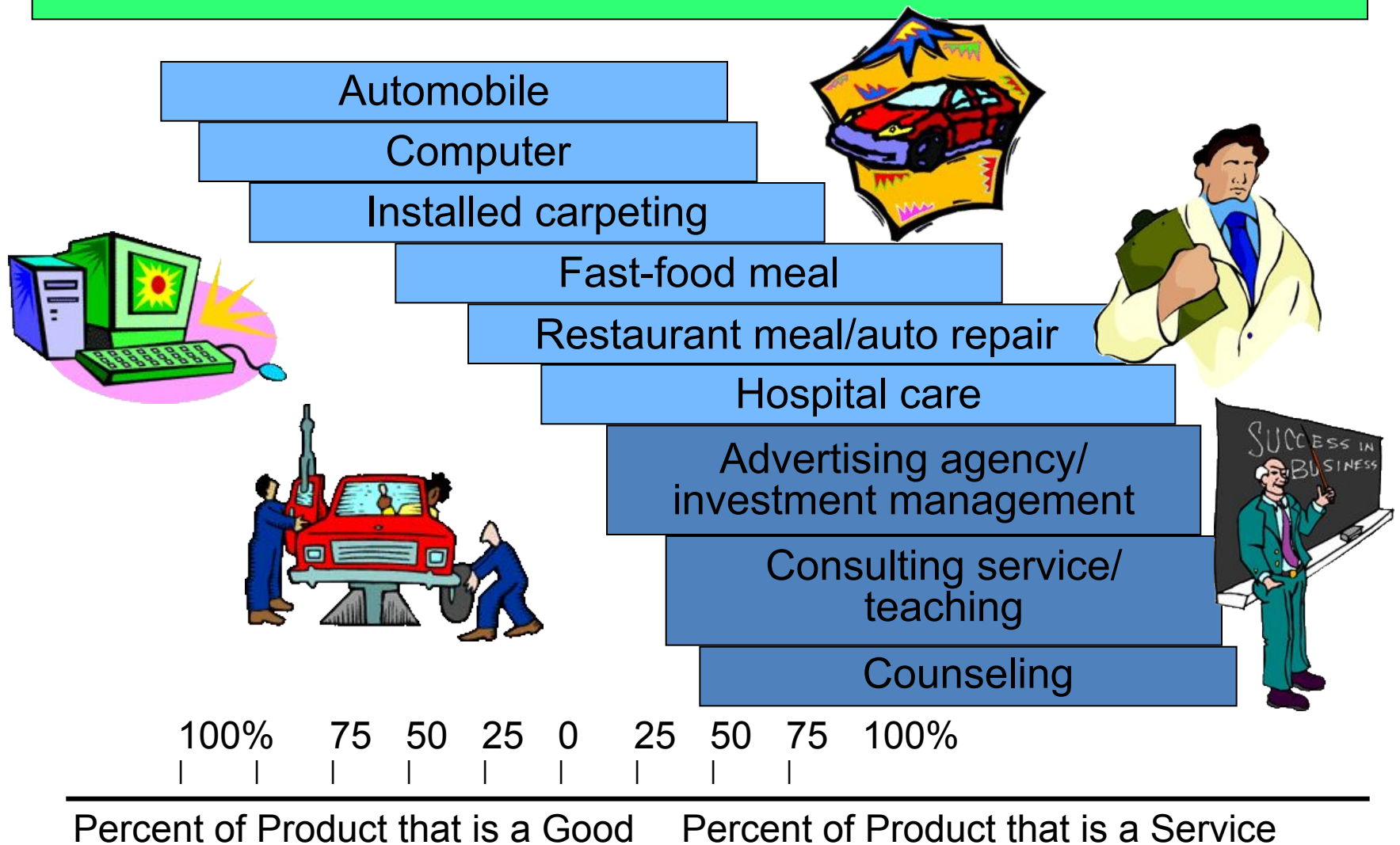
Attributes of Goods (Tangible Product)

Can be resold
Can be inventoried
Some aspects of quality measurable
Selling is distinct from production
Product is transportable
Site of facility important for cost
Often easy to automate
Revenue generated primarily from tangible product

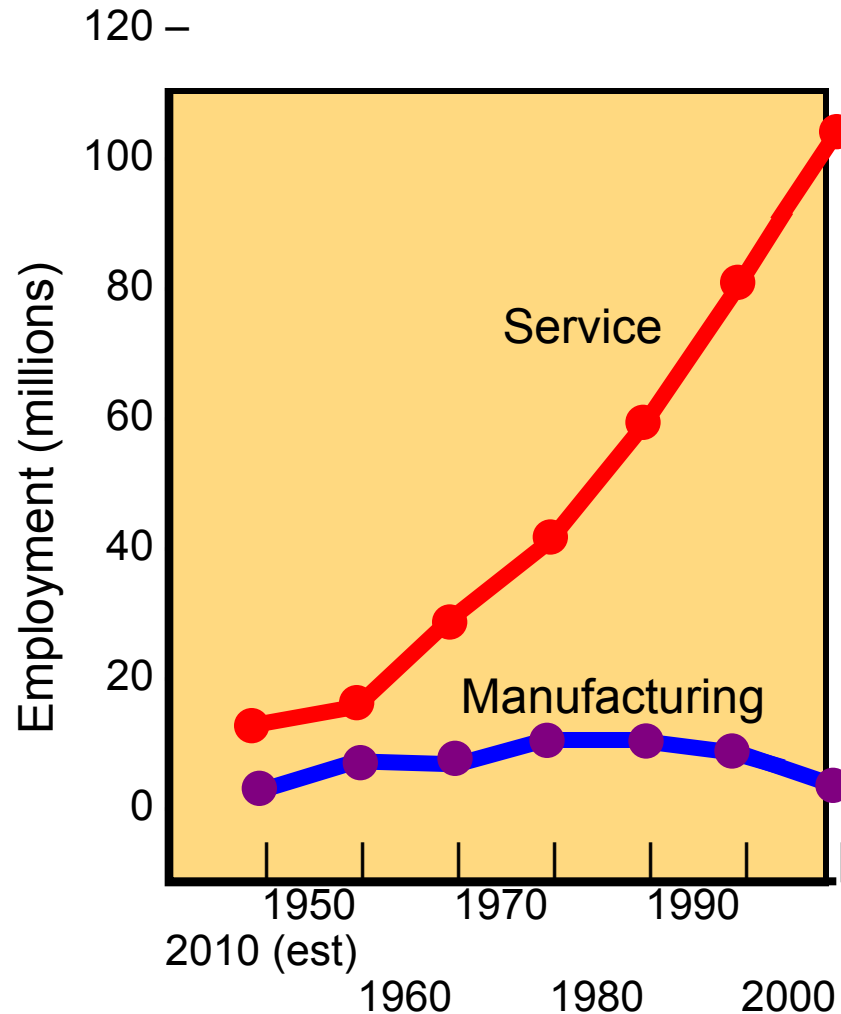
Attributes of Services (Intangible Product)

Reselling unusual
Difficult to inventory
Quality difficult to measure
Selling is part of service
Provider, not product, is often transportable
Site of facility important for customer contact
Often difficult to automate
Revenue generated primarily from the intangible service

Goods and Services



Manufacturing and Service Employment



Operations management

- **A Framework for Managing Operations**

- Managing operations can be enclosed in a frame of general management function as shown in Fig. below.

Operation managers are concerned with **planning, organizing, and controlling** the activities which affect human behavior through models.

Operations management

- **Planning**

- *Activities that establishes a course of action and guide future decision-making is planning.*

- **Organizing**

- *Activities that establishes a structure of tasks and authority.*

- **Controlling**

- *Activities that assure the actual performance in accordance with planned performance.*

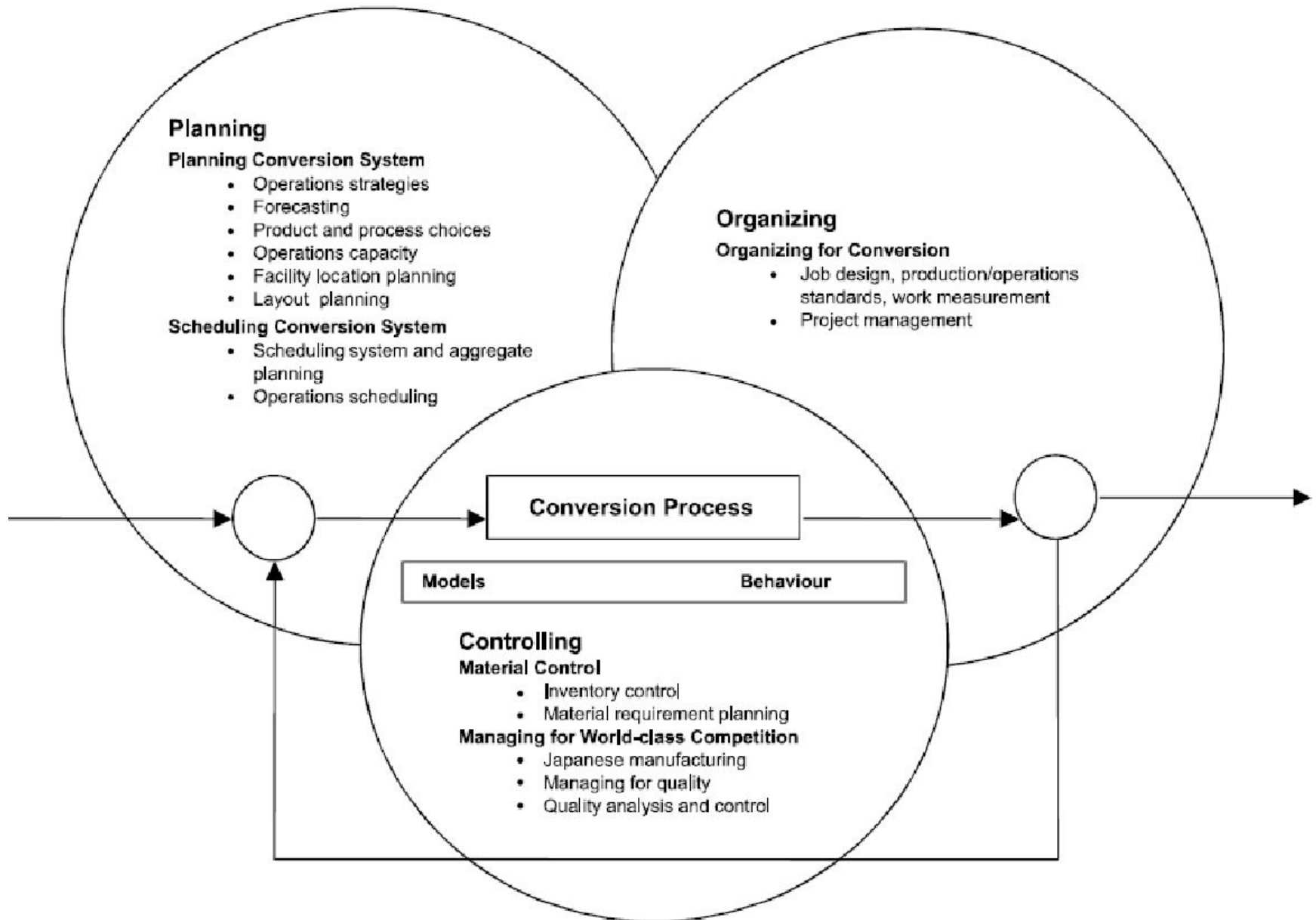
Operations management

- **Behavior**
- **Operation managers are concerned with how their efforts to plan, organize, and control affect human behavior.**
- They also want to know how the behavior of subordinates can affect management's planning, organizing, and controlling actions. Their interest lies in decision-making behavior.

Operations management

- **Models**

- As operation managers plan, organize, and control the conversion process, they encounter many problems and must make many decisions.
- They can simplify their difficulties using models like *aggregate planning models* for examining how best to use existing capacity in short-term, *break even analysis* to identify break even volumes, *linear programming and computer simulation* for capacity utilization, *decision tree analysis* for long-term capacity problem of facility expansion, *simple median model* for determining best locations of facilities etc.



Objectives of Operations Management

- Objectives of operations management can be categorized into **customer service** and **resource utilization**.
- **Customer service**
 - The first objective of operating systems is the customer service to the satisfaction of customer wants. Therefore, customer service is a key objective of operations management.
 - The operating system must provide something to a specification which can satisfy the customer in **terms of cost and timing**. Thus, primary objective can be satisfied by providing the '**right thing at a right price at the right time**'.

Objectives of Operations Management

- **Resource utilization**

- Another major objective of operating systems is to utilize resources for the satisfaction of customer wants effectively, *i.e.*, customer service must be provided with the achievement of effective operations through efficient use of resources.
- Inefficient use of resources or inadequate customer service leads to commercial failure of an operating system.

Objectives of Operations Management

- Operations management is concerned essentially with the utilization of resources,
 - *i.e.*, **obtaining maximum effect from resources or minimizing their loss, under utilization or waste.**
- The extent of the utilization of the resources' potential might be expressed in terms of the proportion of available time used or occupied, space utilization, levels of activity, etc.
- Each measure indicates the extent to which the potential or capacity of such resources is utilized. This is referred as the objective of resource utilization.

Objectives of Operations Management

- Operations management is also concerned with the achievement of **both satisfactory customer service and resource utilization.**
- An improvement in one will often give rise to deterioration in the other. Often both cannot be maximized, and hence **a satisfactory performance must be achieved on both objectives.** All the activities of operations management must be tackled with these two objectives in mind, and many of the problems will be faced by operations managers because of this conflict. Hence, operations managers must attempt to balance these basic objectives.

Objectives of Operations Management

The customer service objective.	The resource utilization objective.
To provide agreed/adequate levels of customer service (and hence customer satisfaction) by providing goods or services with the right specification, at the right cost and at the right time.	To achieve adequate levels of resource utilization (or productivity) e.g., to achieve agreed levels of utilization of materials, machines and labor.

Managing global operations

- **'Globalization'** is:
 - Businesses' **deployment of facilities and operations around the world.**
 - A process in which **geographic distance** becomes a factor of diminishing importance in the establishment and maintenance of **cross border economic, political and socio-cultural relations.**
 - Worldwide drive toward a globalized economic system dominated by supranational corporate trade and banking institutions that are not accountable to democratic processes or national governments.

Managing global operations

- There are four developments, which have spurred the trend toward globalization. These are:
 1. Improved transportation and communication technologies;
 2. Opened financial systems;
 3. Increased demand for imports; and
 4. Reduced import quotas and other trade barriers.

Managing global operations

- When a firm sets up facilities abroad:
 - It involve some added **complexities** in its operation.
 - Global markets impose new standards on quality and time.
 - Managers should not think about domestic markets first and then global markets later, rather it could be **think globally and act locally**.
 - They must have a good **understanding of their competitors**.
 - Some other important challenges of managing multinational operations include:
 - **Languages and customs, different management style, unfamiliar laws and regulations, and different costs.**

Managing global operations

- Managing global operations would focus on the following key issues:
 - To acquire and properly utilize the following concepts and those related to **global operations, supply chain, logistics**, etc.
 - To associate global historical events to key drivers in global operations from different perspectives.
 - To develop criteria for **conceptualization** and **evaluation** of different global operations.

Managing global operations

- To associate success and failure cases of global operations to **political, social, economical and technological environments**.
- **To envision trends in global operations.**
- To develop an **understanding of the world vision regardless of their country of origin, residence or studies in a respectful way of perspectives of people from different races, studies, preferences, religion, politic affiliation, place of origin, etc.**

Scope of production and operations management

- Production and operations management concern with the **conversion of inputs into outputs, using physical resources, so as to provide the desired utilities to the customer while meeting the other organizational objectives of effectiveness, efficiency and adoptability.**
- It distinguishes itself from other functions such as personnel, marketing, finance, etc., by its primary concern for **‘conversion by using physical resources.’**

Scope of production and operations management

Following are the activities which are listed under production and operations management functions:

1. Location of facilities
2. Plant layouts and material handling
3. Product design
4. Process design
5. Production and planning control
6. Quality control
7. Materials management
8. Maintenance management.

Productivity measurement

- ***Productivity*** is the ratio of outputs (goods and services) divided by the inputs (resources, such as labor and capital).
- The operations manager's job is to enhance (improve) this ratio of outputs to inputs.
- Improving productivity means improving efficiency.
- **This improvement can be achieved in two ways:**
 - Reduction in inputs while output remains constant,
 - An increase in output while inputs remain constant.

Productivity

$$\text{Productivity} = \frac{\text{Units produced}}{\text{Input used}}$$

- Measure of process improvement***
- Represents output relative to input***
- Only through productivity increases can our standard of living improve***

Productivity Measurement

Productivity = Output

Labor + Material+ Energy+ Capital + Miscellaneous

For example, if units produced =1000 and labor hours used is 250, then

$$\text{Productivity} = \frac{\text{Units produced}}{\text{Labor-hours used}} = \frac{1000}{250} = 4 \text{ units/labor hour}$$

- The use of just one resource input to measure productivity as shown above, is known as ***single factor productivity***.
- However, a broader view of productivity is ***multifactor productivity*** (*total factor productivity*), which includes all inputs (e.g., labor, material, energy, capital).

Multi-Factor Productivity

$$\text{Productivity} = \frac{\text{Output}}{\text{Labor} + \text{Material} + \text{Energy} + \text{Capital} + \text{Miscellaneous}}$$

- Also known as total factor productivity
- Output and inputs are often expressed in dollars

Multiple resource inputs \Rightarrow multi-factor productivity

Productivity Measurement

Example:

- Collins Title Company has a staff of 4 each working 8 hours per day (for a payroll cost of \$640 /day) and overhead expenses of \$400 per day. Collins processes and closes on 8 titles each day. The company recently purchased a computerized title-search system that will allow the processing of 14 titles per day. Although the staff, their work hours, and pay will be the same, the overhead expenses are now \$800 per day.

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

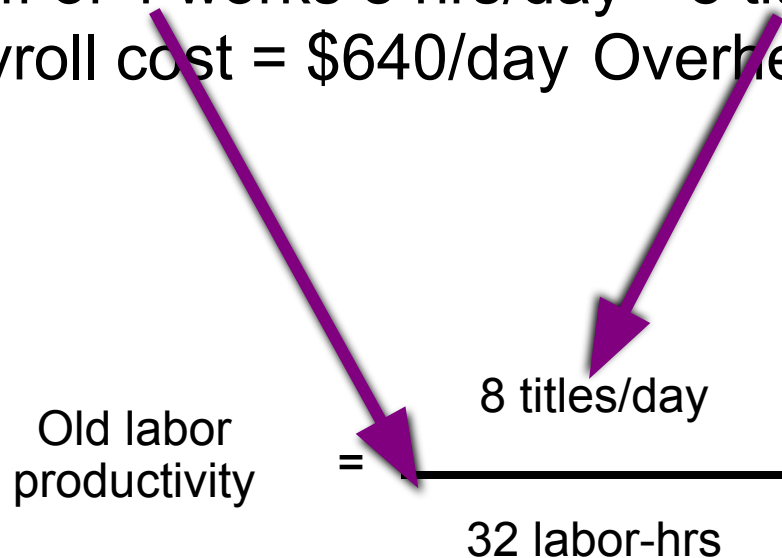
Payroll cost = \$640/day Overhead = \$400/day

Old labor
productivity

=

8 titles/day

32 labor-hrs



Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

$$\text{Old labor productivity} = \frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} = .25 \text{ titles/labor-hr}$$

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

Old labor productivity = $\frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} = .25 \text{ titles/labor-hr}$

New labor productivity = $\frac{14 \text{ titles/day}}{32 \text{ labor-hrs}}$

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

$$\begin{array}{l} \text{Old labor} \\ \text{productivity} \end{array} = \frac{8 \text{ titles/day}}{32 \text{ labor-hrs}} = .25 \text{ titles/labor-hr}$$

$$\begin{array}{l} \text{New labor} \\ \text{productivity} \end{array} = \frac{14 \text{ titles/day}}{32 \text{ labor-hrs}} = .4375 \text{ titles/labor-hr}$$

Labor productivity has increased from 0.25 to 0.4375. The change is $0.4375 \div 0.25 = 1.75$ or a 75% increase in labor productivity.

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

$$\text{Old multifactor productivity} = \frac{8 \text{ titles/day}}{\$640 + 400}$$

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

$$\begin{array}{l} \text{Old multifactor} \\ \text{productivity} \end{array} = \frac{8 \text{ titles/day}}{\$640 + 400} = .0077 \text{ titles/dollar}$$

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

Old multifactor
productivity

$$= \frac{8 \text{ titles/day}}{\$640 + 400} = .0077 \text{ titles/dollar}$$

New multifactor
productivity

$$= \frac{14 \text{ titles/day}}{\$640 + 800}$$

Collins Title Productivity

Old System:

Staff of 4 works 8 hrs/day 8 titles/day

Payroll cost = \$640/day Overhead = \$400/day

New System:

14 titles/day Overhead = \$800/day

$$\text{Old multifactor productivity} = \frac{8 \text{ titles/day}}{\$640 + 400} = .0077 \text{ titles/dollar}$$

$$\text{New multifactor productivity} = \frac{14 \text{ titles/day}}{\$640 + 800} = .0097 \text{ titles/dollar}$$

Multifactor productivity has increased from 0.0077 to 0.0097. This change is $0.0097 \div 0.0077 = 1.259$, or a 25.9% increase in multifactor productivity.

Measurement Problems

- **Quality** may change while the quantity of inputs and outputs remains constant
- **External elements** may cause an increase or decrease in productivity
- **Precise units** of measure may be lacking

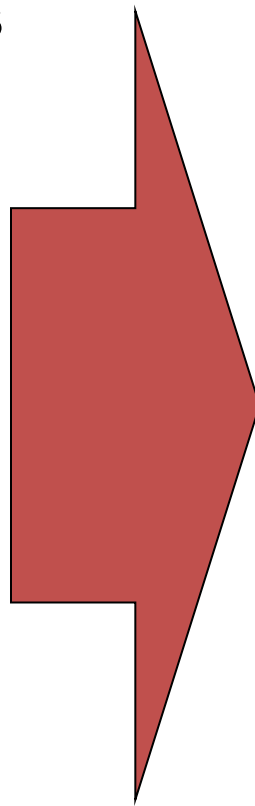
Why Study OM?

- OM is one of three major functions (marketing, finance, and operations) of any organization***
- We want (and need) to know how goods and services are produced***
- We want to understand what operations managers do***
- OM is such a costly part of an organization***

New Challenges in OM

From

- Local or national focus
- Batch shipments
- Low bid purchasing
- Lengthy product development
- Standard products
- Job specialization



To

- ***Global focus***
- ***Just-in-time***
- ***Supply chain partnering***
- ***Rapid product development, alliances***
- ***Mass customization***
- ***Empowered employees, teams***

Ethics and Social Responsibility

Challenges facing operations managers:

- Developing and producing safe, quality products
- Maintaining a clean environment
- Providing a safe workplace
- Honouring community commitments