OPERATIONS MANAGEMENT

“THE HEART OF ALL MANAGEMENT DISCIPLINES WHICH BRING COMPETITIVE ADVANTAGE AND MARKET FOCUS FOR ALL BUSINESS ORGANIZATION.”

- **Production** is the creation of goods and services. The field of production management in the past focused almost exclusively on manufacturing management, with a heavy emphasis on the methods and techniques used in operating a factory.
- In recent years, the scope of production management has broadened considerably. Production concepts and techniques are applied to a wide range of activities and situations *outside* manufacturing; that is, in *services* such as health care, food service, recreation, banking, hotel management, retail sales, education, transportation, and government.

- This broadened scope has given the field the name *production/operations management*, or more simply, **operations management**, a term that more closely reflects the diverse nature of activities to which its concepts and techniques are applied.

1.2Historical Development of Operation Management

- For over two centuries operations and production management has been recognized as an important factor in a country's economic growth
- The traditional view of 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.

- In the early twentieth century, F.W. Taylor implemented Smith's theories and developed scientific management.
- From then till 1930, many techniques were developed prevailing the traditional view.
- Brief information about the contributions to manufacturing management is shown in the Table 1.1.

Date	Contribution	Contributor	Date
1776	Specialization of labour in manufacturing	Adam Smith	1776
1799	Interchangeable parts, cost accounting	Eli Whitney and others	1799
1832	Division of labour by skill; assignment of jobs by skill; basics of time study	Charles Babbage	1832
1900	Scientific management time study and work study developed; dividing planning and doing of work	Frederick W. Taylor	1900
1900	Motion of study of jobs	Frank B. Gilbreth	1900
1901	Scheduling techniques for employees, machines jobs in manufacturing	Henry L. Gantt	1901
1915	Economic lot sizes for inventory control	F.W. Harris	1915

1927	Human relations; the Hawthorne studies	Elton Mayo
1931	Statistical inference applied to product quality: quality control charts	W.A. Shewart
1935	Statistical sampling applied to quality control: inspection sampling plans	H.F. Dodge &H.G. Roming
1940	Operations research applications in World War II	P.M. Blacker and others
1946	Digital computer	John Mauchlly and J.P. Eckert
1947	Linear programming	G.B. Dantzig, Williams & Others
1950	Mathematical programming, on-linear and stochastic processes	A. Charnes, W.W. Cooper & others
1951	Commercial digital computer: large-scale computations Available	Sperry Univac
1960	Organizational behavior: continued study of people at work	L. Cummings, L. Porter
1970	Integrating operations into overall strategy and policy, Computer applications to manufacturing, Scheduling and control, Material requirement planning (MRP)	W. Skinner J. Orlicky and G. Wright
1980	Quality and productivity applications from Japan: robotics, CAD-CAM	W.E. Deming and J. Juran

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.

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. With the 1970s emerge two distinct changes in our views.
- The most obvious of these, reflected in the new name **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.

What is Operations Management?

What is Operations Management?

- **Operations management** is the set of activities that creates goods and services through the transformation of inputs into outputs.
- Activities creating goods and services take place in all organizations (firms), the production activities that create goods are usually quite obvious.
- In them, we can see the creation of a tangible product such as cement or cloth.

- In organizations that do not create physical products, the production function may be less obvious.
- An example is the transformation that takes place at a bank, hospital, airline, or college.
- Regardless of whether the end product is good or service the production activities that go on in the organization are often referred to as operations or *operations management.*

Operations management is the study of decision-making in the operations function.

Three points in this definition deserve emphasis:

- **Decisions-** Decision-making is an important element of operations management. There are four major decision responsibilities in operations management.
  - Process
  - Quality
  - Capacity
  - Inventory

- **Function-** Operations is a major function in any organization, along with marketing and finance.
- The operations function is responsible for supplying or producing products and services for the business.
- In a manufacturing company, the operations function is typically called the manufacturing or production department.
- In service organizations, the operations function is called the operations department.
- In general the term “operations” refers to the function that produces goods or services.

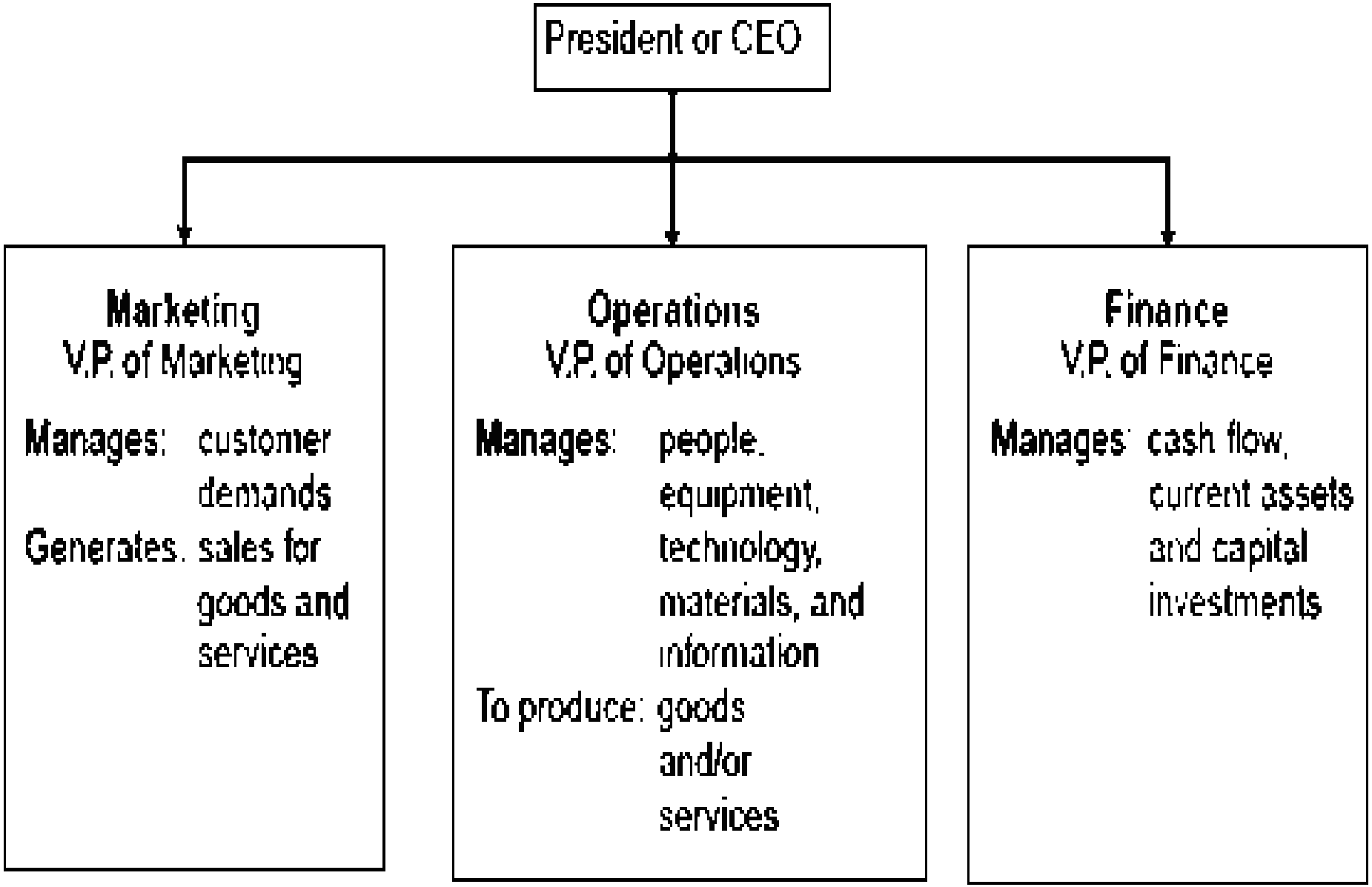


FIGURE 1-1 Organizational chart showing the three major business functions

- Every business is managed through three major functions: finance, marketing, and operations management.
- Figure 1.1 illustrates this by showing that the vice presidents of each of these functions reports directly to the president or CEO of the company.
- Other business functions—such as purchasing, human resources, and engineering—support these three major functions. *Finance* is the function responsible for managing cash flow, current assets, and capital investments.
- *Marketing* is responsible for sales, generating customer demand, and understanding customer wants and needs.

- **An operation is** responsible for supplying the product or service of the organization. Operations managers make decisions regarding the operations function and its connection with other functions.

- **System-** The transformation systems produce goods and services. Using the systems view, we consider operations managers as managers of the conversion process in the firm.
- **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).*
- It is a set of activities that creates goods and services through the transformation of inputs into outputs. 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**

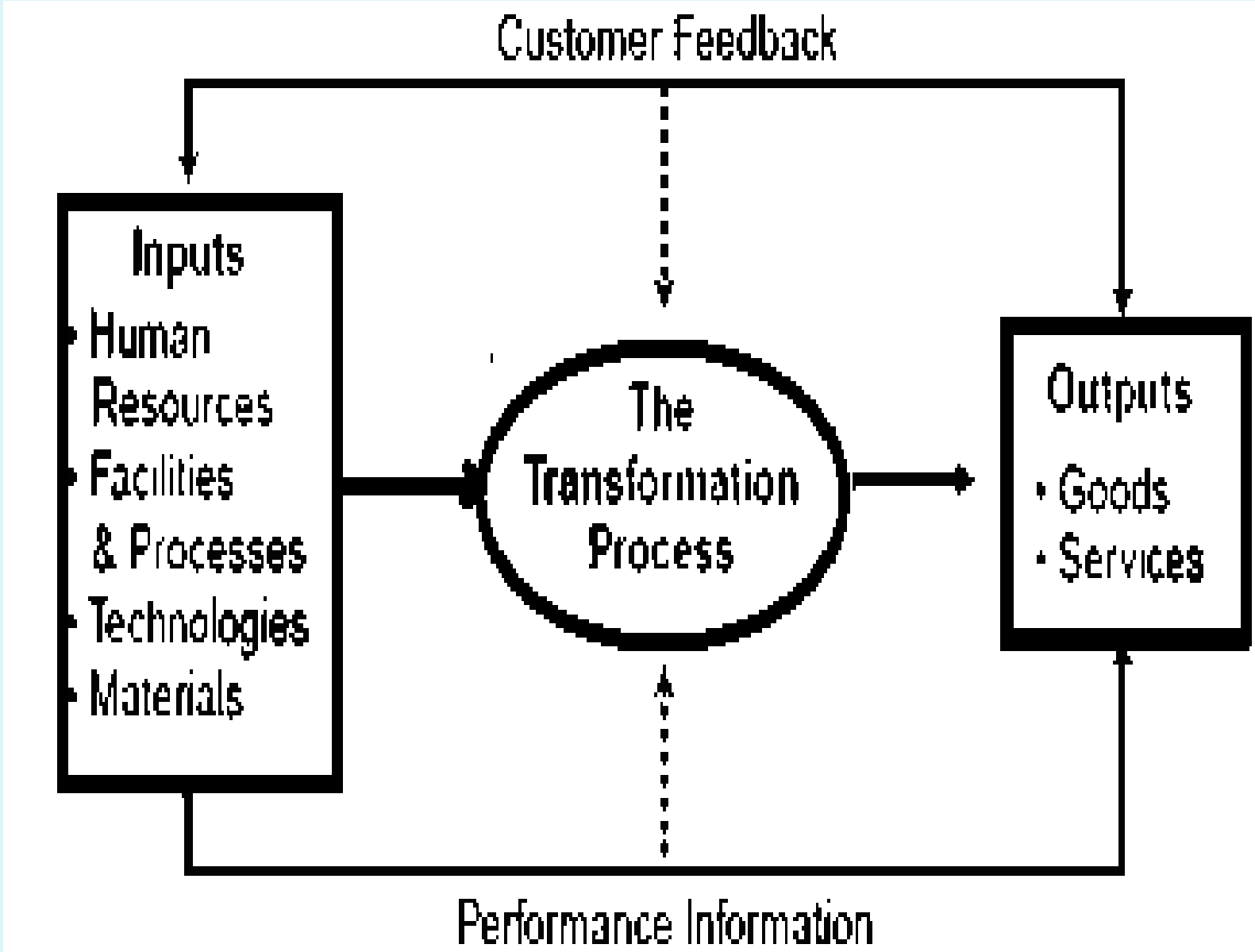


FIGURE 1-2 The transformation process

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

- **2. Out puts**
- Output is 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.

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

Feed back

- 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
- **Boundary of the system**

The role of OM

- The business function that plan, organizes, coordinates and controls the resource needed to produce a company's goods and service.
- OM involves managing people, equipment, technology, information and many other resources.
- To transform a company's input into output (finished products)
- In general, OM is responsible for orchestrating all the resource needed to produce the final product and service. This includes
- Designing the product or service
- Deciding what resources are needed
- Arranging schedules, equipment, and other facilities
- Managing inventory
- Controlling quality
- Designing jobs to make sub products
- Designing work methods

Manufacturing Operations and Service 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,
- whereas, a conversion process that includes **service yields** an intangible output: a deed, a performance, an effort.

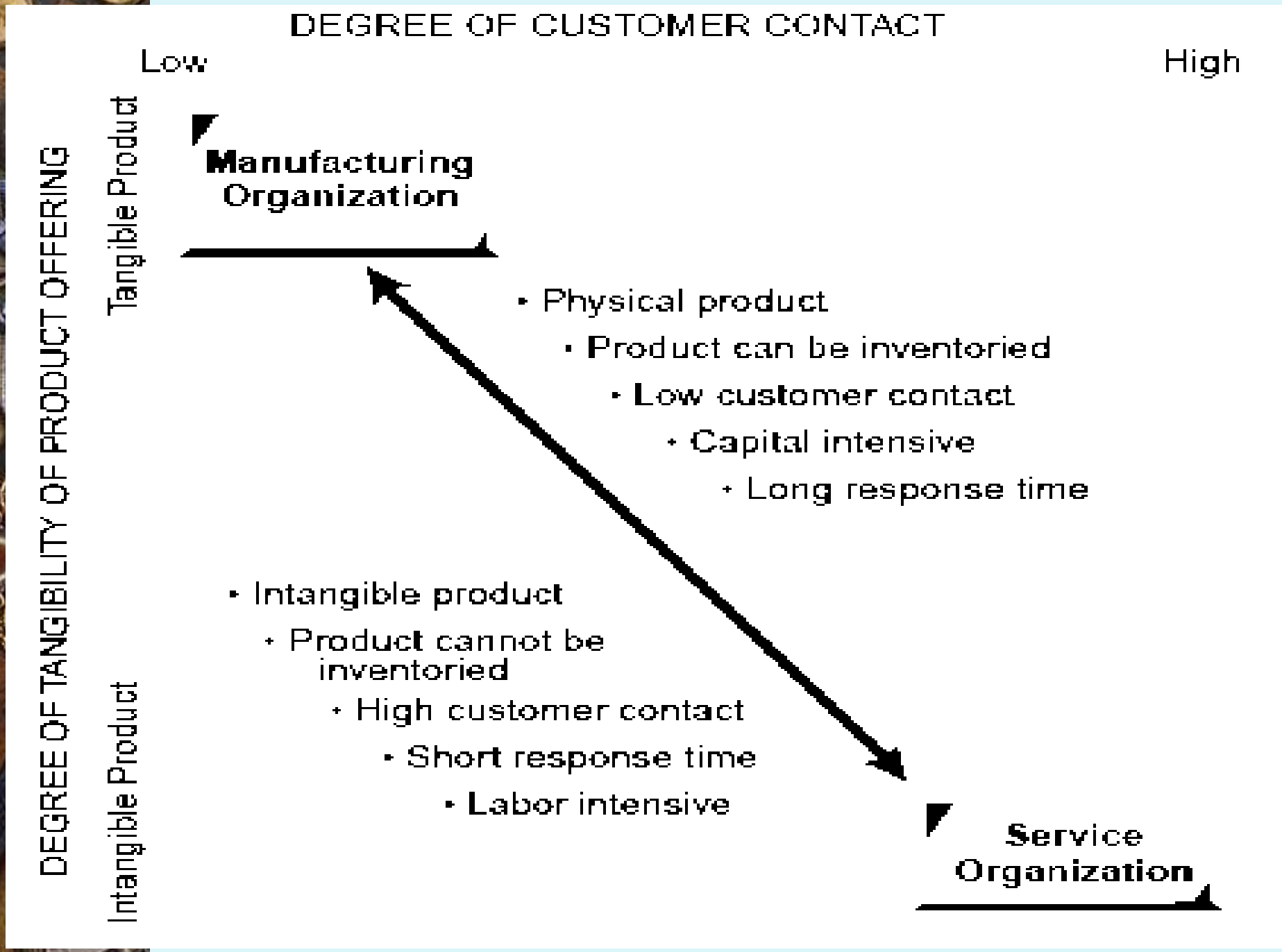
Distinction between Manufacturing Operations and Service Operations

- 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.

- Manufacturing is characterized by tangible outputs (products), outputs that customers consume overtime, jobs that use less labour 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.

- Service is characterized by intangible outputs, outputs that customers consumes immediately, jobs that use more labour 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


DEGREE OF CUSTOMER CONTACT
Low
High
DEGREE OF TANGIBILITY OF PRODUCT OFFERING
Tangible Product
Intangible Product
Manufacturing Organization
• Physical product
• Product can be inventoried
• Low customer contact
• Capital intensive
• Long response time
• Intangible product
• Product cannot be inventoried
• High customer contact
• Short response time
• Labor intensive
Service Organization

- **1.4 Operations Decisions**
- An operation has responsibility for five major decision areas: process, capacity, inventory, work force, and quality.
- ***Process***: Decisions in this category determine the physical process or facility used to produce the product or service. The decisions include the type of equipment and technology, process flows, layout, and all other aspects of the physical plant or service facility. It is important that the physical process be designed on relation to the long strategic posture of the business.

- ***Inventory***: Inventory decisions in operations determine what to order, how much to order, and when to order. Inventory control systems are used to manage materials from purchasing through raw materials, work in process, and finished goods inventories. They manage the flow of materials within the firm.
- ***Work force***: Work force decisions include selection, hiring, firing, training, supervision, and compensation. Managing the work force in a productive and humane way is a key task for operations today.

- ***Quality***: Quality is an important operations responsibility which requires total organizational support. Quality decisions must ensure that quality is built into the product in all stages of operations, standard must be set, equipment designed, people trained, and product or service inspected for quality to result.

Productivity

- The creation of goods and service requires changing resources into goods and services. The more efficiently we make this change the more productive we are.
- *Productivity* is the ratio of outputs (goods and services) divided by the inputs (resources, such as labor and capital).
- Productivity is defined in terms of utilization of resources, like material and labour. In simple terms, productivity is the ratio of output to input. For example, productivity of labour can be measured as units produced per labour hour worked. Productivity is closely inked with quality, technology and profitability.

- Hence, there is a strong stress on productivity improvement in competitive business environment.

Productivity can be improved by

- (*a*) controlling inputs,
- (*b*) improving process so that the same input yields higher output, and
- (*c*) by improvement of technology.

Productivity can be measured at firm level, at industry level, at national level and at international level.

Productivity Improvement Techniques

- **(A) TECHNOLOGY BASED**
- 1. **Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), and Computer Integrated Manufacturing Systems (CIMS):** CAD refers to design of products, processes or systems with the help of computers. The impact of CAD on human productivity is significant for the advantages of CAD are:
- Speed of evaluation of alternative designs,
- Minimization of risk of functioning, and
- Error reduction

- CAM is very much useful to design and control the manufacturing. It helps to achieve the effectiveness in production system by line balancing
- Production Planning and Control
- Capacity Requirements Planning (CRP), Manufacturing Resources Planning (MRP II) and Materials Requirement Planning (MRP)
- Automated Inspection.

- **Computer integrated manufacturing:** Computer integrated manufacturing is characterized by automatic line balancing, machine loading (scheduling and sequencing), automatic inventory control and inspection.
- Robotics
- Laser technology
- Modern maintenance techniques
- Energy technology
- Flexible Manufacturing System (FMS)

- **(B) EMPLOYEE BASED**
- Financial and non-financial incentives at individual and group level.
- Employee promotion.
- Job design, job enlargement, job enrichment and job rotation.
- Worker participation in decision-making
- Quality Circles (QC), Small Group Activities (SGA)
- Personal development.
- **(C) MATERIAL BASED**
- Material planning and control
- Purchasing, logistics
- Material storage and retrieval
- Source selection and procurement of quality material
- Waste elimination.

- **(D) PROCESS BASED**
- Methods engineering and work simplification
- Job design evaluation, job safety
- Human factors engineering.
- **(E) PRODUCT BASED**
- Value analysis and value engineering
- Product diversification
- Standardization and simplification
- Reliability engineering
- Product mix and promotion.

(F) TASK BASED

- Management style
- Communication in the organization
- Work culture
- Motivation
- Promotion group activity.

- 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:

- A reduction in inputs while output remains constant, or
- An increase in output while inputs remain constant.

Productivity Measurement

- Productivity = $\frac{\text{Units Produced}}{\text{Input used}}$

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

Productivity = $\frac{\text{Units produced}}{\text{Labor-hours used}}$ =

$\frac{1000}{250}$ = 4 units/ per 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*, which includes all inputs (e.g., labor, material, energy, capital).
- Multifactor productivity is also known as *total factor productivity*.
- Multifactor productivity is calculated by combining the input units, as shown below:

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

Example

- Biruk Textile 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. Company 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.

- **ILLUSTRATION 1:** A company produces 160 kg of plastic molded parts of acceptable quality by consuming 200 kg of raw materials for a particular period. For the next period, the output is doubled (320 kg) by consuming 420 kg of raw material and for a third period; the output is increased to 400 kg by consuming 400 kg of raw material.
- **SOLUTION:** During the first year, production is 160 kg
- Productivity =Output/Input = 160/200
- = 0.8 or 80%
- For the second year, production is increased by 100%
- Productivity =Output/Input =320/420
- = 0.76 or 76% ↓

- For the third period, production is increased by 150%
- Productivity = Output/Input = 400/400
- = 1.0, *i.e.*, 100%
- From the above illustration it is clear that, for second period, though production has doubled, productivity has decreased from 80% to 76% for period third, production is increased by 150% and correspondingly productivity increased from 80% to 100%.

- **ILLUSTRATION 2:** The following information regarding the output produced and inputs consumed for a particular time period for a particular company is given below:
- Output – birr 10,000
- Human input – birr 3,000
- Material input – birr 2,000
- Capital input – birr 3,000
- Energy input – birr 1,000
- Other misc. input –birr 500
- The values are in terms of base year birr value. Compute various productivity indices.

SOLUTION:

Partial productivity

1. Labour productivity = Output/Human input
   =10,000/3,000 = 3.33
2. Capital productivity =Output/Capital input
   =10,000/3,000 = 3.33
3. Material productivity =Output/Material input
   =10,000/2,000 = 5.00
4. Energy productivity = Output/Energy input
   =10,000/1,000 = 10.00
5. Other misc. expenses =Output/Other misc. input
   = 10,000/500
   = 20.00

= Total output /(Human + Material + Capital + Energy + Other misc. input)

$$\frac{10{,}000}{3{,}000 + 2{,}000 + 3{,}000 + 1{,}000 + 500}$$

$$\frac{10{,}000}{9{,}500} = \mathbf{1.053}$$