

# **ENGINEERING MANAGEMENT**

## **INTRODUCTION TO ENGINEERING MANAGEMENT**

# Adam Smith's Contribution to the Field of Management

- Wrote the *Wealth of Nations* (1776)
  - Advocated the economic advantages that organizations and society would reap from the division of labor:
    - Increased productivity by increasing each worker's skill.
    - Time saved that is commonly lost in changing tasks.
    - The creation of labor-saving inventions and machinery.

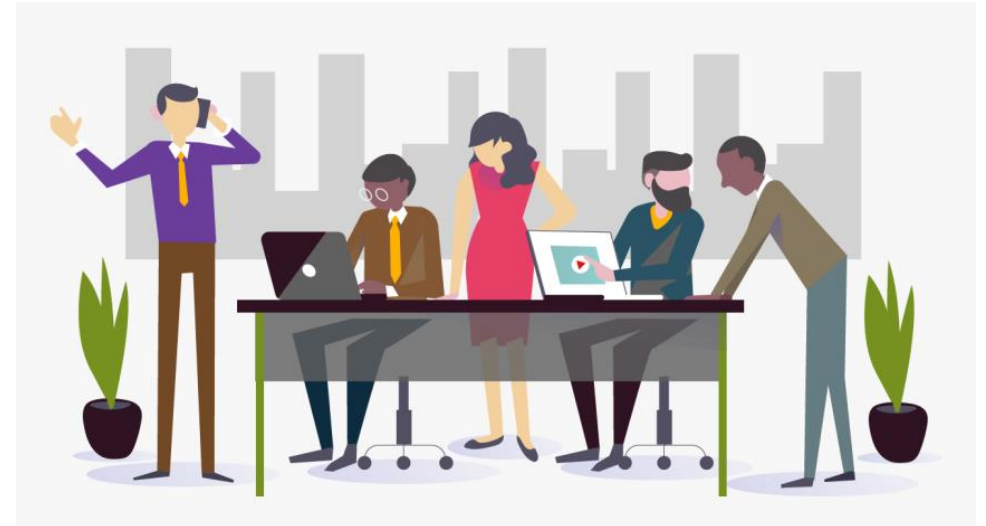
## Competitive Advantage

- Four sets of factors contribute to a nation's well-being (Michael Porter)
  - Resource, labor cost, skills and education of people
  - Demand conditions of a nation (market size, advertisement)
  - Suppliers (location of suppliers)
  - Firm's strategy and structure and rivalry

# Difference between a Manager and Management

➡ A **Manager** is someone who coordinates and oversees the work of other people so that organizational goals and objectives can be accomplished.

➡ **Management** in all business areas and organizational activities are the acts of getting people together to accomplish desired goals and objectives.



➡ **Organizations** comprises of people working together and coordinating their actions to achieve specific goals.

# Difference between Objectives and Goals

## What are Goals?

- 👉 A **goal** is a short statement of a **desired outcome** to be accomplished over a **long-time frame**, usually three to five years.
- 👉 It is a broad statement that focuses on the desired results and does not describe the methods used to get the intended outcome.

Some common examples of business goals include the following:

- ➡ Maximizing profits
- ➡ Increasing efficiency
- ➡ Becoming an industry leader
- ➡ Becoming carbon-neutral
- ➡ Growing revenues
- ➡ Providing excellent customer service
- ➡ Creating a brand

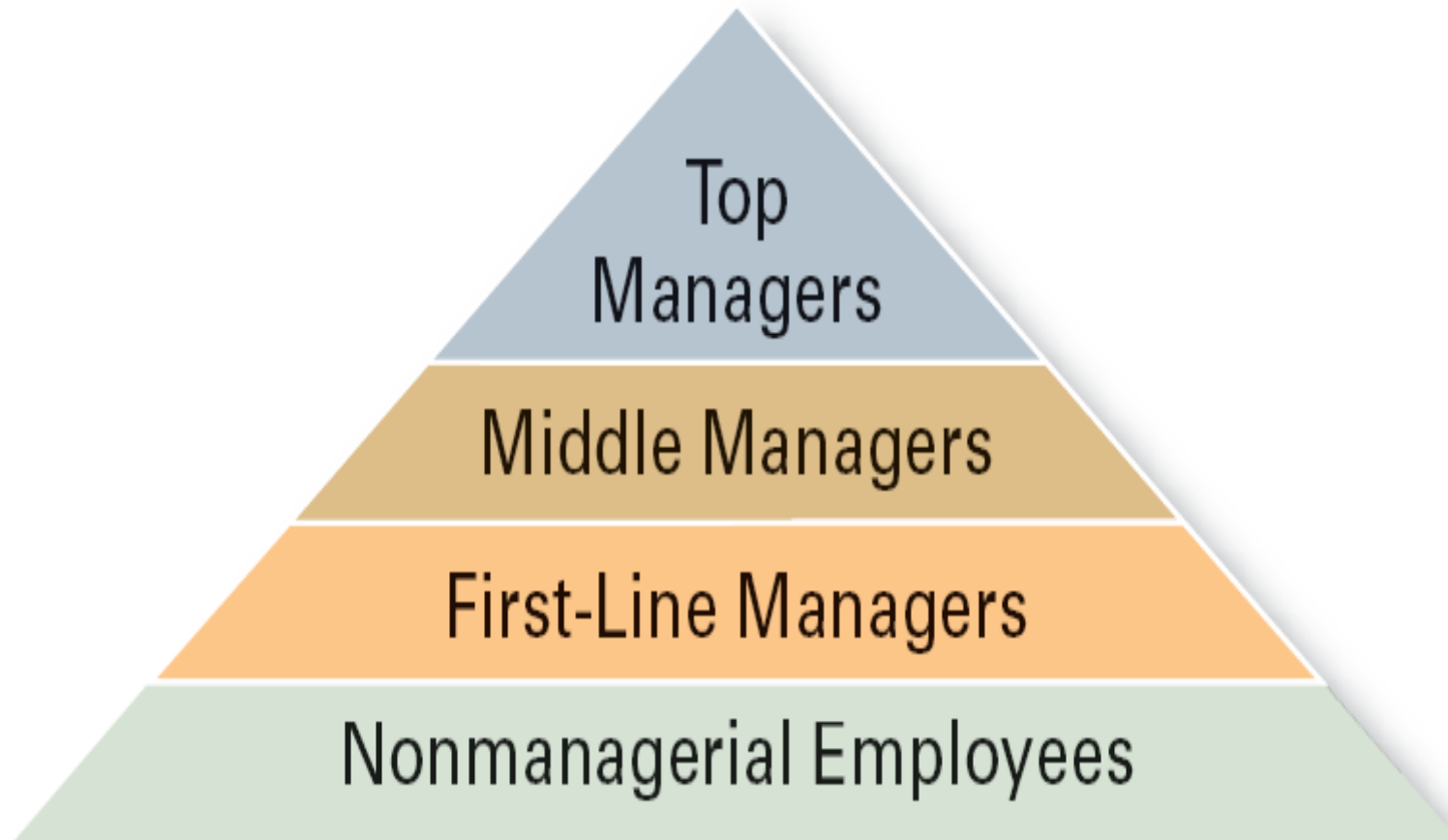
# Resources needed by an Organization

## Resources

Resources are organizational assets and include:

- \* People
- \* Machinery
- \* Raw materials
- \* Information
- \* Skills
- \* Financial capital

# Levels of Management



# Classification of Managers

## First-line Managers

- Individuals who manage the work of non-managerial employees.

## Middle Managers

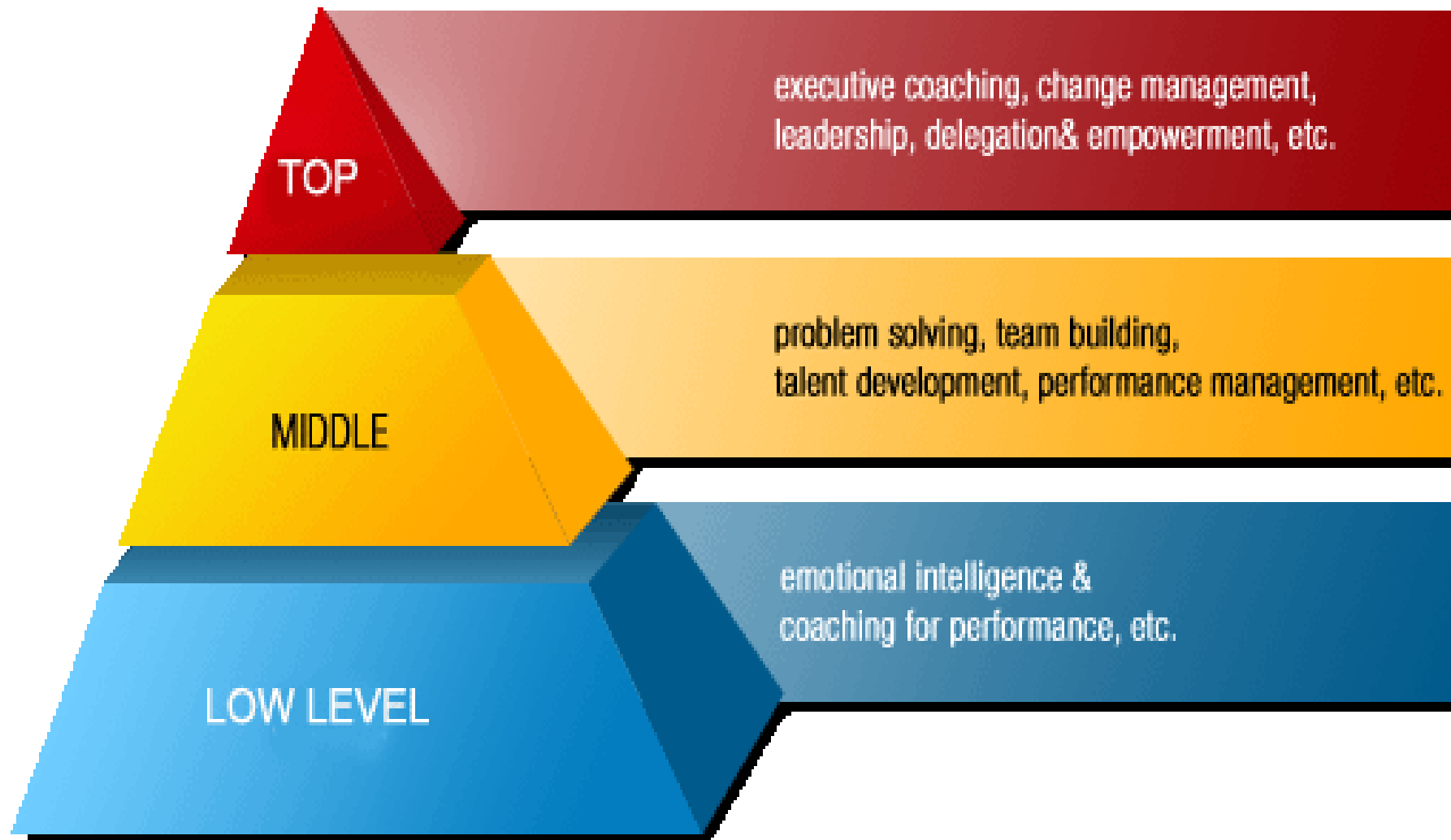
- Individuals who manage the work of first-line managers.

## Top Managers

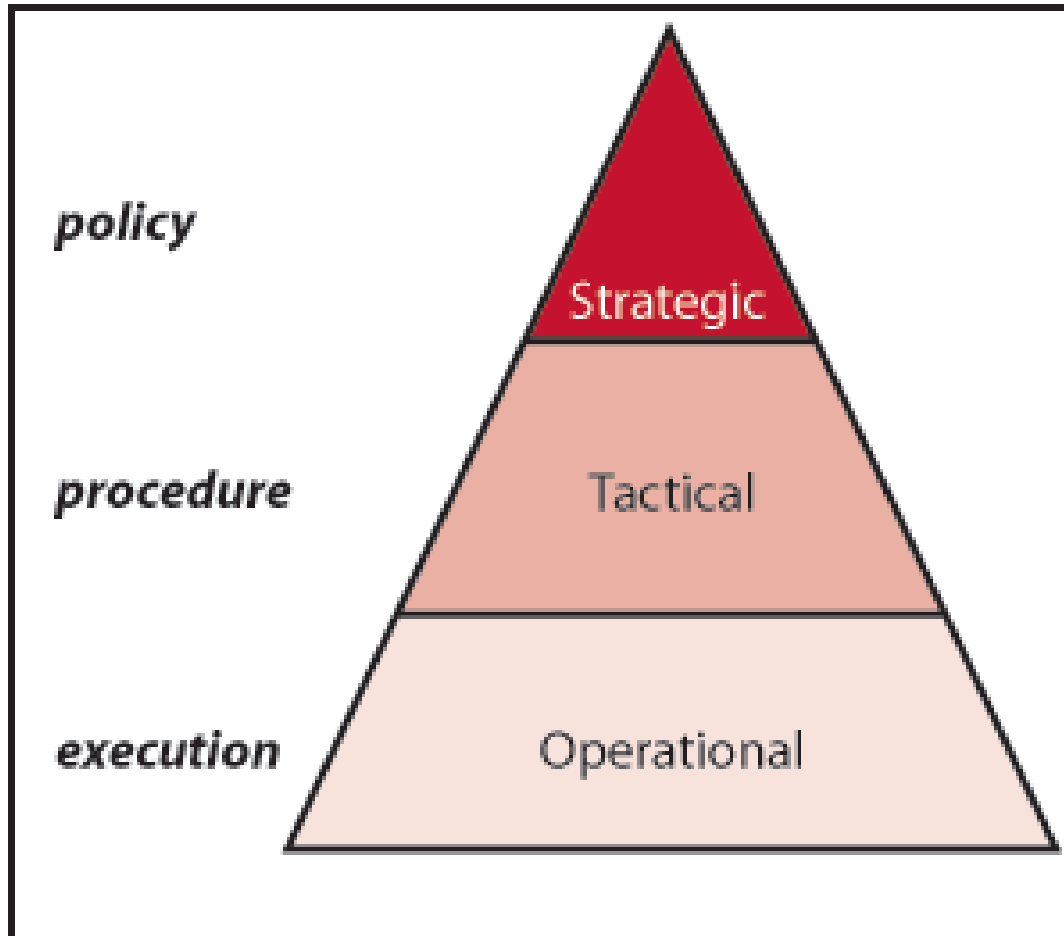
- Individuals who are responsible for making organization-wide decisions and establishing plans and goals that affect the entire organization.



# Level of Management



# Skill and Level of Management



Conceptual and  
design skills

Human skills

Technical skills

# Management in New Era

## The Internet

- changes the way management must think and act
- chief web officer will be one of the most important jobs
  - will oversee information systems and strategies
  - will create and manage business relationships via new communications technologies
- great companies will capitalize most fully on the Web's potential
- distinction between Internet and non-Internet companies is fading

# Management in New Era (Cont.)

## Globalization

- isolationism is a thing of the past
- multinational enterprises have sales offices all over the world
- corporations use their transnational status to operate beyond the control of national governments
- even small firms that do not operate on a global scale must make strategic decisions based on international considerations

## Management in New Era (Cont.)

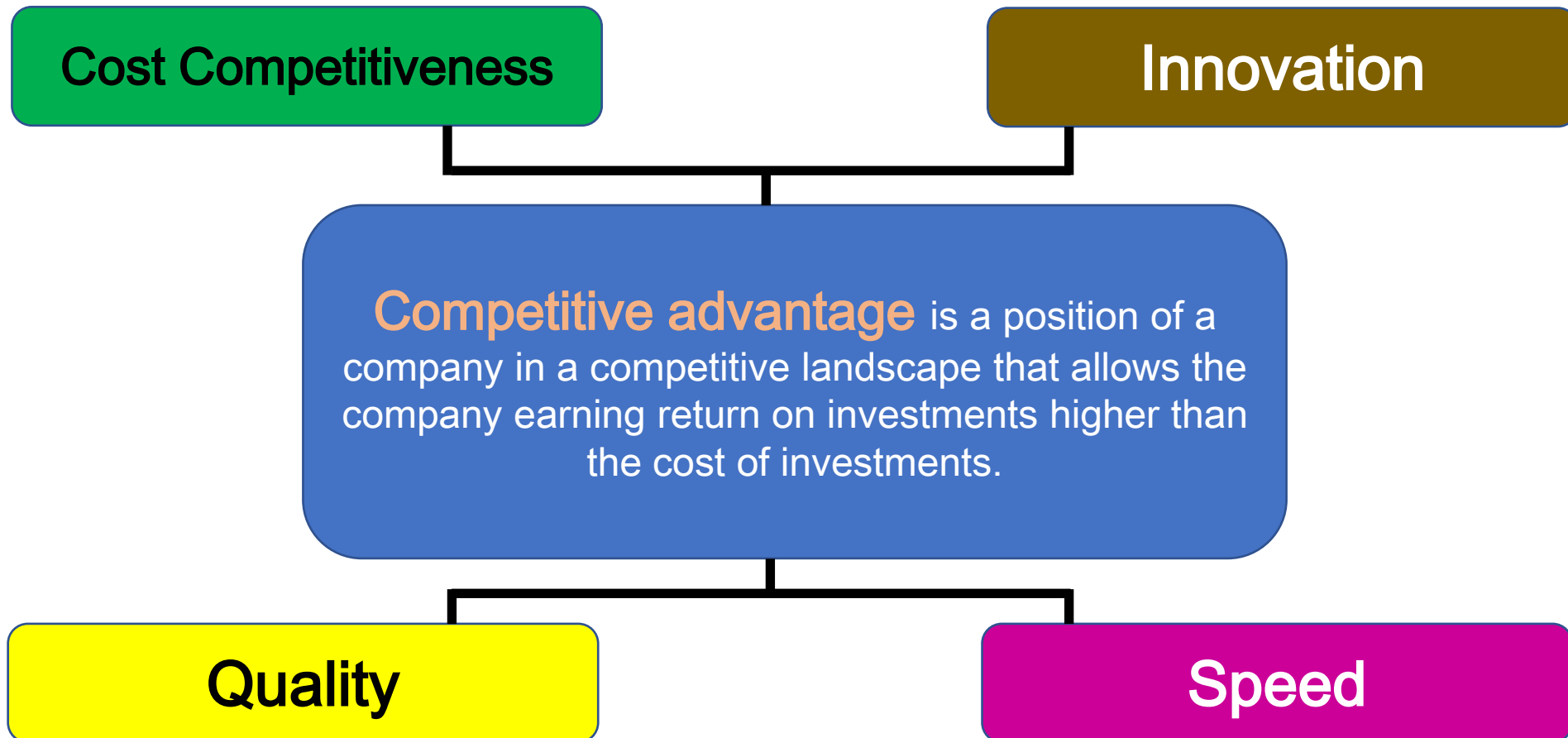
### **Knowledge management**

- set of practices aimed at discovering and harnessing an organization's intellectual resources
- unlock people's expertise, skills, wisdom, and relationships
- intellectual capital is the collective brainpower of the organization

### **Collaboration across “boundaries”**

- capitalize on the ideas of people outside the traditional company “boundaries”
- must effectively capitalize on customers' brains
- get customers to think creatively to identify new product and service ideas

# Managing for Competitive Advantage



# Managing for Competitive Advantage

## 👉 Cost Competitiveness

- costs are kept low enough so that you can realize profits and price your products at levels that are attractive to consumers
- key is *efficiency* - accomplishing goals by using resources wisely and minimizing waste

## 👉 Quality

- excellence of a product, including its attractiveness, lack of defects, reliability, and long-term durability
- importance of quality has increased dramatically
- must identify specific elements of quality to correct problems, target needs, and deliver world-class value

# Managing for Competitive Advantage

## Speed

- often separates winners from losers in world competition
- speed became a vital requirement in the 1990s since requirement has increased exponentially

## Innovation

- the introduction of new goods and services
- important to adapt to changes in consumer demands and to new sources of competition

**Best managers and companies delivering all four.**



# Organizational Performance

Measures how efficiently and effectively managers use resources to satisfy customers and achieve goals.

## ✘ *Efficiency*

A measure of how well resources are used to achieve a goal.

Usually, managers must try to minimize the input of resources to attain the same goal.

## ✘ *Effectiveness*

A measure of the appropriateness of the goals chosen (are these the right goals?), and the degree to which they are achieved.

Organizations are more effective when managers choose the correct goals and then achieve them.

# Efficiency and Effectiveness

Efficiency (Means)

Resource  
Usage

Low Waste



Effectiveness (Ends)

Goal  
Attainment

High Attainment



Management Strives for:  
Low Resource Waste (high efficiency)  
High Goal Attainment (high effectiveness)

# Managerial Functions

## Planning

Defining goals, establishing strategies to achieve goals, developing plans to integrate and coordinate activities.

## Organizing

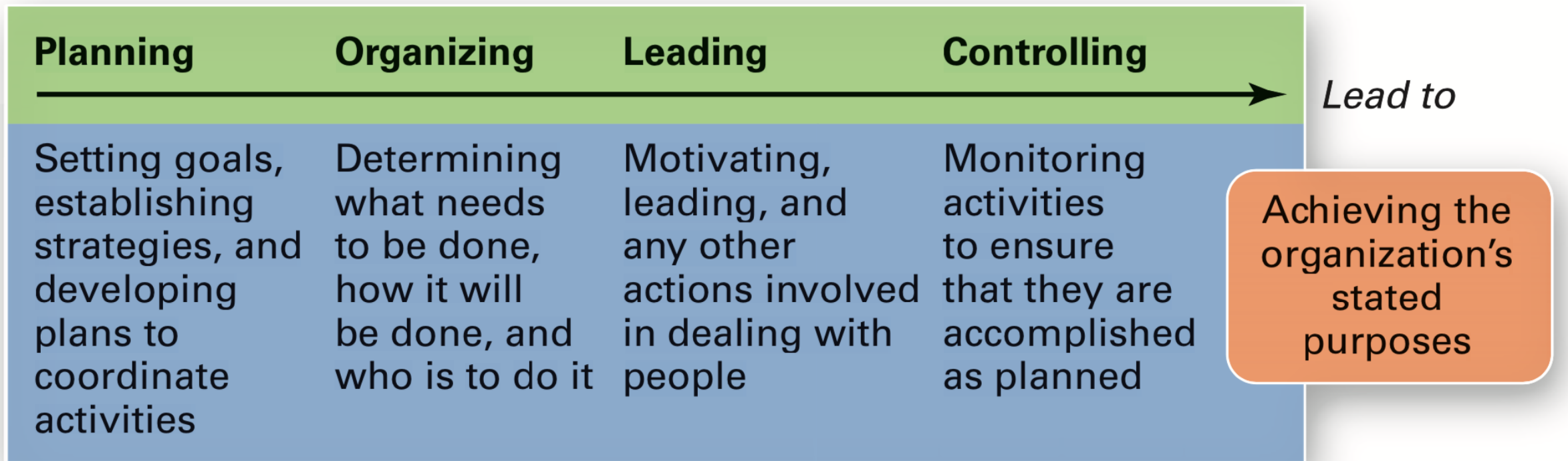
Arranging and structuring work to accomplish organizational goals.

## Leading

Working with and through people to accomplish goals.

## Controlling

Monitoring, comparing, and correcting work.



# Managerial Functions

## ★ Planning

**Planning** is the process used by managers to identify and select appropriate goals and courses of action for an organization.

### 3 steps to good planning

1. Which goals should be pursued?
2. How should the goal be attained?
3. How should resources be allocated?

The planning function determines how effective and efficient the organization is and determines the strategy of the organization.

# Managerial Functions

## ★ Organizing

In organizing, managers create the structure of working relationships between organizational members that best allows them to work together and achieve goals.

- Managers will group people into departments according to the tasks performed.
  - Managers will also lay out lines of authority and responsibility for members.

An *organizational structure* is the outcome of organizing. This structure coordinates and motivates employees so that they work together to achieve goals.

# Managerial Functions

## \* Leading

In leading, managers determine direction, state a clear vision for employees to follow, and help employees understand the role they play in attaining goals.

- Leadership involves a manager using power, influence, vision, persuasion, and communication skills.
- The outcome of the leading function is a high level of motivation and commitment from employees to the organization.

# Managerial Functions

## ✳ Controlling

In controlling, managers evaluate how well the organization is achieving its goals and takes corrective action to improve performance.

- Managers will monitor individuals, departments, and the organization to determine if desired performance has been reached.
  - Managers will also take action to increase performance as required.
- The outcome of the controlling function is the accurate measurement of performance and regulation of efficiency and effectiveness.



# Managerial Roles and Skills

A **role** is a set of specific tasks a person performs because of the position they hold.

**Roles are directed inside as well as outside the organization.**

**There are 3 broad role categories:**

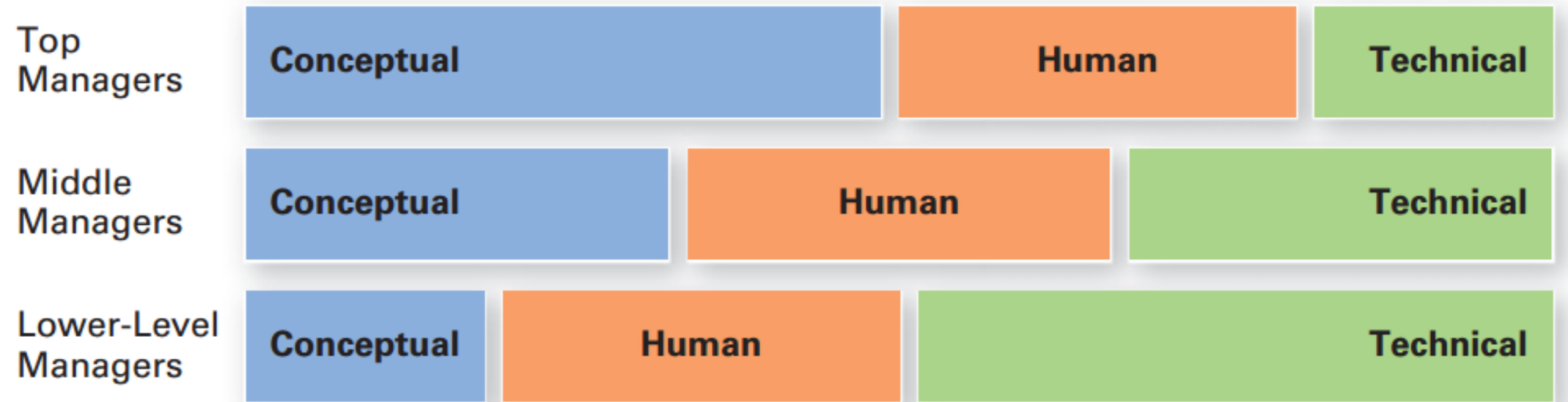
1. Interpersonal Role
2. Informational Role
3. Decisional Role

# Managerial Roles and Skills

- ☑ The **interpersonal roles** involve people (subordinates and persons outside the organization) and other ceremonial and symbolic duties.
- ☑ The three **interpersonal roles** include figurehead, leader, and liaison.
- ☑ The **informational roles** involve collecting, receiving, and disseminating information.
- ☑ The three **informational roles** include monitor, disseminator, and spokesperson.
- ☑ Finally, **the decisional roles** entail making decisions or choices and include entrepreneur, disturbance handler, resource allocator, and negotiator.

# Managerial Roles and Skills

## Skills Needed at Different Management Levels



# Managerial Roles and Skills

## Skills Approach

### ★ Technical Skills

Knowledge and proficiency in a specific field

### ★ Human Skills

The ability to work well with other people

### ★ Conceptual Skills

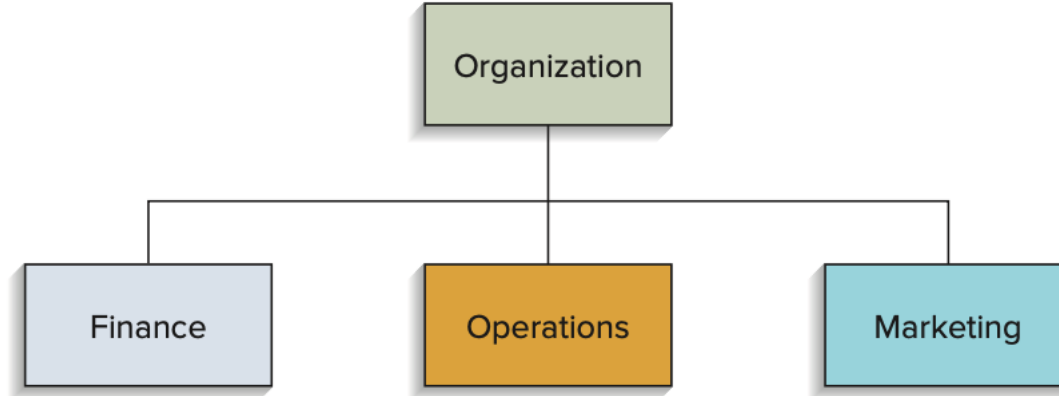
The ability to think and conceptualize about abstract and complex situations concerning the organization

# Operations Management

- ➡ Operations is that part of a business organization that is responsible for producing goods and/ or services.
- ➡ **Goods** are physical items that include raw materials, parts, subassemblies such as motherboards that go into computers, and final products such as cell phones and automobiles.
- ➡ **Services** are activities that provide some combination of time, location, form, or psychological value.

# Operations Management

- While the operations function is responsible for producing products and/or delivering services, it needs the support and input from other areas of the organization.
- Business organizations have three basic functional areas, as shown below:



- It doesn't matter whether the business is a retail store, a hospital, a manufacturing firm, a car wash, or some other type of business; all business organizations have these three basic functions.

# Operations Management

- **Finance** is responsible for securing financial resources at favorable prices and allocating those resources throughout the organization, as well as budgeting, analyzing investment proposals, and providing funds for operations.
- **Marketing** is responsible for assessing consumer wants and needs, and selling and promoting the organization's goods or services.
- **Operations** is responsible for producing the goods or providing the services offered by the organization.

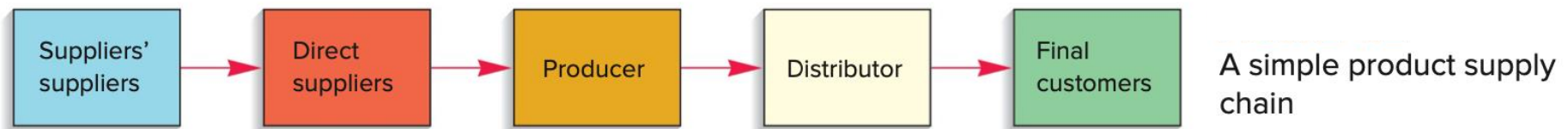
# Operations Management

- To put this into perspective, if a business organization were a car, operations would be its engine.
- And just as the engine is the core of what a car does, in a business organization, operations is the core of what the organization does.
- Operations management is responsible for managing that core.
- Hence **operations management** is the management of systems or processes that create goods and/or provide services.



# Operations Management

- Operations and supply chains are intrinsically linked, and no business organization could exist without both.
- A **supply chain** is the sequence of organizations - their facilities, functions, and activities that are involved in producing and delivering a product or service.
- The sequence begins with basic suppliers of raw materials and extends all the way to the final customer.



# Operations Management

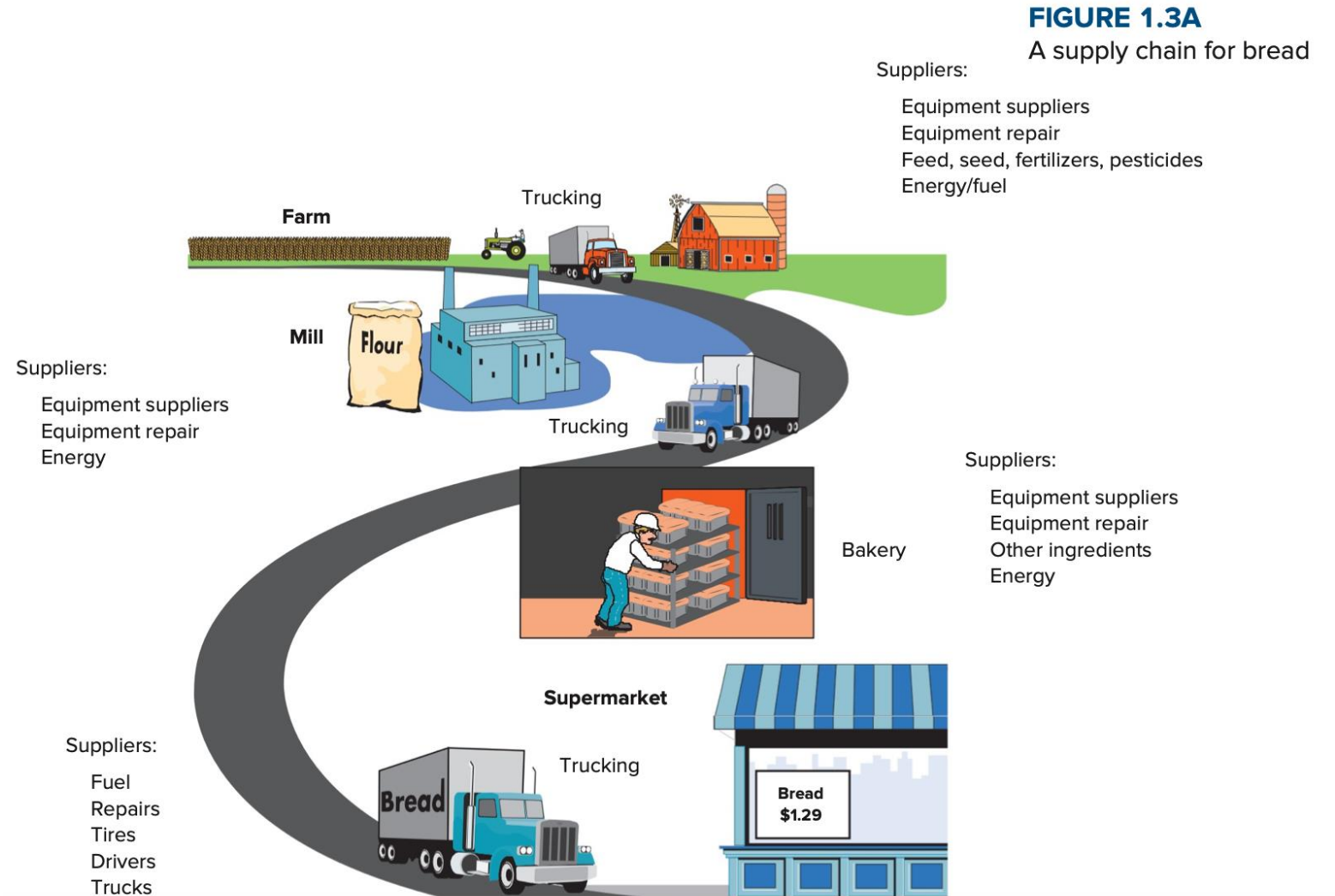
Facilities might include warehouses, factories, processing centers, offices, distribution centers, and retail outlets.

Functions and activities include forecasting, purchasing, inventory management, information management, quality assurance, scheduling, production, distribution, delivery, and customer service.

# Operations Management

The diagram provides another illustration of a supply chain: a chain that extends from wheat growing on a farm and ends with a customer buying a loaf of bread in a supermarket.

The value of the product increases as it moves through the supply chain.



# Operations Management

**Value-added** is the term used to describe the difference between the cost of inputs and the value or price of outputs.

In nonprofit organizations, the value of outputs (e.g., highway construction, police and fire protection) is their value to society; the greater the value-added, the greater the effectiveness of these operations.

In for-profit organizations, the value of outputs is measured by the prices that customers are willing to pay for those goods or services.

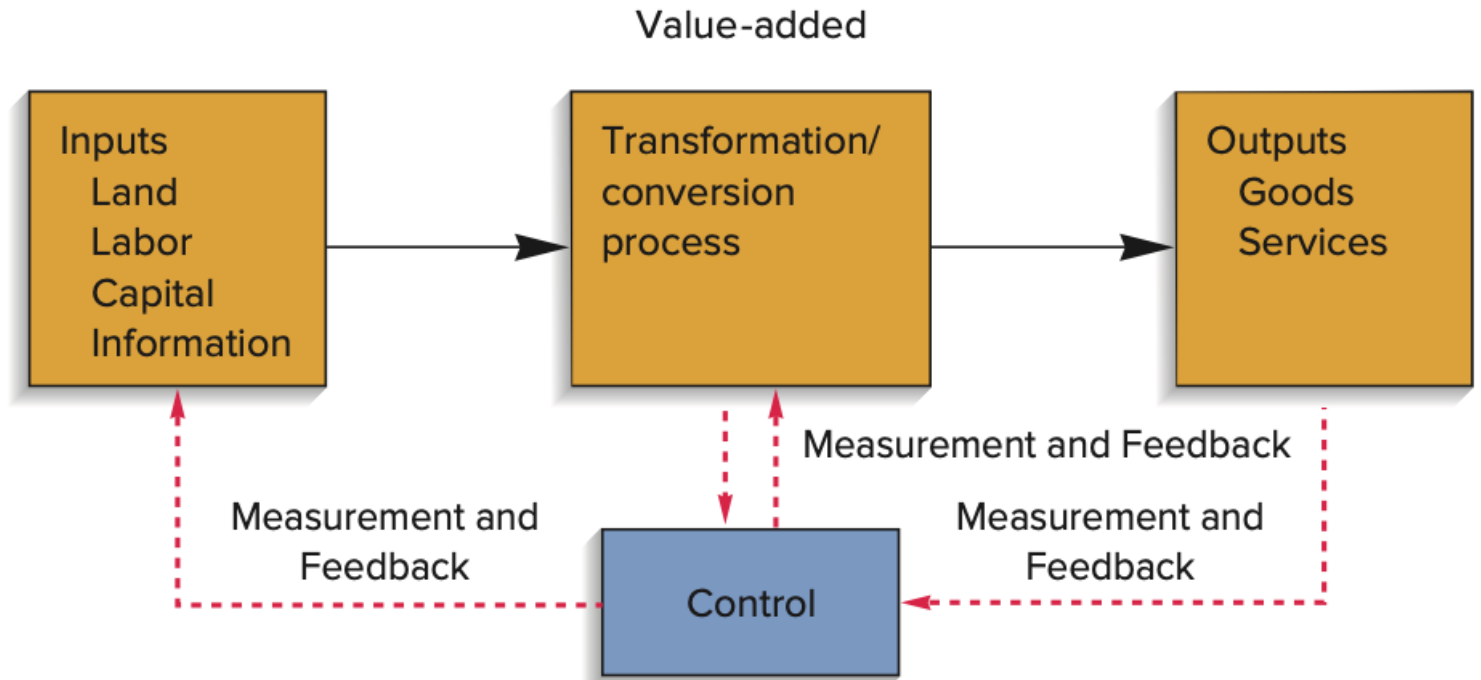
Firms use the money generated by value-added for research and development, investment in new facilities and equipment, worker salaries, and *profits*.

Consequently, the greater the value-added, the greater the amount of funds available for these purposes. Value can also be psycho- logical, as in *branding*.

# Operations Management

**FIGURE 1.4**

The operations function involves the conversion of inputs into outputs



# Operations Management

| Inputs                 | Transformation    | Outputs                 |
|------------------------|-------------------|-------------------------|
| Land                   | Processes         | High goods percentage   |
| Human                  | Cutting, drilling | Houses                  |
| Physical labor         | Transporting      | Automobiles             |
| Intellectual labor     | Teaching          | Clothing                |
| Capital                | Farming           | Computers               |
| Raw materials          | Mixing            | Machines                |
| Water                  | Packing           | Televisions             |
| Metals                 | Copying           | Food products           |
| Wood                   | Analyzing         | Textbooks               |
| Equipment              | Developing        | DVD players             |
| Machines               | Searching         | High service percentage |
| Computers              | Researching       | Health care             |
| Trucks                 | Repairing         | Entertainment           |
| Tools                  | Innovating        | Car repair              |
| Facilities             | Debugging         | Legal                   |
| Hospitals              | Selling           | Banking                 |
| Factories              | Emailing          | Communication           |
| Retail stores          |                   |                         |
| Energy                 |                   |                         |
| Other                  |                   |                         |
| Information            |                   |                         |
| Time                   |                   |                         |
| Legal constraints      |                   |                         |
| Government regulations |                   |                         |

Examples of inputs, transformation, and outputs

# Operations Management

Illustrations of the transformation process

|                | Inputs           | Processing  | Output            |
|----------------|------------------|-------------|-------------------|
| Food Processor | Raw vegetables   | Cleaning    | Canned vegetables |
|                | Metal sheets     | Making cans |                   |
|                | Water            | Cutting     |                   |
|                | Energy           | Cooking     |                   |
|                | Labor            | Packing     |                   |
|                | Building         | Labeling    |                   |
|                | Equipment        |             |                   |
| Hospital       | Doctors, nurses  | Examination | Treated patients  |
|                | Hospital         | Surgery     |                   |
|                | Medical supplies | Monitoring  |                   |
|                | Equipment        | Medication  |                   |
|                | Laboratories     | Therapy     |                   |

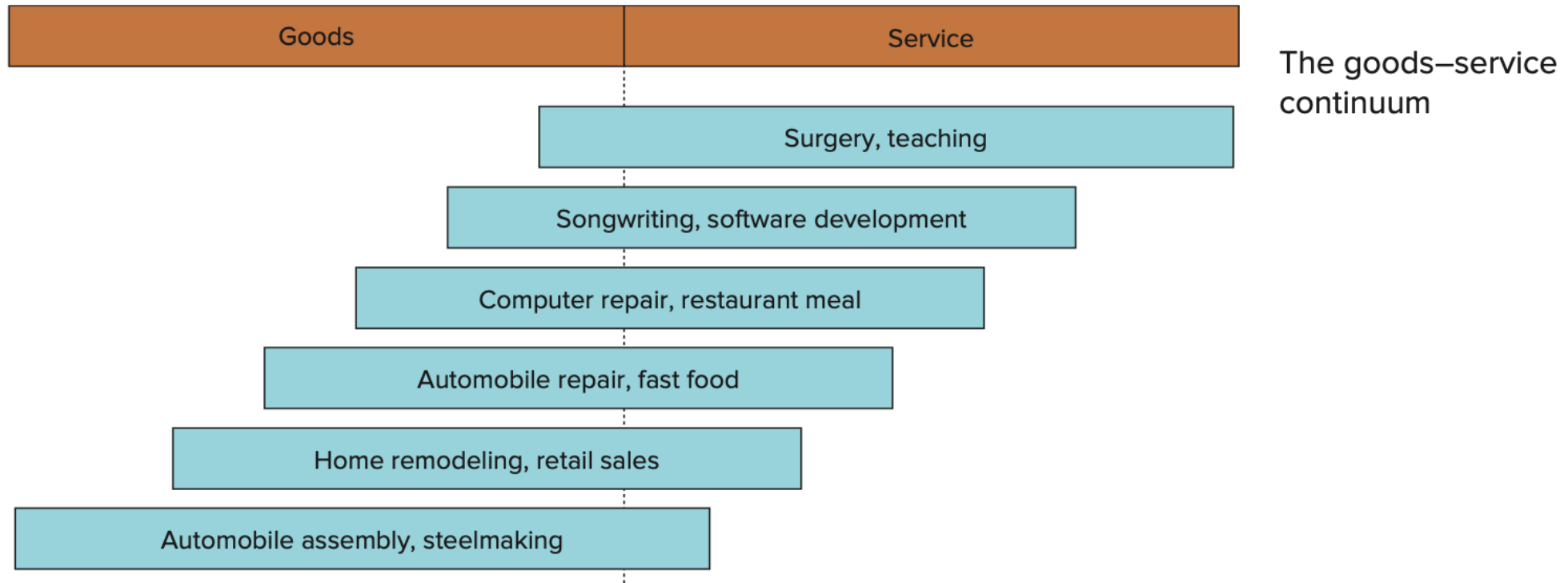
# Operations Management

Typical differences  
between production of  
goods and provision of  
services

| Characteristic                                  | Goods        | Services    |
|---|--------------|-------------|
| Output  | Tangible     | Intangible  |
| Customer contact                                | Low          | High        |
| Labor content                                   | Low          | High        |
| Uniformity of input                             | High         | Low         |
| Measurement of productivity                     | Easy         | Difficult   |
| Opportunity to correct problems before delivery | High         | Low         |
| Inventory                                       | Much         | Little      |
| Wages   | Narrow range | Wide range  |
| Patentable                                      | Usually      | Not usually |



# Operations Management



# Scopes of Operations Management

## Operations Management includes:

- ➔ Forecasting
- ➔ Capacity planning
- ➔ Scheduling
- ➔ Managing inventories
- ➔ Assuring quality
- ➔ Motivating employees
- ➔ Deciding where to locate facilities
- ➔ Supply Chain Management (SCM)
- ➔ And more . . .

# Operations Interfaces

