

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.

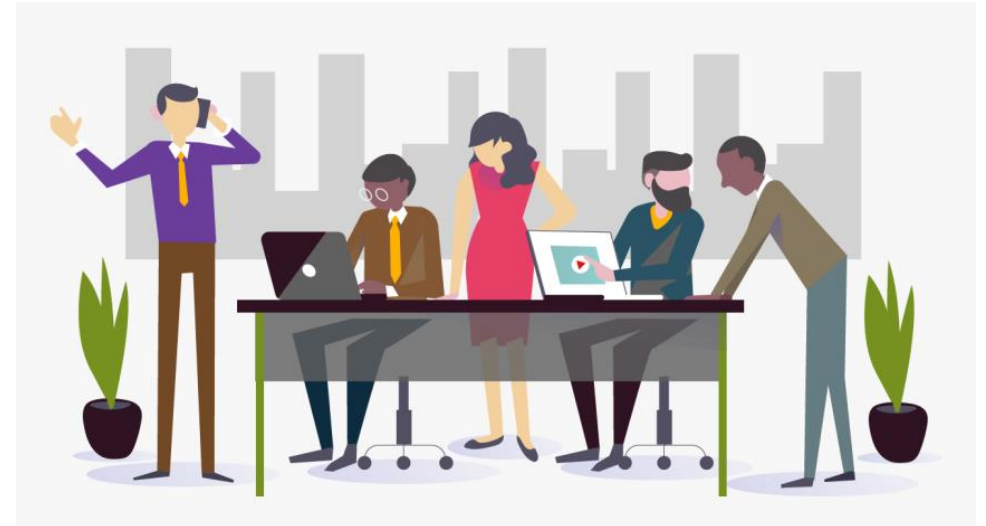
Competitive Advantage

- 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

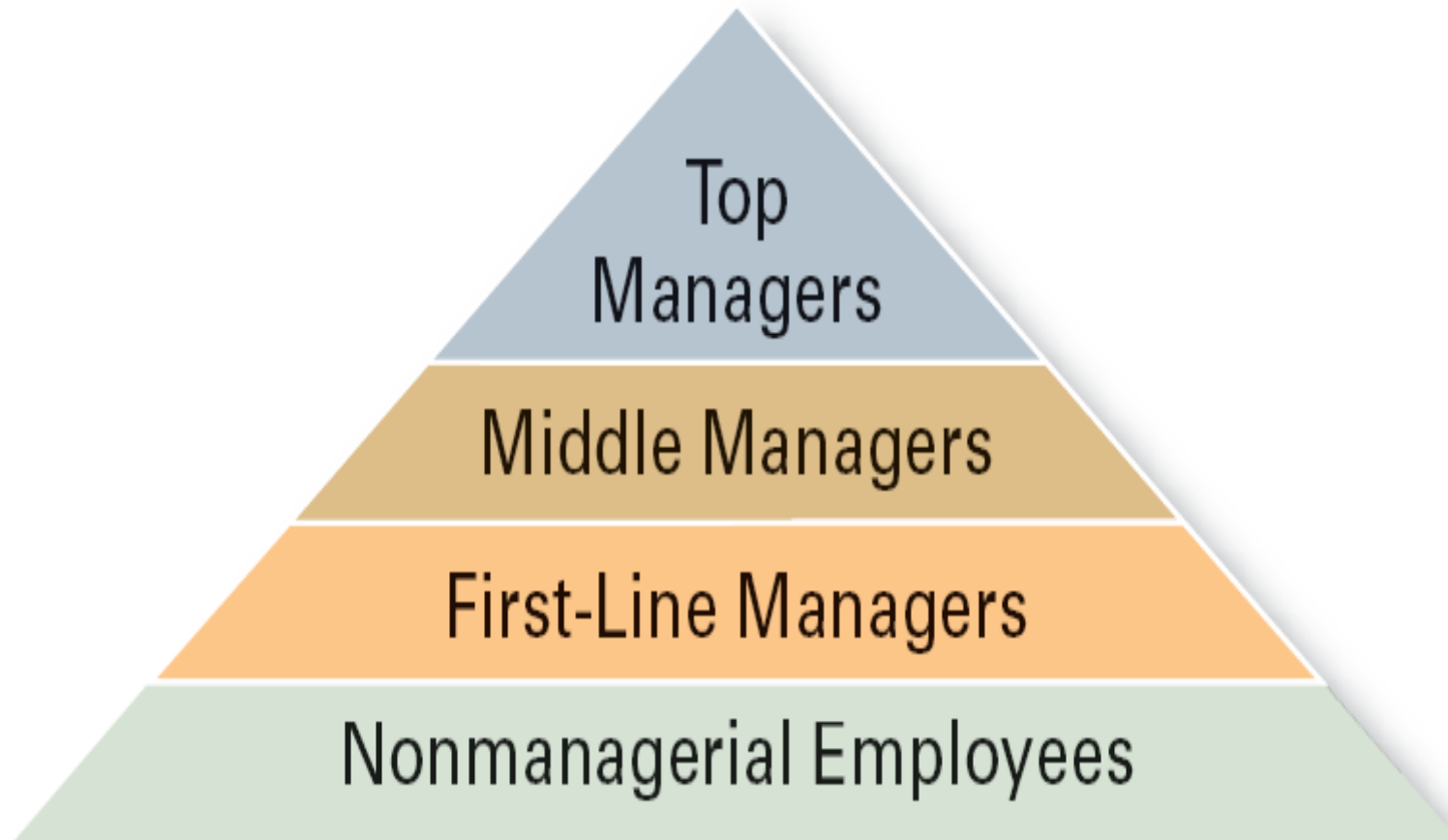
Resources needed by an Organization

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.

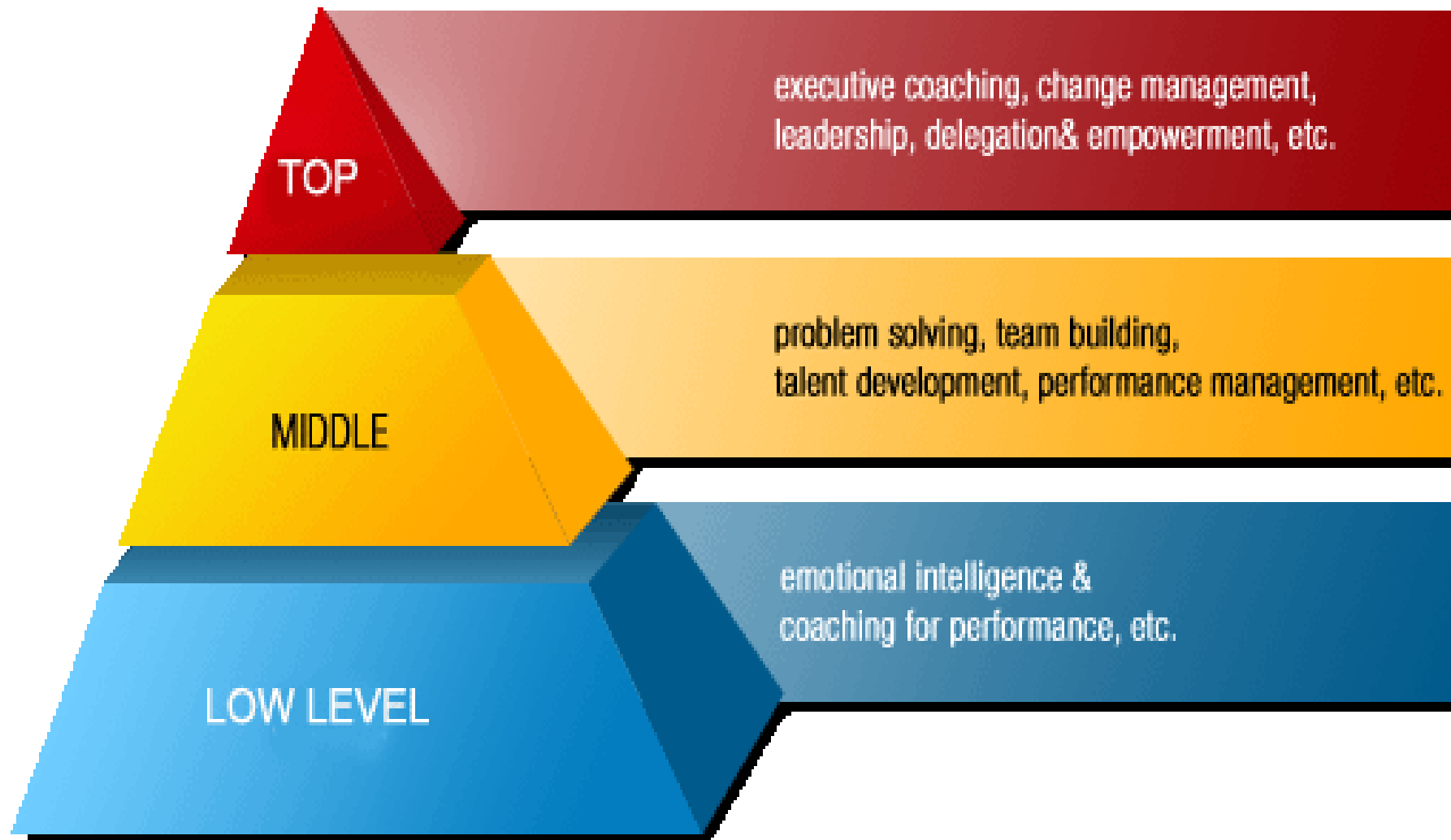
Middle Managers

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

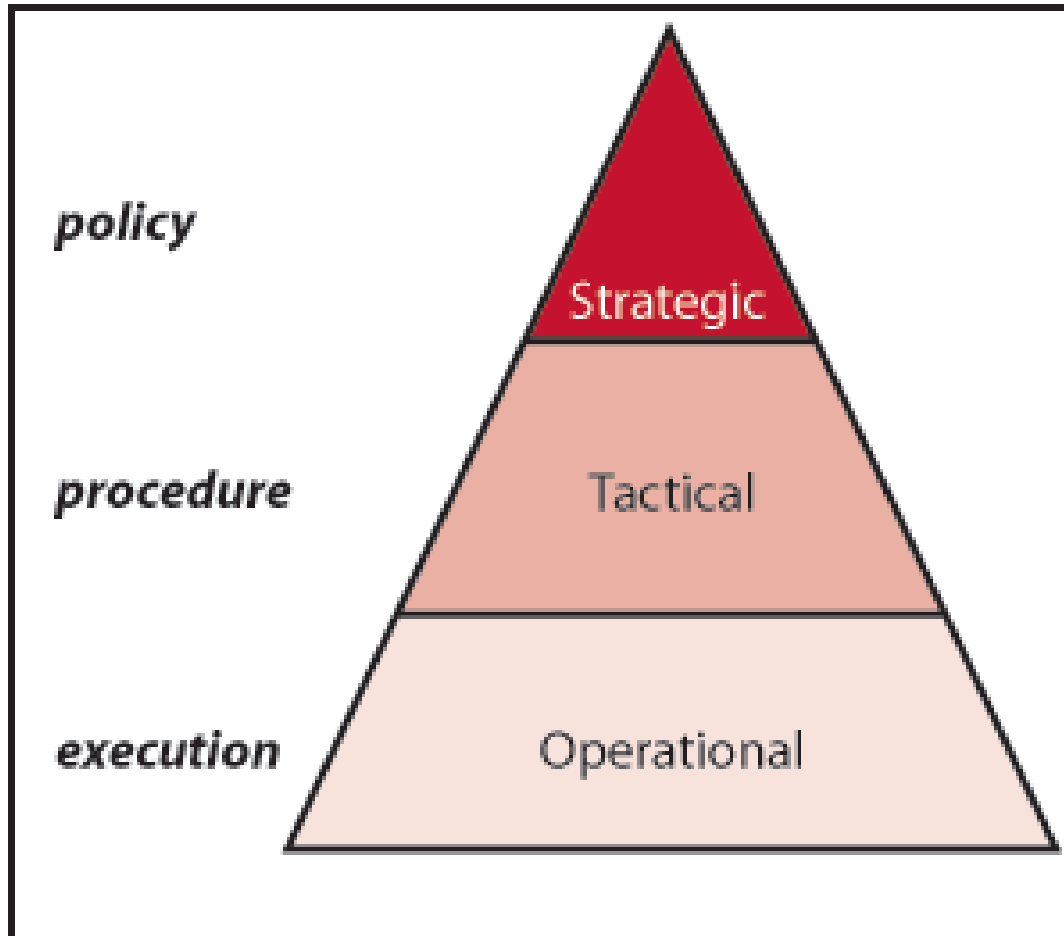
Top Managers

- 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.)

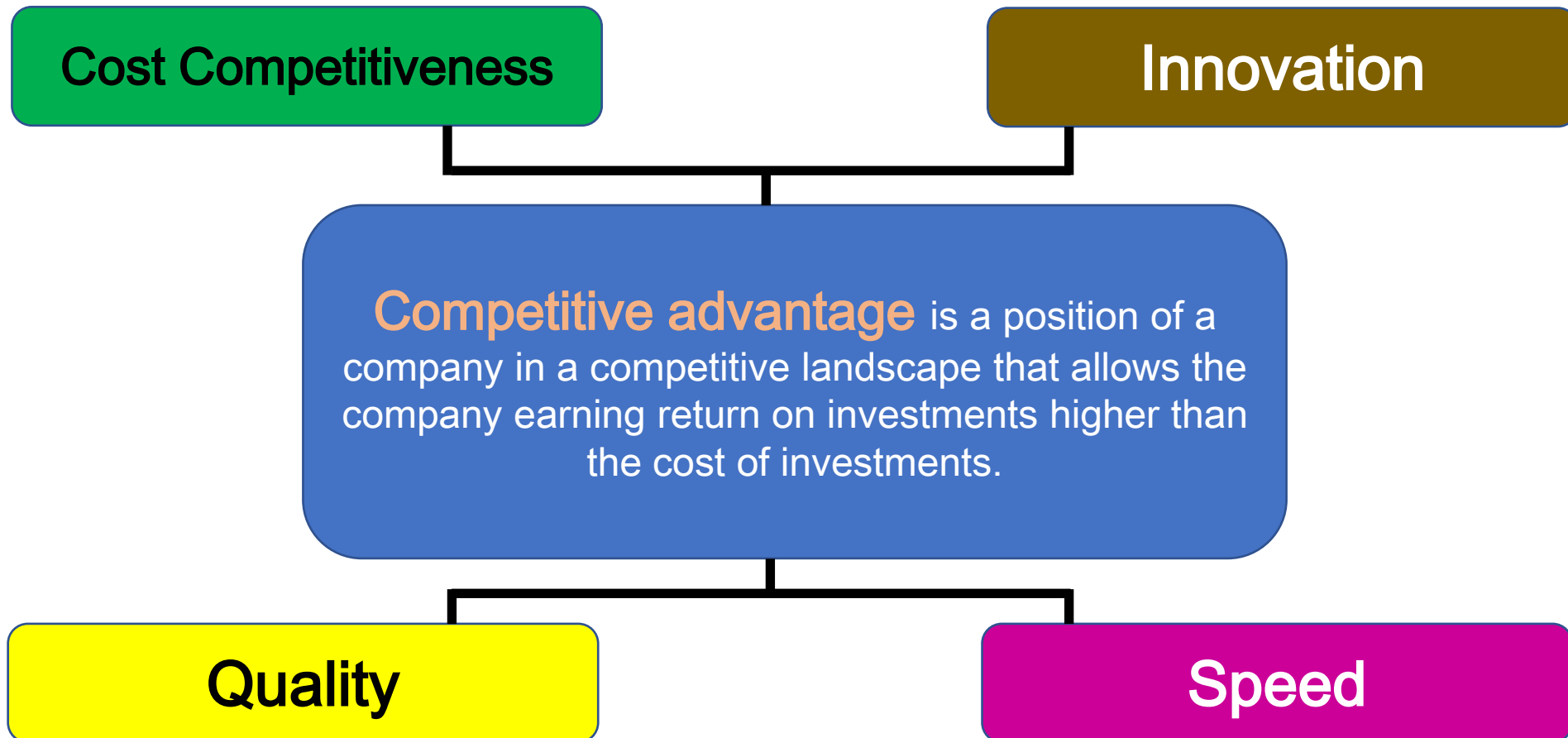
Knowledge management

- 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

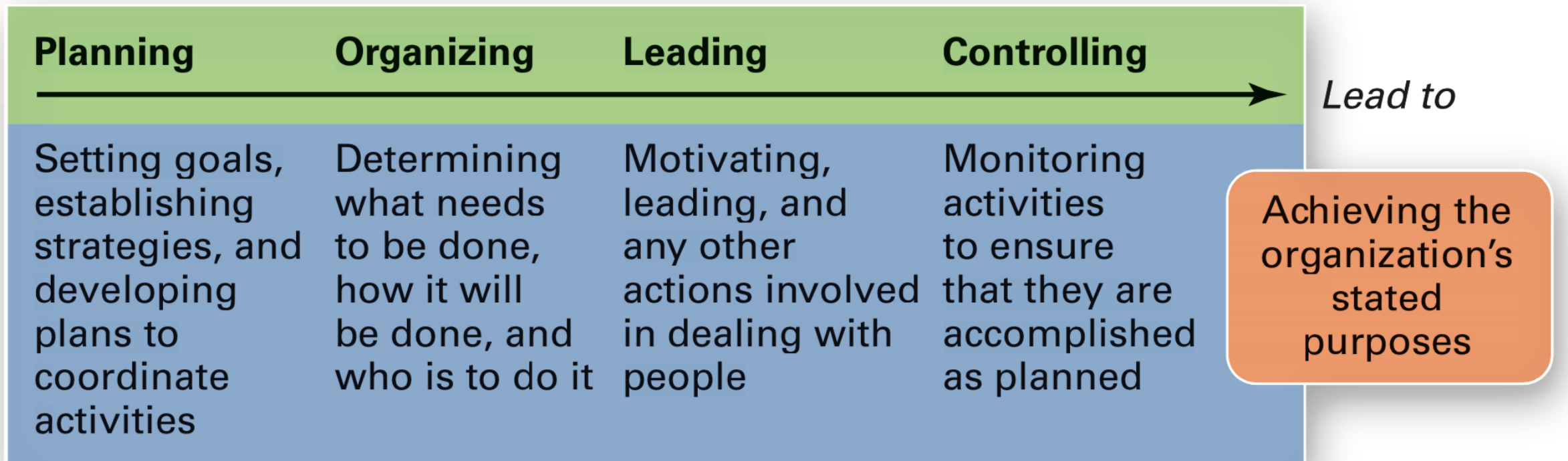
Arranging and structuring work to accomplish organizational goals.

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:

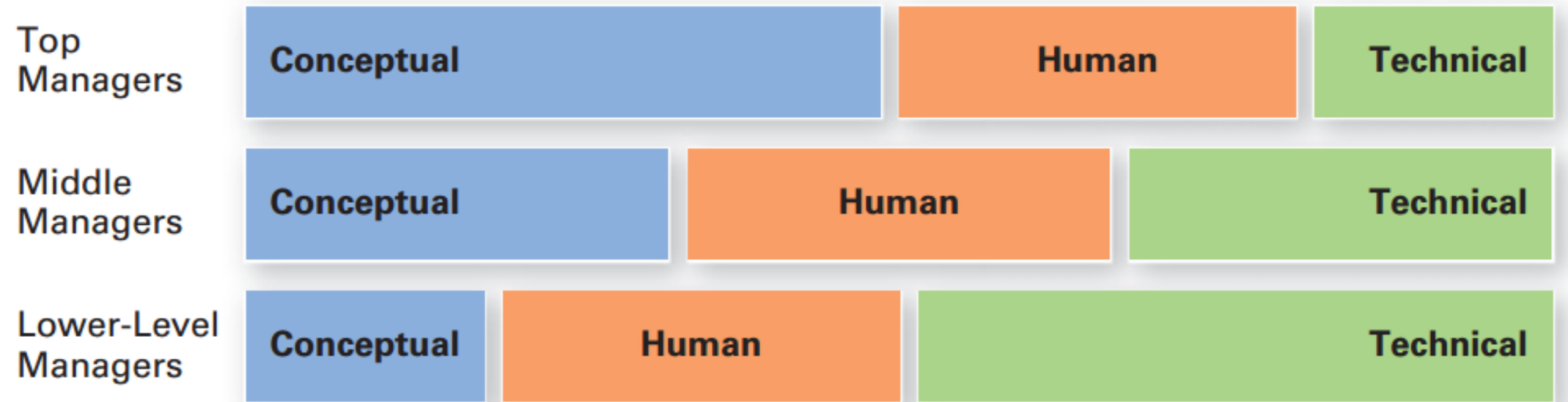
1. Interpersonal Role
2. Informational Role
3. Decisional Role

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

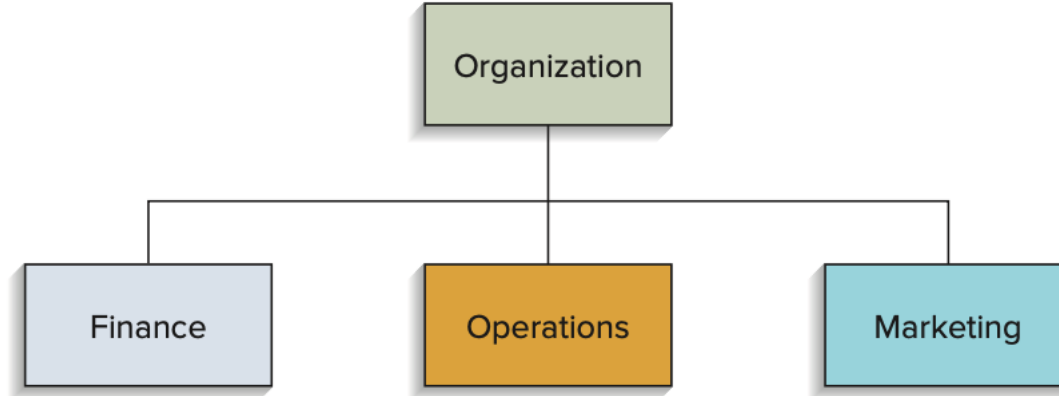
The ability to think and conceptualize about abstract and complex situations concerning the organization

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

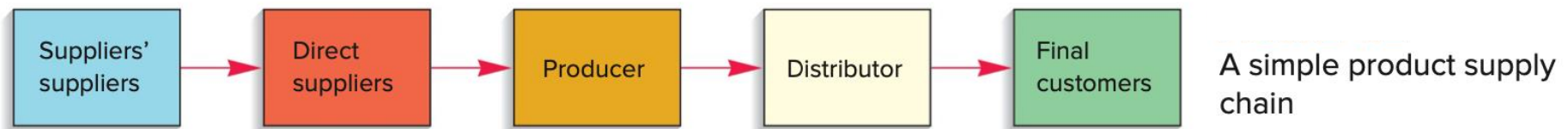
- **Finance** is responsible for securing financial resources at favorable prices and allocating those resources throughout the organization, as well as budgeting, analyzing investment proposals, and providing funds for operations.
- **Marketing** is responsible for assessing consumer wants and needs, 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

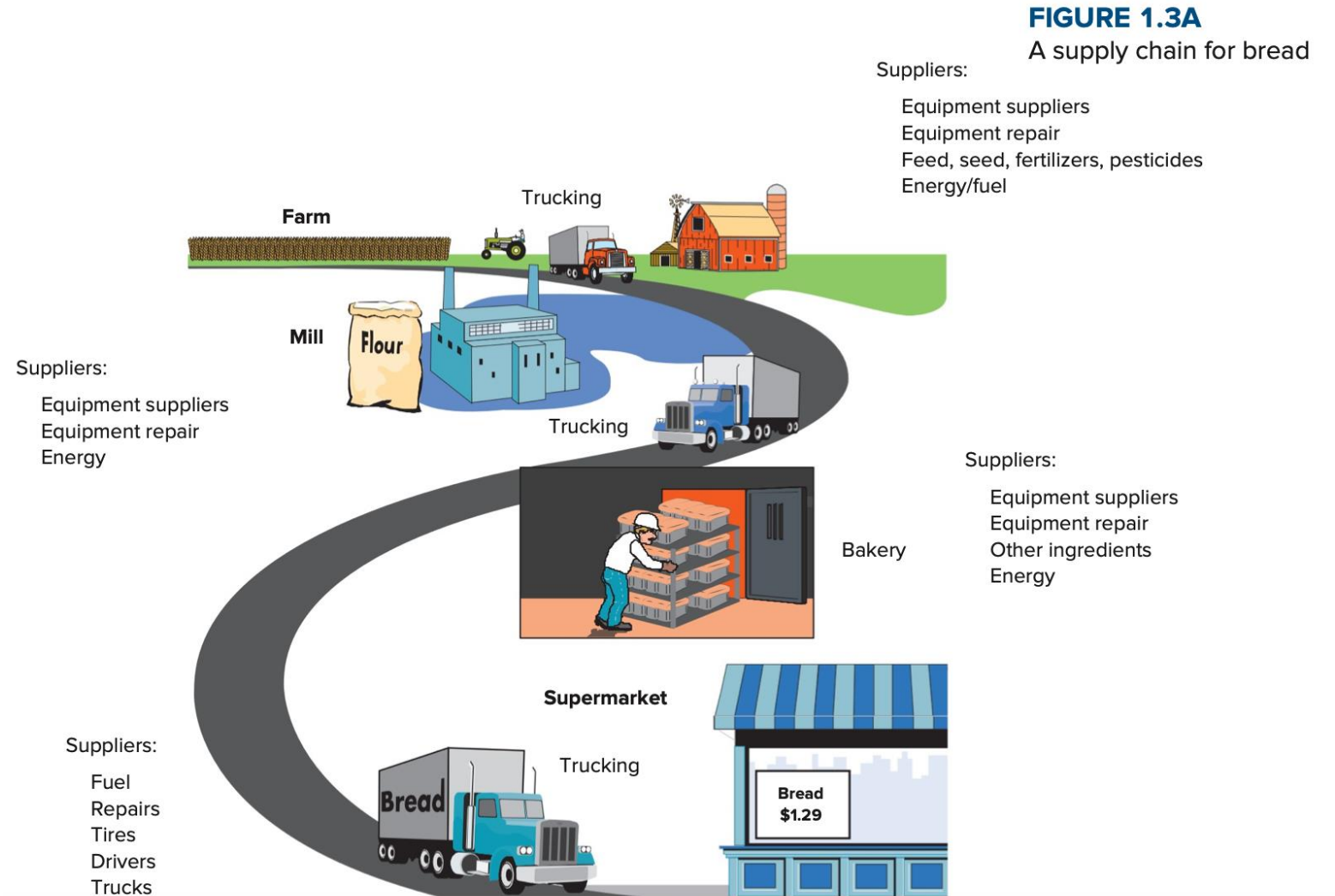
Facilities might include warehouses, factories, processing centers, offices, distribution centers, and retail outlets.

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.

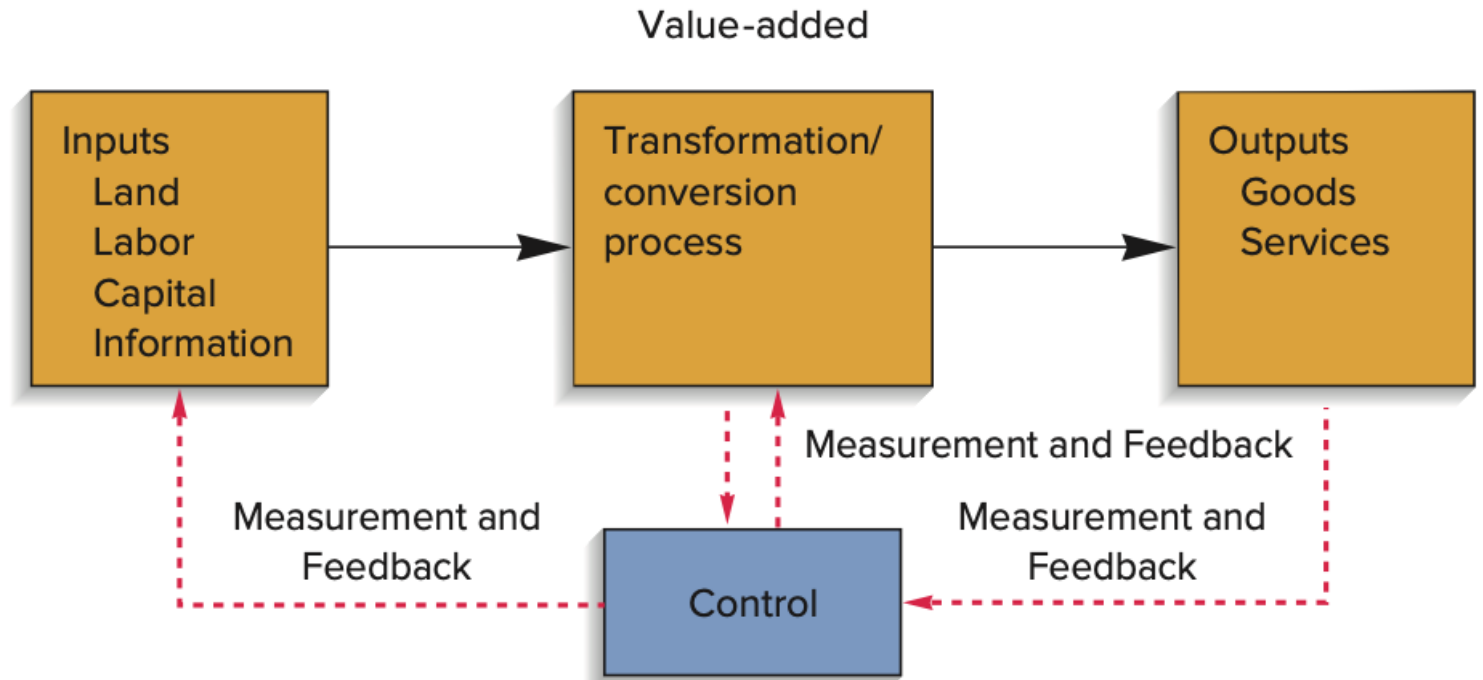
Firms use the money generated by value-added for research and development, investment in new facilities and equipment, worker salaries, and *profits*.

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

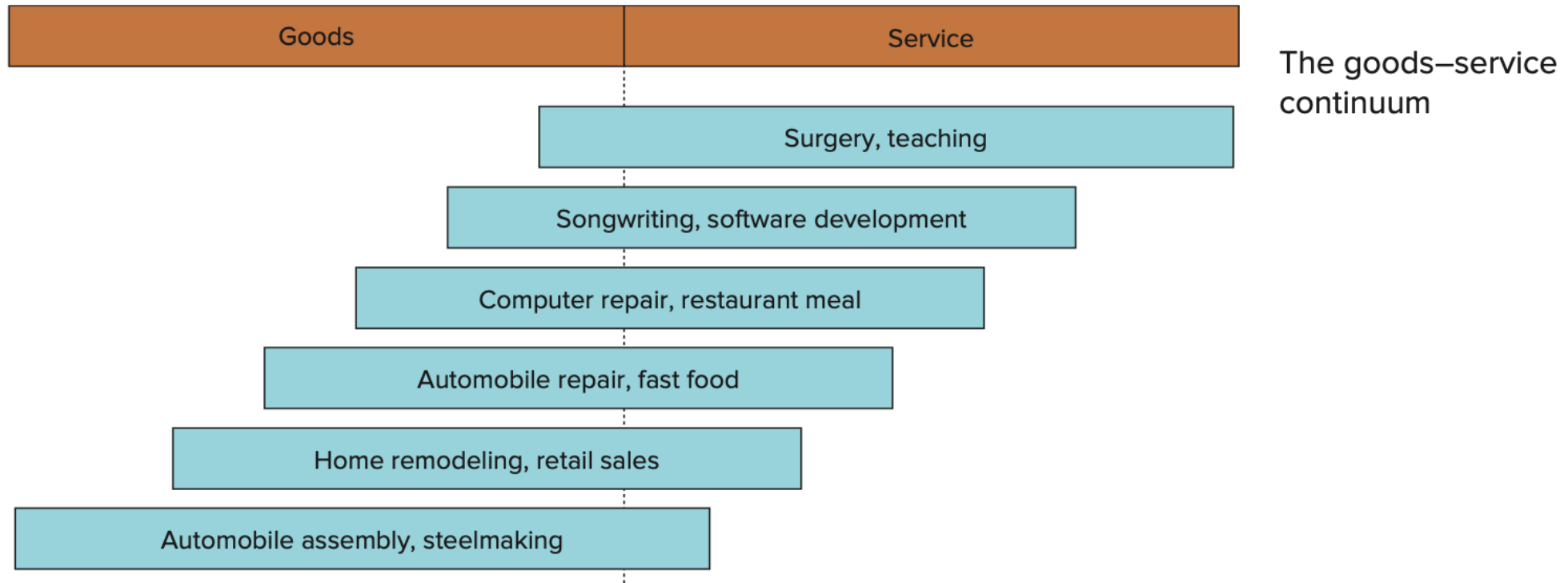
	Inputs	Processing	Output
Food Processor	Raw vegetables	Cleaning	Canned vegetables
	Metal sheets	Making cans	
	Water	Cutting	
	Energy	Cooking	
	Labor	Packing	
	Building	Labeling	
	Equipment		
Hospital	Doctors, nurses	Examination	Treated patients
	Hospital	Surgery	
	Medical supplies	Monitoring	
	Equipment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

