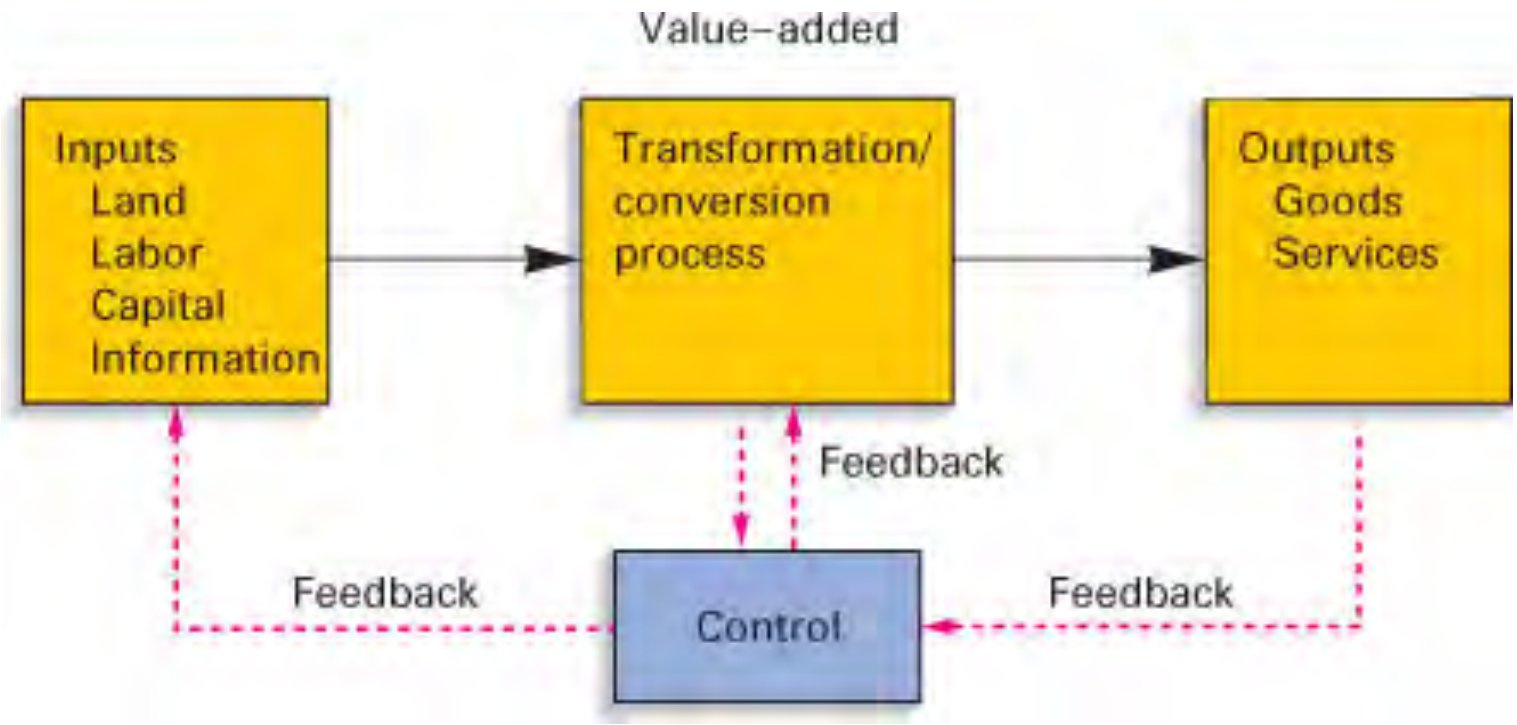
Introduction to Operations Management

Chapter 1 and Chapter 2


Organization
Finance
Operations
Marketing

Operations Management

The management of systems or processes that create goods and/or provide services.



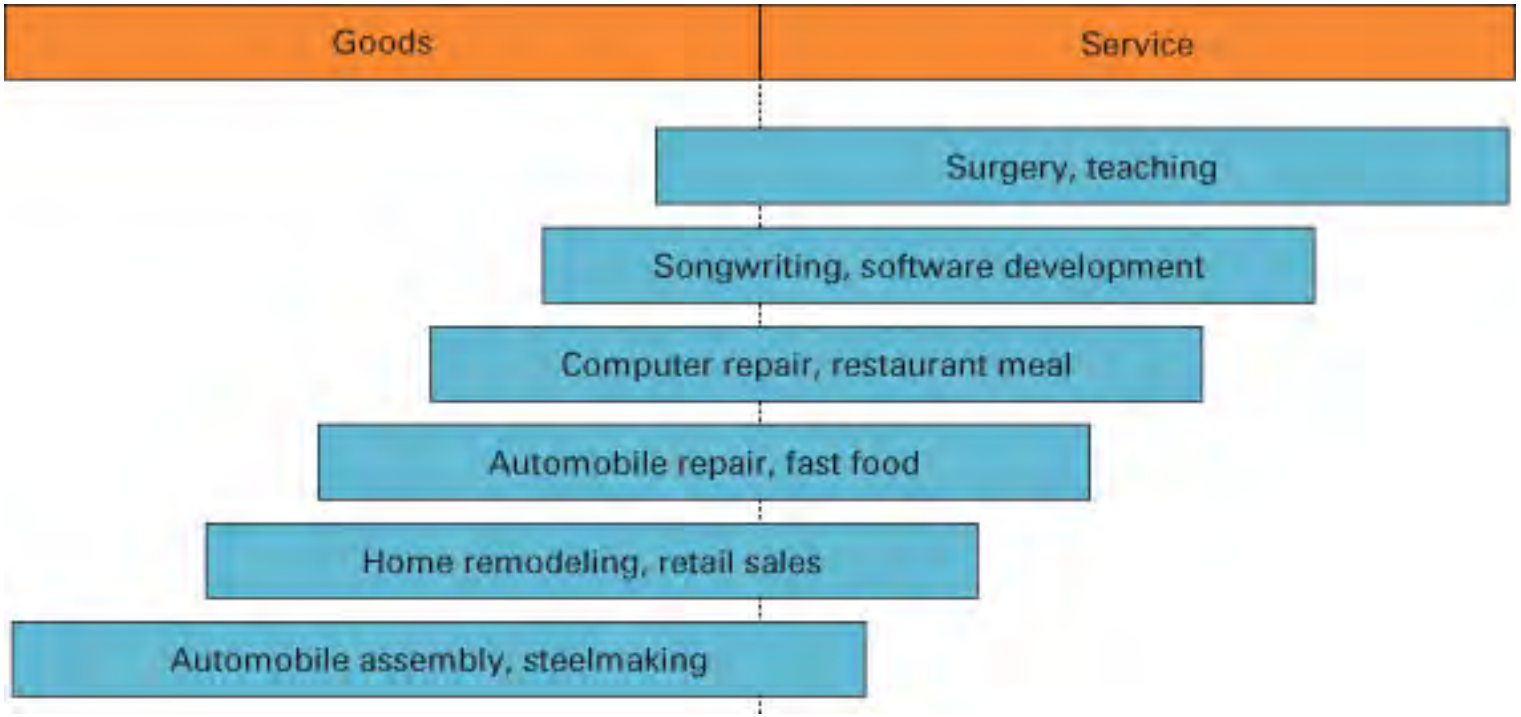
Value-Added: The difference between the cost of inputs and the value or price of outputs.

Production of Goods vs Delivery of Services

Production of goods results in a tangible output.

- Government (federal, state, local).
- Wholesale/retail (clothing, food, appliances, stationery, toys, etc.).
- Financial services (banking, stock brokerages, insurance, etc.).
- Health care (doctors, dentists, hospitals, etc.).
- Personal services (laundry, dry cleaning, hair/beauty, gardening, etc.).
- Business services (data processing, e-business, delivery, employment agencies, etc.).
- Education (schools, colleges, etc.)

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
Energy	Packing	Televisions
Water	Copying, faxing	Food products
Metals		Textbooks
Wood		CD players
Equipment		High service percentage
Machines		Health care
Computers		Entertainment
Trucks		Car repair
Tools		Delivery
Facilities		Legal
Hospitals		Banking
Factories		Communication
Retail stores		Other
Other		Innovation
Information		
Time		
Legal constraints		
Government regulations		


Goods
Service
Surgery, teaching
Songwriting, software development
Computer repair, restaurant meal
Automobile repair, fast food
Home remodeling, retail sales
Automobile assembly, steelmaking

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

Differences Between Goods and Service

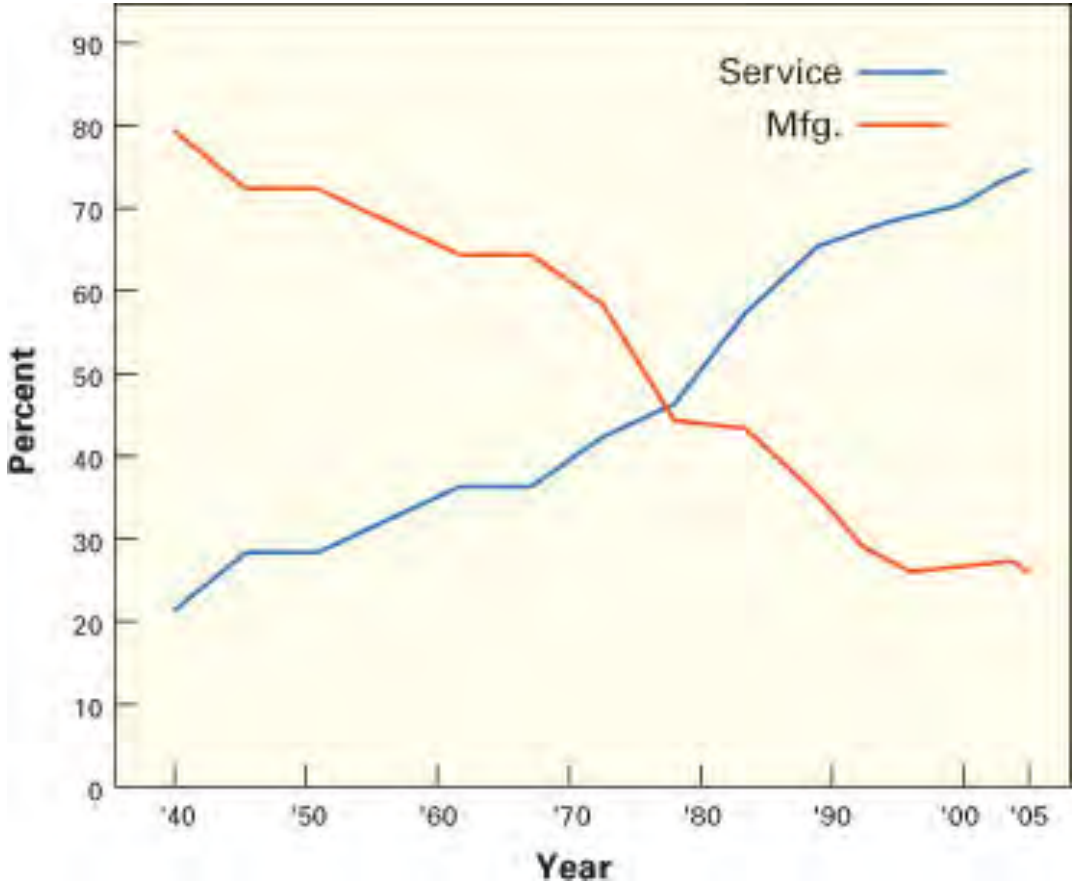
- Degree of customer contact.
- Uniformity of input.
- Labor content of jobs.
- Uniformity of output.
- Measurement of productivity.
- Production and delivery.
- Quality assurance.
- Amount of inventory.
- Evaluation of work.
- Ability to patent design.

Characteristic	Goods	Services
Customer contact	Low	High
Uniformity of input	High	Low
Labor content	Low	High
Uniformity of output	High	Low
Output	Tangible	Intangible
Measurement of productivity	Easy	Difficult
Opportunity to correct quality problems before delivery to customer	High	Low
Inventory	Much	Little
Evaluation	Easier	More difficult
Patentable	Usually	Not usually

The Scope of Operations Management

Type of Operations	Examples
Goods producing	Farming, mining, construction, manufacturing, power generating
Storage/transportation	Warehousing, trucking, mail service, moving, taxis, buses, hotels, airlines
Exchange	Retailing, wholesaling, financial advising, renting or leasing, library loans, stock exchange
Entertainment	Films, radio and television, plays, concerts, recording
Communication	Newspapers, radio and TV newscasts, telephone, satellites, the Internet

Decision Area	Chapter	Basic Issues
Forecasting	3	What will demand be?
Design		
Product and service design	4	What do customers want? How can products and services be improved?
Capacity (long range)	5	How much capacity will be needed? How can the organization best meet capacity requirements?
Process selection	6	What processes should the organization use?
Layout	6	What is the best arrangement for departments, equipment, work flow, and storage in terms of cost, productivity?
Design of work systems	7	What is the best way to motivate employees? How can productivity be improved? How to measure work? How to improve work methods?
Location	8	What is a satisfactory location for a facility (factory, store, etc.)?
Operation		
Quality	9	How is quality defined? How are quality goods and services achieved and improved?
Quality control	10	Are processes performing adequately? What standards should be used? Are standards being met?
Supply chain management	11	How to achieve effective flows of information and goods throughout the chain?
Inventory management	12, 14	How much to order? When to reorder? Which items should get the most attention?
Aggregate planning	13	How much capacity will be needed over the intermediate range? How can capacity needs best be met?
Materials requirements planning	14	What materials, parts, and subassemblies will be needed, and when?
Just-in-time and lean systems	15	How to achieve a smooth, balanced flow of work using fewer resources?
Scheduling	16	How can jobs and resources best be scheduled? Who will do which job?
Project management	17	Which activities are the most critical to the success of a project? What are the goals of a project? What resources will be needed, and when will they be needed?
Waiting lines	18	What service capacity is appropriate?


Service
Mfg.
Percent
90
80
70
60
50
40
30
20
10
0
'40
'50
'60
'70
'80
'90
'00
'05
Year

Operations Management and Decision Making

- Models
- Quantitative Approaches
- Analysis of Trade-Offs
- Systems Approach
- Establishing Priorities (Pareto phenomenon)
- Ethics


Operations
Finance
Marketing


Legal
Public relations
Operations
Accounting
Personnel/ Human resources
MIS

The Historical Evolution of OM

- The Industrial Revolution

Craft production

- Scientific Management

Mass production

Interchangeable parts

Division of labor

- The Human Relations Movement
- Theory X and Theory Y
- Theory Z
- Decision Models and Management Science
- The Influence of Japanese Manufacturers

Approximate Date	Contribution/Concept	Originator
1776	Division of labor	Adam Smith
1790	Interchangeable parts	Eli Whitney
1911	Principles of scientific management	Frederick W. Taylor
1911	Motion study, use of industrial psychology	Frank and Lillian Gilbreth
1912	Chart for scheduling activities	Henry Gantt
1913	Moving assembly line	Henry Ford
1915	Mathematical model for inventory management	F. W. Harris
1930	Hawthorne studies on worker motivation	Elton Mayo
1935	Statistical procedures for sampling and quality control	H. F. Dodge, H. G. Romig, W. Shewhart, L. H. C. Tippett
1940	Operations research applications in warfare	Operations research groups
1947	Linear programming	George Dantzig
1951	Commercial digital computers	Sperry Univac, IBM
1950s	Automation	Numerous
1960s	Extensive development of quantitative tools	Numerous
1960s	Industrial dynamics	Jay Forrester
1975	Emphasis an manufacturing strategy	W. Skinner
	Emphasis on quality, flexibility, time-based competition, lean production	Japanese manufacturers, especially Toyota, and Taiichi Ohno
1990s	Internet, supply chain management	Numerous
2000s	Applications service providers and outsourcing	Numerous

Trends in Business

The Internet, e-commerce, and e-business.

Management of technology.

Globalization.

Management of supply chains.

Outsourcing.

Agility.

Ethical behavior.

Operations strategy.

Working with fewer resources.

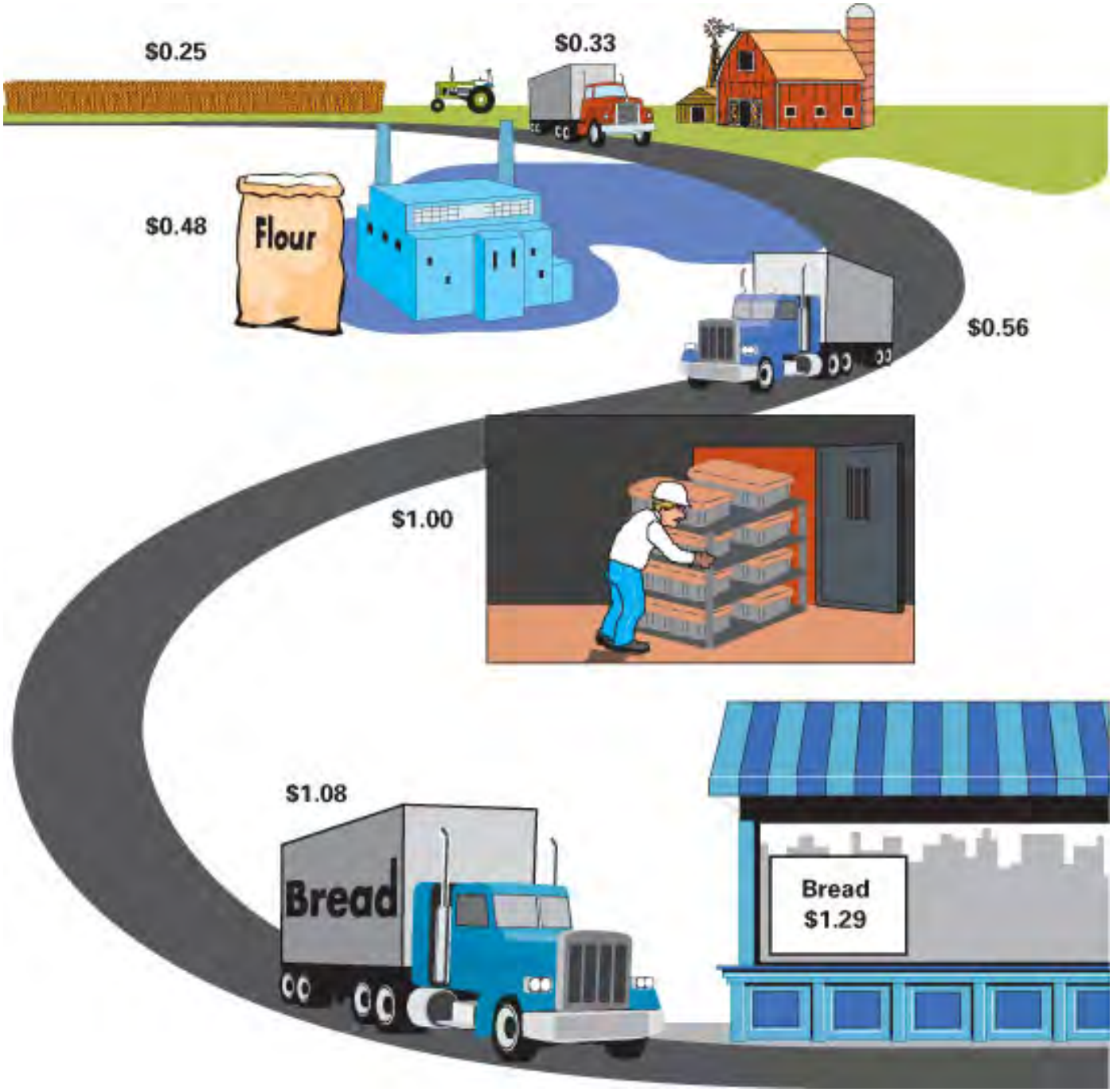
Revenue management.

Process analysis and improvement, and quality improvement.

Increased regulation and product liability issues.

Lean production.


Suppliers' suppliers
Direct suppliers
Producer
Distributor
Final customers


$0.25
$0.33
$0.48
Flour
$0.56
$1.00
$1.08
Bread
Bread
$1.29

Competitiveness

Identifying consumer wants and/or needs is a basic input in an organization's decision making process, and central to competitiveness.

Pricing is usually a key factor in consumer buying decisions.

Advertising and promotion are ways organizations can inform potential customers about features of their products or services, and attract buyers.

- Product and service design
- Cost
- Location
- Quality
- Quick response
- Flexibility

Why Some Organizations Fail

- Putting too much emphasis on short-term financial performance at the expense of research and development.
- Failing to take advantage of strengths and opportunities, and/or failing to recognize competitive threats.
- Neglecting operations strategy.
- Placing too much emphasis on product and service design and not enough on process design and improvement.
- Neglecting investments in capital and human resources.
- Failing to establish good internal communications and cooperation among different functional areas.
- Failing to consider customer wants and needs.

Strategy

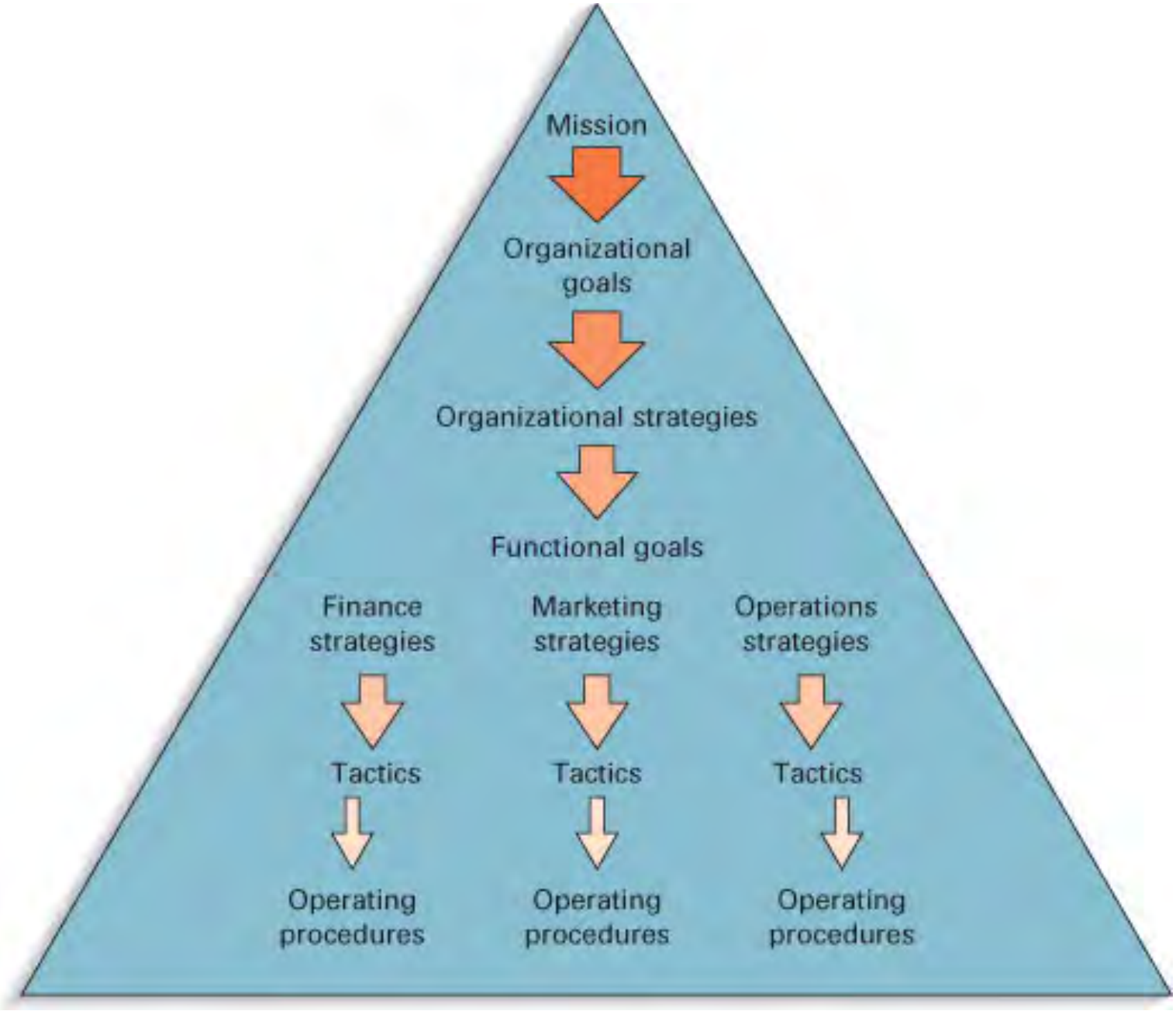
Mission: Live a good life.

Goal: Successful career, good income.

Strategy: Obtain a college education.

Tactics: Select a college and a major; decide how to finance college.

Operations: Register, buy books, take courses, study.


Mission
Organizational goals
Organizational strategies
Functional goals
Finance strategies
Marketing strategies
Operations strategies
Tactics
Tactics
Tactics
Operating procedures
Operating procedures
Operating procedures

Low cost. Outsource operations to third-world countries that have low labor costs.

Scale-based strategies. Use capital-intensive methods to achieve high output volume and low unit costs.

Specialization. Focus on narrow product lines or limited service to achieve higher quality.

Flexible operations. Focus on quick response and/or customization.

High quality. Focus on achieving higher quality than competitors.

Service. Focus on various aspects of service (e.g., helpful, courteous, reliable, etc.).

Factor	Operations Strategy	Examples of Companies or Services
Price	Low cost	U.S. first-class postage
		Wal-Mart
		Southwest Airlines
Quality	High-performance design and/or high quality	Sony TV
		Lexus
		Disneyland
		Five-star restaurants or hotels
	Consistent quality	Coca-Cola, PepsiCo
		Kodak, Xerox, Motorola
		Electrical power
Time	Rapid delivery	McDonald's restaurants
		Express Mail, UPS, FedEx
		One-hour photo
	On-time delivery	Dominos Pizza
		FedEx
		Express Mail
Flexibility	Variety	Burger King ("Have it your way")
		Hospital emergency room
	Volume	McDonald's ("Buses welcome")
		Toyota
		Supermarkets (additional checkouts)
Service	Superior customer service	Disneyland
		Hewlett-Packard
		IBM
		Nordstrom
Location	Convenience	Supermarkets, dry cleaners
		Mall stores
		Service stations
		Banks, ATMs

Economic conditions. These include the general health and direction of the economy, inflation and deflation, interest rates, tax laws, and tariffs.

Political conditions. These include favorable or unfavorable attitudes toward business, political stability or instability, and wars.

Legal environment. This includes antitrust laws, government regulations, trade restrictions, minimum wage laws, product liability laws and recent court experience, labor laws, and patents.

Technology. This can include the rate at which product innovations are occurring, current and future process technology (equipment, materials handling), and design technology.

Competition. This includes the number and strength of competitors, the basis of competition (price, quality, special features), and the ease of market entry.

Markets. This includes size, location, brand loyalties, ease of entry, potential for growth, long-term stability, and demographics.

Human resources. These include the skills and abilities of managers and workers; special talents (creativity, designing, problem solving); loyalty to the organization; expertise; dedication; and experience.

Facilities and equipment. Capacities, location, age, and cost to maintain or replace can have a significant impact on operations.

Financial resources. Cash flow, access to additional funding, existing debt burden, and cost of capital are important considerations.

Customers. Loyalty, existing relationships, and understanding of wants and needs are important.

Products and services. These include existing products and services, and the potential for new products and services.

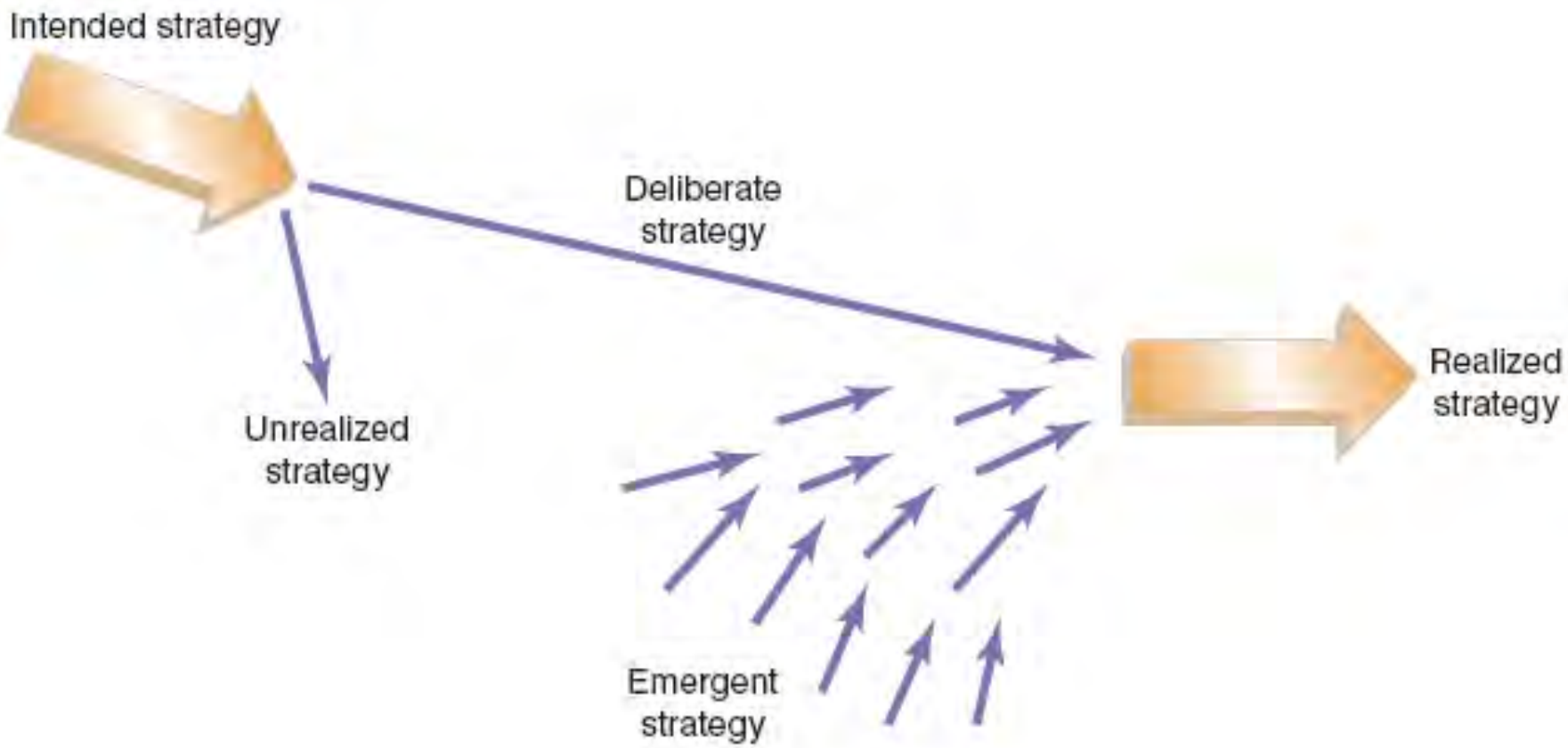
Technology. This includes existing technology, the ability to integrate new technology, and the probable impact of technology on current and future operations.

Suppliers. Supplier relationships, dependability of suppliers, quality, flexibility, and service are typical considerations.

Other. Other factors include patents, labor relations, company or product image, distribution channels, relationships with distributors, maintenance of facilities and equipment, access to resources, and access to markets.

Operations Strategy

		Management Level	Time Horizon	Scope	Level of Detail	Relates to
The overall organization	Mission	Top	Long	Broad	Low	Survival, profitability
	Strategy	Senior	Long	Broad	Low	Growth rate, market share
Production/ operations	Strategic	Senior	Moderate to long	Broad	Low	Product design, choice of location, choice of technology, new facilities
	Tactical	Middle	Moderate	Moderate	Moderate	Employment levels, output levels, equipment selection, facility layout
	Operational	Low	Short	Narrow	High	Scheduling personnel, adjusting output rates, inventory management, purchasing


Intended strategy
Deliberate strategy
Unrealized strategy
Realized strategy
Emergent strategy


Top down
Operations led
Operations strategy
Market led
Bottom up

Strategic OM Decision Areas

Decision Area	What the Decisions Affect
1. Product and service design	Costs, quality, liability and environmental issues
2. Capacity	Cost structure, flexibility
3. Process selection and layout	Costs, flexibility, skill level needed, capacity
4. Work design	Quality of work life, employee safety, productivity
5. Location	Costs, visibility
6. Quality	Ability to meet or exceed customer expectations
7. Inventory	Costs, shortages
8. Maintenance	Costs, equipment reliability, productivity
9. Scheduling	Flexibility, efficiency
10. Supply chains	Costs, quality, agility, shortages, vendor relations
11. Projects	Costs, new products, services, or operating systems

Quality and Time Strategies

Productivity

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}}$$

$$\text{Productivity growth} = \frac{\text{Current productivity} - \text{Previous productivity}}{\text{Previous productivity}} \times 100$$

Partial measures	$\frac{\text{Output}}{\text{Labor}}$	$\frac{\text{Output}}{\text{Machine}}$	$\frac{\text{Output}}{\text{Capital}}$	$\frac{\text{Output}}{\text{Energy}}$
Multifactor measures	$\frac{\text{Output}}{\text{Labor + Machine}}$		$\frac{\text{Output}}{\text{Labor + Capital + Energy}}$	
Total measure	$\frac{\text{Goods or services produced}}{\text{All inputs used to produce them}}$			

Labor productivity	Units of output per labor hour
	Units of output per shift
	Value-added per labor hour
	Dollar value of output per labor hour
Machine productivity	Units of output per machine hour
	Dollar value of output per machine hour
Capital productivity	Units of output per dollar input
	Dollar value of output per dollar input
Energy productivity	Units of output per kilowatt-hour
	Dollar value of output per kilowatt-hour

$$\frac{\text{Yards of carpet installed}}{\text{Labor hours}} = \text{Yards of carpet installed per labor hour}$$

$$\frac{\text{Number of motel rooms cleaned}}{\text{Number of workers}} = \text{Number of motel rooms cleaned per worker}$$