



WelTec

Te Whare Wānanga o te Awakairangi



西安科技大学高新学院
XI'AN KEDAGAOXIN UNIVERSITY

IT5507 Fundamentals of Data Science

Introduction to information
technology and information
systems concepts

Objectives

- ❖ Systems
- ❖ The impact of information technology on business strategy and success
- ❖ Information system
- ❖ Explain how the Internet has affected business strategies and relationships
- ❖ Identify types of information systems and explain who uses them

The Power of Digital Systems

- Binary counting system uses only two digits: 0 and 1
- **Digital systems:**
 - computers and devices that use the binary system
 - Can represent any information as a combination of zeroes and ones
- Information can be represented, stored, communicated, and processed digitally

The Power of Digital Systems (cont'd.)

- Digital information is stored and communicated by means of electromagnetic signals
 - Extremely fast
 - Exact copy of the original is possible
- *Accuracy* and *speed* make digital systems powerful, useful, and important

The Purpose of Information Systems

- Businesses use information systems to:
 - Make sound decisions
 - Solve problems
- Problem: any undesirable situation
- Decision: arises when more than one solution to problem exists
- Both problem solving and decision making require information

The Purpose of Information Systems (cont'd.)

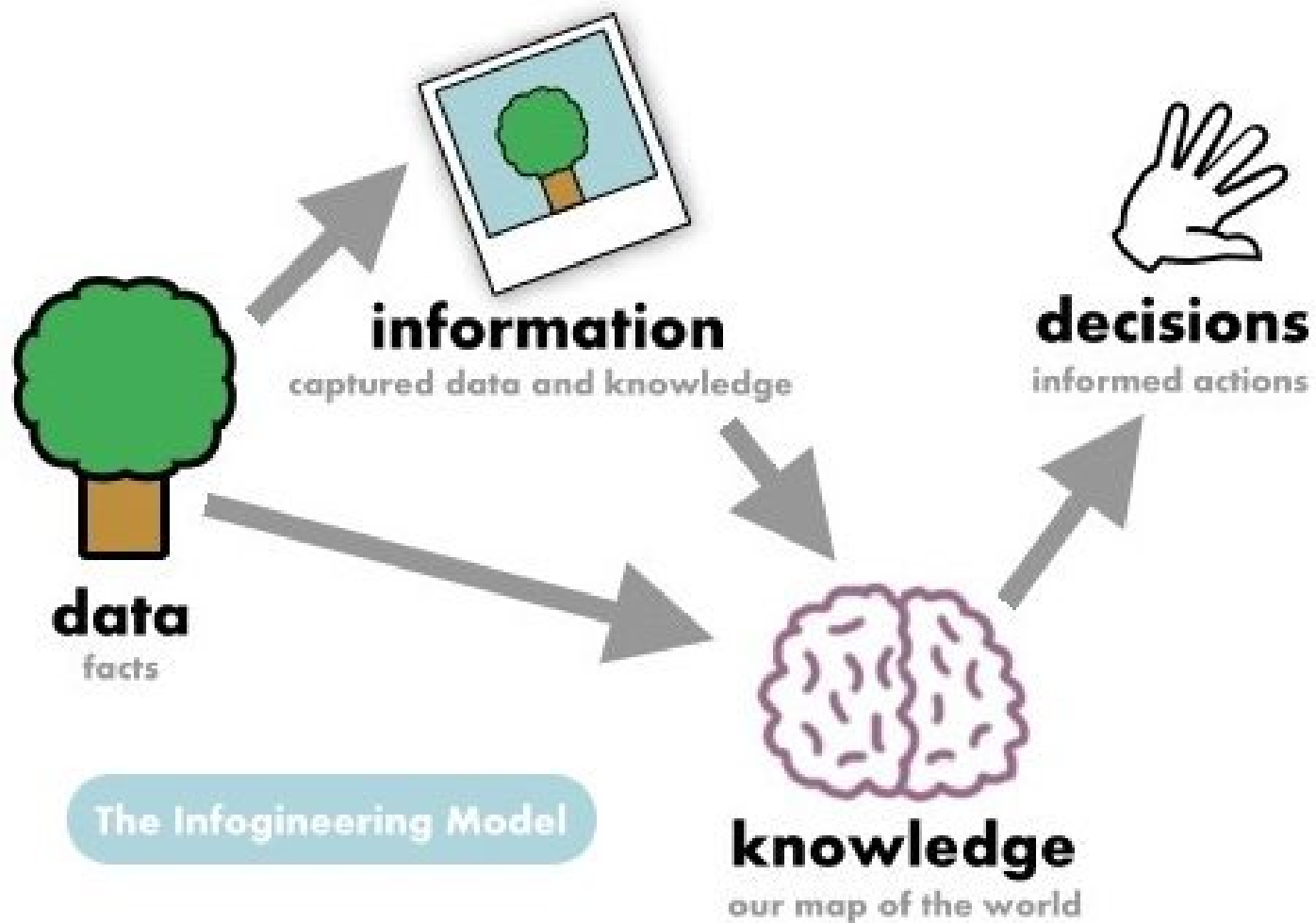
- Keys to success in business
 - Gathering correct information efficiently
 - Storing information
 - Using information
- Information systems support daily operations

Data, Information, and Information Systems

- Commonly used terms
 - Data
 - Information
 - System
- Important to understand similarities and differences among terms

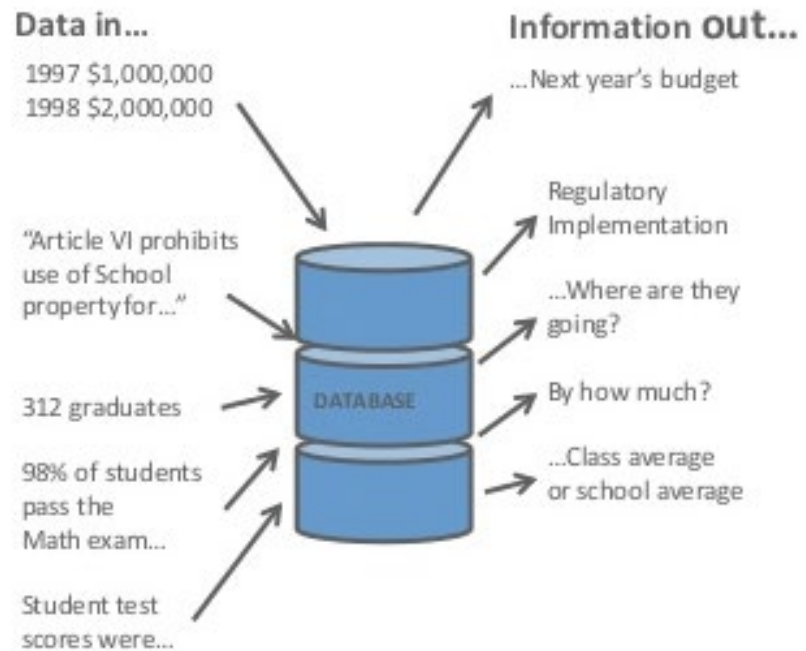
Data vs. Information

- **Data:** a given or fact
 - Can be number, statement, or picture
 - Is the raw material in the production of information
- **Information:** facts or conclusions that have meaning within context
 - Composed of data that has been manipulated



Data vs. Information

- Think about test scores, for example.
- In one class, if every student receives a numbered score, the scores can be calculated to determine a class average.
- The class averages can be calculated to determine the school average.



Data Manipulation

- Survey is common method of collecting data
- Reading data can be extremely time consuming
- Manipulating the data may provide valuable information
- Examples: categorizing and producing statistics
 - May be applied to marketing and manufacturing practices

Generating Information

- **Process:** the manipulation of data
 - Usually produces information
 - May produce more data
- A piece of information (output of a process) in one context may be considered data (input to a process) in another context

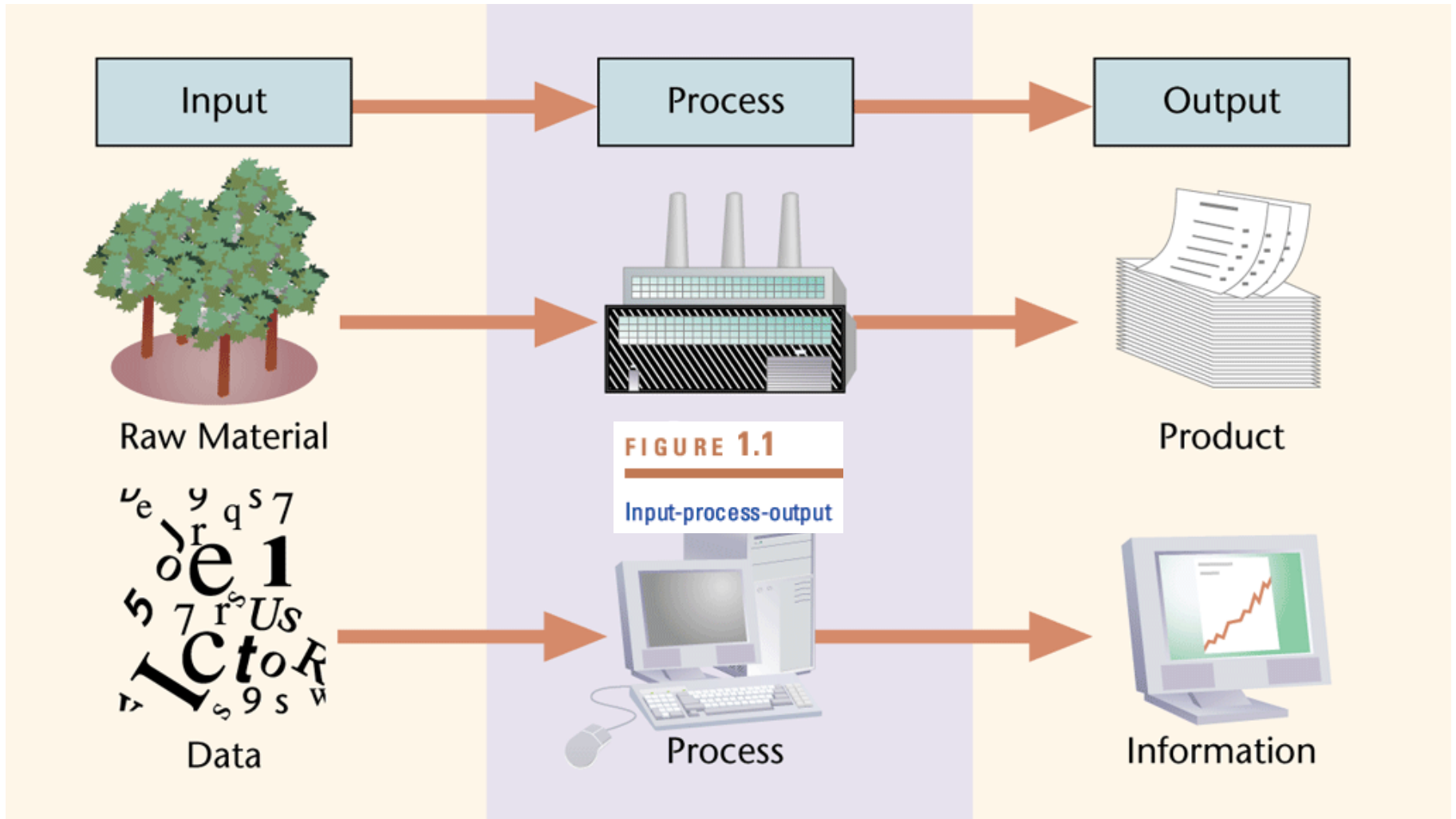


Figure 1.1 Input-process-output

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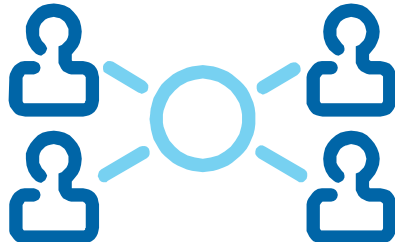
Information in Context

- Not all information is useful
- Characteristics of useful information
 - Relevant
 - Complete
 - Accurate
 - Current

Common Types of Systems

- Natural Systems
- Man-Made Systems
- **Automated Systems**

- *Computer networks – Internet, intranet*
- *Computer systems – database systems, operating systems*



So what is a system?

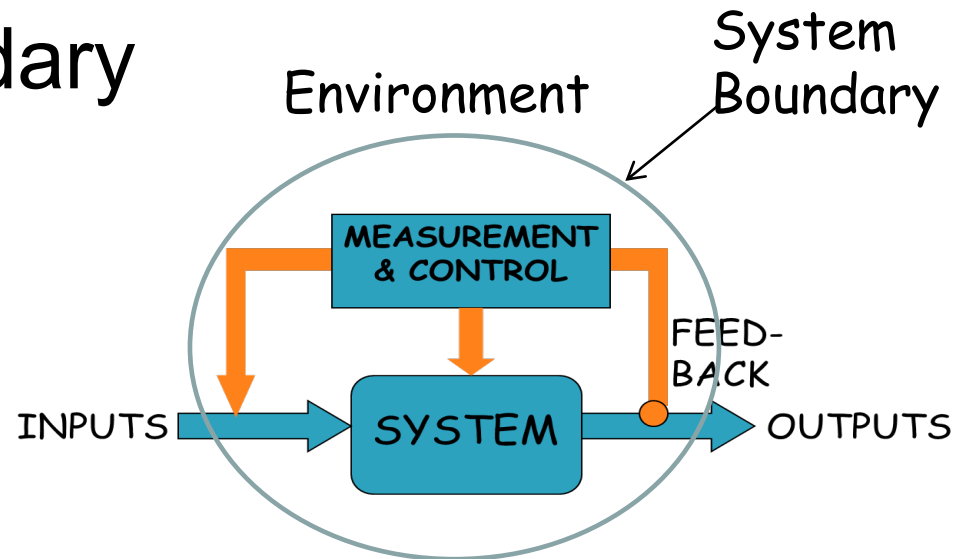
- A system is a set of interrelated components that work together to transform inputs into outputs

Question: Name some types of information system used in education...

Characteristics of systems

Every system has:

1. System environment
2. System boundary
3. Inputs
4. Outputs
5. Feedback
6. Control



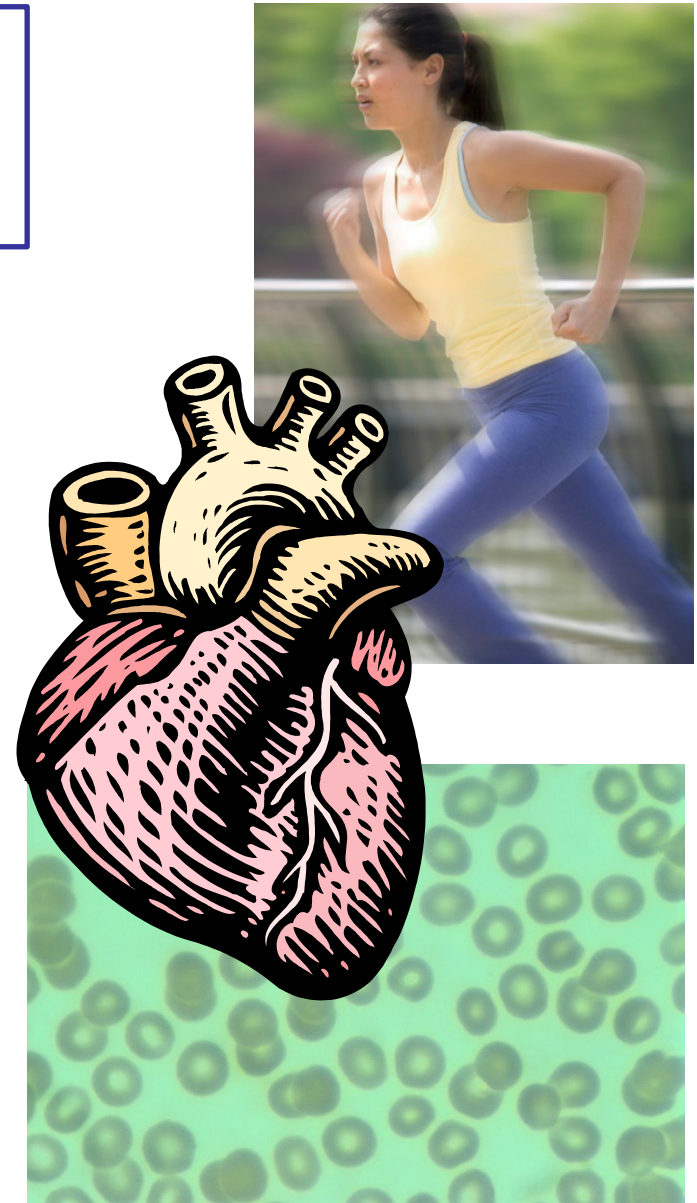
Characteristics of systems

Systems may also have:

- Emergent properties - unexpected properties exhibited by a complex system (complex systems are greater than the sum of their parts)
- Interfaces (connections) to other systems
- Sub-systems (a large system often composed of several smaller sub-systems)

1. System Environment

- A system exists in an environment (everything outside of the system boundary)
- The environment changes depending on the point of view of the observer
 - a human body
 - a heart
 - a cell



2. System Boundary



- A system is separated from its environment by some kind of boundary
- The boundaries of a system are defined by the elements you decide to include in the system
- For example one study of a production system may include raw material and finished products as within the boundary, another study might exclude them
- It is often difficult to specify the boundary of a system

3. Inputs



- Inputs flow across the system boundary into the system and are transformed by it into outputs
- Inputs can be
 - An object (e.g. water flowing into a cooling system)
 - Energy (e.g. electricity into lighting system)
 - or Data (as used in an information system)

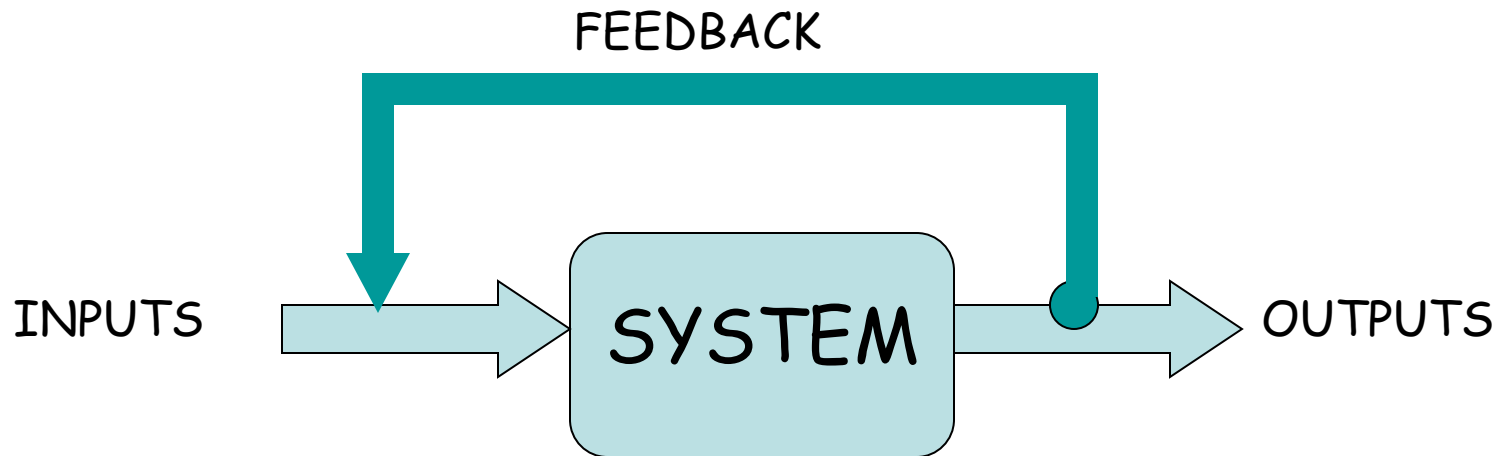
4. Outputs



- The system generates outputs by transforming inputs
- Outputs often have an influence on the environment in which the system operates
- Outputs are commonly objects, energy or information

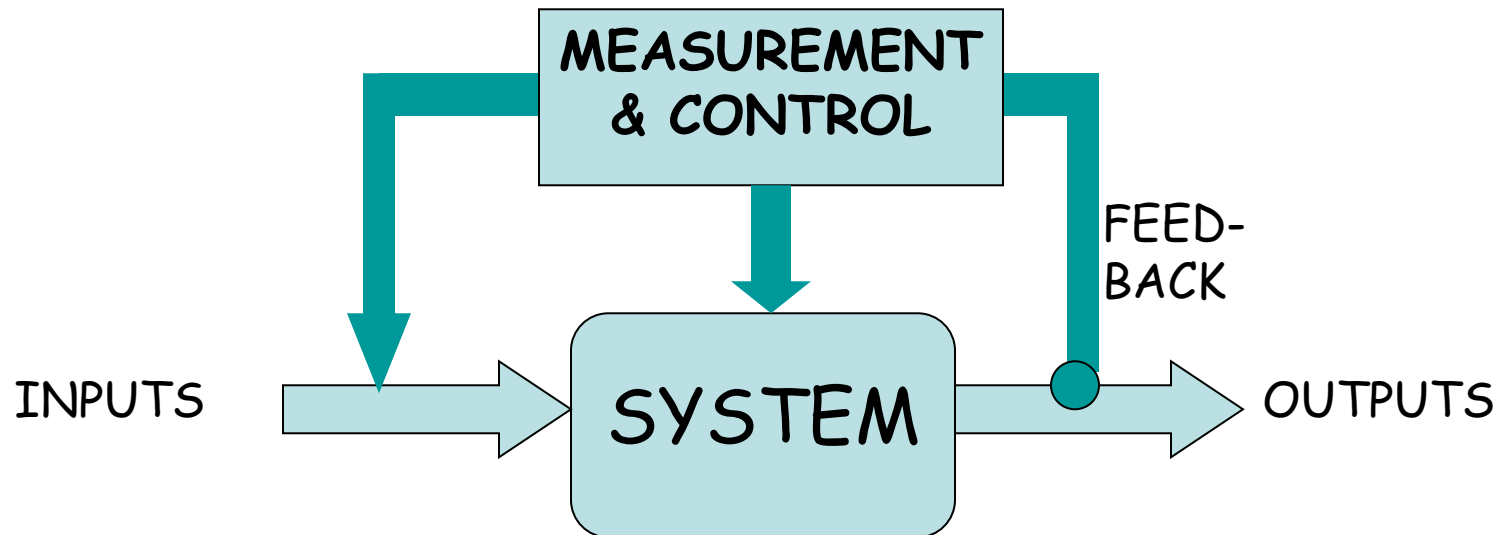
5. Feedback

Feedback is a circular flow whereby information about the process is used to change the process



6. Control

- Control mechanisms reduce the effect of feedback
- Measurement allows the outputs to be measured and compared to desired limits

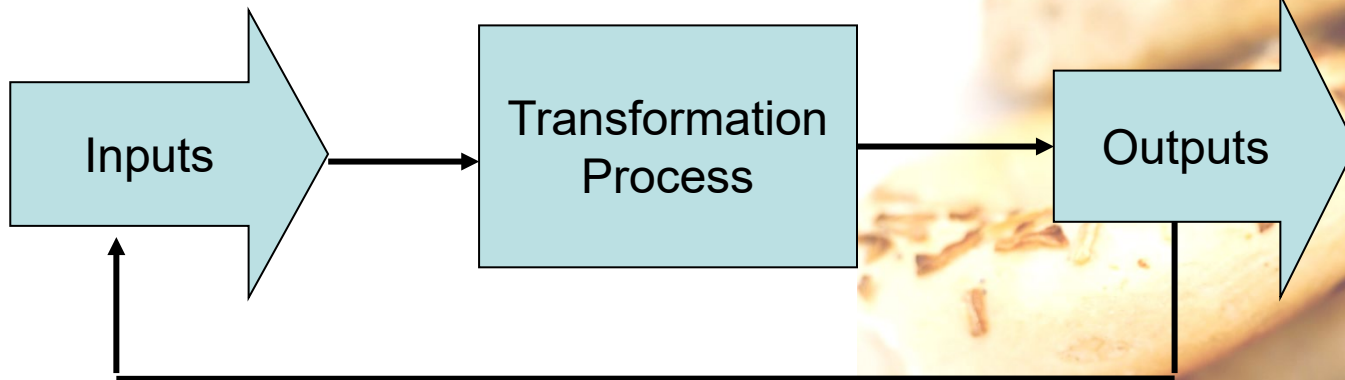


Bakery example

- Bakers
- Ingredients
- Equipment
- Money

-Bread is prepared and baked

- Freshly baked bread and pastries
- Satisfied customers
- Satisfied staff



Customer compliments or complaints

Systems in organisations

Resources

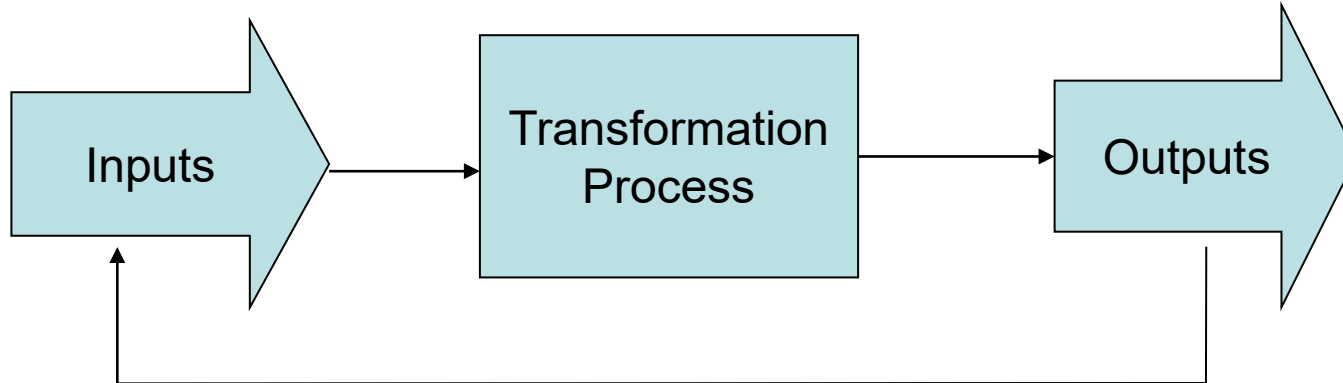
- people
- materials
- equipment
- finances
- information

Managerial and technological capabilities

- planning
- organising
- building
- controlling
- transforming with technology

Outcomes

- products and services
- employee growth and satisfaction



Feedback from environment

Information about:

- Results
- Organisational status

Open and Closed Systems

- **Open System**
 - A system that interacts with its environment by receiving inputs from its environment, and delivering outputs to its environment
- An open system can modify its external environment and in turn it can be modified by its environment
- Most systems are open

Open and Closed Systems

- **Closed System**

- A system whose inputs and outputs are within the system boundary i.e. it does not interact with its external environment – no energy, matter or information is exchanged
- The universe is the only true closed system i.e. nothing within it interacts with anything outside of it

Exercise

- Using the systems model on the previous slide as a guide, list the inputs, transformation process, and outputs of a tertiary institution



Systems in organisations

Resources

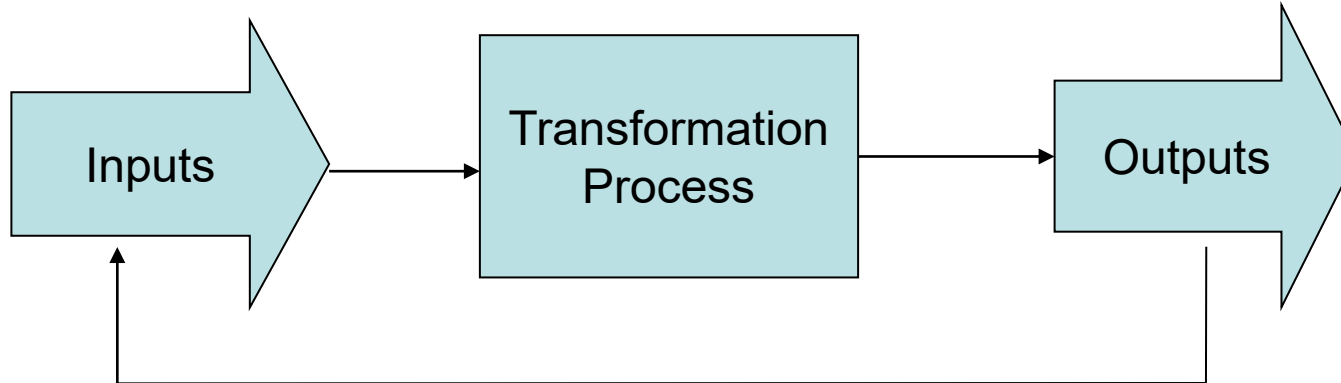
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Feedback from environment

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Introduction

❖ Why IT?

❖ Companies use information to

- ❖ increase productivity
- ❖ deliver quality products
- ❖ deliver services
- ❖ maintain customer loyalty
- ❖ make good decisions

❖ Information technology can mean the difference between success and failure



The Impact of Information Technology

❖ Information Technology

- A combination of hardware and software products and services that organisations use to manage, access, communicate, and share information
- A vital asset that must be
 - used effectively
 - updated constantly
 - safeguarded carefully

The Impact of Information Technology

❖ The Future of IT

- Accounts for almost 30 percent of America's economic growth, and the wage gaps between IT workers and all other workers will continue to widen
- Global online population skyrocketed between 2000 and 2013

The Impact of Information Technology

❖ Who develops Information Systems?

- In-house project teams
- Software packages are purchased
- Internet-based application services are purchased
- Outsourcing – send the work to another company
- Custom solutions
- Enterprise-wide software strategies



The Impact of Information Technology

❖ The role of systems analysis and design

- Systems analysis and design
 - Step-by-step process for developing high-quality information systems by
 - Analysing the situation and talking to people to see what is needed (e.g. a new payroll system)
 - Providing information to system developers so they understand what to develop
- Systems analyst
 - Works with customers and developers to help plan, develop and maintain information systems

Information and Managers

- **Systems thinking:** considering an organization in terms of subsystems
 - Powerful management approach that creates a framework for problem solving and decision making
 - Helps keep managers focused on overall goals
- **Database:** collection of electronic records
- Information systems automate information exchange among subsystems

Information and Managers (cont'd.)

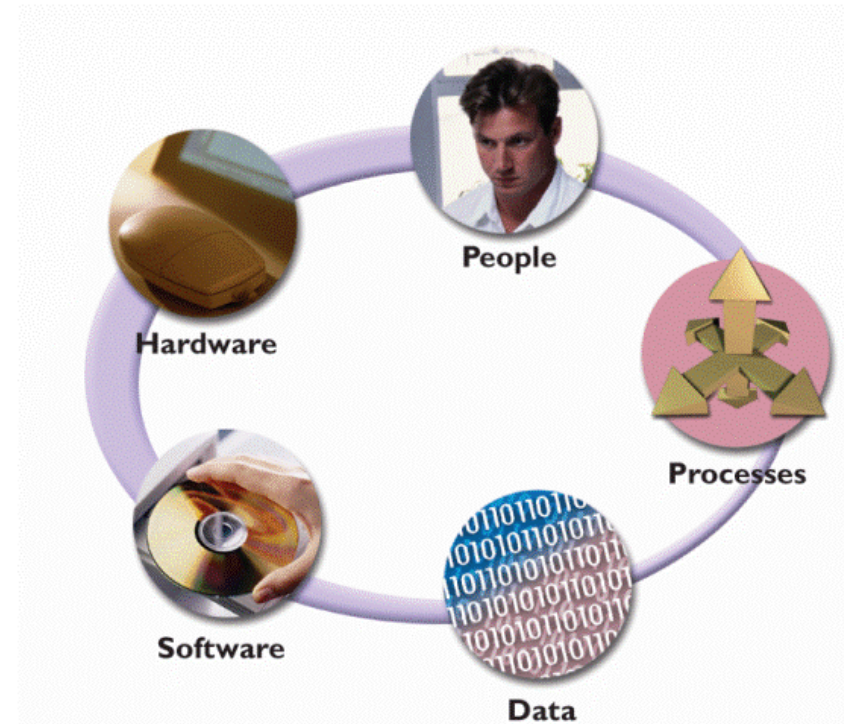
- **Information map:** description of data and information flow within an organization
 - Shows a network of information subsystems that exchange information with each other and with the outside world
- **Information technology:** technologies that facilitate construction and maintenance of information systems

Information Systems in Organizations

- Consist of data, hardware, software, telecommunications, people, and procedures
- **Computer-based information system** includes one or more computers at its center
 - Computers collect, store, and process data into information
 - People give instructions via computer programs

Information System Components

- ❖ A system is a set of related components that produces specific results
- ❖ An Information System Is...



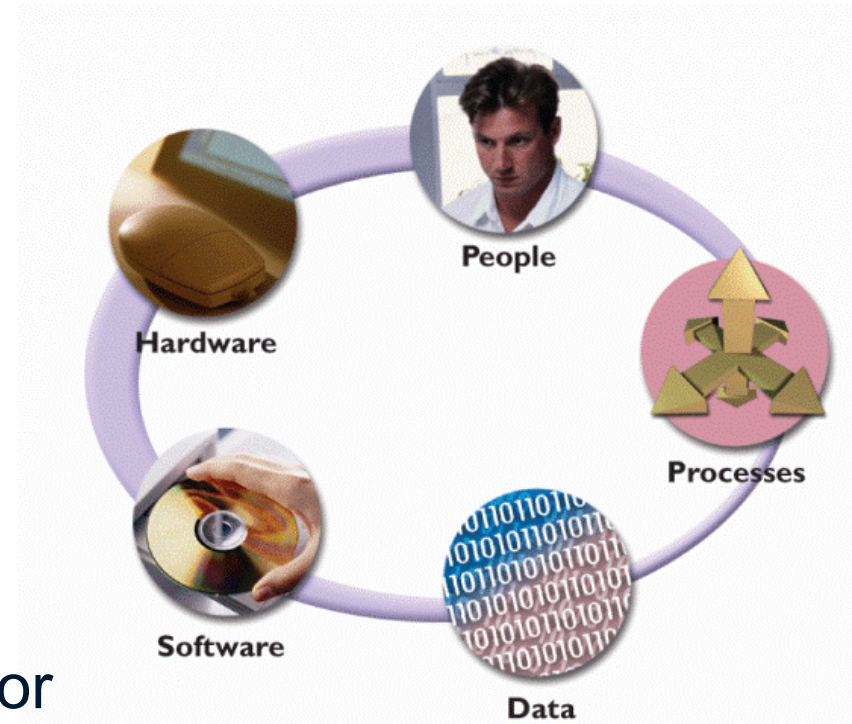
Data	Input that the system takes to produce information
Hardware	A computer and its peripheral equipment: input, output, and storage devices; hardware also includes data communication equipment
Software	Sets of instructions that tell the computer how to take data in, how to process it, how to display information, and how to store data and information
Telecommunications	Hardware and software that facilitate fast transmission and reception of text, pictures, sound, and animation in the form of electronic data
People	Information systems professionals and users who analyze organizational information needs, design and construct information systems, write computer programs, operate the hardware, and maintain software
Procedures	Rules for achieving optimal and secure operations in data processing; procedures include priorities in dispensing software applications and security measures

Information System Components

❖ People

- Use information systems to complete their work
- Users, or end users
- The people who interact with an information system, both inside and outside the company

❖ Processes – the activities, calculations, and any other work the computer performs for people



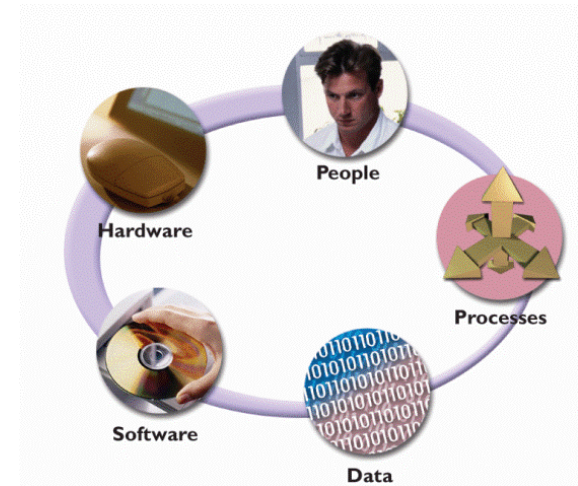
Information System Components

❖ Hardware

- Moore's Law
- Monitors, mice, cabling, drives,

❖ Software

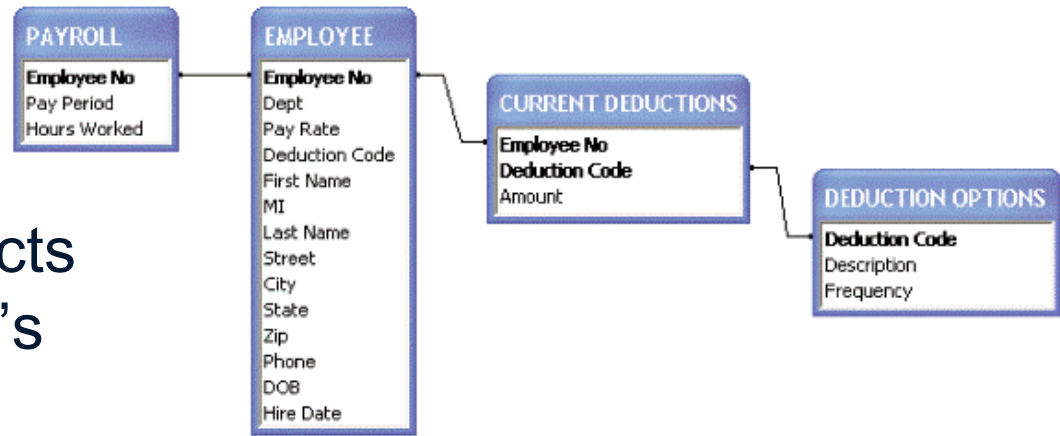
- Operating system software
- Application software
- Enterprise applications
- Legacy systems



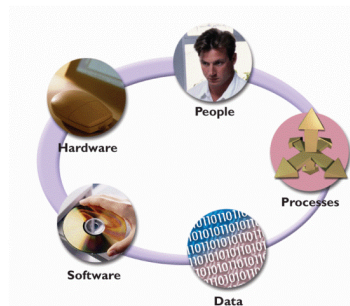
Information System Components

❖ Data

- consists of basic facts that are the system's raw material
- arranged in linked tables

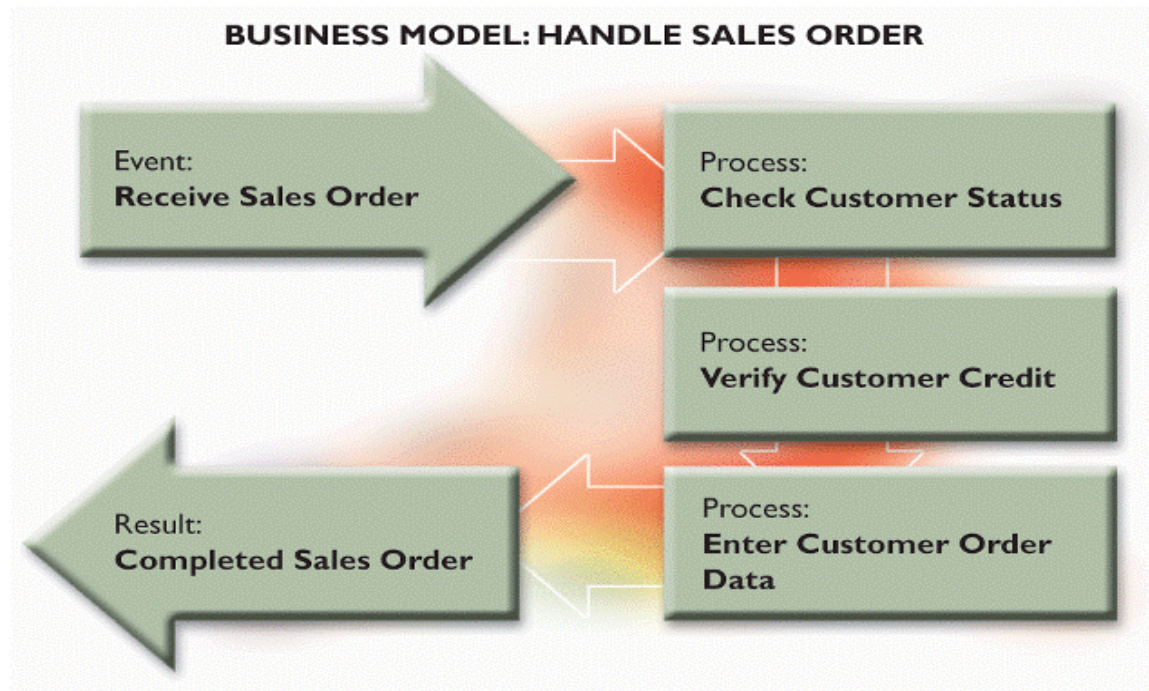


Any Bank Inc.		Date <u>6/5/07</u>	Date <u>6/5/07</u>
PAYROLL ACCOUNT		Pay Period <u>5/21-5/27</u>	Hours _____
Pay to the order of <u>Amy Calico</u>		Employee _____	Gross Pay _____
<u>Four hundred and fifty -----</u> Dollars \$ <u>450.00</u>		Deductions _____	Net Pay _____
Memo: _____			
⑆123456789⑆555000011⑆06789			



Understanding the Business

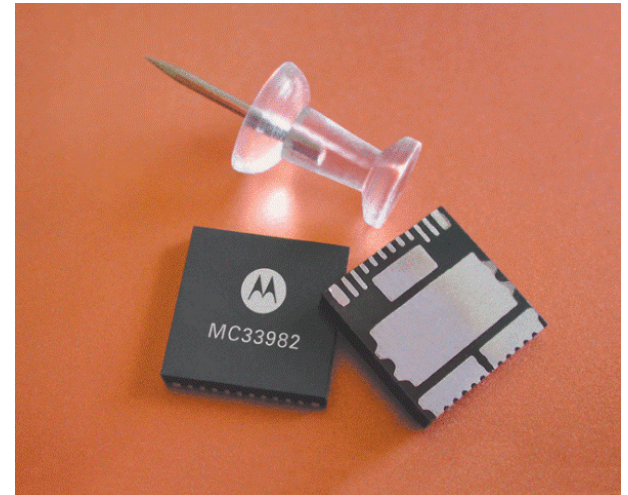
- Business model
- Business process
- Business process reengineering (BPR)



Understanding the Business

❖ Kinds of company

- Production-oriented
 - Create products
- Service-oriented
 - Create services
- Internet-dependent
 - All or part
- Virtual (dot-com)
- Brick-and-mortar



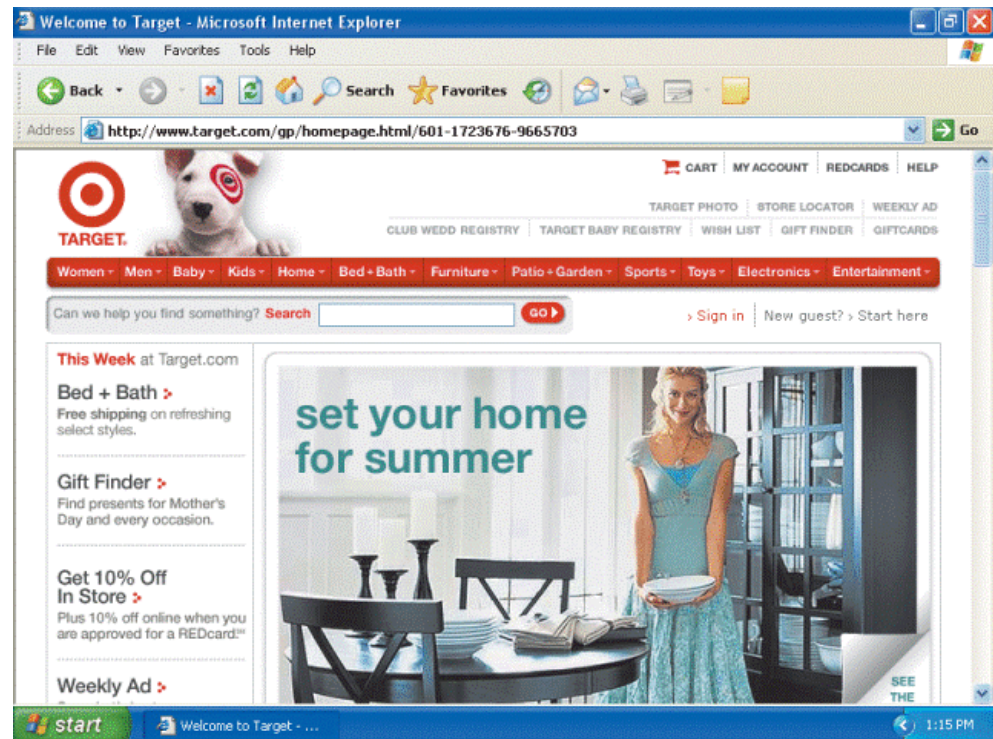
Impact of the Internet

- ❖ E-Commerce or I-Commerce
- ❖ B2C (Business-to-Consumer)
- ❖ B2B (Business-to-Business)

Impact of the Internet

❖ Web-Based system development

- WebSphere
- .NET
- Web services



How Business Uses Information Systems

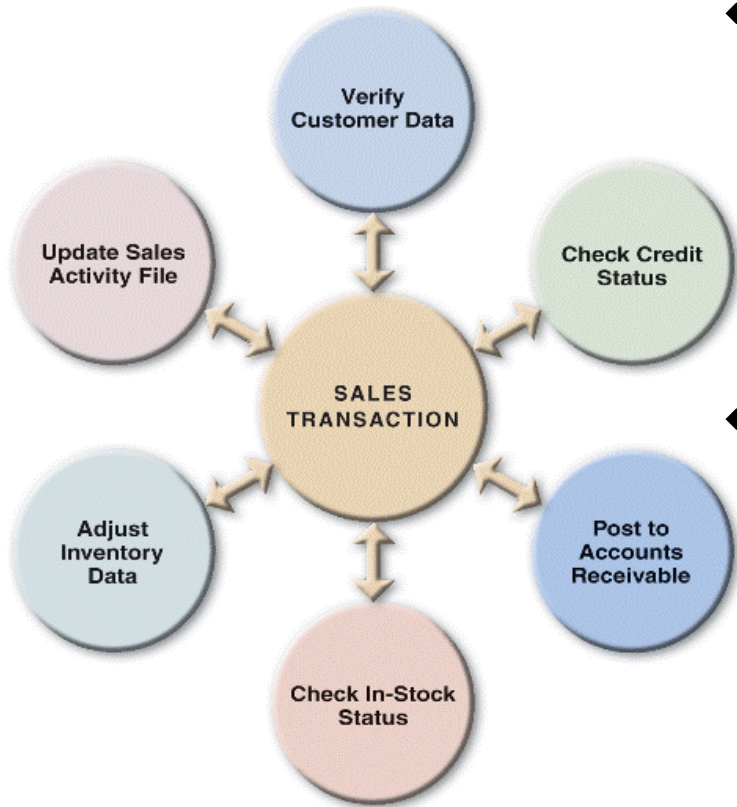
- ❖ **In the past, systems were named depending on which kind of users used the system**
 - Office systems
 - Operational systems
 - Decision support systems
 - Executive information systems

How Business Uses Information Systems

❖ **Today, systems are identified by the functions (the work) they do**

- Enterprise computing systems
- Transaction processing systems
- Business support systems
- Knowledge management systems
- User productivity systems

How Business Uses Information Systems



❖ Enterprise computing systems

- Support company-wide operations and data management requirements

❖ Transaction processing systems

- Efficient because they process a set of transaction-related commands as a group rather than individually

How Business Uses Information Systems

❖ Business support systems

- Provide job-related information to users at all levels of a company
- Management information systems (MIS)
- Radio frequency identification (RFID)
- What-if analysis (what if resources are not available, what if the cost of a resource rises, what if profits fall?)



How Business Uses Information Systems

❖ Knowledge management systems

- Called expert systems
- Simulate human reasoning by combining a knowledge base and inference rules

How Business Uses Information Systems

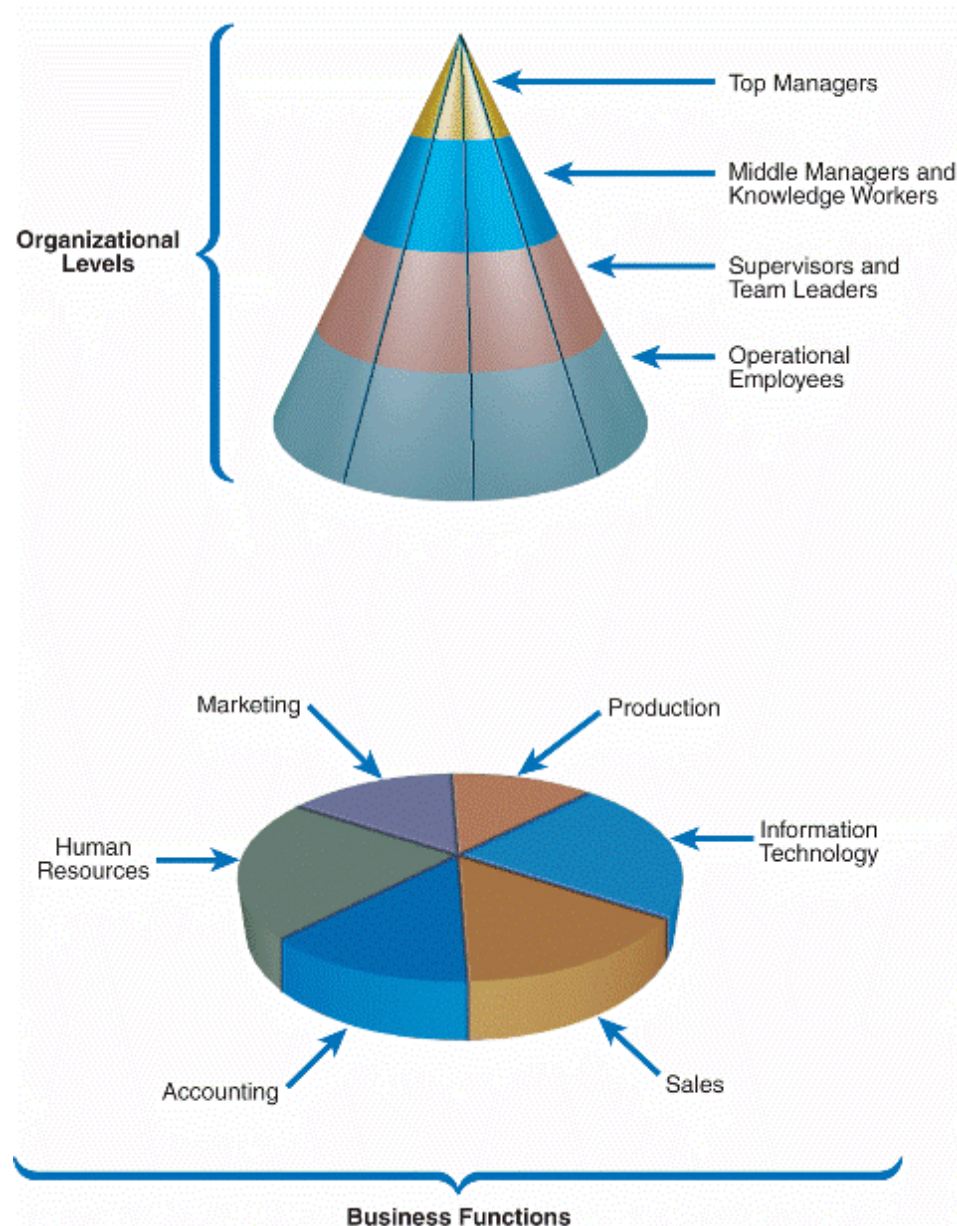
❖ **User productivity systems**

- Technology that improves productivity
- Groupware

❖ **Information systems integration**

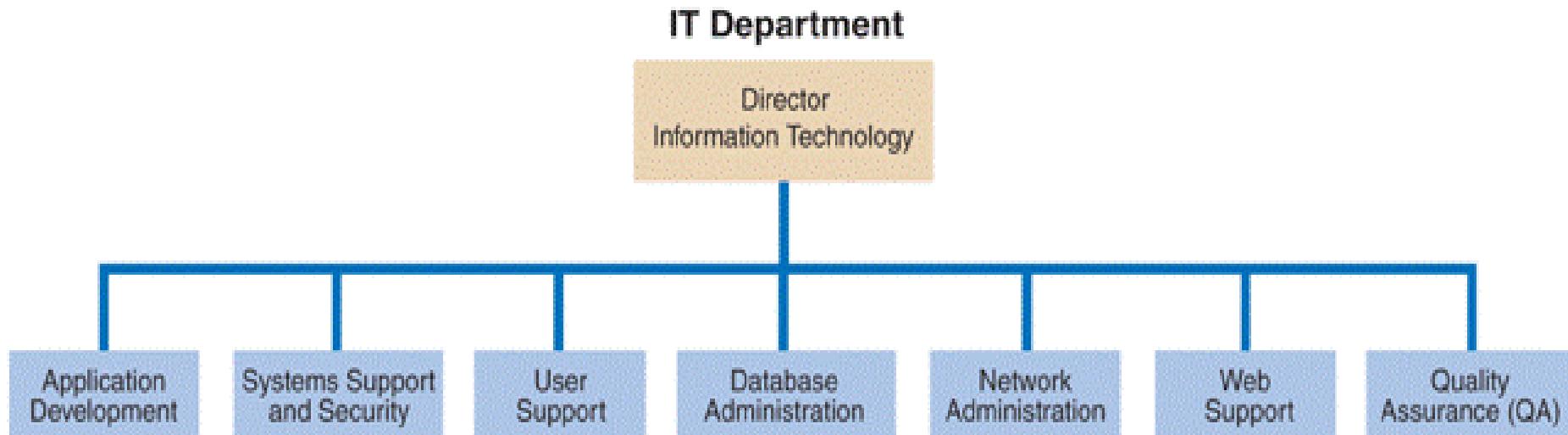
- Most large companies require systems that combine transaction processing, business support, knowledge management, and user productivity features

Information System Users and Their Needs



Information Technology Department

- ❖ The information technology (IT) department develops and maintains a company's information systems
- ❖ The IT group provides technical support



Information Technology Department

- ❖ Application development
 - Team may include users, managers and IT Staff members
- ❖ Systems support and security
 - Deployment team
- ❖ User support
 - Help desk or information center (IC)

Information Technology Department

❖ Database administration

- Database design, management, security, backup, and user access

❖ Network administration

- Includes hardware and software maintenance, support, and security

❖ Web support

- Webmasters

Information Technology Department

❖ Quality Assurance (QA)

- Reviews and tests all applications and systems changes to verify specifications and software quality standards
- Is often a separate unit that reports directly to IT management

The Systems Analyst Position

- ❖ A business analyst...
- ❖ A systems analyst investigates, analyses, designs, develops, installs, evaluates, and maintains a company's information systems
- ❖ On large projects, the analyst works as a member of an IT department team
- ❖ Smaller companies often use consultants to perform the work

The Systems Analyst Position

❖ Responsibilities

- Translate business requirements into practical IT projects to meet needs

❖ Required skills and background

- Solid people and communication skills
- Analytic ability for solving problems
- Technical understanding
- Domain knowledge (banking, sales, medical, marketing...)