Learning Objectives (1)

- Know the eight principles of competitive advantage.
- Understand how information systems create competitive advantage.
- Define problem.

Learning Objectives (2)

- Recognize that different information systems are needed to solve different problem definitions.
- Know the characteristics of decision making.
- Understand how information systems facilitate decision making.

Information Systems for Competitive Advantage

- Businesses continually seek to establish competitive advantage in the marketplace.
- There are eight principles:
  - The first three principles concern products.
  - The second three principles concern the creation of barriers.
  - The last two principles concern establishing alliances and reducing costs.

Figure 2-1 Principles of Competitive Advantage

1. Create a new product or service
2. Enhance products or services
3. Differentiate products or services
4. Lock in customers and buyers
5. Lock in suppliers
6. Raise barriers to market entry
7. Establish alliances
8. Reduce costs

Figure 2-2 Two Roles for Information Systems Regarding Products
Information System that Creates a Competitive Advantage

• ABC invested heavily in information technology.
• ABC led the shipping industry in the application of information systems for competitive advantage.

How this System Creates a ABC, Inc Competitive Advantage

• ABC information system provides the following:
  – Enhances an existing product
  – Differentiates the ABC package delivery product from competitors
  – Lock’s customers into the ABC system
  – Raises the barrier to market entry
  – Reduces costs
Information Systems for Problem Solving

- Information systems can be used to solve problems.
- Problem definition
  - A problem is a perceived difference between what is and what is not.
  - A problem is a perception.
  - A good problem definition defines the differences between what is and what ought to be by describing both the current and desired situations.

A Customer Relationship Management System

- A Customer Relationship Management (CRM) system is an information system that maintains data about customers and all of their interactions with the system.
- CRM systems vary in their size and complexity.

Knowledge Management System

- A knowledge management system (KMS) is an information system for storing and retrieving organizational knowledge.
- This knowledge can be in the form of data, documents, or employee know-how.
- KMS goal is to make the organization knowledge available to
  - Employees
  - Vendors
  - Customers
  - Investors
  - Press and who else who needs the knowledge
A Manufacturing Quality-Control Information System

- Many organizations believe that the optimal way to provide customer service is to eliminate the need for it.
- One way to improve customer service is to improve manufacturing quality.
- The type of system to develop depends on the way the organization defines the problem.
- Before developing the system, the organization must have a complete, accurate, and agreed-upon problem definition.

Information Systems for Decision Making

- Developing an information system is to facilitate decision making.
- Decision making in organizations is varied and complex.

Decision Level (1)

- Decisions occur at three levels in organizations.
- Operational decisions concern day-to-day activities.
  - Information systems that support operational decision making are called transaction processing systems (TPS).

Decision Level (2)

- Managerial decisions concern the allocation and utilization of resources.
  - Information systems that support managerial decision making are called management information systems (MIS).
- Strategic decision making concern broader-scope organizational issues.
  - Information systems that support strategic decision making are called executive information systems (EIS).

The Decision Process

- Two decision processes (method by which a decision is to be made) are structured and unstructured.
  - Structured decision process is one for which there is an understood and accepted method for making the decision.
  - Unstructured process is one for which there is no agreed on decision making process.
- The terms structured and unstructured refers to the decision process-not the underlying subject.
Information Systems and Decision Steps

- A way to examine the relationship between information systems and decision making is to consider how an information system is used during the steps of the decision making process.
- There are five steps
  - Intelligence gathering
  - Alternative formulation
  - Choice
  - Implementation
  - Review
Security Guide–Security as Competitive Advantage

• Example—Two different security problems
  – Slammer worm
    • The Slammer worm infected computers that used a Microsoft program called SQL Server by consuming so many resources on a computer that serious traffic jams occurred over the Internet.
    • Microsoft issued a patch for customers to install via its Web site to plug the hole used by the Slammer worm.

• Example—Two different security problems
  PeopleSoft (Hacker access)
    • Allowed hackers to exploit PeopleSoft software to install unauthorized programs on the computers of PeopleSoft’s customers.
    • No software is known to be completely secure.
    • There is always a chance that a hole will be found in any company’s software.

Ethics Guide–Limiting Access to Those Who Have Access (1)

• It’s easier for those with considerable knowledge and expertise to gain more knowledge and expertise.
• The person with greater knowledge pulls farther and farther ahead.
• Searching the Internet is also a matter of choice

Ethics Guide–Limiting Access to Those Who Have Access (2)

• The increasing reliance on the Web for information and commerce has created a divide of the have-s and the have-nots.
• Various groups have addressed this problem by making Internet access available in public places.
• It’s much cheaper to provide support information over the Internet than on printed documents.

Opposing Forces Guide–G. Robinson Old Prints and Maps

• George Robinson buys and sells old prints and maps.
• George feels that he does not need a computer in his business.
• George keeps a manual list of customers to whom he sends a newsletter 2-4 times per year (keeping the newsletter to 1K or so for the best customers)
• Georges sells 90-95% of the items in his catalog.

Opposing Forces Guide–G. Robinson Old Prints and Maps

• Biggest challenge is finding new inventory.
• Inventory control does not account for gross margin.
• Can George use a CRM system?
Problem Solving Guide–Egocentric versus Empathetic Thinking (1)

- When developing Information Systems, it is critical for the development team to have a common definition and understanding of the problem.
- Egocentric thinking centers on the self.
- Empathetic thinkers consider their view as one possible interpretation of the problem and actively work to learn what others are thinking.

Problem Solving Guide–Egocentric versus Empathetic Thinking (2)

- In business, empathetic thinking is recommended.
- Those who understand others’ point of view are always more effective.
- Empathetic thinking is an important skill in all business activities.
- Skilled negotiators always know what the other side wants.

Hardware and Software
Chapter 3

Learning Objectives

- Learn the terminology necessary to be an intelligent consumer of hardware products.
- Know the functions and basic features of common hardware devices.
- Understand the essentials of the representation of computer instructions and data.
- Know the purpose of the CPU and main memory, and understand their interaction.

Learning Objectives (2)

- Learn about viruses, Trojan horses, and worms and how to prevent them.
- Understand the key factors that affect computer performance.
- Learn basic characteristics of the four most popular operating systems.
- Know the sources and types of application software.

Essential Hardware Terminology

- Computing devices consist of computer hardware and software.
- Hardware is electronic components and related gadgetry that input, process, output, and store data according to instructions encoded in computer programs or software.
- Your personal computer and other computers like it are general-purpose computers.
  - They can run different programs to perform different functions.
Essential Hardware Terminology (2)

- Some computers are **special-purpose computers**.
  - The programs they run are fixed permanently in memory.
  - The computer in your cell phone is a special-purpose computer, and so is the computer in your car that meters fuel to your car’s engine.

Input, Processing, Output, and Storage Hardware

- One easy way to categorize hardware is by its primary function:
  - Input hardware
  - Processing hardware
  - Output hardware
  - Storage hardware
  - Communication hardware

Essential Hardware Terminology (3)

- The principles and fundamental components of general-purpose and special-purpose computers are the same;
  - The sole difference is the computer can process a **variety of different programs**

Figure 3-1 Input, Process, Output, and Storage Hardware

![Diagram showing input, process, output, and storage hardware]

- Storage
  - Magnetic disk
  - Optical disk
  - Magnetic tape

Input
- Keyboard
- Mouse
- Scanner
- UPC reader
- Microphone

Process
- CPU
- Main memory
- Special function cards

Output
- Video display
- Printer
- Speakers
- Slide projector
- Plotter

Figure 3-2 Scantron Scanner

- Input hardware devices are the keyboard, mouse, document scanners, and bar-code (Universal Product Code) scanners.
- Microphones also are input devices; with tablet PCs, human handwriting can be input as well.
- **Processing devices** include the **central processing unit (CPU)**, which is sometimes called “the brain” of the computer.
Input, Processing, Output, and Storage Hardware (2)

- The CPU selects instructions, processes them, performs arithmetic and logical comparisons, and stores results of operations in memory.
- CPU’s vary in speed, function, and cost.
- Whether you or your department needs the latest, greatest CPU depends on the nature of your work.
- The CPU works in conjunction with main memory.

Input, Processing, Output, and Storage Hardware (3)

- The CPU reads data and instructions from memory, and it stores results of computations in main memory.
- Computers also can have special function cards that can be added to the computer to augment the computer’s basic capabilities.
  - A common example is a card that provides enhanced clarity and refresh speed for the computer’s video display.

Input, Processing, Output, and Storage Hardware (4)

- **Output hardware** consists of video displays, printers, audio speakers, overhead projectors, and other special-purpose devices, such as large flatbed plotters.
- **Storage hardware** saves data and programs.
  - Magnetic disk is by far the most common storage device, although optical disks, such as CDs and DVDs are popular.
  - In large corporate data centers, data are sometimes stored on magnetic tape.

Figure 3-3 Special Function Cards

Binary Digits

- Computers represent data using **binary digits**, called **bits**.
- A bit is either a zero or a one.
- Bits are used for computer data because they are easy to represent physically.
- A switch can either be closed or open.

Binary Digits (2)

- A computer can be designed so an open switch represents zero and a closed switch represents a one.
- Or, the orientation of a magnetic field can represent a bit;
  - Magnetism in one direction represents a zero
  - Magnetism in the opposite direction represents a one
- Or, for optical media, small pits are burned onto the surface of the disk so that they will reflect light
  - In a given spot, a reflection means a one
  - No reflection means a zero
Computer Instructions (1)
• Computers use bits for two purposes: instructions and data.
• A given instruction, say to add two numbers together, is represented by a string of digits (01110010001110).
• When the CPU reads such an instruction from main memory, it adds the numbers or takes whatever action the instruction specifies.
• The collection of instructions that a computer can process is called the computer's instruction set.

Computer Instructions (2)
• All of the personal computers that run Microsoft Windows are based on an instruction set developed by Intel Corporation that is called Intel instruction set.
• Until 2006, all Macintosh computers used a different instruction set, the PowerPC instruction set, designed for Powerful PC processors.
• In 2006, Apple began offering Macintosh computers with a choice of either Intel or PowerPC processors.

Computer Instructions (3)
• Currently, you cannot run a program designed for one instruction set on a computer having a different instruction set.
• In the future, you may be able to run Windows on a Macintosh that uses the Intel instruction set, although the particulars of that are uncertain.
• When you pick a family of computers, such as Windows or the Macintosh, you pick not only the hardware, but also the sets of programs that can run on one family of computers.

Computer Data
• All computer data are represented by bits.
• The data can be numbers, characters, currency amounts, photos, recordings, or whatever.
• Bits are grouped into 8-bit chunks called bytes.
• For character data, such as letters in a person's name, one character will fit into one byte.
  - Thus, when you read a specification that a computing device has 100 million bytes of memory, you know that the device can hold 100 million characters.

Figure 3-5 Important Storage-Capacity Terminology

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>Number of bits to represent one character</td>
<td></td>
</tr>
<tr>
<td>Kilobyte</td>
<td>1,024 bytes</td>
<td>K</td>
</tr>
<tr>
<td>Megabyte</td>
<td>1,024 K — 1,048,576 bytes</td>
<td>MB</td>
</tr>
<tr>
<td>Gigabyte</td>
<td>1,024 MB — 1,073,741,524 bytes</td>
<td>GB</td>
</tr>
<tr>
<td>Terabyte</td>
<td>1,024 GB — 1,099,511,827,776 bytes</td>
<td>TB</td>
</tr>
</tbody>
</table>
Knowledge for the Informed Professional

- Suppose that your IS department states that you can buy three different computer configurations for three different prices.
- The computers are described by expressions like the following:
  - Intel Pentium 4 Processor at 2.8 GHz with 533MHz Data Bus and 512K cache, 256MB RAM
  - Intel Pentium 4 Processor at 2.8 GHz with 533MHz Data Bus and 512K cache, 512MB RAM
  - Intel Pentium 4 Processor at 3.6 GHz with 533MHz Data Bus and 1MB cache, 256MB RAM

Knowledge for the Informed Professional (2)

- Now, you have two choices:
  - You can tell the people in the IS department to specify what they think is best;
  - Or, with a little bit of knowledge on your part, you can work with the IS department to ask intelligent questions about the relationship of these computers to the kind of work your department does.

Figure 3-6 Computer with Applications Loaded

CPU and Memory Usage

- The motherboard is a circuit board upon which the processing components are mounted and/or connected.
- The central processing unit (CPU) reads instructions and data from main memory, and it writes data to main memory via a data channel, or bus.
- Main memory consists of a set of cells, each of which holds a byte of data or instruction.

CPU and Memory Usage (2)

- Each cell has an address, and the CPU uses the addresses to identify particular data items.
- Main memory is also called RAM memory, or just RAM.
- RAM stands for random access memory.
- The term random is used to indicate that the computer does not need to access memory cells in sequence; rather, they can be referenced in any order.

CPU and Memory Usage (3)

- To store data or instructions, main memory or RAM must have electrical power.
- When power is shut off, the contents of main memory are lost.
- The term volatile is used to indicate that data will be lost when the computer is not powered.
  - Main memory is volatile.
CPU and Memory Usage (4)

• Magnetic and optical disks maintain their contents without power and serve as storage devices.
• You can turn the computer off and back on, and the contents of both magnetic and optical disks will be unchanged.
  – Magnetic and optical disk are nonvolatile.

The Contents of Memory

• Memory is used for three purposes:
  – It holds instructions of the operating system
  – It holds instructions for application programs such as Excel or Acrobat.
  – It holds data.
• The operating system (OS) is a computer program that controls all of the computer’s resources
  – It manages main memory.
  – It processes key strokes and mouse movements.
  – It sends signals to the display monitor.
  – It reads and writes disk files.
  – It controls the processing of other programs.

Memory Swapping

• Memory swapping occurs when there is a request to the operating system to store data in memory and the data will not fit because there is not enough free memory to store the requested data.
• In this case, the operating system will have to remove something to make space.
• Little swapping occurs when:
  – Your computer has a very large main memory.
  – You use only one or a few programs at a time.
  – You use small files.

Memory Swapping (2)

• You may have a serious problem if:
  – Your computer has a small memory capacity.
  – You need to use many programs or process many large data files.
  – Your computer has a small memory capacity.
• In this latter case, adding more main memory will substantially improve your computer’s performance.

Work at the CPU

• The CPU reads instructions and data from memory via the data bus.
• The maximum speed at which it transfers data is determined by the speed of main memory and the speed and width of the data bus.
• A bus that is 16 bits wide can carry 16 bits at a time; one that is 64 bits wide can carry 64 bits at a time.
• The wider the bus, the more data it can carry in a given interval of time.
Work at the CPU (2)

- Because the data transfer rate depends on both the width of the data bus and the speed of main memory, another way to speed up the computer is to obtain faster memory.

- Some data are accessed more frequently than other data.
  - Because of this, computer engineers found they could speed up the overall throughput of the CPU by creating a small amount of very fast memory, called cache memory.
  - The most frequently used data are placed in the cache.
  - Typically, the CPU stores intermediate results and the most frequently used computer instructions in the cache.

- Each CPU has a clock speed that is measured in cycles per second, or hertz.
- A fast modern computer has a clock speed of 3.0 gigahertz (abbreviated GHz), or 3 billion cycles per second.
  - By the time you read this, CPU speeds will be greater.
- In general, the faster the clock speed, the faster work will get done.