

# Part 2

## Information Technology

# Experiencing MIS

Fifth Canadian Edition



## Chapter 4

### Hardware and Software

## Study Questions

- Q4-1 What do business professionals need to know about computer hardware?
- Q4-2 How can new hardware affect competitive strategies?
- Q4-3 What do business professionals need to know about software?

# Q4-1: What Do Business Professionals Need to Know About Computer Hardware? (1 of 2)

Recall three key IT themes that have emerged

## 1. Price and performance advances

- Recall Moore's Law – price of processing power drops
- Data storage and network capacity have increased

## 2. Smaller is better

- And is more mobile

## 3. The network is the thing

- Power of IT is in the power of the network accessed

## Q4-1: What Do Business Professionals Need to Know About Computer Hardware? (2 of 2)

- **Computer hardware** – the electronic components and gadgets that input, process, output, and store data according to software instructions
- **Components:**
- **Central processing unit (CPU)** - “the brain”
  - Can be dual-processor and quad-processor computers
  - Vary in speed, function, cost
  - Works in conjunction with **main memory** (or random access memory, **RAM**)
  - Reads data and instructions from memory, stores results of in RAM

# Storage Hardware

- Common storage devices
  - Magnetic disks (Hard disks): most common
  - Solid-state storage (SSD drive): faster than hard drives, more expensive
  - USB flash drives: Small, portable
  - Optical disks (CD/DVD): Small, portable

# Types of Hardware (1 of 2)

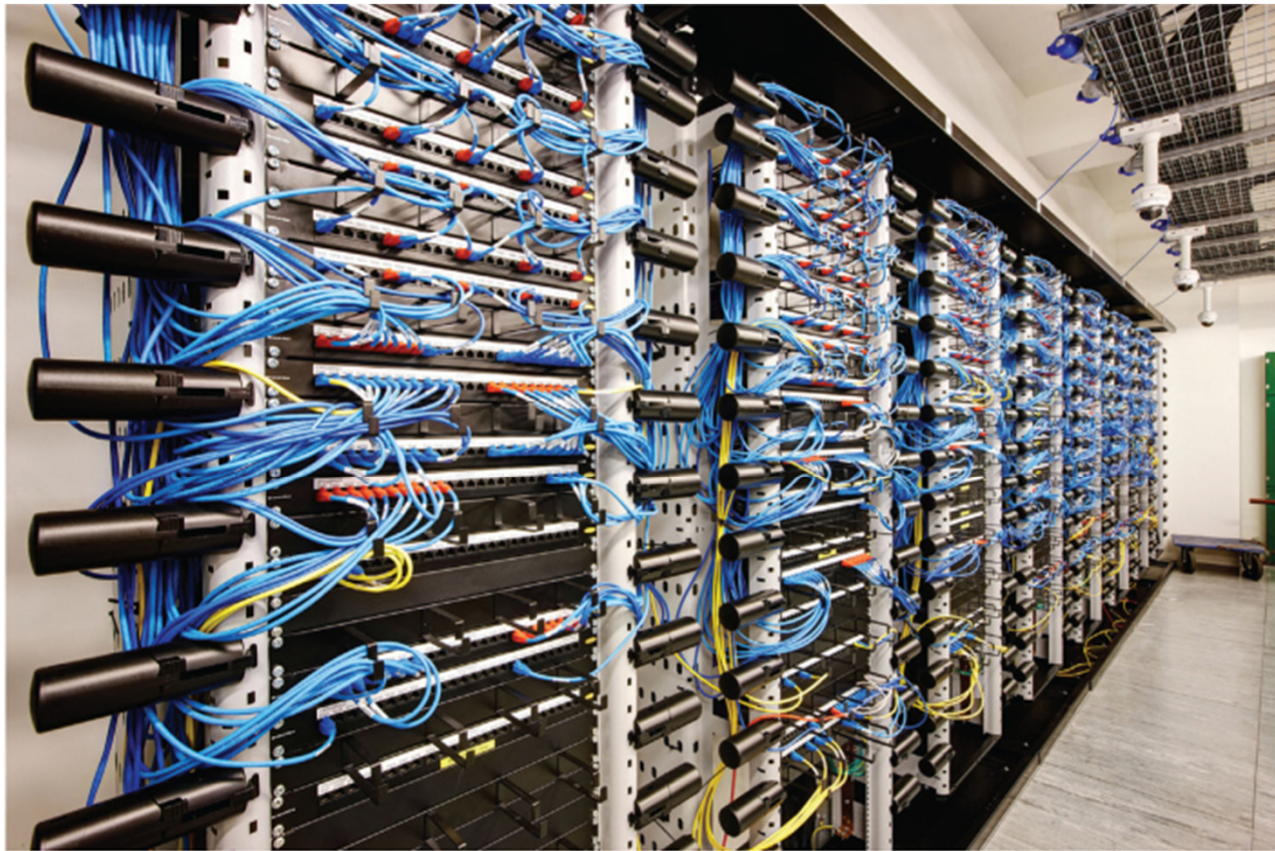
- **Personal computers**: classic computing devices
  - Gradually being supplanted by tablets, mobile devices
- **Tablets**: brought to prominence with iPad in 2010
  - Microsoft Surface, Google Nexus, also available.
- **Phablet**: functionality of a smartphone with the larger screen of a tablet
  - Samsung Galaxy, iPhone Plus
- **Smartphones**: Cell phones with processing capabilities
  - Samsung Galaxy 8, Google Pixel 2, iPhone 8.

## Types of Hardware (2 of 2)

- **Server**: computer design to support processing requests from remote computers and users.
  - PC on steroids
  - Differs from a PC mostly in what it does
  - Clients – PCs, tablets, smartphones that access a server
- **Server farm**
  - Collection of many servers-
  - Often in large truck trailers, holding 5,000 or more servers, with one power cable and one processing cable coming out.



## Figure 4-2 Server Farm

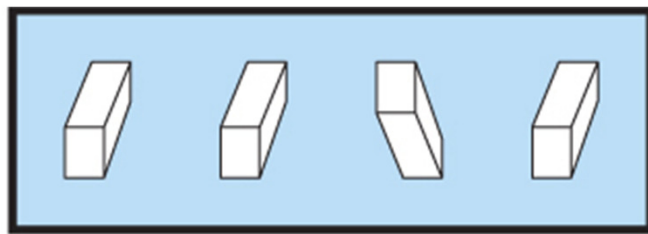


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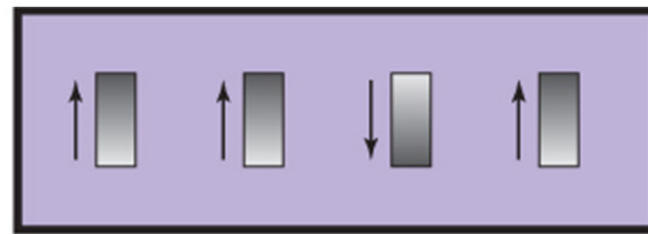
Source: Andrew Twort/Alamy Stock Photo

# Computer Data (1 of 2)

- **Binary bits (bits):** how computers represent data
  - Either a zero or a one
  - Computer can be designed so an open switch represents zero, closed switch represents one
  - Or, magnetism in one direction represents a zero, magnetism in the next direction represents one



1 1 0 1  
A. Light switches representing 1101

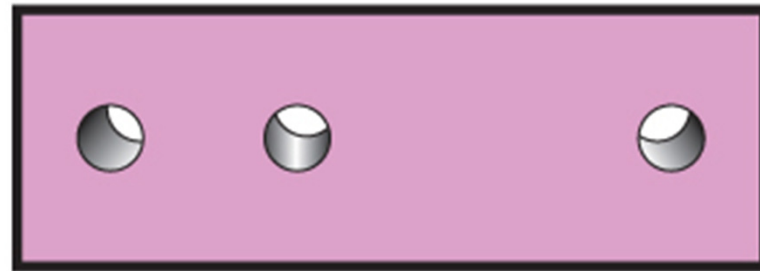


1 1 0 1  
B. Direction of magnetism representing 1101

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## Computer Data (2 of 2)

- Optical media has pits burned into the surface of the disk so they reflect light
- Reflecting indicates a one, no reflection indicates a zero



1      1      0      1  
C. Reflection/no reflection representing 1101

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# Computer Data Sizes

- All computer data are represented by **bits**: numbers, currency amounts, photos, recordings
- Grouped into 8-bit chunks: **Bytes**
- If a picture is 100 000 bytes in size, that means the length of the bit string that represents the picture is 100 000 bytes (or 800 000 bits, since 8bits per byte)

# Figure 4-4

## Storage Capacity Terminology

Note these are simplifications

| Term      | Definition                                    | Abbreviation |
|-----------|---|--------------|
| Byte      | Number of bits to represent one character     |              |
| Kilobyte  | 1024 bytes                                    | KB           |
| Megabyte  | 1024 K = 1 048 576 bytes                      | MB           |
| Gigabyte  | 1024 MB = 1 073 741 824 bytes                 | GB           |
| Terabyte  | 1024 GB = 1 099 511 627 776 bytes             | TB           |
| Petabyte  | 1024 TB = 1 125 899 906 842 624 bytes         | PB           |
| Exabyte   | 1024 PB = 1 152 921 504 606 846 976 bytes     | EB           |
| Zettabyte | 1024 EB = 1 180 591 620 717 411 303 424 bytes | ZB           |

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# Specifying Hardware with Computer Data Sizes

- Computer disk capacities are specified by amount of storage
  - 500 GB disk can contain 500 GB of data, programs
- CPU speed in cycles called hertz
  - Slow personal computer speed of 3.0 Gigahertz
  - Fast PC 4.0+ GHz
- 12 GB+ RAM for large applications

# Volatility of Memory

- Cache and main memory are **volatile**
  - Contents are lost when power is off
- Magnetic, optical disk memory are **non-volatile**
  - Contents survive when power is off
  - Saving often saves!

## Q4-2: How Can New Hardware Affect Competitive Strategies?

- Smart device
  - Processing power, large memory, Internet access, Wi-Fi connectivity, ability to interconnect with other devices and applications
- Potential to disrupt existing organizations
- Internet of Things (IoT)
- Self-driving vehicles
- 3D Printing



# Internet of Things (IoT)

- Everyday objects **embedded** with hardware capable of sensing, processing, transmitting data
- **Connect** to a network to share data with any other applications, services, devices
- Objects becoming connected with each other can **communicate**, interact with each other

## **Q4-3: What Do Business Professionals Need to Know About Software?**

- Native applications
- Thin-client vs thick-client applications
- Web applications

# Figure 4-8

## Categories of Computer Software

|        | Operating Systems                                     | Application Programs                                |
|--------|---|---|
| Client | Programs that control the client computer's resources | Applications that are processed on client computers |
| Server | Programs that control the server computer's resources | Applications that are processed on server computers |

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# What Are the Major Operating Systems? (1 of 3)

## Nonmobile clients

- **Windows**
  - Used for personal computer clients
- **MacOS**
  - Macintosh clients
- **Unix**
  - Workstation clients
- **Linux**
  - Just about anything

# What Are the Major Operating Systems? (2 of 3)

## Mobile clients

- **Symbian**
  - Nokia, Samsung, and other phones
- **BlackBerryOS**
  - ResearchInMotion Blackberries
- **iOS**
  - iPhone, iPod Touch, iPad

# What Are the Major Operating Systems? (3 of 3)

- **Android**
  - Samsung, Google, HTS, and Sony smartphones, tablet
- **Windows 10**
  - Nokia and Microsoft Surface

# Server Operating Systems

- **Windows Server**
  - Used on servers
- **Unix**
  - Used on servers
- **Linux**
  - Used on servers

# Owning Versus Licensing

- License
- Right to use specified number of copies
- Limits vendor's liability
- Site License
  - Flat fee to install software on all company computers or all computers at specific site
- Open Source
- No license fee



# What Types of Applications Exist, and How Do Organizations Obtain Them?

- **Application software** performs a service or function.
- **Horizontal-market application** software provides capabilities common across all organizations and industries
  - Graphics programs, word processors, spreadsheets, presentation software
- **Vertical applications** serves the needs of a specific industry.
  - Dental offices, auto mechanics, warehouses for inventory

# Figure 4-14

## Software Sources and Types

| Software Type | Software Source            |                                   |                  |
|---------------|----------------------------|-----------------------------------|------------------|
|               | Off-the-shelf              | Off-the-shelf and then customized | Custom-developed |
|               | Horizontal applications    |                                   |                  |
|               | Vertical applications      |                                   |                  |
|               | One-of-a-kind applications |                                   |                  |

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# What Is Firmware?

- **Special software on read-only memory (ROM)**
  - Printers, print servers, communication devices
  - As if program's logic designed into device's circuitry
  - Changeable and upgradable, usually IS professionals