

# Chapter 1: Becoming Skilled at Information Technology

## Fluency with Information Technology Third Edition

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## Terms of Endearment

- Defining Information Technology
  - Learning the language of IT
    - Acronyms
      - WYSIWIG
    - Jargon
      - "Clicking around"
    - Metaphors
      - Everyday terms like "window" have special meanings in IT

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## Why Know Just the Right Word?

- There are many new terms in IT
  - Terms are invented for ideas, concepts and devices that never existed before
- Educated people use the right word at the right term
  - "le mot juste" (the right word)

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## Why Know Just the Right Word? (cont'd)

- Terminology is basic to learning a new subject
  - Words represent ideas and concepts
    - Precision in word use represents precision in understanding idea
- Communicating with others
  - To be able to ask questions and receive help
  - By email, by telephone, through online help facility

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## Where's the Start Button?

- Most computers are left on all the time
  - Screen savers prevent burn-in on screen
  - Computer is reactivated by moving or clicking mouse, or pressing a key
- Why bother to learn where the Start Button is?
  - Sometimes computers are off
  - Need to power-cycle

## Two Basic Organizations

- *Component*
  - Desktop PC's with separate components
    - Monitor
    - Hard Drive
    - Speakers
    - Etc.
  - Allows user to mix and match
  - Power switch on box with disk drives



Figure 1.1. Example of (b) component systems.

## Two Basic Organizations (cont'd)

- *Monolithic*
  - iMac or laptop has all devices bundled together
  - Simple and convenient
  - Power switch on chassis or keyboard



(a)

Figure 1.1. Example of (a) monolithic systems.

## The Monitor

- Interactive video screen
  - *Bit-mapped*
    - Display information stored in computer memory

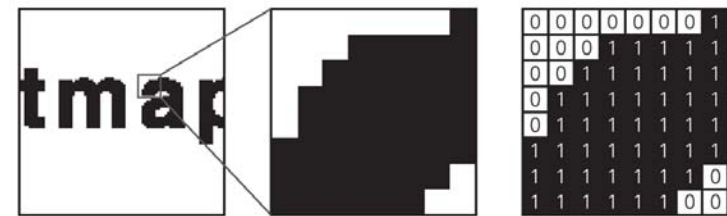


Figure 1.2. An enlargement of a monitor's display of the word bitmap and the corresponding bits for each pixel.

## The Monitor (cont'd)

- CRT's and LCD's
- Screen displays images from its memory
  - *Virtual Reality*



Figure 1.2. An enlargement of a monitor's display of the word *tmap* and the corresponding bits for each pixel.

## Cables

- Connect components to computer and to power source
- Cables need to be plugged in correctly
  - Sockets and plugs labeled with icons and **color coded**

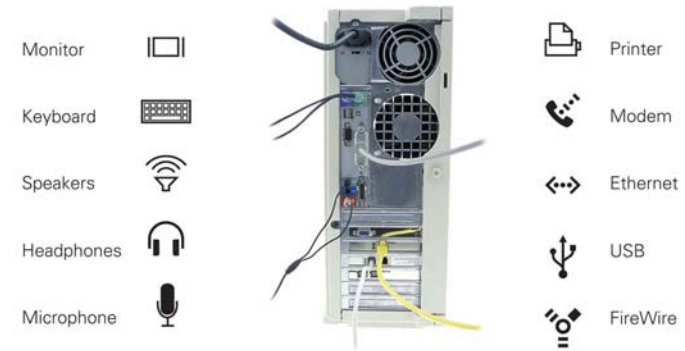


Figure 1.3. Examples of icons commonly displayed on computer cables and sockets.

## Colors

- RGB
  - Primary colors of light
    - red, green, blue
  - Colors on screen created by combining different amounts of primary colors
- CMYK
  - Primary printer colors
    - cyan, magenta, yellow, key/black



Figure 1.4. The RGB color scheme.

## Pixels

- Grid of small units called *pixels* (for picture elements)
  - Size of the dot on letter *i*
- Computer draws each pixel in the designated color for the image or figure
- The more pixels in each row and column, the smoother and crisper the image (*high resolution*)

## A Virtual Button

- Color the screen's pixels to make a believable 3-D looking button
  - Medium-gray background
  - Rectangle with top and left sides white, bottom and right sides black

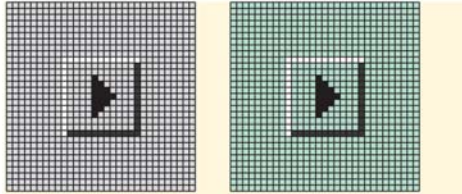


Figure 1.5. Two virtual buttons with different "feels."

## A Virtual Button

- Button Motion
  - Reverse black and white colors
  - Move position down and to right

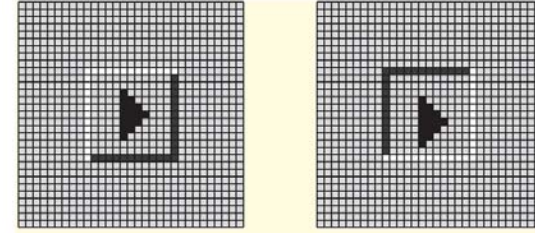


Figure 1.6. Pushing a button.

## Pressing a Virtual Button

- Moving the mouse pointer
  - Mouse pointer is drawn on screen like any image
  - When mouse moves, computer re-draws in correct direction
  - Fast *refresh rate* (30 times per second) creates illusion of motion
  - Computer keeps track of which pixel is at the point of the arrow

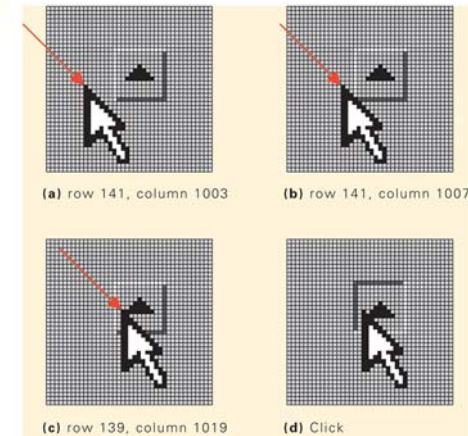


Figure 1.7. Mouse pointer moving toward (a, b), pointing to (c), and then clicking (d), a button; the coordinates of the point of the pointer are given by their row, column positions.

## Coordinating the Button and the Mouse

- When mouse is clicked, computer redraws button that mouse is hovering over
  - Computer keeps a list of every button drawn on screen
    - Positions of upper-left and lower-right corners
  - When button is re-drawn in clicked position, software reacts by performing appropriate action (event-driven)

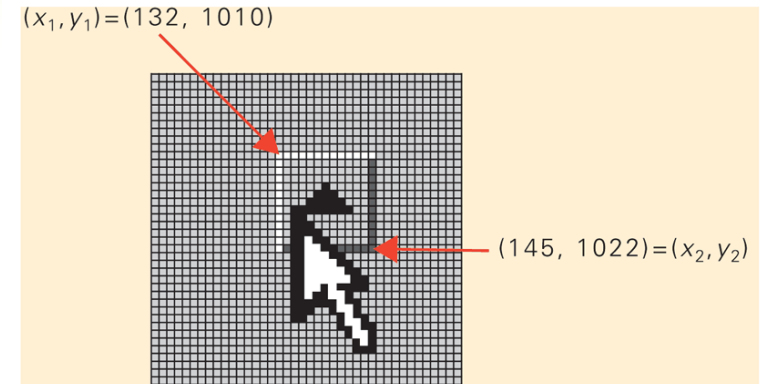


Figure 1.8. A button's location is completely determined by the positions of its upper-left and lower-right corners.

## Motherboard

- Printed circuit board inside processor box
  - Contains most of the circuitry of PC system

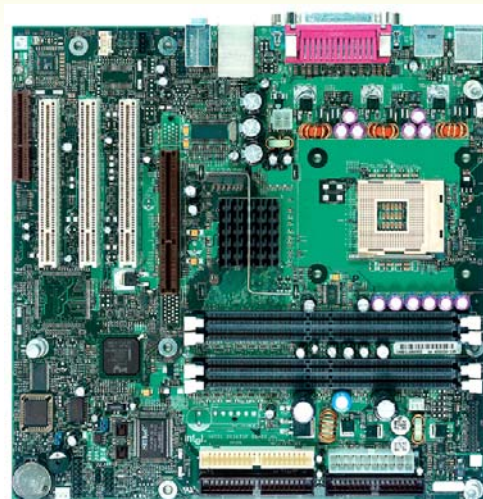


Figure 1.9 A computer motherboard.

## Motherboard (cont'd)

- Smaller circuit boards, called *daughter boards* or *cards*, plug into motherboard for added functionality
- Motherboard contains the *microprocessor chip* or *central processing unit (CPU)* and the *memory*



## Microprocessor

- "Smart" part of system
- Performs actual computing
- "Micro" was adopted around 1980 to distinguish single chip circuitry from larger mainframes of the day.
- Term is archaic. It is more correct to say "processor" or CPU.
- Multi-Cores

## Memory (Primary/Main Memory)

- Where program and data are located while program runs
- RAM: Random Access Memory
  - volatile
- PC Contains millions/billions of bytes of RAM
  - Megabytes (MB) / Gigabytes (GB)
- What Random Access means
  - Any item can be retrieved directly
  - Unlike sequential access (ex. tapes)

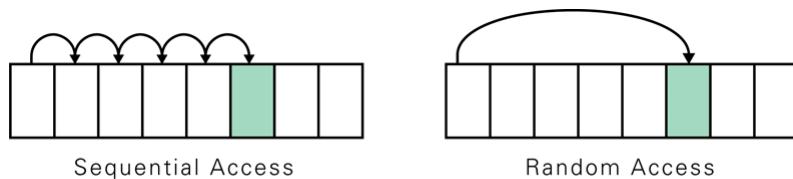


Figure 1.10 Sequential versus random access.

## Hard Disk (Secondary Memory)

- High-Capacity, persistent peripheral storage device
  - Stores programs and data not in immediate use by computer
  - Made from magnetized iron compound
    - Information remains whether PC is on or off
    - Called *permanent* or *persistent* storage
      - non-volatile

## Hard Disk (cont'd)

- Small stack of bright metal washers with arm that sweeps across



Figure 1.11 A hard disk.

## Saving from RAM to Hard Disk

- *Saving* moves information from RAM to hard disk
  - Prudent user saves frequently
- RAM memory is *volatile*
  - Information is lost when power turns off
  - If computer fails or power-cycles, only data on disk will survive

## How Soft is Software?

- *Hardware* is old term for metal items used in construction
  - Refers to physical parts of computer
  - Functions implemented directly with wires and transistors
- *Software* is a term created for computers
  - Means *programs* or instructions the computer follows to implement functions

## Algorithms and Programs

- Algorithm
  - Precise and systematic method for solving a problem (steps to accomplish a task)
  - Examples:
    - Arithmetic operations
    - Sending a greeting card
    - Searching for a phone number
    - Determining when a mouse pointer hovers over a button
  - Algorithms need to be precise

## Algorithms and Programs (cont'd)

- Writing out steps of algorithm is called *programming*
  - *Program* is an algorithm written in specific language for specific set of conditions
- Running a Program
  - Click on program icon (ex. Firefox browser)
  - We instruct computer to *run* or *execute* or *interpret* the program from Mozilla company that browses Internet.

## Boot

- *Booting*: Start computer
- *Rebooting*: Re-start computer
- Boot instructions are stored in a microchip called the boot ROM
- Term comes from "bootstrapping"

## The Words for Ideas

- *Abstract*: Remove the basic concept, idea, or process from a situation
- Abstraction is a more succinct and generalized form of the removed concept.
  - e.g., parables and fables (moral is abstracted from story)
  - Decide which details are relevant
  - Understand and convey the same point to apply to many situations

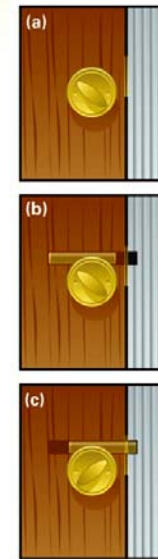
## "Generalize"

- Recognize common idea in two or more situations
- Summarize expression of idea, concept, or process that applies to many situations
  - e.g., faucet handles usually turn left for on and right for off
  - Caps usually twist left to loosen, right to tighten
- Remember that generalizations will not apply in every single situation



## "Operationally Attuned"

- Being aware of how a gadget works
- Apply what we know about how device or system works to simplify use
  - e.g., cap lids usually twist less to loosen, so we are confident about which way to twist if unsure
- Thinking about how IT works makes it simpler to use technology



**Figure 1.12** Deadbolt lock. (a) The external view. (b) Internal components, unlocked. (c) Internal components, locked. Thinking about how the deadbolt works allows us to see at a glance whether the door is locked or not.

## "Mnemonic"

- Memory aid
  - How to pronounce words and phrases
  - e.g., 5 Great Lakes are HOMES (Huron, Ontario, Michigan, Eire, Superior)
  - PILPOF - Plug in last, pull out first
  - Spring ahead; Fall back
- Helps simplify use of technology
  - Easy memorization of infrequently used details

## Analytical Thinking

- Use specific facts and comparisons to back up statements
- Non-analytical statement:
  - World record in the mile run has improved
- Analytical statements:
  - In 45 years, the world record in the mile has improved from 3.59.4 to 3.43.13, a 7% improvement
  - The average 20 year old can run a mile in 7.5 minutes. The world record holder is twice as fast.

## Factor of Improvement

- As a percentage
  - Divide the new rate by the old rate
  - New rate is 7% faster
- As a factor:
  - New rate is factor-of-1.07 times faster than old rate, and factor-of-2 times faster than average person

## Super Computers

- Analytical comparison of computer speeds
  - UNIVAC I
    - First commercial computer released in 1951
    - Rate of 100,000 addition operations (adds) per second
  - Today's Thinkpad
    - Affordable laptop system
    - Rate of 1 billion adds per second
    - Factor of 10,000 improvement over UNIVAC
  - ASCII Red
    - Intel Computer built for Sandia National Labs
    - Rate of 2.1 trillion floating points (decimal) adds per second
    - Factor of 21 million improvement over UNIVAC

## Benefits of Analytical Thinking

- Learning specific facts, and comparing to other specific facts
- Putting things in perspective
  - Factor of 1.07 improvement in mile run record does not seem small when compared to factor of 2 difference between world record holder and average person

## Defining WYSIWYG

- First acronym in this chapter
  - "What you see is what you get"
  - Text is stored in memory as long line of letters, numbers, punctuation, etc.
  - Original text editing software could not display formatting; users had to guess what it would look like when printed
  - WYSIWYG applications, like word processors, display data as formatted page



**Figure 1.13** The runners Hicham El Guerrouj (left) and Roger Bannister (right).