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

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)

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

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

(b)

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 bitmap 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

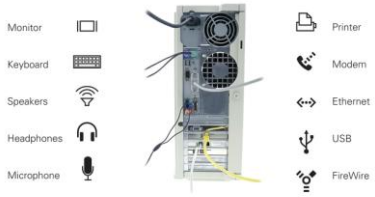

Figure 1.3. Examples of icons commonly displayed on computer cables and sockets.

Colors

- RGB
  - Primary colors of light
    - red, green, blue
  - Colors on screen created by combining different amounts of primary colors

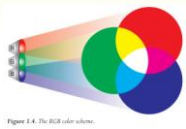

Figure 1.4. The RGB color scheme.

- CMYK
  - Primary printer colors
    - cyan, magenta, yellow, key/black

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

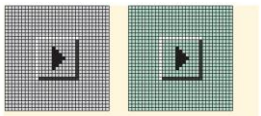

Figure 1.5. Two virtual buttons with different "feels."

A Virtual Button

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

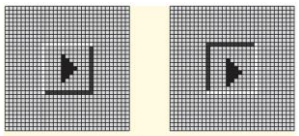

Figure 1.6. Pushing a button.

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

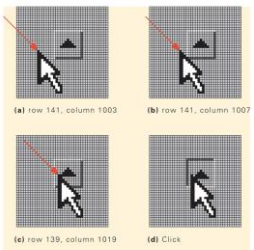

Figure 1.7. Mouse pointer moving toward (a, b), pointing to (c), and then clicking (d), a button; the coordinates of the point of the pointer are given by their row, column positions.

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)

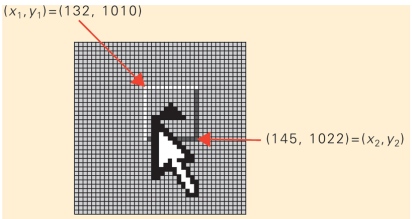

Figure 1.8. A button's location is completely determined by the positions of its upper-left and lower-right corners.

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)

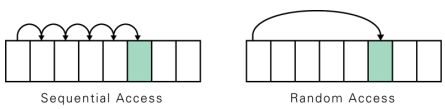

Figure 1.10 Sequential versus random access.

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
  - ASCI 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

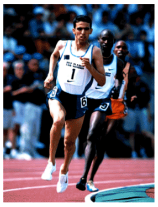

Figure 1.13 The runners Hicham El Guerrouj (left) and Roger Bannister (right).