CSE 3

- Comics / Warm-Up
- Class Website
  http://www.cse.ucsd.edu/~ricko/CSE3/
  vs.
  http://www.cse.ucsd.edu/users/ricko/CSE3/
  (in general, avoid using – and space chars in URLs)
- Shortcut(s) of the day

Chapter 1: Becoming Skilled at Information Technology

Fluency with Information Technology
Third Edition

by
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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

  ![Component System](image)
  
  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

  ![Monolithic System](image)
  
  Figure 1.1. Example of (a) monolithic systems.

The Monitor

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

  ![Bit-mapped Display](image)
  
  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.](image)

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.](image)

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
**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.'](image)

**A Virtual Button**

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

![Figure 1.6: Pushing a button.](image)
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

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)
Motherboard

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

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)
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

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

"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
Why is lifelong learning emphasized?
• Consider a college education as a “product” with a 55 year “useful life”
  – What to teach the class of 1944?
  • The first computer invented in 1946
  • First packet sent on “Internet” in 1969
Lifetime of Learning

Why is lifelong learning emphasized?

• Consider a college education as a “product” with a 55 year “useful life”
  – What to teach the class of 1944?
    • The first computer invented in 1946
    • First packet sent on “Internet” in 1969
    • PC as “Personal Computer” used in ~1980

• WWW came “on the scene” in 1994

Why is lifelong learning emphasized?

Why is lifelong learning emphasized?

• What to teach/learn in this class to have a lasting usefulness?