Human Computer Interaction: An Overview

- What is Human Computer Interaction (HCI)?
- Importance of HCI
- Good and Poor Design Examples
- What and Who are involved in HCI design?
- General Principles of HCI Design
- Norman's Principles of Usability
- Conceptual Model

What is HCI?

How Human interacts with Computer:

- Not primarily the study of Human
- Not primarily the study of Computer
- The study of bridge between them, which includes
  - Observation of interactions between people & computers, e.g., Find examination papers via our library Web
  - Analysis of the involved interactions, e.g., Are all the steps involved are necessary?
  - Investigating outcomes after interacting with computers, e.g., Can the user perform his task? Does he enjoy working with the computer?

What is HCI?

The term HCI was adopted in mid-1980s:

Association for Computing Machinery (ACM): “discipline concerned with the design, evaluation & implementation of interactive computer systems for human use & with the study of major phenomena surrounding them” (1992)

Dix: “HCI is study of people, computer technology and the ways these influence each other. We study HCI to determine how we can make this computer technology more usable by people” (1998)

Carroll: “HCI is the study and practice of usability. It is about understanding and creating software and other technology that people will want to use, will be able to use, and will find effective when used.” (2002)

What is HCI?

Human:

Individual user, a group of users working together, a sequence of users in an organization

Computer:

Desktop computer, large-scale computer system, smart phone, embedded system (e.g., photocopier, microwave oven), software (e.g., search engine, word processor)

User interface:

Parts of the computer that the user contacts with, e.g., screen, mouse, keyboard, switch button, knob

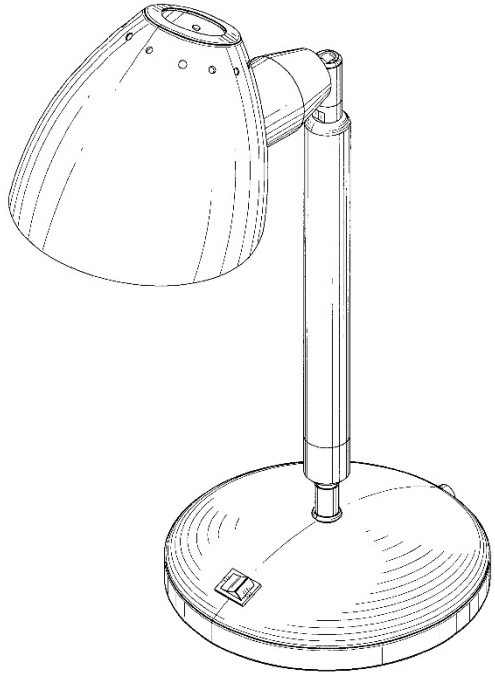
Interaction:

Usually involve a dialog with feedback & control throughout performing a task (e.g., user invokes “print” command and then interface replies with a dialog box)

What is HCI?

Lamp

- Function/objective: to illuminate the environment
- Interface: power switch button
- Functional part: light bulb
- Interaction: press “On”, light on; press “Off”, light off
- User tasks: turn on the lamp, turn off the lamp



What is HCI?

Stapler

- Objective: to bind paper together
- Interface: top surface where you press
- Functional part: stapler ejection gap
- Interaction: put an edge of the stack of paper in the stapler's mouth, press down firmly and quickly, hear "click" sound, see paper bound
- User tasks: bind paper together, refill the staples

What is HCI?

Word processor

- Objective: to edit a document
- Interface: windows, icons, menus, pointers (WIMP), etc.
- Functional part: sub-routines for command execution, file handling, etc.
- Interaction: use mouse to click the “WORD” icon, observe WORD is invoked, use mouse to click “FILE” icon, ...
- User tasks: edit file, save file, etc.

Why HCI?

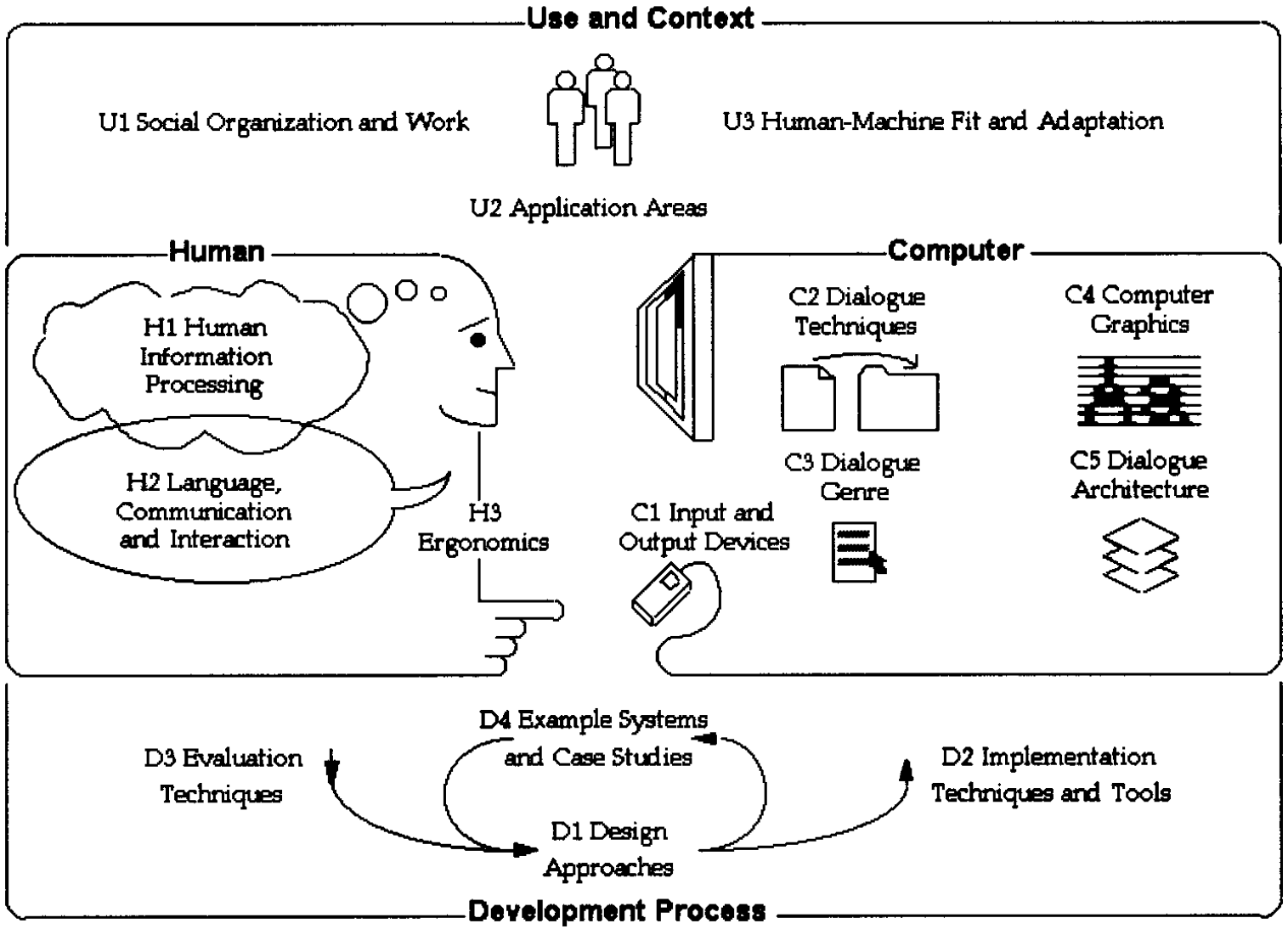
- In the past, computers were expensive & used by technical people only

- Now, computers are cheap and used by non-technical people (different backgrounds, needs, knowledge, skills)

  ⇒ Computer and software manufacturers have noticed the importance of making user-friendly interfaces: including easy to learn, easy to use, save people time
  e.g., **Is your washing machine user-friendly?**

  ⇒ We also desire good user experience
  e.g., **Do you feel pleasure and satisfaction when using your smart phone?**

HCI Scope


Use and Context
U1 Social Organization and Work
U3 Human-Machine Fit and Adaptation
U2 Application Areas
Human
H1 Human Information Processing
H2 Language, Communication and Interaction
H3 Ergonomics
Computer
C2 Dialogue Techniques
C4 Computer Graphics
C3 Dialogue Genre
C5 Dialogue Architecture
C1 Input and Output Devices
D4 Example Systems and Case Studies
D3 Evaluation Techniques
D2 Implementation Techniques and Tools
D1 Design Approaches
Development Process

HCI Scope

Use & Context:	Find application areas for computers
Human:	Study psychological & physiological aspects e.g., study how a user learns to use a new product, study human typing speed
Computer:	Hardware & software offered e.g., input & output devices, speed, interaction types, computer graphics
Development:	Design, implementation & evaluation

HCI Goals

- Understand the factors that determine how people use technology
- At physical level, HCI concerns selecting the most appropriate input devices and output devices for a particular interface or task
- Determine the best type of interaction, such as direct manipulation, natural language, icons, menus
- For systems that include computers, develop or improve
  - Safety
  - Utility
  - Effectiveness
  - Efficiency
  - Usability
  - Appeal

HCI Goals

- Safety: protecting the user from dangerous conditions and undesirable situations
  - Users
    - Nuclear energy plant or bomb-disposal – operators should interact with computer-based systems remotely
    - Medical equipment in intensive care unit (ICU)
  - Data
    - Prevent user from making serious errors by reducing risk of wrong keys/buttons being mistakenly activated
    - Provide user with means of recovering errors
    - Ensure privacy (protect personal information such as habits and address) & security (protect sensitive information such as passwords, VISA card numbers)

HCI Goals

- Utility: extent of providing the right kind of functionality so that users can do what they need or want to do
  - High utility
    - Scientific calculator provides many mathematical operations, built-in formulae, and is programmable
  - Low utility
    - Software drawing tool does not allow free-hand drawing but only supports polygon shape drawing
- Effectiveness: concern a user's ability to accomplish a desired goal or to carry out work
  - Find a master thesis in our library Web

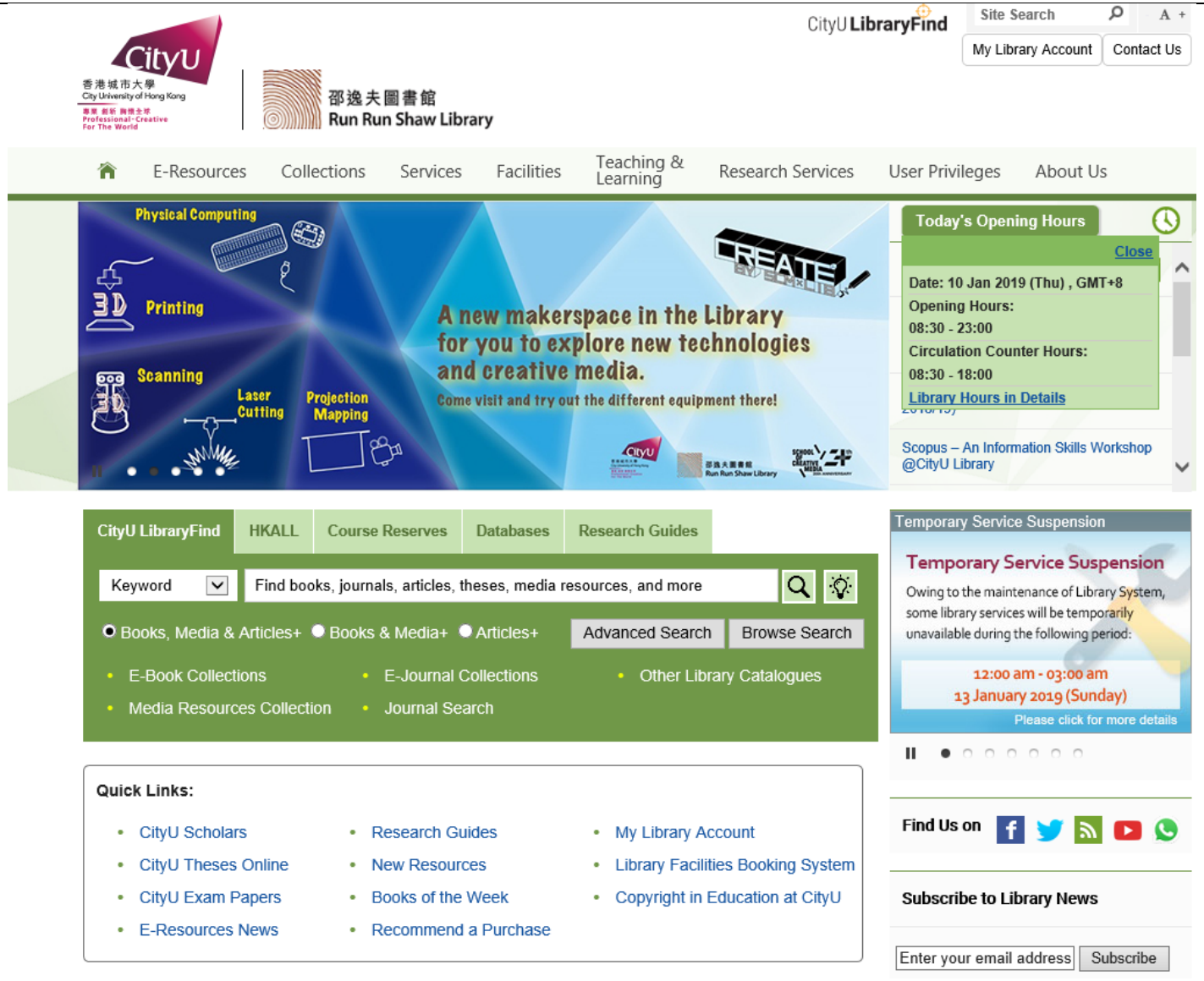
Any difference between utility and effectiveness?

HCI Goals

Consider a shopping Web that provides all the information, instruction and server-side support required to perform an on-line purchase. However, the users cannot figure out how to find the items they want to buy.

- Efficiency: a measure of how quickly users can accomplish their goals or finish their work using the system
  - Find a book whose title contains “human computer interaction” in our library Web
  - How about a Ph.D. thesis whose author’s last name is “Cheng”?
  - How about the newest book in the subject of “human computer interaction”?

HCI Goals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HCI Goals

- Usability: ease of learning and ease of use
  - Can I use the basic functions of a new digital camera without reading the manual?
  - Does the software facilitate us to learn new functions easily?

- Appeal: how well the user likes the system
  - First impression
  - Long-term satisfaction

HCI Goals

- Use Microsoft WORD as an example:

Goals	Achieved?	Example
Safety	Yes	Warning for “Exit before Save”
Utility	Yes	A lot of word processing functions is provided
Effectiveness	Yes	A science student can edit equations
Efficiency	Yes	Default template avoids initial document setting
Usability	Yes	Icons help ease of learning
Appeal	Yes	Interface is attractive

HCI Benefits

- Gaining market share
  - People intend to buy/use products with higher usability
  - e.g., Google's search engine has the largest market share because it is easy to use with higher efficiency; iPhone gives good user experience
- Improving productivity
  - Employees in a company perform their jobs in a faster manner
  - e.g., Workers in a mainland company needed to press a lengthy sequence of buttons in performing a task. An IAS student helped to increase their productivity via writing a batch program for the button pressing operation

HCI Benefits

- e.g., Cafe de Coral uses a business management system (BMS) to increase productivity, e.g., food photos are available on cashier display and operators do not need to memorize food codes, automatic collection of sales information at all shop saves staffing cost

  Hong Kong Economics Times (8 Oct. 2004)

大家樂新銷售系統 生產力增30%

大家樂集團總監李愛珍（右）指出，開發「業務管理系統」後，集團生產力提高約30%。旁爲自動系統集團董事總經理賴音廷。（陳國峰攝）

「大家樂推出一哥火鍋船優惠價（8時半後39元）後，每晚各店的銷售數據，可即晚傳送回寫字樓，哪家分店售罄都會一目了然。」大家樂集團專業事務總監李愛珍昨在記者會表示，自從開發「業務管理系統」（BMS）後，集團整體生產力提高約30%。

大家樂過去三年投資約6,500萬元，委託自動系統集團開發該系統。同一場合，自動系統集團董事總經理賴音廷透露，該公司首次替食肆度身訂造BMS軟件，並花3年時間研製。

記錄各店銷售 利分配補給

李愛珍表示，系統可記錄前綫店舖的銷售情況、現金出入及其偏差等，每晚把資料傳送到後勤部門，讓寫字樓了解各店生意，以便分配補給。

後勤部門透過該系統，可預先設定當日出售的產品及價格，並把資料傳送到前綫，「員工每天開市前都知道最新餐單，減省以往人手輸入的偏差，又可按市場反應，加快更新餐單。」

李愛珍續說，該系統亦把原本長達1星期的員工培訓，縮至2至3天，「因員工現可於屏幕上看到食物圖片，不用牢記4,000多款食品的編號。」

她又指出，由於電腦可計算每店日常營業額，財務部不再須以人手計算總額，故生產力提高約30%。

集團預計，未來數年還要多花千多萬元安裝。集團亦有意在3年內，將華南地區的分店進行電腦化。

■本報記者 羅羽庭

HCI Benefits

- Lowering support costs
  - If the product is not usable, calls to customer support can be enormous
  - e.g., If a washing machine is difficult to use even after reading the instruction manual, many users will call the customer service, which will result in high cost
- Reducing development cost
  - Avoid implementing features users do not want and creating features that are annoying or inefficient
  - e.g., If there are too many unnecessary confirmation dialog boxes in using a word processor, it is likely this product needs to be redeveloped

HCI Benefits

However, good user experience may not guarantee final success, e.g., Bluegogo, China's third largest bike sharer went bankrupt. Its founder mentioned "with plenty of investors praising it but not a single commitment for new funding"

Hong Kong Economics Journal (18 Nov. 2017)

小藍易手 共享單車恐爆倒閉潮

放大圖片 / 顯示原圖

中國一度火熱的共享單車進入調整期，3Vbike、町町、悟空、酷騎等小型業者先後倒閉，就連號稱「最好騎」的第三大共享單車經營商小藍單車亦宣布轉手。有意見認為，共享單車業「凜冬將至」，這場「單車淘汰賽」白熱化。 面對ofo和摩拜兩大巨頭搶佔先機，中小型業者燒錢無以為繼，融資成為存續的最大考驗。《北京晨報 ...

Good and Poor Design Examples

HCI arises in our daily life, e.g.

- Elevator controls and labels on the bottom row all look the same, so it is easy to push a label by mistake instead of a control button (www.baddesigns.com)

- People do not make same mistake for the labels and buttons on the top row. **Why not?**

Any suggestions to improve the interface?

Good and Poor Design Examples

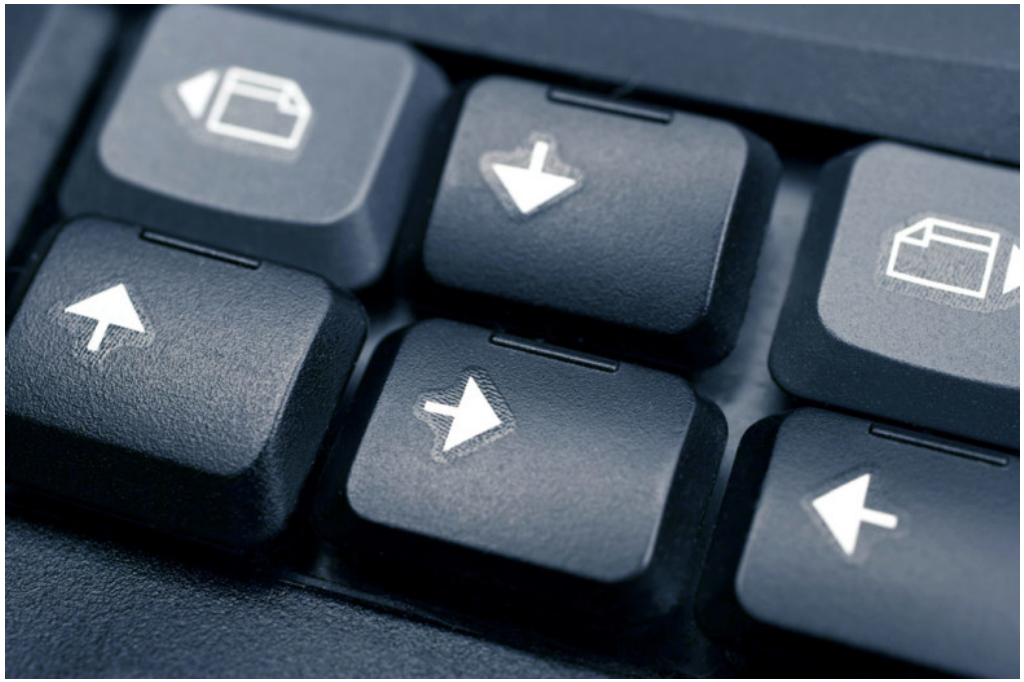
- This is a lamp switch (www.baddesigns.com)

There are 3 modes: “I”, “O” and “II” correspond to Low, Off and High, respectively

Is it a good design? Why?

Good and Poor Design Examples

- Cursor keys (https://www.uxpassion.com/blog/implementation-mental-representation-models-ux-user-experience/)



Is it a good design? Why?

Good and Poor Design Examples

- Wine glass (https://www.theuncomfortable.com/)

Is it a good design? Why?

Good and Poor Design Examples

- Inside a lift at Yau Ma Tei

Any problems?

Good and Poor Design Examples

Do you know how to use them?

Good and Poor Design Examples

- DYMO and Brother label makers

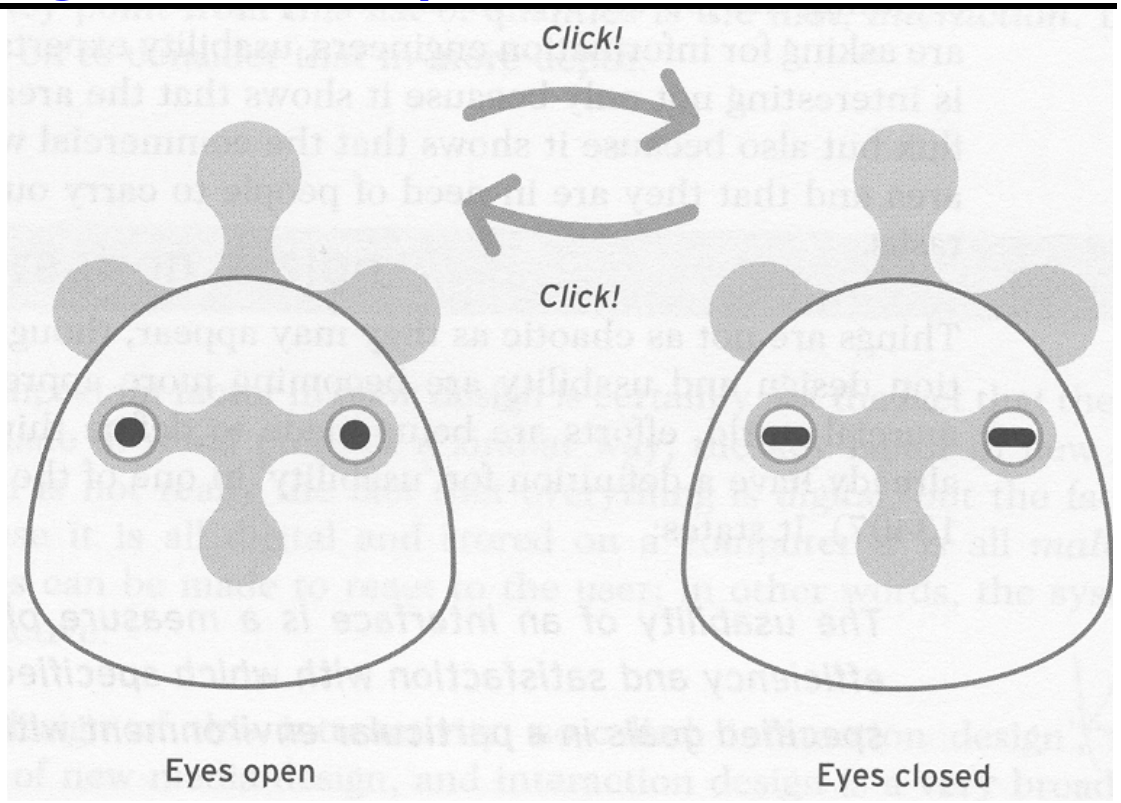
Which one is more preferable? Why?

Good and Poor Design Examples

- Dayton and Dyson hand dryers

Which one is better? Why?

Good and Poor Design Examples



Is there any problem for the alarm clock?

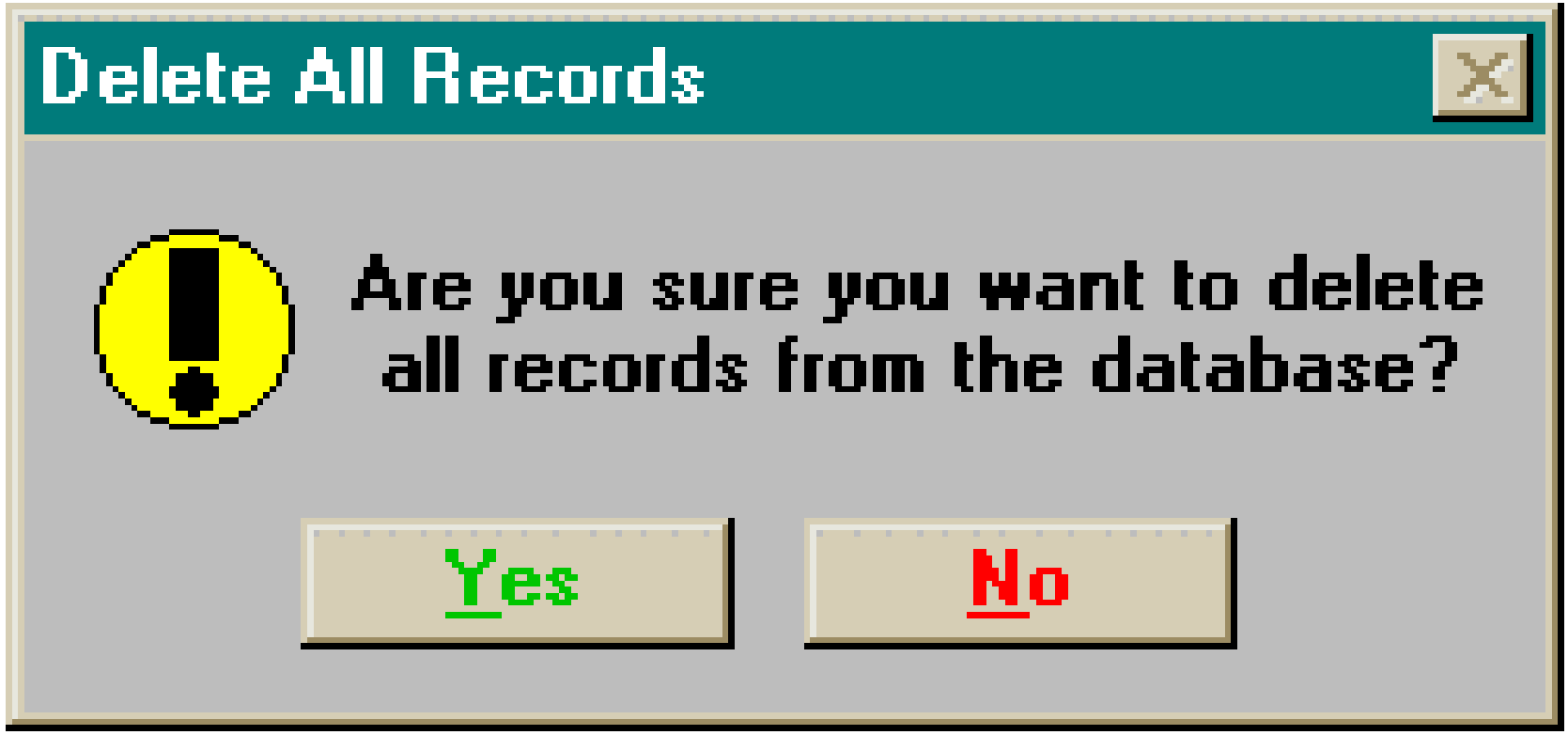
Good and Poor Design Examples

- This is the interface for WORD 97

Any suggested improvement?

Good and Poor Design Examples

- This is an interface of a dialog box



Is it a good design?

Good and Poor Design Examples

Can you guess what is it? How to operate it?

Good and Poor Design Examples

- This is found in restroom at Vienna Austria airport

Is it a good design? Any suggested improvement?

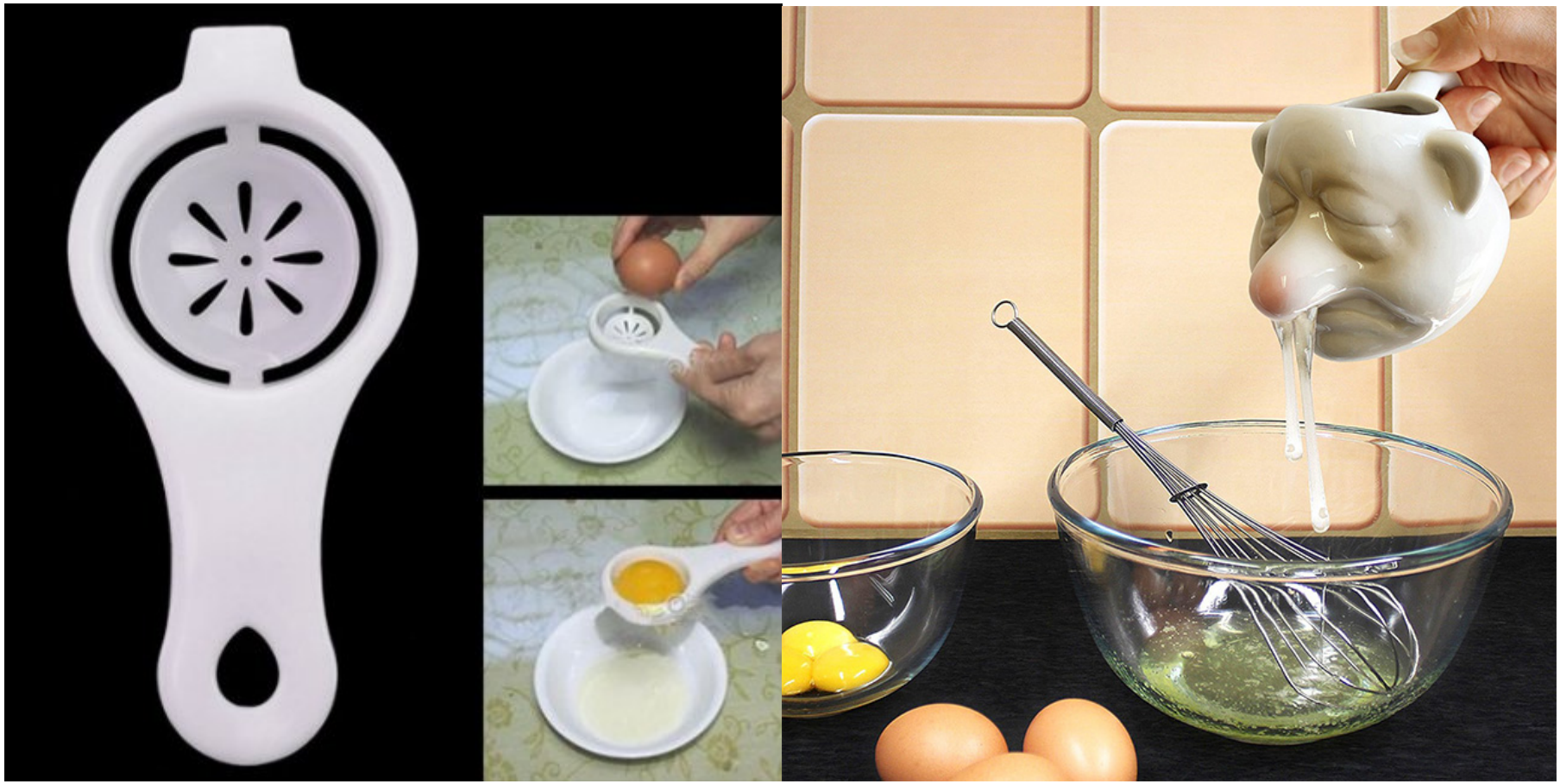
Good and Poor Design Examples

- Chair or Table?

Is it a good design?

Good and Poor Design Examples

- Egg yolk separators:



Which one do you prefer?

Disciplines Contribute to HCI

Academic Disciplines:

- Computer Science
  - Develop programming languages, system architectures, etc. of the computing systems
- Engineering
  - Provide faster and cheaper equipment
- Linguistics, Artificial Intelligence (AI)
  - Speech synthesis and recognition, natural language processing, etc.
- Psychology
  - Provide information about human mental capabilities (e.g., memory, decision making)
- Ergonomics (Human Factors)
  - Provide information about human physical capabilities

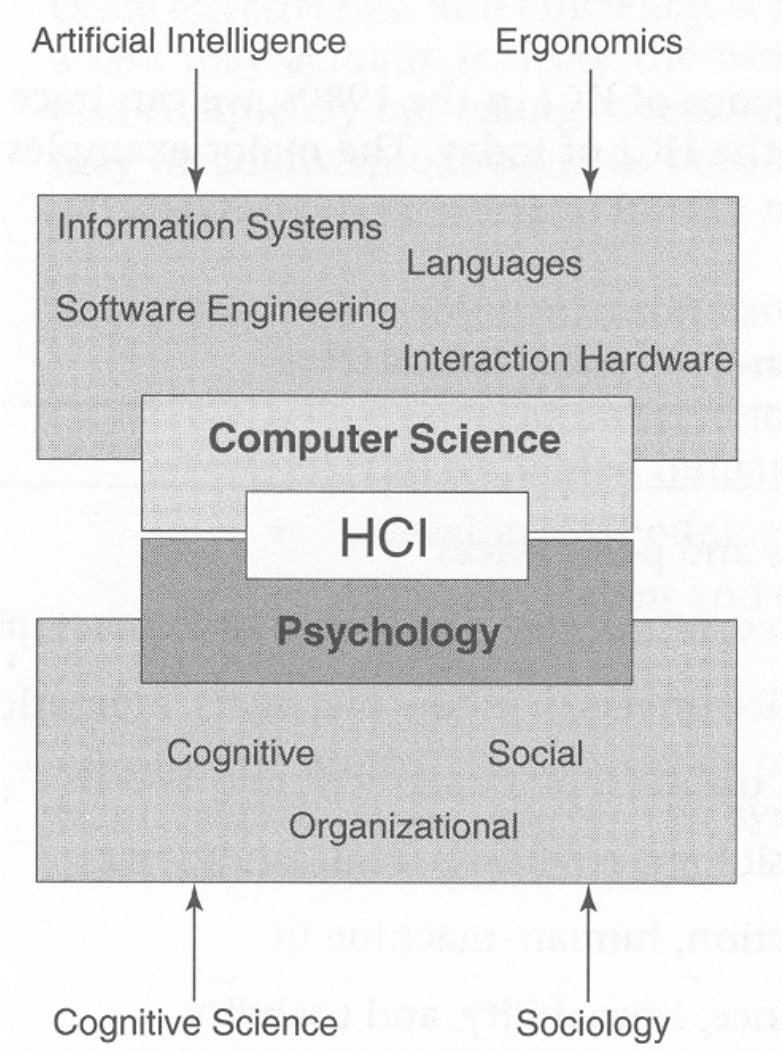
Disciplines Contribute to HCI

- Sociology
  - How people interact in groups

Design Practices:

- Graphic Design
  - Art of combining text and graphics and communicating an effective message in design of posters, brochures, signs, logos & other type of visual communications
- Product Design
  - Process of planning the product's specification
- Industrial Design
  - Applied art whereby aesthetics and usability of products may be improved. Aspects include overall shape of the object, colors, textures, sounds & product ergonomics
- Film Industry

Disciplines Contribute to HCI



http://paper.hket.com/article/1986970/阿里雲創辦人王堅%20從心理學教授到 CTO

Disciplines Contribute to HCI

AI has been extensively applied in many areas including HCI, e.g., Hung Fook Tong (鴻福堂), the top retailer of Chinese herbal products, introduces 「鴻家 HUNG+」Health Preservation vending machine equipped with IBM Cloud, AI and big data techniques

Consumers only need to take photos before it, and through face recognition, combined with the weather of the day, they can be recommended

People in HCI Business

- Interactive / Interaction Designers: People involved in the design of all the interactive aspects of a product
- Usability Engineers: People who focus on evaluating products using usability methods and principles
- Web Designers: People who develop and create the visual design of Websites, such as layouts & animations
- Information Architects: People who come up with ideas of how to plan and structure interactive products
- User Experience Designers: people who do all the above but who may also carry out field studies to inform the design of products

https://www.indeed.hk/Interaction-Designer-jobs

People in HCI Business

User experience is

- An important concept in interaction design
- About how people feel about a product and their pleasure and satisfaction when using it, looking at it, holding it, opening it, closing it, etc.
- Examples: how smoothly a switch rotates, the sound of a click, the touch of a button when pressing it
- Cannot design a user experience, only design for a user experience
- You might be involved

People in HCI Business

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People in HCI Business

Famous companies which provide HCI consultancies and education:

- Nielsen Norman Group: “help companies enter the age of the consumer, designing human-centered products and services” (www.nngroup.com)
- IDEO: “is a global design company. We create positive impact through design.” (www.ideo.com)
- Apple (https://developer.apple.com/design/)

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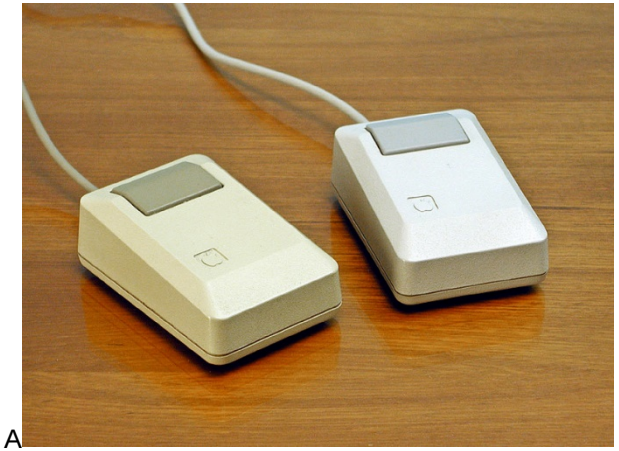
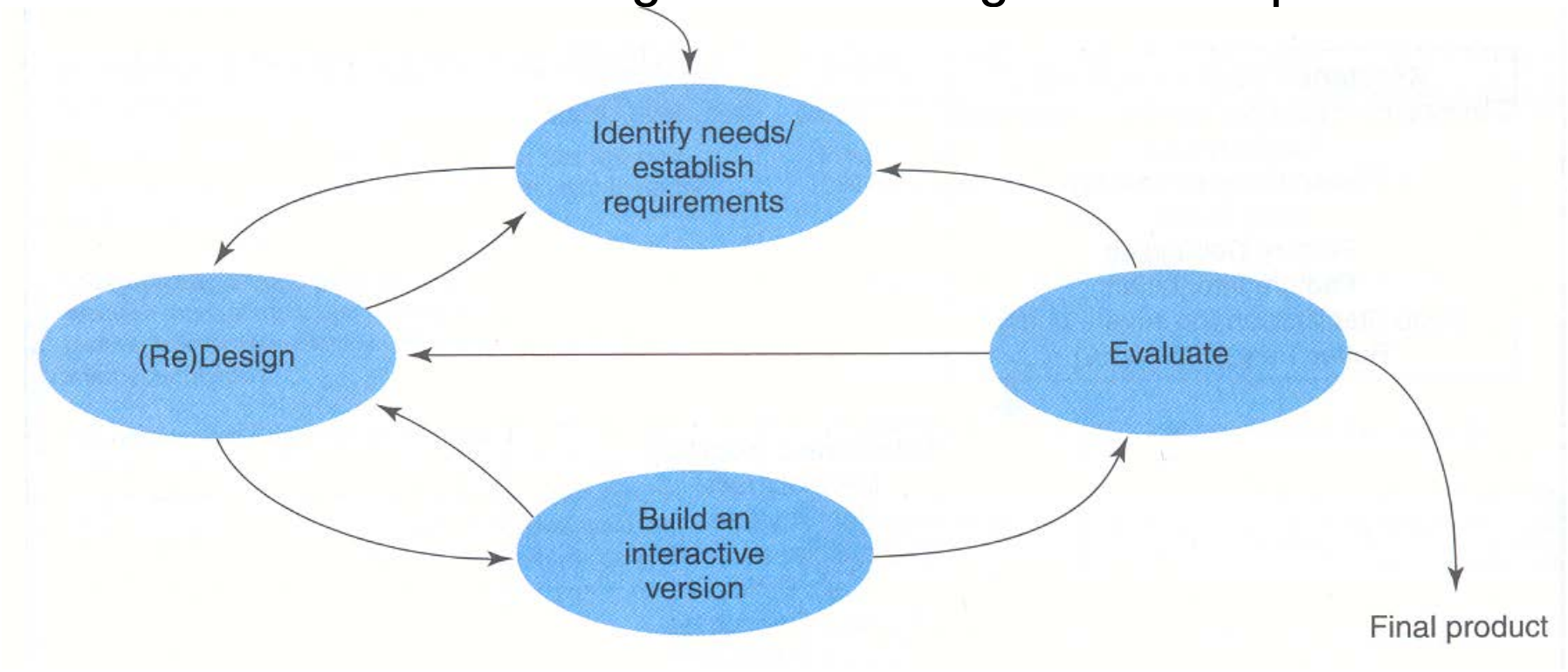


Activities in HCI Design

1. Identify needs and establish requirements
2. Develop alternative designs
3. Build interactive prototypes that can be communicated and assessed
4. Evaluate what is being built throughout the process



Activities in HCI Design

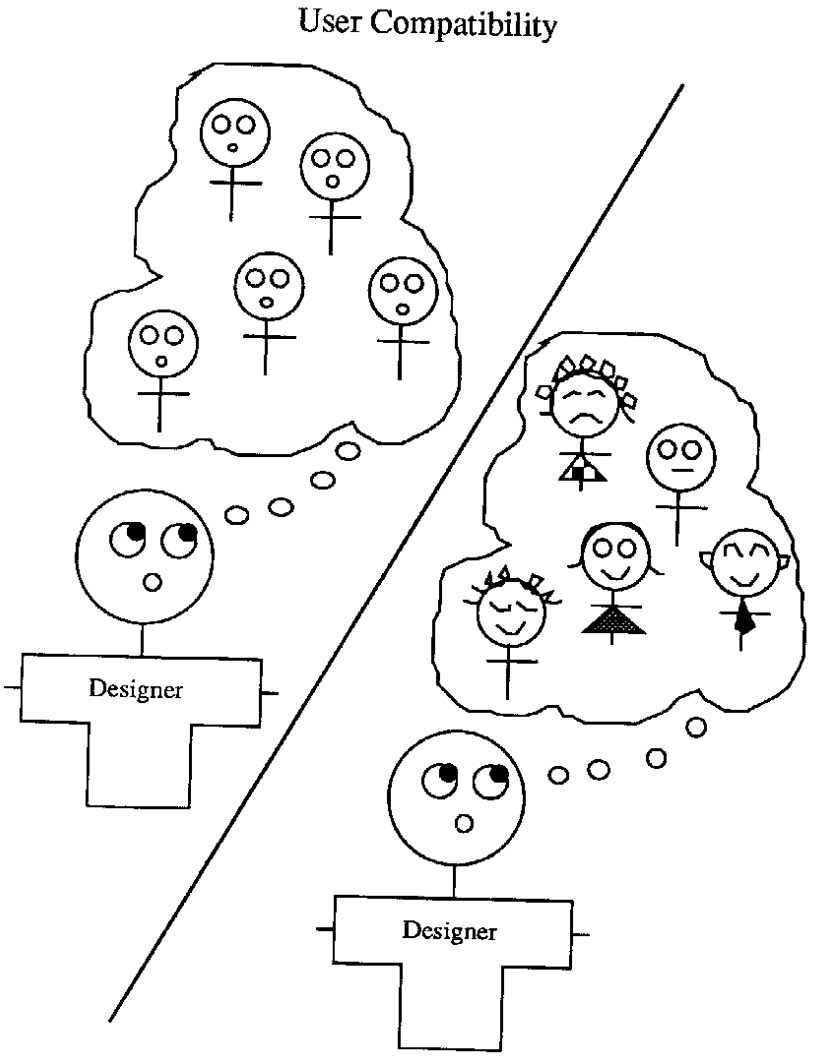
- Users should be involved through the development of the project
- Specific usability and user experience goals need to be identified, clearly documented and agreed at the beginning of the project
- Iteration is needed throughout the core activities

General Principles of HCI Design

- Making systems easy to use & learn
- Usability applies to all aspects of a system
- Principles support usability include
  - Compatibility
  - Ease of Learning
  - Memorability
  - Predictability
  - Simplicity
  - Flexibility
  - Responsiveness
  - Protection
  - Invisible Technology
  - Control
  - WYSIWYG
  - Accessibility

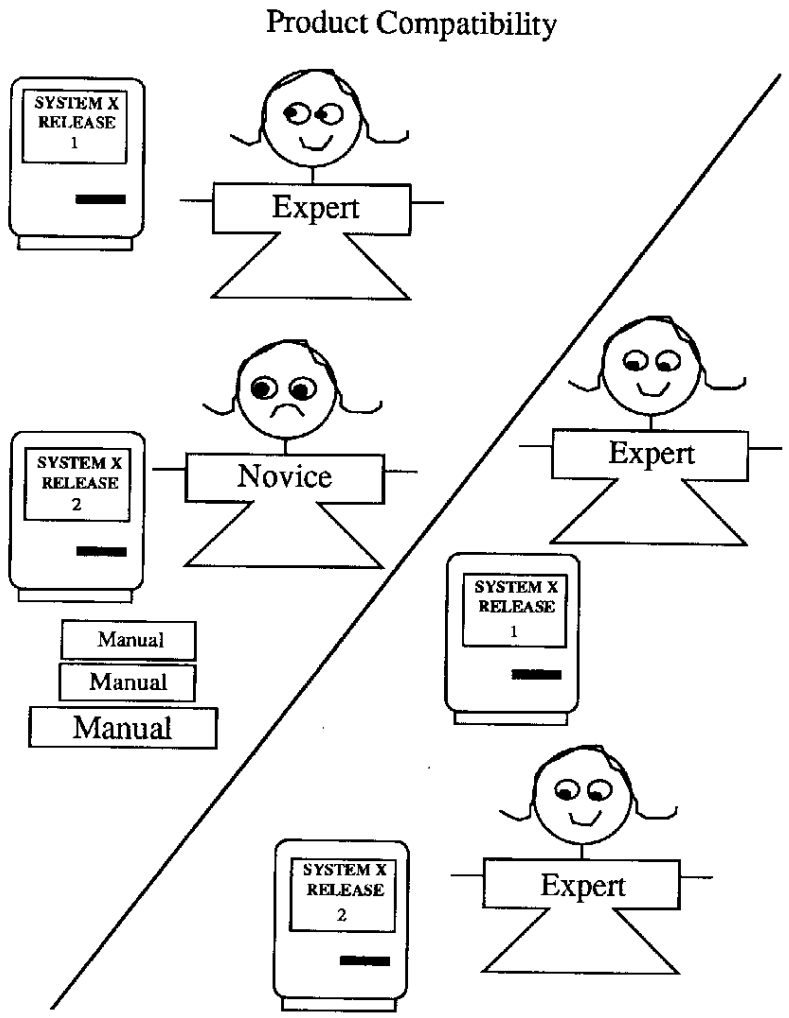
Compatibility

- User – know the user
- Design must be appropriate and compatible with the needs of the user or client
- Effective design starts with understanding the user's needs and adopting the user's point of view
- One common error among designers is to assume that users are all alike
- Another is to assume that all users think, feel, and behave exactly like the developer



Compatibility

- Product – can reduce both learning time & errors
- The intended user of a new system is often the user of other systems or earlier versions of the system. Habits, expectations, and a level of knowledge have been established and will be brought in learning the new system



Compatibility

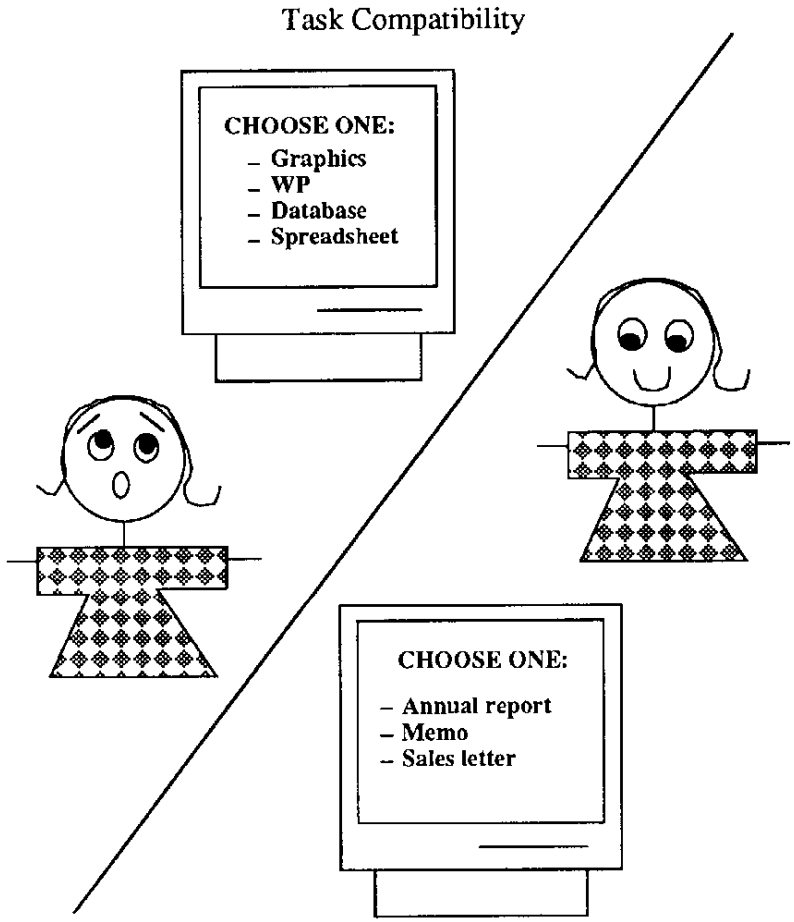
- If these cannot be applied to the new system, confusion results and learning requirements are greatly increased

- While compatibility across products must always be considered in relation to improving interfaces (e.g., different applications in Microsoft Office), making new systems compatible with existing systems (e.g., different versions of WORD) will take advantage of what users already know and reduce the necessity for new learning

Any disadvantage?

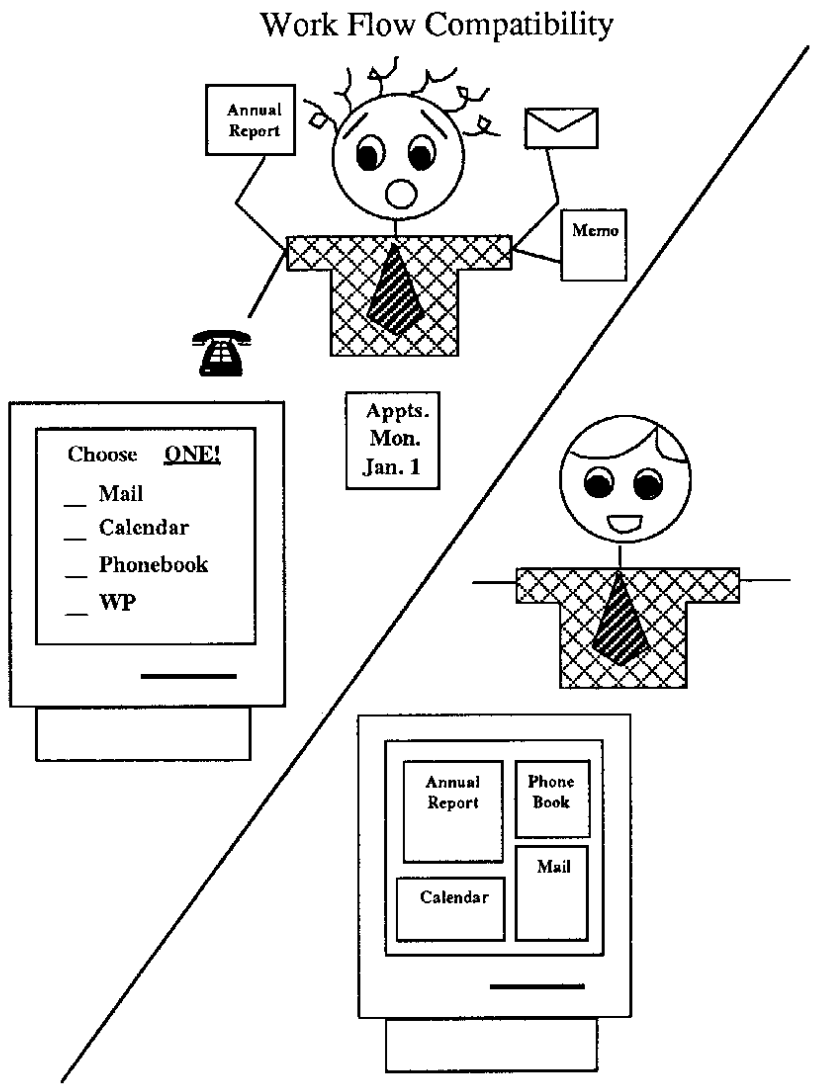
Compatibility

- Task compatibility: The organization of a system should match the tasks a person must do to perform the job



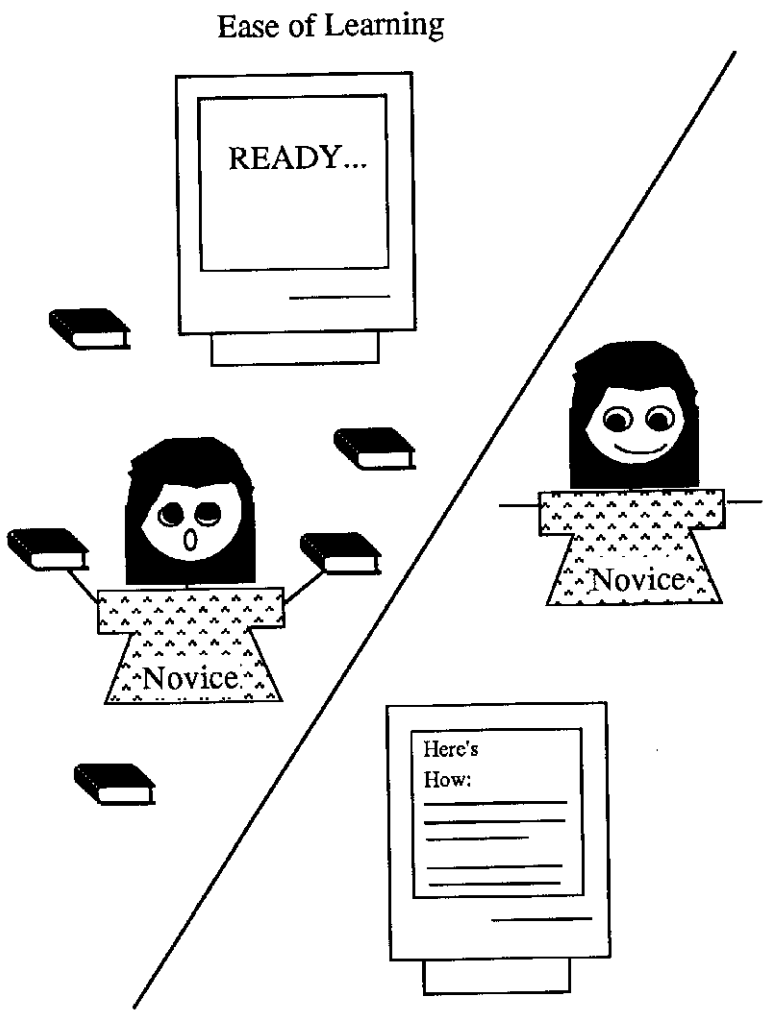
Compatibility

- Work flow compatibility: Structure and flow of functions should permit easy transition between tasks. The user must never be forced to navigate between applications or many screens to complete routine daily tasks



Ease of Learning

- Ease of learning – the system should be easy to learn so that the user can rapidly start getting some work done with the system



Memorability

Interfaces that have high memorability will be easier to learn and use. Factors which affect memorability include

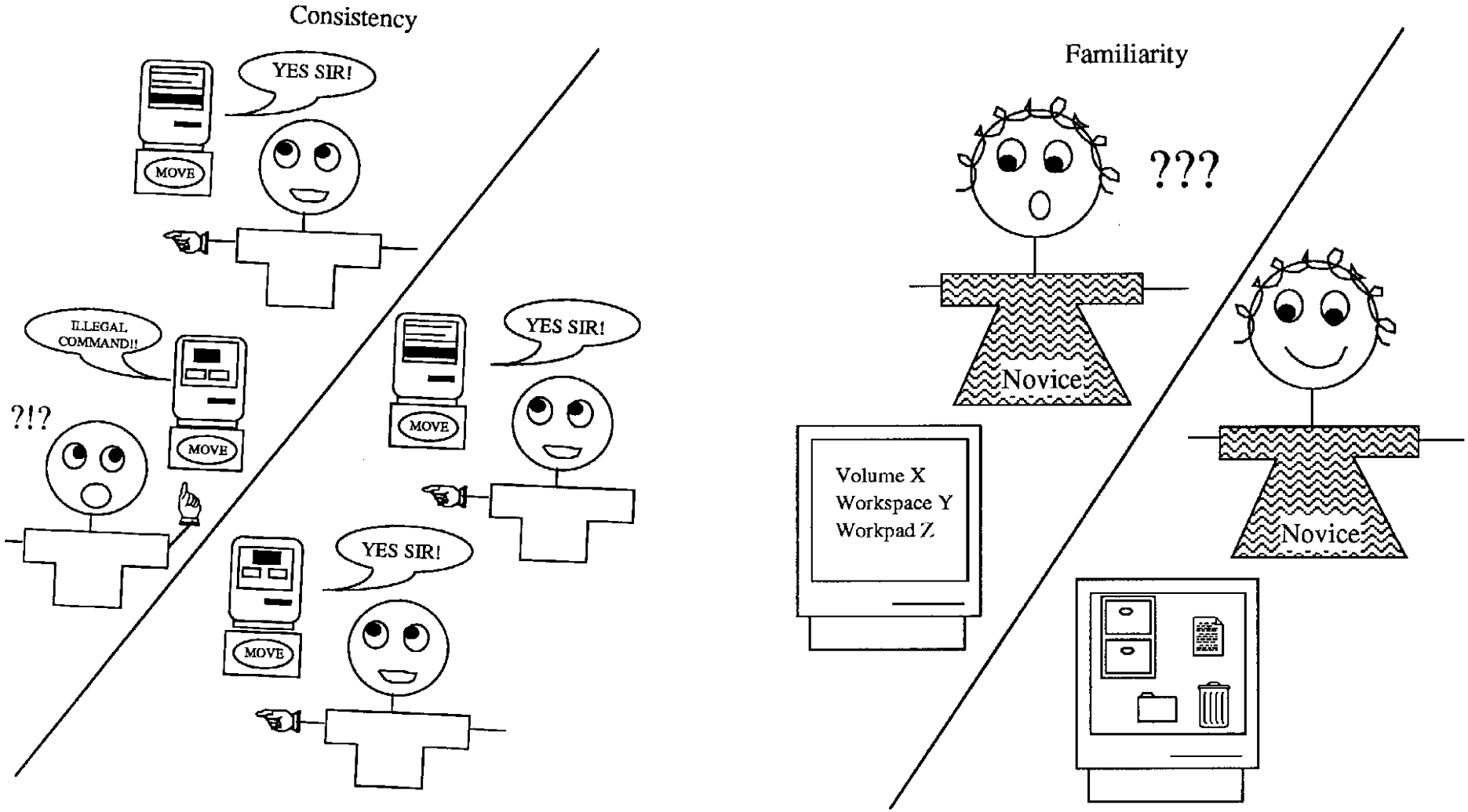
- Location: It will be easier to remember if a particular object is placed in a consistent location, e.g., always putting the search box in the upper right-hand corner of a Web page
- Logical grouping: It will be easier to remember if things are grouped logically, e.g., putting related options together in a menu
- Conventions: Conventional objects and symbols will be easier to remember, e.g., shopping cart symbol 

Predictability

Predictability involves a person's expectations and his/her ability to determine the results of actions ahead of time. It includes:

- Consistency – Reinforce our associations and therefore increase our ability to remember and predict outcomes and processes, e.g., same format in command, screen layout, and navigation control
- Generalizabilty – Help us use the knowledge we gather from previous experience and apply it to similar situations
- Familiarity – A user's knowledge and experience in other domain can be applied when interacting with a new system, e.g., familiar menu names and options help users locate objects and functions more easily

Predictability



Predictability

- Conventions – Allow us to use our intuitions which are based on previous experience and logic; if something is consistently done in a particular way, it will eventually become the conventional way of doing it

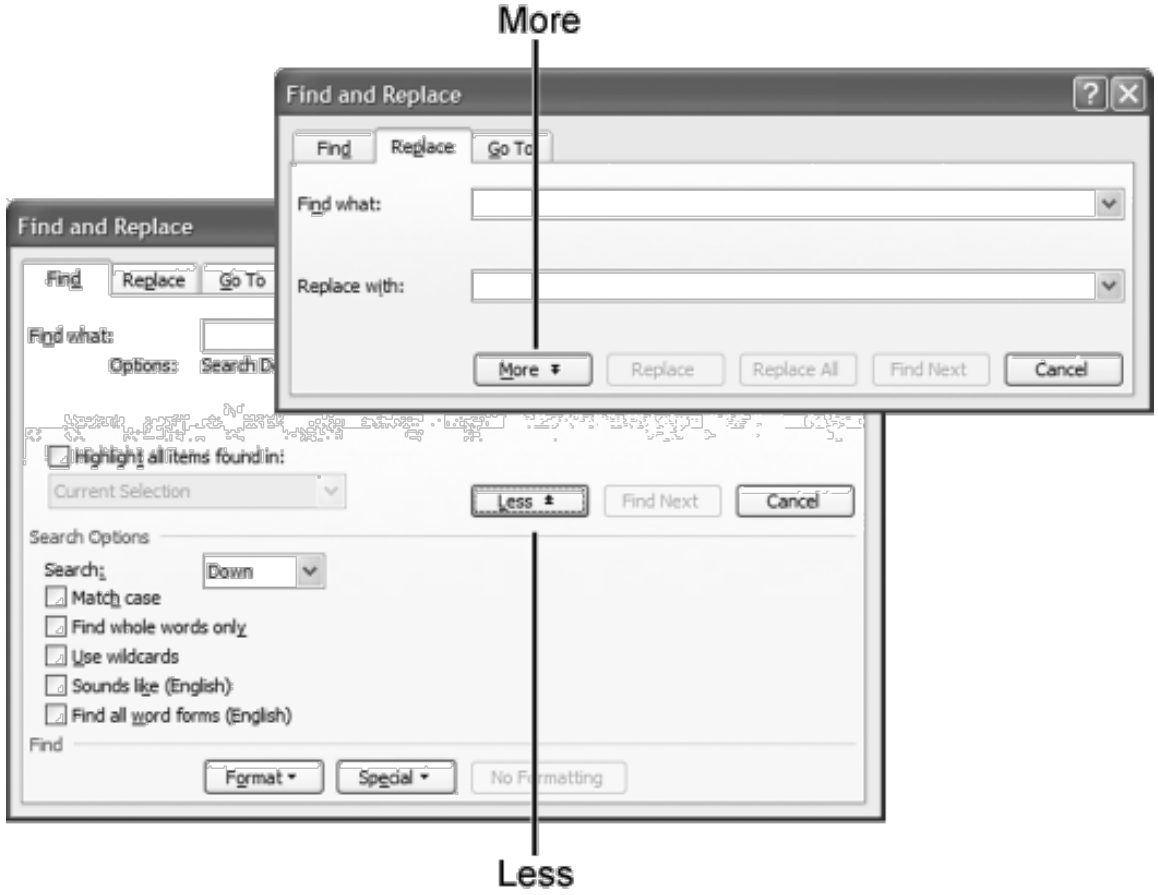
Simplicity

If things are simple they will be easy to understand and thus easy to learn and remember

Simplicity

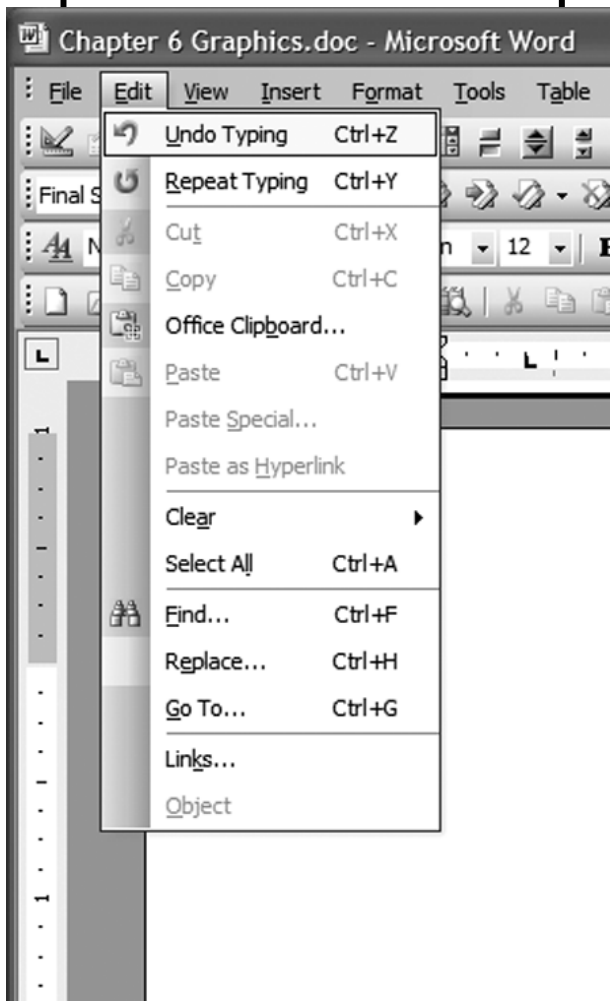
It includes:

- Progressive disclosure – Show the user only what is necessary



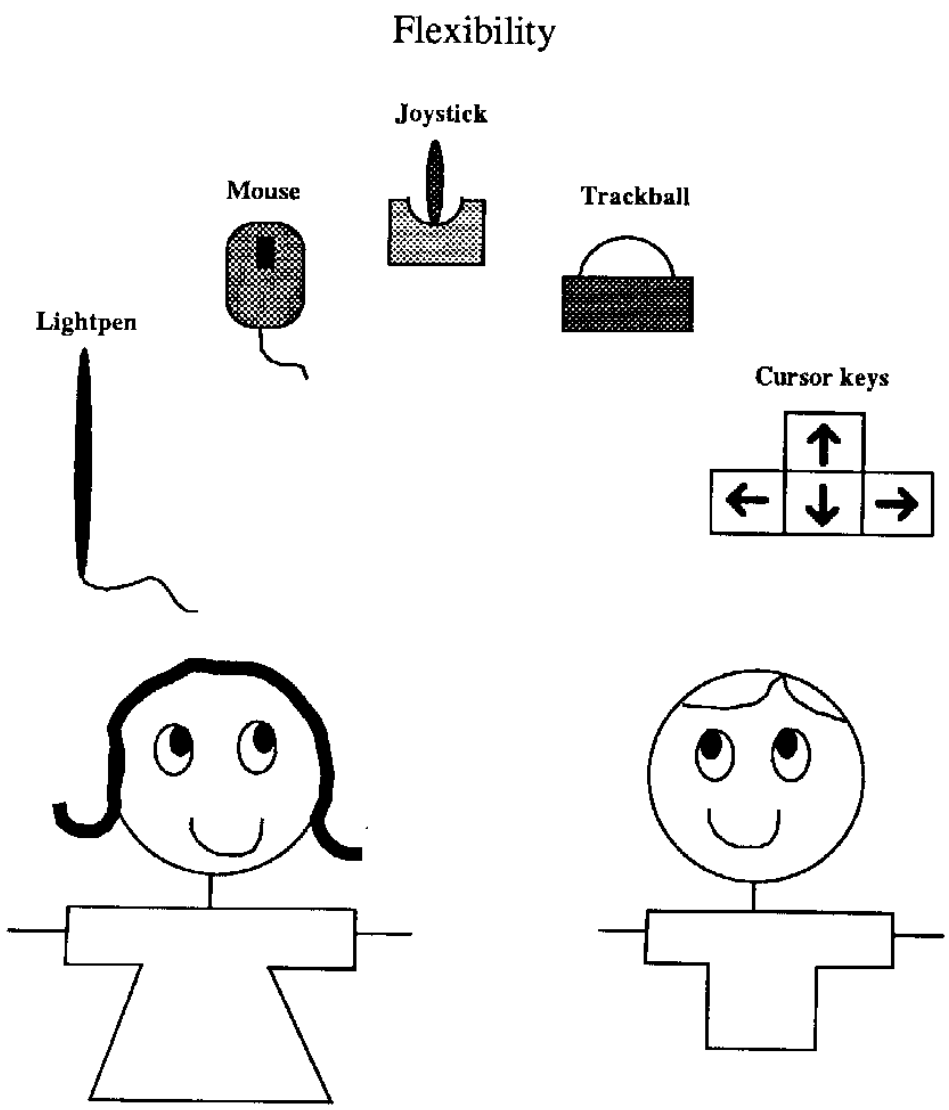
Simplicity

- Constraints – Involve limiting the actions that can be performed in a particular design



Flexibility

- Allow more user control & accommodates variations in user skill and preferences, i.e., give users choices
  - Hardware
  - Types of interaction
  - Data format

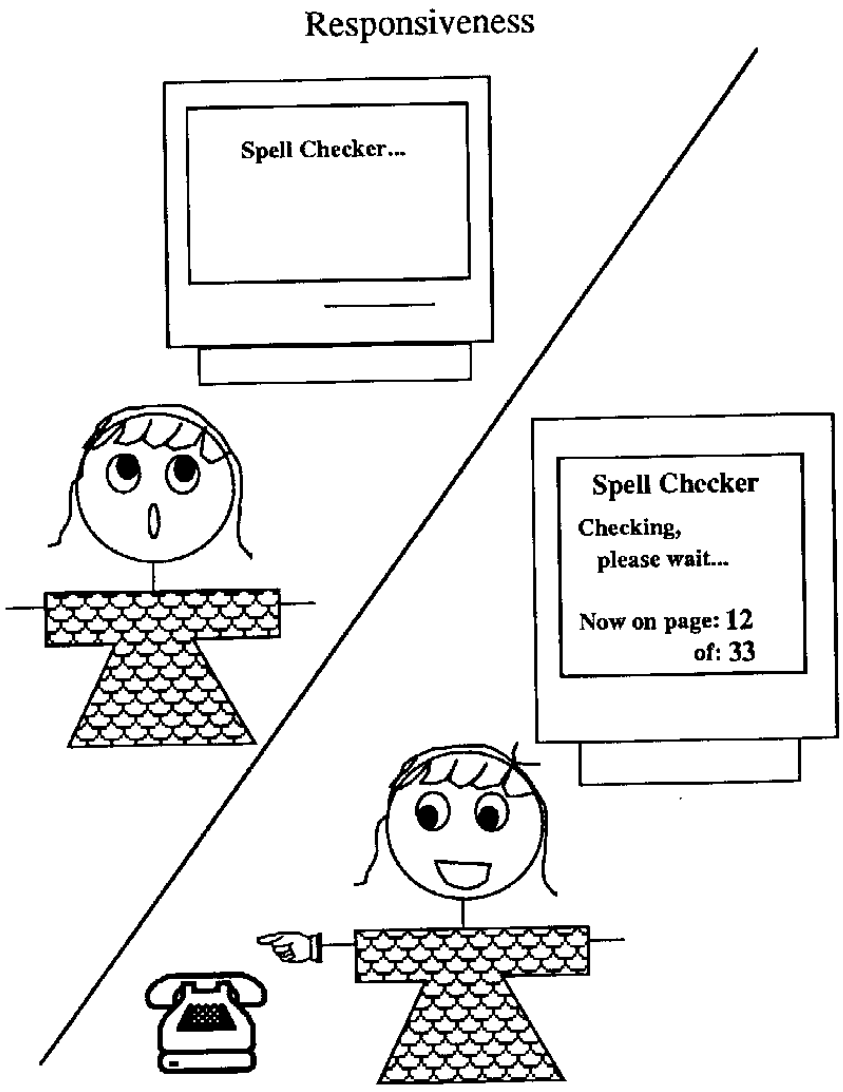


Flexibility

- Flexibility is the system's ability to respond to individual differences in people
- Permit people to choose the method of interaction that is most appropriate to their situation. People should be able to interact with a system in terms of their own particular needs including knowledge, experience, and personal preference
- Flexibility is accomplished by providing multiple ways to access application functions and perform tasks
- It is also accomplished through permitting system customization

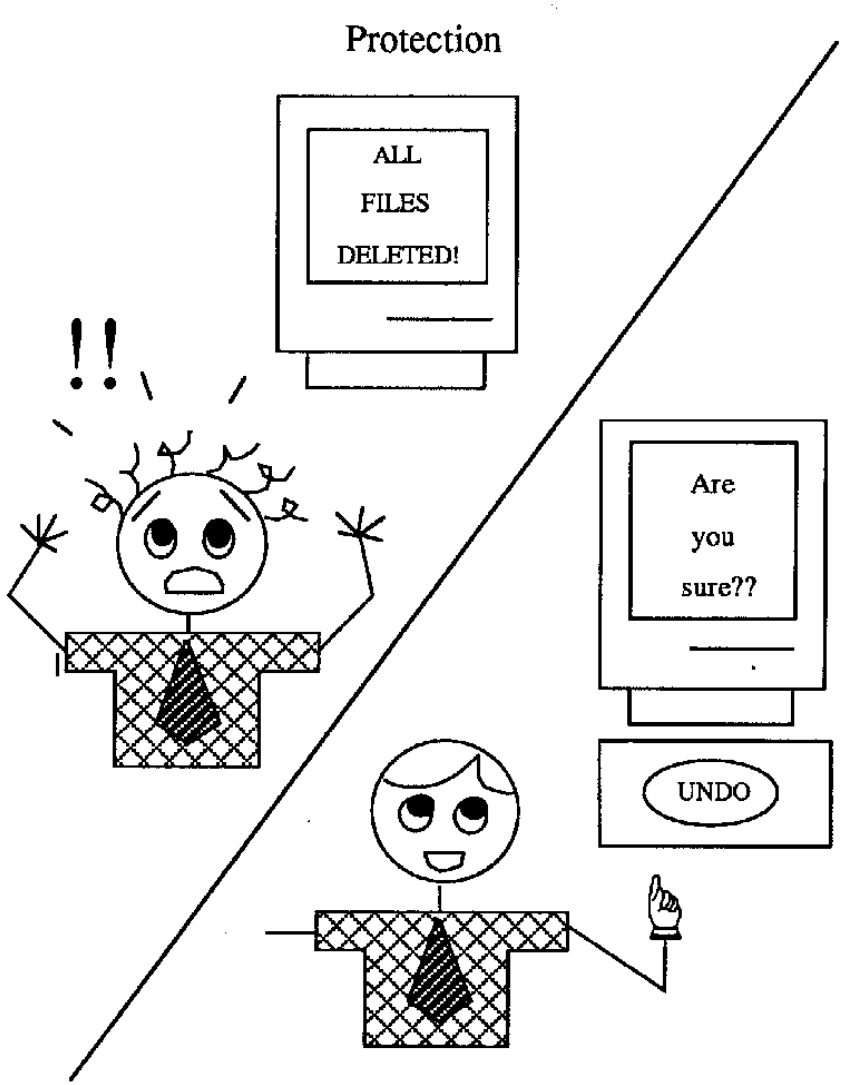
Responsiveness

- The system must rapidly respond to the user's requests
- Provide immediate acknowledgment for user actions: visual, textual, and/or auditory



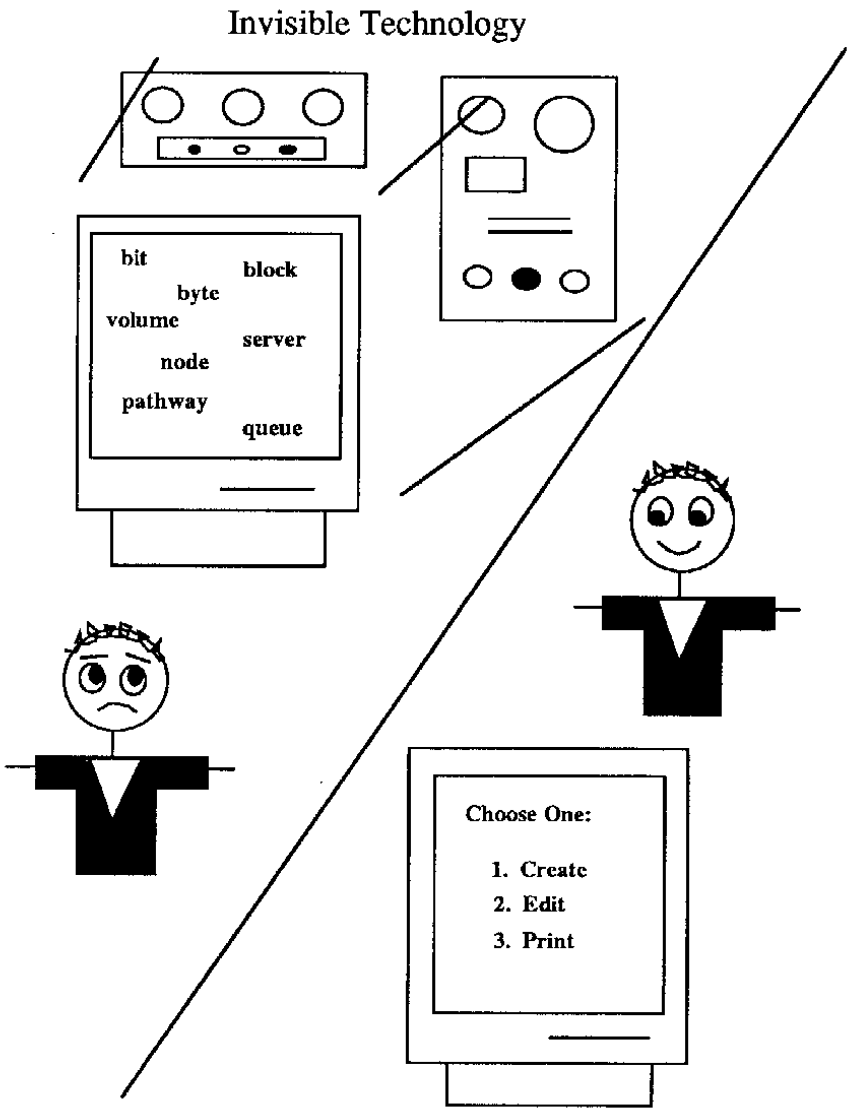
Protection

- Protect users against disastrous results of common human error



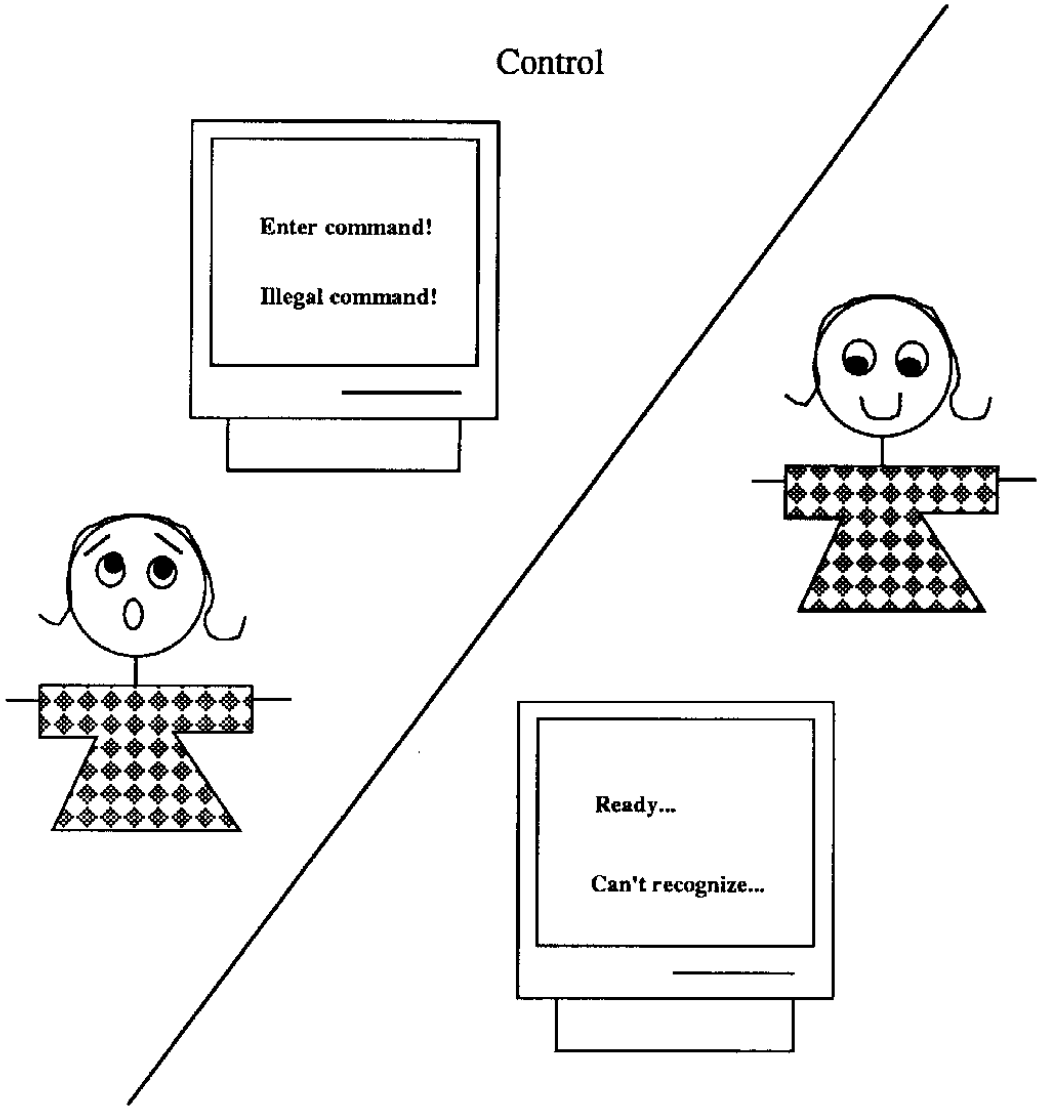
Invisible Technology

- In general, the user should need to know as little as possible about the technical details of how the system is implemented and operates



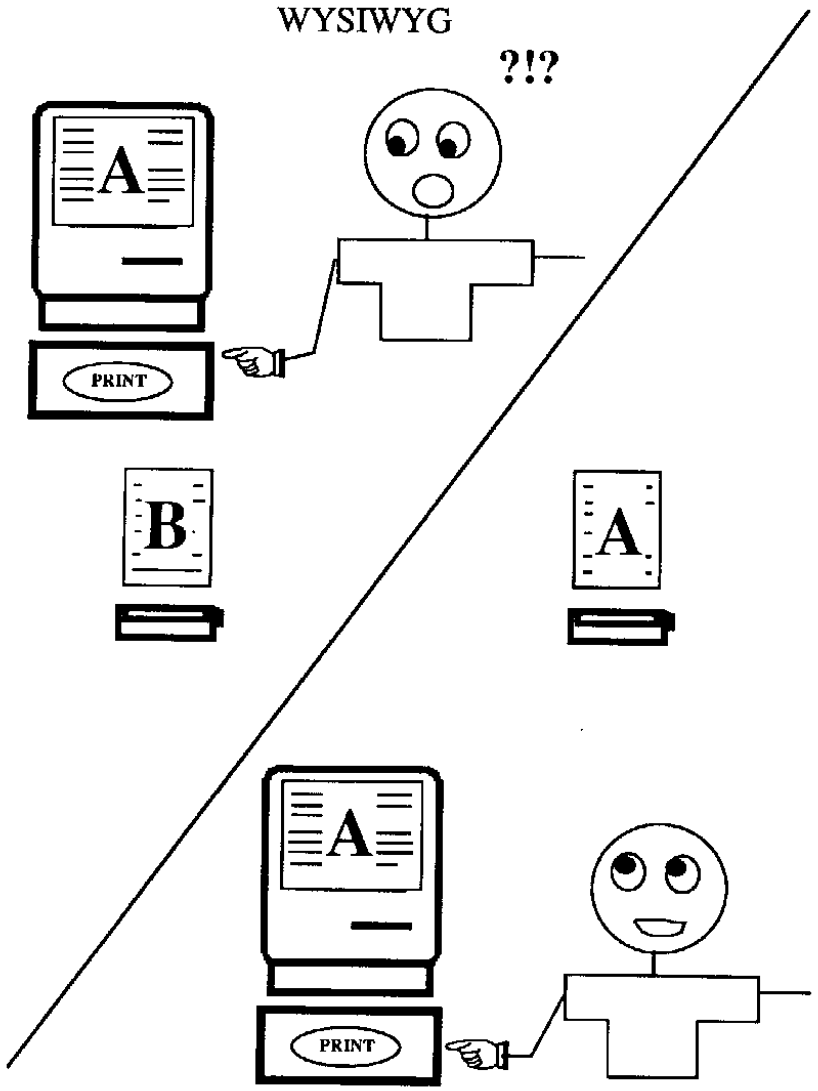
Control

- Users prefer to feel a sense of mastery and control over the system
- It is frustrating and demoralizing when the user is being controlled and directed by machine



WYSIWYG

- What you see is what you get



Accessibility

- Degree to which a product is accessible by as many people as possible
- Focus on disability, including
  - Visually impaired (who need magnifier to see) or blind
  - Color blind (who are not able to distinguish two colors)
  - Dyslexia (who have difficulties in reading and writing)
  - People with missing limbs
- Now a legal issue: Disability Discrimination Ordinance (Cap 487) has created a legal duty for organisations to ensure their services are available to everyone regardless of disability. This principle is applicable to information and services provided through Websites
  https://www.elegislation.gov.hk/hk/cap487

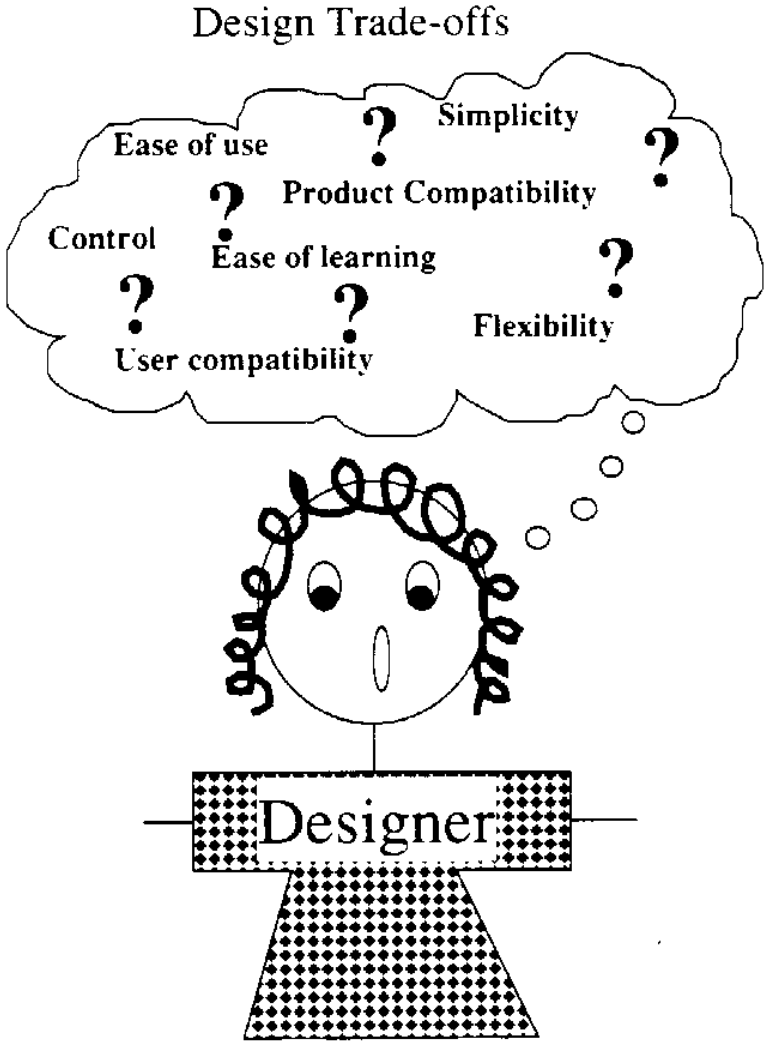
General Principles of HCI Design

- Principles which do / do not support user experience
  - Satisfying
  - Fun
  - Enjoyable
  - Entertaining
  - Helpful
  - Surprising
  - Aesthetically pleasing
  - Rewarding
  - Supportive of creativity
  - Emotionally fulfilling
  - Boring
  - Frustrating
  - Annoying

General Principles of HCI Design

- Principles are often in direct conflicts with one another. In order to make the trade-offs intelligently, a thorough understanding of the intended users is required

- These principles are very general and designers may not know how to apply them directly



Norman's Principles of Usability

Norman is a cognitive psychologist, expertise in computers

Cognition refers to how we gain knowledge, includes understanding, remembering, reasoning, acquiring skills, creating new idea

Basic ideas of Norman's principles:

- We can learn from common objects
- We are able to operate common objects without a user manual
- The objects should provide some cues. If a simple piece of equipment such as a door or a kitchen stove requires labelling, that need is sign of design failure
- Visibility, affordance, mapping, constraints, feedback

Norman's Principles of Usability

A product or design with good usability should provide perceptual cues for us to answer:

- Can we see the interface elements?
  Related to visibility
- What do you perceive you can do with the interface?
  Related to affordance
- How our interaction is constrained by the interface?
  Related to constraint
- What is supposed to happen when we interact with the interface?
  Related to mapping and feedback

Norman's Principles of Usability

- Visibility
  - Interface feature is accessible to a human sense organ? (e.g., Can an answering machine indicate the presence of incoming voice mails? The number of mails?)
  - Indicate what parts operate & how
  - Indicate how user is to interact with the device (e.g., on/off key on a calculator)
  - The more visible functions are, the more likely users will be able to know what to do next

Norman's Principles of Usability

Which one is of higher visibility?

Norman's Principles of Usability

Which one is salt shaker? Which one is pepper shaker?
Which pair is of higher visibility?

Norman's Principles of Usability

- This is a control panel for an elevator (www.baddesigns.com)
- How does it work?
- Push a button for the floor you want?
- Nothing happens. Push any other button? Still nothing. What do you need to do?

$\Rightarrow$ It is not visible as to what to do!

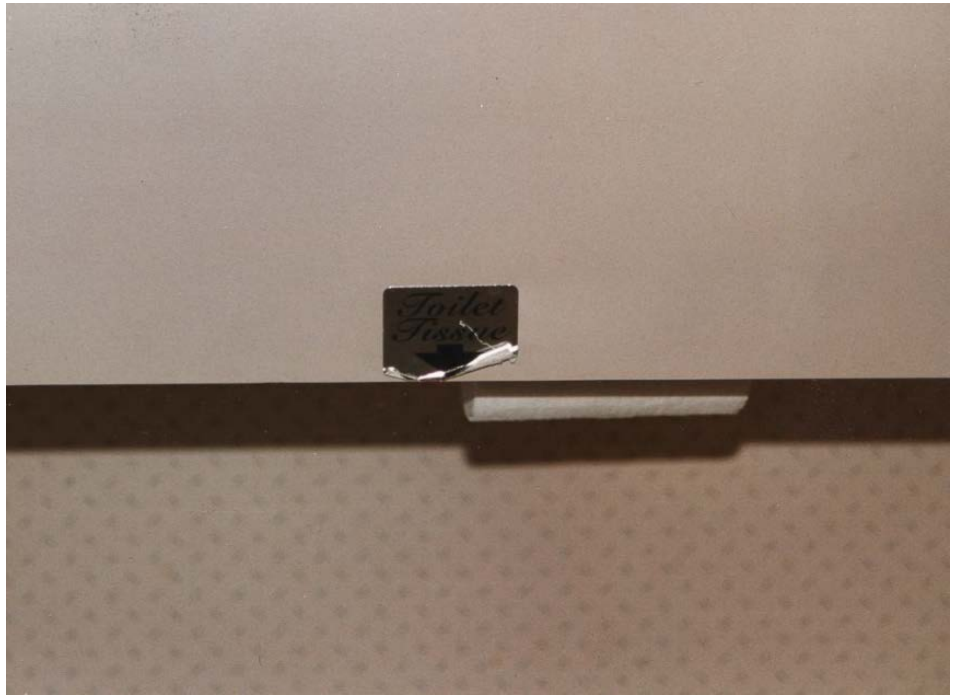
Norman's Principles of Usability

Need to insert your room card in the slot first!

How would you make this action more visible?

- Make the card reader more obvious
- Provide an auditory message, that says what to do
- Provide a big label next to the card reader that flashes when someone enters
- Make relevant parts visible
- Make what has to be done obvious

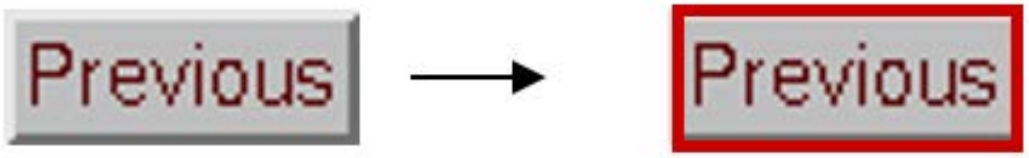
Norman's Principles of Usability



Is it easy for you to find where is the toilet paper?

Norman's Principles of Usability

- Feedback
  - This principle is nature: when you talk to somebody, you expect a reply
  - Send back to user information about what action has actually been done. This allows a person to continue with the activity
    (e.g., press a key on a telephone, copy a file in PC, progress of downloading a file from internet, screen button clicked on provides sound or red highlight feedback)



  - Include sound, highlighting, animation and combination of these

Norman's Principles of Usability

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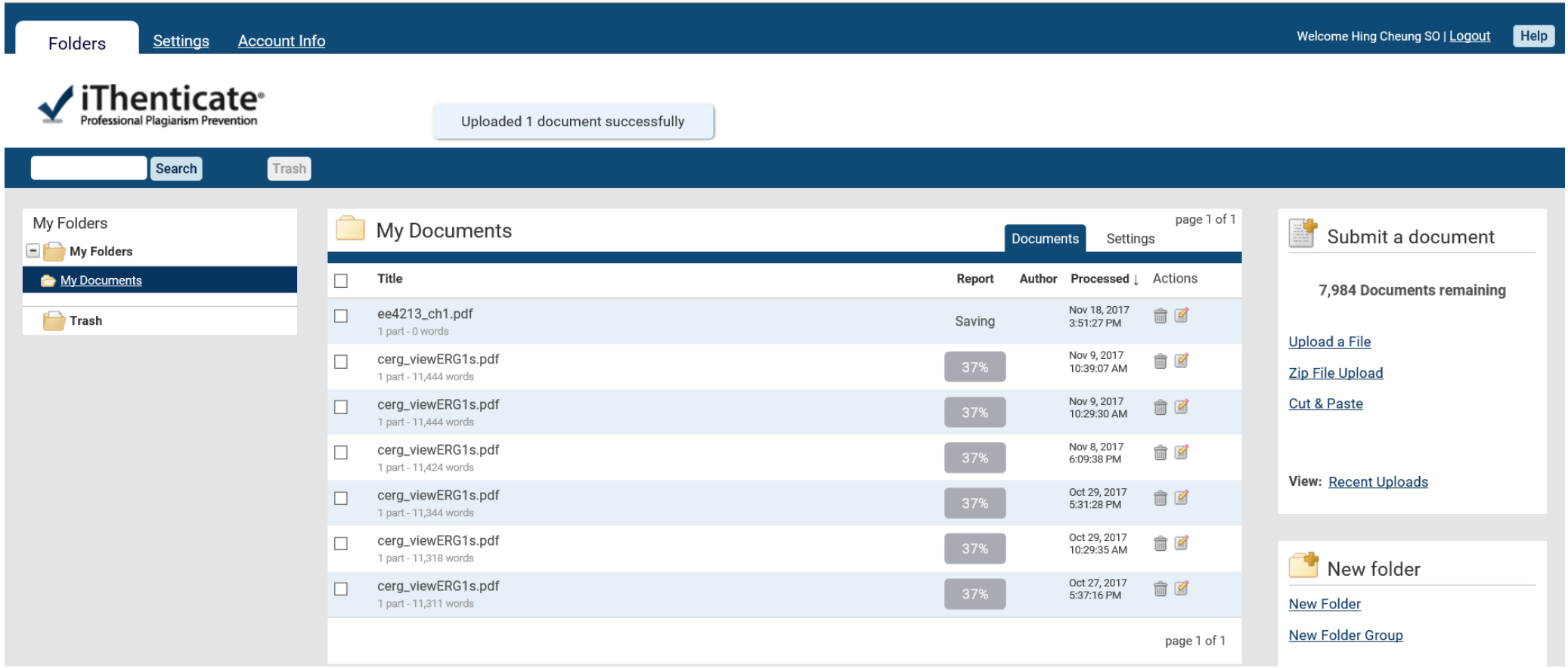

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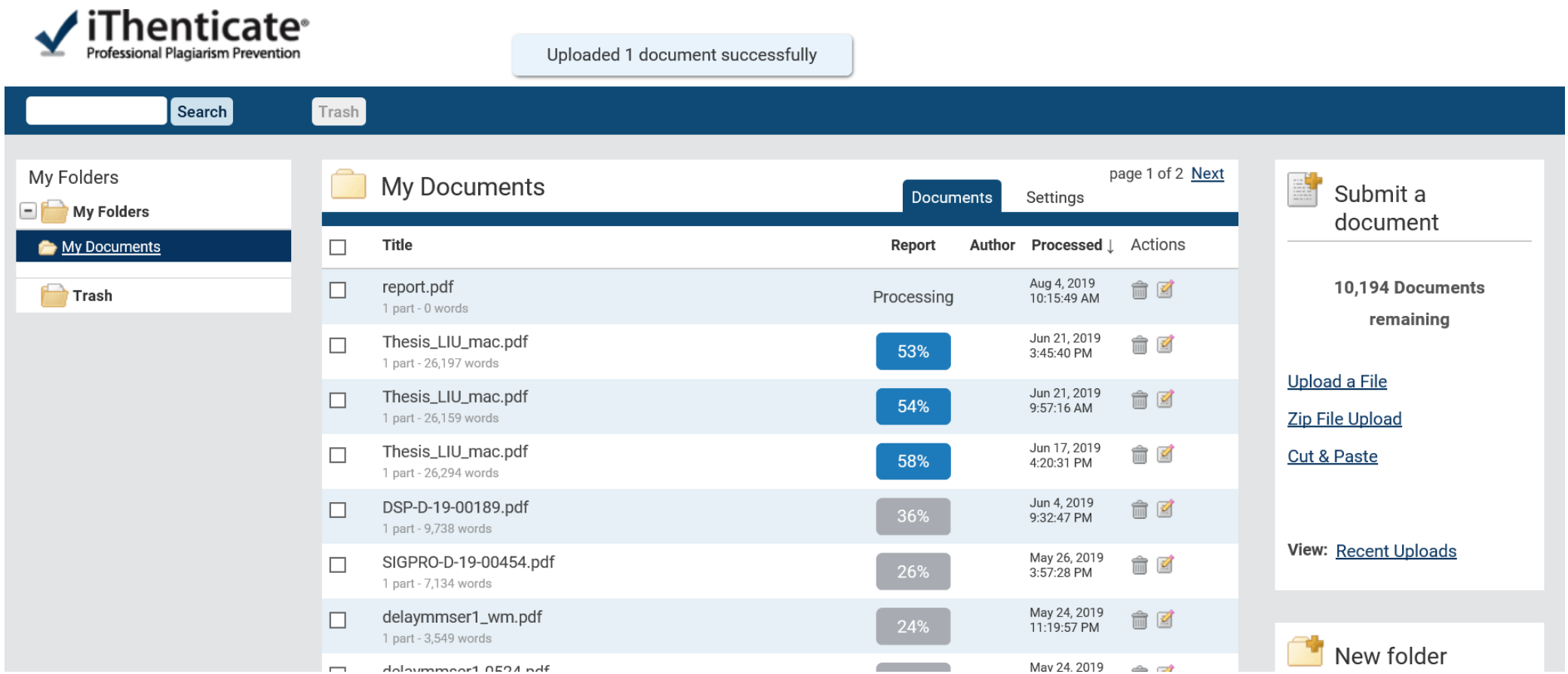
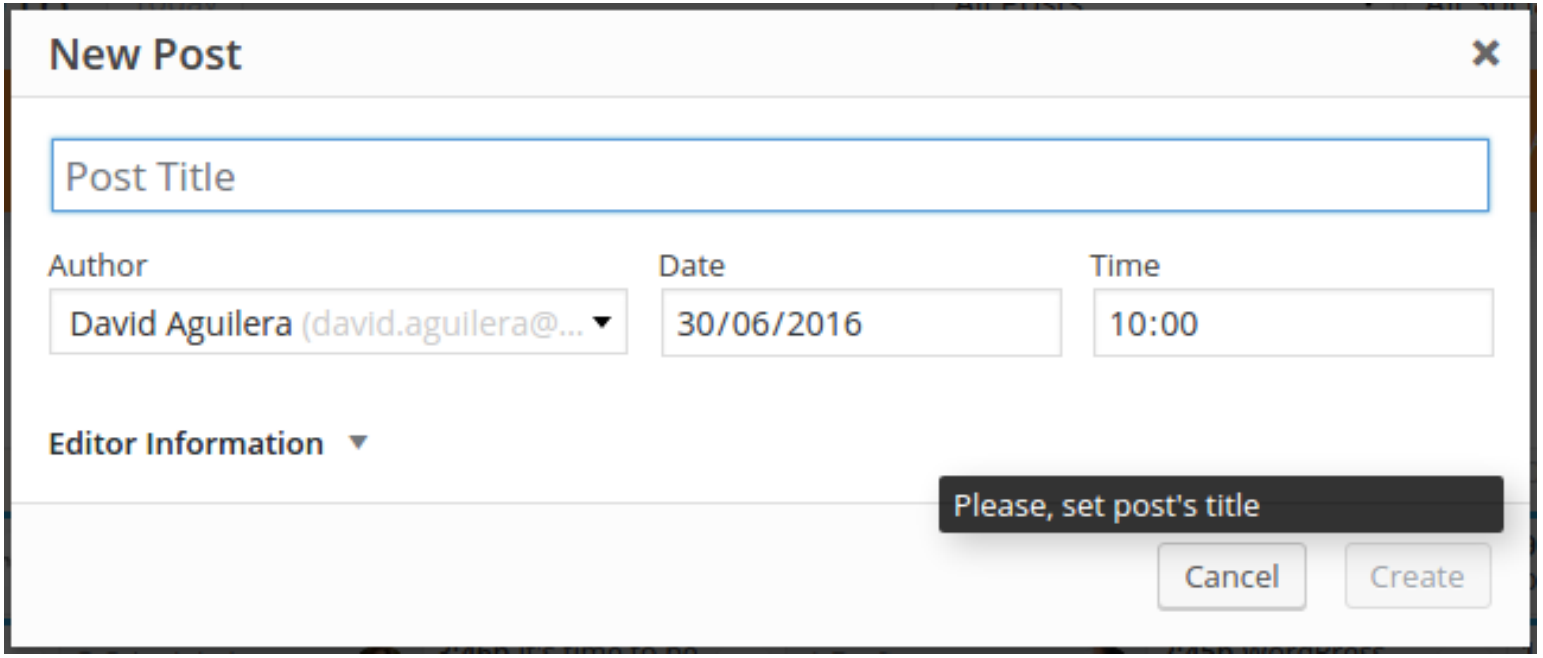
Norman's Principles of Usability

Any improvement?



Norman's Principles of Usability

A user wants to create a new post and moves the pointer over the “Create” button:



Has the user received any feedback?

Norman's Principles of Usability

- Constraints
  - Restricting the possible actions that can be performed at a given moment
    (e.g., some menu options will be deactivated by shading them at some occasions)
  - Avoid wrong uses of thing, i.e., help prevent user from selecting incorrect options
  - 3 main types:
    - Physical
    - Logical
    - Cultural

Norman's Principles of Usability

Physical Constraints

- Physical objects can be designed to constrain things, and this constraint restricts the user interaction
- How many ways can you insert electrical plug to a socket?
- How about inserting a CD into a computer?

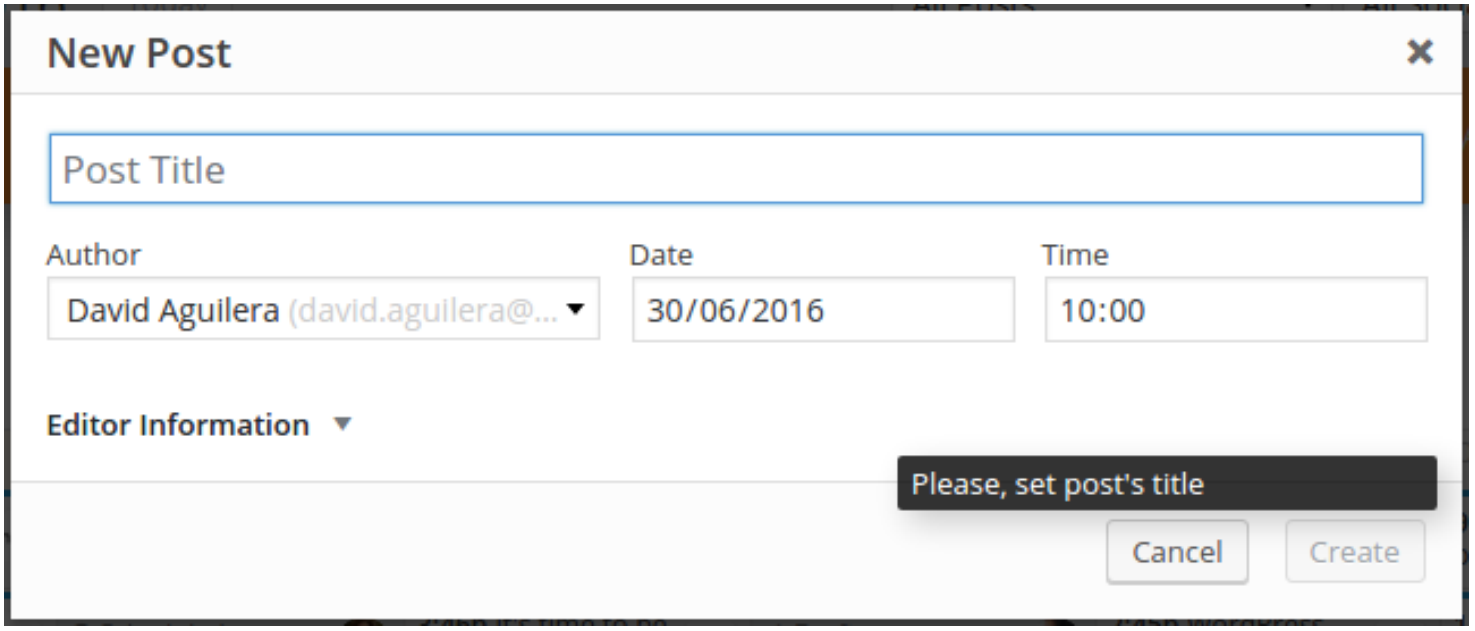
Which of them has a better physical constraint?

- The more possible interpretations a thing has, the more difficult it will be to use

Norman's Principles of Usability

Logical Constraints

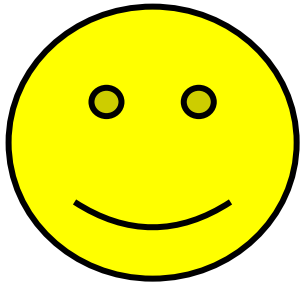
- Exploit people's common sense reasoning about actions and their consequences
- When no object is selected, it is not allowed to use the "Cut" command in WORD



Norman's Principles of Usability

Cultural Constraints

- Society has evolved numerous artificial conventions that govern acceptable social behaviour. These cultural conventions have to be learned, but once learned they apply to a wide variety of circumstances.
- Red colour stands for danger while green colour stands for safe
- Smiling face stands for happy emotion



Which one is universal and which one is culturally-specific (i.e., accepted by a cultural group only)?

Norman's Principles of Usability

- Light switch:
  - America: down is off
  - Britain: down is on

- Water tap:
  - America: anti-clockwise is on
  - Britain: anti-clockwise is off
- Red colour:
  - America: danger
  - Egypt: death
  - India: life
  - China: happiness

Norman's Principles of Usability

- Affordance
  - Refer to an attribute of an object that allows people to know how to use it, i.e., give clues to operations of things
  - Indicate what thing is for
    (e.g., a door handle affords pulling, a cup handle affords grasping)

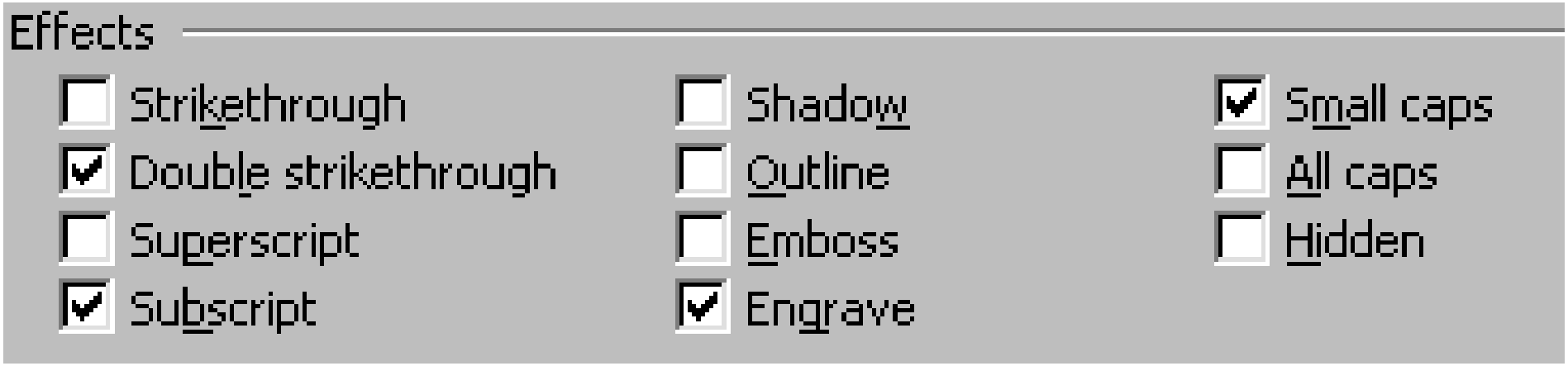
  - Indicate how thing could possibly be used
    (e.g., knobs are for turning, slots are for inserting things into)

Norman's Principles of Usability

- Other examples include: scrollbars afford moving up and down, icons afford clicking on

A radio button in a Web page affords you to choose 1-of-many choice by clicking one of the items

Norman's Principles of Usability



A check box affords you to choose 0 to all choices

Is it true for Microsoft WORD?

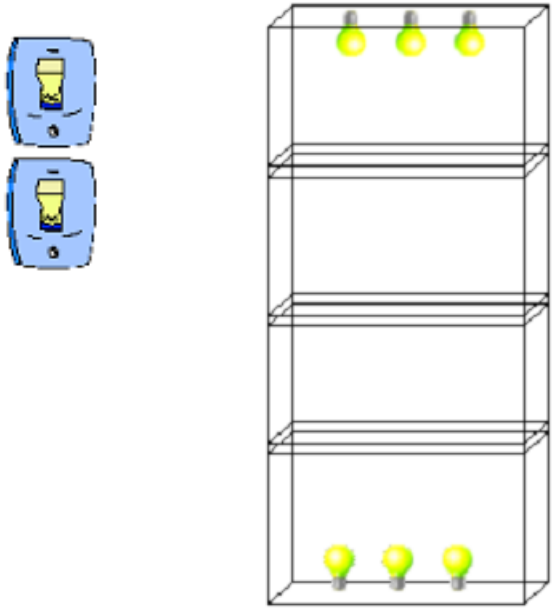
There are two kinds of affordance:

- Real: for physical objects and do not have to be learned
- Perceived: for screen-based interfaces and can be considered as learned conventions

Norman's Principles of Usability

Norman's Principles of Usability

- Mapping
  - Natural relationship between controls & their effects (e.g. move mouse to left, pointer goes left)
  - Upper button controls upper bulbs while lower controls lower bulbs (button affords you to press)



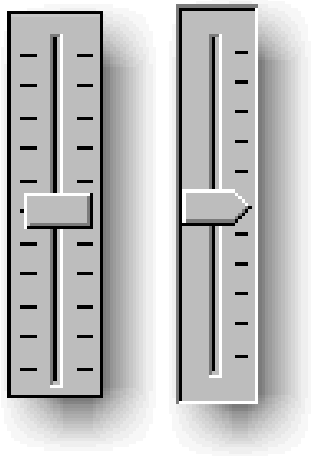
Norman's Principles of Usability

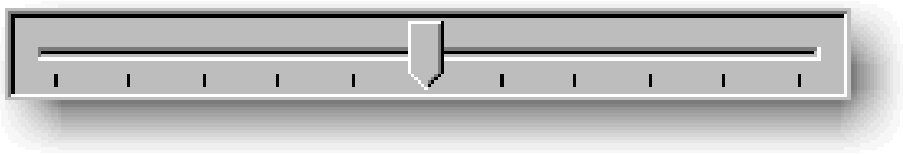
- The timer knob in a microwave oven is of good mapping because turning it clockwise implies increasing cook time (the knob affords you to turn as well)

- The volume knob in a Hi-Fi system is of good mapping because turning it clockwise implies increasing volume (the knob affords you to turn as well)

Norman's Principles of Usability

- Slide bar also has a strong mapping, since moving it to the right/top will increase the value while moving it to the left/down will decrease it (the slider affords you to move)

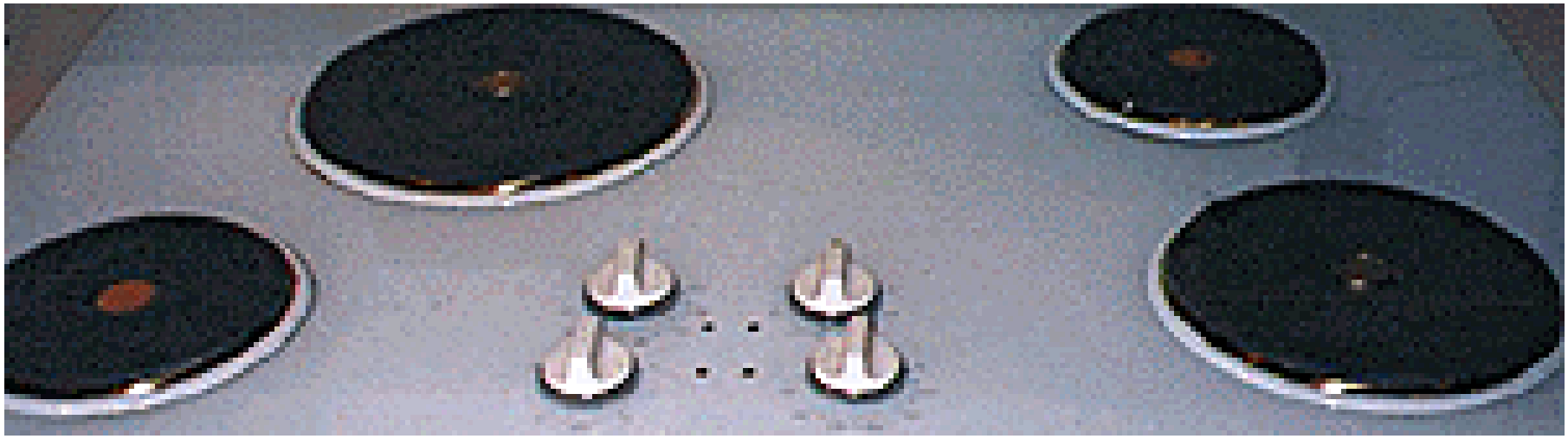




Norman's Principles of Usability

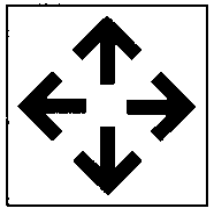
Which controls go with which burner rings?

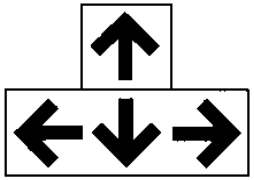
Norman's Principles of Usability



Is it better?

Norman's Principles of Usability





Which arrow-key layout is the best?

Which set is better?

Norman's Principles of Usability

- **Pull or Push?**
- **Which Norman's principle has been used?**

Norman's Principles of Usability

- **Pull or Push?**
- **Which Norman's principle has been used?**

Norman's Principles of Usability

Any suggested improvements?

Norman's Principles of Usability

Which Norman's principle(s) has/have been applied in this education toy?

Norman's Principles of Usability

Which Norman's principle(s) has/have been applied in this unit?

Norman's Principles of Usability

How about this? What is the meaning of 3 black dots in yellow?

Norman's Principles of Usability

Different vibrating patterns to indicate states of pedestrian signal

Directional arrow to indicate the direction of the pedestrian crossing

This is provided for visually impaired persons to use

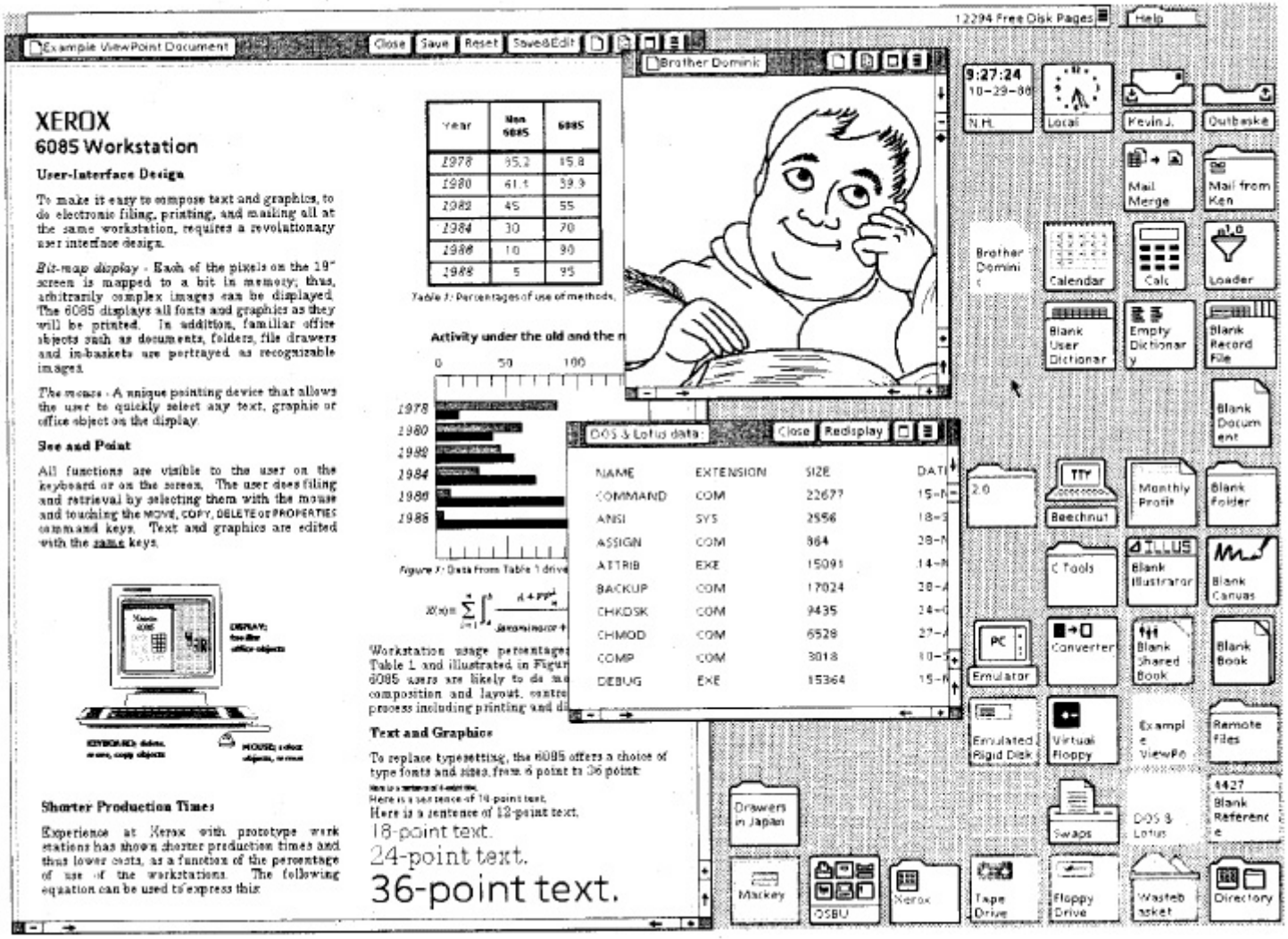
Have you misused it?

Conceptual Model

- Conceptual model is a fundamental aspect of HCI for interaction designers
- It is a high-level description of how a system/product is organized and operates
- It outlines what users can do with a product and what concepts are needed to understand how to interact with it
- If the conceptual model meets the user's intention, this implies that the user will use the system easily.
- How to develop a conceptual model?
  - Identify user's needs and system requirements
  - Identify a set of possible ways of interactions
  - Select suitable metaphors (e.g., icons)

Conceptual Model

A classic example is the Star interface by Xerox



Conceptual Model

- Targeted for workers not interested in computing – make the computer as "invisible" to the users as possible and to design applications suitable to them
- Based on an analogy to a physical office
- Metaphors: paper, folders, filing cabinets and mailboxes were represented as icons on the screen and were designed to possess some of their properties of their physical counterparts
- Concepts: Dragging an electronic document onto an electronic folder was seen as being analogous to placing a physical document into a physical cabinet; Placing an electronic file onto the printer icon would print it out

Conceptual Model

Another example: Recycle Bin in Windows 7

What is your understanding on the recycle bin?

- A place for deleting objects
- Drag objects to be deleted to the bin

Suppose a company wants to develop a mobile App for facilitating tourists to hike in Hong Kong.

How to develop a conceptual model for this system?

What questions should we ask in developing the conceptual model?