Introduction to Human Computer Interaction (HCI)

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What is Human Computer Interaction (HCI)?

User definition:

HCI, also known as man-machine interaction, is a discipline that organizes interaction between man and computing devices to make it more successful.

Developer Definition:

Human-computer interaction is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them.

HCI?

- Organizes interaction between man and computing devices to *make it more successful*
- Multidisciplinary
- Involves:
  - *Psychology and cognitive science*
  - Ergonomics
  - Sociology
  - Computer Science and Engineering
  - Business/Management
  - Arts
  - *Writing*

HCI?

- Organizes interaction between man and computing devices to make it more successful
- **Multidisciplinary**

Involves:

- **Psychology and cognitive science**
  - to give someone knowledge of the user's perceptual, Cognitive and problem-solving skill
- **Ergonomics**
  - for the user's physical capabilities
- **Sociology**
  - to help her understand wider context of the interaction
- **Computer Science and Engineering**
  - to be able to build the necessary technology
- **Business/Management**
  - to be able to market it
- **Arts**
  - Graphic designer's to produce effective interaction
- **Writing**
  - Technical writing to produce the manuals

Why Multidisciplinary?

A beautifully designed graphic display may be unstable if it ignores dialog constraints or the psychological limitations of the user

Do you agree?

What are your experiences?

Why HCI?

- We are complex beings in complex settings!
- Inadequate attention to users and task → bad user interfaces → System failure

Is HCI a Science or a Craft?

Theoretically, it is a marriage of art and science

- But it is not always true,
  [a beautiful woman + a wise man] ->
  handsome and intelligent child
- Beautiful and/or novel interfaces are artistically pleasing and motivate fulfilling the tasks required
- Scientific view/reasoning: why certain things are successful whilst others are not? Then, allow creative nature to feed off this information

HCI is required to be both a craft and a science in order to be successful

Role of HCI – develops the relationship

- Some users not only cannot work but also cannot live without their computers in everyday life ☺
- E.g. emails, Facebook, …

What are type of tasks for which people could use computers?

Computers now affect every person in society

ICT literacy – fundamental right in a society

"*Product success may depend on ease of use, not necessarily power of machine*" – find reasons to justify this

Challenge of developing products for everyone

HCI takes advantage of our everyday knowledge of the world to make software and devices more understandable and usable for everyone.

e.g. Desktop Computers – Consider introducing a computer for very beginner

Designing **interactive systems** is concerned with many different aspects of a product.

e.g. ask a question from visiting foreigner in your village

aspects : language, understanding, interpretation, finding answer(solution), …..

Components of HCI

Human

Interaction

Computer

The user is interacting with the computer in order to accomplish something (he has a goal !)

Describe Human Users

An individual

A group of users working together

A sequence of users in an organization (each dealing with some parts of task)

How to classify or understand human users?

- Physical abilities
- Personality differences
- Skill differences
- Cultural diversity
- Motivation
- Special needs

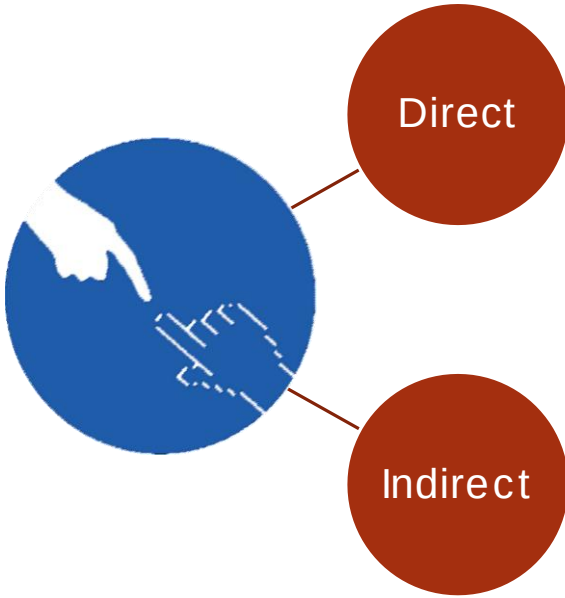
Computer(s)

- Desktop/Laptop
- Mobile phones/tablet computers
- Tabletops
- Virtual Reality
- Large scale computer systems
- Process control system
- Embedded system

What is Interaction?

A communication between a user and computer be it direct and indirect

Two types of interaction:



Direct: a dialog with feedback and control throughout the performance of the task

Indirect: Batch processing or intelligent sensors controlling the environment

Take Home : Identify direct and indirect interaction in MS Office.

Goals of Interaction Design

Allow users to carry out tasks

- **Safely**
- **Effectively**
- **Efficiently**
- **Enjoyably**

Two types of interaction design

User-centered design

- In order to optimize the system functionality and resources, human user is considered main stakeholders that need to be satisfied

Task-centered design

- “Tasks are what the user is carrying out in a way he/she wants.

What is interface?

Interaction happens through the interface

Interface facilitates the communication between the user and system

How?

The interface needs to provide some mechanisms for

- people to provide instructions and enter data into the system: ‘input’.
- the system to tell people what is happening: ‘feedback’
- the system to display the content (i.e. information, pictures, movies, animations) : ‘output’.

Interactive interfaces

The interface of an interactive system is all those parts of the system with which people come into contact,

- physically, (by pressing buttons or moving controls)
- Perceptually (by displaying things on a screen, or making noises)
- Conceptually (by providing messages and other displays)

Ways to extend the interface of a device

- The device can be handled in different ways to do the same (**multiple ways**)
- Use the devices to increase the productivity (**simplify** the **interface**)
- Single device to multiple tasks (**multitasking**)
- Change the device to use it easily to do the task (**Customization**)
- Some people like to do in a specific way (**personalized**)

Good and bad interfaces

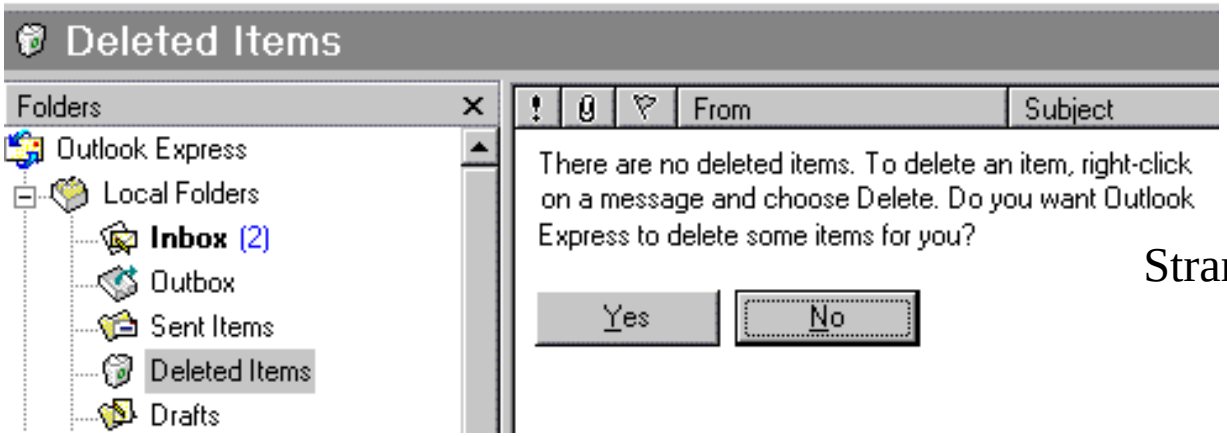
Poor user interfaces

- can cripple a system that is outstanding in all other respects
- can be very irritating for the user
- Can be hard to learn or remember
- Can loose productivity
- could literally become a life or death situation

Good user interfaces (User Friendly …)

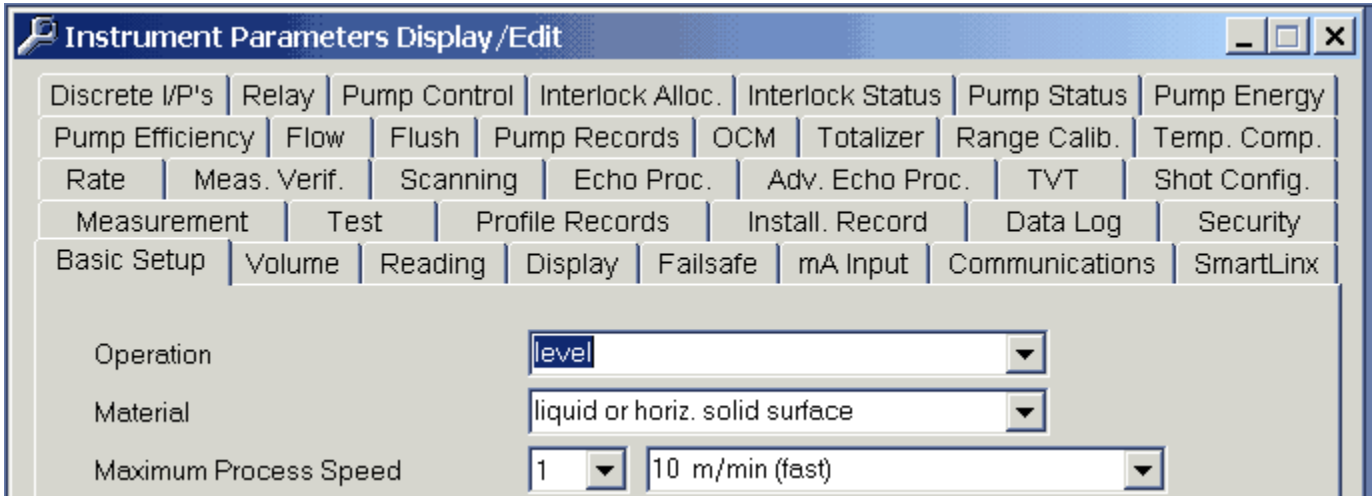
- Find features of good user interfaces
- Find examples of good user interfaces

Examples of poor UI design



Strange message???

Too many tabs???



Human-Computer Interaction (HCI)

Developing Interactions / interfaces

When developing interactions in a system, the designer should

- understand the human capacities of the user
- understand the consequences of using information technology as a tool for solving work related tasks
- develop and evaluate the system by putting the user at the center of the design process.

Why designing is so difficult?

- I am not you!
- Designers design things that will be used by others
- Solutions
  - Closing the gap
  - Design by yourself – DIY design

Developing Interfaces for good interaction

Interface is not the last thing to do

- Should be developed integrally with the rest of the system
- Iterative work that goes with evaluation

Good interfaces

- Suitable for the task
- Easy to use (appropriate, adaptable to the user's knowledge and experience)
- Feedback on performance
- Display information useful for the user
- Confirms to the "Principles of Software Ergonomics"
- People need to have a proper 'say'

References for Readings

Human-computer interaction (HCI) is an area of research and practice that emerged in the early 1980s, initially as a specialty area in computer science embracing cognitive science and human factors engineering …….

http://www.interaction-design.org/encyclopedia/human_computer_interaction_hci.html

HCI Past, Present and Future

Let’s watch a video !!!

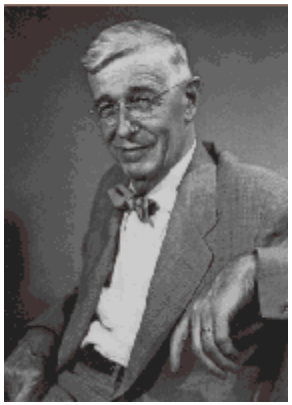
Key people: Father of HCI

Vannevar Bush

Postulated **Memex device**

- Can store all records/articles/communications
- Large memory
- Items retrieved by indexing, keywords, cross references.
- Can make a trail of links through material (now called hyperlinks)
- etc.

Envisioned as microfilm, not computer



Vannevar Bush established the U.S. military / university research partnership that later developed the *ARPANET* *(The First Internet*), and wrote the first visionary description of the potential use for information technology, inspiring many of the *Internet*'s creators.

Read "As we may think" at - 1945 *Atlantic Monthly*

"…publication has been extended far beyond our present ability to make real use of the record."

http://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/

History of HCI – Key people

J.R. Licklider

1960 - Postulated “man-computer symbiosis”

- Couple human brains and computing machines tightly to revolutionize information handling

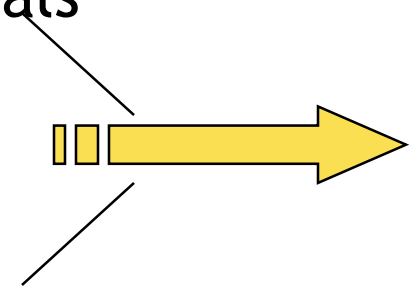
History of HCI

Mid 1960's

Computers too expensive for individuals

And those were timesharing

- increased accessibility
- interactive systems, not jobs
- text processing, editing
- email, shared file system



Need for HCI

- **Read**

http://grouplab.cpsc.ucalgary.ca/saul/hci_topics/pdf_files/history.pdf

http://www.cs.cmu.edu/~amulet/papers/uihistory.tr.html

Ivan Sutherland

SketchPad - 1963 PhD thesis at MIT

- Hierarchy - pictures & subpictures
- Master picture with instances (ie, OOP)
- Constraints
- Icons
- Copying
- Light pen as input device
- Recursive operations

Watch at:
https://www.youtube.com/watch?feature=player_embedded&v=USyoT_Ha_bA

History of HCI

- **Landmark developments affected HCI**

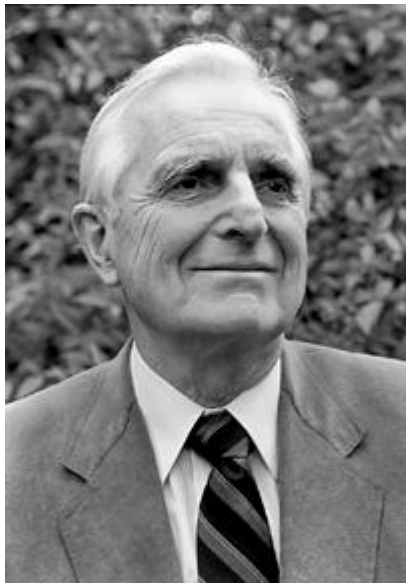
Video Display Units (VDU)

- More suitable medium than paper
- Sutherland's Sketchpad as landmark system
- Computers used for visualizing and manipulating data

Douglas Engelbart

Landmark system/demo:

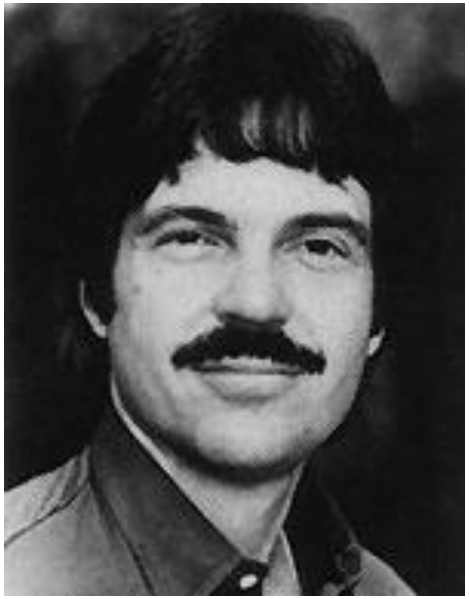
- hierarchical hypertext, multimedia, mouse, high-res display, windows, shared files, electronic messaging, CSCW, teleconferencing, ...



Inventor of mouse device

History of HCI

Alan Kay



Dynabook - Notebook sized computer loaded with multimedia and can store everything

Personal Computing

- System is more powerful if it's easier to use
- Small, powerful machines dedicated to individual
- Importance of networks and time-sharing
- Kay's Dynabook, IBM PC

History of HCI

- **Personal computing and GUI development**

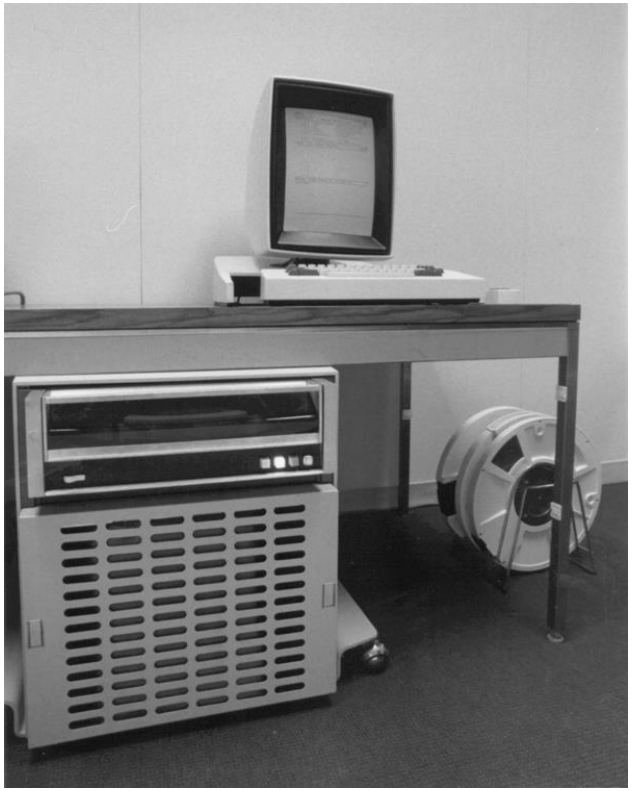
Personal Computers

- Text and command-based
- Sold lots

PCs with GUIs

Xerox PARC - mid 1970's

- local processor, bitmap display, mouse
- Precursor to modern GUI, windows, menus, scrollbars
- LAN - ethernet



History of HCI

- **Development of GUI for common people**

Lisa

- Apple Inc. reinvented more user friendly devices with graphic interface
  - **Apple Lisa -1983**
  - **Apple Macintosh -1984**

Macintosh

Tim Berners-Lee

World Wide Web

- a system of globally unique identifiers for resources (URL/URI)
- the publishing language HyperText Markup Language (HTML);
- the Hypertext Transfer Protocol (HTTP).

History of HCI

Main characteristics of HCI – Past

- Function/process centered
- Not much use of graphics
- Early PC and mouse
- High learning curve

History of HCI

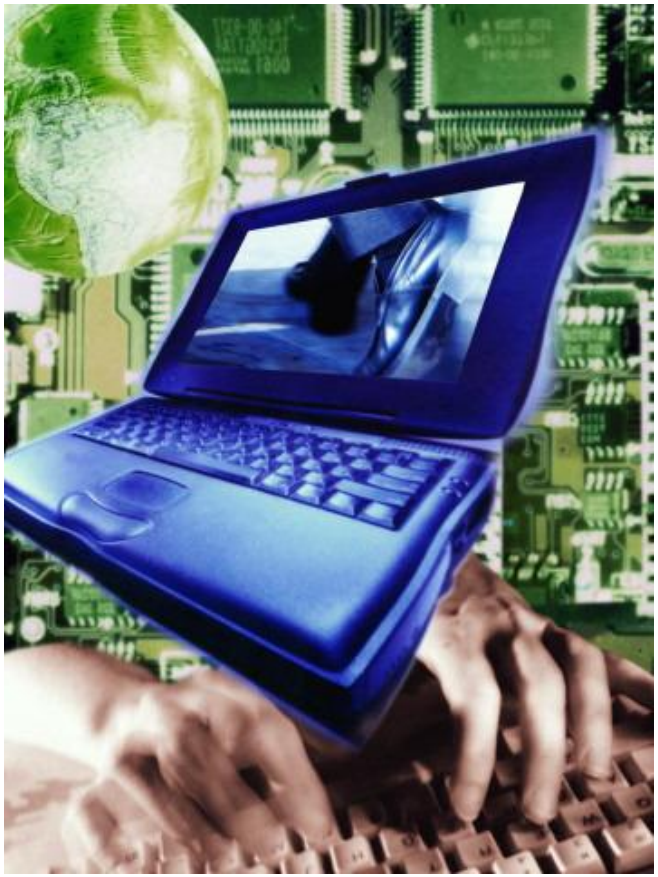
- 2000- present
  - XBOX 360 – Video Game Console- 2005
  - Nintendo Wii – 7th generation Console
  - Android – Linux based phone OS -2007
  - iPhone – Apple's smartphone- 2007
  - Windows 8 – Popular Microsoft's OS - 2012
  - HMZ-T1- Sony HD and 3D viewer 2012
  - Windows 10 - 2015
  - Etc… ???

History of HCI

Main characteristics of HCI – Present

- User centered
- OS development
- New technologies aimed at
  - Natural feel
  - motion capture
  - Touch screen
  - Multi-touch

HCI Future?



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