

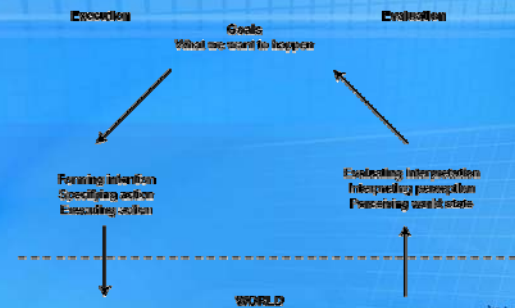
Human Computer Interaction

Usability

1

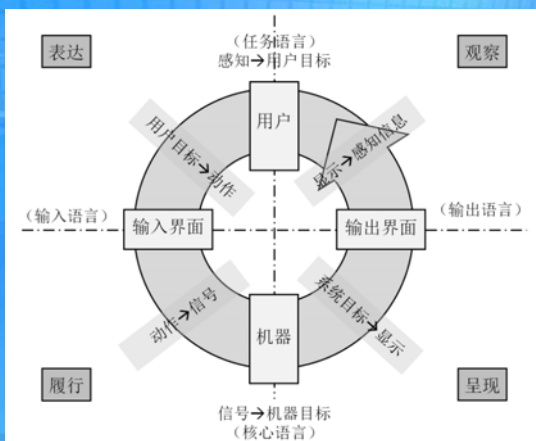
Execution/Evaluation Action Cycle (EEAC): Recap

- Seven Stages of Action



1-2

Interaction framework: Recap



General Idea of a User Interface: Recap

- A computer system involves communication from a *Designer* to a *User*
- Hopefully, the model intended by the designer is perceived by the user

Goal in HCI: Universal Usability: Recap

- Address the needs of ALL users
- The computer is incidental to the design
- Achieve usability by considering humans and human needs as the driving force behind a design.

- (1) Occurring or likely to occur as an unpredictable or minor accompaniment
- (2) Of a minor, casual, or subordinate nature

What is usability?: Recap

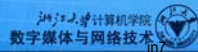
- what do you think usability is

IBM

- “IBM's focus on **ease of use** has led to technology breakthroughs and advances in design research”
- “For developers and manufacturers, the advantages of creating usable products far outweigh the costs”
- “Every dollar invested in ease of use returns \$10 to \$100”

<http://www.ibm.com/ibm/easy/>

<https://www-01.ibm.com/software/uccd/>

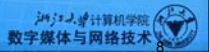


Microsoft

- “The Usability Group is an integral part of the product design process at Microsoft”
 - Over 120 usability engineers
 - Over 25 usability labs

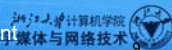
<http://www.microsoft.com/usability/>

<http://www.microsoft.com/userresearch/default.mspx>



Why is usability important?

- Focus on user and organisational needs
 - reduce development times
 - less training and support and documentation is required
- Improve productivity
 - simpler interface, fewer user errors
- Improve the competitive edge
 - increasing expectations for ease of use
 - increasing usability of competitive products
 - high profile of usability in advertising
- Improve the quality of life
 - less stress, users are more satisfied
 - lower staff turnover
- Health and safety legislation
 - European Directive on Display Screen Equipment



Case study: Hewlett Packard

User-centred design methods were applied to redesign software used for identifying network problems:

	Old	New
time to finish task	9.4 min	4.1 min
problems identified	16%	78%
average length of call	30 min	10 min
size of manual	25 pages	4 pages
people needing the manual	53%	3%
user satisfaction rating	3.5	6.8

In addition to the benefits to customers, HP recovered their costs in 18 months



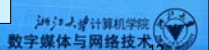
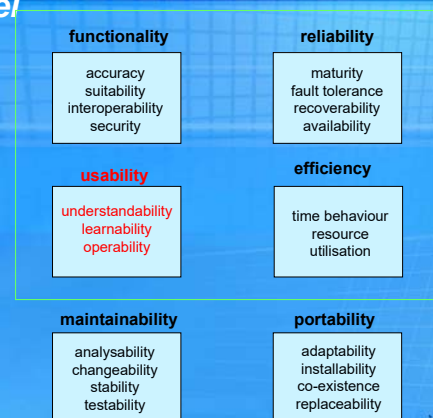
Usability is good business

- Quick facts:
 - \$1 spent up front saves \$10 during development and \$100 after release
 - Reduce development time by 33-50%
 - Reduce need for training by at least 25%
 - Reduce call centre volume by up to 66%
 - Increase customer satisfaction
 - Increased revenues and customer retention
 - Huge reduction in errors
 - Increased productivity
 - Avoid costly design flaws before you start coding.

http://www.hiser.com.au/articles/uccd_usability_is_good_business.html#section/274



ISO/IEC 9126 Software Product Quality Model



ISO/IEC 9126-1 Definitions

- Functionality
 - The capability of the software product to provide functions which meet stated and implied needs when the software is used under specified conditions.
- Reliability
 - The capability of the software product to maintain a specified level of performance when used under specified conditions
- **Usability**
 - **The capability of the software product to be understood, learned, used and attractive to the user, when used under specified conditions.**
- Efficiency
 - The capability of the software product to provide appropriate performance, relative to the amount of resources used, under stated conditions.
- Maintainability
 - The capability of the software product to be modified. Modifications may include corrections, improvements or adaptation of the software to changes in environment, and in requirements and functional specifications.

ISO 9241-11 Guidance on Usability

Usability: The extent to which a product can be used by specified users to achieve specified goals with **effectiveness**, **efficiency** and **satisfaction** in a specified context of use.

Effectiveness : The accuracy and completeness with which users achieve specified goals.

Efficiency: The resources expended in relation to the accuracy and completeness with which users achieve goals.

Satisfaction : The comfort and acceptability of use.

Usability

- Usability is a **quality measure** for a system.
- It is a dynamic, unpredictable process which requires understanding of
 - who the **users** are, and
 - their knowledge, **goals** and **tasks**.
- It is *measured* by different types of evaluation.

Attempts to define Usability

- Usability is one *measure* of software quality:
 - The degree to which user tasks are supported for achieving user goals
- Usability may be *assessed* in terms of:
 - Effectiveness (speed of use/frequency of errors)
 - Learnability (time to reach a specified performance level)
 - Flexibility (range of tasks supported)
 - Attitude of users (reflecting acceptability, effort, etc.)
- Principles of Usability may inform design (see later)

Some Criteria for measuring Usability (1)

1. A. Time to complete a task
- B. Percent of task completed
- C. Percent task complete per unit time
- D. Ratio of success to failure
- E. Time spent in errors
- F. Percent or number of errors
- G. Percent or number of competitors better than it.
- H. Number of commands used

Some Criteria for measuring Usability (2)

- I. Frequency of help and documentation used
- J. Time spent using help or documentation
- K. Percent favorable/unfavorable user comments
- L. Number of repetition of failed commands
- M. Number of times interface misleads user
- N. Number good/bad features recalled by users
- O. Number of available commands not involved
- P. Number of "regressive behaviors"
- Q. Number of runs of success and of failure

Some Criteria for measuring Usability (3)

- R. Number users preferring your system
- S. Number of times users need to work around a problem
- T. Number of times a user is disrupted from a work task
- U. Number of times user loses control of the system
- V. Number of times user expresses frustration or satisfaction
- W. etc.

But there are limitations of a list like this....

Caution

1. Is each attribute measurable in practice?
2. Are users specified clearly enough to find them?
3. Are there resources to measure all attributes?
4. Do all project members agree on each attribute?
5. How well do the attributes capture "usability" for the system?

Measurement Operation

- A. Ask users to perform a specific task
- B. Monitor users during interaction
 1. Stand & watch
 2. Audio tape
 3. Video tape
- C. Questionnaire
- D. Interview users
- E. Survey users
- F. Ask users for critical incidents revealing success or failure

- List at least 5 criteria for measuring usability.

Different sorts of Users and Tasks

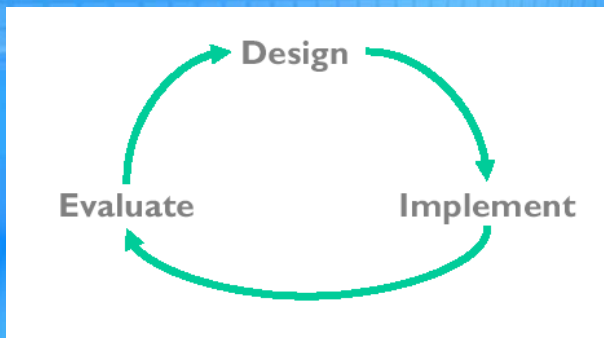
- A major problem is the variety of users:
 - In knowledge and training (e.g. experienced, or novice)
 - In goals (e.g. medical image workstation for radiologists making diagnoses, or surgeons planning surgery)
 - In physical size and capability (e.g. pilot, or child)

Usability Is Only One Attribute of a System

- Software designers have a lot to worry about:

– Functionality	– Usability
– Performance	– Size
– Cost	– Reliability
– Security	– Standards
- Many design decisions involve **tradeoffs** among different attributes

Usability Engineering Is a Process



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Usability Engineering—Design Methods (1)

- Usability Engineering is a kind of software engineering
- Pitfalls to avoid:
 - Too easy to jump into a detailed design that is:
 - founded on incorrect requirements
 - not easily used
 - never tested until it is too late

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Usability Engineering—Design Methods (2)

- Problems:
 - Users request changes, overlook tasks
 - Users do not always understand their own requirements
 - Technology issues

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How to Design

- Need to take into account:
 - Who the users are (children, parents, people on a bus, elderly)
 - What activities are being carried out (on-line shopping, remote communication)
 - Where the interaction is taking place (home, work, public place)
 - **Anything else?**
- Need to optimize the interactions users have with a product
 - **Match the users activities and needs**

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Analyzing Interaction Paradigms

- Numerous and diverse configurations for computing systems have been created since Bush's Memex
- These configurations involve
 - Construction and arrangement of hardware
 - Development of software applications to control the hardware
 - Topologies of networked systems
 - Components of the human interface that define how people access the system's functionality.
- Together these components comprise an interaction paradigm.

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Analyzing Interaction Paradigms

- Interaction paradigm: A model or pattern of human-computer interaction that encompasses all aspects of interaction, including physical, virtual, perceptual, and cognitive
- An interaction paradigm defines the “who, what, where, when, why, and how” (5W+H) of computer system use.

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Analyzing Interaction Paradigms

- Principal interaction paradigms
 - Large-scale computing
 - Personal computing
 - Networked computing
 - Mobile computing
- Why use the 5W+H heuristic to define existing interaction paradigms?
 - Help to give us an understanding of
 - how the interactive systems work
 - how to apply that knowledge to the development of future systems

Understanding Users' Needs

- Take into account what users are good and bad at
- Consider what might help people in the way they currently do things
- Listen to what people want and get them involved -- SYZ
- Employ tried and tested user-based methods

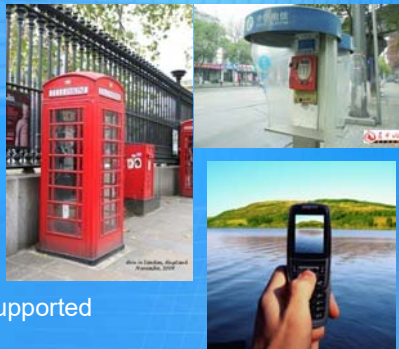
Activity Break

How does making a call differ when using a

- Cell phone
- Public phone box?

Write down for both:

1. the kinds of user
2. type of activity being supported
3. context of use.



Paper Presentation Prep. Project Prep.