Human Computer Interaction

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

User Interface and User-friendly

- User Interface (UI) refers to the user interface artifact.

- Goal of usability -> user friendly???
  - Which is not correct and misleading.

Factors affecting success of UI

- Type of user
- Type of task
- Hardware constraints
- Social and cultural limitations

Usability and UI Importance

- Changes in h/w environments
- Diversification of users
- Diversification of applications

Changes in h/w environments

- More sophisticated UI can now be developed such as GUI as hardware has become more powerful
- Diversified hardware for the user to interact with – means different user interfaces need to be developed.
- Hardware is more accessible to diverse users – large number of ways to interact with the technology

Diversification of users

Discretionary users are more than professional computer scientists today

Novice users have sophisticated expectations today about the computer systems: easy to use and robust system expectations

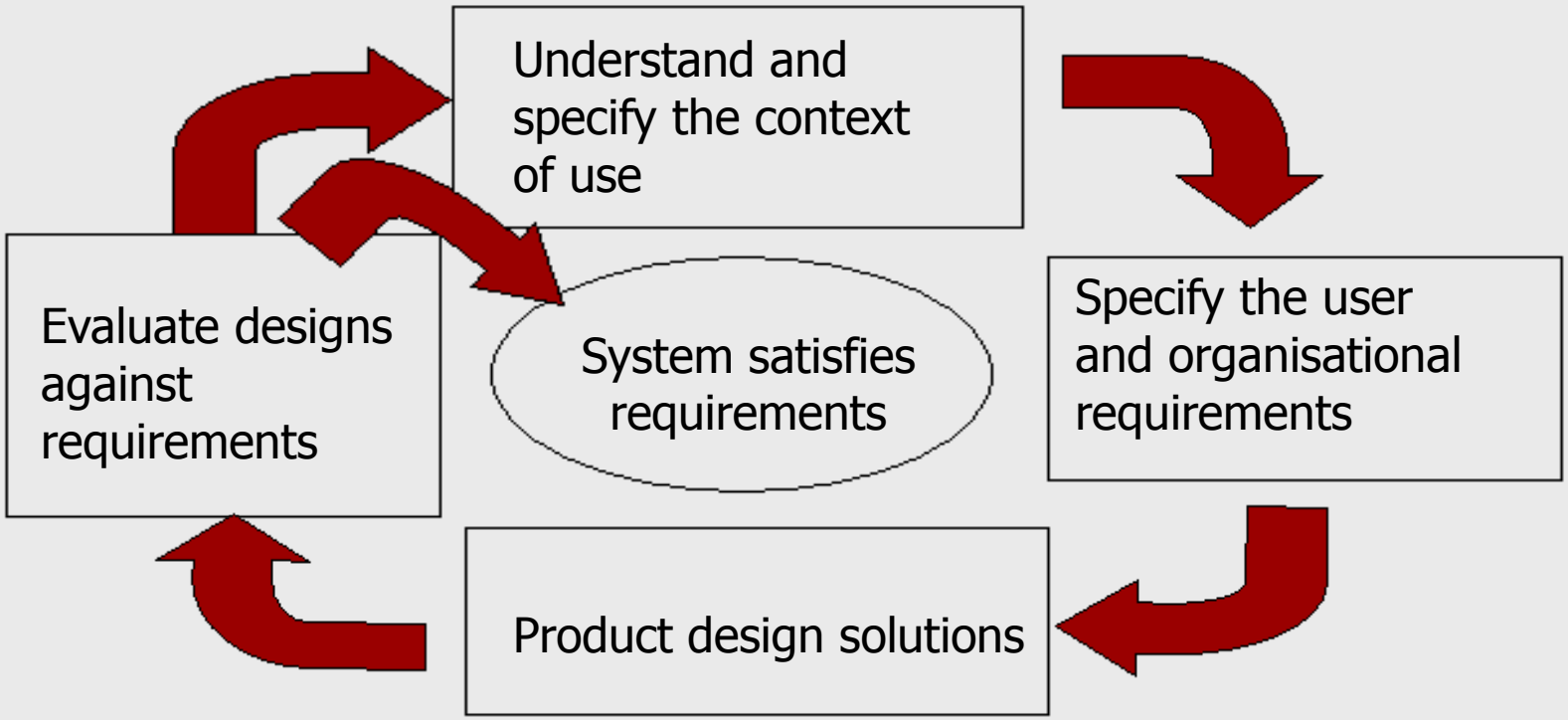
Changes in Software Environments

- Direct manipulation of graphical objects
- Mouse
- Windows
- Touch screens
- Gestures

Novel Applications

- Video Games, Drawing programs
- Text Editing, Spreadsheets, Image manipulation

User-Centred Design



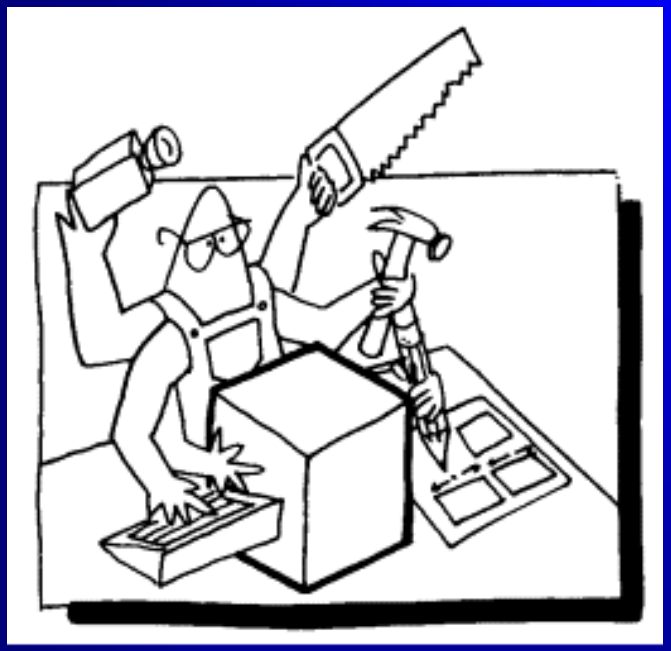
Why Evaluate?

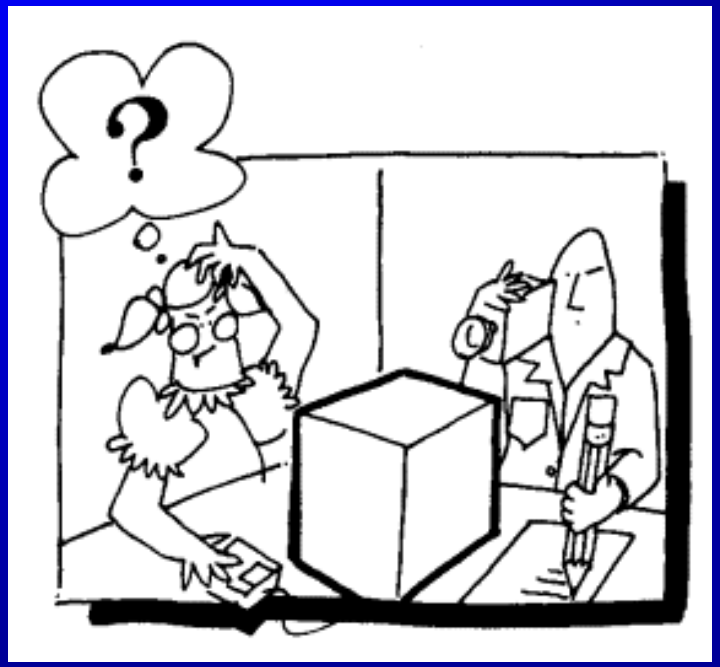
You cannot get it right the first time

- Iteratively improve the design
- Combine prediction of problems and observing problems

Evaluation Phases - 1

Evaluation phases (2)





Good Design Characteristics

Discoverability : Is it possible to even figure out what actions are possible and where and how to perform them?

Understanding: What does it all mean? How is the product supposed to be used? What do all the different controls and settings mean?

Chrysler (Jeep) Grand Cherokee Gear Shifter

Chrysler (Jeep) Grand Cherokee

Probable cause of death of *Star Trek* actor Anton Yelchin

... [T]he Monostable shifter is not intuitive and provides poor tactile and visual feedback to the driver, increasing the potential for unintended gear selection.

ODI's analysis... identified *306 incidents* of vehicle rollaway following intended shifts to Park in the 2014-2015 Grand Cherokee. These resulted in 117 alleged crashes. Twenty-eight of the crashes reportedly caused injuries, including 3 with a fractured pelvis and 4 others requiring some degree of hospitalization (a ruptured bladder, fractured kneecap, broken ribs, damaged to right leg). Other injuries include reports of a broken nose, facial lacerations requiring stitches, sprained knees, severe bruising, and trauma to legs.

Source: National Highway Traffic Safety Administration, US Department of Transportation

Industrial design

Industrial design: The professional service of creating and developing concepts and specifications that optimize the function, value, and appearance of products and systems for the mutual benefit of both user and manufacturer (from the *Industrial Design Society of America's* website).

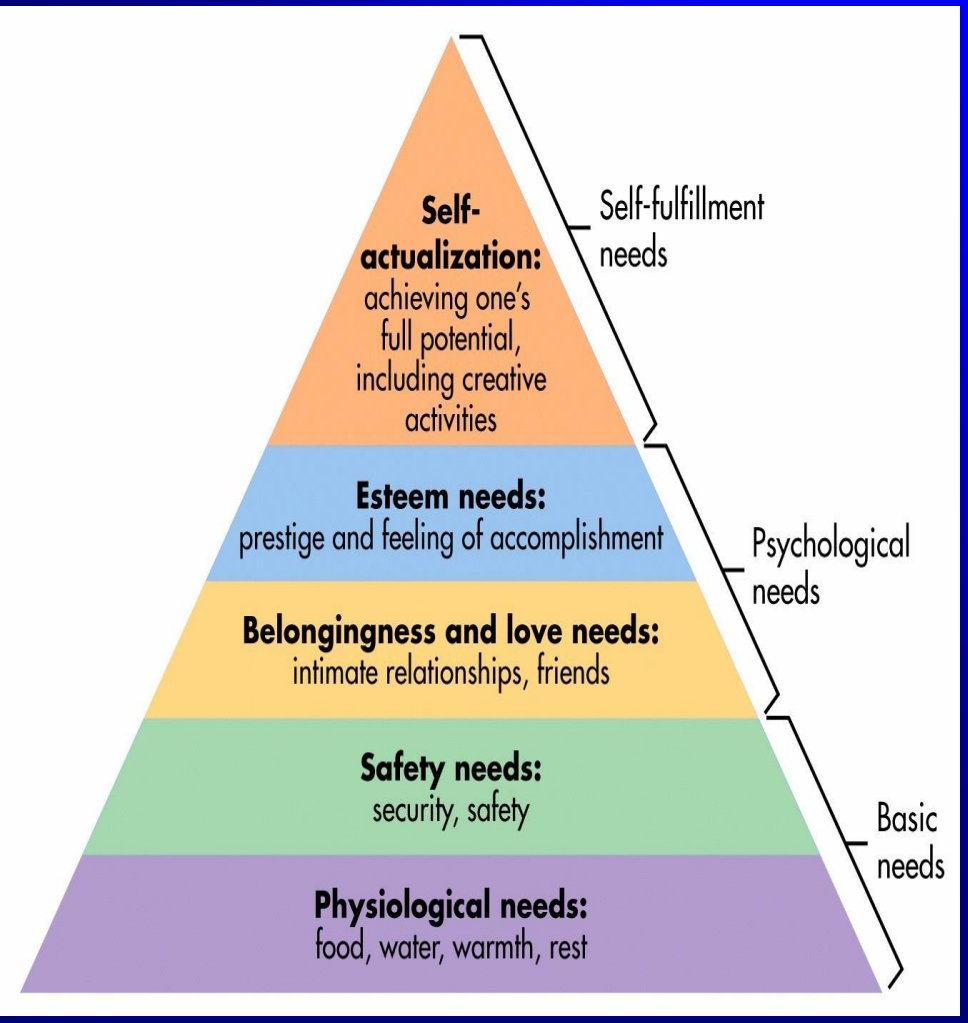
Interaction design

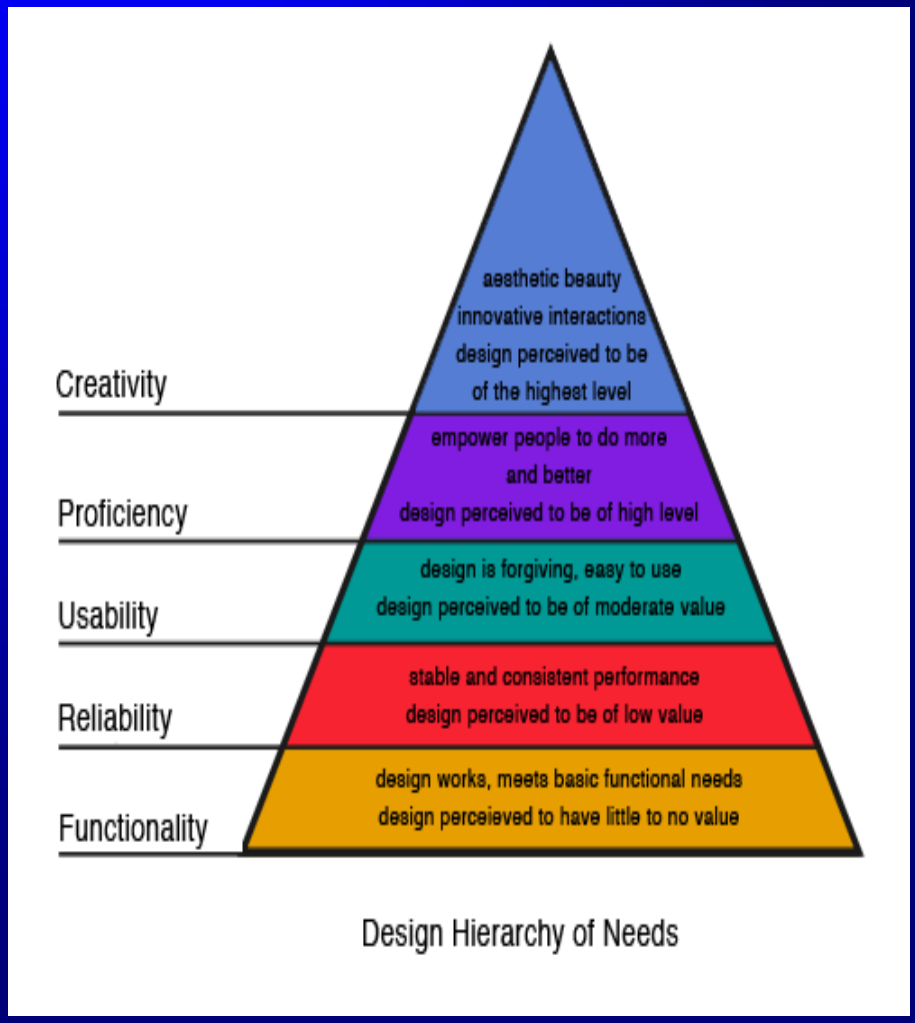
The focus is upon how people interact with technology. The goal is to enhance people's understanding of what can be done, what is happening, and what has just occurred. Interaction design draws upon principles of psychology, design, art, and emotion to ensure a positive, enjoyable experience.

Experience design

The practice of designing products, processes, services, events, and environments with a focus placed on the quality and enjoyment of the total experience.

Maslow's hierarchy of needs





Hierarchy of consumer needs

Pleasure ⬆

Usability ⬆

Functionality ⬆

- When people get used to something, they want more (Jordan, 2000)

Evaluation

In order to evaluate you have to:

- Define what is ideal or intended behaviour, to know when user deviates
  - e.g., exploration or straight towards goal
- Define what are usability goals of product, to know whether goal is met
  - e.g., easy to learn, efficient in the long run, or have fun

Two examples of preparation for evaluation

User group: Consumer vs DJ

Ideal behaviour: simple steps to reach goals vs complex goals

Usability goals:

easy to learn, easy to use vs efficient in the long run

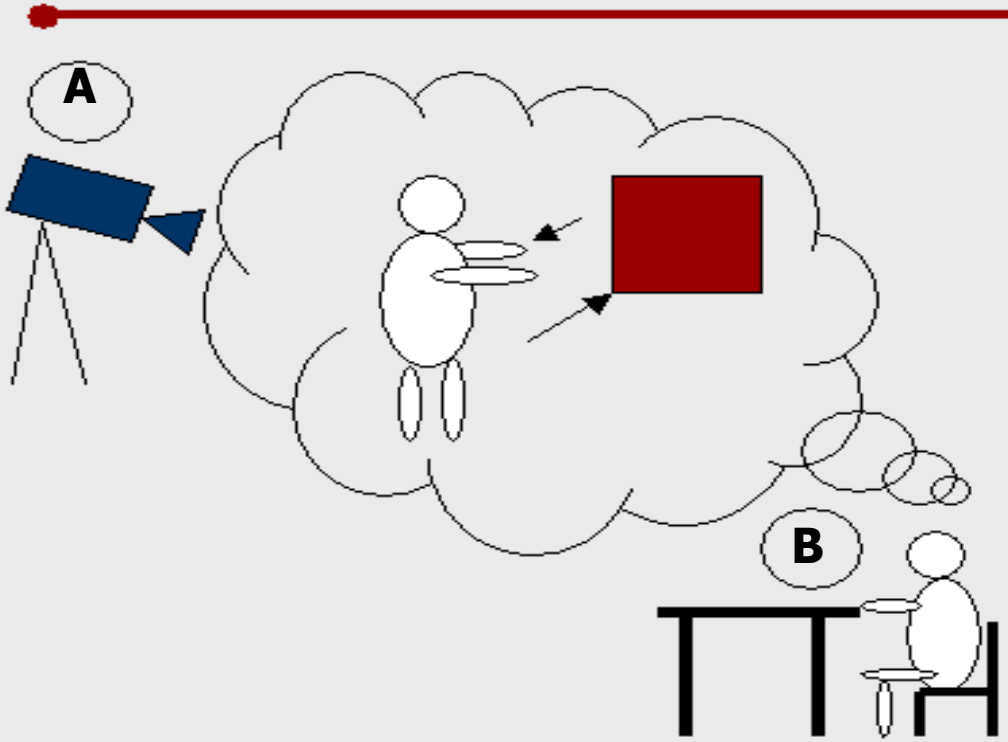
Why evaluate?

- Design is based on assumptions and predictions
- Assumptions on different levels
  - Need for a certain kind of product
  - About functionality
  - About understanding of words and icons
- Amount of evidence for assumptions may vary
- These assumptions need to be verified

Why evaluate? …

- Design is based on providing a good mapping between goals of users and products
- Such a mapping may be wrong because of:
  - Incorrect assumptions
  - Unpredicted behaviour
- How to predict what is deviating/unpredictable behaviour?
- Predict errors i.e., base on theory and models
- Record errors that occur e.g., using observations.

Incomplete models of user system interaction



A) an error is observed, it is unclear what caused it

B) an error is predicted, it is unclear whether it will really occur

Example: cause and effect of problem

Predicted Problem:

The user will not know that an Icon has to be double clicked

Observed Problem:

The user doesn’t realise that a particular icon should be selected at all.

Failure of Interaction

Interaction can fail at different stages of model

The gulf of execution:

- the difference between the intentions of the person and the perceived, allowable actions

The gulf of evaluation:

- the amount of effort that is exerted to interpret the physical state of the system and determine how well the expectation and intentions have been met.

Choosing Evaluation methods

- Based on financial tradeoffs: cost-benefit analysis
- Based on quality of the method (validity, reliability etc.)
- Based on characteristics of methods (suitable for design phase, type of design problem etc.)