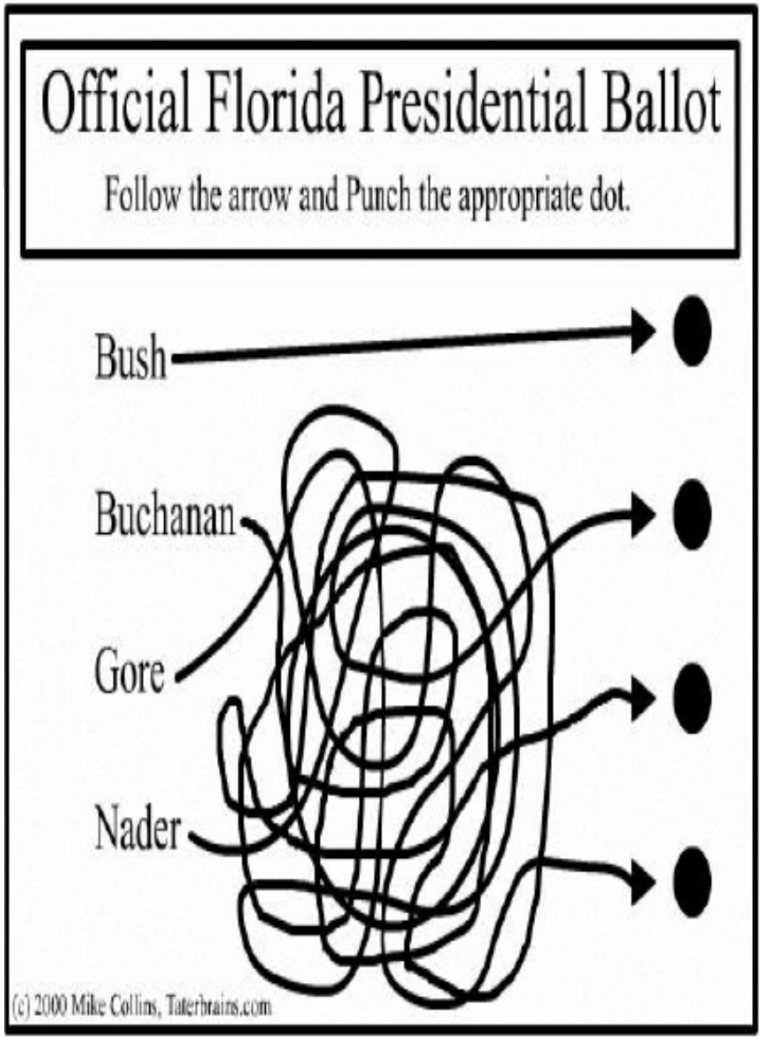

Official Florida Presidential Ballot
Follow the arrow and Punch the appropriate dot.
Bush
Buchanan
Gore
Nader
(c) 2000 Mike Collins, Taterbrains.com

Usability


COLA

What is it?

Usability is the measure of the quality of a user's experience when interacting with a product or system – whether a website, a software application, mobile technology, or any user operated device.

Why should you care about it?

In a website:

Lost in a website?

- Research by User interface Inc., shows that people can not find the information they are looking for on websites about 60% of the time.
- Left a site without finding the information you wanted?
- 62% of the web shoppers gave up looking for an item
- 50% of web sales are lost because visitors can not easily find content.
- Waited too long for page to download?
- Gone to a site you can not view or read?
- Visited a site with outdated information?
- 40% of repeat visitors do not return due to a negative experience
- 85% of visitors abandon a new site due to poor design.
- Can lead to wasted time, reduced productivity, increased frustration, and loos of repeat visits and money.

Some other usability issues

- Product does not match the job or task
- Poor organization/layout
- Unexpected occurrence of events
- Product not self evident
- Requires recall rather than recognition
- Inconsistent screens, message, terminology
- Design is inefficient
- Cluttered or unattractive design
- No feedback or poor feedback about status or errors
- No exit or undo
- Help or documentation is not helpful

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training
- Customer support
- Accessibility
- Internalization
- Localization

Context of usability

Market research

What do people want, what will they pay for?

Context of usability

- Market research
- HCI design

What looks cool? What design will work?

Context of usability

Market research

HCI design

Testing

Does the code work as specified?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs

What help the user need?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training

What does the user need to know in advance?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training
- Customer support

How can we best serve/keep our users?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training
- Customer support
- Accessibility

How can we make our functions and information available to all?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training
- Customer support
- Accessibility
- Internalization

How can we maximize its foreign use?

Context of usability

- Market research
- HCI design
- Testing
- Tech pubs
- Training
- Customer support
- Accessibility
- Internalization
- Localization

How can we make it used in a particular culture?

Usability goals

Usability is the extent to which a product/system can be used by specified users to achieve specified goals with:

- Effectiveness (Correctness, errors)
- Efficiency (time, effort)
- And satisfaction (experience)

And also …

Safe to use
Have good utility
Easy to learn
Easy to remember how to use
Motivating
Aesthetically pleasing
Rewarding
Supportive of creativity
Emotionally fulfilling
Satisfying
Fun
Enjoyable
Entertaining
Helpful

Usability by Norman

- Users have difficulties to translate their intentions into specific acts to an interface

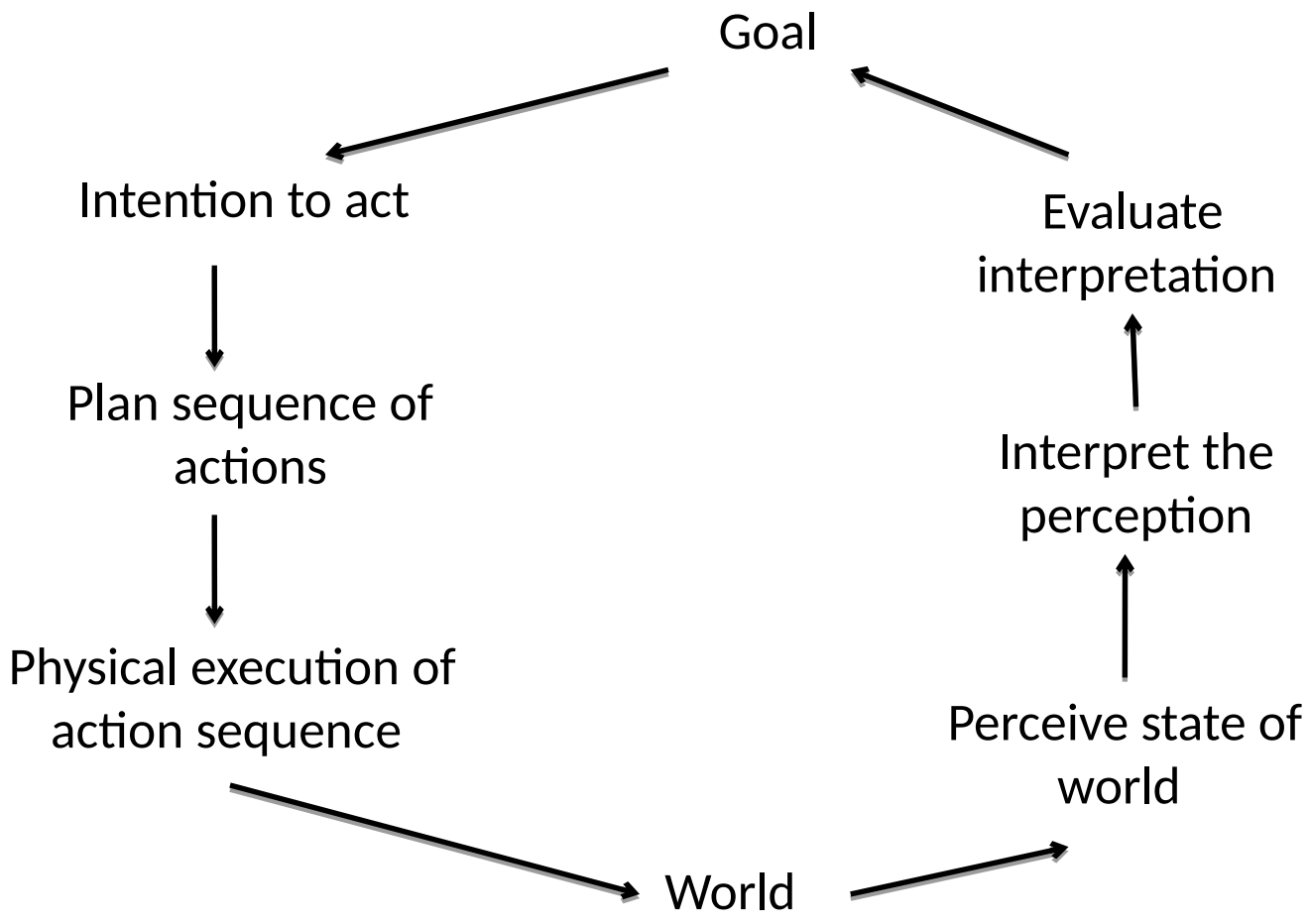
- Human beings have intentions , goals they want to reach in the world. Systems offer only simple acts.

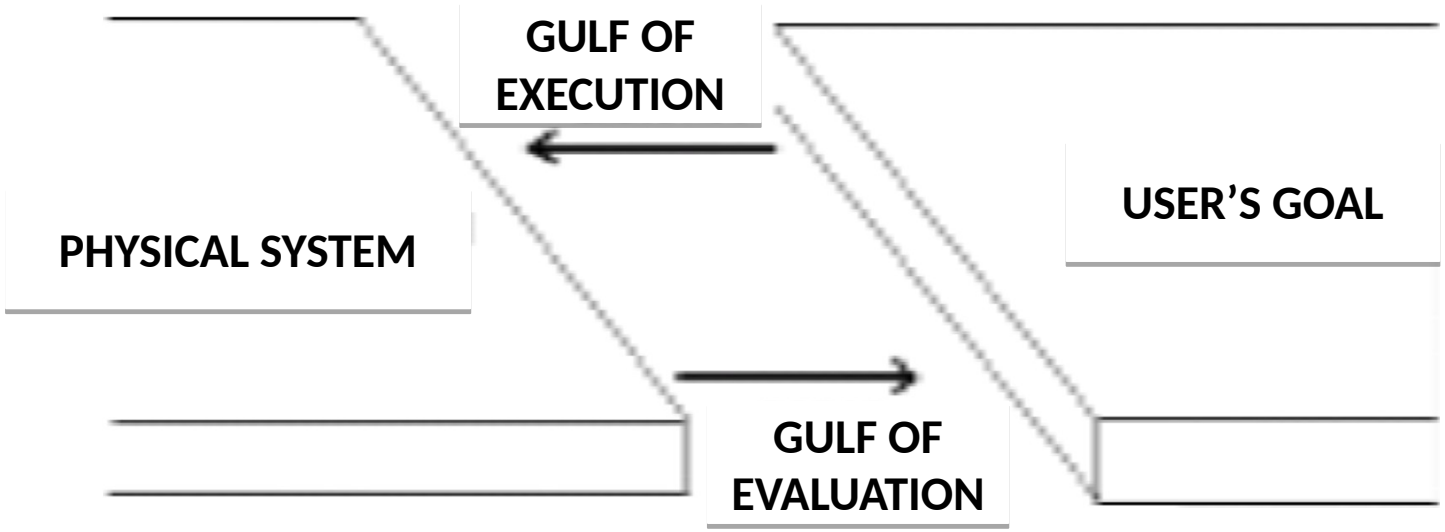
- This results in twice a gulf or gap

Gulf of execution: The user has to translate goals into acts

Gulf of evaluation: The user should be able to determine whether his acts have brought the user closer to the goal.

Seven stages of action




GULF OF EXECUTION
USER'S GOAL
PHYSICAL SYSTEM
GULF OF EVALUATION

Problems with

Gulf of execution

Intentions do not fit to the possible actions of the system
Plan does not work

Problem with execution

Gulf of evaluation

Not noticing of reaction or change

Not understanding what happened

Not being able to invent new goal on basis of result

Design principles

- Starting points for good usability, close the gap of the gulf of execution and gulf of evaluation
- Generalized abstractions that enable us to attack different aspects of design
- Deducted from theoretical knowledge, experience and common sense.

So…what is design?

- “to conceive or fashion in the mind; invent”

http://dictionary.reference.com/search?q=design

- Design is the art that humanizes our environment through visual communication and the construction of all the products that help us in our daily lives.

According to Jodi Forlizzi

Human power of conceiving, planning and making all the products that serve human beings in the accomplishment of their individual and collective purposes.

Design vs. Art

What's the difference?

- Often hard to distinguish
- Traditional distinction: both visually satisfying but design should have practical purpose.
- Design often entails working out form or structure of something by creating plans
- Art is concerned with creation of something beautiful or significant in some way.

- Design involves working out form or structure by creating plans and solving problems

- Art is concerned with creating something evocative

- Traditional distinction: Design centrally serves practical purposes, art typically doesn’t.

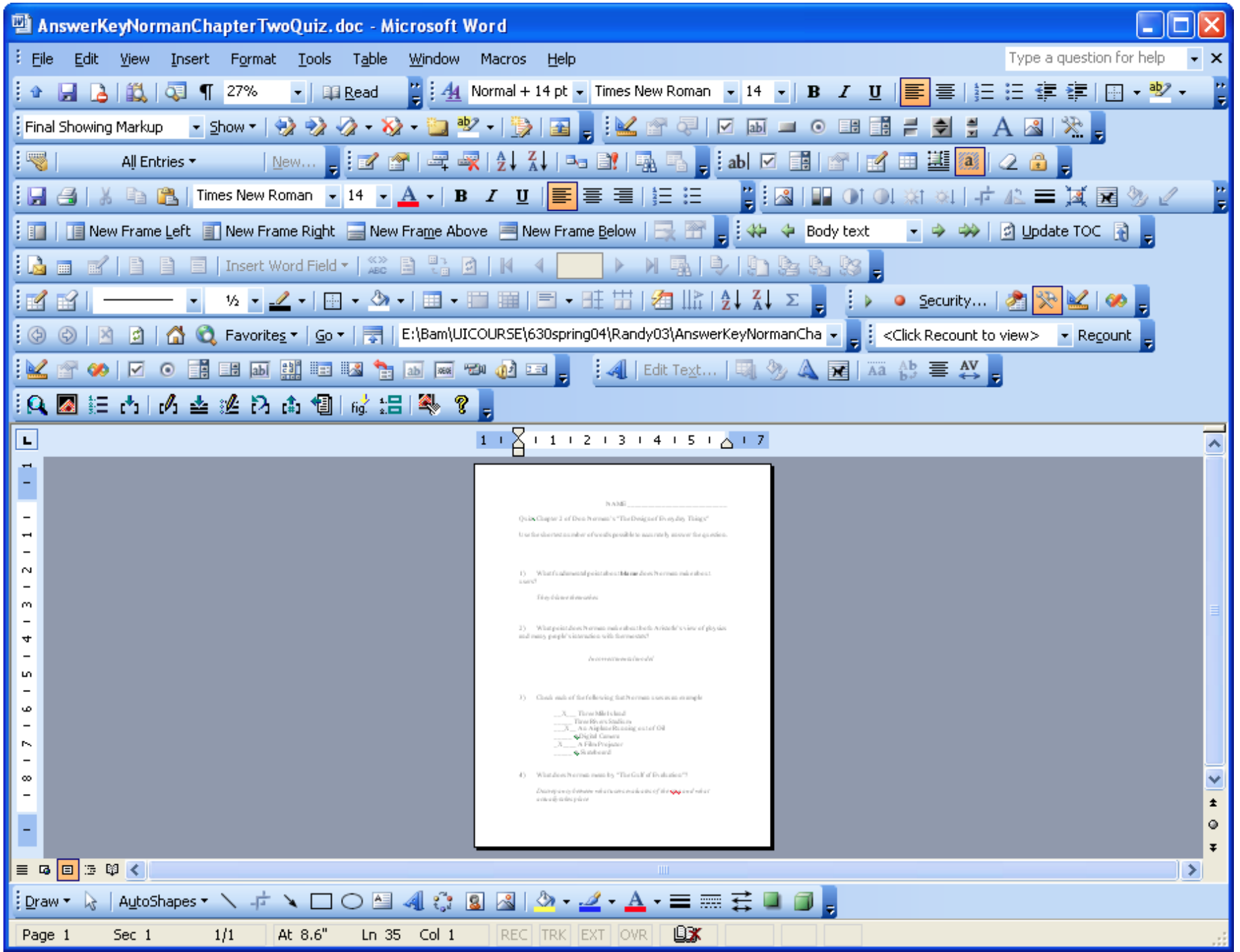
Norman's definition

- "Design is the successive application of constraints until only a unique product is left"

design is ….

- Creative
- Informed
- Respectful
- Responsible

Complexities…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Times New Roman
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Bad design vs. Good design

- What is the difference?

- Properties of good design?

Design principles

Visibility:

Control elements are visible

Feedback:

Reaction of the system to action

Constraints:

Restriction (and possibly simplification) of the possible interaction

Mapping:

Fit between control and effect

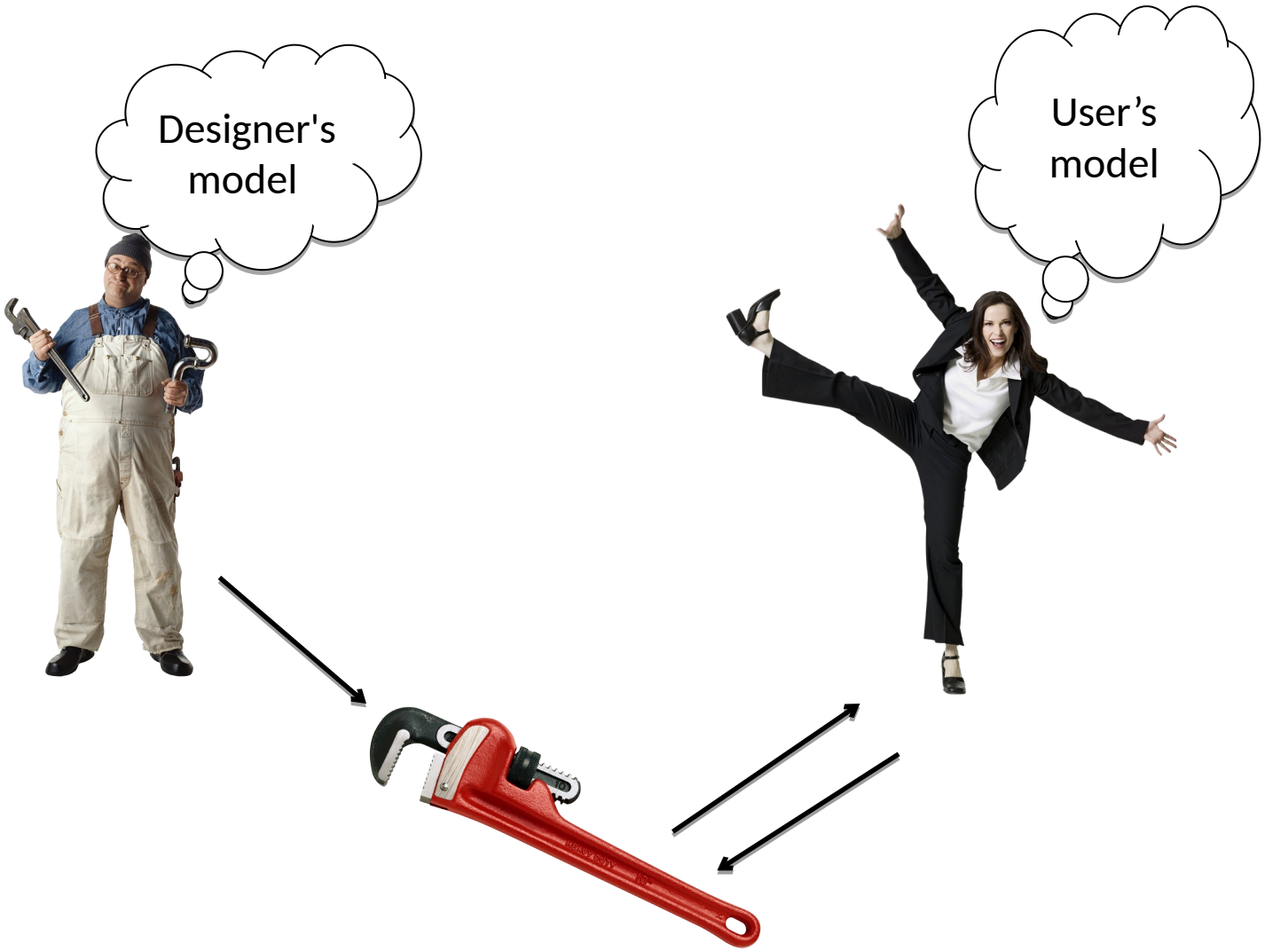
Consistency:

Consistency between actions and layout

Affordance:

Control element invites to action

Encourage accurate user model



Conceptual model

- Users form mental models
- Users always form mental model of how things work
- Human nature to create explanations (functional and predictive)
- You had better have plan for the model you want (a conceptual model) or you will have something more random
- Use everything you have at your disposal to instill and reinforce your conceptual model

Getting the right mental model induced in the user

- Simpler models are easier

- Revealing the stat of the system and its operations are critical

  Visibility of system status/state

  Natural mapping for actions

  Feedback (visibility of change)

People create explanations

- People will invent explanations for pretty much all observed behavior

- Even if unrelated or unintentional

- Coincidences

It crashed the last time I did this

- Observed differences ..so consistency is important

Visibility

- Critical to provide accurate and appropriate visibility and feedback

- Both for avoiding errors and mental model formation

Important properties of people

- Memory
- Recognition (working from world) vs. recall (working from memory)
- A critical difference between novice and expert

- Remembering things clearly critical to learning and performance

Memory

Short term (working) memory

- Capacity of 7 (+-2)/ chunks
- Decays quickly

Long term memory

- Essentially infinite capacity
- Last indefinitely (but recall may become hard)
- Names, phone numbers, birthdays, email accounts, IM names, zip codes, address, etc.
- Special codes, passwords, etc.

Easier to remember things

- That have Symbolic meaning

- Patterns or rules
- Explanations

  Control C= copy

  Control V= Paste???
- Consistency

Affordances

- Perceived and actual properties of the thing, primarily those fundamental properties that determine how the thing could possibly be used.
- When affordances are taken advantage of, the user knows what to do just by looking.

- Example: Knurling
- Small ridges typically found on knobs

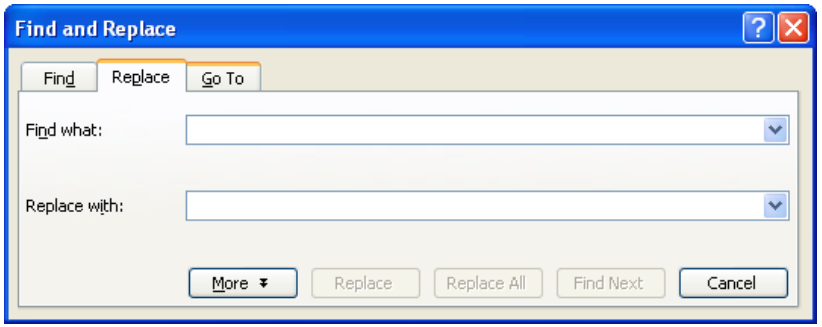
- Increases friction affords grip

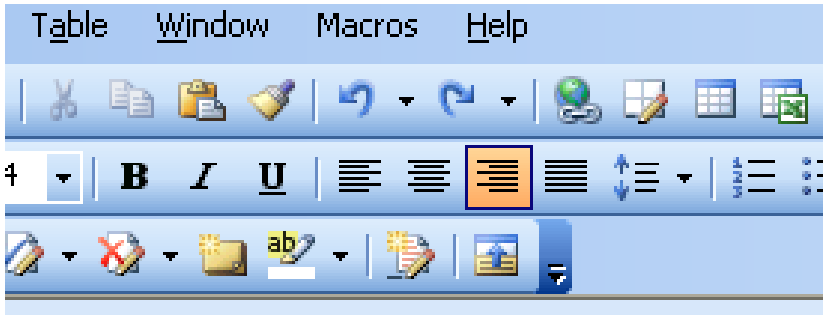
Analogs in the virtual world

- Interactors (AKA interactive components, widgets, controls provide analogs of affordances and constraints on screen

Widget design

- Try to make it obvious what to do with the widget
- 3-D buttons ‘afford’ pushing





Constraints

Semantic constraints

- Meaning of operation implies certain limits

Cultural constraints

- (consistency)
- Turn a knob clockwise or CCW

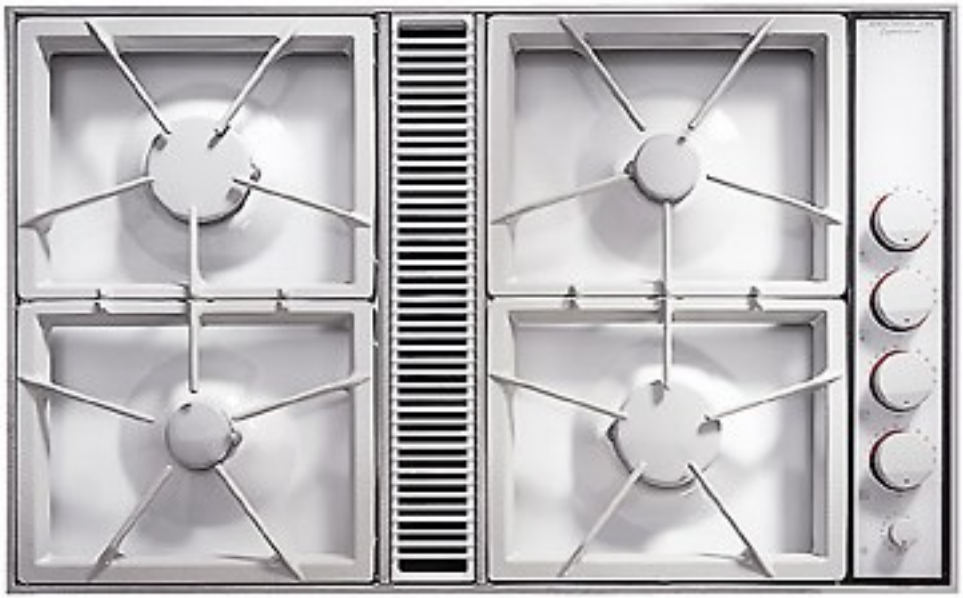
Logical constraints

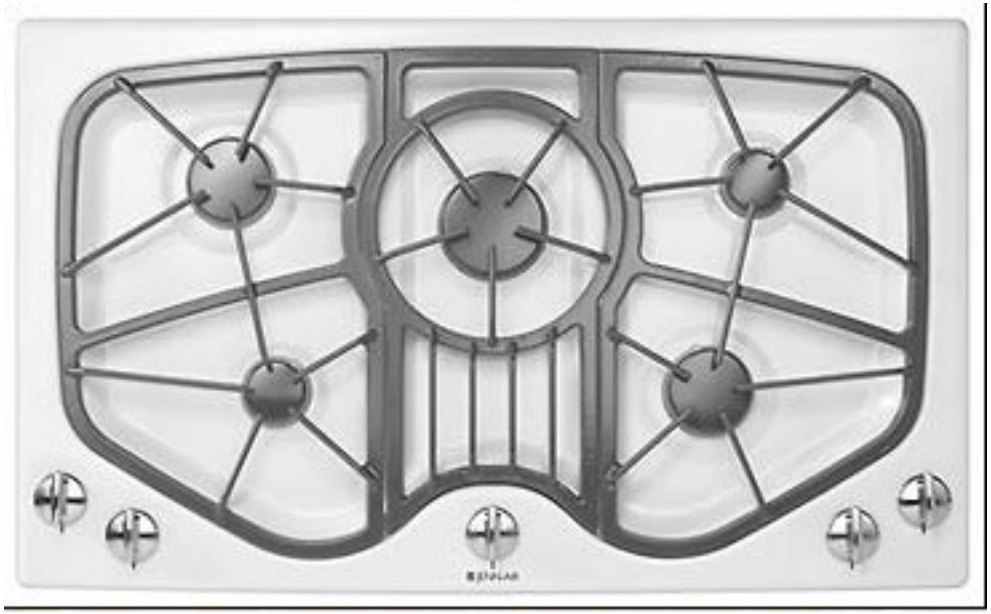
- Switches to lights, knobs to burners
- Natural mappings

Natural mappings

- Mappings

(relationship between parts) evident from observation





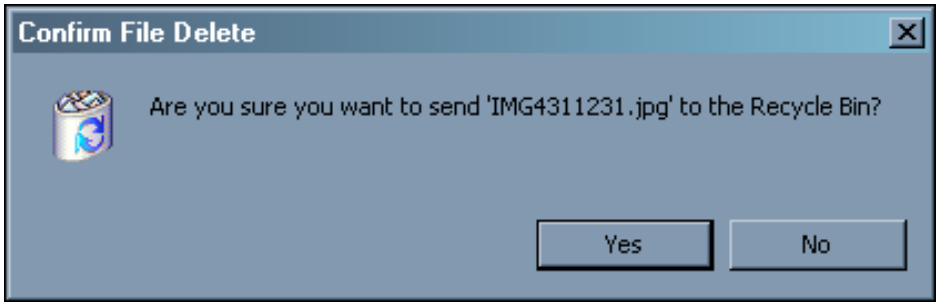
Natural mappings

- Taking advantage of physical analogies and cultural standards
- Leads to immediate understanding
- Which way to turn a knob, which light switch to use, automobile window adjustments.

Taking errors into account

- Errors are an inevitable part of being human
- All people make errors
- All the time
- Not exceptional but expected
- Part of what should be considered normal, expected, valid input
- Have to handle it (and handle it well)

Errors



Slips

- Typos
- Hitting the wrong menu item
- Drag and drop to wrong place

- Very common had better not have big negative consequences

Mode errors

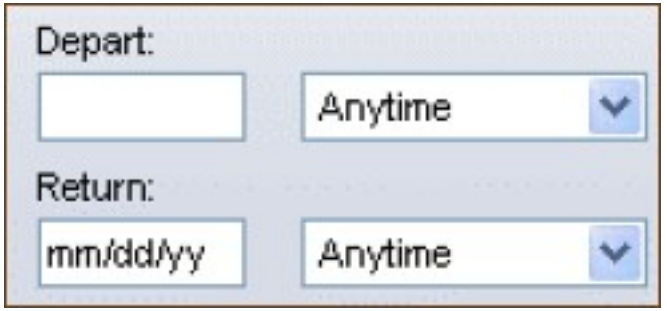
- Digital watch

Confirmations do not help (much)

- Confirms operation more than parameters

Designing to minimize errors

- Reduce opportunities for errors
- Selection rather than fill in



Forcing functions

- Physical constraints
- Lock outs

Designing to minimize errors

Reduce severity of errors

- Cancel and undo

Make errors more obvious

- Good feedback
- Uncaught or misunderstood errors tend to quickly lead to malformed mental models

Aesthetics and desirability

- Beyond usability

Useful, usable and desirable

Useful: you can get the job done

Usable: without too much pain

Desirable: You WANT it

- Good visual design (look)
- Good industrial/ product design (form; feel)

Design in the real world

- Lots of practical considerations and tradeoffs that may not seem to relate directly to the product

- But still need to address them to be successful

Tradeoffs and tensions

Time to market vs good design

Cost

Curse of individuality

- Need to be different/ distinctive

Legal considerations

Market force

- Creeping featurism
- Cant sell the next version if it does not have more than the last

Other real world considerations

Client is not the user

Occasionally usability is not desired

- Uncomfortable chairs to discourage lingering

- That all tells us about what kind of things to look for in good and bad design
- Some notion of how to evaluate designs or prospective designs
- But it does not really tell you much about how to design
- Need processes, tools, methods

Consistency

- Interfaces should be consistent in actions for comparable tasks
- For instance: ctrl key plus the first letter of the command of an action, e.g. ctrl+C, ctrl+S, etc.
- Important advantage: consistent interfaces are easy to learn and to use
- Internal consistency: within the program
- External consistency: between different programs
- Form the basis of evaluation
- Form a framework for heuristic evaluation

Usability metrics

Effectiveness: (ability to successfully accomplish tasks i.e. enable user to find required info)

Percentage of tasks/goals achieved (success rate)

Number of errors

Efficiency: (ability to accomplish tasks with speed and ease)

Time to complete a task

Frequency of requests for help

Number of time facilitator provides assistance

Number of times user gives up

Usability metrics

Satisfaction and likeability:(attitude of users, includes perceptions, feelings and opinions of the product i.e. motivate user to come again)

Positive and negative ratings on a satisfaction scale

Percent of favorable comments to unfavorable comments

Number of good vs bad features recalled after test

Number of users who would use the system again

Number of times users express dissatisfaction of frustration

How to do it? Usability engineering

- An evidence methodology that involves end users in the design, testing, and evaluation process to produce information systems that are measurably easier to use, learn and remember.
- The process is user-centered (not developer centered)
- Based on data, not opinions
- Testable and verifiable
- Performance driven
- Saves money and time

User centered process

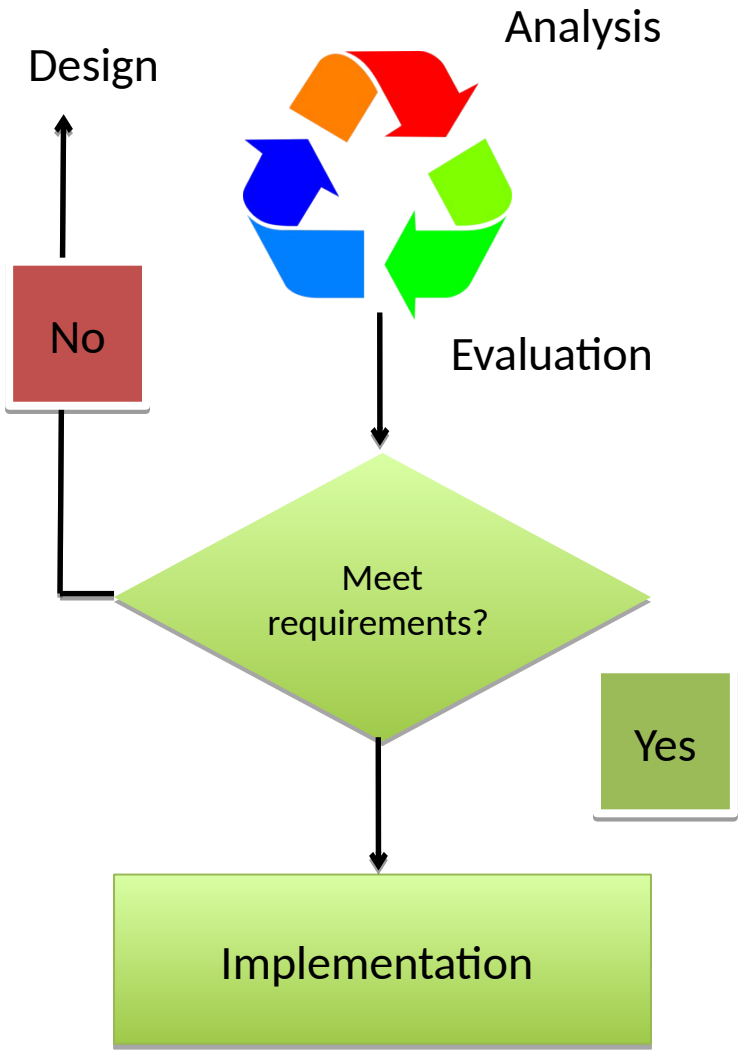
Analysis:

- Data collection
  - Users' need
  - Wants and goals
  - Behaviors
- Requirement specifications
- User and task analysis

Design and prototyping

Evaluation as early and frequent as possible

Continuous iteration



Usability methods

Methods that can be used during the analysis phase and evaluation phase of the design process

- Inspection methods
- Heuristic evaluation
- Cognitive walkthrough
- Test methods
- Thinking aloud
- Field observation
- Questionnaires
- User testing

Heuristic evaluation

Heuristic specialists inspect if the interface follows usability principles (e.g. the usability heuristic by Nielsen 1994)

Each evaluator inspects the interface alone
After all the evaluations have been completed the evaluators communicate and aggregate their finding
Usually 3 to 5 expert evaluators are necessary
(cost factor)

Most common informal method

Advantages

Application of recognized and accepted principles
Intuitive
Usability early in the development process and can be used throughout the development process
Effective identification of major and minor problems
Rapidity

Disadvantages

Dissociation from end users
Does not identify or allow for unknown users' needs
Does not necessarily result in evaluating the complete design
The validity of Nielsen's guidelines has been questioned

Ten heuristic principles

by Jacob Nielsen

Heuristic evaluation is the most popular of the usability inspection methods. Heuristic evaluation is done as a systematic inspection of a user interface design for usability. The goal of heuristic evaluation is to find the usability problems in the design so that they can be attended to as part of an iterative design process. Heuristic evaluation involves having a small set of evaluators examine the interface and judge it compliance with recognized usability principles (the heuristics)

-Jacob Nielsen

Ten heuristic principles

1. Visibility of system status
2. Match between system and the real world
3. User control and freedom
4. Consistency and standards
5. Error prevention
6. Recognition rather than recall
7. Flexibility and efficiency of use
8. Aesthetic and minimalist design
9. Help users recognize, diagnose, and recover from errors
10. Help and documentation

1. Visibility of system status

The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. Match between system and the real world (Metaphor)

The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system oriented terms. Follow real world conventions, making information appear in a natural and logical order.

3. User control and freedom (Navigation)

Users often choose system functions by mistake and will need a clearly marked ‘emergency exit’ to leave the unwanted state without having to go through an extended dialogue. Supports undo and redo and a clear way to navigate.

4. Consistency and standard

User should not have to wonder whether different words, solutions or actions mean the same thing. Follow platform conventions.

5. Error prevention

Even better than good error message is a careful design, which prevents a problem from occurring in the first place.

6. Recognition rather than recall

Minimize the users' memory load. Make objects, actions and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. Flexibility and efficiency of use

Accelerators – unseen by the novice user- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. Aesthetic and minimalist design

Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility. Visual layout should respect the principles of contrast, repetition, alignment and proximity.

9. Help users recognize, diagnose and recover from errors

Error messages should be expressed in plain language (no codes). Precisely indicate the problem and constructively suggest a solution.

10. Help and documentation

Even though it is better if the system can be used without documentation. It may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user’s task. List concrete steps to be carried out and not be too large.

Cognitive walkthrough

Simulates step by step user behavior for a given task

The emphasis is put on learnability, by analyzing the mental processes required of the users

Several versions exists
e.g. Pluralistic walkthroughs wherein end users, software developers and usability engineers go through the system, discussing every single dialogue element.

Advantages
A fully functioning prototype
Helps designers to take on a potential user's perspective
Effective identification of problems arising from interaction with the system
Can help to define users' goals and assumptions

Disadvantages
Possible tediousness
Emphasis on low-level details
Non-involvement of the end-user

Thinking aloud

Involves having an end user continuously thinking out loud while using the system

Enables to understand how they view the system

A variant is constructive interaction and involves having two test users use a system together (co-discovery learning)

Advantages

Reveals why users do something
Preference and performance information can be collected simultaneously
Can help to anticipate and trace the source of problems to avoid later misconceptions and confusion in the early stage of design

Disadvantages

Failure to lend itself well to most types of performance measurement
Participants can feel inhibited
Time consuming
Can result in less than natural interactions

Field observation

Simplest method
Involves one or more users in their workplace
Notes must be taken as unobtrusively as possible to avoid interfering with their work
Sometimes video is used to make the observation process less obtrusive
Another means of electronic observation is data logging involves statistics about the detailed use of a system
Timing
Frequency with which each user has used each feature in the program
Frequency with which various events of interest (such as error messages) have occurred

Advantages
Simple
Examines real-life settings in real workplace

Disadvantages
Applicable rather in the final testing, at least with using prototypes
Relatively many users needed (20+)
Required expertise is high

Questionnaire

Good for issues in the subjective satisfaction of the users and their possible anxieties, which are hard to measure objectively.

Indirect method; it does not study the actual user interface

Collects the opinions of the users about the user interface

A still simpler form of questionnaire is the interview. The form of interview can be adjusted to respond to the user and encourage elaboration

Advantages

Subjective user preferences, satisfaction and possible anxieties' can be easily identified.
Can be used to compile statistics

Disadvantages

Indirect methods result in low validity (discrepancies between subjective and objective user reactions must be taken into account)
Needs sufficient response to be significant (30 users is a the lower limit for a study)
Identifies only a low number of problems relative to the other methods

User testing

Users – one at a time two working together – perform tasks with the system in the lab

Quantitative measures (e.g. errors)

Control of variables

Advantages

Control of variables allows to extract conclusions

Cause-effect

Disadvantages

Can result in less than natural interactions

Comparison usability evaluation methods

	Heuristic evaluation	Cognitive walkthrough	Think aloud	Field observation	Questionnaire	User testing
Applicability in phase	all	all	Final testing	Final testing	All	Final testing
Required time	low	medium	high	Medium	Low	Medium
Needed users	none	None	3+	20+	30+	20+
Required evaluators	3+	3+	1	1+	1	1
Required equipment	low	low	high	Medium	Low	high
Required expertise	Medium	high	Medium	high	low	Medium
Intrusiveness	no	no	yes	yes	no	Yes

Combining methods

- Useful to combine complementary methods
- E.g (Karat et al., 1992): using heuristic evaluation and user detected complementary problems
- Heuristic evaluation first and questionnaire later
- Interview (exploration) and questionnaire later (on big scale)