Module 7: EVALUATION TECHNIQUES

Goals and types of Evaluation, Evaluation through Expert analysis, Evaluation through user Participation, Choosing an evaluation method.

Understand evaluation techniques for evaluating interactive system.

.1 Explain the main goal of evaluation

.2 Evaluate the design by expert analysis

- **a. Cognitive walkthrough**
- **b. Heuristic evaluation**
- **c. Review-based evaluation**
- **d. Model-based evaluation**

3 Evaluate the design by user participation

- **a. Laboratory studies**
- **b. Field studies**
- **c. Observational techniques**
- **d. Query techniques**
- **e. Empirical design : Experimental evaluation**

4. Choosing an evaluation method

WHAT IS EVALUATION?.....

we have discussed a design process to support the design of usable interactive systems. However, even if such a process is used, we still need to assess our designs and test our systems to ensure that they actually behave as we expect and meet user requirements. This is the role of evaluation.

Ideally, evaluation should occur throughout the design life cycle, with the results of the evaluation feeding back into modifications to the design. Clearly, it is not usually possible to perform extensive experimental testing continuously throughout the design, but analytic and informal techniques can and should be used.

3.1.1 Main goal of evaluation

Evaluation has three main goals:

- To assess the extent and accessibility of the system's functionality.
- To assess user's experience of the interaction.
- To identify any specific problems with the system.

3.1.2 Evaluate the design

- The first evaluation of a system should ideally be performed before any implementation work has started.
- If the design itself can be evaluated, expensive mistakes can be avoided, since the design can be altered prior to any major resource commitments.
- Consider four approaches to expert analysis:

a) Cognitive walkthrough.

b) Heuristic evaluation.

c) Review-based evaluation.

d) Model-based evaluation.

a) Cognitive walkthrough

- The origin of this method is the code walkthrough familiar in software engineering.
- Require a detailed review of a sequence of actions.
- Sequence of actions refers to the steps that an interface will require a user to perform in order to accomplish some known task.
- Evaluators then ‘step through’ that action sequence to check it for potential usability problems.
- Main focus of the cognitive walkthrough is to establish how easy a system is to learn.

a) Cognitive walkthrough

- Focus is on learning through exploration.
- Experience shows that many users prefer to learn how to use a system by exploring its functionality hands on, and not after sufficient training or examination of a user's manual.
- Evaluators go through each step in the task and provide a 'story' about why that step is good or not good for a new user.

How to do it

Prior to doing a walkthrough, you need four things:

1. You need a description of a prototype of the interface. It doesn't have to be complete, but it should be fairly detailed. Things like exactly what words are in a menu can make a big difference.
2. You need a task description (for a representative task).
3. You need a complete, written list of the actions needed to complete the task.
4. You need an idea of who the users will be and what kind of experience they'll bring to the job.

Four question for each step in the action sequence

- Is the effect of the action the same as the users goal at that point?
- Will user see that the action is available?
- Once user have found the correct action will they know it is the one they need?
- After the action is taken, will users understand the feedback they get?

b) Heuristic Evaluation

- Proposed by Nielsen and Molich.
- Usability criteria (heuristics) are identified
- Design examined by experts to see if these are violated
- Example heuristics
  - system behaviour is predictable
  - system behaviour is consistent
  - feedback is provided
- Heuristic evaluation `debugs' design.

b) Heuristic Evaluation

Neilson's Heuristics (original)

1: Visibility of system status
2: Match between system & real world
3: User control & freedom
4: Consistency & 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

- Keep users informed about what is going on.
  - example: pay attention to response time

    0.1 sec : no special indicators needed, why?

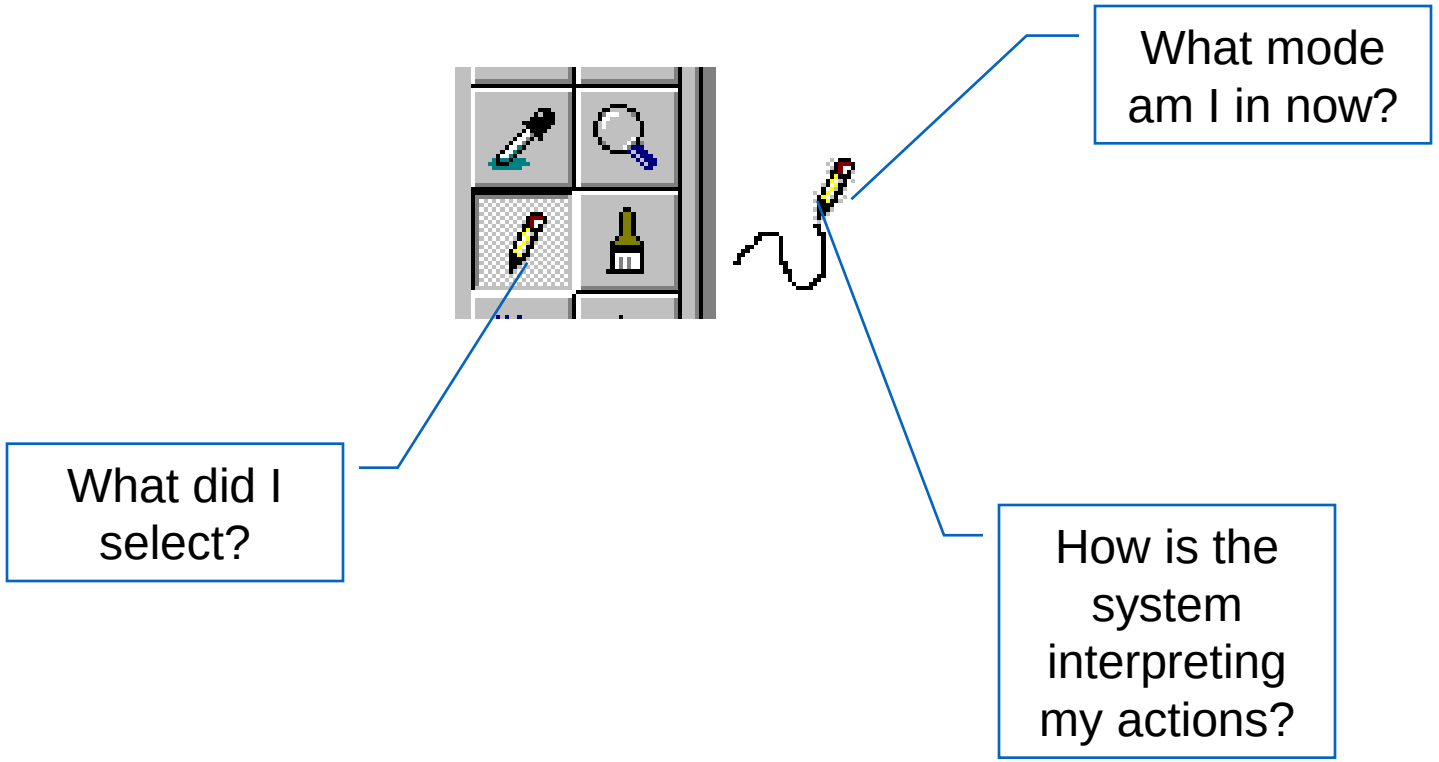
    1.0 sec : user tends to lose track of data

    10 sec : max. duration if user to stay focused on action

    for longer delays, use percent-done progress bars

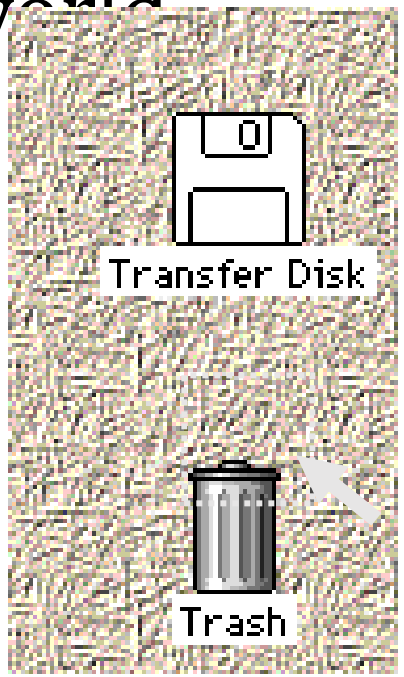
1: Visibility of system status

- Appropriate visible feedback



2: Match between system & real world

- speak the users' language
- follow real world conventions
- (bad) example: Mac desktop
  - Dragging disk to trash
    - should delete it, not ***eject*** it!

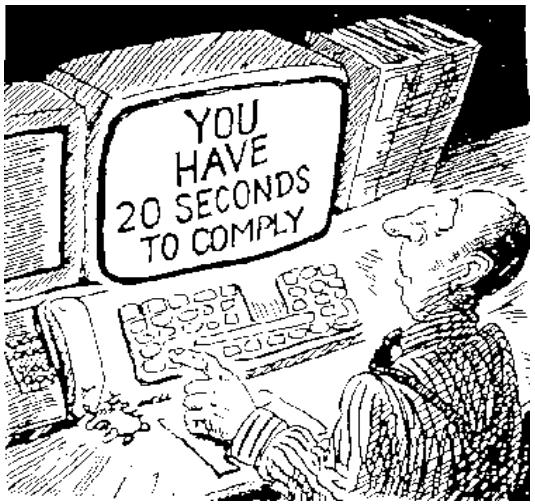


3: User control & freedom

- "exits" for mistaken choices, undo, redo
- don't force down fixed paths

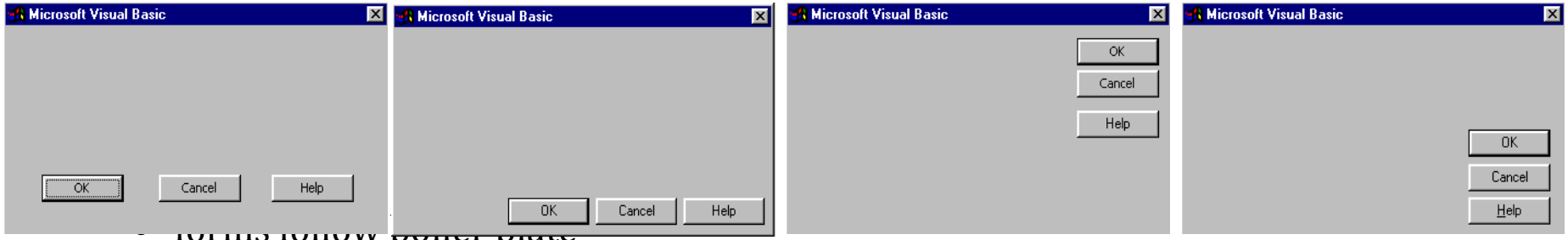
Strategies:

- Cancel button (for dialogs waiting for user input)
- Universal Undo (can get back to previous state)
- Interrupt (especially for lengthy operations)
- Quit (for leaving the program at any time)
- Defaults (for restoring a property sheet)



4: Consistency & standards

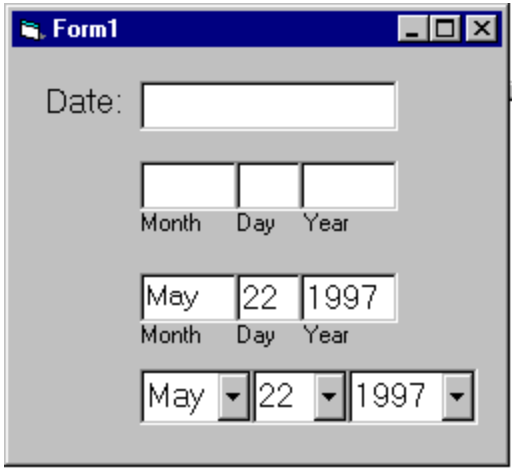
- Consistency of effects
  - same words, commands, actions will always have the same effect in equivalent situations
    - predictability
- Consistency of language and graphics
  - same info/controls in same location on all screens/dialog boxes

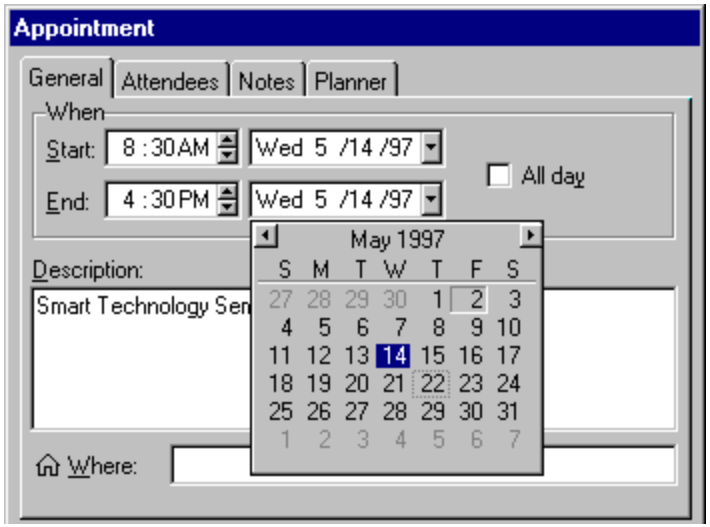


  - forms follow boiler plate
  - same visual appearance across the system (e.g. widgets)
    - e.g. different scroll bars in a single window system!
- Consistency of input
  - consistent syntax across complete system

5: Error prevention

- Try to make errors impossible
- Modern widgets: only “legal commands” selected, or “legal data” entered

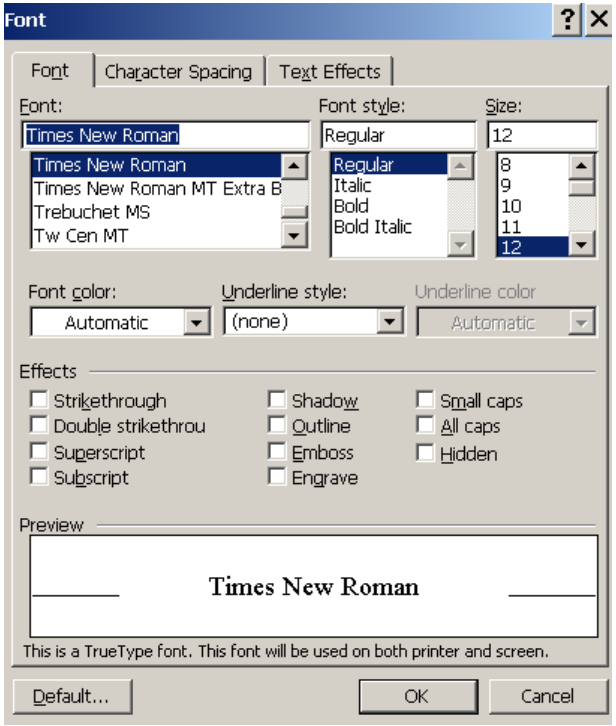


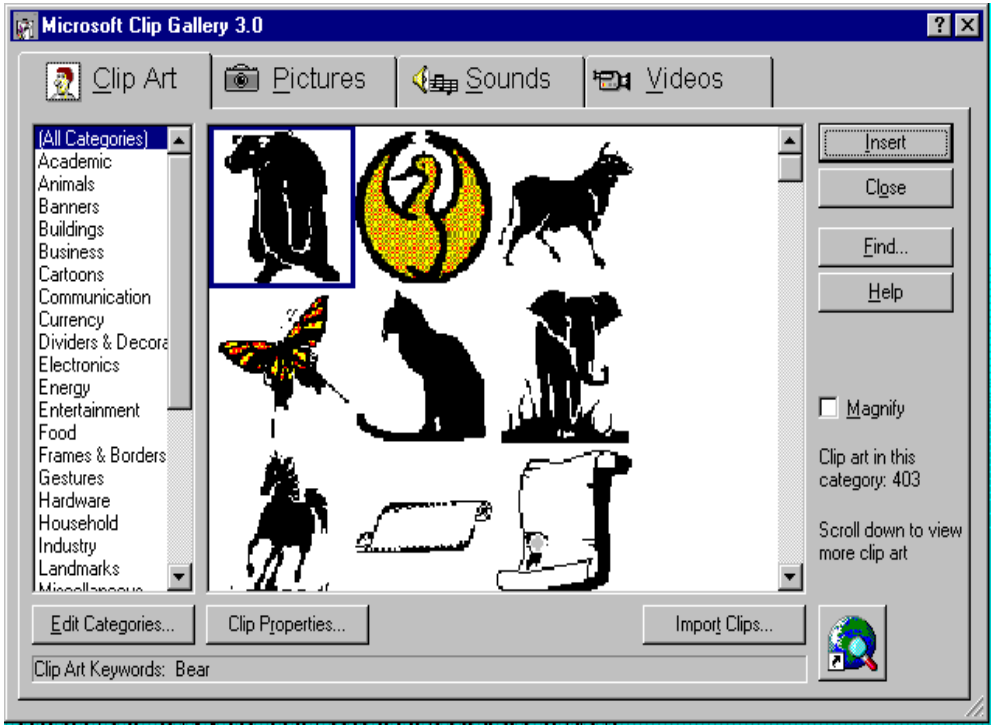


- Provide reasonableness checks on input data
  - on entering order for office supplies
    - 5000 pencils is an unusually large order. Do you really want to order that many?

6: Recognition rather than recall

- Computers good at remembering things, people aren't!
- Promote recognition over recall
  - menus, icons, choice dialog boxes vs command lines, field formats
  - relies on visibility of objects to the user (but less is more!)





7: Flexibility and efficiency of use

- Experienced users should be able to perform frequently used operations quickly
- Strategies:
  - keyboard and mouse accelerators
    - abbreviations
    - command completion
    - menu shortcuts
    - function keys
    - double clicking vs menu selection
  - type-ahead (entering input before the system is ready for it)
  - navigation jumps
    - e.g., going to window/location directly, and avoiding intermediate nodes
  - history systems
    - WWW: ~60% of pages are revisits

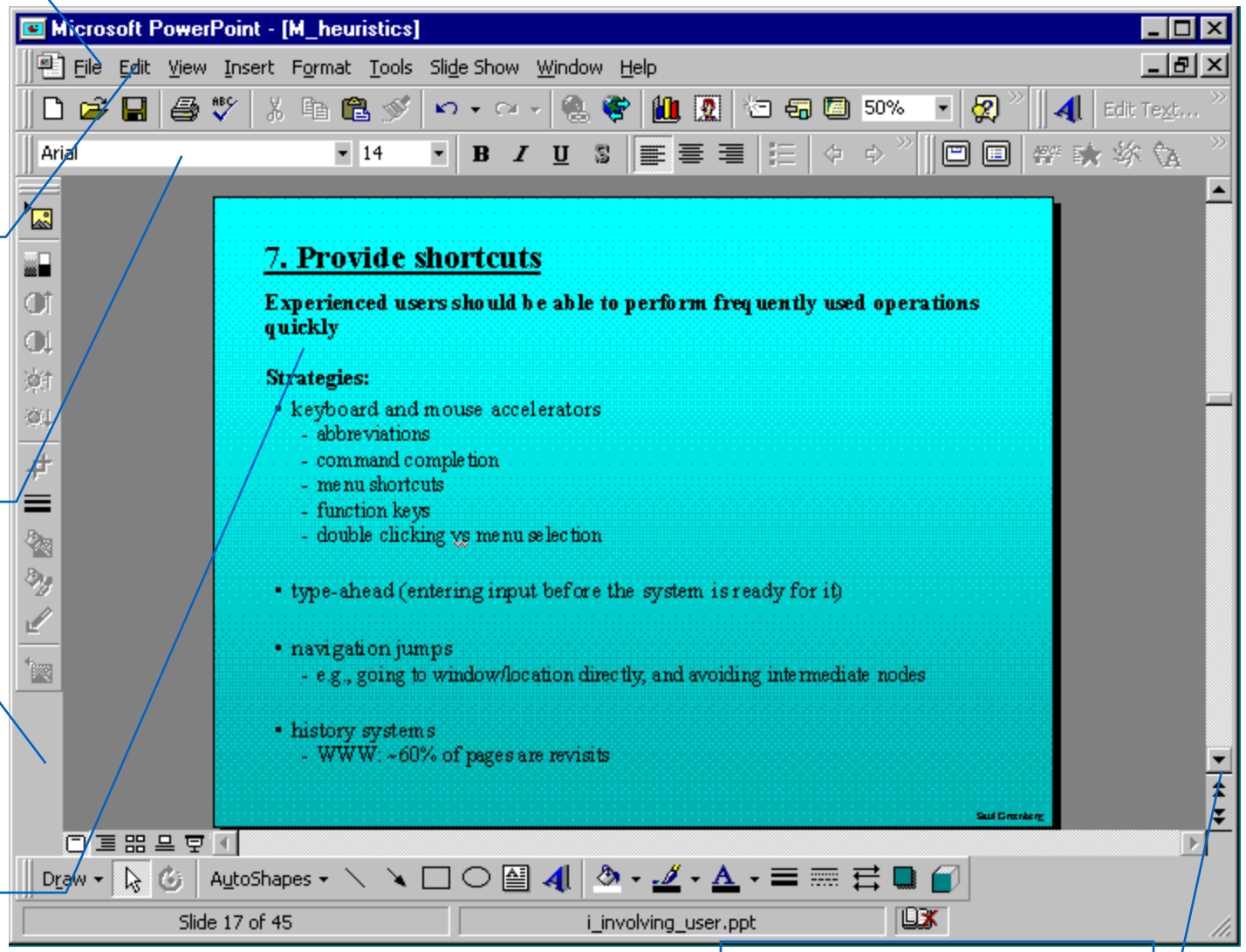
Keyboard accelerators for menus

Customizable toolbars and palettes for frequent actions

Split menu, with recently used fonts on top

Double-click raises toolbar dialog box

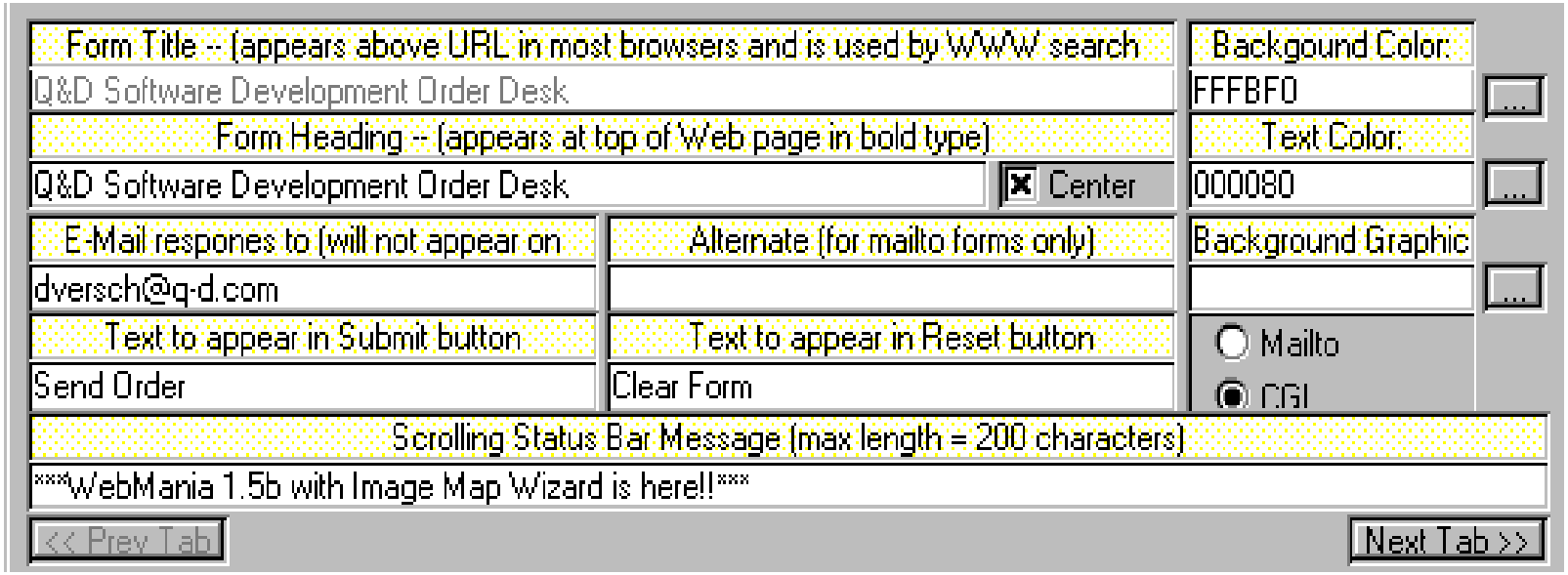
Double-click raises object-specific menu



Scrolling controls for page-sized increments

8: Aesthetic and minimalist design

- No irrelevant information in dialogues
- Bad example:



9: Help users recognize, diagnose, and recover from errors

- error messages in plain language
- precisely indicate the problem
- constructively suggest a solution

10: Help and documentation

- Help is not a replacement for bad design!

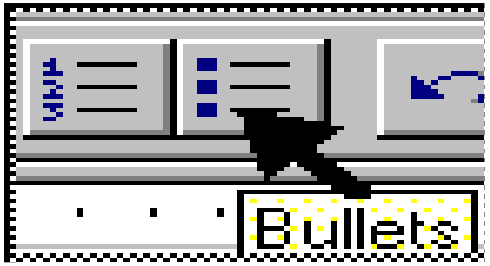
- Simple systems:
  - walk up and use; minimal instructions
- Most other systems:
  - feature rich
  - some users will want to become “experts” rather than “casual” users
  - intermediate users need reminding, plus a learning path
- Many users do not read manuals
  - prefer to spend their time pursuing their task

- Usually used when users are in some kind of panic, need immediate help
  - indicates need for online documentation, good search/lookup tools
  - online help can be specific to current context
  - paper manuals unavailable in many businesses!
    - e.g. single copy locked away in system administrator’s office
- Sometimes used for quick reference
  - syntax of actions, possibilities...
  - list of shortcuts ...

Types of help

- Tutorial and/or getting started manuals
  - short guides that people are likely to read when first obtaining their systems
    - encourages exploration and getting to know the system
    - tries to get conceptual material across and essential syntax
  - on-line “tours”, exercises, and demos
    - demonstrates very basic principles through working examples
- Reference manuals
  - used mostly for detailed lookup by experts
    - rarely introduces concepts
    - thematically arranged
  - on-line hypertext
    - search / find
    - table of contents
    - index
    - cross-index

Types of help (cont.)



- Reminders
  - short reference cards
    - expert user who just wants to check facts
    - novice who wants to get overview of system's capabilities
  - keyboard templates
    - shortcuts/syntactic meanings of keys; recognition vs. recall; capabilities
  - tooltips
    - text over graphical items indicates their meaning or purpose

3 stages for doing heuristic evaluation

- Briefing session to tell experts what to do.
- Evaluation period of 1-2 hours in which:
  - Each expert works separately;
  - Take one pass to get a feel for the product;
  - Take a second pass to focus on specific features.
- Debriefing session in which experts work together to prioritize problems.

Advantages and problems

- Few ethical & practical issues to consider because users not involved.
- Can be difficult & expensive to find experts.
- Best experts have knowledge of application domain & users.
- Biggest problems:
  - Important problems may get missed;
  - Many trivial problems are often identified;
  - Experts have biases.

Advantages and Disadvantages of Heuristics

Advantages	Disadvantages
• It can provide some quick and relatively inexpensive feedback to designers. • You can obtain feedback early in the design process. • Assigning the correct heuristic can help suggest the best corrective measures to designers. • You can use it together with other usability testing methodologies. • You can conduct usability testing to further examine potential issues.	• It requires knowledge and experience to apply the heuristics effectively. • Trained usability experts are sometimes hard to find and can be expensive. • You should use multiple experts and aggregate their results. • The evaluation may identify more minor issues and fewer major issues.

Comparison

Cognitive Walkthrough	Heuristic Evaluation
Informed by cognitive psychology	Informed by design practices
Done by one person (the researcher)	Done by appointed experts
More formal	Less formal
Better for highly structured tasks	Better for less structured tasks

c) Review-based Evaluation

- Experimental psychology and human–computer interaction between them possess a wealth of experimental results and empirical evidence.
- Examples of such issues are the usability of different menu types, the recall of command names, and the choice of icons.
- A final approach to expert evaluation exploits this inheritance, using previous results as evidence to support or refuse aspects of the design.

c) Review-based Evaluation

- It is expensive to repeat experiments continually and an expert review of relevant literature can avoid the need to do so.
- The reviewer must therefore select evidence carefully, noting the experimental design chosen, the population of participants used, the analyses performed and the assumptions made.
- Expertise in the area is required to ensure that correct assumptions are made.

d) Model-based Evaluation

- A third expert-based approach.
- Certain cognitive and design models provide a means of combining design specification and evaluation into the same framework.
- For example, GOMS (Goals, Operators, Methods and Selection).
- GOMS is the model that predicts user performance with a particular interface and can be used to filter particular design options.

d) Model-based Evaluation

- **GOMS**: Goals, Operators, Methods, and Selection rules are the elements of a model that describes purposeful HCI.
  - ***Goals*** specify what the user wants and intends to achieve.
  - ***Operators*** are the building blocks for describing human-computer interaction at the concrete level.
  - ***Methods*** are programs built with operators that are designed to accomplish goals.
  - ***Selection*** *rules* predict which method will be used. For example, "If the mouse is working, select 'point to an item on screen', if not select 'choose OPEN option in file menu'".

Usability analysis methods HCI

- In Human-Computer Interaction (HCI), usability analysis methods aim to assess how easy and enjoyable it is for users to achieve their goals using a product or system.
- Usability Testing
- Heuristic Evaluation
- Cognitive Walkthrough
- Contextual Inquiry
- Scenario-Based Testing

Usability Testing

- Observing real users as they interact with a product or system to identify usability problems and areas for improvement.

Types:

- **Moderated:** A facilitator guides the user through tasks and observes their behavior.
- **Unmoderated:** Users complete tasks independently, often with automated data collection.
- **In-person:** Users and researchers are in the same physical location.
- **Remote:** Users complete tasks from a distance, often using video conferencing or screen sharing.

Goals:

- Determine whether users can complete tasks successfully and independently.
- Assess user performance and mental state.
- Identify usability problems and their severity.
- Find solutions to usability problems.

Example:

- A researcher might ask users to navigate a website to find a specific product, observing their actions and listening to their feedback.

Heuristic Evaluation

- Experts evaluate a product or system against a set of usability principles (heuristics)

Process:

- Experts independently review the interface and identify potential usability problems.

Example:

- Nielsen's 10 Usability Heuristics (visibility of system status, match between system and the real world, user control and freedom, consistency and standards, error prevention, recognition rather than recall, flexibility and efficiency of use, aesthetic and minimalist design, help users recognize, diagnose, and recover from errors, help and documentation)

Cognitive Walkthrough

- Experts simulate how users would interact with a system, focusing on the cognitive processes involved.

Process:

- Experts walk through the user interface, considering the user's goals, knowledge, and potential difficulties.

Example:

- A cognitive walkthrough might focus on how a user would understand and use a specific feature of a software application

Contextual Inquiry

- Observing users in their natural environment to understand their needs and behaviors.

Process:

- Researchers visit users at their workplace or home, observing how they use the product or system in context.

Example:

- A researcher might observe how doctors use a medical software application in a hospital setting

Scenario-Based Testing

- Users are given specific scenarios and tasks to complete, allowing researchers to observe their interactions and identify usability issues.
- **Process:**
- Researchers create realistic scenarios that reflect how users might use the product or system.

Example:

- A user might be asked to navigate a website to book a flight, with the researcher observing their actions and listening to their feedback

Evaluate the design by user participation

a) Laboratories Studies

- Users are taken out of their normal work environment to take part in controlled tests, often in a specialist usability laboratory.
- This approach has a number of benefits and disadvantages.
- A well-equipped usability laboratory may contain sophisticated audio/visual recording and analysis facilities, two-way mirrors, instrumented computers and the like.
- In addition, the participant operates in an interruption-free environment.

a) Laboratories Studies

- It is especially difficult to observe several people cooperating on a task in a laboratory situation.
- Also some very constrained single-user tasks may be adequately performed in a laboratory.
- We may deliberately want to manipulate the context in order to uncover problems or observe less used procedures, or we may want to compare alternative designs within a controlled context.

Example of Laboratory Studies

Chemical Kinetics and Photochemistry

The JPL laboratory kinetics group measures the rate of many reactions on the surface of aerosols, clouds, and in the gas phase that are relevant to our understanding of stratospheric and tropospheric ozone. The group uses measurement techniques such as discharge-flow, flash-photolysis and laser-photolysis, mass spectrometry, and laser resonance fluorescence. Several members of this group are members of the NASA Panel for Data Evaluation, which publishes approximately every two years a document entitled "Chemical Kinetics and Photochemical Data for Use in Stratospheric Modeling." This document provides a comprehensive review of the kinetics literature since the last evaluation and makes recommendations regarding the reaction rates and absorption cross sections that should be used for quantitative studies of ozone.

a) Laboratories Studies

- Advantages:
  - specialist equipment available
  - uninterrupted environment
- Disadvantages:
  - lack of context
  - difficult to observe several users cooperating
- Appropriate
  - if system location is dangerous or impractical for constrained single user systems to allow controlled manipulation of use

b) Field Studies

- This method takes the designer or evaluator out into the user's work environment in order to observe the system in action.
- High levels of ambient noise, greater levels of movement and constant interruptions make field observation difficult.
- The context is retained and we are seeing the user in his 'natural environment'.

b) Field Studies

- Controlled experiments can be useful for evaluation of specific interface features, and must normally be conducted under laboratory conditions.
- From an economic angle, we need to weigh the costs of establishing recording equipment in the field, and possibly disrupting the actual work situation, with the costs of taking one or more participants away from their jobs into the laboratory.

Example of Field Studies

Latest FSC News

2010 Natural History, Arts and Family Courses Available Now!

Our exciting 2010 programme of Natural History and Arts courses is now available to help you discover, understand and be inspired by the natural world that surrounds us.

FSC Sponsored INSET courses for PGCE students and NQTs

In 2010 FSC will again be running its popular programme of subsidised courses for PGCE student and NQTs, providing effective and meaningful training to deliver learning outside the classroom.

Michael Palin Supports Darwin Scholars

Michael Palin and Charles Darwin were both students at Shrewsbury School. Michael recently returned to the school to deliver a lecture about his predecessor and to help raise money for the FSC's Darwin Scholarship.

OPAL Air Survey 2009 - free fieldwork resources for your school

Funded by the Big Lottery Fund, OPAL is running a national air quality survey in Autumn Term 2009 which anyone can take part in.

Residential courses change lives for urban children

The FSC has just published a report which highlights how residential experiences for young people from London's secondary school s has

Prepare your students for the new GCSE Geography controlled assessments

FSC are developing a new range of programmes, available from September 2009 to:

b) Field Studies

- Advantages:
  - natural environment
  - context retained (though observation may alter it)
  - longitudinal studies possible
- Disadvantages:
  - distractions
  - noise
- Appropriate
  - where context is crucial for longitudinal studies

c) Empirical method

- Most powerful methods of evaluating a design or an aspect of a design is to use a controlled experiment.
- Provides empirical evidence to support a particular claim or hypothesis.
- Can be used to study a wide range of different issues at different levels of detail.
- Evaluator chooses a hypothesis to test, which can be determined by measuring some attribute of participant behavior.

c) Empirical method

- Any experiment has the same basic form.
- Within this basic form there are a number of factors that are important to the overall reliability of the experiment.
- These include the participants chosen, the variables tested and manipulated, and the hypothesis tested.

d) Observational Methods

- Think Aloud
- Cooperative evaluation
- Protocol analysis
- Automated analysis
- Post-task walkthroughs

Think Aloud

- user observed performing task
- user asked to describe what he is doing and why, what he thinks is happening etc.

- Advantages
  - simplicity - requires little expertise
  - can provide useful insight
  - can show how system is actually use
- Disadvantages
  - subjective
  - selective
  - act of describing may alter task performance

Cooperative evaluation

- variation on think aloud
- user collaborates in evaluation
- both user and evaluator can ask each other questions throughout

- Additional advantages
  - less constrained and easier to use
  - user is encouraged to criticize system
  - clarification possible

Protocol analysis

- paper and pencil – cheap, limited to writing speed
- audio – good for think aloud, difficult to match with other protocols
- video – accurate and realistic, needs special equipment, obtrusive
- computer logging – automatic and unobtrusive, large amounts of data difficult to analyze
- user notebooks – coarse and subjective, useful insights, good for longitudinal studies

- Mixed use in practice.
- audio/video transcription difficult and requires skill.
- Some automatic support tools available

automated analysis – EVA

- Workplace project
- Post task walkthrough
  - user reacts on action after the event
  - used to fill in intention
- Advantages
  - analyst has time to focus on relevant incidents
  - avoid excessive interruption of task
- Disadvantages
  - lack of freshness
  - may be post-hoc interpretation of events

post-task walkthroughs

- transcript played back to participant for comment
  - immediately $\rightarrow$ fresh in mind
  - delayed $\rightarrow$ evaluator has time to identify questions
- useful to identify reasons for actions and alternatives considered
- necessary in cases where think aloud is not possible

e) Query Techniques

- Interviews
- Questionnaires

Interviews

- analyst questions user on one-to -one basis
  usually based on prepared questions
- informal, subjective and relatively cheap

- Advantages
  - can be varied to suit context
  - issues can be explored more fully
  - can elicit user views and identify unanticipated problems
- Disadvantages
  - very subjective
  - time consuming

Questionnaires

- Set of fixed questions given to users

- Advantages
  - quick and reaches large user group
  - can be analyzed more rigorously
- Disadvantages
  - less flexible
  - less probing

Questionnaires (ctd)

- Need careful design
  - what information is required?
  - how are answers to be analyzed?

- Styles of question
  - general
  - open-ended
  - scalar
  - multi-choice
  - ranked

What is important to XTZ's success? How important is each of the following to ensuring XYZ's success?

	NOT AT ALL IMPORTANT	SLIGHTLY IMPORTANT	IMPORTANT	VERY IMPORTANT	OF UTMOST IMPORTANCE
20. Strong emphasis on innovation	☐	☐	☐	☐	☐
21. Superior delivery of service	☐	☐	☐	☐	☐
22. Significant impact on link institutions	☐	☐	☐	☐	☐
23. Regional cooperation	☐	☐	☐	☐	☐
24. Clear organizational vision	☐	☐	☐	☐	☐
25. Strong organizational values	☐	☐	☐	☐	☐

26. What suggestions would you give XYZ to improve itself under any of the above categories? (Give suggestions regarding those categories you feel strongly about.)

Your experiences Please answer the following questions. Anecdotes and descriptions of your experiences are especially encouraged. All comments will be kept anonymous.

27. What do you feel are XYZ's strengths?

3.2.4 Factors considered in experimental design

A. Participants
B. Variables
C. Hypothesis
D. Experimental design
E. Statistical measures

A - Participants

- The choice of participants is vital for success.
- Participants should be chosen to match the expected user population as closely as possible.
- If participants are not actual users, they should be chosen to be of a similar age and level of education as the intended user group.
- A second issue relating to the participant set is the sample size chosen.
- The sample size must be large enough to be considered to be representative of the population.

B - Variables

- Experiments manipulate and measure variables under controlled conditions, in order to test the hypothesis.
- 2 main types of variable:
    1. Those that are manipulated or changed
       (known as the independent variables)
    2. Those that are measured
       (the dependent variables).

B - Variables

- Independent variables are those elements of the experiment that are manipulated to produce different conditions for comparison.
- E.g : interface style, level of help, number of menu items and icon design.
- Each of these variables can be given a number of different values.
- Each value that is used in an experiment is known as a *level of the variable*.
- More complex experiments may have more than one independent variable.

B - Variables

- Dependent variables are the variables that can be measured in the experiment, their value is depend on the changes made to the independent variable.
- Must be measurable in some way, it must be affected by the independent variable, and, as far as possible, unaffected by other factors.
- Common choices of dependent variable in evaluation experiments are the time taken to complete a task, the number of errors made, user preference and the quality of the user's performance

C - Hypothesis

- Prediction of the outcome of an experiment.
- Framed in terms of the independent and dependent variables.
- Stating that a variation in the independent variable will cause a difference in the dependent variable.
- Aim of the experiment is to show that this prediction is correct.

D – Experimental Design

- In order to produce reliable and generalizable results, an experiment must be carefully designed.
- There are two main methods: *between-subjects and within-subjects.*
- In a between-subjects design, each participant is assigned to a different condition.
- There are at least two conditions: the experimental condition (in which the variable has been manipulated) and the control (which is identical to the experimental condition except for this manipulation).

D – Experimental Design

- The second experimental design is within-subjects.
- Each user performs under each different condition.
- Within-subjects is less costly than between-subjects, since fewer users are required, and it can be particularly effective where learning is involved.
- There is also less chance of effects from variation between participants.
- Choice of experimental method depend on resources available, how far learning transfer is likely or can be controlled, and how representative the participant group is considered to be.

E – Statistical Measures

- 2 rules of statistical analysis are to *look* at the data and to *save* the data.
- Easy to carry out statistical tests blindly when a glance at a graph, histogram or table of results would be more instructive.
- In particular, looking at the data can expose outliers, single data items that are very different from the rest.
- Saving the data is important, as we may later want to try a different analysis method.

E – Statistical Measures

- Choice of statistical analysis depends on the type of data and the questions that want to answer.
- Variables can be classified as either discrete variables or continuous variables.
- A discrete variable can only take a finite number of values or levels; for example, a screen color that can be red, green or blue.
- A continuous variable can take any value (although it may have an upper or lower limit); for example a person's height or the time taken to complete a task.

Choosing an evaluation method

Factors distinguishing evaluation techniques

We can identify at least eight factors that distinguish different evaluation techniques and therefore help us to make an appropriate choice. These are:

- the stage in the cycle at which the evaluation is carried out
- the style of evaluation
- the level of subjectivity or objectivity of the technique
- the type of measures provided
- the information provided
- the immediacy of the response
- the level of interference implied
- the resources required.

Choosing an Evaluation Method

- when in process: design vs. implementation
- style of evaluation: laboratory vs. field
- how objective: subjective vs. objective
- type of measures: qualitative vs. quantitative
- level of information: high level vs. low level
- level of interference: obtrusive vs. unobtrusive
- resources available: time, subjects, equipment, expertise

classification of evaluation techniques

Classification of analytic evaluation techniques

	Cognitive walkthrough	Heuristic evaluation	Review based	Model based
Stage	Throughout	Throughout	Design	Design
Style	Laboratory	Laboratory	Laboratory	Laboratory
Objective?	No	No	As source	No
Measure	Qualitative	Qualitative	As source	Qualitative
Information	Low level	High level	As source	Low level
Immediacy	N/A	N/A	As source	N/A
Intrusive?	No	No	No	No
Time	Medium	Low	Low–medium	Medium
Equipment	Low	Low	Low	Low
Expertise	High	Medium	Low	High

Classification of experimental and query evaluation techniques

	Experiment	Interviews	Questionnaire
Stage	Throughout	Throughout	Throughout
Style	Laboratory	Lab/field	Lab/field
Objective?	Yes	No	No
Measure	Quantitative	Qualitative/ quantitative	Qualitative/ quantitative
Information	Low/high level	High level	High level
Immediacy	Yes	No	No
Intrusive?	Yes	No	No
Time	High	Low	Low
Equipment	Medium	Low	Low
Expertise	Medium	Low	Low

Classification of observational evaluation techniques

	Think aloud[1]	Protocol analysis[2]	Post-task walkthrough
Stage	Implementation	Implementation	Implementation
Style	Lab/field	Lab/field	Lab/field
Objective?	No	No	No
Measure	Qualitative	Qualitative	Qualitative
Information	High/low level	High/low level	High/low level
Immediacy	Yes	Yes	No
Intrusive?	Yes	Yes[3]	No
Time	High	High	Medium
Equipment	Low	High	Low
Expertise	Medium	High	Medium