

User Interface Evaluation

User Participation

Lecture #18

Agenda

- Evaluation through User Participation
 - Empirical or experimental methods
 - Observational method
 - Query techniques
 - Physiological monitoring techniques

Evaluation through User Participation

- Actual usability testing with the people (user) for whom the system is intended
- User participation in evaluation should occur at the final stage of the development (or at least a working prototype of the system is in place)
- The evaluation can be carried either in laboratory or in normal working environment

User Analysis Approaches

- A number of techniques to evaluate with users
 - Empirical or experimental methods
 - Observational method
 - Query techniques
 - Physiological monitoring techniques



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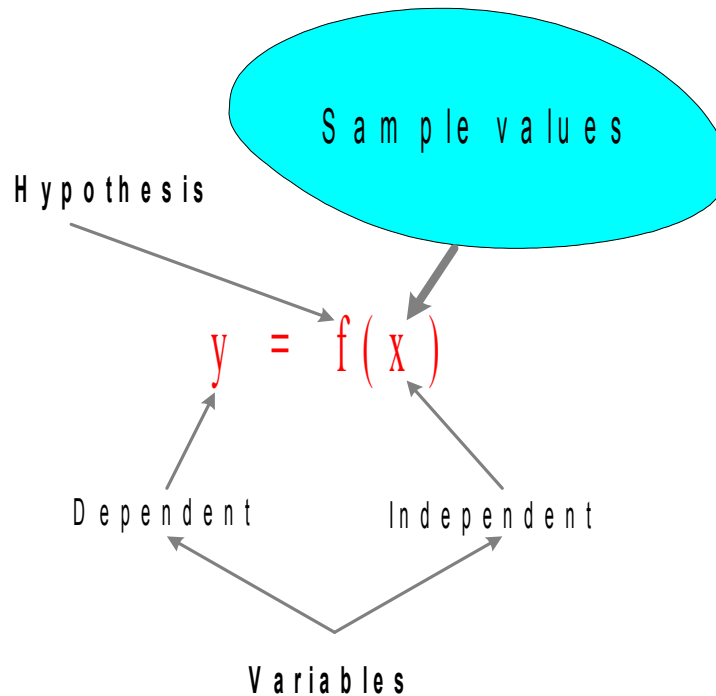
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on Spring 2008, Lecture

Empirical Method (EM)

- This method is used to study wide range of different issues at different levels of detail
- Method uses controlled experiment
- There are a number of factors to be considered in this type of method
 - Participants
 - Variables
 - Hypothesis

Basic Principle in EM

- The underlying principle in this approach is best described by the following



Participants in EM

- Choice of participants is vital in this method
- Participants should be chosen to match the expected user population as closely as possible
- Preferably by the actual users
- Participants sample size should be as far as possible large enough so that majority of the usability problems can be debugged (Nielsen and Landaus Model [1994])

Variables in EM

- Experimental method manipulate and measure variables under some controlled experiments
- There are two type of variables
 - Independent variables
 - Those that are manipulated or changed
 - Dependent variables
 - Those that are measured

Variables in EM

- **Independent variables**
 - Examples of independent variables in experimental methods are interface style, level of help. Number of menu items, number of icons etc.
 - In evaluation, 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 variables
 - e.g. an experiment that wants to test whether search speed improves as the number of menu items decreases may consider menus with 5, 7 and 10 items; here independent variables, number of menu items, has three levels
 - An experiment may consist of more than one independent variables

Variables in EM

- **Dependent variables**
 - The variables that can be measured in an experiment
 - Variables are dependent on the changes made to the independent variable
 - e.g. speed of the menu selection is a dependent variable and depends on the number of menus in the interface
 - The dependent variable must be measurable in some way, it must be affected by the independent variables, and as far as possible, unaffected by other factors
 - Some commonly dependent variables in evaluation experiments are
 - Time taken to complete a task, the number of errors made, user preference, the quality of the user's performance etc.

Variables in EM

- **Hypothesis**

- Is the prediction of the outcome of an experiment
- It is framed in terms of independent and dependent variables, stating that a variation in the independent variable will cause a difference in the dependent variable
- The objective of the experiment is to show that a prediction is correct or wrong

How to Evaluate?

- Step 1:
 - Decide the number of factors in the method, i.e. participants, variables
- Step 2:
 - Choose the hypothesis – to decide exactly what it is that we are trying to demonstrate
- Step 3:
 - Deciding the experimental methods that we should follow
 - Two category of methods: between-subjects and within-subjects

(Details of the procedure can be had from the book by Alan Dix, Chapter 9, page 331-339)



Observational Techniques

- A popular way to gather information about actual use of a system is to observe users interacting with it
- Users are asked to complete a set of predetermined tasks
- Evaluators watches and records the user's action
- Observation can be carried out in laboratory or in the normal place of work of users

Protocols in OT

- There are several things that evaluators can watch and record in the observational technique (OT)
- Mainly two protocols that are commonly in use for this purpose in OT
 - Verbal protocol
 - Think-aloud protocol
 - Cooperative evaluation

OT: Verbal Protocols

- Form of observation where the users are asked to talk through what s/he is doing
- Adds an extra dimension to the information gathered by addressing the cognitive activity underlying the user's physical behavior
- From this protocol it is possible to obtain a wide range of information
 - The way that a user has planned to do a particular task

OT: Verbal Protocols

- From this protocol it is possible to obtain a wide range of information (continued..)
 - User's identification of menu names or icons for controlling the system
 - User's reaction to when things go wrong and whether or not s/he understands the error message provided by the system etc.
 - Observer also may get a clue about user's subjective feeling about the activity from comments and the tone of user's voice

OT: Think-aloud Protocols

- It is a special kind of verbal protocol, in fact
- Here, user is asked to talk loudly what s/he is thinking while s/he is carrying out a task or doing some problem solving
- This protocol places added strain on users, who are required to do two things at once – the task itself and talk about their actions or what they are thinking about
 - Evidence from cognitive psychology shows that humans are poor at maintaining divided attention for more than a few minutes

OT: Cooperative Evaluation

- User is encouraged to see himself as a collaborator in the evaluation and not simply as an experimental participants
- As well as asking the user to think aloud at the beginning of the session, the evaluator can ask the user question (like, ‘why?’ or ‘what-if?’) if his behavior is unclear, and the user can ask the evaluator for clarification if a problem arises

OT: Cooperative Evaluation

- The cooperative evaluation has a number of advantages compared to the other protocol in this genre
 - The process is less constrained and therefore easier to learn to use by the evaluator
 - The user is encouraged to criticize the system
 - The evaluator can clarify points of confusion at the time they occur and so maximize the effectiveness of the approach for identifying problem areas

Observations in OT

- Having a protocol it is very important in the OT is recording the observations for subsequent use
- In this aspects OT can be classified into two broad categories
 - Direct observation
 - Indirect observation

Direct Observation

- Individual users may be directly observed doing specifically devised tasks or doing their normal work
- Observer (evaluator) making notes about interesting behavior or recording their performance
- Direct observation is may also be very useful early in a project when designers are looking for informal feedback, and gaining a picture of the kinds of things that users do and what they like or do not like

Direct Observation

- Direct observation is often obtrusive method because of what is called **Hawthorne Effect** (user may be constantly aware of their performance being monitored, which can alter their behavior and performance levels)
- This allows only one pass observation
- Although the observer may take notes, the record of the observation will usually be incomplete because observer miss things and hence will have a less complete picture to review later

Indirect Observation

- There are several ways that the indirect method of recording the observations
 - Audio recording
 - This is useful if the user is actively ‘thinking aloud’
 - However, it may be difficult to record sufficient information to identify exact actions in later analysis
 - Video recording
 - One can see what the user is doing.
 - Problem is that camera should record from different angle to get the view for any situation of user

Indirect Observation

- There are several ways that the indirect method of recording the observations (continued...)
 - Computer logging
 - While user is working, system automatically to record user actions at a keystroke level.
 - This is method is cheap , unobtrusive and can be used for longitudinal studies (where we look at one or more users over periods of weeks or months)
 - User notebooks
 - The participants themselves can be asked to keep logs of activities/problems.
 - This technique is especially useful in longitudinal studies, and also where we want a long of unusual or frequent tasks and problems



Query Techniques

See from the book of Alan Dix
Chapter 9, page 348-352



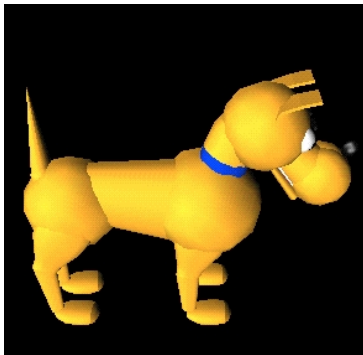
Evaluation with Physiological Monitoring

See from the book of Alan Dix

Chapter 9, page 352-356

Recommended Materials

- See the course web page
<http://www.iitkgp.ac.in/course/it60110/>
(For the presentation slides of the current lecture and other materials)
- Book
Human-Computer Interaction by Alan Dix et al.
Pearson-Education,
Chapter 9



17 April, 2008

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32