

Welcome

Do not, I beg you, look for anything behind phenomena. They are themselves their own lesson.

Goethe



Evaluating Through User Participation

Abbas Moallem, Ph.D.



Evaluation studies: From controlled to natural setting Usability Testing

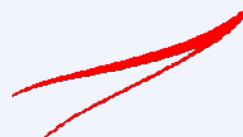
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Overview

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- Explain the key concepts used in evaluation.
- Introduce different evaluation methods.
- Show how different methods are used for different purposes at different stages of the design process and in different contexts of use.
- Discuss the conceptual, practical, and ethical issues involved in evaluation.
- Show how evaluators mix and modify methods.
- Discuss the practical challenges

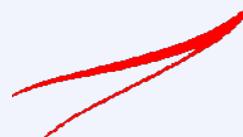




Introduction

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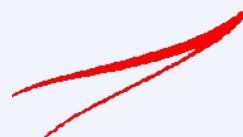
- Usability evaluators must broaden their methods and be open to non-empirical methods, such as user sketches, consideration of design alternatives, and ethnographic studies.
 - Recommendations needs to be based on observational findings
- The design team needs to be involved with research on the current system design drawbacks
 - Tools and techniques are evolving
 - The range of evaluation plans might be anywhere from an ambitious two-year test with multiple phases for a new national air-traffic control system to a three-day test with six users for a small internal web site
 - The range of costs might be from 20% of a project down to 5%.
- Usability testing has become an established and accepted part of the design process



Why, what, where and when to evaluate

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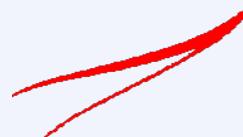
- **Iterative design & evaluation is a continuous process that examines:**
 - Why: to check that users can use the product and that they like it.
 - What: a conceptual model, early prototypes of a new system and later, more complete prototypes.
 - Where: in natural and laboratory settings.
 - When: throughout design; finished products can be evaluated to collect information to inform new products.
- **Designers need to check that they understand users' requirements.**



Key points

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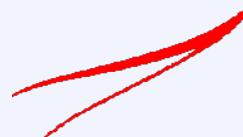
- Many issues to consider before conducting an evaluation study.
 - goals of the study;
 - involvement or not of users;
 - the methods to use;
 - practical & ethical issues;
 - how data will be collected,
 - analyzed & presented.



Evaluation Guide

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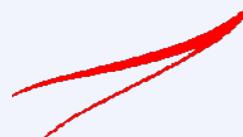
- Determine the *goals*.
- Explore the *questions*.
- Choose the evaluation *methods*.
- Identify the *practical issues*.
- Decide how to deal with the *ethical issues*.
- Evaluate, analyze, interpret and present the *data*.



Determine the Goals

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- What are the high-level goals of the evaluation?
- Who wants it and why?
- The goals influence the methods used for the study.
- Goals vary and could be to:
 - identify the best metaphor for the design
 - check that user requirements are met
 - check for consistency
 - investigate how technology affects working practices
 - improve the usability of an existing product



Explore the Questions

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- **Questions help to guide the evaluation.**
- **The goal of finding out why some customers prefer to purchase paper airline tickets rather than e-tickets can be broken down into sub-questions:**
 - What are customers' attitudes to e-tickets?
 - Are they concerned about security?
 - Is the interface for obtaining them poor?
- **What questions might you ask about the design of a cell phone?**

Evaluation Techniques

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User-Based Evaluations



Expert Reviews and
Heuristics

Evaluation Techniques

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User-Based Evaluations



Usability Testing



Field Testing

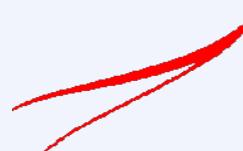
Overview

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What is usability testing?

- Determining the appropriate testing
- Selecting usability test type and method
- Understanding and identifying the purpose of usability testing
- Developing a user profile and selecting participants
- Creating a usability test storyboard
- Preparing the test environment
- Creating the test packet
- Defining team composition
- Collecting data
- Reporting results





Evaluation Techniques

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- **Review-based Evaluation or Expert Evaluation**
 - Cognitive Walkthrough
 - Heuristic Evaluation
- **User-Based Evaluations**
 - Usability Testing
 - Lab Testing
 - Field Testing
- **Testing Tools and Techniques**

Laboratory Studies

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- 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



Field Studies

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



Usability Testing

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A formal and rigorous process involves :

- having users complete a series of typical or representative tasks on a product.
- letting the users complete tasks with as little interruption or intervention as possible.
- collecting information during a usability test by
 - Observing the users' actions.
 - Capturing comments as they "think aloud".
 - Analyzing information from responses to post-task and post-test questionnaires.



Usability Testing

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- Performed in controlled environments such as a usability lab.
- Participants are selected and recruited to test the product by a precisely defined user profile.
- Provides objective, accurate, and reasonable data for improving a product's design.
- Performed in:
 - Early development: Exploratory test
 - Mid development: Assessment test
 - Late development: Validation test



Usability Labs

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Activity Room



Developer Viewing Room



Observation Room

Usability Labs

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Activity Room



Developer Viewing Room



Observation Room

Usability lab

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http://iat.ubalt.edu/usability_lab/

www.id-book.com

Usability lab with observers watching a user & assistant

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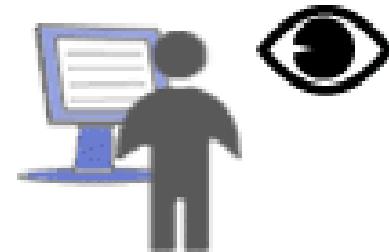
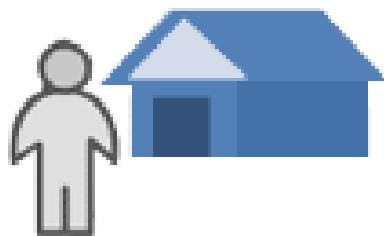


www.id-book.com

A selected group of panelists are invited to participate

...They are asked to evaluate the web from their natural context, using Internet Explorer

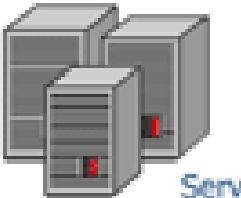
...A robot (UZ Bar) guides the users and monitors their behavior



Remote Usability Testing

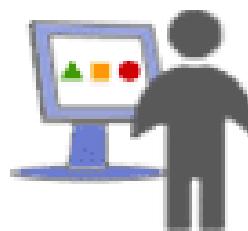


The data is analysed and a final report is prepared



Servidores
UserZoom

The UZ Platform gathers and saves the data in real-time



The users are asked to complete certain tasks and answer questions

Mobile head-mounted eye tracker

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Picture courtesy of SensoMotoric Instruments (SMI), copyright 2010

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Portable equipment for use in the field

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Lab Testing

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Steps

- Determining the appropriate testing
- Selecting usability test type and method
- Understanding and identifying the purpose of usability testing
- Developing a user profile and selecting participants
- Creating a usability test storyboard
- Preparing the test environment
- Creating the test packet
- Defining team composition
- Collecting data
- Reporting results





Field Studies

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Experiments dominated by group formation

Field studies more realistic:

distributed cognition ⇒ work studied in context

real action is *situated action*

physical and social environment both crucial

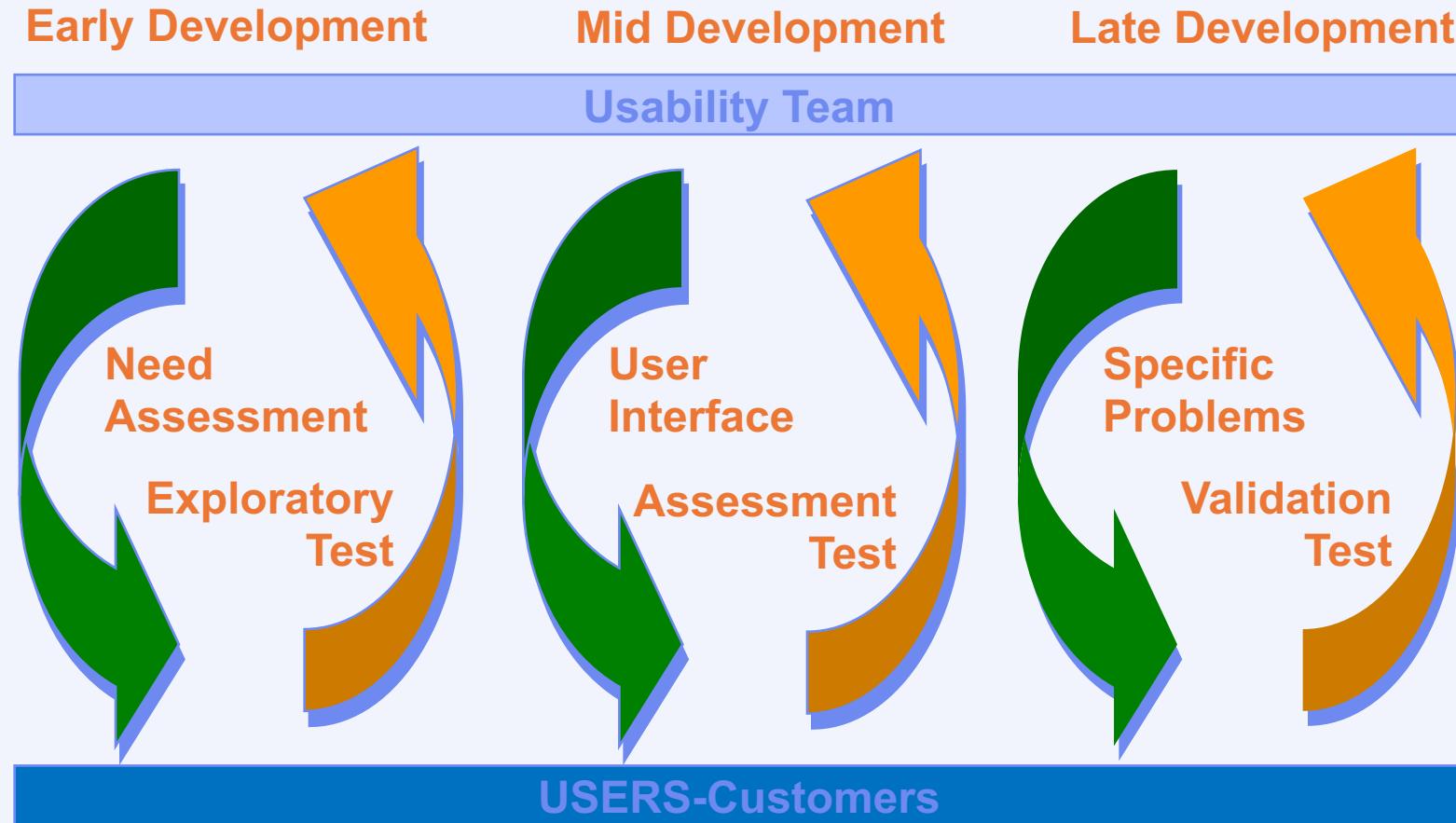
Contrast:

psychology – controlled experiment

sociology and anthropology – open study and rich data

Usability Testing Phases

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Early Development: Exploratory Test

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- Tests are performed with an early prototype.
- Alternative possibilities in prototype are evaluated by varying a single aspect each time.
- Early designs of a product are evaluated by a group of experts.
- Participants are asked to define an effective structure for presenting instructions.
- Tests are performed in informal setting such as a customer site or lab.



Mid Development: Assessment Test

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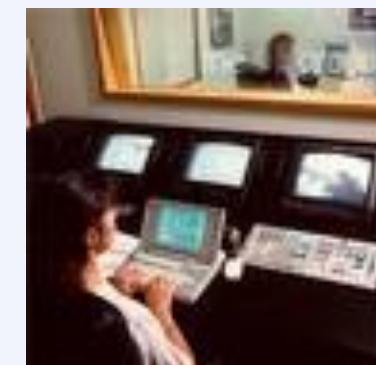
- The most common tasks as well as most important tasks are evaluated.
- Participants are asked to express their strategies, feelings, and experience with the product.
- Qualitative and quantitative data are collected.
- Tests are performed in a formal lab setting.



Assessment Test at Mid-Development

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- Design decisions made during early development phase are tested.
- Key Benefit:
 - Helps evaluate realistic tasks to understand how well design decisions have been implemented.
- Objective of the test:
 - Qualitative data about user experience can be obtained (This test is not concerned with how participants perform the tasks, but how well they perform the defined tasks).

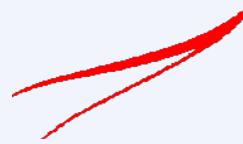


Late Development: Validation Test

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- Tests are performed in a formal lab setting
- Measures:
 - Response time
 - Accuracy
 - Time to finish task
 - Time spent navigating, learning
 - Number of wrong choices
 - Participants' behaviors (example: frustration)
 - Participant rating





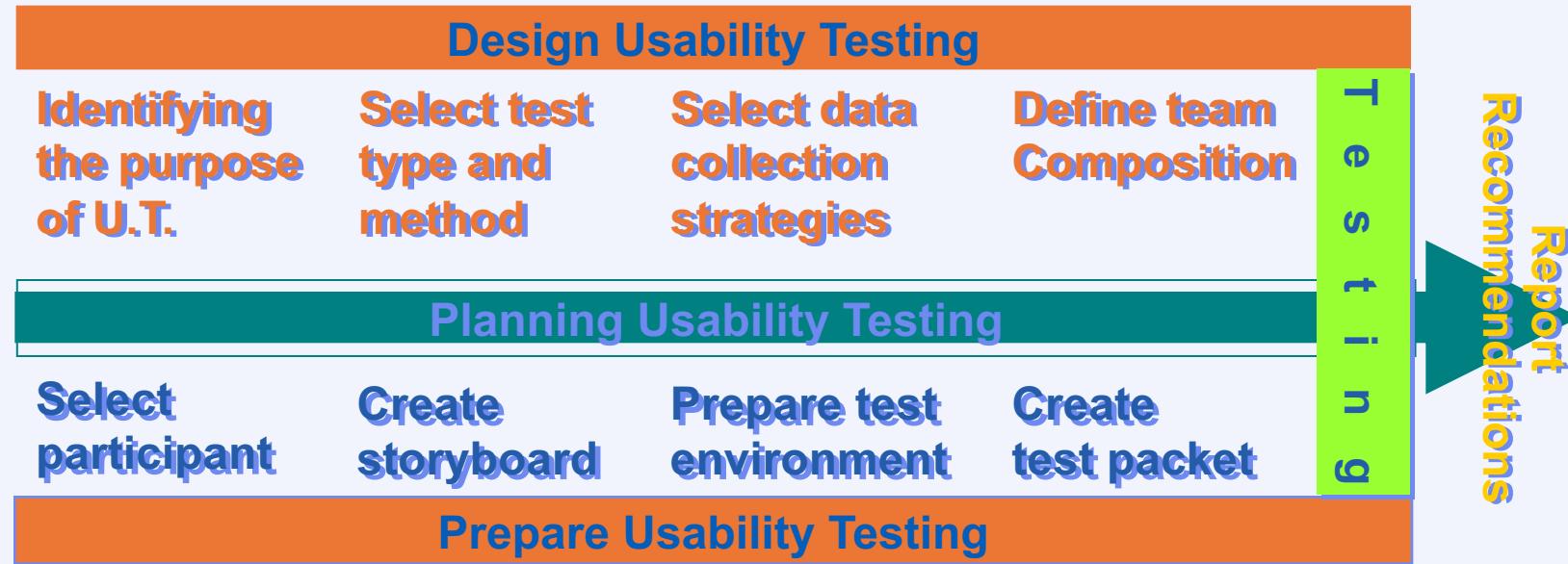
Usability Test Life Cycle

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- Usability tests must be planned as part of product development.
- Usability testing must be integrated early and throughout the design and implementation phases of the development cycle.

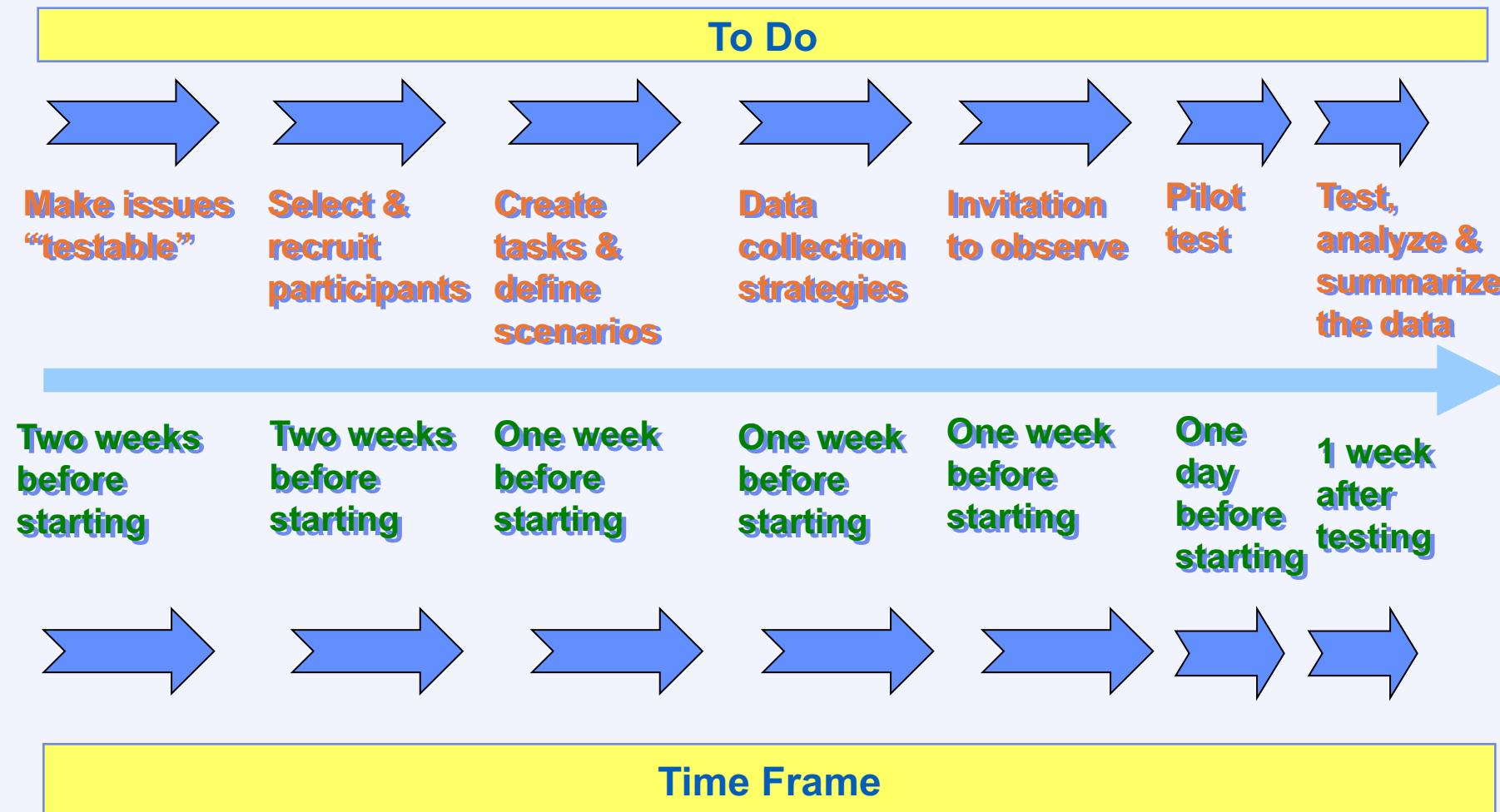
Planning Usability Testing

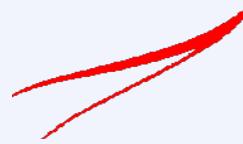
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Usability Testing Timeline

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Preparing for a Usability Test

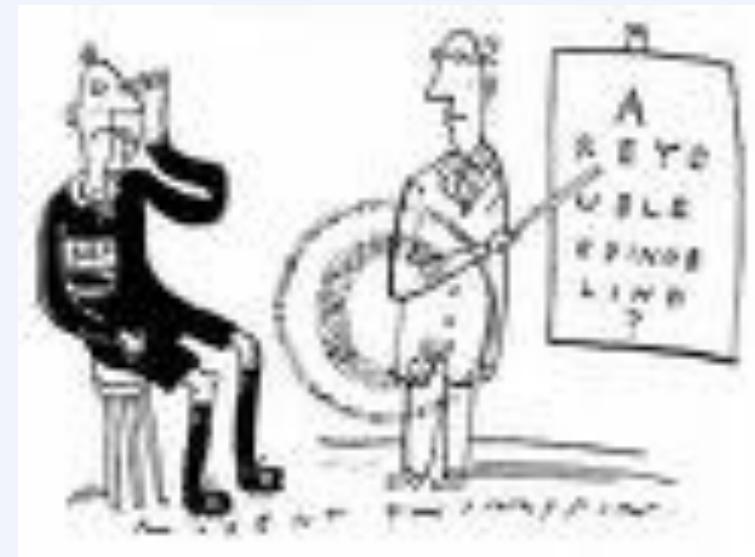
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- Develop a user profile and select participants
- Create a usability storyboard
- Prepare a test environment
- Create a test packet
- Define the team's composition
- Collect data
- Report results

Observational Methods

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

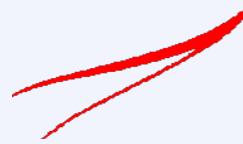




Think Aloud

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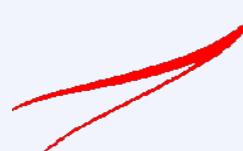
- user observed performing task
- user asked to describe what he is doing and why, what he thinks is happening etc.
- Advantages
 - simplicity - requires little expertise
 - can provide useful insight
 - can show how system is actually used
- Disadvantages
 - subjective
 - selective
 - act of describing may alter task performance



Cooperative Evaluation

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- 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

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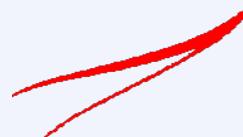
- paper and pencil – cheap, limited to writing speed
- audio – good for think aloud, difficult to match with other protocols
- video – accurate and realistic, needs special equipment, obtrusive
- computer logging – automatic and unobtrusive, large amounts of data difficult to analyse
- user notebooks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

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- **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

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

Task

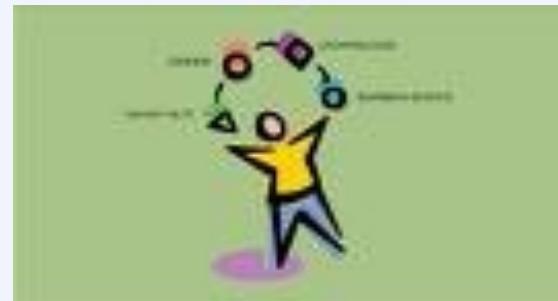
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must encourage cooperation

perhaps involve multiple channels

options:

- **creative task** e.g. ‘*write a short report on ...*’
 - **decision games** e.g. desert survival task
 - **control task** e.g. ARKola bottling plant



Data Gathering

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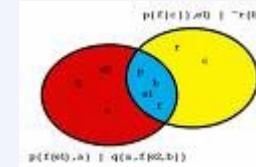
Several video cameras
+ direct logging of application

Problems:

- synchronisation
- sheer volume!

One solution:

- record from each perspective



Collecting Data

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- Starting time
- Amount of time spent performing each task
- Number of times a participant referred the help manual
- Spoken comments
- Requests for help (include the reason for the request)
- Ending time
- Sequences of steps taken by each participant
- Problem-solving processes used
- Time to complete a task
- Number of errors made while attempting each task
- Time spent navigating
- Number of observations of frustration
- Participants' ability to recall items



Analysis

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N.B. vast variation between groups

solutions:

- within groups experiments
- micro-analysis (e.g., gaps in speech)
- anecdotal and qualitative analysis

look at interactions between group and media

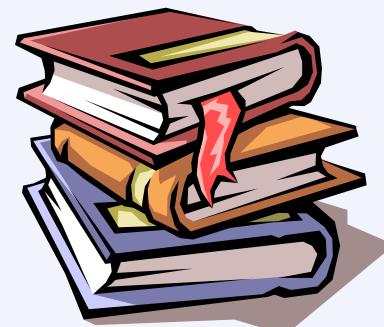
controlled experiments may 'waste' resources!



Reporting Results

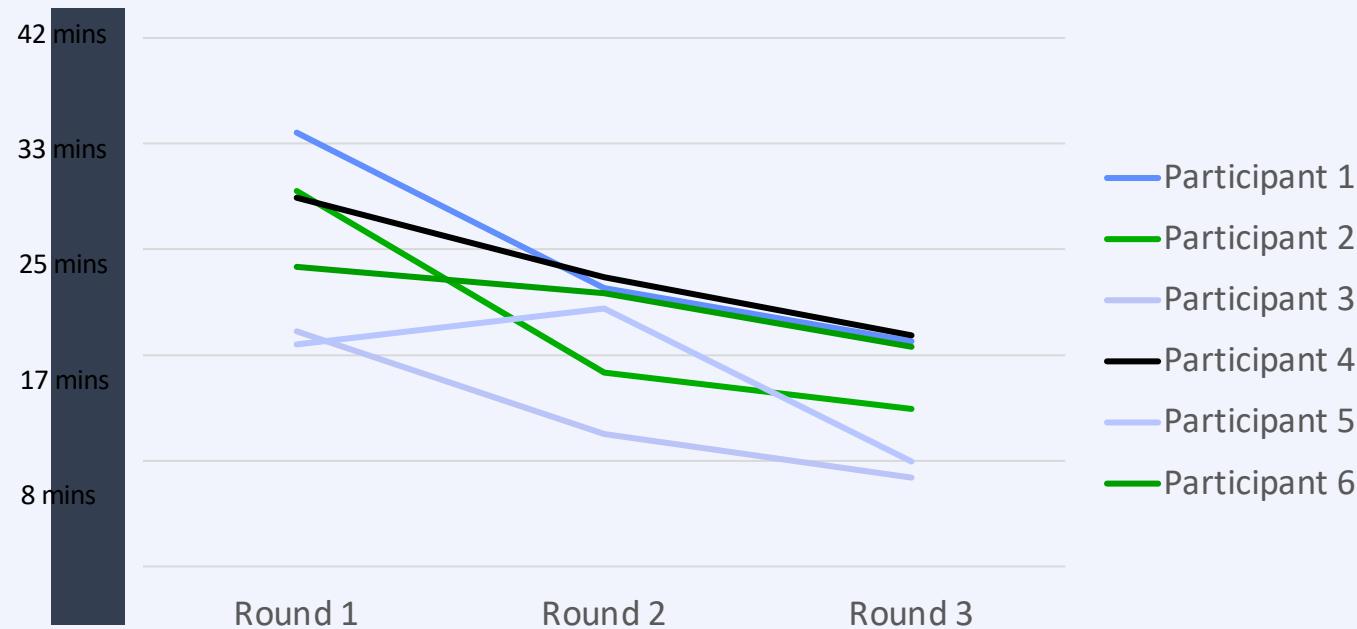
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- Statement of purpose
- The problem statement
- A summary of user profiles
- A compilation of questionnaire results
- A summary of observations
- A summary of participants' reactions and comments during the interview process
- Data collection strategy
- Evaluation measures
- A summary of what aspects of the product worked well
- A summary of what aspects of the product need to be improved
- Recommendations based on findings



Results

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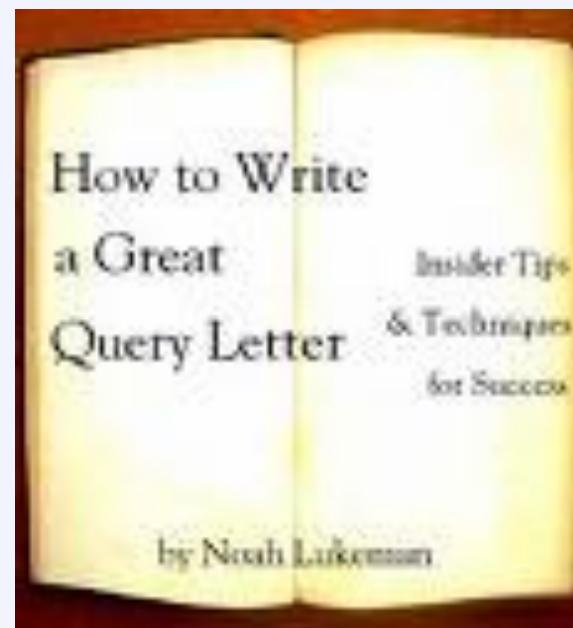


Time to complete all tasks for each round, per participant.

Query Techniques

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- **Interviews**
- **Questionnaires**



Interviews

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- 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

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- Set of fixed questions given to users
- Advantages
 - quick and reaches large user group
 - can be analysed more rigorously
- Disadvantages
 - less flexible
 - less probing



Questionnaires (ctd)

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- Need careful design
 - what information is required?
 - how are answers to be analyzed?
- Styles of question
 - general
 - open-ended
 - scalar
 - multi-choice
 - ranked



Physiological Methods

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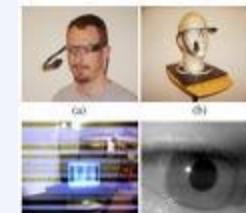
- Eye tracking
- Physiological measurement



Eye Tracking

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- head or desk mounted equipment tracks the position of the eye
- eye movement reflects the amount of cognitive processing a display requires
- measurements include
 - fixations: eye maintains stable position. Number and duration indicate level of difficulty with display
 - saccades: rapid eye movement from one point of interest to another
 - scan paths: moving straight to a target with a short fixation at the target is optimal

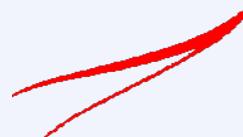




Physiological Measurements

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- Emotional response linked to physical changes
- these may help determine a user's reaction to an interface
- Measurements include:
 - heart activity, including blood pressure, volume and pulse.
 - activity of sweat glands: Galvanic Skin Response (GSR)
 - electrical activity in muscle: electromyogram (EMG)
 - electrical activity in brain: electroencephalogram (EEG)
- Some difficulty in interpreting these physiological responses
 - more research needed



Choosing an Evaluation Method

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- 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

What Method is Most Appropriate?

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- Combine the three methods for better accuracy and results.
- Always include usability testing and evaluation in the early stages of design.
- Whenever possible, include formal usability testing for more objective data.
- Usability must be planned as part of product development and included in the design cycle.



Conclusion

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Conducting a formal and rigorous Usability Test:



Reduces
customer
support
costs



Reduces user
training costs



Prevents user
frustration



Improves
productivity
& efficiency



Improves
customer
fidelity



Raises Customer Satisfaction

Questions

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See You Next Week



Thank You For Your Participation