

Übung zur Vorlesung Mensch-Maschine-Interaktion

e6: User Studies

Sara Streng

Ludwig-Maximilians-Universität München

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Introduction

Why do we need user studies?

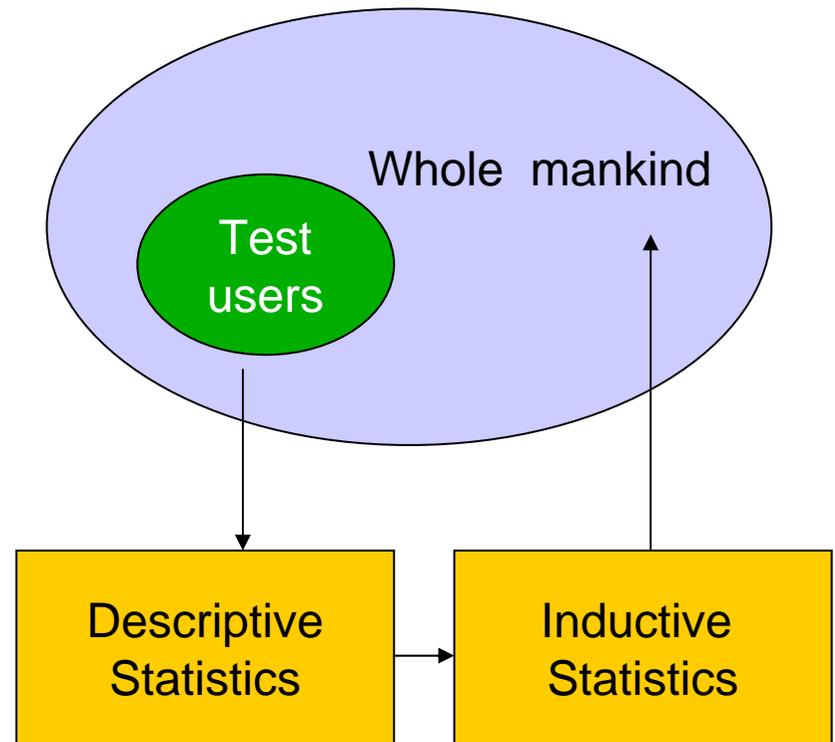
- To get a scientific statement (instead of personal opinion)
- To learn more (because of surprising results)
- To ensure quality in product development
- To compare solutions
- To provide quantitative figures

Examples of scientific statements

- Users are quicker using version A than using version B
- Users make 10% less errors when using version X than when using version Y
- 90% of the users can complete the transaction using version Y in less than 3 minutes
- On average users will be able to buy a ticket using version A in less than 30 seconds

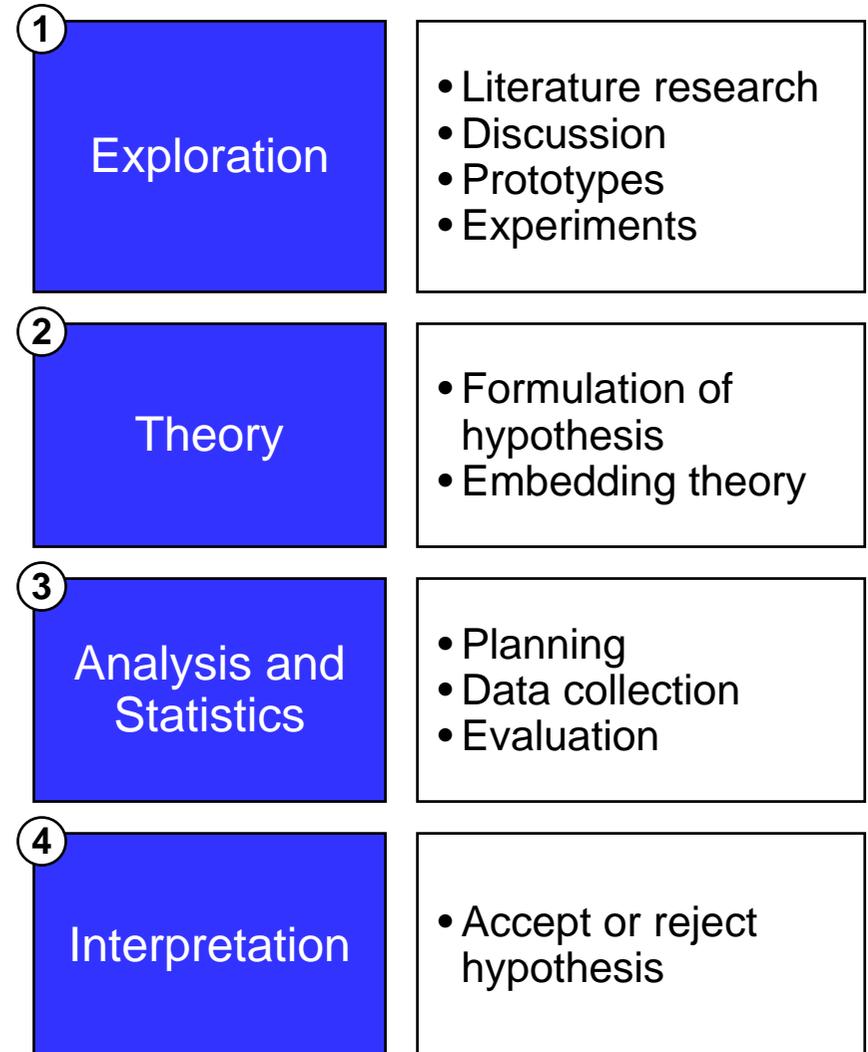
What Do We Get From a User Study?

- Result, which is valid for all people
- Test users must be representative
- Descriptive statistics:
 - Tables
 - Diagrams
 - Means
 - ...
- Inductive statistics:
 - Ensure validity for the whole



How To Do a User Study?

- 4 Steps
- Warnings
 - A user study takes a lot of effort
→ plan it carefully!
 - A user study without a hypothesis formulated BEFORE is worthless!
- Recommendations
 - Make sure all relevant data are recorded and friendly for evaluation.
 - Do a complete pre-test with somebody – from data collection to evaluation



Subject to Evaluation is the System Usability

- **Inform participants, that the system is evaluated - not the user.**
 - If something does not work, it is never the user's fault!
- What exactly is evaluated depends on the stage of a project:
 - Ideas and concepts
 - Designs
 - Prototypes
 - Implementations
 - Products in use
- Approaches
 - Formative evaluation
 - » throughout the design
 - » helps to shape a product
 - Summative evaluation
 - » quality assurance of the finished product

Participants

- The number of subjects needed depends on
 - Project
 - Goals
 - Setup

Minimal size is about 10 subjects

- Participants should be representative for the user group
 - Age
 - Background (e.g. technical vs. not technical)
 - Skills
 - Experience
 - ...

In most cases your team members are NOT representative!

Variables

- Identify independent and dependent variables
- **Independent** variables
 - Manipulated by the experimenter
 - Conditions under which the tasks are performed
 - The number of different values used is called **level**
 - The number of experimental conditions is the product of the levels
e.g. font can be *Arial* or *Times* (2 levels), background can be blue, green, or white (3 levels) → 6 experimental conditions
- **Dependent** variables
 - Affected by the independent variables
 - Measured in the user study
 - Objective values: e.g. time to complete a task, number of errors, etc.
 - Subjective values: ease of use, preferred option
 - They should only depend on the independent variables (conditions)
- Accuracy of measurements

Hypothesis

- Prediction of the result
- States how a change in the independent variables will effect the measured dependent variables
- By doing the study, the hypothesis is either proved or disproved
- Formulate hypothesis BEFORE running the study!
- **Null hypothesis** predicts that independent variables do not have any effect on the dependent variables

Procedure

1. Set goals
2. Design the experiment
3. Do a pilot study
4. Schedule users
5. For each user, typically:
 - Inform the user
 - » About the procedure (amount of time, breaks, ...)
 - » What the study is about in general (do NOT reveal the hypothesis!)
 - Consent form
 - Do a survey on
 - » Demographics
 - » Questions related to the experiment (e.g. left- / right-handedness)
 - Give instructions on the task
 - Let the user do the tasks and measure the variables
 - Be available for questions and (informal) feedback
6. Analyze the results

Experimental Method

- Across subjects
 - All subjects do the tasks under all different conditions
 - Randomize the order of conditions to avoid ordering affects
- Between subjects
 - Multiple groups
 - Each group does the test only under one conditions
 - Careful selection of groups is essential

	Pros	Cons
Across subjects	<ul style="list-style-type: none">• Fewer participants required (n)	<ul style="list-style-type: none">• Learning may influence results
Between subjects	<ul style="list-style-type: none">• Learning effects are avoided	<ul style="list-style-type: none">• More participants required (n * [number of conditions])• Usually harder to show significance

Specification

- The experiment should be set up to be reproducible
 - write a specification describing everything which is important for others to reproduce the experiment:
 - Hard- and software in use
 - Circuit schematics of self-build prototypes
 - The environmental conditions
 - » Light conditions
 - » Atmosphere
 - Skills of the test users, e.g.
 - » „All participants have to be professional designers”
 - » “The candidates should have no experience on using eye-trackers”
 - » ...

What You Should Keep in Mind

- State clearly how the experiment will be conducted
- Every test user must have same conditions.
- Don't learn how to conduct the experiment during the user study.
Think about what to do in case of problems in advance, e.g. how to proceed, if the mobile phone of a user gets an incoming call during a test run? Stop the recording and repeat afterwards? Repeat the test run? Stop the test and don't use the data?
- Randomize as much as possible:
If there are two test runs for two different text input methods, dice out the order. Perhaps people are a little bit faster in the second test run because they know the text already.
- Specify the measurements.
- Times can be recorded automatically by the testing software or stopped manually with a watch.

Consent Form

- **Participants Consent Form**

- **Study** _____ **Institution** _____

- Name: _____ Date of Birth: _____

- Email: _____

- Phone: _____

- I have been informed on the procedure and purpose of the study and my questions have been answered to my satisfaction.
- I have volunteered to take part in this study and agree that during the study information is recorded (audio and video as well as my interaction with the system). This information may only be used for research and teaching purpose. I understand that my participation in this study is confidential. All personal information and individual results will not be
- released to third parties without my written consent.
- I understand that I can withdraw from participation in the study at any time.
- Date: _____ Signature: _____