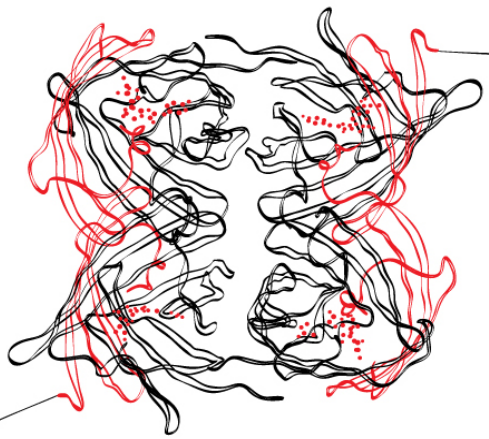
HCI DESIGN & EVALUATION

Controlled Experiment Proposal

Module ID: 202001032
Bachelor Technical Computer Science / Business & IT
January 2022



UNIVERSITY OF TWENTE.

CONTROLLED EXPERIMENT PROPOSAL

Overall goal of controlled experiment proposal and ethics:

- Learn to write a plan to describe a controlled experiment including ethics
- Reflect on the ethics of your HCI project

Important Note:

- This deliverable is **not** about the final 3 to 5-user pilot study with re-sit students in week 8. This is an experiment that you will **plan only** and you will **not execute** in this course. Instead, you will execute a usability test of your hi-fi prototype (similar to the lo-fi prototype test) with resit students in the tutorial of week 8. You will report about the results of the usability test in a separate chapter in the final report.

Instructions controlled experiment proposal

There are 2 possible options for doing a controlled experiment
Option 1: Experiment about 1 difference in your system.
Option 2: Proof-of-concept.

Select only one of those options as a project group.

Option 1:
If you choice to go for option 1, please think about the following points:

- **Identify a "difference" in your system that you think would make a "difference" to the user's experience of your system**
- *A difference in the system (called "independent variable") can be:*
  - Male voice vs. female voice (for voice system) – difference in voice gender
  - Human-like motions versus robotic motions (for robot gestures) - difference in motion style
  - Human appearance versus robotic appearance (for virtual agent) – difference in virtual agent appearance.
  - Displaying high level advice versus low level advice (for recommendations) – difference in information type.
  - Providing multimodal cues (audio+visual) versus single modality cues (only audio or only visual) – difference in multimodalities.
  - Providing full account information versus partial summary information (for kiosk) – difference in amount of information

- *A difference in the user's experience (called "dependent variable") can be:*
  - Higher trust – measured by questionnaire ratings of trust in the system on a scale from 1-100.
  - Better performance – measured by response time.
  - Attention – measured by more eye gaze (attention) at agent.
  - Higher trust – measured by percentage of participants who cross the road.
  - Lower trust – measured by questionnaire ratings of trust on a scale from 1-100.
  - Lower trust - measured by percentage of participants who cross the road.

For the difference in the system, please select 2 or 3 "conditions" for the difference. For example, if you select difference in voice gender of the system, your levels are automatically set to be male, female and perhaps an androgenous voice.

However, if you select amount of information, you need to specify what is more or less information in the context of your system. In such a case it should be clear to a designer/programmer that one of your conditions has much more information than the other.
Similarly, if you select "type of audio signal" as your difference in the system, you should not just choose any 2 or 3 sounds you think could be good, but you must explain why each of those sounds could be good and ideally be able to identify three classes of sounds where you pick one out of each. For a robot, this could be: natural sound (more relaxing) vs artificial sound (matches robot better).

- It is best if this "difference" in your system is something that someone in the future who is designing a similar system with the same overall goal as yours would find valuable to have answered (e.g., What kind of information should I display? What sound is good or bad to use? Should I display high-level or low-level recommendations?)
- Do **not** select a graphic design question. A graphic design question is something like: which of these icons is most readable? Is blue or red light better in a car? (If you feel strongly about testing this, contact the tutorial leaders; you must have explicit permission from the instructor to select this type of question)
- Your research topic is to evaluate how a specific design difference in your system affects user experience.
- Select between 2 and 3 conditions
- Your **research question** is something like "Does <"*difference in your system*"> influence <"*difference in user's experience*">?"
- Decide whether to use within- and between-participants design (see lecture of week 6 and/or the book). And how many participants you need in this design.

Option 2:
If you choice to go for option 2, please think about the same points as above, expect for the following:

- Instead of finding a difference in your system, you select 1 condition to be your system and a 2nd condition (the 'control') to be the existing state-of-the-art system that your system would replace. For example, a smart assistant for mental health might have a human therapist as the control; an augmented reality app might select a traditional screen based app as its control.
- The research topic here is to evaluate how the novel part of your system (e.g., that it's augmented reality or that it is a virtual agent instead of a human) affects user experience (e.g, augmented reality is better, or virtual agent results in similar performance as human)
- Your **research question** is something like "What effect does <"*the novel part of your system compared to the control*"> have on <"*dependent variable*"> in <"*application area*">?"

Instructions ethics reflection

User research involves aspects of ethics, as discussed in the lecture of week 7. In this assignment, project group members individually reflect on the ethics of the HCI project according to one aspect in order to show understanding of the subject matter.

Every member of the project group picks a different subject from the list below and writes a section (length: towards approximately 1 page, or longer as needed) addressing that topic. Submit the sections in a combined document; indicate clearly which section was written by which group member. A group of N members picks N subjects from the list.

- **Participant selection.** Cover at least: recruitment procedures; inclusion and exclusion criteria; screening; and representativeness of the participants for your target user group.

- **Informed consent.** Write information brochure for the participant including the consent signature form. In this document, refer to the "task, stimuli, and measures" section for the details on those parts.
- **Data management plan.** Cover at least: which types of data are collected; how much and in what form; whether the data is PII and/or of a sensitive nature; how you will deal with secure storage and deletion of data; who will have access to the data and how you will ensure rightful access
- **Task, stimuli and measurements.** In brief form, providing sufficient information for ethics check and for the prospective participant as a basis to decide upon participation. Note that measurements include automatic measures, interviews, questionnaires, observations, etcetera.
- **Desirability of the product.** From an ethical perspective, reflect upon desirability of the product. Cover at least also the potential for non-inclusivity (excluding certain groups of people intentionally or unintentionally), dual use (ethically problematic use of your product that you did not intend to design for), and data science and privacy related aspects of your product.

REPORT

Include

- Your research topic of the controlled experiment proposal
- Your research question of the controlled experiment proposal, which includes:
  - Your independent variable and dependent variable(s)
- Your study design is a [between-/within-] participants study.
- Motivation for between/within participants
- Explain and motivate each condition and why the design in each condition might be advantageous OR Explain how you chose your control condition and why your system's difference from that control could be meaningful
- Who would be your participants and how many participants are you going to include
- Details on how you would measure your dependent variable(s)
- Your statistical analysis method, so:
  - Independent-samples t-test (between) or paired t-test (within)
  - With correction for multiple-comparisons (if 3 conditions)
- Your combined ethics reflection (clearly which section was written by which group member)

Peer-review

The feedback from the peer-reviews are given by students who do an alternative assignment for the project. If you have questions or doubts on the reviews, please contact your tutorial leader to discuss the review.

Grading Criteria:

Area	Formative feedback
Is the research topic and research questions well and clear described?	
Is the study design well and clear described? Is the study design well motivated? Are the conditions well and clear described?	

Are the measurements of the dependent variables well and clear described?	
Are the participants needed well and clear described?	
Are statistical analysis methods well described and motivated?	
Participant selection is clear described and addressed?	
Informed consent is clear described and addressed?	
Data management plan is clear described and addressed?	
Task, stimuli, and measurements are clear described and addressed?	
Desirability of product is clear described and addressed?	