Lecture 4
Quantitative HCI Research

UNIVERSITY OF AUCKLAND
COMPSCI 705 / SOFTENG 702
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Announcements

- Students must be in groups by Friday
- Group project check-in’s in Friday tutorial
- Will release a schedule for presentations next week
Course projects
Today’s Outline

- Key concepts for quantitative HCI experiments

- Readings
We are curious about impacts on perceived delays

goal: experience an experiment
What did we learn?
Experiments

Control variables

Random variables

Confounding variables
Model of research

Theory

Cause Construct

Operationalize

What you think

Effect Construct

Operationalize

Observation

What you do

What you test

What you see
Do perceptions of delays vary in distracting environments?

Theory

- **Cause Construct**
  - operationalize
  - **What you think**

- **Effect Construct**
  - operationalize
  - **What you test**

Observation

- **What you do**
  - Person A talking and music

- **What you see**
  - Length of perceived delays
Are auditory voice notifications more effective than ambient visual ones in a piloting scenario?

Theory

Medium of stimulus

Cause Construct

operationalize

What you think

Effect Construct

operationalize

Perceptual acuity

Observation

What you do

What you see

Visual dashboard vs. Auditory voice

What you test

Length of response time to notice
Observational Studies

Includes interviews, field investigations, contextual inquiries, case studies, field studies, focus groups, think aloud protocols, storytelling, walkthroughs.

As a result, observational methods achieve *relevance* while sacrificing *precision*.

Observational methods are generally concerned with discovering and explaining the reasons underlying human behaviour. In HCI, this is the *why* or *how* of the interaction, as opposed to the *what*, *where*, or *when*.

The methods focus on human thought, feeling, attitude, emotion, passion, sensation, reflection, expression, sentiment, opinion, mood, outlook, manner, style, approach, strategy, and so on.
Experiments

Referred to as the scientific method. Knowledge is acquired through controlled experiments conducted in laboratory settings.

Must include:

- a manipulated or independent variable
  - in HCI, typically a property of an interface
- a response or dependent variable
  - a property of human behaviour that is measurable

As a result, experimental methods achieve precision while sacrificing realism.

Allows for conclusions about cause and effect.
Statistical significance

- **SE error bars**
  - If bars overlap, any difference in means is not statistically significant (P>0.05)
  - If bars do not overlap, indicates nothing

- **95% CI error bars**
  - If bars overlap, indicates nothing
  - If bars do not overlap, difference is statistically significant (P<0.05)
EXAMPLE EXPERIMENT:

is multitasking good or bad?
media multitasking

definition:

Multitasking

Media Multitasking

state/trait:

State

Trait
What are the effects of multitasking on writing quality?

80 high and low multitaskers sessions in groups of 5
GRE-style essay
irrelevant and relevant links/comments in faux “live forum, synched with another group”
Prompt: “The luxuries and conveniences of contemporary life prevent people from developing into truly strong and independent individuals.”

Write a response in which you discuss the extent to which you agree or disagree with the statement and explain your reasoning for the position you take. In developing and supporting your position, you should consider ways in which the statement might or might not hold true and explain how these considerations shape your position. Use facts and references to support your position.

This is my essay response...
Jacques Ellul
as the Philosopher of the Technological Society

Ernst Jünger once wrote that technology is the real metaphysics of the twentieth century. The irreversible collectivist tendencies of technology, whether it calls itself democratic or authoritarian, were already apparent to him, at the end of World War I. It is this society, in all its forms, which Jacques Ellul, of the Faculty of Law of Bordeaux, seeks to analyze.

Professor Ellul, unlike most of the other surviving leaders of the French Resistance, still functions as a voice of conscience for a France which seems to feel itself in danger of being overwhelmed from literally every point of the compass by the materialistic values of the cold war—consumer society. Greater influence is enjoyed by others such as Malraux and Sartre; but Malraux is in the service of the welfare state (albeit one with Gallic flourishes) and Sartre is growing rich by dispensing absinthe morality in the cellars of the Left Bank. “I sometimes wonder,” says Ellul in a related con-
User posted content

- Top 10 Ways to Smash a Pumpkin (Slow-Motion)
- Sneezing Panda
- Shark vs. Kite Surfer
- These are jokes that are so bad they are good
- My friend sent this to me: Indie artists Organize yourselves and get what you deserve.
- Have you guys seen Maru the cat?
- I love this video. It will brighten up your day if you know who Bob Ross is --

Send content

Comment:  
Link:  http://

Top 10 Ways To Smash A Pumpkin (Slow Motion)
Does multitasking affect writing quality?

Theory

- Cause Construct
- Effect Construct

Observation

- What you do
- What you see

Relevance of distractors and multitasking habits

- Relevant links vs. Irrelevant links and MMI score
- Analytic writing

What you think

What you test

Observation

Essay quality score

operationalize
Results

As expected, the more switches, the less time spent writing ($r = -0.528$, $p < .001$) and the worse the quality of writing ($r = -0.307$, $p = .006$).

HMM spent a quarter of their allotted time following irrelevant links (almost 7 minutes) whereas LMM spent only 4.5 minutes

$F[1,79] = 6.314$, $p = .01$
HMM seduced by distractions but **helped by** relevant links!
is multitasking good or bad?

it’s both.

multitasking can be a good thing!
Course notes
Research questions and hypotheses

1. Identify key variables/constructs in the study
2. The independent variable/construct is manipulated by the researcher and the dependent variable/construct is the outcome which is measured.
3. Operationalise the variables (define and state how you will measure a specific variable)
4. Decide on a direction for your prediction / hypothesis
5. Write your hypothesis in concise, clear, and simple language.
Experimental designs

- "Between subjects" single group of participants is allocated randomly to the experimental conditions.

- "Within subjects" all participants appear in the experimental conditions.

- Matched participants - participants are matched in pairs, e.g., based on expertise, gender, etc.
Experiments vs. usability testing

- Usability testing is applied experimentation to ultimately improve design.

- Experiments test hypotheses to discover new knowledge by investigating the relationship between two or more variables.

- Experiments use statistical methods to test hypotheses.

- Statistical methods test the hypotheses for expected relationships between independent and dependent variables.
Apply this to your project

- What is your main research question?
  - What are your measures?
Design an experiment to test whether videogame players and non-players have different emotional reactions to videogame play?

Justify your operationalization of variables and choice of measures.
What are emotional reactions to gameplay?

Theory

Videogame play

Cause Construct

What you think

operationalize

Observation

What you do

Running game

What you test

Facial expressions
Skin conductance shapes (sensual evaluation instrument)

Emotions

Effect Construct

What you think

operationalize
What’s next

- Lectures tomorrow: Qualitative HCI Research
- Tutorial this Friday: group check-in’s