Current Topics in Media Computing and HCI

L02 Experimental Research: Writing a Protocol

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http://hci.rwth-aachen.de/cthci

Expected Until Now

- Received the "Welcome to CTHCI SS 18" email via L2P

- Read Research contributions in human-computer interaction

- Watched all videos on iTunes Podcasts (RSS) (total 8)

  - HCI contribution types

  - Contribution and benefits statement

  - Experimental approaches

  - Experimental research
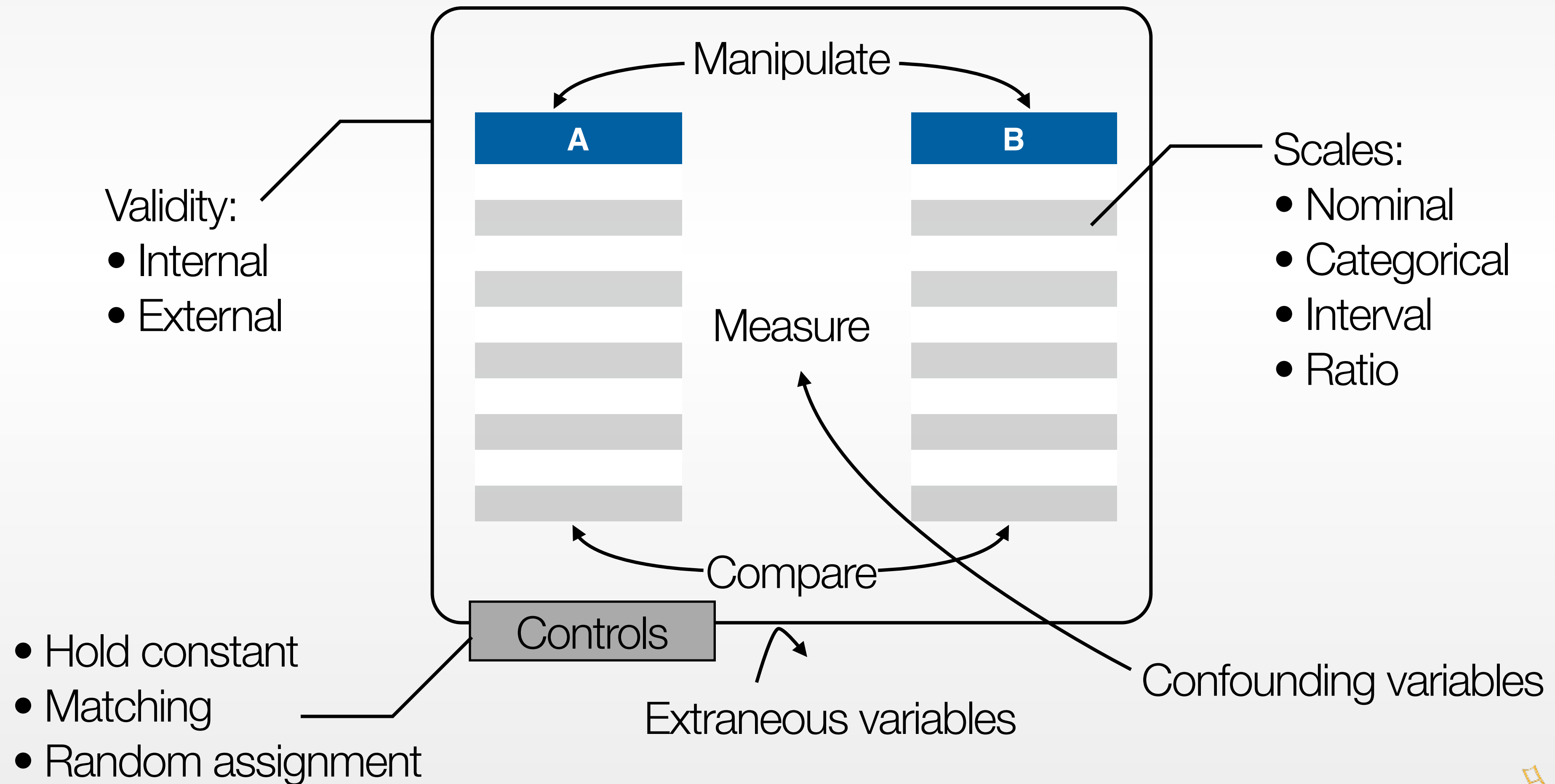
- Formed a team for assignments

Assignment Teams

Last Name	First Name	Team
Shanmuga Sundaram	Harish Balaji	1
Arsenij	Anton	1
Pelinescu	Catalin-Ionut	1
M?nguez Garrigues	Jose	1
Isaenko	Vitalii	1
Ahnvik	Louise	2
Messerschmidt	Moritz Alexander	2
Olbrich	Joshua	2
Röttgen	Michel Maximilian	2
Belova	Anastasiia Albertovna	2
Benscheid	Jan	3
Bayer	Patrick	3
Slupczynski	Michal Piotr	3
Golinski	Tanja	3
Offermanns	Tobias	3
Bayer	Julia	4
Peskovic	Mirela	4
Raouf	Emania	4
Wronska	Ada Magdalena	4
Junga	Marten	4

Last Name	First Name	Team
Lagare	Rakesh Mahaveer	5
Snizhko	Oleksandr	5
Kücükyareli	Tayfun	5
Menon	Vishnu Nandakumar	5
Hupri	Devendra Bharatesh	5
Tavarekere Ramamoorthy	Nagesh	5
Schmidt	Alexander	6
Strüver	Jakob	6
Ho…	Luisa	6
	Patrick	6
Schäfer	René	6
Comanns	Fabian	6

This list is no longer valid!

Basic Elements of Experimental Study

BREAK

Manipulate

A

B

Validity:
- Internal
- External

Scales:
- Nominal
- Categorical
- Interval
- Ratio

Measure

Compare

Controls

- Hold constant
- Matching
- Random assignment

Extraneous variables

Confounding variables

Hypothesis

- Hypothesis

  - A hypothesis is an educated prediction about the relationship between two or more variables. It is a specific, testable prediction about what you expect to happen in a study.

- Example: "Young participants will have significantly better memories than older participants"

- How could we study this?

- Variables?

https://explorable.com/operationalization

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Operationalization

- Operationalization

  - "Operationalization is the process of strictly defining variables into measurable factors. The process defines fuzzy concepts and allows them to be measured, empirically and quantitatively."

- Example: "Young participants will have significantly better memories than older participants"

  - *Young participants:* aged between 16 - 30

  - *better memories:* recall more nouns from a list of twenty

  - *older participants:* aged between 55 - 70

- Final hypothesis "Participants aged between 16 - 30 will recall significantly more nouns from a list of twenty than participants aged between 55 - 70"

User Study Protocol

- A document that explicitly states why a research project is being conducted and how

- Purpose:

  - Clearly state the research question and hypotheses

  - Plan the research procedure in details

  - A guide for all involved personal

  - Monitor research progress

  - Reproducibility

*(O'Brien and Wright, 2002) How to write a protocol

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Protocol Structure:
The Research Problem

- Title - "Evaluating the performance of a new keyboard layout"

- Research problem - "We intend to find if our new keyboard layout performs faster and with less errors than the QWERTY keyboard. The new layout would lead to smaller form factors."

- Context - "There have been many new layouts that appear to perform faster than QWERTY but lead to fatigue [X, Y, Z]"

- Aim (derived from context)

- Hypotheses - "There is no difference in typing speed between the new layout and QWERTY"

Protocol Structure:
The Research Method 1/2

- Independent variables & dependent variables (levels, operational definition, measurement scale and unit)

- Task - "The user will perform a composition task using statements from MacKenzie et al. (CHI 2003). The participant will do the following activities to complete the task…"

- Subjects/Participants (number, gender, age distribution, main characteristics, criteria to include or exclude them)

- Experimental design (within or between groups and how the conditions will be assigned)

Protocol Structure:
The Research Method 2/2

- Experiment setup and/or apparatus (such as hardware or special features in the testing space)

- Experiment procedure (what the experimenter will do to setup the testing space)

- Data analysis methods

- References

- Include images or sketches if informative

- Write this section in future tense

A01: Reverse Engineering User Studies

- Split each team to two smaller teams

- Read the paper's introduction and experiment sections

- Reconstruct the experiment protocol

- How did the paper attempt to establish internal and external validity?

- Peers will evaluate the protocol using a checklist

Validation

- The difference between a claim and a result is validation

- Internal validity: the extent to which you can say that no other variables expect the ones you are studios caused the measure result.

- External validity: the extent to which the results of one experiment can be generalized to the world at large.

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Protocol Evaluation Check List

- Is the research question stated clearly?

- Is there any alternative interpretation of the question?

- Suppose you can accept the stated hypotheses, does it contribute to the understanding of the research question?

- Are variables defined clearly on the operational level?

- Is there more than one possible interpretation for the variables?

- Is the experimental design chosen carefully with consideration of the trade-offs?

- Are the statistical methods specified?

- Are the resources needed to conduct the experiment stated?

- Is the duration of the experiment appropriate?

- Ultimate question: If you had no idea about the experiment before, could you pick up this protocol, set up, and conduct the experiment? (Replicability)

What You Need To Do Now

- Finish and submit A01 via L2P

  - The assignment will also be available for you on L2P

- Required Read:

  - Methodology Matters – McGrath, 1995 (starting from STUDY DESIGN, COMPARISON TECHNIQUES, AND VALIDITY section)

- Recommended Read:

  - Evaluation of Text Entry Techniques – MacKenzie, 2007

  - Developers ask reachability questions – LaToza, T. D., & Myers, B. A., ICSE 2010

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