LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

FAKULTÄT FÜR MATHEMATIK, INFORMATIK UND STATISTIK
INSTITUT FÜR INFORMATIK
ARBEITSGRUPPEN MEDIENINFORMATIK UND
MENSCH-MASCHINE-INTERAKTION

Experiments

Seminar presentation
Katharina Sachmann & Lisa Ulmer
14. May 2014

Media
informatics
munich
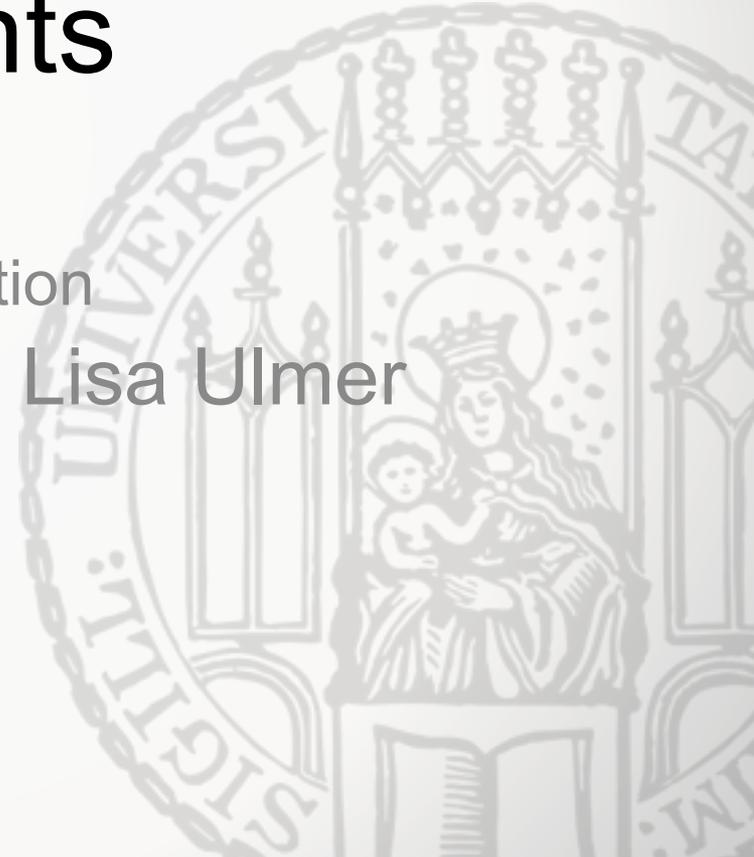
What are experiments?

- Strategy that investigates cause and effect relationships

- Base: hypothesis

- Prove or disapprove a casual link

→ Experimental Research Strategy: Research based on experiments

Terminology

- Hypothesis

- Participant

- Independent variable

- Dependent variable

- Internal and external validity

Types of experiments

- True experiments
- Quasi-experiments
- Single-subject experiments
- Non-experiments

Types of experiments

True experiments

- There need to be at least three things:
  - Two comparison groups (simplest case: an experimental and a control group)
  - Variation in the independent variable before assessment of change in the dependent variable
  - Random assignment to the two (or more) comparison groups
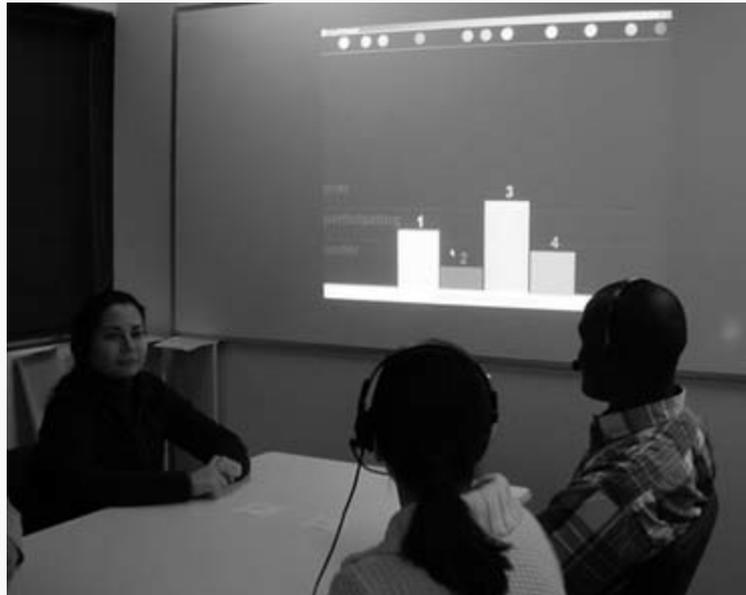
DiMicco, Joan Morris, et al. "The impact of increased awareness while face-to-face." *Human–Computer Interaction* 22.1-2 (2007): 47-96.

Types of experiments

Quasi-experiments

- The comparison group is predetermined
- Social context

Schiavo, Gianluca, et al. "Overt or subtlefi: supporting group conversations with automatically targeted directives"

Types of experiments

Single-subject experiments

- Long period of time

- One individual or situation is exposed to the varying levels of the independent variable

Non-experiments

- No attempt to conform with experimental concerns such as randomized selection of participants or use of control groups

Design of experiments

- Underlying hypothesis

- Independent and dependent variables

- Measurements

- Design aspects/ type of experiment/ methodology

Conduct and analysis of experiments

- Recruit participants
- Conducting the experiment according to the design
- Study protocol
- Evaluate results
- Report results

Criteria for "good" Research and Experiments

- Internal and external validity
- Measurement Validity
- Generalizability
- Causal Validity
- Authenticity

Experimental IS Research

- Often conflicting results due to methodological problems
  - Problems of reliability and internal validity
- Problems
  - Lack of underlying theory
  - Proliferation of measuring instruments
  - Inappropriate research designs
  - Diversity of experimental tasks

Experimental IS Research - Problems

Lack of underlying theory

- Lack of common ground for developing experimental hypotheses and interpreting results

- Independent studies not built upon other work

- → Goal: Building of a framework that defines the boundary for research to be conducted.

Experimental IS Research - Problems

Proliferation of measuring instruments

- Great number of differing measuring instruments, many of which may have problems with reliability and validity

→ Goal: A set of measuring instruments, applicable and easily adaptable to a large number of experiments.

Experimental IS Research - Problems

Inappropriate research designs

- Many experiments include irrelevant dependent variables and are highly simplistic and include only one kind of independent variable

Experimental IS Research - Problems

Diversity of experimental tasks

- Tasks pertain not only to what the participant actually does, but also to the context or surrounding environment in which the activity occurs

→ Internal validity problems

Advantages of experiments

- Well-astablished
- Can prove causal relationships
- Permit high levels of precisions
- Allows researchers to remain at their normal place of work
- Elimination of interference factors

Disadvantages of experiments

- Create artificial situations
- Difficult or impossible to control all the relevant variables
- Difficult to recruit a representative sample of participants
- Ethics
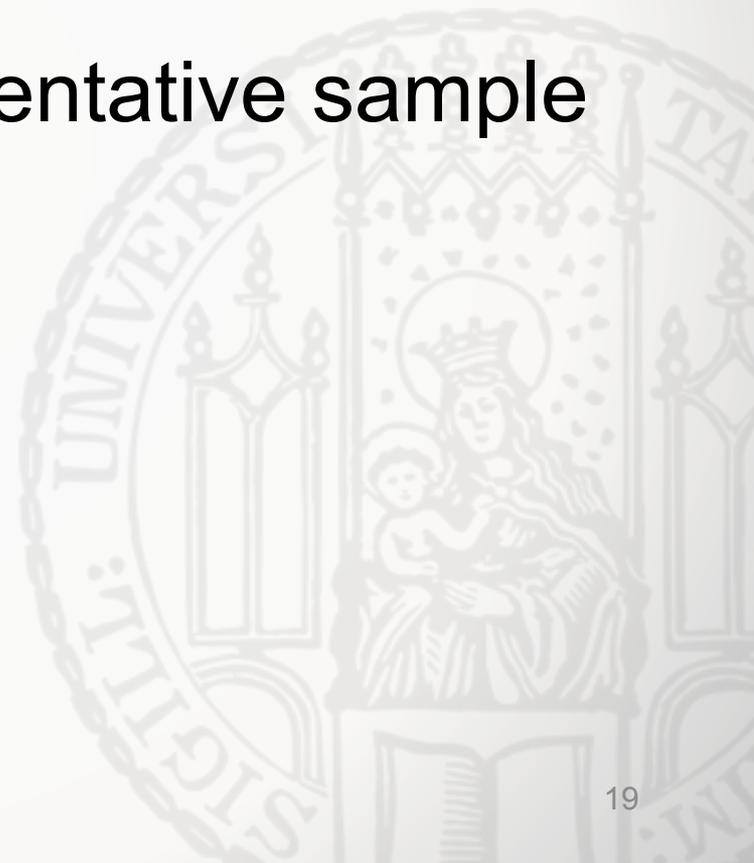
Conclusion

- Good strategy to support research but consider the disadvantages

- Results of experiments should always be interpreted in relation to the experiment

- Important:
  - Do not base your opinion/ work/ research on the outcome of one single experiment
  - Always consider related work

Discussion
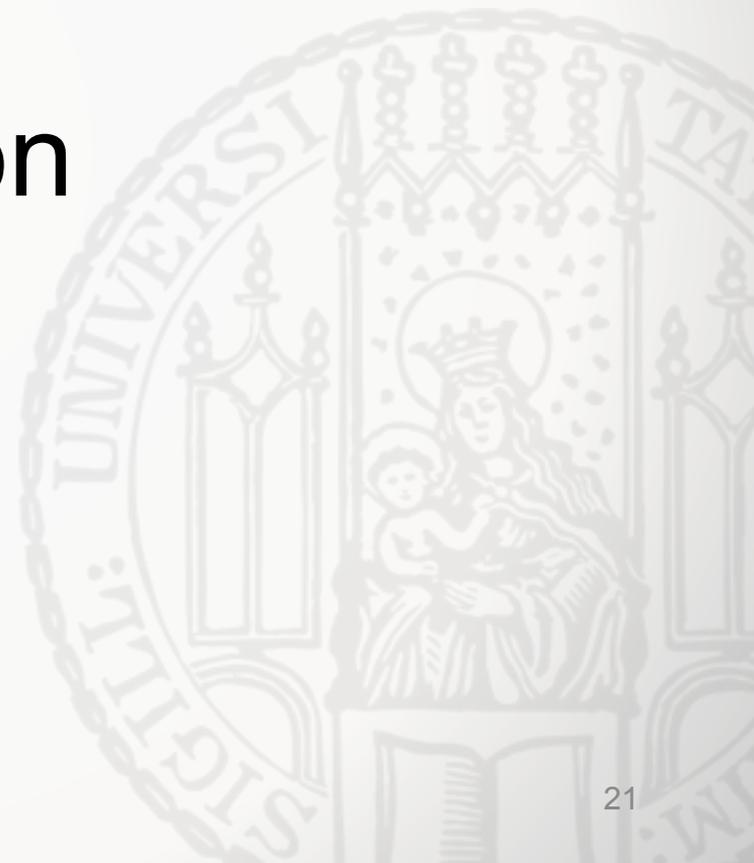
Discussion

- Ethical limits

- Advantages/ disadvantages true experiments vs. quasi-experiments vs. single-subject experiments vs. non-experiments
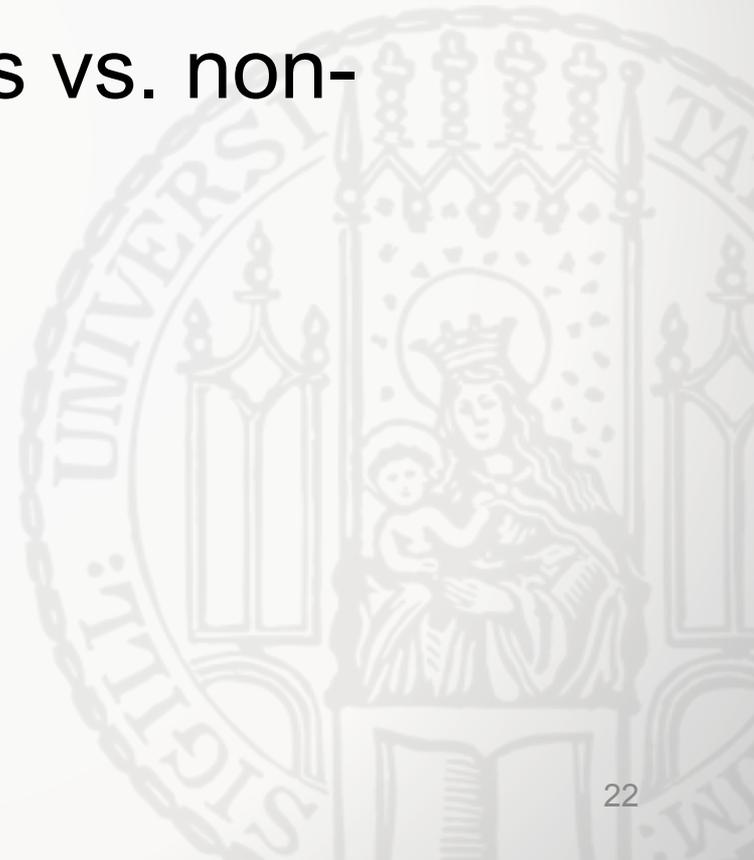
Sources

- Jarvenpaa, Sirkka L., Gary W. Dickson, and Gerardine DeSanctis. *Methodological Issues in Experimental IS Research: Experiences and Recommendations*. MIS quarterly 9.2 (1985).
- MacKenzie, S. *Empirical Research Methods in Human-Computer Interaction*. York University. http://www.yorku.ca/mack/CourseNotes.pdf
- Oates, Briony J. Researching informationsystems and computing, Chapter 9 - Experiments. Sage, 2005
- Schiavo, Gianluca, et al. "Overt or subtlefi: supporting group conversations with automatically targeted directives." *Proceedings of the 19th international conference on Intelligent User Interfaces*. ACM, 2014.
- DiMicco, Joan Morris, et al. "The impact of increased awareness while face-to-face." *Human–Computer Interaction* 22.1-2 (2007): 47-96.
- http://en.wikipedia.org/wiki/Stanford_marshmallow_experiment
- http://psychology.ucdavis.edu/faculty_sites/sommerb/sommerdemo/experiment/types.htm
- http://changingminds.org/explanations/research/design/experiment_types.htm
- http://www.methoden-psychologie.de/buch_fazit.html
- https://www.soc.umn.edu/soc3801w/Lecture%20Slides/lecture_11_sp06.pdf