

Lecture

Empirical Model Building and Methods (Empirische Modellbildung und Methoden)

Dr. Andreas Jedlitschka

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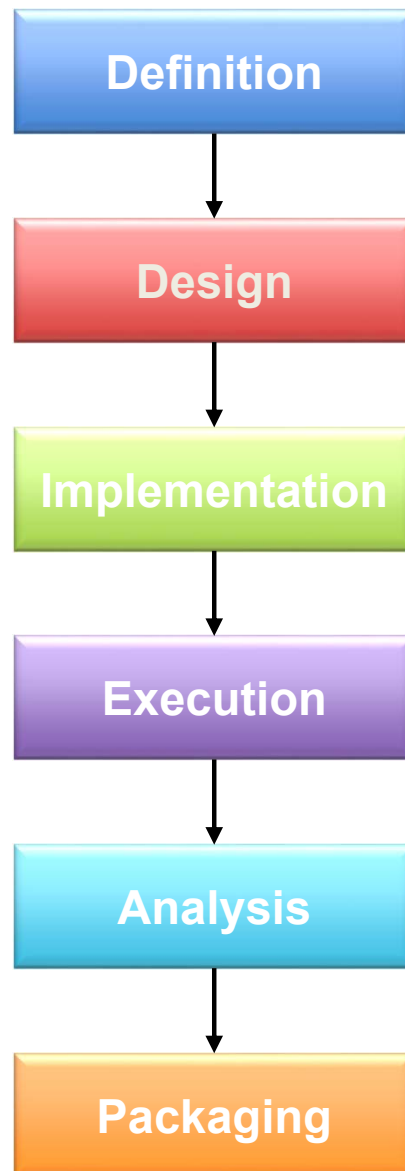
Chapter 3.4 – Implementation

Chapter objectives

At the end of this chapter, you should ...

- ... know the steps for preparing the execution of an empirical study

Empirical process - Implementation



- Prepare material required to conduct the study.
- Review research design

Implementation

3.4.1 Overview

3.4.2 Peer review

3.4.3 Pre-evaluation

3.4.4 Ethical issues

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3.6 Data analysis

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Purpose

- Instantiate the experimental design, so it can be executed

Tasks

- Develop all required instruments used for measurement
 - Questionnaires, templates, and tools
- Prepare all necessary material to be used by participants
 - Guidelines, document templates, specifications, codes and tools
- Peer review of instruments and material
- Perform trial-run (pre-evaluation) for testing the quality of the design, instrument and materials
 - Collect data and feedback
 - Analyze data and feedback
- Improve design, instruments and material
- (If applicable) Train researchers

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Presenting research design, instruments and materials to other experts

- **Scope**
 - Research design and instruments (by other researchers)
 - Material (by domain experts)
- **Perspectives**
 - Researcher responsible for performing the study, e.g. interviewer and observer.
 - Participants
- **Focuses, e.g.**
 - Language and terminology
 - Ambiguity and understandability
 - Completeness w.r.t research questions
 - Principles of good design
 - Ethical issues

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Before the peer review

- Schedule the review and communicate its purpose
- Make the research design, instruments or material available to participants
- Assign a moderator
- Prepare the presentation

During the peer review

- Present research design, instruments or material
- Discuss possible problems and needs for improvements

After the peer review

- Document and analyze feedback
- Define solutions
- Improve research design, instruments or material

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Perform the empirical study as planned with a small sample

- Pre-evaluation sample \neq Study sample !

- Perspectives
 - Researcher responsible for performing the study, e.g. interviewer and observer.
 - Participants

- Focuses, e.g.
 - Consistent administration of treatments
 - Consistent use of instruments
 - Identification of deviations and problems
 - Identification of confounding variables
 - Ambiguity, understandability and completeness of material and instruments
 - Identification of missing data

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Before the pre-evaluation

- Define and contact sample for pre-evaluation
- Prepare location, data collection instruments and material
- Train researchers responsible for performing the study

During the pre-evaluation

- Perform the empirical study as planned with a small sample

After the pre-evaluation

- Document and analyze data
- Document and analyze feedback
- Define solutions
- Improve research design, instruments or material

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Problem definition

- **Relevance**
 - Is the research problem well justified?
 - Have relevant and related previous researches properly being identified/documented/referenced?
 - Does current research contribute to the state of the art and practice?

- **Precision**
 - Is it clear what data should be collected for answering the research question?
 - Does the research question is clear enough to avoid unnecessary intrusion in the participant's life?

- **Impact**
 - Which consequences may the study have for participants?

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Research design (1/4)

- Participants
 - Selection
 - Is it justifiable to expose them to some study?
 - Which consequences may have the selection of participants (within the organization)?
 - No harm
 - Is it possible to collect and keep data anonymous?
 - How will the researcher and the research methodology avoid that participants suffer any disadvantages, harm or risk by taking part in the research?

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Research design (2/4)

- Participants
 - Informed consent
 - Are all participants informed about the research purpose and how the collected data will be used and by whom?
 - Do they have the chance to refuse participating in the study?

Content of an Informed consent

1. Identity and motivation of the researcher(s)
2. Research purpose; but not about assumptions, conjectures and hypotheses
3. Study plan including (at least) number and duration of sessions
4. How data will be collected, storage and used
5. Who will have access to raw data and results
6. Where will results be published
7. Procedures for data anonymity and confidentiality of results
8. Benefits
9. Any possible risks or disadvantages including prevention and mitigation strategies

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Research design (3/4)

- Data collection
 - Disturbance
 - Is the presence of the researcher justified in the field?
 - Being ignorant
 - Do the researchers understand the purpose and scope of the study?
 - Are they prepared to work in the field (practice) with the selected methodology?
 - Being pushy
 - How much should the researcher insist to get answers?
- Does data collection break data protection laws?

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Research design (4/4)

- Data analysis
 - Avoid cemeteries of data
 - Will all collected data be stored?
 - Is all stored data necessary for the analysis?
 - How long will the data be stored?
 - Who will have access to the raw data and results?
 - Will the results be published – and how?

References

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- Wohlin, Runeson, Höst, Ohlsson, Regnell, Wesslén (2012). **Experimentation in Software Engineering**, Springer.