

Systems Engineering Course Research Methods; Assignments

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Abstract

This course teaches research methods for systems engineering and related disciplines, such as industrial economy, engineering management, innovation, and technology management. This field of research needs research methods combining the traditional scientific methods ("hard") and methods from social sciences ("soft").

The course prepares students for their master thesis.

Distribution

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logo
TBD

Colophon

This course is a joint development of

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Research Methods Course Pre-assignment

- Determine a topic for the master project
- Position the topic in its context (e.g. in your company, in ongoing projects)
- Discuss the topic with its stakeholders
- Try to formulate the line of reasoning:
 - problem, goal, envisioned solution, rationale, open research questions

What Specific Problem Triggers this Research?

- Describe what problem triggers your research
- Be as specific as possible, for instance asking:
 - Why, what, how, who, when, where
- If you find it difficult to describe the problem, then start with listing symptoms and challenges, or identifying dilemmas

Problem Exploration

- Who are the stakeholders related to this problem
- What can you ask them to explore the problem
- What can you tell them to introduce your research
- Transform the answers into a script for interviews of stakeholders

Formulate an Initial Set of Research Questions

- Transform the problem statement into a main research question
- What sub-questions will help you to answer the main research question?

Good research questions are open questions, e.g. allowing an answer in terms of how well, how much, etc.

You typically need one main question and 3 to 5 sub-questions.

Make all questions as specific as possible. The main question may invite some generalization.

Feasibility of this Study

- Define the scope of the research, fitting in the available time and effort
- What do you need (e.g. information, contacts, access to people, tools, ...) to perform the study?
- What risks do you see for the research?

Search Literature

- Use the research questions to determine 5 to 10 key words or phrases
- Search for relevant literature
- Identify ~10 potentially interesting papers
- Read the abstracts
- Sort on relevancy, based on abstract
- Read at least one paper

Keep notes on all papers you find

Refine Literature Search

- Refine the 5 to 10 key words or phrases
- Look for literature reviews
- Look for founding papers
- Use these to search for relevant papers
- Order on relevancy based on abstract

Keep notes on all papers you find

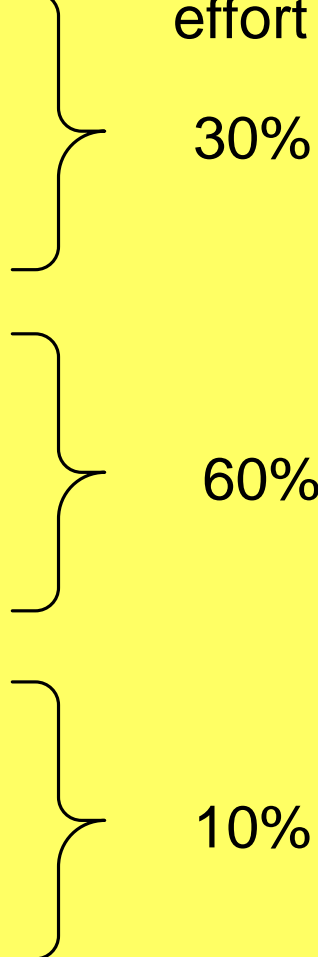
Make an Initial Research Design

- What will you do, when and where with who?
- What will you look for and look at?
- How can you analyse what you did and observed?
- How will this help you to answer the research questions?

Block 1 Post-assignment

- Refine the topic for the master project
- Position the topic in its context (e.g. in your company, in ongoing projects)
- Discuss the topic with its stakeholders
- Reformulate the line of reasoning:
 - problem, goal, envisioned solution, rationale, open research questions

Homework Block 1

- initial interview and/or survey
 - initial problem analysis
 - literature survey Body of Knowledge
 - search secondary data sources
 - read Research Methods paper
 - elaborate research design
- effort
30%
60%
10%
- 

maintain a detailed logbook!

Homework Block 2

- continue literature survey
- write critic of 2..3 papers
- identify challenges and risks in problem definition 15%
- make research design more concrete 30%
- make book plan for the course paper 5%

} 50%

maintain a detailed logbook!

Final Homework

write a course paper, as an academic paper of ca 15 pages, containing:

- line of reasoning
- literature survey
- research design
- expected results

and make

- an execution plan
- a book plan of the final paper