Abstract

The master study Systems Engineering is completed by performing a master project. This document describes objectives and guidelines for the project and the resulting paper or report.
Objectives of Master Project

Apply SE methods, techniques, and concepts in practice and evaluate and reflect on its application, while providing value to the industrial sponsor.
The goals of the Final Project are:

- the students have to show their **professional competence** and the acquired command of the systems engineering discipline by applying it to a selected problem.
- the selected problem has to be **relevant** in the context of the **company** in which the student works
- **competence** is truly put into **practice**.
- to facilitate the students to make the step from “just applying” to **critical evaluation and reflection**.
- to verify that students are capable to operate at **academic level**.
Stakeholders of the Master Project

academic supervisor
coaching
quality
grading

student research paper

master project

company supervisor
coaching
industrial context
usable results

industrial company sponsor

academic

industrial

version: 1.8
May 15, 2021
SETP: stakeholders
Scoping is Crucial

<table>
<thead>
<tr>
<th>What methods, techniques, tools, concepts</th>
<th>Systems Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>What (sub)systems, releases, functions, qualities, aspects, disciplines, technologies</td>
<td>industrial</td>
</tr>
<tr>
<td>What timing of activities and deliverables</td>
<td>planning</td>
</tr>
<tr>
<td>What resources (student time, means, advisors)</td>
<td>planning</td>
</tr>
<tr>
<td>What approach, criteria</td>
<td>research</td>
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</table>
Case Positioning

organizational and operational context

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SETPcasePositioning
Depth, Breadth and Reflection

SE body of Knowledge

organizational and operation context
user needs and system requirements

design and realization

evaluation & reflection

organizational and operational context

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SETPcaseT
Difference Academic and Industrial Goals

- Academic perspective
- Industrial perspective
- Organizational and operation context
- User needs and system requirements
- Design and realization
- Case connect
- SE body of Knowledge
- Reflection
- Depth
- Breadth

Goal

Means
## Process of Master Project

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>Explore company needs and ideas; pick subject</td>
<td></td>
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<tr>
<td>Secure academic supervisor (USN-SE) and company supervisor</td>
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<tr>
<td>Write proposal, project plan; write research approach or abstract</td>
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<tr>
<td>Perform project; involve supervisors regularly</td>
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<tr>
<td>Write paper and iterate with supervisors</td>
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<tr>
<td>Present master project</td>
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<tr>
<td>Grading by academic and external assessors</td>
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<tr>
<td>Graduation</td>
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<tr>
<td>Publication in journal or conference</td>
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</table>
Timeline of the Master Project

Think & explore
Prepare with coordinator
Prepare with academic supervisor
Execute project
workshops
Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun

proposal
- system
- SE need company

abstract
academic approach & contribution

book plan introduction
check structure, style

final paper and presentation

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SETPtimeLineSEMP
tentative dates for milestones for IM students

- **August**: 
  - anticipating in RP how to apply

- **June**: 
  - approach searching a topic

- **August**: 
  - research methods prepare academic project execution

- **September**: 
  - project execution

- **February**: 
  - academic writing

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**Systems Engineering Master Project**

**Gerrit Muller**

**version: 1.8**

**May 15, 2021**

**SEMPworkshops**
Master Project Milestones

- **Proposal**
  - Systems Engineering
  - Need to Company
  - September

- **Abstract**
  - Academic Contribution
  - November

- **Book Plan**
  - Introduction
  - Check Structure, Style
  - February

- **Final Paper/Report**
  - Presentation
  - May

Tentative dates for milestones for IM students
Plan: Simple PERT Diagram

- Control system architecture and design
  - Analyze stakeholders, requirements, analyze system concepts and context
  - 70\%-1.5\% - 1 wk
- Incremental build mathematical models, simulate various inputs
  - "Simple" context model, analyze system impact and adapt requirements
  - 50\%-5\% - ~4 wks
- Analysis and simulation f1
  - 70\%-6\% - ~4 wks
- Analysis and simulation f2
  - ~4 wks
- Verify system performance
  - 20\%-5\% - 20\% - 5\% - 20\% - 11\% - 10\% - 10\% - ~4 wks
- Case (depth)
- System and context (breadth)
- "Meta" reflection and consolidation

Legend:
- 70\%
- 20\%
- 10\%

Write phase report
- 10\%-1\% - 20\%-1\% - 10\%-1\% - 10\%-10\% - 60\%-2\%
- 1 wk ~ 2 wks
- 20\%-2\%
"A good abstract should answer three questions:

What did I do,
what did I learn,
and why is that important?

The key is to identify something or things that can be reused in the future."

Prof. Michael Pennotti, Stevens Institute of Technology
Needed: Time Machine

"fast forward" yourself into the future what do you expect to be the project outcome?

Students write an initial abstract at the start to think through what can happen. At the end of writing the paper, you write the real abstract. The academic supervisor has to accept the initial abstract before starting the project.
### Project Execution

<table>
<thead>
<tr>
<th>Maintain a project log</th>
<th>Data, findings, documents, references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep supervisors involved</td>
<td>Regular presentations, regular meetings</td>
</tr>
<tr>
<td>Time box and iterate</td>
<td>Case system and context, reflection and consolidation</td>
</tr>
<tr>
<td>Early feedback on paper</td>
<td>Start writing early feedback, early work incremental</td>
</tr>
</tbody>
</table>
1. Explanation of the subject; what is the goal of the project?

2. Positioning of the subject in the academic context and literature; what does this paper add to the Body of Knowledge?

3. How is the project performed, what has been done.

4. Evaluation of the project, reflection on the results and the project itself.

5. Paper should be submittable to a refereed conference or to a journal; the academic supervisor may accept a report as well.
1. Clearly introduce the problem that the manuscript is discussing/addressing,

2. Discuss the problem background. That is, discuss the research that has been previously conducted by you or others in the field (or related fields) to solve/address the same or similar problem,

3. Develop a succinct argument for the methods or ideas proposed in your manuscript,

4. Present a clear and understandable justification of why the proposed methods or ideas contribute to a superior or different solution to the problem. A clear statement of your contributions is often crucial to reviewers. Clear specify this when possible. And finally,

5. Discuss the likely future directions of the research being conducted by you (your group).

Final Presentation at the end of the project

- Student presentation of master project
- ~30 minutes presentation
- ~20 minutes questioning by examinators
- ~10 minutes examinators conclude

Committee:
- Academic supervisor
- At least one other academic staff member of SE
- External assessor
- (Optional) Company supervisor or representative
- At least 3 people
## Publication Process

Company screens paper for sensitive or confidential issues, see [http://www.gaudisite.nl/BuskerudSEpublicationProcedureSlides.pdf](http://www.gaudisite.nl/BuskerudSEpublicationProcedureSlides.pdf)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Select target journal or conference, typical choices are:</td>
</tr>
<tr>
<td>INCOSE symposium, CSER, Journal of SE</td>
</tr>
<tr>
<td>Transform the paper into the prescribed format or template</td>
</tr>
<tr>
<td>Review of the paper by USN-SE and Company, adapt paper</td>
</tr>
<tr>
<td>Submit paper to journal or conference</td>
</tr>
<tr>
<td>Process journal or conference feedback</td>
</tr>
<tr>
<td>Final review by company</td>
</tr>
<tr>
<td>Submit final version</td>
</tr>
<tr>
<td>Visit conference and present paper</td>
</tr>
</tbody>
</table>
Third Party Involvement

If a third party is involved, e.g. a customer or supplier, then ask the third party to agree with publication procedure:


and ask who will be reviewer for the third party.
Conventions for Submitting Project Deliverables

Submission instructions

use for all preparation deliverables the following conventions:
filename: SEMP <your name> <subject>.<version>.<extension>
   e.g. SEMP John Student abstract.2.doc

where subject = {proposal | abstract | plan | presentation | paper | ...}

email to: <gerrit . muller@ gmail . com>
subject: SEMP <subject>

"standard" file types preferred, e.g. pdf, jpg, doc, xls, ppt
workshop 1 in June
workshop 2 in August
workshop 3 in September
  Master Project; Writing an Abstract: http://www.gaudisite.nl/MasterProjectWritingAnAbstract.pdf
  Master Project; Execution Phase: http://www.gaudisite.nl/MasterProjectProjectExecution.pdf
Validation of Systems Engineering Methods and Techniques in Industry
Systems Engineering Research Methods (paper)
Published Master Project papers: http://www.gaudisite.nl/MasterProjectPapers.html
Workshop Academic Writing http://www.gaudisite.nl/RPacademicWritingSlides.pdf