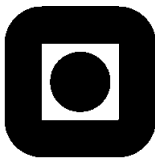


# Your Thesis Title

Mikael Brevik & Øyvind Selmer

## Master's Thesis



Department of Computer and Information Science  
Faculty of Information Technology, Mathematics and Electrical Engineering  
Norwegian University of Science and Technology

January 24, 2013

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# Abstract

10-15 lines on motivation, 10-15 lines on approach, 3-5 research questions (named RQ1, . . .), 3-5 main contributions (named C1, ...) being briefly coupled to the RQi. Start with the abstract ASAP! Keep the abstract to 1 page. **Example from Bjørnson's thesis below** (with smaller font to fit in page):

Reports of software development projects that miss schedule, exceeds budget and deliver products with poor quality are abundant in the literature. Both researchers and the industry are seeking methods to counter these trends and improve software quality.

Software Process Improvement is a systematic approach to improve the capabilities and performance of software organizations. One basic idea is to assess the organizations' current practice and improve their software process on the basis of the competencies and experiences of the practitioners working in the organization. A major challenge is to create strategies and mechanisms for managing relevant and updated knowledge about software development and maintenance. Insights from the field of knowledge management are therefore potentially useful in software process improvement efforts to facilitate the creation, modification, and sharing of software processes in any organization.

In the work presented in this thesis, we have made an overview of empirical studies on the effect of knowledge management in software engineering. We have categorized these studies according to a framework and we report findings on the major concepts that have been investigated empirically, as well as the research methods applied within the field. We have also followed software process improvement initiatives in three companies through action research studies. We examined socialization through a mentor program, and codification of software process through two approaches, one based on the Rational Unified process and one using Process Workshops. Finally we have suggested a revised method for project reviews, which we have shown empirically in a controlled experiment to be more effective than previously suggested methods for our chosen context.

We have classified the work in this thesis within three main themes:

- RT1 Overview of previous research on knowledge management in software engineering.
- RT2 Application of knowledge management to improve the software process through codification of knowledge.
- RT3 Application of knowledge management to improve the software process through sharing of knowledge from person to person

The main contributions are:

- C1 An overview of the research literature on empirical studies of knowledge management in software engineering.
- C2 A method for tailoring the Rational Unified Process to the development process of a software consulting company.
- C3 Improvements of the Process Workshops method by contextualization.
- C4 Improvement of the root-cause analysis phase of the lightweight Post Mortem Analysis for more effective project reviews.
- C5 Proposed methods to increase the learning effect of mentor programs in software engineering.



## Preface

This thesis is submitted to the Norwegian University of Science and Technology (NTNU) for partial fulfilment of the requirements for the degree of philosophiae doctor.

This doctoral work has been performed at the Department of Computer and Information Science, NTNU, Trondheim, with [NN as main supervisor](#) and with co-supervisors [NN1](#) and [NN2](#).

[A section on how the thesis was financed. If you are financed by an external project, make sure to mention it. Also give a possible project number from the Norwegian Research Council or from similar, external funding agencies.](#)



## **Acknowledgements**

Thank everyone you want to thank: advisors, colleagues, companies, friends, family etc.  
Try to keep it short - less than a page.





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# Chapter 1

## Introduction

(6-10 pages) This chapter should contain: Motivation. Context e.g. a R&D project. Problem definition. Research questions. Summary of main results/contributions. Clarification of possible contributions from co-authors. Outline of rest of thesis. We suggest the following subchapters:

### 1.1 Problem Outline

Motivate the thesis, why is your topic an interesting one?

### 1.2 Research Context

In what context have you been working? Was it an externally financed project, did that put restrictions or directions on your research directions?

### 1.3 Research Questions

Name your research questions, outline briefly why these are interesting. Do not go too in depth here, remember it is only an introductory chapter they will be covered more thorough in later chapters.

RQ1:...

RQN:...

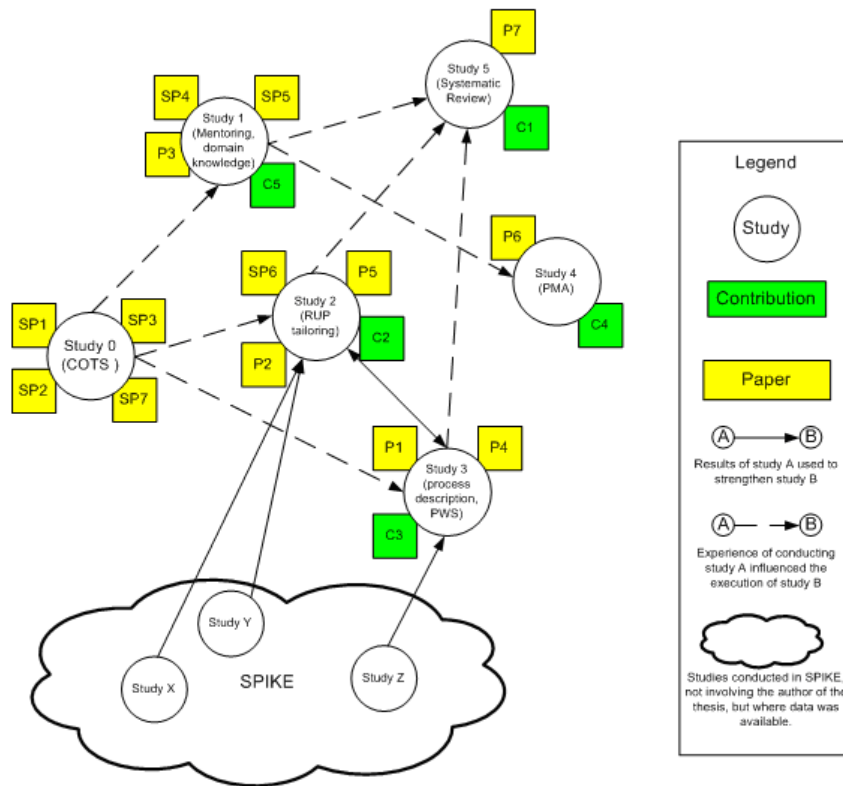


Figure 1.1: Example studies vs. contributions vs. papers [Björnson's PhD thesis]

## 1.4 Research Design

Outline how your research has been happening, figures, timelines and tables that connect papers, research questions and studies are a nice help here to create an overview of the work - see Figure 1.1.

## 1.5 Papers

If your thesis is an article thesis, provide a list of your included papers here with full bibliography. If you want to go more in depth here you could include abstracts, identify their relevance to the thesis and your contributions towards them. Keep in mind you are still in the introduction chapter and you should keep it as short as possible.

## 1.6 Contributions

Identify and list your contributions in the thesis, provide a short description of each contribution.



P1 Finn Olav Björnsen and Tor Stålhamre: "Harvesting Knowledge through a Method Framework in an Electronic Process Guide", Proc. 7th International Workshop on Learning Software Organizations (LSO), Kaiserslautern, Germany, 2005, 107-111 (Post conference proceedings printed in Springer LNAI 3782, 2005, 86-90)

**Relevance to this thesis:** This paper presents our initial findings in study 3, and details how they envisioned their knowledge sharing project. It describes a tool based on the preferences of the developers and input from the research literature. The paper answers research question RQ2.1 and contributes towards contribution C3 and to some degree C2. The study contributes to a small degree towards research theme RT2.

**My contribution:** This paper is the result of a cooperation in SPIKE. I performed half of the interviews during the data gathering and was responsible for performing the analysis of the qualitative data. I was the leading author of this paper.

C1: ...

C2: ...

+++

Research	Question	Contribution	Papers	Focus
RQ1	C1, C2	P4	P7	COTS

Table 1.1: Example of relations

## 1.7 Thesis Structure

Briefly outline the rest of your thesis:

Chapter 2: State of the Art

Chapter 3: Context and Research Design

Chapter 4: Results

Chapter 5: Evaluation and Discussion of Results

Chapter 6: Conclusion

Appendix A: (enclosed, selected papers)

Appendix B: (basic info incl. abstracts of secondary papers)

...

Appendix N: lab results and other data, empirical tools like questionnaires, enclosures.

## **1.8 Examples REMOVE!**

This is an example of a reference [?].

This is a reference to Table 1.1 and to Figure 1.1.

A glossary example which will be included in the glossary at the end of the document:

An abbreviation example which will be included in the list of abbreviations:

# Chapter 2

## State of the Art

(10-20 pages) This chapter should provide an overview of the State-of-the-art/practice: Literature study. Conclude by identifying challenges.

### 2.1 State of the Art Area 1

### 2.2 State of the Art Area N

Describe state of the art for various fields related to your thesis. Remember to describe enough so that your readers have the knowledge to understand your work in the context of previous research, but don't go overboard. Identify challenges in the field that your work addresses.

### 2.3 Research Methods in "Software Engineering" (or likewise)

It is optional if you want this chapter in the State of the Art chapter or in the next chapter. It should outline the research methods you have used and highlight strengths and weaknesses of each one. You could also briefly describe other research methods in your field and relate your research methods to these. This is only a description of the research method. Your application of these for your thesis will be described in the next chapter.



# Chapter 3

## Architecture

(5-8 pages) Here you will present the architecture or model that you have chosen and that is (or will be) implemented in your work. Note that putting algorithms in your report is not desirable but in certain cases these might be placed in the appendix. Code further be avoided in the report itself but may be delivered in the fashion requested by the supervisor or, in the case of masters delivery, submitted as additional documents.



# Chapter 4

## Experiments and Results

This should most likely contain both the results from the classification task and the visualization task.

(8-10 pages) In this chapter you present your results from your work, coming from testing/validating/exploring the theory/research-questions by empirical studies. It can be structured by contributions, research questions, or studies done. Find what suits your thesis and results. Some also like to include the bibliography of the included papers with abstract and identified contributions towards the thesis. Do not use all of the headlines below, if it leads to the same point being said over and over. Find the approach that best makes your point.

Summary of the studies Study 1: ... StudyN)

Overview of the contributions Contribution C1: ... CN

Research questions answered RQ1: ... RQN

Paper Abstracts P1 ... PN





# Chapter 5

## Evaluation and Discussion of Results

(8-10 pages) In this chapter you assess your results. Identify your contributions. Possible theory building (establish cause-effect). Compare to other work described in chapter 2. Suggestions for improvements. Discuss construct-, internal-, external- and conclusion-validity. The major challenge in this chapter is usually which axis you want to structure your discussion around: research questions, contributions or studies. Find what works best for you and your studies.

### Evaluation of research questions

If you did not answer these questions in the results chapter, now is the time to revisit.

### Evaluation of Contributions

How does our contributions fit with the state of the art we described in chapter 2? Do they extend the field? In what way? How do your contributions compare to your research questions? Do you have your own reflections on the contributions.

### Evaluation of Validity Threats

What are the major threats to our research? Mention the major threats like:

- Internal Validity
- External Validity
- Construct Validity
- Conclusion Validity

Note that you might have to discuss these separately for each study, and every validity might not be applicable depending on what research method you have used.

### Reflections on the research context

Optional. But it is often good to reflect on the (project) context of your research and how it has affected you and your research.



# Chapter 6

## Conclusion

(2-3 pages) Time for the conclusion, be short and try to nail down the essence. This should usually list the major conclusions from your previous discussion. There should also be a section on possible future directions for your work in this chapter.

Contributions

Future Work

Concluding Remarks



# Appendix A

## Selected Papers

P1: ...

Normally include the full reference list of each paper. You should also check with your previous publisher if they have any special requests for allowing a reprint of your paper in the thesis, like including original copyright notice or a thanks to the publisher. Your papers may be uniformly formatted for the thesis. However, this may take a lot of effort to go e.g. from two columns to one, so set aside some days for this.



# **Appendix B**

## **Secondary Papers**

If you are not including all your papers from the PhD study in the thesis, list the ones you excluded - each with general info and abstract only.





# **Appendix C**

## **Other Stuff**

Other stuff you want to include for example: collected and processed data, software, empirical tools like questionnaires and interview guides etc. Ÿ but only if needed.