# Some advice for a successful thesis project

*Robert Feldt, Version 1.3, 2006-12-21*

*In this document you find some advice, ideas and recommendations to increase your chance of a successful thesis project. These guidelines combine experience gained from writing, supervising and examining several B.Sc. and M.Sc. projects at Blekinge Institute of Technology, University West and Chalmers University of Technology in Göteborg. The guidelines elaborate on the most common mistakes made by B.Sc. and M.Sc. candidates. It is expected that students who are yet to start their thesis projects will be able to avoid many of these mistakes by following the advice in this document. Note that this document should be read in addition to the course book; the course book contains important information not found here so you need to study them both!*

## Write early, write often, write all the time

The central result from your thesis project is the knowledge you gain and the knowledge you can convey to others. Your main way to do the latter is with the thesis itself; the written account on what you did, why you did it, how you did it, what results it gave and which significance it has in a bigger context.

If you start writing your thesis the last couple of weeks before the final report is due, the result will not be very good. The main reasons are that you will not remember the details of what you did and especially not why you did it. Another reason is that good writing requires good thinking; it's a process of continuous refinement that you cannot rush in a short amount of time. Therefore you must start writing directly when your project starts and continue writing throughout your project. Furthermore, the earlier you start writing, the earlier you have something to show your advisor so he/she can give relevant feedback.

## Focus, focus, focus

It is ok to attack a large problem if you focus your efforts on a small part. If you try to do too much you will not have the time to finish anything (or start anything!) and thus the outcome will not give any new insight or knowledge. Better to focus your efforts on one part and then take it from there; maybe it will even be easier than you thought so that you can expand your scope as you go along.

A clear indication that you are trying to do too much is that you do not know where to start; there are simply too many things to be done for you to choose. Step back, decide on a number of steps to take and then just do it.

## Write a log

During the course of a (technical) project there is a multitude of information that you need to collect. You search research databases and find interesting articles, you read an article and jot down some notes, you get ideas for the design of your solution or questions you need to seek answers to, and you make decisions that affects the final system/outcome/result. A good way to collect all this information is by writing a technical log/diary of your progress.

Writing a log ties in nicely with the advice to "Write early, write often, write all the time". The log can be your main vehicle for writing. From the log you get the "seeds" to go into your thesis. You copy an URL or article reference into the reference list, you copy your notes on a paper into the "Related work" section where you summarize the findings in the paper and how it relates to your work, and you copy design ideas and expand on them to describe your system etc.

The log and the thesis complement each other. While the former documents your progress and thinking with the details of the why and the what, the latter is the polished, refined and distilled final form of your ideas and results. Together they encompass the range of thinking and writing activities you need to go through to succeed. It is important to remember though that the final report can never be in the form of a log/diary.

## Write with the reader in mind

The main problem with technical reporting is lack of clarity. The purpose of a report is to present information and knowledge for someone else. It is your responsibility to present that information as clearly as you possibly can; you should do everything in your power to make things easy for the reader.

Readers are busy. While you write a single report, there are many different things and texts that attract the attention of a reader. Easing the task of the reader should be your main concern.

With readers we do not only mean the examiner and your adviser (although easing their task is of course your main concern ;)). No one should start a thesis project with the goal of only writing for your examiner. Why limit yourself like that? Your goal should be to do a project interesting enough to have a large group of potential readers. So you need to ease the reading for all of them. If your report or thinking is unclear you will have problems attracting broader interest even if your work is of good quality.

## Think logically and clarify your line of thought

Clear writing requires an ability to think logically. You should be able to write down (or map out in a visual form) the ideas, decisions and arguments that constitutes your "line of thought". The line of thought is your essential argument. It should be rational and you should be able to motivate each step of it. If you make it very clear for yourself it will be so much easier to convey it to others.

## Be honest and modest

Apart from the moral and ethical problems with hiding or concealing information or right out misrepresenting facts there is a more pragmatic reason to be honest: readers will be grateful that you point out the problems with your work. By giving a frank and open statement of the weak sides you make it easier to assess the generality of the results. Why would you want to claim your work is stronger than it really is? If you mislead a reader they will eventually find out the problems anyway (and be the more angry with you for making them waste their time). Over hyping will just lead to frustration. Be honest and modest.

## Be bold

Even if you should be modest when you report on your results you should be bold when choosing and defining your project. You know more and can do more than you think! Don't just look at some gurus (be they world-known researchers or a student in your class) and amaze yourself with the quality of their work; focus on your tasks and work hard to do a good job with each one of them. You will probably be amazed with what you can achieve.

## Consider alternatives

There is never a single right way to do something. There are always many alternative ways. Some of them are somewhat better or somewhat worse than the others but there is seldom a single one that is "the best". Readers will think of alternatives when they read your paper and will want to know why you chose to do what you did and the trade-offs it entailed. You should try to anticipate as many alternatives as you can and make sure that you understand your own choices. Not only will it be easier for you to defend your main line of thought later, it will also make it easier to choose a good one from the outset.

## About writing style

The preferred writing is in the passive voice. That is, you do not refer to yourself or to your group. Use formal language. Informal style is not acceptable. The following example is a bad example of writing:

"I decided to study firewalls because security is cool. Therefore I looked at some books on firewalls, read a bit of www.firewalls.org, and configured a couple of MS Windows firewalls in my home computer. It was interesting".

This is sloppy, hard to read and puts the focus on you and your feelings and not on what you have done. Instead this text would be better if written as:

"Due to wide-spread use of computer networks computer security aspects play an important role in the modern society. Firewalls are one of the mechanisms to achieve secure communication and protect network services. The goal of this project is to study the most common firewall techniques and compare their performance. The study is based on several literature and web sources, as well as on a comparison of some firewall installations. The results of the project are the following: … "

## Have a logical structure

Naturally, the report must contain all the necessary parts, such as abstract, introduction, methodology, results, discussion and conclusions. An example of each of those parts can be found in any published scientific article and in courses related to scientific writing.

The report must have a logical structure. This means, that if you e.g. introduce concepts A and B, and concept B is a derivative of concept A, then you must first introduce concept A and then concept B.

This structure should also be present at lower levels. Within one section each paragraph follows from the previous one. Within one paragraph each sentence follows from the previous one etc.

## Use proper references and describe important concepts

Whenever you introduce something new, for example, a fact, a term, or a technique, you either describe it yourself or provide a complete reference to a document that contains a comprehensive and authoritative description of it. Usually, well-known broad terms like deadlock, waterfall process model and middleware do not require references, but a description is necessary. All the important concepts that are crucial to understand your project needs to be defined in the report. The report should be self-coherent, i.e. a reader should not be required to look up other sources to understand it.

## Use a spellchecker

Do not hand in any writing with minor errors that disturbs the reader. The reader will not be able to follow your line of thought and give feedback on the bigger picture since the minor errors will distract. Spelling errors is a typical example that is easily fixed. There are spell checkers in all modern document editors. Be sure to use it.

## Avoid plagiarism

In an undergraduate project it is likely that much of what you do in your project have been previously covered by others. This is an opportunity for you to strengthen your argument, justify your choices and show how your work ties in with the current state-of-the-art. You achieve all this by providing proper and timely references. Occasionally, you can also use a quotation from a text, but only if you explicitly mark it as such and state from which source it is taken. However, quotations are an exception and should be used sparingly.

Whatever you do, **<u>you should never</u>** present other peoples ideas, designs, texts, paragraphs, sentences, tables, diagrams, source code, systems, solutions, results and so on without referencing them. If you make someone

else's work look like your own it is plagiarism and, when detected, will be punished. Copying from others, without giving them proper credit, is considered a very serious academic offence. If you do it, you risk a lot. Not only will you fail the thesis course, you will not be able to finish your degree.

## Intermediate versions of your report

It is absolutely necessary to present written results before every meeting with the advisor. It is not necessary to write an exhaustive report on everything you show at a meeting, especially in the beginning of the project. However, whatever you show must be well motivated and explained. The intermediate versions of your report will grow into your final report so the writing you do for them directly helps to produce a final report of high quality.

Remember, no matter how good you are your skills are worthless if you cannot explain what you are doing, how and why. Written reports are necessary for you and for the advisor/examiner. Your advisor has other students to take care of and the reports are necessary to make a record of your progress. You benefit from the intermediate reports by identifying potential problems in early stages of the project and by preparing yourself for the final report.

## When in doubt or stuck, ask

Don't be stalled for many days because you do not know how to proceed. Think about the problem and clearly map it out so you understand what the problem is. Do your "homework"; try to find information that might help you solve the problem. Use the Internet and the library. But don't be afraid to ask. Your adviser is there to help you. He/she will help you but it is hard for him/her to understand that you are "stuck" and need help. While it is his/her responsibility to help you it is your responsibility to ask. Do that.

## Weekly status emails

To help you work continuously it is a good idea to have at least a weekly contact with your advisor. This can be in the form of an email answering the following questions:

·   What you have done this week?

·   How many words your report currently contain? New and changed since last week?

·   What you plan to do next week?

·   Which, if any, problems you are currently struggling with? What do you need help with?

Your email can be the basis for a short discussion with your advisor and help him/her help you. However, please note that it is up to you and your advisor to decide how and what kind of meetings and contacts you will have. You should decide on this and write it into the thesis proposal.

## Additional information

Some references related to the advice in this text:

·   Katzhoff, S. *Clarity in Technical Reporting*. Langley Research Center, NASA report SP-7010, 2nd eddition, 1964, http://techreports.larc.nasa.gov/ltrs/PDF/NASA-64-sp7010.pdf.

·   *Notes on the structure of a Scientific Paper*. http://www.pronovomundo.com/research/knowledge_base/research_howto/notes_on_the_structure_of_a_scientific_paper.htm

·   Kim Kastens, Stephanie Pfirman, Martin Stute, Bill Hahn, Dallas Abbott, and Chris Scholz (eds). *How to write your thesis*. http://www.ldeo.columbia.edu/~martins/sen_sem/thesis_org.html

And much more information that will help you succeed in your thesis project is available in the course book:

Christian Dawson, *Projects in Computing and Information Systems,* Pearson, 2005, ISBN 0321263553.