Introduction to Research Methodology
An essay

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June 22, 2016

1 Introduction

I have just started my research. For that reason, I will focus in this essay on future research methods and just briefly described how I have worked so far.

2 My research method so far

I have not finished writing any papers yet. The research I do today begin with me and my advisor talking about what we can do. I then try to build an artefact out on thus thoughts. We have also meetings with others in the project and discuss what to do in broader terms. During these meetings, we also try to see if I can use other results from the project in my research.

So far the research I make seems to follow the build, evaluate approach, but I have not done any evaluation yet. The build part is me programming using some standard software engineering principles such as automated testing and continuous integration. For me, the idea of the build phase is to as fast as possible with sufficient quality make an artefact ready to be evaluated.

3 Possible future research methods

The research method I want to discuss in this essay is the *Engineering Research Method*. This is described in the slides Anton and Lotta presented during their talk. The method they presented was the following:

- Identify a problem

- Invent/build/design something

- Evaluate

In the following sections, I will talk about these three points and last about their interconnections.

3.1 Identify a problem

Because I work in an already defined project the bigger problem is already defined. But at the same time, there is an opportunity to identify smaller problems within the larger one. These smaller problems can be solved using the *Engineering Research Method*. Strategies for identifying a problem can be the following:

- *Own imagination* You can come up with new questions by just reflecting using your current knowledge in the domain.

- *Results from prior evaluations* When studying the evaluation from previous iterations of the process, new problems is developed.

- *Discussions in the project* In discussion with other participants in the research project, new questions is formulated.

- *Talking to external sources* Talking to other academics outside the project and people from industry can be an inspiration for finding new problems.

- *Literature review* By study what other people has written in the subject area it is possible to incorporate their findings in new problem formulations.

I think the best questions is generated by a combination of these strategies.

3.2 Invent/build/design something

The design of a solution can be formulated by discussions with the people in the project but also done individually. I think the future build processes will look similar to the current one I use. Maybe the build processes get more influence from standard software engineering principles.

3.3 Evaluate

During the evaluation, depending on the problem we are solving, different aspects of the artefact are evaluated. A list of some of these aspects follows.

- *Performance of the software*, this type of evaluation can be done by measuring, for example, run time and memory use of the program. Then using statistical methods to draw conclusions.

- *Usability of the program*, this can be done by conducting different types of studies, for example, the one used by [1].

- *Utility of the artefact* , for the case of utility I can come up with a few different ways to evaluate this aspect of the software. The first is to have one or more use cases taken from the real world and implementing a solution using the new software and the comparing it with a solution implemented in a traditional way. These results can then be compared in different aspects such as time to develop, code metrics on the implemented solutions and difference in functionality. Another way to evaluate a solution is to let both industry and academia review the artefact and then compile all the reviews. The artefact can be reviewed with different aspect in mind such as feature completeness and estimated usefulness.

3.4 Iteration and interplay

These three phases have according to me to be iterated over. The faster you iterate the faster you know if you are on the right track. The phases also interplay, maybe some new problems are identified during the build phase or at the same time as the problem is formulated you also come up with a solution to it.

References

[1] Jakob Nielsen and Rolf Molich, *Heuristic evaluation of user interfaces* Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, (CHI '90), Jane Carrasco Chew and John Whiteside (Eds.) ACM, New York, NY, USA, 249-256 1990