Learning report

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December 9, 2025

Chapter 1

Introduction

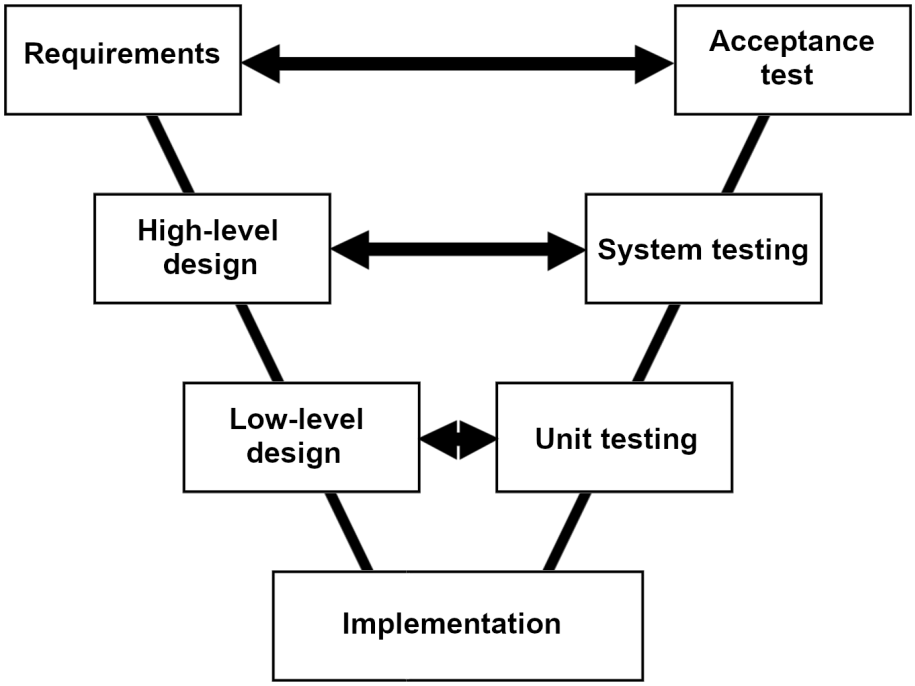

Figure 1.1: V-model

There are various reasons for using the V-model (Figure 1.1) for this project. My previous thesis was based on the waterfall model, but this lead to some outcomes which were not to my liking and which I believe the V-model addresses more than adequately.

As an extension of the waterfall methodology, the V-model offers a linear approach to problems, which suits hardware projects particularly well. Consequently, both models are reliant on well-established requirements and solid planning. Testing is also an important differentiating aspect of the models. Unlike more software-oriented methodologies, the two offer the more straightforward approach of sequential testing, instead of more convoluted alternatives like iterative testing.

While similar, there are differences that make the V-model more suitable for the project. One of its main advantages is the much more thorough testing system. In contrast with the waterfall model, which is entirely linear, the V-model provides verification and validation opportunities. The extra focus on testing is exactly what I previously found lacking in the waterfall model. Another benefit is the slightly less rigid structure of the methodology, as this gives more room for further refinement of the goals and the more involved participation of the client.

Although the V-model is better suited to the project, I found my implementation of it lacked in some regards. For example, it asks for well-defined goals from the start, however I could not define the specifics of the assignment early on, in part due to my limited amount of knowledge I had in the field of quantum physics.

Chapter 2

Self-evaluation

This chapter discusses what I did well during the project and what I could improve on by relating back to the competences that need to be covered during a graduation assignment. Every competence is discussed and the activities related to it are put forward as evidence of its application.

2.1 Analyze

2.1.1 Expectation

Analytical skills have many application and are a vital part of a graduation project. They need to be used to contextualize knowledge, which is the first step to applying it to the particular project. One of the most obvious uses of these skills is when doing the analysis of the requirements, but an analytical approach needs to be taken with the products as well. This also involves relating them back to the goals and requirements, in the reflective manner of the V-Model.

2.1.2 Evidence

The analysis competence played a big part in this thesis. I used it to extract the goals and project boundaries from the requirements, as I have done in all of my previous projects. Furthermore, I had to apply this competence extensively to the photodetector. As there was an existing design that needed improvement, I had to decide which possible upgrades would benefit the client and which were not as useful.

2.1.3 Evaluation

Analyzing various aspects of a project is one of my favorite tasks and I also believe I am quite proficient at it. While I think I delivered on the expectations of the client, I also think there might have been other solutions that, for example, would improve the photodetection circuit even more. A broader analysis would have shown a better overview that showcased more alternatives, but due to the time constraints, I was not eager to spend more time on exploring other options.

2.2 Design

2.2.1 Expectation

Similar to the analyze competence, design heavily relies on previous knowledge. Where they differ is how and what they are applied to. Designing involves the application of theoretical knowledge, in combination with practical guidelines where necessary, in order to come up with a system and predict its behavior. This competence can be applied to tests and measurements as well, because making a standardized routine uses theoretical and practical knowledge much like system design.

2.2.2 Evidence

As the main goal of the project was to develop a photodetector, I spent a lot of time on designing a solution that combined my knowledge of control systems and analog electronics. The different iterations of the system all had intentional design choices behind them, a detailed explanation of which is presented in the technical report. In addition, all tests were also meticulously designed

to measure the metrics that mattered most for the client while also being replicable and following testing protocols.

2.2.3 Evaluation

There are a number of similarities between design and analysis, which is why I think I implemented this competence well. Additionally, design is even more technical, which is why I think it suits me. The main thing I need to improve on, in my opinion, is the scope of considerations for the design. Just like in Chapter 2.1, I believe I should broaden the number of variables I consider during the design process. Currently, I have a very focused approach, which is good for saving time up front, but results in more system iterations and thus more time spent on a single system over time.

2.3 Realize

2.3.1 Expectation

Realization is one of the most practical competences. It is exercised extensively during the implementation and integration phases of the project, which require the application of practical skills and a proficiency at using laboratory equipment. Another important aspect of realization is that it follows the previously-established design.

2.3.2 Evidence

The project had a big focus on implementation. I had to make boards I designed, as well as solder ones that were later put to use in the setup. The integration of the photodetector subsystems was also carried out. Afterwards, it was integrated with the rest of the quantum sensing setup. Lastly, the software component was also realized in line with the competence expectations.

2.3.3 Evaluation

As I mentioned, I worked on realizing both software and hardware solutions for the project, as well as the integration with the other systems of the sensing setup. This process went well, although I saw that there are some areas for improvement. Most importantly, I think I need to invest more effort in honing my practical skills. For example, other students from different projects in the same research group could achieve analogous results to mine, but in a shorter time frame. The theoretical knowledge was not an issue, but applying it was not always as straightforward as I would like it to be.

2.4 Control/Verify

2.4.1 Expectation

Control and verification plays an important role in ensuring the systematic tackling of the project in its various stages. Tight control of activities is needed to mitigate any problems that might arise while working on the project. The verification of results also builds on the control structures by creating a feedback loop, which enables the data-driven management of the project. In particular, this competence is most clearly present in the testing activities.

2.4.2 Evidence

To maintain structure in my work, I documented every stage of the project while I was executing it. This helped me to systematized the work for every individual phase by coming up with the tasks that needed to be completed at the start of a phase. Another benefit of this method of documentation is that the structure of the report often resembles the structure of the working process. Identically, the testing activities also employed a meticulous methodology based on setting and tracking key performance metrics, which were first declared in the report before being implemented.

2.4.3 Evaluation

Over the numerous projects I have done during my degree, I think I have become proficient at controlling the activities of projects. However, during this project I ran into issues that could not be foreseen or avoided, like for example equipment availability. They showed me that I still need to come up with a systematic way of dealing with unforeseen problems. In terms of testing, I feel like I used a solid methodology, but I think the measurements would have been even better if I accounted for and controlled the environmental factors.

2.5 Manage

2.5.1 Expectation

Project management is an extension of the control competence, but on a more general level. Instead of being concerned with the individual stages of the project, this competence deals with organizational matters. Communication with the client and dissemination of information is also a part of this competence.

2.5.2 Evidence

I used several management techniques, among which the daily task sheet is the most important. I used it to keep track of what I did. Additionally, I employed version control software for data integrity, but it also doubled as a system to keep track of what was done and what needed to be done. The company coach had access to both in order to ensure complete transparency. Other more direct methods were more commonly used to communicate with the client. In particular, biweekly meetings were held with other interns from the research group where everyone shared their progress.

2.5.3 Evaluation

2.6 Advise

2.6.1 Expectation

2.6.2 Evidence

2.6.3 Evaluation

2.7 Research

2.7.1 Expectation

2.7.2 Evidence

2.7.3 Evaluation

2.8 Professionalize

2.8.1 Expectation

2.8.2 Evidence

2.8.3 Evaluation

Chapter 3

Self-analysis

Chapter 4

Personal development plan