

Henna Virnes

**TEACHING SOFTWARE TESTING IN UNIVERSITIES OF APPLIED SCIENCES  
AND HOW IT SUPPORTS WORKING AS A TEST ENGINEER**

Diary of a test engineer

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Henna Virmes  
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## ABSTRACT

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This thesis follows a ten-week period of a test engineer. The time for the observations has taken place on 26.9.-4.12.2022. The period is followed with diary entries which are including insights on the work and real-life examples. The thesis reflects the learnt subjects in school and whether the given education is granting enough information for being able to work as a test engineer. Different kinds of books, articles, law acts and internet pages have been used as a source material.

This journey has given a lot of different perceptions to ponder and reflect the work. There are many skills which are universal to many fields in information technology. Communication skills, problem solving skills, patience, willingness to spend hours on a problem, are all needed skills throughout the information technology industry.

The conclusion states the education for test engineers relies a lot on the companies to give the needed tutoring since there is no study path to graduate as test engineer in Finland. Therefore, it seems there is a need for such a program.

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Keywords: Test engineer, Learning diary, Testing

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# 1 INTRODUCTION

This thesis concentrates on following a test engineer's work in a Finnish multinational information technology company. I am going to go through my weekly tasks and some theory related to those. The theory is related to schooling opportunities in testing engineering, skills needed in the work and the principles of software testing. In addition, I am going to open the importance of communication in a big multinational company.

The observation period is ten weeks long and it starts 26<sup>th</sup> of September and ends in 04<sup>th</sup> of December 2022. Weekly entries are written with including some of the tasks done in the week and following the main work. In addition to the tasks written in the diary, the work includes also other aspects, such as daily/weekly meetings, helping colleagues and etcetera. However, it is not feasible to write every single detail to the diary. Therefore, I have picked the ones which are relevant outlooks from the week.

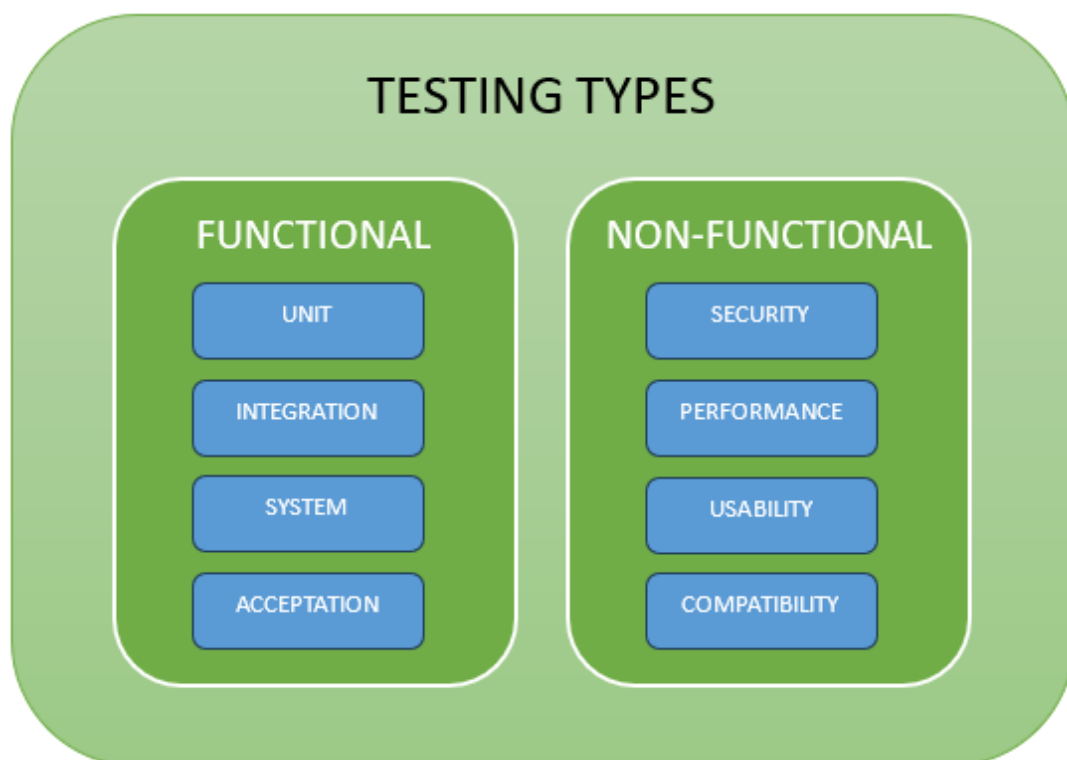
The work has a different aspect to what I have been learning in school. In the university of applied sciences my class has been focusing more on software coding than testing part. The job, however, is mainly testing and reporting those tests. Therefore, the start of the work has included a lot of learning and studying different tools and methods. These tools include both universal software and company's own software which are designed specifically to the company's needs. For example, I have used Excel a lot before and we also use it in our daily work. However, the formulas and use cases are different compared to my previous usage. In addition, the testing software, task management software and physical equipment were all new to me and required some hands-on learning.. In addition, learning the ways of the company has been a part of it too. Fortunately, my team has been amazing, and they are always there for me and my questions. In addition, the immediate supervisor is making sure I am doing good and if there are any concerns.

While working, my main task is to use a test line for testing a specific feature of the software and reporting any faults or defects. After reporting I have a duty to help on the investigation and testing the provided fixes. After the test has passed without any problems, I need to make a test report of the test. Including all needed information to later reproduce the test or check the procedures used.

## 2 THE MEANING OF TESTING

This thesis will ponder whether there should be more studies related to testing. Testing is a big part of a successful software development. In addition to the software having all the functionalities working, the tests can also cover the user perspective and their experience. Software can be flawless, and everything works without any bugs but if the usability is not high enough, the software can be pointless. Different kind of testing exists and the things tested can vary on the need and resources available. In addition, it is important the testing matches the software development life cycle and supports it. (Ratilainen 2020.)

Basically, the testing can be divided into two main categories which are functional testing and non-functional testing. Both categories can be divided into four sub types as it can be seen in the figure 1.



*FIGURE 1. Different types of testing*

Functional testing includes unit testing, integration testing, system testing and acceptance testing. While non-functional testing includes security testing, performance testing, usability testing and

compatibility testing. If one wants to have comprehensive testing one needs to have multiple aspects covered. For example, if testing is done only on performance and usability point of view, everything can work perfectly for the customer, the app is easy to use, and all the systems work as intended. But there can be some serious weaknesses on the security side and that's something nobody wants to have. (SoftwareTestingHelp 2023.)

There are 22 Universities of Applied Sciences in Finland which are operating as public limited companies in the Ministry of Education and Culture's administrative branch. In addition, there are Åland University of Applied Sciences and the Police University College which are not under the Ministry of Education and Culture's administrative branch. (Ministry of Education and Culture 2023.) It is a known case, there is not a possibility to graduate as a test engineer in Finland. Many schools offer some courses of the matter but there is no actual study path to become as a test engineer. (Korpimies 2010 & Tivi 2013.) When taking a closer look at the Universities of Applied Sciences in Finland and their curriculums one can confirm this is the case also in the present day. When looking up each school's offers for educations and their curriculums one can find many of them offering different kind of studies for Bachelor of Engineering in Information Technology. However, it seems none of the education has aim on software testing as it was stated in the articles (Korpimies 2010 & Tivi 2013). Taking a closer look at the different curriculums shows that most of the paths has only one compulsory course whose name is related to software testing. So, there has not been any improvements made, even though this is a known issue.

This is the case also in my studies in Oulu University of Applied Sciences. There was also only one course concentrating on software testing in the curriculum of Information Technology students starting in autumn 2019 (OAMK 2023). However, depending on the teacher there were some aspects of testing handled in other courses and projects on top of that. All in all, the amount of learning about testing was not that high compared for example to coding. One aim for this thesis is to see, whether the information gotten in school has been enough, or should there be more.

### 3 WORK IN GENERAL

The work started in the company already at the beginning of 2022. First months included a lot of different trainings and getting to know to the work and tools being used. Slowly, the theoretical part changed to more practical ways of working. Good and clear induction for the employee is advisable and mandatory in Finnish companies. As the Finnish law occupational safety and health act states there is a section about "instructions and guidance to be provided for employees." This section focuses on the safety aspect of the work and to the employee knowing how to handle the equipment and situations in a safe manner. (Työturvallisuuslaki 738/2002 14§.) In the workplace this had been considered by passing different courses and trainings. For example, completing Electrostatic Discharge Control (ESD) training and safety training are mandatory, before one is allowed to do certain tasks. In addition, some of the trainings are mandatory to go through every three years or sooner if there is a need. This way, the employer knows they employees do not forget the instructions and they can have the updated material.

In addition to safety aspect, induction of a new employee is highly important for everyone. Annina Eklund states in her book that at its best a good induction of the employee can be a great competitive advantage for the company. In addition, it can provide a positive image of the employer to the employee and other interested. (Eklund 2018.) The induction process is different for different companies. Some are focusing more on getting the employee to commit to the company while others value more on getting to know the potential of the new worker. It is important for the company to address what is the goal of the induction to get the most out of it. In addition, it is essential the supervisor or whoever is guiding through the induction, knows the company induction plan and follows it.

In the company, new employees get a so-called buddy who will be their tutor in the beginning. There are certain things which the tutor will go through with the new employee, such as common procedures and the way of working. In addition, the tutor will show the daily work and guide through the day-to-day tasks. The implementation is followed by sending a survey to the new employee after a specific time frame from the start date. In the survey, it is asked whether they have been pointed a buddy and whether they have gone through some specific aspects. At least, this is done in my department. As stated earlier, the induction process may be different between companies, but it can be so also inside the company. When having a large multinational company, it makes



sense the processes may differ in departments, since the needs may also differ. Eklund (2018) explains effective induction process includes a good plan to get to the destination. The key aspects to a good plan are “who”, “what”, “when”, “how” and “to whom”. So, in a big company some of these aspects may be similar but others can have a huge difference. For example, the work and related safety issues have a big difference if one is working in the office at HR while the other is in the electrical laboratory working with high voltage machinery. Therefore, the induction plan and the induction itself may differ as well inside the company. (Eklund 2018.)

Before the thesis process began, there had already been work contract to the company for approximately nine months. Therefore, the main induction process had been completed beforehand. Such as signing a buddy and completing the compulsory courses and trainings. To be fair, there is still a lot to learn and study about the job itself and the company. Mainly because the field is always evolving and growing. In addition, new techniques are invented and discovered.

### **3.1 The team**

The team consists of more than twenty persons of which couple of them work part time. Many of the fulltime employees have been working in the company for years and have wide experience in the field. There is a direct manager and another group leader inside the team. There are other teams doing similar work but are having a little different concentrating area. In the team, approximately one third of the employees are women and it has been said the team has the most women to men ratio compared to the other teams.

When starting the job, everyone in the team was welcoming and easily approachable. They understood all the things were new and there were a lot of questions about the work, tools and everything related. Sometimes there were moments when the work seemed impossible but with the help of a fantastic team, it has been possible to overcome those difficulties. The working environment and the people in it are very important for mental health wellbeing. I share the thought of Pekka Hämäläinen (2005) in his book of “Ihmisen kokoinen työyhteisö”. Where he firmly believes if the employees are feeling well as individuals and they feel treated right and valued as human beings, they will cope better and they are more ready to give their own input for the benefit of the company. In

addition, if the employees feel they are just game pawns without any actual possibilities to influence, the motivation will fade away. (Hämäläinen 2005.)

Hämäläinen (2005) describes when employees are feeling well as individuals and are sensing they are treated and valued as persons they will cope better and are more willing to give their contribution to the company as well. On the other hand, if employees feel they are mere pawns without a real possibility of influence, motivation fades.” (Hämäläinen 2005.) This can be witnessed similarly in many workplaces, hobbies and in everyday life. When the atmosphere is supportive and positively charged people are able and willing to do more. They are more ready to be flexible and give of oneself. If the work itself has many negative aspects, it is more tolerable if the team is supportive and amazing. However, if the work itself would be great but the team is negative and the atmosphere is unbearable, it is hard to enjoy the nice work. Therefore, the positive environment and supportive team is a big part of the wellbeing of the employee.

### **3.2 Hybrid work**

Since Covid-19 a lot of companies have moved to hybrid working or to working completely remotely. On the other hand, some of the companies have also come back to the offices after a period of forced remote work (Kullas 2023). Currently, in the company in question the employees are allowed to choose the work model if it is possible due to the nature of work. Since it is a big corporation where there are different departments, some of the work requires on site presence more than others. Most members of the team have agreed to a flexible work contract which means they work partly from home and partly from the office. To be honest, both have advantages and disadvantages. For example, one study has found there are lower emissions when working from home (Tienari 2023). In addition to the lower emissions, the employee saves the time reserved for commuting. And one of the advantages of working on site is the presence of colleagues. Even though it is simple to chat and call over the internet even when working remotely, it is easier to ask straight in the office. There are several people hearing the question at once and the same question and answer can help multiple persons at the same time. Meanwhile, this might also be disadvantage when one needs to focus and there are some conversations happening in the office.

### 3.3 The actual work

The work is done in a performance entity testing (PET) team and the main job is to be the final gate guard before the software goes to the customer. There are other teams testing the software and its functionality before PET department and each have their own criteria and processes. Usually each of the team members have their own test line where the software can be tested. There are different hardware variations and usually the test lines are not 100% same between the testers. This way there are wider possibilities to conduct the testing.

The process starts by participating to the viewing of the test plan. Later there begins to be this feature related meetings where there are participants from all departments that are needed to participate on the implementation, e.g., developers, planners, and testers. These meetings usually start before testing part has started and lasting the whole process. If there is needed to do some hardware changes on the test line, those are done usually before starting to setup the actual test. However, sometimes this might be done the other way around, for example if the needed hardware has not arrived yet and therefore it is best to start preparing the case in other ways.

Each test case has its own requirements and settings to achieve them. So, next the employee will check the requirements and set the correct conditions, settings, and parameters. If there are any questions, one can ask colleagues, the planner or the feature meeting for help and guidance. Sometimes setting the test line for new tests take more time and another time it is easier and faster. When the test is run it is either passed or failed. If passed, the tester makes the necessary entries to the tools, takes the required logs, and makes a report of the test. If the test case is failed, they need to first investigate if everything is correctly setup and what is causing the failure. If the outcome is, that there is a fault in the software, one needs to check from the tool if the fault is already reported. If yes, they can attach their test case to that. If not, it is their responsibility to make a fault ticket with correct logs and information. Now, investigation will start, and the tester will help the developers by answering their questions, making changes on the settings, and taking new logs. When there is a correction made, the tester will validate or reject it based on the performance. If it is rejected, the investigation will continue until a correct solution is found. If the correction is passed the tester will continue the test case to see whether the whole test case is now also working and passing or if there is another fault seen in later test phase.

The test is set to pass if there are no faults seen and everything goes as it should. For example, this includes having the correct settings and meeting the requirements.. The tester will collect the needed logs and will fill a report of the testing including required information. The pass results and location of the logs and report is also marked to a specific tool where the managers and project owners can see the progress. It is also important to update the tool during the test phase if there is a fault or some delay. Then, the managers can have better understanding of the progress without asking every tester individually.

## 4 WEEKLY DIARY

The work includes different aspects and tasks of which some are more important than others. In the weekly diary, important factors will be raised and discussed of what have been done or what has happened. The diary consists of ten weeks of work and some of the events also have theory related pondering.

As mentioned in the beginning the work in the company has started in the beginning of January 2022. Therefore, when starting this journal, there were ongoing tasks given a couple of weeks before. In the test environment being used, there were no tests ongoing. However, there was another test line available where there was testable content open. Hence, a swap was made. It was supposed to be workload for a couple of weeks and after finished, there was an intention for changing the test environments back. However, there were some issues with starting the tests. The test line itself was not working properly and a couple of days to a week was spent on investigating the root cause to it. Finally, it was found out there was a hardware issue and there needed to be a change made in the test equipment.

### 4.1 Week 1 – Importance of communicating (26.09.-2.10.)

The week started by getting the new piece for the hardware and testing whether the test line would work correctly with it. After having changed the equipment, it seemed the test line worked properly, and it was possible to continue testing. However, there was another problem since the technology needed for these new tests was not working as it should. A couple of days was spent searching for the cause with the persons who were responsible for the technology working. Finally, they believed there would be a need for an update on the server side to have the functionality working properly.

Since performing the update would affect almost everyone's testing, it is hard to find a suitable time for such updates on short notice. Especially, when it was already planned to have a different maintenance break during the weekend. The weekend's break included shutting down all the systems, so it was not possible to execute the server update meanwhile. In addition, since the weekend's service break was already stopping the tests, the stability tests were running day and night to complete tests before the break. Therefore, there was no time for that week to have the server

update. However, there was an agreement for an update break straight after the maintenance break. The goal was to start the update on early Monday morning, so it would be ready at nine a.m. Then, people would be able to start testing almost immediately when coming back to work on Monday.

#### **4.1.1 Communication is the key**

There was a timetable made when each department should have their equipment and tools shutdown. For our department, there was a four-hour period when people needed to shutdown their equipment. Some started the process immediately in the beginning of the given cycle and some planned to use all the time available to continue their testing as long as possible. However, some of the needed connections for testing shut down in the beginning of the given period. Therefore, people were not able to continue testing and some needed to stop earlier than they had originally planned. There were questions if something was shut down too early, if there was some unexpected happening or misunderstanding in the schedule. In the end, it seemed there might have been a misunderstanding in the timetable and communication. Fortunately, after the problems occurred, there was good communication between the different teams and departments to solve the situation and the arisen problems.

There are certain rules on communicating inside the company in the law, such as financial statement and statement of the company's financial state, which are also stated in the book of Yrityksen viestintä (2009). In addition to the compulsory communication a company should have wider interaction besides the necessity. A good internal communication is also a key to work satisfaction. (Kortetjärvi-Nurmi, Kuronen & Ollikainen 2009.) Furthermore, with good internal communication working can be easier since everyone is on the same page and knows what is happening and what is expected. Moreover, good communication can resolve many problems and situations.

#### **4.1.2 Communication for a tester**

As previously discussed, communication is a key element in the workplace. Moreover, when there are many people working on same components throughout its life cycle, the communication is going to have strong impact on the matter. As a tester, one needs to understand the requirements and functionalities to be able to test the software properly. The communication can happen through

different methods: face-to-face, e-mail, chat, zoom-call, etc. In school, communication was emphasised for all the workers, not just for testers. This is a good thing, since clear communication is key for everyone in the workplace.

There is a good example when one teacher gave a good learning experience in the classroom of communication. There was a “customer” coming to the classroom, having an assignment for the lecture. There needed to be a bridge built for toy cars in small groups. There was a budget to buy some materials and time to design and build the bridge. There was a possibility provided to ask further questions of the given task. The assignment seemed quite clear, and everyone started to work on the project. Further on, when the bridges were almost ready, it was realised the bridge should be able to hold much heavier vehicles than was originally thought. It was nothing but a miss in communication. There was not enough communication between the classroom and the customer about the requirements. If the bridge would have gone to the tester without the clearance in communication, they could have also tested it with too little load. The bridge could have passed the tests and then in actual usage, it could have collapsed since there was more weight than in the tests. Therefore, communication is a key in the workplace. Not just for software engineers but to testing engineers and to others.

#### **4.2 Week 2 – Learning at the workplace (03.-09.10.)**

The service break and server update were conducted during the weekend and early Monday morning. Since this kind of large service break includes many elements and departments and has to take many different aspects into account it took some time to get everything working afterwards. Although, this was a normal thing for my colleagues, for me, it was something new. It was interesting to see and experience all the moving parts and discussions related to a big service break. In addition, to see and learn how different obstacles were faced and resolved. Unfortunately, the server update did not resolve the issue hindering the testing. Therefore, there was a need for further investigation.

Besides setting test line back to work and figuring out some errors it was having, there was a training about a tool being used in the testing. Training was mainly about the basics and for people who wanted to have a better understanding of the basic functionalities of the tool. Since the tool

has so many different aspects and dimensions, the training was also recommended to new employees. There were a couple of options to participate, and a decision was made to have the first part of the training on the ongoing week and the second part on the following week. Even though some topics were familiar, there were many new tips and tricks learnt. In addition, there was room for questions during the training to have better understanding of things which were unclear. It is an asset when a company is offering different trainings and possibilities to study for the employees to evolve.

In their book, Kupias and Peltola (2019) are telling ways how to learn on the job. They introduce the 70-20-10 model which suggests how and where the learning is happening at the work. The model states seventy percent is learnt by doing the actual work. Twenty percent is learnt by interacting with others and the final ten percent is acquired by actual trainings and studying. When learning by doing it is important to stop and reflect the things learnt to get the most out of it. It can be also a good idea to write something down, to deepen the learning process. The second step, learning by interaction is also an important part in the job. Especially, when the field is broad and there are multiple persons who are experts on slightly different things it is good to ask their guidance and utilize their knowledge. There can be a lot of information inside a team and for the company it is good the knowledge is shared. In addition, when having own expertise, it is very educational to explain things to others. Finally, even though the trainings are taking only ten percent in this model, it is an important part of the learning. The most important thing with the trainings is the relevancy and goals of it. If the training is not related to the needs on the workplace, what is the point on doing it. Therefore, it is important to reflect how each training would help on the work before taking it. (Kupias & Peltola 2019.)

In the workplace this 70-20-10 model has been taken into action with personal development plans (PDP). Everyone makes goals for the upcoming period on this tool for developing their skills and knowledge. The plan has been divided into three sections as in the model and the employee can design the different steps by themselves or with the manager. For example, on my PDP, one of the goals for the "learning by doing", was to learn by setting up a new test line. On "learning by interaction" part, one of the goals was to learn by mentoring the summer employees. And for "learning by trainings", one of the goals was to go through the mandatory training. After filling the plan, the immediate supervisor will go through it if the plan is realistic or if there are some changes to be



done before accepting. When the plan is accepted, it is then followed and filled along the way. One can set the progress and give comments during the execution.

### 4.3 Week 3 – Project management triangle (10.-16.10.)

Since the actual testing could not yet start because of the different issues faced, there was a meeting concerning the test cases and whether there is a possibility to reduce some of the steps. Naturally, it is important to make sure the tests are sufficient and testing the right things. But if the plan is not doable on the available timeframe, it is important to discuss what to do. Whether to increase the time frame, reduce the testing scope or add working hours by for example making overtime. Every aspect has its own advantages and disadvantages. The outcome of the discussion was to reduce the scope by cutting steps if needed. In this particular case, there will not be as much data received, but the required steps to confirm the software is working are still made.

There is widely used “project management triangle” which helps to explain the constraints of different resources and their impact to the quality. The main idea of the triangle is, to be able to have a good quality project/software/other there needs to be the balance of scope, cost and time as can be seen in the figure 2

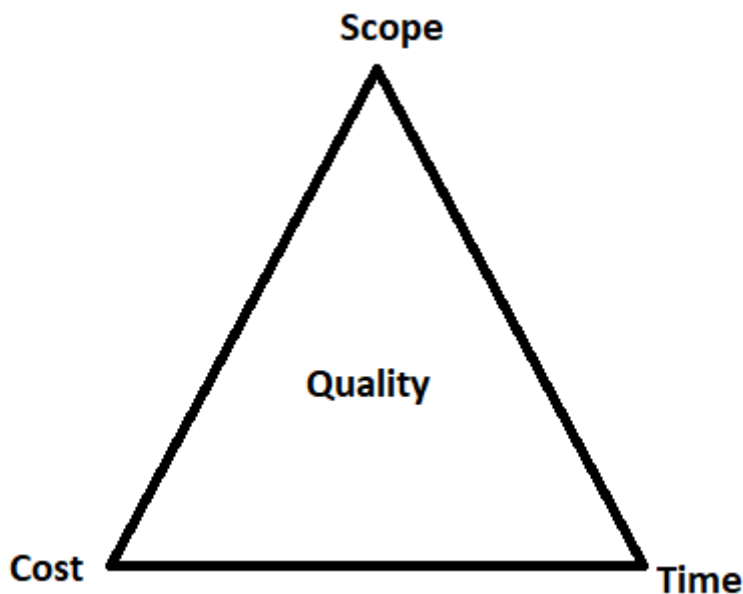


FIGURE 2. Project management triangle

If one or more angles are reduced from the triangle, the quality will have a negative impact. In the ongoing case there was specific hours allocated to the testing as representative of time. Then, working hours can be seen as cost in the triangle and finally the scope was the testing content. In the beginning, before testing, a time frame was agreed on when testing needed to be finished, how many working hours is reserved and the scope of the testing. Since there was now a concern if all the set criteria can be met, one can think if there were too little resources allocated to one or more aspects at the beginning with. The main cause, we needed to start thinking this, was the unexpected problems with the start. But could those have been avoided for example by giving more time on the planning phase and allocating more time on investigating what aspects were needed from the server side. (Coursera 2023.)

The project management triangle is familiar from school. As communication, this is also important for all, not just for some. However, it might be the tester itself who is not part of the decision of these aspects. In bigger companies, there are managers responsible for deciding the timeframe, scope, cost and quality. Therefore, the tester is not planning the project but is going to follow the set guidelines from the manager. It is important the tester is communicating with the manager about the realities of the plan. If they can see immediately, testing is not possible on the given guidelines, they should speak up as soon as possible. Not, when the time is running out and there is still too much content to be tested. Again, communication is the key.

#### **4.4 Week 4 – Adapting when something unexpected happens (17.-23.10.)**

There was again another scheduled service break planned to happen on Monday. It was meant to be done before nine am on the morning. The idea was it would not hinder the testing so much since people usually start their working hours around eight am. There are usually things to do before starting the actual testing process, so the service break ending around nine a clock would be a good time. However, they were facing some issues on the update, and it was not ready when it was supposed to be. The server team needed some help with taking logs and explaining the different behaviours of different actions. Meanwhile, many of the testers were eager to start their testing to be able to stay on schedule. In the end, a back-up server was needed for letting people to start testing while figuring out what went wrong with the update. So, some started testing with the other server, some were helping to investigate the issue, and some were doing other tasks while the main server was not in use. Even though there was some time lost while people could not start

testing because of the issues, it was good there was a backup plan for providing work-around for those who were on a tight schedule.

It is always possible to make plans and schedules, but it is not possible to always predict all potential scenarios. For example, it is reasonable to reserve ten minutes more time for driving to work to take the possible traffic into consideration. But it is not reasonable to reserve two hours more for the trip just in case there is a flat tire and a fallen tree in the road. When there is no sign of those things would be likely to happen. What is more important, is the ability to adapt and to overcome the encountered problems. As in the issues in the previously mentioned updates. Is nothing going to be done since things are not going as planned or is the plan going to be changed and adapted to the new situation? One can help solve the situation, another can start another task and so on.

After overcoming multiple difficulties, it was possible to proceed with the testcases and on Wednesday one of the test cases was passing. There was no need for a fault ticket since someone else had already found the same fault and had it registered. Therefore, the test was marked as failed with the same fault ticket for people to see the fault is seen also in multiple tests and test lines. This is done for the managers and other interested ones to see how widely a fault is seen and perhaps it may also indicate the fault's criticality. If the fault is seen on multiple sites and multiple test lines, the managers tend to escalate the problem and address more people on investigating the issue. Since there was a tight schedule, straight switch to the other two cases which were still on "no run" status was made. "No run"-status means the tester has not started the testing yet. Those tests were meant to be run at the latest on Sunday and there was an agreement to do some overtime to complete them if needed. Finally, in the weekend, the other case was passing the tests while the other was failing. There was an issue with the second case where it was not clear what was wrong. Luckily there are always others who are working on weekends, and there was a possibility to discuss the issue with a colleague. Together the issue was identified to be already reported by other test line, so the ongoing test was added to the fault ticket and the case was failed.

Even though it might seem there is unnecessary repetitive testing, since there are same faults seen in different test lines, that is not the case. There might be some similar steps and functionalities, but the target is usually different. For example, one might have a feature A to be tested together with a feature B while other has a feature C to be tested with the feature B. So, in this case the

main features are different, but both are having their test to be tested with the sub feature B. Therefore, if there is some problem with the behaviour of the feature B, both testers might encounter the same issue. And then the cases might be failing because of the same reason.

#### **4.5 Week 5 – Discussion helps to avoid misunderstandings (24.-30.10.)**

On Monday there was a discussion with the person who was responsible for the fault ticket which was used on the weekend to fail one of the cases. Even though it was assumed with the other colleague there was a same issue on both tests, after the new discussion, it seemed the problems were slightly different after all. In addition, in the end of the discussion there was uncertainty whether the behaviour was even a fault or actually the expected behaviour. In the test case, a feature was enabled, and a test was run multiple times altering the number of users. After, the feature was disabled the same tests with the same number of users was conducted. However, without the feature it was not possible to attach as many users than with the feature. And now there were uncertainty whether it was expected behaviour or a fault. Therefore, a pre-ticket for investigation was made.

A pre-ticket is made instead of a fault ticket when there is some uncertainty with the problem. As, in this case there was doubt whether there was a fault in software or if it was expected behaviour. The next steps depend on the outcome of the analysis of the pre-ticket. For example, there can be a decision to make an actual fault ticket for the software, service ticket for the support or to find another way to continue. In this case, in the beginning it seemed people were a little unsure why the test would not work with the feature disabled. But since there were not any actual requirements stating the case would work without, the investigation took a little longer. Finally, it was possible to attach the same number of users also with the feature disabled with the newer software packets. Thus, there was something wrong with the software on previous weekend, but it had been fixed somewhere during the week.

In the team, there are a few designated planners and some who help with the planning every now and then. They are responsible for making the testcase plans to our system and collecting all the needed information for the plan. This information includes for example the test line being used, targets, parameters to be used, test steps and things what needs to be monitored. There are so

called test branches which includes different features. And those features include different tests, and the tests might have multiple steps. It might be all the test cases inside a feature is meant only for one test line and one tester. Or the feature might have tests for multiple test lines and testers. When a planner has the features test cases planned, they organize a viewing. Before the viewing, they send an invitation including a commentary sheet to all the testers who are going to have tests in the feature, other planners, and other interested parties. Then everyone has a responsibility to look the tests through and make comments if there are any questions, doubts, possible misunderstandings etc before the planned meeting. In the meeting the participants go through the plan with the comments. If there is room for improvements, the planner will make them either immediately or afterwards before the final plan is accepted. This is a good way to see everyone is on the same page with the testing and possible misunderstandings are handled beforehand. There was one viewing on this week to be participated. It is beneficial to be able to ask questions, raise concerns if there are any and make clarifications during these meetings. Sometimes there might be something the planner has not considered, or the tester might understand something differently than originally intended. In addition, when there are multiple persons checking the plan, it is more likely to find the possible mistakes or risks.

#### **4.6 Week 6 – Communication through meetings is important (31.10.-06.11.)**

This week included another viewing. Last week's viewing was about test cases which were going to be on the original test line, and the test cases were planned for me. This week's meeting was about a feature which is planned to be tested by other testers. However, since the test line, which was part of the plan, was currently in my hands, it was important to participate to the viewing. Therefore, there was a possibility to comment the plan based on the test line functionalities and the tests it had ongoing. Since there were some similarities with the ongoing tests and the new coming tests, there was a good impact on the meeting with the comments and insights. As previously said, the participants in the meeting can be also other interested or linked persons even though they are not going to execute the actual tests.

This week, one of the remaining test cases was passing and there was only one failed case left to be retested. The fault seen in the test was already fixed and there was not anything hindering the tests, or at least that was the assumption. Some of the steps were successfully run but then there were some problems faced when adding different kind of users to the test. After some investigation,

a service ticket for the support was made since the server had some issues with handling that type of users. To help the service team, logs were taken, and different scenarios were tested when requested. The issue was unresolved on Friday afternoon, so the investigation from our side was passed to our duty officer for the weekend.

In addition, there was a team meeting this week. Meetings are held frequently and are good opportunities to pass information towards the team or to the manager. Usually, the meetings include information from the above managers. It is important, the communication is clear, and people are getting the needed information on time. In a big company as this, it might be, people would not get the needed information without these team meetings. There is so much information coming for example by email, people might miss some of it. When the point is discussed in the team meeting, it will stick better to people's mind. In addition, people can raise questions and have a discussion on the topic. In addition, if there are any concerns, those can be dealt right away and if needed the team leader can address the issues also to higher managers. Communication is a key to a good working atmosphere.

#### **4.7 Week 7 – Good quality reporting helps in the future (07.-13.11.)**

The issue raised last week was not solved during the weekend, so the investigation continued in this week. The help was provided for the investigation and on Tuesday the issue got resolved. It was possible to continue with the test case, but another issue was faced shortly. First, the investigation started whether there was a software fault, configuration issue, test tool matter or other problem. After examining the problem, it was seen there was a problem with the tester tool and its behaviour. A fault ticket was made to the test tool software's support. Other testers were also having similar looking problems and it was clarified if they were facing the same issue. Some of them had the same problem but others did not, and they needed to continue their investigations. Even though there were an issue with the testing tool, there was quickly a work-around to be used in some of the cases. In the test in hand, it was possible to use the work-around and it was possible to continue the testing. Finally, after all the difficulties, the final test case was passing.

However, the work for the feature was not completely done, since it was time to write the final test reports and transfer the needed logs to proper places. Usually, it is preferred to do this at the same

time or right after executing the test and it is not wise to leave these reports hanging. It is easier to do reporting as soon as. There is no need to think back since things are clear in the mind right after testing. However, in this case the schedule was so tight, there was no spare time for the reports since it was most important to advance the actual testing whenever it was possible. In addition, it is important to write the reports properly so those can help in the future. For example, it is sometimes helpful to check old reports and the results too see, what were the actual results and if there were some deviations. When a report is made with thought, it can also give a lot to the reader in the future. But if the report is done below par, it does not give sufficient information. The required information depends on the project, requirements, and situation as it is said in the book *Software Foundations* (2021). Spillner and Linz (2021) provide a list which aspects are usually included in the reports: tested content, dates, summary, test progress statistics measured against the predefined exit criteria, quality statistics and defect status, risks, deviations from plan, forecast and overall assessment. Even though, these items are usually found on a report, it can have much different content if it seems more fitting. For example, the reader group will impact on the report and its style. If the report is meant for other developers, it can contain more precise and detailed information than when targeted to non-technical audience. The main thing is the report is reflecting the needs and it is meeting the set requirement. (Spillner, Linz 2021.)

The report documents used in the company are there to be able to check what have been tested and how and if there were any deviations. The document should include all the needed steps and information to duplicate the test also later. From the Spillner and Linz list, almost all the points can be identified to be included more or less in the reports written in the team (Spillner, Linz 2021).

Writing good and clear reports is an important part of a testers job. In the Oulu University of Applied Sciences, the importance of reporting has been discussed in the courses and there have been some exercises related to it. However, there could have been more on the topic. For really emphasising how important it is to fill and write the reports with care. When a report is filled precisely, it has much more value to the reader.

#### **4.8 Week 8 – Changing the test lines (14.-20.11.)**

This week a switch back to the original test line was made and the other test line, which had been in use for these last weeks, was given to another colleague. There were some hours spent in the

change process for ensuring people are aware of what has been done, what are the next steps and other important notes concerning the test line. Whenever one is changing the test line, it takes time to get to know it. All lines are a little bit different, and therefore, it takes some time to understand all the quirks of the specific environment. The received test line was already familiar since it was in use before. However, there were some changes done to hardware to match up with the new test cases. Therefore, there were also new things to be known. In addition, there had also been made some preparations to different test cases and a short introduction to those was given. That way, the prepared items and next steps were clearer. There was only one test case left in one feature and three tests left for a different feature. The other feature required some changes to the line and therefore, it was advised to complete the one test before moving to the other feature. For that one test case, the preparations were done and there was an issue needed to be resolved. It was again the question of what caused the test not to pass. Whether there was a fault in the software, some wrong setup or something else. The issue was left unresolved for next week after multiple try outs.

#### **4.9 Week 9 – Patience is gold (21.-27.11.)**

Finally, the last week's issue was resolved, the test was passing, and it was possible to move to the other feature. As told earlier, there needed to be done some changes to the test line for being able to start with the other feature. The previous person responsible of the test line had already made some preparations and the changes were possible to without going to the site. The necessary changes to configuration for the software and for the tester tool was made. In addition, the test itself was prepared. In the end of the week the case was ready to be properly tested. However, the working hours were reduced for the week and the workweek was about to end. There was time to run the test case only once. Since the test was not passing, the investigation of the problem needed to be left for next week.

Occasionally it feels there is not much progress in a week when it starts and ends with the same issue or problem existing. However, there might have been multiple different actions taken to overcome the issue. Sometimes finding the root cause or the fix takes time. What is important, is to be patient and to take some notes for the possible next time. In addition, there is a "tips" folder in the team, where found fixes and tips can be shared. When long hours for resolving an issue have been spent, it is good to provide the solution also for others. Then, the other person does not spend the same amount of time on overcoming the issue on their line.



In the beginning of the year, there was a couple of plans made with the immediate supervisor of what are the goals and targets for this year. In addition, what is done for achieving them. This included also the PDP discussed on second week. Since it was almost the end of the year, there was a final meeting with the manager about the accomplishments and whether the goals were achieved. Sometimes it might feel, there has not happened much but when stopping and reflecting the things done, a huge development can be seen. There is still a lot to learn, mainly since IT is always changing and developing. There needs to be patience, since the field is changing, and things cannot be learnt over night. Nevertheless, there is now much more competency than in the beginning of the work.

#### **4.10 Week 10 – Hardware problem on the test line (28.11.-4.12.)**

The work with the case started in the previous week was continued by investigating the problem, whether it was a software flaw, parameter error, tester tool problem or what. Quite quickly the issue was resolved, and the case was passing the test. It was time to move to the next cases. The test cases needed again some little modification to the test line, so it was practical to start with that. Testing preparations were made on Tuesday alongside some testing. Testing continued on Wednesday and in the middle of the day there was an issue with the hardware. One of the components did not come back after a manual reset. A couple of weeks ago, there was information given if this kind of a thing happens, the testing should be stopped, and an investigation should be started about why the unit did not correctly get setup. Therefore, the investigation started, and a problem ticket to both the software and the hardware engineers was made. These flaws are important to check what was the original reason and whether there is something to be fixed on the software. Since leaking these flaws to customers is quite expensive. As the test line was busy with the component flaw and investigations related to it, the original test case could not be advanced. Instead, some help with the investigations were provided and possible preparations for upcoming tests were done.

#### **4.11 End of the journey**

Even though the work weeks for this thesis has ended, the work is not done. The testing will be continued after it is possible and meanwhile the help with the problem ticket investigations will

continue. Moreover, there can be more preparations for upcoming tests. Even though not all the components of the test line are accessible, there is still plenty of different preparations which can be made beforehand. That way, when the whole test line is again available, the work for the test cases does not need to start from scratch. But the prepared material can be used for getting to actual testing quicker.

When looking back at this ten-week period, there have been both troubles and success on the way. After all, this is expected as a test engineer. Finding the flaws is not always easy but it is rewarding when something gets fixed. Especially when the investigation has taken time. In addition, reflecting these ten weeks and the previous work period, it can be seen the weeks can be quite different to each other. With these ten weeks, there were more of unexpected problems and issues with the server which slowed down the actual testing than there have been with the previous nine months. In addition, most of the problems were not caused by the software, so there was no need to do as many fault tickets to the software team as before. Even though ten weeks is quite a long period, it still can be very different depending on the period. If the reviewing process would have happened on summertime, the issues faced would have been different. However, this does not mean the chosen period was bad but to be aware the work can differ a lot between the weeks and given work tasks.

## 5 DISCUSSION AND CONCLUSION

In the beginning of this thesis, I was curious if I have received enough information in school to be able to work as a test engineer. I have seen, many of the skills needed to be a test engineer, are similar for example to software engineers. For doing a good job, there need to be decent skills on communication, problem solving skills, patience, willingness to spent hours on a problem, etc. So, even though some of the aspects were not discussed in tester point of view in school, I am also able to reflect those from a tester's perspective.

When I was in the interview for the job, one of the recruiters said something about "we don't get competent workforce straight from school, but you need to be ready to continue learning and studying the matter if you start to work with us". Therefore, it is clear, the job market also knows, the lack of the schooling system. Kari Kakkonen, the chairman of Finnish Software Testing Board also acknowledges this issue (Tivi 2013). However, some of the aspects of being a tester is highly dependable on the software to be tested and the tools being used. If I would have studied more about testing in school, would it have been the needed topics for this particular job. Or would I still have had to learn all the same things in the workplace as I needed now. Since there are several different tools and some are specific to the companies.

Since the company acknowledges they do not get ready students from school, but they are ready to educate them themselves, I do not see the small amount of testing courses in school preventing me to becoming a test engineer. However, this takes the responsibility from the schools to the companies and not all companies are able to do it. In addition, if a smaller company wants to invest to a fresh graduated student, what guarantees they have, the graduate will stay after the training period is over. It is not sustainable for the company to spend months or even years on educating the new worker if they leave as soon as they are capable enough. There can be contracts made which require the employee to stay within the employer or to reimburse the cost of education. However, these contracts have their own complications and are not always straight forward and can be unreasonable. (PWC 2019.)

When I applied to the job, I was in the middle of my Bachelor's Degree. My studies were mainly concentrating on software and coding side, not so much on testing and its aspects. Therefore, when getting the job, there was a lot of new learning in the beginning. When starting the thesis process,

I had already been working in the company and in the job for about nine months. During this period, I have gained a lot of experience and understanding of the field. Still, I acknowledge there is much to know more of.

Deciding to do the thesis in the company where I already worked was clear for me. What a better way to increase the understanding by making a weekly diary alongside. It was nice to see, how the different tasks were going. In addition, seeing the amount of time some of the tasks took, was quite surprising.

When looking back, I need to be honest. I should have written notes for the diary more regularly. I noticed my memory did not always put tasks on a correct week. I was certain some tasks were done on the ongoing week, but when looking from a note or a calendar I realized it had happened already a week before. Therefore, when writing the diary, I needed to double check some topics from calendar, tools, or chats. This could have been avoided by making better daily notes. In the future, I am going to utilize this method also in my daily work. Sometimes when there is a problem and I am investigating what is the issue, my colleagues are trying to help by asking me, if I have tried "thing A" already. I might have tested it and I remember it did not fix the issue. But I do not necessarily remember whether it did not have an effect at all or did it make the issue worse. Since, I might have already tried dozens of different things, and some did not do anything, and some made it worse. When making a little note, I could look up from there to see what the actual effect was. And then it would be easier to show the colleague what was the outcome of the suggested improvement.

When learning more on the field, I have realised how much there is still to learn. While the IT field is always developing and moving there is no-one who can master all at the same time. One needs to accept there is always room for improvement. Moreover, one needs to accept there is always some level of uncertainty. I have noticed this by also observing my colleagues. There are a lot of co-workers who have been working more than twenty years in the company or in the field and even they are sometimes unexperienced on the issues what we are facing. This job has taught me to accept my incomplete knowledge and not to frustrate when things are not solved immediately. There might be a day or even couple of weeks, when it feels I have accomplished nothing since I am on the same point as when I started. However, I have maybe tried twenty different things to fix it, of which none just did not work. I am still twenty things ahead than in the beginning even if it

does not always feel so. But after accepting this, it is easier to keep my head high and to continue the investigation.

I am also very grateful to my great team and supportive supervisors. I am aware of the impact of the team and the atmosphere in the workplace has a big impact on individual wellbeing. With the positive environment and helpful colleagues, it is much easier to face all the problems and difficulties on the way. It is also nice to be accepted to being part of the team and to support the team's wellbeing with my own actions and personality.

With all this experience and knowledge gained throughout the process, I am more than happy to continue in this workplace. I have identified issues where I need more studying and learning. In addition, I know where I have already decent base capabilities. The main thing is to trust yourself and not be afraid to ask help when needed.

As a conclusion, I would prefer to have an opportunity in schools for becoming a test engineer. I share the vision, there is a demand for skilled testers (Tivi 2013). Even more, since the software is being all the time more complicated and more comprehensive, there is a need for quality testers. In addition, I am more than happy, there are companies who are willing to hire and educate fresh students, so they can become competent test engineers.

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