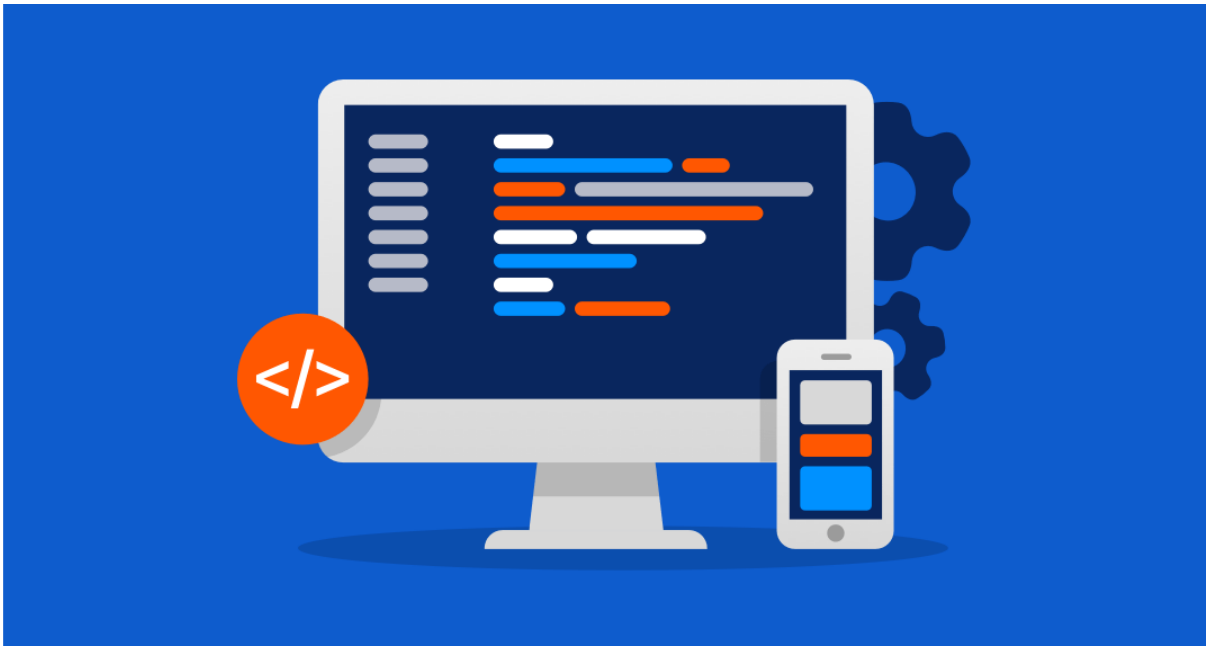
Reader’s Guide for Semester 3 Portfolio



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V9

Version control

Version	Changes
1	Initial version.
2	Added Learning outcomes. Added Overall structure to the document.
3	Added 3.1 Agile. Added 3.2 Full Stack.
4	Added 4 Individual project. Added 5 Group project.
5	Added Links to components and different documents. Added 4.2 CI/CD. Added 4 Progressive Web App. Added 5.1 My Contribution.
6	Added 3.5 Business process. Added 4.1 Design. Added 4.3 Software Quality. Added 4.4 Data Persistency. Added 6.1 Reflection 12-12-2022.
7	Updated 4.2 CI/CD. Updated 4.3 Software Quality.
8	Added 3.3 Ethics and Cultural Differences.
9	Updated 5.0 Group project. Added 3.6 Security research project (DOT). Added 6.1 Final reflection.

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1. Introduction

This document serves as a reader's guide for my semester 3 portfolio of the bachelor's program of ICT. This portfolio contains the products I have created and developed during this semester. These products will prove that I have gained knowledge to fulfil the learning outcomes. This guide provides a summary of the different products, and points to the files which contain the fully worked-out versions of the subject.

This reader's guide is divided into 6 sections, including this introduction. In the second section there will be the learning outcomes explained and where you can find the execution. In the third section, I have short descriptions of all the research I have done this semester. The fourth section is about my individual project, what this is and how I designed/developed it. In the fifth section I will explain the group project and what my contributions where in this project. And at the last section I will reflect on this semester with everything that went well and the things I can still improve on.

2. Learning outcomes

1. Web application

You design and build **user-friendly**, **full-stack** web applications**.**

Clarification:
User friendly: You apply best practices when creating user interfaces and basic user experience testing and development techniques.

Full-stack: You design and build a full stack application using a commonly accepted front end JavaScript framework and back end application implementing relevant communication protocols, persistence of data by usage of ORM and addressing asynchronous communication issues.

Where can I find this:

- 4. Individual Project (WorkoutTracking)
- 4.4 Data Persistency Individual Project

2. Software quality

You use software **tooling and methodology** that continuously monitors and improve the software quality during software development.

Clarification:
Tooling and methodology: Carry out, monitor and report on unit integration, regression and system tests, with attention for security and performance aspects, as well as applying static code analysis and code reviews.

Where can I find this:

- 4.3 Software Quality Individual Project
- 3.6 Security research project (DOT)

3. Agile method

You **choose** and implement the most suitable agile software development method for your software project.

Clarification:
Choose: You are aware of the most popular agile methods and their underlying agile principles. Your choice of a method is motivated and based on well-defined selection criteria and context analyses.

Where can I find this:

- 3.1 Agile
- 5.1 Agile Group Project
- 5.3 Version control and planning Group Project

4. CI/CD

You **design and implement** a (semi)automated software release process that matches the needs of the project context.

Clarification:
Design and implement: You design a release process and implement a continuous integration and deployment solution (using e.g. Gitlab CI and Docker).

Where can I find this:

- 4.2 CI/CD Individual Project
- 4.3 Software Quality Individual Project

5. Cultural differences and ethics

You **recognize** and **take into account** cultural differences between project stakeholders and ethical aspects in software development.

Clarifications:
Recognize: Recognition is based on theoretically substantiated awareness of cultural differences and ethical aspects in software engineering.

Take into account: Adapt your communication, working, and behavior styles to reflect project stakeholders from different cultures;
Address one of the standard Programming Ethical Guidelines (e.g., ACM Code of Ethics and Professional Conduct) in your work.

Where can I find this:

- 3.3 Ethics and Cultural differences

6. Requirements and design

You analyze (non-functional) requirements, elaborate (architectural) designs and validate them using **multiple types of test techniques**.

Clarification:
Multiple types of test techniques: You apply user acceptance testing and stakeholder feedback to validate the quality of the requirements. You evaluate the quality of the design (e.g., by testing or prototyping) taking into account the formulated quality properties like security and performance.

Where can I find this:

- 4.1 Design Individual Project
- 5.2 UX Design Group Project
- 5.4 Software design and requirements Group Project

7. Business processes

You analyze and describe **simple** business processes that are **related** to your project.

Clarification:
Simple: Involving stakeholders, predominantly sequential processes with one or two alternative paths.

Related: Business processes during which the software that you are developing will be used (business processes that the software must support by fully or partially automating them).
or
Business processes needed for the success of your software development project (e.g., product release, market release, financial assurance).

Where can I find this:

- 3.4 Business processes

8. Professional

You act in a **professional manner** during software development and learning.

Clarification:
Professional manner: You develop software as a team effort according to a prescribed software methodology and following team agreements. You are able to track your work progress and communicate your progress with the team.
You actively ask and apply feedback from stakeholders and advise them on the most optimal technical and design (architectural) solutions. You choose and substantiate solutions for a given problem.

Where can I find this:

- 3. Research
- 5. Group Project (World Of Content, Is It Live?)
- 5.5 Professionalism Group Project

3. Research

During this semester, I have performed a lot of research into new technologies, business processes and methods, cultural differences and ethics, security risks and prevention methods. I have worked out these research reports in different documents. Here you can read a short description of the research.

3.1 Agile

In the software development world, companies often use Agile methods. During this semester I have used an Agile method called SCRUM. The SCRUM method is used in my individual project and in the group project. SCRUM is one of many methods that is called Agile. Each method has their benefits to different projects. I have done some research about what Agile is, what methods there are and how they improve the development process.
Agile document

3.2 Full stack

For my own project I have done some research about what backend, frontend, and database I want to use. Also, about thing I didn't know like Progressive Web App. For all these subjects I make a conclusion on what I want to use in my own project. This is useful because I do research about this and then I can implement this immediately in my project.
Full stack document

3.3 Ethics and Cultural differences

In this section, I researched what software ethics and cultural differences are. I also showcase my own experience with ethics and cultural differences. This can be read in this document:
Ethics and Cultural Differences document

3.4 Business process

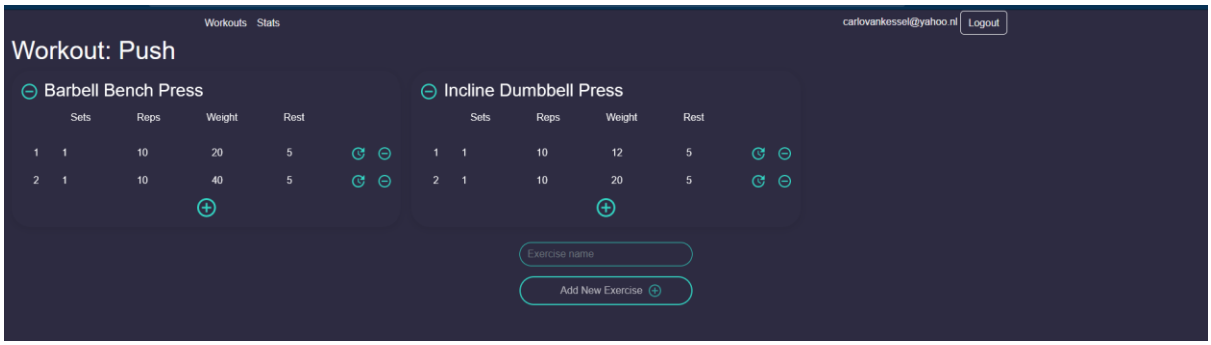
In this section, I researched what a business process is and what its connection is with software development. I created my own business process for making a new feature in my WorkoutTracking website.
Business process document

3.5 Security research project (DOT)

In this research document I learn about the OWASP top 10 security principles and go deeper in the Broken Access Control part and how to prevent this. I also have a small part where I show what I did to prevent this in my own project.
OWASP security document

4. Individual project (WorkoutTracking)

WorkoutTracking is my individual project and is a web-based tracking site. It functions as a simple app on the web. With WorkoutTracking you can easily track your workouts and exercises. You can start a new workout when you want. You can give the workout a name or choose an old workout you have done. When you started a new workout you can add exercises to this workout, and again choose between a new exercise or an exercise you have already done. If you add a new exercise, you can now add sets to your exercise with the number of reps, amount of weight, and rest time for each set. If you chose an old exercise the old data will be visible so that you can easily see what you did last time. If you are done with the workout, you can save it. In your own account you can see with each exercise if you have gone up in weight in a simple graph.



(Image of a workout where users can add, delete, and update exercises and sets)

As of the last semesters I have mostly used C#/.NET. This semester I wanted to learn something totally different: JAVA. With no experience in JAVA, I have researched different types of frameworks. In the end I chose for Quarkus and have watched and followed tutorials to learn this language and framework.
Backend frameworks research

The front end of the application is developed in a JavaScript framework called Vue. In the past I have worked with plain JavaScript but never with any kind of framework. This semester I want to learn this framework and really see the difference in a framework and plain HTML, CSS, and JS.
Frontend frameworks research

Because in the gym you can't really take your laptop with you, I have researched something called Progressive Web App. This means that my website can be used on a laptop but can be installed on the mobile phone. This means that in the gym you can just open the app on your phone and use it as normal. This gives the user a whey better experience for using the application.
Progressive Web App research

For now, I have not been able to implement all the features that I had in mind when producing my design for the workout tracking web/app yet, but my motivation is good, and I want to finish this web/app. So that I can use this for my own workouts and maybe my friend will use it to.

4.1 Design

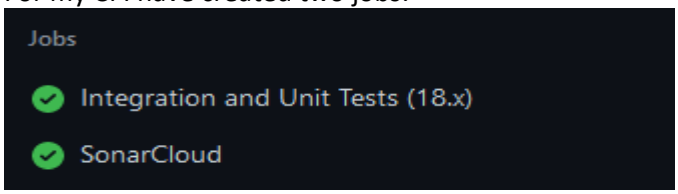
For my application I have made user stories, an C4 model and a web design. These diagrams/models, designs, and additional information about Keycloak and Async can be found in the software design document.
Software design document

4.2 CI/CD

For my application I used GitHub Actions for my CI and CD. GitHub Actions is a feature of GitHub that allows me to automate my software development workflows. This includes tasks such as building, testing, and deploying code. With GitHub Actions, I can set up continuous integration and continuous deployment (CI/CD) pipelines that automatically build, test, and deploy my code each time I push changes to my repositories. This can save time and effort and help ensure that code is always up-to-date and ready for production.

Frontend CI

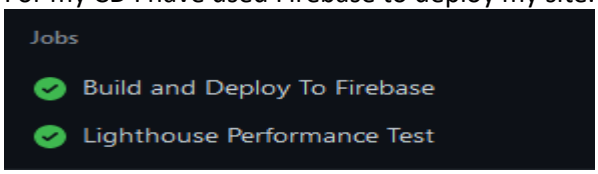
For my CI I have created two jobs:



For each pull request to the main branch this workflow will run. In this workflow the first job runs the unit and integration tests, and the second job runs the SonarCloud scan.

Frontend CD

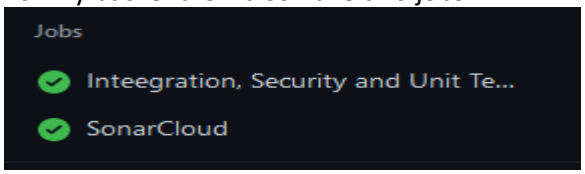
For my CD I have used Firebase to deploy my site. Again, for my CD I also have two jobs:



The first job deploys to firebase. The second job makes a performance test using Google Lighthouse. The result can be seen on: https://workouttracking-wt.web.app/

Backend CI

For my backend CI I also have two jobs:



The first job builds the program. In this build all the unit, integration, and security tests are checked. The second job is the SonarCloud scan.

My CI/CD workflows:

- Frontend CI
- Frontend CD
- Backend CI

4.3 Software Quality

Software quality is a measure of how well a software meets the needs of its users and performs its intended functions. It is important for software to have high quality to be effective and reliable. Good software quality can be achieved through careful planning and testing. I have done research about what kind of tests there are and where they are good for. I did this using the DOT framework.
Software testing document (DOT)

To ensure that the software I wrote for my individual project was of high quality and reliable, I wrote several kinds of tests in my frontend and backend. For a in dept explanation of all my tests you can read my software quality document:
Software quality document (Here I also explain what it does in the CI/CD)

4.4 Data Persistency

4.4.1 ORM

Object-Relational Mapping (ORM) is a technique that allows developers to work with data from a database using an object-oriented programming paradigm. This means that instead of writing SQL queries to interact with the database, the developer can use objects and methods in their programming language of choice to perform the same tasks.

For example, in my case of Java and Quarkus, I use the Hibernate ORM library and the Panache library to manipulate data in my database. I define a class, such as 'WorkoutRepository', that implements the PanacheRepository interface, with the 'Workout' object as a reference. This class would then contain all the properties and methods needed to manipulate the data in the corresponding database table.

(Workout object)

```java
@Entity
public class Workout {
    @Id
    @GeneratedValue(generator = "UUID")
    private UUID id;
    @NotBlank(message = "User email cannot be blank.")
    private String userEmail;
    @NotBlank(message = "Name cannot be blank.")
    private String name;
    @CreationTimestamp
    private LocalDateTime createdAt;

    public Workout() {
    }

    public Workout(String userEmail, String name) {
        this.userEmail = userEmail;
        this.name = name;
    }

    public UUID getId() {
        return id;
    }
    public String getName() {
        return name;
    }
    public void setName(String name) {
        this.name = name;
    }
```

```
    public String getUserEmail() {
        return userEmail;
    }
    public void setUserEmail(String userEmail) {
        this.userEmail = userEmail;
    }
    public LocalDateTime getCreatedAt() {
        return createdAt;
    }
}
```

This approach to working with databases has many benefits, such as making it easier to write and maintain code and providing a more intuitive and consistent way to interact with data.

4.4.2 Database

For my database I have done some research. Last semester I used a MySQL database, this semester I wanted to learn a new database. First, I read about what kind of databases there are and what is best for my project. This can be read in my Full stack research document under the database section.
Database research

5. Group project (World Of Content, Is It Live?)

Is It Live? Is a project founded by World Of Content. World of Content is a managing tool as a company, high market brands fill for each product the specifics in this program. The program makes then an export and sends it to the retailers. The retailers need to add these texts to their website. But after the export is send the brands have no other way of seeing if it is live by looking for every product and texts.

So, they have asked us for help. We need to make a scraper/crawler to get the data from the retailers. When the data is found it needs to be compared to the text that the brand wants the retailer to have on their site. The application needed to be as maintainable and scalable as possible for they have a lot of brands and a lot of retailers.

We split the group into frontend (Ward), Backend (Jorn and Nick), Database (Jarno) and Lambda API (Me). I needed to make Lambda functions so the frontend can call these functions and get data from the database back.

5.1 Agile

In this group project we used Scrum an Agile method. What we have done with scrum and how we have done this is explained in this document:
Agile documentation

5.2 UX Design

For our design we have created a full design of the website. We have had contact with the designers of the customers to make the design as good as possible.
UX Design Figma

5.3 Version control and planning

For our planning we have made the use of GitHub. Here we made our scrum planning. We used GitHub because we could link our repositories to an item, and we could easily use this together as we made different branches in the repositories.
GitHub project board

5.4 Software design and requirements

For our design we together made an ERD, EER, architecture for the software, and architecture for the AWS. These images can be found here: Software design images. For the requirements we consulted as a group with the costumer and came eventually with these: Requirements.

5.5 Professionalism

In a group project you need to have some rules to keep everyone straight and focused on the job that need to be done. We created a contract with some rules we all needed to follow:
Contract

When working with a costumer you always must be professional. We always attended the meetings with the customer as one group and always had a planning to give a structure to our meetings. We always had good feedback and usable feedback.

5.6 My contribution

5.6.1 Scraper with Jarno

To check if something is live on a website you need to scrape the website. This can be done different kind of ways. We divided the group into two groups and research in what kind of ways you can scrape a website. After some research Jarno and I produced something called a search bar scraper. What we did was find the search bar on a shop and type the product. Then we searched this product and clicked on it so that we had the full product page. We did this with an import called selenium which helped us to find the correct elements on the page and click on them.

But there were some downsides on this approach. To search a product, we needed to find the search bar. We did this by text that was inside the search bar like: “What are you looking for?” But not every shop has the same text in the search bar. And if you have five hundred retailers you first need to look up all these texts and then hope they do not change. So, after talking to the other group members we decided to stop trying with this approach because it is not scalable which it should be.
Python search bar web scraper

5.6.2 Lambda Python functions

For our projects we divided the roles. We divided them into frontend, backend, database, and API. I took the role of making the API. We decided that we wanted to use Lambda functions and use a REST API gateway. We host this on AWS because it is free and easy to use for everything that we wanted.

First, we decided that we wanted the functions made with Python this was because the backend was in Python, and we thought that if everything is in python it would be easier. We started with an SQL database and so I started working on the Lambda functions to connect to an SQL database. After trying this on local it worked perfectly with a library. But when I transferred it into AWS nothing worked anymore. This was because I did not have the library installed in AWS. After I fixed this there still was an error, but eventually this was because I needed to have a specific version of the library to make it work with Lambda. After finding the right version everything worked and true the API gateway I could get data from the database.

Then we decided that SQL was not the right way of storing the data. So, we switched to MongoDB. At first, I thought that I was going to find the same difficulties now than before. But this time I knew what I needed to do and came across pymongo. Then everything went quick, and I had the same functions running again.
Python Lambda functions

After the functions where done I wrote API documentation for the functions. In this you can find the URL of the function, which method to use, possibly parameters to use, the content of the response and error messages.
API documentation

5.6.2.1 What could I have done better

For all the functions I did not make the best error messages. Now if you make a request but let us say you did not provide the right JWT token you get a status code 200 which means it has worked but then get the error inside that you did not provide the right JWT token. I should have done more research on how to give a better error message so when there is an error it would give a 400-status code instead of a 200. This way the user of the API would know that there was an error wright away.

6. Reflection

6.1 What did I learn?

In this semester I really wanted to focus on learning new things. This went well, for my individual project I learned about Vue, Quarkus, Rest API, CI/CD, PostgresSQL, PWA, SSO/Keycloak, Docker, and different types of testing. I did a good job on finding new things to learn and challenging myself to learn new things.

For the groups project I learned how a serverless API works, Lambda functions, al little bit of python and MongoDB. But I learned a lot about Agile. The way of working in a group with daily standups really sticking to the Agile way of working with sprint poker, planning, retrospective and peer feedback. Really surprised me in a way that is good.

6.2 What went well?

For me, the learning new things really went well. I wanted to learn new things and I did learn a lot of new things. I found that the communication in the group project went well, and we all had strong positive feedback to each other which I think pushed our project to a new level. I really was glad to see that in the end Tom found our project and group the most outstanding of the class.

6.3 What could be improved?

At the start of the semester, I really struggled with my motivation. I also got this feedback from the group in the first few weeks. This did get me in the end where I really needed to work harder towards my goals. I also struggled with asking what needed to be done to reach my goals. The weekly meeting was good for me to try to work harder and harder. But I still need to ask more questions if I do somethings the wright way, or if I am going in the right directions.

I would also like to improve on my planning and making tasks and sticking to them. I worked with GitHub project and cards, in the beginning I did not really used this and did not really specify what I needed to do. Further in the semester I started to use this good, and I started to work harder because of this.

All these problems I want to change in the fourth semester immediately. I start with making a planning in GitHub. When I have this planning, I get a structure on what to work on, this helps me improve my motivation in the first few weeks. I still need and want to learn a lot more in the next semester and I am really excited to specialize myself in a direction.

6.4 Final reflection

6.4.1 Web Application

Rating: Proficient
Why: For my application I used a backend Rest API and I have made an interacting frontend. I can explain my code and can easily add new features to my project which I want to do in my spare time. So, that I can use my own program in the gym.

6.4.2 Software quality

Rating: Proficient
Why: in both my frontend and backend I created multiple tests like unit, integration, security, performance, end-to-end, and stress tests. I can explain all of these and show where I created them. At first, I thought why we need so many different tests but now I see that when making an application you want to have a secure and working pipeline/code.

6.4.3 Agile method

Rating: Proficient
Why: For my individual project and for the group project we used the SCRUM method. In the group project you can really see the benefits of Agile and I really liked working this way. It comes with simple but efficient ways to know what others are doing and give good feedback to each other.

6.4.4 CI/CD

Rating: Proficient
Why: I implemented CI/CD in my frontend and only CI in the backend. In these I added almost all my tests. End-to-end testing, I could not get to work because of a Docker problem but this was also a learning phase and I failed which is not bad. The CD still deploys my application to firebase and tests the rest of my application. I did not implement my load tests because then my CD would take 30 minutes.

6.4.5 Cultural differences and ethics

Rating: Proficient
Why: Since the last time I really worked on this learning outcome. I added my personal experience and what I do to enhance the ethics in software. When working in a team of different cultures you always need to take these norms and values into account.

6.4.6 Requirements and design

Rating: Proficient
Why: In our group project we together with the stakeholder made requirements. We then during the sprint reviews always got great feedback from the stakeholder and could implement this feedback in out project. When the designers of the company helped us with the design it was helpful and we in the end had a great design.

6.4.7 Business process

Rating: Proficient
Why: for my individual project I created a business process which was just for the developers but can also be a process that can get more efficient. In our group project we created another business process where a costumer uses the application. After the research and making of these business process I could really see the benefits of this. Not only for the customer but also for the developer to get things clear and see if the business process improves over the developing period.

6.4.8 Professional

Rating: Proficient

Why: for our group project we behaved professional to the stakeholder. When there was a college of the stakeholder speaking English, we switched the presentation to English which was a switch in the beginning but not a problem. As a group we had made a contract for some rules just to be clear what to do when someone is late or sick. When we did our feedback meeting with the teacher, I also tried to stay professional.

6.5 Reflection (12-12-2022)

6.5.1 Web Application

Rating: Proficient
Why: My application is a full stack user friendly application where users can login, start a workout, add exercises and sets. For my frontend I use Vue as my JavaScript framework and for my backend I use an ORM. I understand my own code and can explain this.

6.5.2 Software quality

Rating: Beginning
Why: I created different tests for my backend and frontend like unit, integration, e2e, and security tests. I want to add more tests and more different tests. I gave myself a beginning because I have not yet documented this.

6.5.3 Agile method

Rating: Proficient
Why: For my own project and group project I use a scrum board with sprints. For the groups project we have sprint reviews, stand ups, and retrospectives. I have done some research about Agile and what kind of methods there are.

6.5.4 CI/CD

Rating: Beginning
Why: I created my CI pipeline for my frontend and backend where my unit and integration tests are tested. I have yet created a CD where I test my e2e tests and deploy my application to.

6.5.5 Cultural differences and ethics

Rating: Undefined
Why: I have yet done research about these topics. In the coming weeks I am giving a presentation about these topics so then I want to focus on this.

6.5.6 Requirements and design

Rating: Beginning
Why: For my own project I created protypes and a design. For the design I used multiple UX methods which I have researched. I have not finished this which I want to do in my vacation. For the groups project I take the stakeholders feedback and change my functions or think with the other group members about solutions.

6.5.7 Business process

Rating: Proficient
Why: I researched what a business process is and what its link is to software. I created my own business process and use it for my own project.

6.5.8 Professional

Rating: Proficient
Why: With the group I am professional when needed like in sprint reviews with the stakeholder but also in group meetings link stand ups and retrospectives. We have a contract with the group where there are some rules, here we say that if you are late for the day, you message the group that you are late due to the reason you are late. All this combined I find myself being professional when needed.