TUDELFT, GROUP 12

Go Green

Project Report

for the subject:

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Affidavit

I declare that I have authored this report independently, that I have not used other than the declared sources/resources, and that I have explicitly indicated all material which has been quoted either literally or by content from the sources used.

Abstract

One of the risks of possible long-term global concern is the emission of carbon dioxide (CO_2) from fossil fuel consumption.

At the levels discussed here, CO_2 is not toxic and one should not confuse it with the highly toxic carbon monoxide. On the contrary, CO_2 increases plant growth as it provides, together with water, the basic materials needed for photosynthesis.

The principal risk of an increase in atmospheric CO_2-concentration is its impact on the radiation balance of the atmosphere, the so-called "greenhouse" effect.

The aim of this project is to reduce the CO_2 consumption. In order to do so, we programmed a software platform consisting of a client and server, both written in the java programming language. The application consists of different features which are the ones that will encourage the user to perform healthier actions, leading to a better world. The system works by utilizing light gamification aspects by trying to create a positive feedback loop for healthier and environmental-friendly actions. This scoring system will encourage users to compete with friends and other people. As a result, people will use the application in a more engaging way, and therefore the amount of CO_2 reduced will be higher.

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1 Product

After 9 weeks of work we ended up with a final working product, which satisfies the general goal. In this chapter, we will talk about the decisions we made, resulting into this final product i.e. we will talk about technical choices, architectural choices...

We decided to communicate via "Mattermost", as it was the platform used also for communicating with the TA.

In this project we learned a lot as a team during this process as we had to force ourselves to communicate among us in an efficient way, and to deliver a final product on time. We could improve the former as some times, specially at the beginning the tasks were not clearly assigned.

1.1 Design Choices

API type

Even if it wasn't a requirement we most likely would have build a RESTful JSON HTTP WEB API. Due to its stateless nature its more reliable and predictable, which makes it easier for expansions and adding both server side features and deploying new clients for various platforms.

Build system

Firstly, we had to choose between "Maven" or "Gradle" for our build system. We decided to use Maven because we were more familiar with it, and we concluded that it would be more convenient to work with this technology due to the superior amount of documentation and knowledge about it.

Server

The backbone of our server is build using Spring. We decided on that because of its great reputation, thorough documentation and focus on productivity by allowing us to have our attention on new features instead of reinventing the wheel.

Version Control

For version control we used Gitlab, both because it was recommended from the teaching staff and because it comes with a large set of useful features that we adopted such as hosting our "SCRUM" board and Continues Integration.

Database

For our database solution we decided on MongoDB, because of its great scalability and since its JSON based that meant we had lower overhead for translating server request to queries. For interacting with it we used Mongo's own Java driver due to its simplicity and performance.

Security

In our security schema we employed authorization through JSON Web Tokens in order to comply with the RESTful nature of our API and to reduce possible attack vectors, by lowering the time the user is required to send their credentials across the internet.

Client front-end

We also decided to use JavaFX for the GUI, with the help of "SceneBuilder".

Testing

For testing we used Junit as well as Mockito in combination with PowerMock in order to ensure that every possible case is tested and that we can quickly ship a product with confidence about its quality.

2 Process

In this chapter you will be able to read how the project went process-wise. Firstly we set everything up, we started adding some issues, documentation, etc... This is a screenshot of one of our first issues board 2.1

For our development process we used Agile method, specifically SCRUM. We had sprints with duration of 3 weeks while conducting a meeting every Monday in which we discussed what we did last week and what we should do next by utilizing a digital board hosted on the same space as our project.

We immediately started working on a first version of client and server with ability to communicate with a simple request/response. After that, we implemented the full workflow of the feature for "Eating a vegetarian meal" (click button to register meal, send a request to the server, store it and display it). Finally we implemented 6 features for Food, Transportation and Energy. We also had full workflow for tracking the CO2 that you save and compare to your friends. And we managed to get an overview of CO2 produced by you and others.
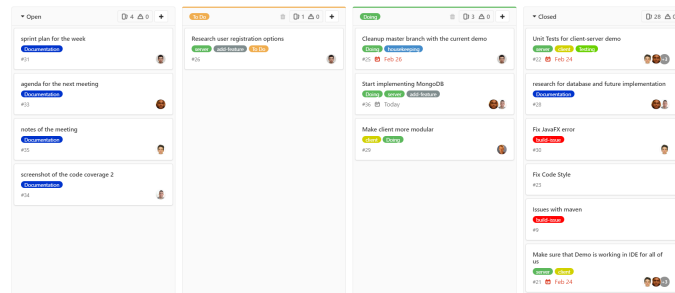

Figure 2.1: first scrum board.

3 Reflection

In this chapter we will talk about what can be improved from the product, process and course. To be honest, as you can read in the paper by F. Niehaus, 1979, At the levels discussed here, CO_2 is not toxic and one should not confuse it with the highly toxic carbon monoxide. On the contrary, CO_2 increases plant growth as it provides, together with water, the basic materials needed for photosynthesis. Moreover, almost all the CO_2 pollution in the planet is caused by big companies, so the impact on the environment of our product could be lower than desired as it might only affect ordinary users, that's something we can improve.

Something to improve from our process and our project, might be that we worked much more right before the deadlines than after them, maybe we should have organized the time better. Moreover, in gitlab there were some unassigned issues and I think that they should be always assigned. Apart from that, we finished everything as intended, and, after all that's the most important thing so I think that we did a good job overall.

Regarding what we can improve from the course, I think that we will say more about this in the Individual Feedback chapter but, as a sneak peek, we really appreciate the usefulness of a subject like this, and we think that we struggled a bit at the beginning with git, and I think that if we learnt how to use it, by using it during previous subjects like Web and Data (for the assignments) or even Computer Organisation or OOP, we wouldn't have such problems.

4 Individual Feedback

PABLO BIEDMA NUNEZ (4850114): First of all I wanted to address the fact that this project was really useful for all of us since it gave us the experience of a professional situation that we will surely encounter during our careers. My teammates and I knew about the importance of this from the beginning, for that reason, we took it really seriously, and we worked hard since the first day. Regarding my personal, contribution, I can say that I might not be the smartest person or the one who coded the most, but I can guarantee that I spent a lot of hours on the project, programming until late night, and spending hours in StackOverflow, and, I am happy about this, because I can only say that it made me a better programmer.

Referring back to my personal development plan, I can say that my strongest points were that I was really committed to the project and I was willing to the every task that was unassigned, also my relationship with my teammates was good and I can say tried to make all of us a more productive group. About my weaknesses, I think that I didn't work that much at the beginning of the project, but fortunately I worked much harder after that.

I think that we didn't have too many problems, we accomplished every deadline without a lot of pressure, perhaps, we found the last one a bit more difficult but still we were able to made it on time and I think that makes us a really competent group.

FLO VAN DER VLIST (4957644): The final product we delivered is okay, but nothing special in my opinion. I hoped for more, but some things took more time than expected and the tasks we hand out to each other were sometimes not clear enough which caused delay.I learned a lot in this team and there were no conflicts. Furthermore the 2 people that were missing from our group also didn't't really improve the programming power we had.

In the beginning of the project I set some goals which I wanted to achieve during the project. One of them was to improve my programming skills. I

certainly achieved it, I never expected that I would improve my programming skills so quickly. Another goal I had was to improve teamwork while working on a project. On one hand this really improved since I never coded with a group and never used Gitlab, but on the other hand, the communication in the group was not always optimal and also the tasks were not always finished on time, I learned a lot in this team and there were no conflicts.

AYUSH PATANDIN (4958195): First of all, I want to say that I learned a lot in this team and there were no problems. Since the beginning of the project my main goal has been to learn from my team and gain experience from them. I think we achieved this, even though we were having some delay with some of the work. But I'm proud to say that we helped each other out to manage the work just fine. Personally, in the first few weeks I was having trouble working with git, because it was totally new for me and was really annoying sometimes. Because of this, I recommend the head of this course to have more than 2 lectures on git to prepare the students for a better use of GitLab. To take a look at my personal contributions till now, I want to start with the first 2 weeks when I didn't really find my place in the group yet: Instead of immediately starting to implement things, I did a lot of research. Furthermore, I did all of my documentations right on time. And also I've already worked on implementing some of the features like installing solar panels and using Public Transport instead of a car. For this I've done lots of tests and checkstyle to increase our code coverage again. One thing I like to improve in this team is communication between team members.

IVAN DIMITROV (4839250): The course has been very helpful to me as a team member, programmer and has certainly improved my skills regarding those two aspects. Also, there were no conflicts, that's a good thing. As I stated in the README those were my main goals this quarter and I am really happy that I have managed to achieve them. During this course the team held good we have delivered every demo on time, the code has been tested with well over the required 70 per cent of test coverage and has been delivered with no or a few occasions few checkstyle errors. As for my personal contribution I have worked on the server side of our application since the begging first on building a simple server which sends responses then I moved onto doing the Database for which we chose MongoDB then tested big part of our first feature and finally worked on user schema feature creating the leader board, friends list, and few others. I am happy with the team I was put in since some of them were willing to always help and even give some interesting talks a

couple of meetings which educated me on some new things. In conclusion, I would like to add that this course was handled much better by some of the other courses and there was a good portion of materials regarding Git and overall team performance handed out by the people responsible for this course and therefore I enjoyed it a lot, I learned a lot in this team and there were no conflicts.

LAZAR NENOVSKI (4839587): This project was really helpful for improving my skills in communication and coordinating as a team. It was the first time for me working in such environment, and the overall experience was definitely enlightening. Although I have some reservations about most of the technology that we employed, this course definitely helped broaden my perspective on the world of software engineering, by providing a more realistic picture on how technologies are built than what I had before. As a part of the group my goal was to be helpful, by education on common good practices, and to be encouraging, by trying to keep the atmosphere open for discussion. While I believe there was a degree of success on the former, I am not satisfied with my work towards the latter. Probably due to my lack of experience, I'm afraid I could not keep a balanced conversation and perhaps I asserted my personal beliefs far too often. There were times where I expected someone to object my decisions but perhaps I came too aggressively and that didn't happen as often as I'd like. Perhaps a silver lining from this is the fact that team has been mostly synchronised during the project and we never serious internal conflicts that needed to be resolved. In the end this has been an unique learning opportunity and I hope I managed to be of benefit to my fellow team members.

5 Value Sensitive Design

Our stakeholder is going to be the upcoming generations. We are going to design our product for them, not only because its impact might be bigger after time, but also because, unfortunately, next generations will be more affected by pollution, and that's something they don't deserve, therefore, we would design our application in such a way than changes society enough for next generations to live life as we are doing nowadays, and, if possible, even better. We are only going to choose that, as our stakeholder because as you can read in Clarke (2013). It is a possible future that is increasingly at risk as more evidence emerges of the various threats of climate change.

If we had to design for this stakeholder, we would take care of the CO_2 consumption from industries rather than daily users as it was planned initially because big industries are the ones generating the most pollution. The problem with this is not only that it is more difficult to achieve (you are fighting against the biggest companies in the world) but also more expensive and less profitable.

When trying to define the stakeholders we are designing for, the problem is that as we want to design for people that are not born yet, we cannot know how they are, however, to impact on future generations we don't really need to know it, as we can affect their lives even before they are born. That is the reason why I think that our design plan for this specific stakeholder should not be something fixed, and depending on any hypothetical definition, as people are unpredictable and we may want to adjust our solution in order for it to survive and evolve, to keep influencing people's life before and after they are born.

As we concluded before, we want to design for future generations but we want to do it affecting industry, so what sources would we consult to gain insights into industries? Well, first of all we need to find out which industries are the ones generating the biggest amount of pollution. We could hire environmental

Figure 5.1: top 5 'worst polluting companies' revealed by Green Peace..

experts for that, or we could just google it. In fact you can find them here, in, Nag (2018), then, maybe, hiring people to find the guilty ones is not the most efficient thing, however, we could hire people to find out how to fix the damage that the guilty ones have made, i.e. how can these companies reduce their pollution.

A really good thing about our concept is that it involves the realization of two values for two stakeholders, because, as we said before, we want to affect future generations by affection industry so there you can find both stakeholders, and therefore, our values are sustainability, for future generations, and environmental-friendliness for the industries

Now, the problem is that the interests between the two stakeholders are going to conflict, because, industry is focused, obviously, on wealth, and we want health for people, therefore, sustainability and environmental-friendliness are in tension.

We are going to try to solve this tension by affecting industry slowly, because we know that industry is more powerful, we want to start limiting its power slowly, this could be achieved by means of legislation or also influence from people. So, what we want to do, is trying to make people aware of this conflict, so that they realize that they are the only ones loosing in this situation of tension between values, and then, they might want to stay healthier and let industry loose power eventually. But it wouldn't be that doable, as you can see in 5.1. So this is only a hypothetical solution to try to loosen this tension by some new design, but this would be definitely on of our toughest tasks.

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