**Mushroom++ Process Report**

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# Introduction

During this project, two methodologies were used to execute tasks and proceed toward the predefined goal. These were Agile Unified Process (AUP) and the Scrum framework. Unified Process consists of four distinct phases: Inception, Elaboration, Construction and Transition.

During the first phase, Inception, the team defined the base technical requirements of the project, agreed on a common interpretation of facts concerning both the problem domain and the proposed solution, and established the core non-technical requirements, such as solution functionality, targeted process and timeline, and feasibility. This phase ended on the 17th of March 2021, beginning the next phase.

During the second phase, Elaboration, the team established the groundwork for all future work. Common design elements, such as the connectivity between different parts of the system, and general architecture were established, with supporting materials such as descriptions, core documentation and a working proof of concept.

During the second half of this phase (from the 7th of April 2021), the Scrum framework was also used to support the development. This was due to a variety of factors which will be further detailed in the Project Execution section.

For Scrum, Levente Nagy served as Product Owner and Kristóf Lénárd served as Scrum Master. All other team members served as members of the development team. This team was organized into smaller departments, consisting of three or four members, working on a distinct part of the system, led by the agile role of technical leads. Scrum was organized regularly, with the usual set of meetings, ie. sprint planning, daily scrum, sprint review and sprint retrospective. Further details can be found in the Project Execution section. Scrum was used, as previously mentioned, during the second half of the Elaboration phase and during the Construction phase.

During the Construction phase, the main focus was on the development of the software code, along with all required supplementary materials such as diagrams, reports, and other documentation. This was the longest phase of the project, stretching from the 28th of April all the way to the 2nd of June, with more frequent working days than before.

On the 3rd of June 2021, the project reached Transition phase. This phase was the shortest, even though, in theory, it could possibly be indefinitely long, since this phase consists of post-release support. This was also when the system was deployed to its currently final Production Release iteration- This phase also included finalization of supplementary materials such as user guides, and the final hand-in of the project.

# Group Description

## Android team

The Android team had three group members by the end of the project: developer Uldis Alksnis from Latvia, developer Bogdan Mezei from Romania and technical lead and Scrum master Kristóf Lénárd from Hungary.

In our group, tasks were divided fairly evenly, with all members working on coding, Kristóf working on the process report, along with handling the compilation of materials for the hand-in, while Uldis and Bogdan worked on the project report and technical materials.

We all had some experience, of course, this being our fourth project at VIA. This we feel helped us in many ways. One was that we have had more experience with software engineering and development in general, enabling more individual work, which is one of the core tenets of both Scrum and AUP. We have also known more about the issues we might have ran into during the project, which helped us in estimating what we need, and what we can accomplish in a given timeframe. Both of these were vital to the successful completion of the project.

In the group, we have emphasized working with the other philosophies of the Agile Unified Process, besides the aforementioned individual work.

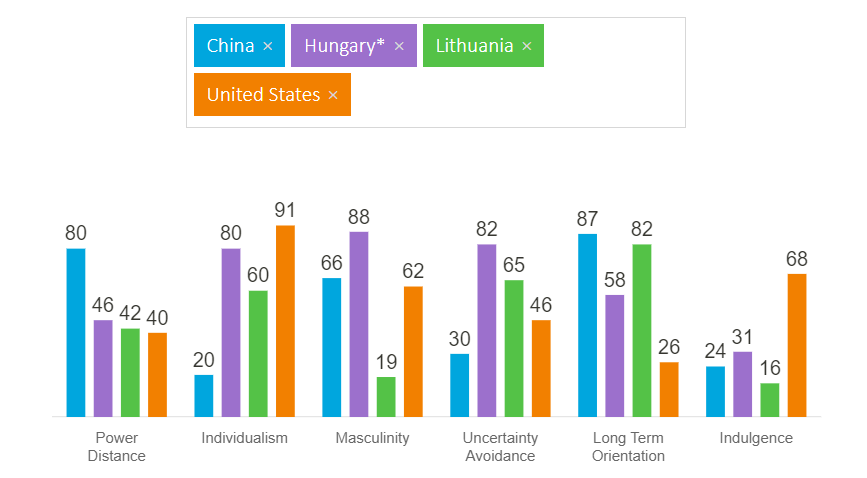
We have not based our work on huge amounts of documentation, but planned connectivity and other things only in advance, the ones where substantial modification would have needed the other teams to adjust as well. Obviously, by using Scrum, we have worked in an agile context. We, from start to finish, prioritized (after completing general architectural duties) working on the most high-value requirements, only adding others after we had known that what we needed earlier worked.

All of these were core issues that we considered as such; therefore, we feel that our groupwork was successful in this project.

## Data team

The Data group consists of four members, Audrius Sauciunas (Lithuania), Levente Nagy (Hungary), Samantha Nettesheim (United States) and Shaoyu Liu (China). The group was formed based on previous collaborations over the last three semesters.

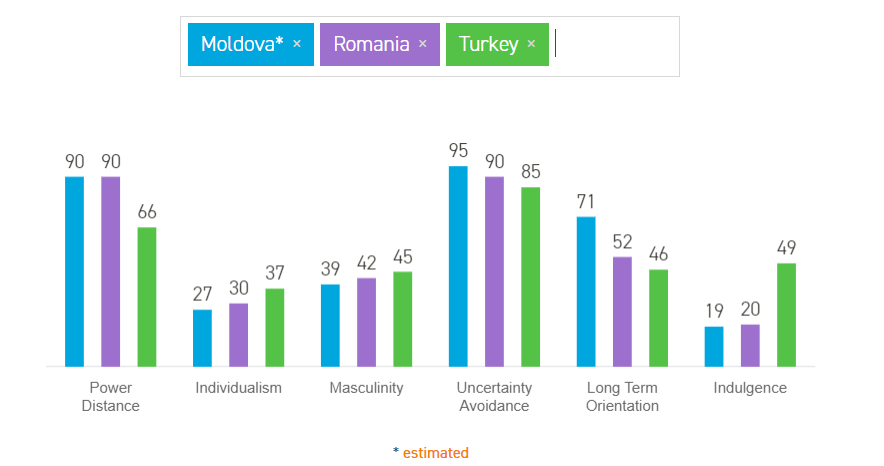
The cultural differences at times were apparent but we worked through our differences throughout the project period to maintain a healthy work environment.



*Figure 1 Hofstede's Cultural Dimension (Hofstede, n.d.)*

The Hofstede’s cultural dimensions provide us a reminder of how our cultural backgrounds influence our behavior and interpretations of other’s behavior. As the group had not experienced working together in this specific constellation, the adjustment to each other’s habits was a challenge. In addition, previous disappointments in group work and with each other influenced our feelings towards one another. This was a disadvantage and our initial progress suffered. We experienced a few weeks of disconnect during the design and implementation which was resolved through communication and over the course of time. Fortunately, the group started the project design and implementations phase early so we were able to mostly recover from our initial missteps. Group members were encouraged to assert themselves about their feelings and concerns. While some members were more reticent to discuss such matters than others, as the project progressed, members found confidence in each other and themselves which provided for a positive work environment.

## IoT team

The IoT team for this semester project is formed of three people: Daria, Natali and Mihai. We were all lucky to have known and worked together before, which aided with the speed of the team integration and the general organization.

All three members come from different countries, which brought a lot of diverse views and experiences to the team, a fact which we considered really valuable. Even with Natali being from Turkey, Mihai from Moldova, and Daria from Romania, countries with unique and different cultures, we all shared similar views on teamwork and task prioritization.

The Hofstede profiles for our countries had very similar values, with a high power distance, low individualism and masculinity, high uncertainty avoidance, and a medium long term orientation (see Image 2.1). The indulgence for Turkey was the only noticeably higher value than for the other two countries (49 versus 19 / 20), but we all personally agreed with a high level of indulgence. For the power distance and masculinity, we also went against the values of our countries, choosing teamwork as equals and quality of life over goals and competition.

Our personal colour profiles were mostly composed of blue and green, with little red or yellow, which also indicates our common preference for good communication and teamwork, striving to work as equals and avoid conflicts by talking through ideas and listening to everyone equally, things which were very true for our team and made the project work a really pleasant thing to do.

Based on our country values and personal profiles, we therefore created a team which held as main values: communication, unity, equality, and freedom of expression and speech. We worked together as teammates but also as friends, shared everything equally and fairly, and managed to achieve all our goals in due time.

# Project Initiation

Before any group starts a project, there must be something that generates the group, a metaphorical force that gets the members of the group together. Of course, in our case, one aspect of this was the fact that the project is a mandatory part of our studies here at VIA. There were other factors, though.

At the beginning, some of us have tentatively formed two groups, each consisting of only a few people, expecting a similar project as we have experienced in previous years. This, as it later turned out, was not the case. When the project description meeting was held and the full scope of the project detailed, we had known that we needed more people. Soon after a group was generated – the original group of seven. This was still too few, so we sought to attract more people, ones that we knew we could trust to accomplish their tasks. Thus, through friends and contacts, we came into contact with another small group. This group then joined us, bringing the count of our members to eleven. While this number would later be reduced to ten by the unfortunate departure of Eva Nikolaeva, this was still a number that was sufficient – and thus, the group came to be.

So now we had a group. We asked the question: “What next?”. The answer was obvious – we need to have something as our project. For that we needed an idea, and so we sat down (unfortunately, due to the corona-situation, not in person, but online, which we kept on using through the whole project). We have discussed many ideas, iterating through the ones that we thought of as interesting or otherwise appropriate. The results of this can be seen in Appendix C. In the end, we reduced the final round of ideas to two, and voted on the better one – thus, we selected our topic.

We then knew what should be our next step – forming a consensual understanding of the problem, and detailing our way of solving it.

# Project Description

The first challenge when writing the project description came from the fact that most of us were unfamiliar with the problem domain, that is, the processes and inner workings of fungiculture. This problem was tackled by intense research, and with the most experienced member of our group, Audrius Sauciunas, working to secure more data from personnel who were then working in the industry. This gave us a significant amount of data on which we could base our background description. This helped us define the problems within the entire problem domain more precisely, and have allowed us to select a realistic goal.

Many of the following parts of the project description phase were derived from this information, as per usual procedure. These sections were no less important, however, since, for example, the supporting questions of the problem statement, formed the basis of our functional requirements later.

These parts were also critical procedurally. Before, we have worked on either single-issue problem resolutions (such as the decision of the idea), or on heavily factual texts (such as the background description). These sections, however, taken all that and added the problem of balancing the derivation of certain elements from others, and negotiating which aspects should we focus on. Both of these are critical to the process of software development. Therefore, we have, with the benefit of hindsight, have seen this as the final rehearsal of these before starting the more technical work on the project. During these, all members demonstrated such conduct and integrity that it was obvious to all members what to expect if and when the group again had similar meetings. We have aimed at having similar discussion in both procedure and conduct for the entire remainder of the project, a goal that we hope we have achieved.

This phase was, however, perhaps the most important in forming a preliminary way of meetings. During this phase, we have agreed on how to hold meetings, both with regards to meeting issues and procedures, and the conduct of the person chairing the meeting. These we have sustained during the rest of the project. Some of these matters derive from the group contract – however, some are merely procedural, which occasionally required adjustment.

The following sections, however, were more technical in nature. For example, the time schedule, while without a doubt important, was a highly factual and technical document, with perhaps only one thing remarkable with regards to the process. This was the fact that the group showed admirable restraint and appropriacy in discussing these issues. There was nearly no time wasted, which proved to be of advantage later, as we have continued to show these traits in later procedural discussion, which have allowed us to spend more time on, and focus better on, the development of the project instead of having to spend additional time on resolving minor issues. We were still able to solve all issues – but the time and energy not expended on these were of great use in the project.

All in all, however, we view this phase as highly influential in conducting this project, and highly successful in enabling further work on the project.

# Project Execution

## General work

After getting the feedback on the project description document, and finalizing it based on that, we began working in earnest on the first phase of the project, that is, the analysis section. This, and the first part of the Design section belonged to the first half of the Elaboration phase of AUP, involving four disciplines: the main discipline of Modeling, and the supporting disciplines of Configuration Management, Project Management, and Environment.

Our execution here was very simple: we held regular meetings on every working day (ie. on Wednesdays), and talked about the things we needed.

First and foremost was the definition of the requirements, both functional and not. These we derived from two sources by consensus – the functional ones from the project description document, chiefly the Problem Statement and Definition of Purpose sections, while the non-functional ones were derived from the predefined mandatory requirements document.

From these, further documents were derived: the use cases, the supporting documentation for said use cases (such as activity diagrams and test cases), and other materials that composed the analysis of the problem domain.

All of these, however, had one and only one goal: to help define a document that can both be non-technical, and be the core of the technical implementation. This was none other than the domain model, which was the last document created for the Model discipline of AUP.

As this discipline Model, according to the official description of Agile Unified Process, is defined as “The goal of this discipline is to understand the business of the organization, the problem domain being addressed by the project, and to identify a viable solution to address the problem domain.”, the domain model and the other aforementioned documents fulfil this purpose. Therefore, we concluded that this discipline was completed for the time being, and the team could move on to the next main discipline – Implementation.

Here is where I ask others to step in, and help me detail what the reflections of each team are in this phase, where we, while not working together on day-to-day issues, still relied on each other to form a coherent system.

## Android team

The Implementation discipline began after the Model discipline was finished, and lasted for the second half of the Elaboration phase and the entirety of the Construction phase, running concurrently with the Test and, occasionally, the Deployment discipline.

This part was, naturally, the largest – this is where we had to develop the system, test it, and deploy the final version of it to gain documents that we needed for the hand-in.

To facilitate this, and support the AUP, we have employed another framework, both in-group and in-team: Scrum.

This, of course, had numerous advantages: experience, a clear and concise methodology of working, and a good way of tracking the supporting disciplines of the AUP.

The implementation of Scrum followed the constructed framework. Before each sprint, the project backlog was reviewed by the Scrum master and the product owner, and constructed or reconstructed in such a way that ensured continuous refinement of tasks, and facilitated the selection of sprint goals.

This was followed by a sprint planning meeting. During this meeting, the teams were assessed individually, with any member of the group able to ask questions and add comments to anything that was decided, with these being explicitly recommended in tasks involving multiple departments. After the tasks have been decided and estimated for all teams, the group clarified the acceptance criteria for that given sprint. When this, too, was concluded, the group voted to accept these resolutions as the sprint plan.

The daily scrum meetings were individual for each team. Usually, they started at 10, with the Android team’s meeting taking place first (this was so that the Android team could start working while the Android team’s technical leader Kristóf Lénárd, who was also Scrum master, could hold the meetings for the other teams). During this meeting, three things were usually discussed: the completed work, the work that the team members planned on doing that day, and whether there were any impediments to progress, either from a technical or a process standpoint. Occasionally, “after-party” meetings were conducted later, to discuss a problem in more detail.

At the end of the sprint, two meetings were conducted as a whole group, usually directly following each other. These were, of course, the sprint review and sprint retrospective meetings. The sprint review meeting, as usual, focused on the completed and incomplete tasks. We discussed the tasks that were completed, how they impacted both currently existing and future work and how they contributed to the sprint goal. Incomplete work was also discussed, along with reasons of delay, and how that impacted the future work. Finally, the product owner, as customer representative, made suggestions with regards to future work, which in turn impacted the next sprint planning meeting.

The other meeting was the sprint retrospective. Here we discussed what we thought of the past sprint, and what issues we had with the process. Sometimes, there were no issues, other times, however, the team resolved to have a quick brainstorming session to try and find solutions to any aforementioned issues. Usually these lasted for about 30 minutes with discussion, at the end of which the group resolved to adopt one or more of the proposed solutions. These were then employed by the teams, enabling better cross-team work.

The Android team feels that these methods were effective at driving the development forward. We feel that the group has avoided micromanagement, yet still was able to work together on their goals, even though the group was essentially working in three smaller pieces. We feel that out of the methods we are familiar with, this one was perhaps the most balanced with regards to working together in three small teams.

We also think that with these frameworks and methodologies, we have been able to work together efficiently, and were able to execute the tasks that we planned to. Therefore, we think this project was successful not only in a technical, but also in a procedural sense.

## Data team

The data group followed AUP and Scrum for the project methodology. Kristof Lenard acted as Scrum Master for the entire group and Levente Nagy was the Product Owner as well as the team lead for the data group. The data group held daily scrum meetings to discuss our progress and challenges from the previous day as well as the intended work for the current day. The data tasks were assigned on a volunteer basis, tasks were executed together, in sub-groups or independently. Due to challenges that the group faced during the elaboration phase, executing tasks independently proved inefficient. The data group had to reassess the work established during the elaboration phase which led to in-depth discussions of the knowledge obtained from the Data Analytics Infrastructure (DAI) class. Upon implementation of the data warehouse, we continued to face challenges and it was necessary to work very closely with each other to complete these tasks. We continually met with the data supervisor to receive feedback on our new design. At times, we could not progress until we had received satisfactory communication from our supervisor.

The AUP/Scrum process proved effective for the data group but only because we started the design process early and we worked well together to recover from our mistakes. The group members were in constant communication and helped each other through design or coding challenges with detailed explanations for members when needed. We continually experienced challenges with our knowledge of the DAI material and sought explanations from the supervisor. Although, the supervisor was instrumental to the process, she could not advise the group that our design or implementation were always correct.

The results of the data aspects of the project fell short in some respects. Changes to the data warehouse resulted in destroying the PowerBI reports from which we were unable to recover. Therefore, dedicated efforts from the team to create useful visualizations with a limited data set were wasted and we cannot present our true abilities. However, we all worked on this effort equally, so the wound is spread amongst the members.

## IoT team

For the execution of the project our main helping tool was Azure DevOps, where we listed all the requirements for the sprint and kept track of their status throughout the sprint duration. Although the SCRUM meetings were held together, all individual teams had daily short meetings for checking up on the progress, including our IoT team.

For most of the sprints, the IoT work was split into three major areas: the gateway application, the embedded application, and the documentation of changes or new features. The last sprint was especially aimed towards adding finishing touches to the code and documentation, finishing testing and preparing for deployment.

The sprint tasks were split into individual smaller tasks for each member to complete. Occasionally, especially for the first couple of sprints, essential tasks like setting up the hardware for the first time, were handled by meeting up and working together. Even when we were not working together physically, the semester project work days were done via Discord, so we could talk through the process, share the screen, and figure out any problems or questions together.

For the first 2-3 sprints our work focused on the embedded side and gateway separately and their related requirements, such as measuring values and ensuring local persistence in the embedded side, and setting up the Loriot connection and preparing for receiving data in the gateway. Afterwards, the work continued to be a cycle of sending and receiving information between the two sides, implementing new features, testing, fixing (with supervisor help sometimes) and deploying the changes.

After the connection between the embedded and gateway server was ensured, the other connection between the Data server and Gateway server was also continuously and thoroughly tested in collaboration with the Data team after any changes.

All in all, this workflow proved successful in implementing all the requirements, passing the tests, and constructing the documentation along the way, and therefore having the IoT system working as intended ready to deploy in time.

# Personal Reflections

## Data team

Audrius Sauciunas

This was the third semester marked by covid-19. This semester I finally felt like the online teaching didn’t affect me negatively at all study-wise. Consequently, I had a great semester during which I managed to gain a tremendous amount of knowledge about the different subjects. At first, for our SEP project I chose to be in the IoT group, but after realizing that I have some sort of passion for data analytics and data warehousing I chose to switch the teams for the first and last time, ending up in the data team.

For the very first time during the 4 semesters, I was very content with my SEP team. Previously having experienced enormous amounts of stress due to team members lacking motivation, this semester I felt like everyone was finally on the same track. I enjoyed every single day we worked together, which in result helped us achieve better results as a team. Every part of the project was done with passion and care. It felt a little bit strange at first to see so much organization as a group of 4 as well as a team of 12. It wouldn’t have been as well done if not for the outstanding work of the team leads.

We got our semester project theme just by brainstorming. I was very happy with the thematic as I’ve been thinking about growing mushrooms for a long time for bio fabrication. We all liked the idea and as such all worked together trying to research the topic. I had the honor to make some sort of an interview with people who are growing mushrooms, something I’ve never done before. I took this idea of interviewing others after our innovation weeks, after this we managed to shape our project in different ways. This experience helped me open my eyes on how important it is to connect with people that might be using your project later on instead of just playing the guessing game.

While working on the data warehouse, there were many things that weren’t clear at first, but after having a dialogue with my teammates, though constant helping with explaining the different concepts and ideas I felt like it helped me solidify my existing knowledge about data warehousing. I realized that this is the field where a part of my passion lies and finally realized after so long what path as a software engineer, I would like to take.

All things considered; I am very pleased with working in this team. This semester was the most important to me so far, where I finally realized what I would like to do as a software engineer. I am happy that this semester project gave me so much insight on not only what it means to work together as a big group but also what it means to be responsible for your specific part, as the whole project depends on it.

**Samantha Nettesheim**

I chose to work on the data team because IOT and Android was not a viable option as I live in Aarhus and I don’t have an Android phone. I now know how to use the emulator in Android Studio well enough but I faced so many challenges with it during the semester that it I did not feel that the Android team was an option. I generally like data, but I don’t feel confident in my knowledge of the subject, despite having an excellent teacher and supervisor. Perhaps this is due to my previous experience as a subject matter expert and one semester of DAI along with a heavy semester load is not enough to achieve the experience that I need to understand material at a deeper level.

I feel disconnected from the other two disciplines, IOT and Android, since I did not actively participate in any of them for SEP.  At least with Android we created our own projects but with IOT, the distance between completing class exercises and creating a project using the knowledge attained from class is enormous and I now lack that experience.

I enjoyed working with the four data group members. All the team members were dedicated and worked well together. Levente made for a valuable team leader, he was very open to concerns or ideas from the group. He has a high level of coding knowledge, but he was able to explain concepts without being condescending and at a level that is understandable for me. Kristhof as Scrum Master was also indispensable, he and Levente really led the project as a cohesive unit. I was able to express concerns or vent to him whenever I needed. He provided a lot of insight and help with technical and process related questions throughout the project. I feel that the efforts made by the team were exceptional and I found the experience and knowledge that I attained to be invaluable.

**Shaoyu Liu**

    This is another semester that we have to study and work at home due to the current situation.  In the beginning, I thought it’ll be a tough time again, but somehow having a lot of similar experience makes it kind of easier for us to accept and adjust our cooperation. Although there’re still inconveniences and obstacles during the online studying, I recovered quickly to my track.

    As for the process of the project period, I’ll give a high rating towards our data teamwork together. Though in the beginning I felt like I didn’t fully immerse into it since the team is new to me, we had much better interaction as time went. And different from the last few semesters, I also have an even better working environment in which I can express my deep ideas more. Except for more experience of online working, I think another important reason is also the whole team’s high motivation, acceptability and seriousness towards our project. Therefore, on this point, I think every group member has contributed to the group as much as possible. There’s something else I have to mention here is that we implement our scrum and scrum meetings very well not only in my 4-person data group but also in the 12-person whole group. When we’re executing our meetings, we make it clear that what problems we countered, what needs to be finished before a certain date and how we can do better based on the past working to get accessible result after each separate working period. It’s also every member’s hard work and fully communication that makes the result more understandable with better performance.

    It’s not easy to imagine how things could smoothly work through a large group with so many members, but during the process everyone’s positivity turns it to be reliable for me. I would say I enjoy such a working environment that every single day during the project period seems to be new and challenging, and during every period we work together trying to solve different problems that continuously occur as the project progresses. During elaboration part we try to make use cases clearer. When designing data warehouse, we had plenty of attempts and finally with more and more ideas come up as well as supervisor’s helpful suggestions we made the mature version. During data handling (mostly ETL) we found potential problems in the database and data warehouse modeling and went back to resolve them, which to some extent also thanks to scrum’s non-linearity.

    Overall, I really enjoy working in this team with satisfying environments. From our scrum master, project owner to every member in the devolving team, everyone is willing to answer questions and offer enough help, which makes the process go pretty well.

## IoT team

**Personal reflection - Daria**

This semester was completely different from all the other projects so far and therefore brought forward a couple of new challenges. Although suddenly working together with so many people was a bit scary in the beginning, with good cooperation, organization, and especially a lot of communication, it proved to be really pleasant to do.

I believe working in specialization gave us a lot more time to work on the specific parts of the project and therefore at the end we had a really good and polished project to hand in which I am happy about.

The group formation was done before the start of the project period and it was overall quite a simple process, we were all quick to decide on specialization teams and start the ideation process. The mushroom farm system idea came from an overall agreement of using the sensors to aid with farms/plants, and I think the mushroom farm was an especially interesting idea to work with because it added some special requirements for the system and pushed us to think even more about our design.

In order to handle the communication, we used multiple organizing and social platforms, most notably being Discord, Microsoft Teams and Azure DevOps. For me it was the first time using Azure and it worked perfectly for organizing task by sprints and checking the overall progress, so I would definitely like using it again.

Working in the IoT team, most of what we did for this semester was new and obviously a little challenging, but having physical components and seeing the code interact with the real world was extremely rewarding and I believe I have learned a lot about embedded and real time programming, and generally about the C programming language.

Overall, I think we managed to set realistic goals and organize ourselves really well to achieve them. I am proud of the end result and the general collaboration of the team, both in our IoT group and overall, and there is nothing I would have changed or done differently. I have learned a lot and it was a great practice for working in a real-world scenario and specialising on certain work areas.

**Personal reflection - Natali Munk-Jakobsen**

This semester project was more challenging for me compared to the other semesters because we had to work in a bigger group and I was not familiar with most of the group members. At the beginning of the semester, I was afraid of having conflicts in the group since we were not very experienced in working in big groups. However, it all turned out better than I expected. All group members were open to communicate and solve problems, therefore we worked in a pleasant environment, knowing that all members are reasonable, responsible and complete their tasks on time.

In the beginning I was a little bit worried about working in the IoT part, because C programming was completely new for me, but now I’m really glad that I challenged myself and became a part of the IoT team, because I had the opportunity to learn more about embedded systems and hardware components in the project.

As IoT team members we already knew each other and our working styles because we worked together in former semesters. Therefore, from the very beginning we managed to cooperate perfectly with each other and we did not have any problem in terms of communicating and sharing tasks.

Our scrum meetings were more professional and well-organized this semester. I think our scrum master organized everything very well and managed the process successfully. Although we did not have the chance to have physical meetings and met only on online platforms, those meetings were efficient and beneficial. I believe everybody contributed and shared their ideas freely and we managed to communicate and cooperate without any problem.

In conclusion, I enjoyed working on this project with my teammates. I am glad that we managed to fulfil project requirements and had a satisfying product in the end. I learned a lot of new technical knowledge about embedded systems and C programming and had the experience of working with a group of 10 people. I am sure all these valuable experiences will be very useful for me in the future.

**Personal reflection - Mihai**

This semester was a lot better than I expected. My first thought when I heard that we need groups of 9-12 persons was that it would be difficult to cooperate with each other. It was actually the opposite. Part of what made this work was constant communication and good coordination.

For the first half of the semester, we all worked together on the same thing. After brainstorming ideas for the project, we chose the one to present by voting. The workload was then divided between members, so each had something to do.

Around the middle of the semester, we were divided into 3 teams that focus on a specialization. We decided our roles when we formed the team, so we did not encounter any problems here. I ended up working with my group members from the previous semester. Knowing each other’s strengths and weaknesses, we did not encounter many problems.

We worked on the IoT section of the project. Although it started off a bit frustrating, after we managed to make it work, it was quite satisfying seeing the hardware work. A big downside to it was the long waiting time needed for testing. In order to properly test if the code was working properly, we had to leave it running for a couple of hours.

The SCRUM meetings were really well done. From the big ones at the beginning of sprints to the short daily ones. The scrum master had everything prepared, asked important questions and made sure we were on the right track.

In conclusion, I am happy with how things ended up. We managed to set realistic requirements and complete all of them. I experienced working in a bigger group than my previous project, which I believe will be valuable during my internship next semester.

## Android team

**Personal Reflection - Bogdan**

This semester was a challenging one overall, from all the new technologies we had to use and being part of a much bigger semester group. But because of these reasons I also had the opportunity to learn a lot more and take responsibility in working and time management.

This semester the project idea was more restricted than other semesters, having to develop a system that uses IoT sensors and displays the readings on an Android app makes it so the implementation is almost the same across teams but we can choose the context. We chose to create a mushroom cultivation monitoring system because we had some great ideas on how we want the application to look like and we could make full use of the sensors.

We created our group by combining different groups from the previous semester and I think it went great as everyone got to be in the specialization they wanted. The biggest difference from previous semesters was the size of the group. Having 12 people in one team proved to be an organizational challenge in the beginning which we solved by communicating more, having the tech lead role in each specialization group and making full use of organizational tools. For example, for me it was the first time I have worked on a project while organizing the sprints in Azure DevOps and it proved to be such a powerful tool that allowed everyone to know what the others were doing. I enjoyed very much working in this group as everyone was very friendly and helpful and we could trust each other to get the work done while meeting deadlines.

Overall, starting the work on the project was a bit slow at first, especially when combining the work from different specialization groups, because we did not have the most efficient cooperation there were a lot of small fixes and tweaks, we had to make when combining the work from everyone. However, we quickly adapted and solved all these issues and, in the end, I believe we created a system we can all be proud of.

**Personal reflections – Kristóf Lénárd**

In my opinion, while it certainly wasn’t easy, the process of the project was still well-executed.

I’m fairly sure that others will talk about some of the more fact-based things. Things such as the group contract, its impact on our process, our methodology, the general process of the execution of this project. I want to do something different, give a perspective on the management of this project as Scrum master.

I have seen Scrum in action. I have worked with the Hungarian firm Nemesys Games, who used Scrum. Who better to serve as Scrum master than a person who has seen it in action, who has seen it work in a real-life context? So, I volunteered. The group accepted. It was all said and done there, and I became the Scrum master. I knew it would not be easy. It was the biggest group I had worked with, both here at VIA and before. The project, so varied in many things, was perhaps the most complex. But we persevered. We all did, and here is our result. There were many obstacles in the way, and what we have is far from perfect. This is something that is not necessarily bad. The blood, sweat and tears that this team – that any team – would pour into a project is a necessary part of any project that is successful. Sometimes, it seemed meaningless, that no matter how much we work, it would not matter in the end. That we would fail. Looking back at that, I wonder how we got so far. We have accomplished things that sometimes seemed impossible. We have worked separately yet together so that our project may become whole. Did it work? Did we manage to make it work? Looking at it, I see all the mistakes we made. All the small and big problems we had, all the hours we spent on hammering all this into shape. What we have is not perfect – there are many things not done, perhaps even more small, yet-unseen mistakes. The key is, it never had to be perfect. I knew that from start and yet on some level, I do not want to accept it. That all this work, the combined work of such a great team, perhaps the best I even worked with, and still, it’s not enough. That there are still things left unfinished. Accepting this was a hard thing to do. It always was so for me. But that is part of our journey. Part of becoming an engineer is learning to accept such things – and then disregarding that acceptance, and trying, desperately trying to make sure that there is nothing left to do. It never is so, and it probably never will be.

Looking at this team, I see a group that is, in my opinion, united in purpose. When I look at them, I still see the differences between them. I see points of friction; I see things waiting to erupt one day. This could, possibly be enough to destroy a group like ours. There is one thing that gives me hope against this – and that is the group itself. We had been through many troubles during these last few months. We have learnt what makes us work better together – and what we need to avoid. When I look at this group, I couldn’t be gladder – and for me, as Scrum master, I feel that this is, perhaps, the greatest thing I could achieve. This group has surpassed my expectations. All members are great workers, and I feel that they will all become great software engineers at some point. They sometimes needed motivation or arbitration. They needed guidance in both technical issues and process. Once they learned what and how to do certain things, there was nothing that could stop them. That I had managed to make it work, that we were able to collaborate so effectively – this is such a feeling that I cannot and as matter of fact, do not want to describe. I always loved the feeling of accomplishment. Whenever I solved a problem in software, whether a bug or a logical problem, I felt this feeling. This is why I loved it so much. That is why I wanted to become a software engineer. That is why I came here. I have not felt this before just in my capacity as Scrum master. Now, I feel this very thing – and I know in my heart that while we had, and if we work together again, will always have some difficulties, we will be able to overcome them. That whatever stands in our way – we can beat it. We can and we did in this project. For me, that alone would be enough to call this project a success. There are many other things why I could say that we succeeded – but this is why I will remember our success. That no matter what life threw at us – we persevered, and we succeeded. And that is all that matters in the end.

# Supervision

## Android team

The Android team was completely satisfied with the supervision. We, personally, have not needed to work with the supervisors a lot, except for a few questions about implementing certain things and clarifications to other small matters, but all of these questions were answered in a timely and helpful manner.

The other times we met with the supervisors, during feedback meetings, we received helpful information, tips and other guidance that helped us create, even though some of the suggested things were merely not scoped for that release, instead of not being thought of. However, one thing I must highlight is the amount of preplanned feedback we received, which was much greater than the previous two semesters. We feel that this is a welcome improvement.

Communication with the supervisors was easy – we could just send an email, or ask them in a Zoom chat, and while this was not as fast and quick as the in-person method (which is, unfortunately, still unusable for some of us), it was still fast enough for basically all things that we could need.

All in all, while we have not had much contact with our supervisors, when we had, their help was greatly appreciated.

# Conclusions

At the conclusion of the project, we discussed whether we felt that the project was successful, both from a project and a process standpoint. We felt that both the project and process were successful. We have worked together efficiently and purposefully, and have been able to achieve our goals. While our original plans for working were not always flawless, they were adjusted, including by sprint retrospective meetings (see appendix A for further details). Therefore, we have no further major recommendations regarding the process.

**Appendices**

* Appendix A – Scrum log book
* Appendix B – Azure DevOps log
* Appendix C – Ideation document