**Collection of Good Examples of Setting up Various Projects**

**Systematically**

**Described and Evaluated**

An important part of the EPIC project is to collect experiences with different ways of creating collaborative student projects. In this document, we present the experiences gained from the third year EPIC projects as an inspiration for others.

In 2020, there have been nine projects carried by 39 students selected from 6 universities in Europe (including Turkey). Also, among three projects, students collaborated with 15 students from Brazil. Collaboration with non-EPIC partners within the project is tried first time. It has been between-projects collaboration and many interesting experiences are gained.

At the beginning of the third year, the main theme of the projects are set as “Sustainable Development Goals” and companies which can provide for this theme are contacted. Then, student project definitions given by different companies are announced in the EPIC webpage. In each university, EPIC project is announced and applications from students together with their project preferences are collected. In each university, student recruiting is done through an open, fair and transparent process. Supervisors come together and assign students to projects according to the preferences and background of students and project requirements. For each project, an EPIC supervisor is assigned in order to make the communication between company and students from different universities. The supervisor is selected from the same country of the company if possible. The students/company/supervisor matching is announced so that before companies and students come together in the student meeting, they can start talking about the details of projects via conference calls.

The list of the projects is given in Table 1 together with the company defining the project and names of supervisors and students working on the project. In the following sections, project proposals, learning objectives, final project report submitted by students, comments from students and supervisor evaluations are presented for each project. Note that names of students from Brazil are written in bold in the table.

The evaluations are based on interpretations of multiple data-sources. Two quantitative evaluations distributed through SurveyXact questionnaires to all participating students and supervisors; one midway through the collaborations and one after the final hand in. These questionnaires primarily consist of questions asking the evaluator to rate their satisfaction with a certain aspect of the collaboration on a scale from 1-5 and few questions encouraging more extensive comments in text. Furthermore, all supervisors and students that have participated in blended learning activities, are subjected to another quantitative questionnaire for that specific experience. Lastly, to emphasize the importance of the industrial collaborations, each participating company has been interviewed qualitatively, to ensure an in-depth understanding of the learning outcome and value-generation from both sides of each project. The evaluation sections for each project in this document, sum up interpretations of all these data-sources.

Table 1: Projects of 2020

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| --- | --- | --- | --- |
| **Project Name** | **Company** | **Supervisor (?)** | **Students** |
| Carbon Footprint for Companies | AteneKOM | One from RTU  Two from Atene KOM | One from AGU  One from RTU  One from UIS  One from UPC  One from SAX |
| Circular Textile Platform | Sustainable & Functional Textiles, Saxion Enschede | One from SAX  One from The Research Group | Three from UTP  Two from SAX  One from RTU |
| Cyber Security Challenges | Norlys Aalborg University | Two from AAU  One From Norlys | Two from AGU  One from SAX  One from AAU |
| Energy Consumption Optimization in 5G | 2operate | One from UPC  Two from 2Operate | One from TUHH  One from SAX  Three from AGU |
| Global Recruitment Tool | NOKIA | One from UTP  One from Nokia | Two from UTP  Three from AGU |
| Mobile Education Platform | Solid Waste Recovery Installation (SWRI)  Serviço de Limpeza Urbana (SLU) | One from AAU  Two from UnB | Five from UnB  Three from AAU |
| River Waste Plastic Recovery Collection System in Rivers of Brasilia | TPAC  Serviço de Limpeza Urbana (SLU) | One from AAU  One from SAX  Two from UnB | Two from UIS  Three from SAX  Five from UnB |
| IoT in Selective Collection | Green Ambiental | One from AAU  One from UnB | Four from AAU  Six from UnB |
| Rambase | Hatteland Cooperation | One from UIS  One from Hatteland | Two from UIS  One from RTU |

1. Carbon Footprint for Companies

**Company (profile)**

The Agency for Communication, Organization and Public Management (atene KOM GmbH) offers Europe-wide consulting services for various topics of defining regional competitive profiles and innovation development. The work of atene KOM is supported by and dedicated to inter-sectoral network of economists, scientists and engineers as well as decision makers from municipal and transregional public institutions all over Europe. With excellent networking and wide-ranging creative input, it is possible to always pick up new ideas, prepare and translate them into innovative projects. The atene KOM’s areas of expertise are regional development, broadband deployment and technologies, sustainable energy and education. The strengths of atene KOM lie in intercultural cooperation and the moderation of joint work of economy, politics and science.

Number of employees: >200

Head quarter: Berlin

Further locations: Osterholz-Scharmbeck, Wiesbaden, Leipzig, Stuttgart, Schwerin, München, Bonn, Brussels

**Objective of the Project**

Global warming - and how to stop it - is a challenge that concerns politics, industry and citizens alike. While politicians are debating on how to implement a legal framework to reduce CO₂e emissions, many companies have set their own goals to contribute to a low-carbon economy. What tools can help to calculate the CO2e emissions of a company? Are there standard solutions fitting for several companies across sectors?

**Case**

Recently, atene KOM hired a climate protection officer in order to reduce the CO₂e emissions of the company. As a first step, the carbon footprint of atene KOM will be evaluated. Therefore, atene KOM will establish an internal database to gather information about Co2e emissions of items and elements used within the company.

In a second step, this database can be expanded to data concerning further processes and items usually found in offices and other work places and their respective carbon footprint. By making this data available as open source, it could be used by other companies who are planning to evaluate and optimize their own CO₂e emissions but do not have the capacity or budget to use the service of specialized consulting companies.

Additionally, the structure and content of this database could also take into account the needs of private consumers, who are looking for guidance in their daily life. Citizen scientists could help to establish such a huge database. To guarantee the integrity of the data, a peer reviewed and scientific sound guidance system needs to be developed.

Students working on this project will work on the following questions:

* How can data to determine the carbon footprint be collected, stored and evaluated?
* How can a database (and a possible front-end interface) be designed and how can it be made available for others to use and participate?
* How can the integrity of open source data be guaranteed in a peer-reviewed process?

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_carbon-footprin-companies.pdf).

**Evaluation**

Students found it challenging to create the IT system of the project. However, they agree that it was a completely enrichment process. They learned to, first of all, give a higher value to our habitat and now going into details they learned new technologies such as serverless technologies and the integration with the front end. They also learned how to participate into a multicultural team in which even the communication was a little challenge as they all had different languages, but they managed to overcome all situations.

AteneKOM sees EPIC project as an opportunity to work with students from several disciplines. At the end of the project, they had a good impression on the project. They find the international and multidisciplinary approach of EPIC really valuable for working on an industry project, especially if it includes an open problem. However, they are aware that the different knowledge levels could be a problem in some cases and make the work on the project more complicated than needed. Company supervisors might not have the time or be willing to fill these gaps. From a company perspective, they think that diversity in terms of nationality and discipline would be enough.

2. Circular Textile Platform

**Company (profile)**

The research group Smart Functional Materials at Saxion University of Applied Sciences, Enschede, The Netherlands, investigates applied research questions from industry in close collaboration with students and teachers of relevant study programs. The research line “sustainable textiles” runs several projects in relation to the circular economy in textiles. Recycling is a particular research focus. In 2013 a chemical recycling process for cotton was invented, which transfers cotton textile waste into virgin high quality regenerated cellulose fibres. In 2019 the research group started to build a European network for textile recycling to establish a circular economy for textiles in this area.

**Objective of the Project**

There is need for a registration system that is used in the events organized by Nokia to the internal & external society. Nokia has to use the external platforms to arrange them currently. Nokia employees or other participants such as students or other individuals who not related with the company are possible users of the registration system.

**Case**

Textile recyclers often look for specific textile materials and structures that fit into their processes. This is often in misbalance with companies that can offer textile waste streams. The match between supply and demand could be improved by an online platform or market, where companies that would like to offer textile waste could describe their waste streams. Additionally, recycling companies could look for specific textile materials for recycling. This platform could bring supply and demand together and enable a more intensive trading of textile waste in Europe. The students are asked to come up with a concept for such an online platform. A working prototype would be the desired product. Additionally, the students could look at legal aspects of textile waste trading/exchange in Europe.

**Final Report**

The final report of the project can be found in [here.](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_CircularTextilePlatform.docx)

**Evaluation**

Students express that they all had a great experience with EPIC. They made a little remark on that it would be good to have a control for the English language skill of selected students. So that, the communication can be better and better achievements can be made this way. They think that EPIC is a great international opportunity and the English language is a must to have a good co-operation with the group and achieve the best result.

The company of the project wanted to join the EPIC project because the international aspect of the EPIC projects was appealing for them. Also with the international approach of EPIC an international student group was interesting. They expressed that they are satisfied with their participation in EPIC regarding the costs and benefit. They remarked that the results are of great value and they will be used. One of their precious suggestions was students should have been more flexible to meet up with the company advisors and the other members of the group. It is because all the students had different time schedules so it sometimes was difficult for them to meet. Some of the students had a job during the day and would work on the project in the evenings and weekends.

3. Cyber Security Challenges

**Company (profile)**

The project is carried out between Norlys (a major Danish energy company) and Aalborg University**.**

**Objective of the Project**

Together with other academic and industrial partners, Aalborg University has taken the lead in developing a National Training Platform for Cyber Security. The platform provides a safe and secure environment, where students and professionals can perform various challenges related to cybers security – basically providing a “hacker lab”, where each team get a machine from which they can attack a number of vulnerable machines and other devices.

The platform is based on a virtualisation environment, and the focus has been on making it easy to use for both students and teachers – in particular, users can access everything in a browser. Through a simple registration process, they get access to a Kali Linux Windows (known for its penetration testing capabilities), from where they can explore their own virtual network including vulnerable machines.

The platform has been accepted for demonstration at Blackhat Europe in December 2019. And it has also been used by important Danish businesses, including the Central Bank of Denmark, companies from the energy sector, and financial businesses.

During 2019, the platform has been successfully extended, making it more stable and extended the number of challenges. We have received a grant for development that runs until April 2021, but we need to think ahead to be able to continue the project.

One direction to explore is to developing training concepts for particular sectors, such as the financial sector and the energy sector. This is what is explored in this project.

There is need for a registration system that is used in the events organized by Nokia to the internal & external society. Nokia has to use the external platforms to arrange them currently. Nokia employees or other participants such as students or other individuals who not related with the company are possible users of the registration system.

**Case**

The project focuses particularly on developing more specific training concepts for the energy sector. The energy sector is interesting, because energy supply is so critical for societies, and because there has been many cyberattacks on this sector in the past: Being able to take down energy supply (or even worse, to incur lasting physical damage) is an extremely dangerous scenario. The questions to be answered are:

* What is the current market for cyber security training, and how could we fit in there?
* What cyber security training is needed in key sectors, including the energy sector?
* How can the training platform be used to meet some of these needs?
* Does it pose additional requirements to the training platform?
* What challenges should be designed in order to do more training within the energy sector?

We hope that the outcome of the project can be both an analysis of the market for cyber security training, a proposition of relevant training concepts that include business and technical aspects, and a set of new technical challenges for the platform.

**Final Report**

The final report of the project can be found in [here.](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_cyberSecurity.pdf)

**Evaluation**

Here is the comment from the students who implemented the project.

“The project was very beneficial because it affected both academic and soft skills of the group members positively. In terms of academic and professional skills, we have learnt different concepts about the cyber security field, we analysed the current trend on cyber security field and by creating challenges we were implement gained knowledge in real life by contributing to Hawkins. In terms of soft skills, we were a multicultural team, the members are from different countries and cultures. We have learnt or reinforced followings: Respecting to another person, dealing with different problems, being a good team, doing time management and so on.

The problems were started to happen after epidemic. The epidemic affects our work and team collaboration. Due to epidemic, all of our universities have changed the education system and there was an uncertainty. We faced with adaptation problem and we could not do weekly meetings. This affected the progress of the project negatively and this problem continued about three or four weeks. After that we manage the problem and we were courtnie to communicate with each other.

Technical supervisors supported the project and that was very useful. After completing the challenges we were asking for supervisors’ help and their feedbacks. According to these feedbacks we are improving the challenges.

In general, we have learnt a lot and enjoyed the project. It was quite hard topic but it was also interesting. We recommend that next year, there should be more interaction between supervisors and group. Because their technical supports are very important. The seminar can be a little bit long to understanding the project.”

4. Energy Consumption Optimization in 5G

**Company (profile)**

2operate was founded in 2009 in Denmark by a team of experienced telecom executives and software experts to commercialize IPR developed under two European research projects on network automation. The company is supported by public and private investors, including former President of Ericsson Denmark and Telia Denmark, Kaj Juul-Pedersen, who is also the Chairman of the Board as well as former CEO of Sonofon (Telenor Denmark), Torben Svanberg, who is a Board Member.

Located in Aalborg in Denmark, 2operate has since it was founded in 2009 established itself in the market for network management software. Today the company delivers OSS solutions to network operators worldwide and has both potential and strategy for further growth.

**Objective of the Project**

In relation to the worldwide development of mobile networks, the need for better mobile coverage is thereby followed by an increase in the deployment of base stations. This is due to the expansion of 4G/LTE technologies and to the upcoming deployment of 5G, which has sparked mobile operators to look for solutions for lowering the energy consumption in radio units. These are currently mostly based on semi-automated processes, such as disabling some of the network cells, typically in night hours. The scope of the mobile operators is to make these processes more automized by taking into consideration configuration parameters such as frequency, radio access technology (RAT) type, handover procedures etc.

Therefore, there are both economic and environment-related concerns that constitute the motivation for this study. One of the main environmental issues is related to how the energy consumption in cellular networks affects the increase/decrease of CO2 emissions. This project proposal is directed towards investigating and evaluating methods for developing an automatic process for energy saving in cellular networks. Basic data mining techniques and dedicated market research are expected to be the baseline for the study. The goal is to prove that the chosen methods can contribute to an efficient business model for the operators in terms of both efficient network planning and cost savings, by lowering their Operational Expenditures (OpEx).

**Case**

The view for this project is to pitch into the problem of 5G network planning and management from two perspectives: business and telecommunications/computer science. The challenge for the involved students is to perform a proof-of-concept analysis on network(s) consisting of 5G deployments.

The collaboration among the students must be oriented towards proposing methods for adapting the current planning and management of mobile networks to the future deployment of 5G technology:

• The first phase of the project consists of performing a case study analysis for power consumption trends in 5G scenarios;

• In the second phase the students will work on proposing and designing methods for power saving based on the analysis done in the first phase. The methods should consist of data models and data mining techniques for 5G network deployments. These would serve as 5G network model validation for the aforementioned case study, by approaching the problems from both a marketing and a technical point of view.

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_energy5G.pdf).

**Evaluation**

Here are the comments coming from the students of “Energy Consumption Optimization in 5G” project.

* The team has gained a lot of experience by working in an international team. The kick-off week in Hamburg opened a lot of opportunities to get to know students from other universities, learn about their cultures and their projects as well.
* Being a part of EPIC has also thought how to communicate online. Most of the projects at universities are held by directly communicating with team members, but during this project we needed to learn to collaborate online - respect other student time differences and schedules, write a proper documentation and update it constantly for other group members to always have an access to the latest versions.
* Through this project we have made a lot of progress working in a group. The opportunity to be a better group member we already were able to master before kick-off week in Hamburg by the offered videos and tests on “Eduspace”. We learned more about problem-based learning, teamwork, conflict resolution, distance learning and challenges. These study materials prepared us better for the group work during kick-off week and after.
* We learned a lot about 5G Network itself, which is a popular topic nowadays since the mobile network’s growth and demand has been rapidly increasing. Doing a research on this field has been beneficial and gives the opportunity not only get to know the working of 5G network, but also rest of the networks as 4G, LTE, since the energy optimization in cellular networks has always been a concerning topic.

To improve the workflow, communication, and teamwork for the next project, they made the following recommendations:

* Communicating more between the group members in order to keep each other motivated and share knowledge more. Make a strict schedule for only group meetings.
* Try to understand the specific project requirements at the beginning of the project (company and university requirements) and looking at the planned deliverables more realistically timewise.

2operateparticipated EPIC because they saw this as an opportunity to learn alternative/ innovative approaches and perhaps new methodologies, combined with the opportunity to possible build an international network of young professionals. 2operate is involved with a project of carrying out energy saving measurements in mobile RAN networks for 4G and they found it interesting to explore the energy saving features of 5G and how this enables operators to build denser networks, meet performance demands and maintain low 5G energy consumption and as such the EPIC project seemed to match what we they currently working on. At the end of the project, they remark that they are going to recommend other companies to participate in similar collaboration projects.

5. Global Recruitment Tool

**Company (profile)**

Nokia is a global technology leader at the heart of our connected world. Powered by the research and innovation of Nokia Bell Labs, we serve communications service providers, governments, large enterprises and consumers, with the industry’s most complete, end-to-end portfolio of products, services and licensing. From the enabling infrastructure for 5G and the Internet of Things, to emerging applications in virtual reality and digital health, we are shaping the future of technology to transform the human experience. A truly global company, we are 160 nationalities working in more than 100 countries.

The company provides the mentoring to students and is also able to host them in the Bydgoszcz office.

**Objective of the Project**

Global companies need effective tools to recruit top talents from the market. At the same time while collecting candidates’ sensitive information they need to make sure it is being carried out in the secure and legal way. Expanded talent pools in international area makes difficult to find the ideal candidate in specific fields. Therefore, for meeting the needs of HR departments, there are several technologies and tools that have been developed to find the best talent in the market by using the most efficient manners. According to HRM’s study on innovative recruitment tools, these technologies can be classified as applicant tracking systems (ATS), mobile recruiting tools, gamification, collaborative tools, video interviewing and examination tools. In this manner, the diversity of innovative tools recently introduced in this area shows that global companies are in different quests to choose their ideal candidates in the most efficient way. In addition, many recruitment websites or apps are existing in this field already, such as indeed, angel.co, linkedin and etc. Also, number of them increases every single day which proves that there is a gap in this field. Furthermore, at the same time while collecting candidates’ sensitive information the companies need to make sure it is being carried out in the secure and legal way.

**Case**

Students need to build the online tool allowing candidates’ data collection under published job offers taking into consideration GDPR & data retention requirements. The challenge will be to propose secure solution for data submission of the candidates so recruiters and hiring managers could access the date without being exposed to the potential risks related to opening candidates’ files on their PCs. The other challenge would be to implement correct data retention mechanisms depending on the different scenarios. Students could also work on the list of key competencies and the way of automated pre-selection of the candidates for the positions. Tool needs to have ability to create candidates, recruiters and hiring managers’ accounts together with functionality of sending emails to the rejected candidates by the key users.

**Final Report**

The final report of the project can be found in [here.](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_GlobalRecruitmentTool.pdf)

**Evaluation**

Here are the comments from the project group members:

“The EPIC project was a very good opportunity for us to see how we are doing in a group, especially in a group that works remotely. Most of us have never had the opportunity to participate in an international project before. We are pleased that we got the opportunity to expand our interests and enrich our current life with new experiences. Working on our project allowed us to learn in some areas that we were interested in. In addition, we could see how difficult it is to work on the project from beginning to end. We had to plan our work properly, set control points, and then try to implement our assumptions. We took up the challenge of creating mobile applications for Nokia. We experienced new experiences together and made many important decisions for us that were to reflect on our work on the project.

EPIC was a very interesting and new experience for us. We are glad that we could participate in it and take advantage of the opportunity to develop our skills in fields other than those of the university. We have also experienced working in a completely remote and international group. We learned the responsibility of such cooperation and how it should be carried out.”

Nokia decided to participate EPIC I to support young talents in their first contact with the business. At the end of the project, they found that the collaboration was satisfying and on a very good quality level. They think that it was a very refreshing experience to work with such a professional team and their mentor.

6. Mobile Education Platform

**Company (profile)**

The Serviço de Limpeza Urbana do Distrito Federal (SLU) is a public entity from the Brazilian Federal District and is responsible for providing holistic urban cleaning services, including treatment and disposal of solid urban waste. SLU is the contractor of the cooperatives of waste pickers, which are the target group of this project.

**Objective of the Project**

The purpose of the Mobile Education project is to achieve an understanding of how an education platform can be designed for the waste pickers in Brasilia, Brazil. The goal is to develop the first steps towards designing a prototype that will support the waste pickers to learn how to manage their personal finances.

**Case**

In 2018 the world’s second largest dumpsite located in Brazil, closed. The Estrutural dumpsite (Lixão da Estrutural) in Brasilia was up to the closure, a workplace for about 1200 people who made their livelihood by scavenging the trash for goods and recyclable materials. These people, referred to as waste pickers, had the opportunity to transfer to new recycling centres established by the Brazilian government when the dumpsite closed. The new recycling centre also known as Solid Waste Recovery Installation (SWRI) would improve the waste pickers working conditions in several ways. At SWRI, the waste pickers were obligated to wear personal protection equipment and their ergonomic working conditions were improved. Health issues, quality of life and the removal of illegal activities were the main reasons for closing the dumpsite. According to Purchase Serviço de Limpeza Urbana do Distrito Federal (SLU) had registered 47 accidents from 2009 to 2017. These accidents range from burns to more serious cases, such as a truck overturning on waste pickers and deaths. Another reason for closing the dumpsites is to improve the environment and health conditions of the general population. In the report “A Roadmap for Closing Waste Dumpsites” by the International Solid Waste Association (ISWA), the Estrutural dumpsite is highlighted, as one of the world’s largest and most threatening to human health. Thereby, the closing of the dumpsite contributes to the implementation of the UN Sustainable Development Goals (SDG). However, most if not all waste pickers, have resentment towards the SWRI, caused by the reduced earnings.

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_MobileEducation.pdf).

**Evaluation**

Students express that they learnt how a cooperation with another country could be like, where they contributed with different knowledge. They have learnt about each other’s culture and the different lives realities that each one lives. In addition, they have gained knowledge about how to communicate, make plans and schedules between many people. Further they remark that it has been great to make new friends.

SLU, the target company, have been applying the EPIC methodologies to conduct their sustainability-focused projects since the beginning. When in 2019 they were told about the opportunity to integrate EPIC's 2020 with the members of their students' company representatives to connect their SDGs approach, they accepted immediately. At the end of the project, they were very satisfied with the result of the project and they remarked that the results met with their expectations. They gained new insights for the future of the project. They think that the partnership and the collaboration system were effective.

7. River Waste Plastic Recovery Collection System in Rivers of Brasilia

**Company (profile)**

The TPAC research group offers many facilities and equipment that can be used for (re-) processing of (waste) thermoplastics. The group has strong connections with other research groups, (local) government and entrepreneurs in the plastics and composites processing industry. It has built up a strong record of innovative solutions for recycling challenges.

The Serviço de Limpeza Urbana do Distrito Federal (SLU) is a public entity from the Brazilian Federal District and is responsible for providing holistic urban cleaning services, including treatment and disposal of solid urban waste. SLU is a major interested and responsible institution for preventing and solving pollution in the Paranoa Lake in Brasília, which has been one of the targets of this project.

**Objective of the Project**

During the recent years the presence of immense amounts of ocean plastics has become a recognized environmental problem. It has become obvious that hazards of e.g. suffocation and toxicity to animal and plant life in aquatic environments have become a global concern, while the quantities of plastics still accumulate at an ever increasing pace. Most of these plastics originate from rivers, and more upstream from dense communities, in combination with inappropriate governmental regulations.

All over the world many parties have already undertaken initiatives to start the mitigation of waste leakage into the environment or cleaning it up (e.g.: <https://theoceancleanup.com/sources/>).

**Case**

Multiple partners of the TPAC have the ambition to mobilise and combine the many different initiatives and convert marine waste plastics into useful products. They therefore have requested to do further research in order to prepare for a market for river plastics waste (re-) processing. The following topics can hence be part of this project:

* River-plastics extraction initiatives in the world
* Plastics extraction technologies used
* Waste plastic quantities in rivers of Europe and variations during daily and yearly cycles
* Composition of marine plastic waste (material types and cleanliness)
* Known reprocessing technologies and resulting products
* Recommendations for further development of business cases for products to be made from marine plastics.

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_riverWaste.docx.pdf).

**Evaluation**

Here are the comments from the students of the project:

“The collaboration has been a unique opportunity to exchange knowledge of difference fields of study. The meeting in Hamburg was really helpful for the members to get to know each other before further collaboration online. The weekly meetings have been sufficient for continuing work progress during the whole semester. Because of the COVID there was some hinders of work at school as normal and arrange the meeting. We were also supposed to meet a second time, but this was not possible under the circumstances we had this spring. Further we found a good way to collaborate and distribute knowledge across.

It’s important to emphasize that the EPIC search results are already been used to start developing a viable solution for Brasilia, and also can be used to build a solution for others locations. “

TPAC research group participated the project because they need more insight in river waste plastics knowledge. SLU found this project brought by Saxion University a great opportunity for them to canalise efforts to the SDG 6. Plastic pollution is one of the biggest problems to our water bodies worldwide, and SLU thought that it would be worth it to work on this problem with the River Plastic Waste Recovery Project. At the end of the project, companies participated in the project remarked that they several benefits such that; they had an experience to work with students, a problem that they had no capacities for was solved and the results are of great value and will be used.

8. IoT in Selective Collection

**Company (profile)**

Green Soluções em Tecnologia Ambiental is a company from the Brazilian Federal District that provides sustainable solutions in waste chain management, including collecting and recycling waste. Its mission is to transform waste into energy, jobs e social integration, and has important contributions to the recycling of glass, collecting and disposing/distributing waste from big generators and water and sewage treatment in Brasília. Selling recycled glass is one of their major income sources, and collecting glass with their own containers is an important step for their value chain. This project’s focus is to apply IoT technologies to their containers.

**Objective of the Project**

The purpose of the IoT in Selective Collection project is to elaborate and validate a viable IoT structure prototype, including network architecture and device setting, for continuous data acquisition in waste containers from Green Ambiental.

**Case**

Waste collection and proper disposal is a serious challenge all over the world. In Brasília, these processes have changed significantly since the closure of dumpsite previously located there, which was the largest dumpsite in Latin-America. However, there is still much to improve, as there are more than 3 million people living in the city with more than 3,000 tons of waste collected every day. In this scenario, many waste companies involved in Brasília’s waste chain lack the technology needed to make their routes efficiently for material collection. For the Green Ambiental, that works with glass, this is a particularly important problem, as several containers are distributed throughout the area of the city without having data on whether the containers are full or empty. This lack of information leads to an increase in the operational time and transport costs, as they often find empty or almost empty containers that do not have enough value to compensate the truck travel to the container site.

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_IOT_Epic-report.pdf)

**Evaluation**

Here are the comments from the students working on the project:

“Amid warm group discussions, sometimes our cultural differences stood in the way. The language barrier usually presented as a step back on fluid communication and for that reason the members choose, when needed, to discuss in their own language and find a joint answer to present to the rest of the group in English. This strategy worked well when several opinions could be misunderstood if not fully explained. Also, the presence of teachers during decision-making processes helped to guide the team with a second opinion and wide experience. The insights provided were very good in the sense of agreeing with deliverables and clarifying expectations.

Even with COVID-19 crisis, the project kept virtually among members from the same country and, as planned, with the rest of the team following the communication agreement. We were provided with frequently professor's supervision and will work together to re plan the implementation phase until a safe environment is guaranteed. The team has developed a great work and the results are attending the expectations.”

Green Ambiental, one of the participating companies of the project thought that the project represents a very important opportunity for the company. Having a pilot project where they don't have to invest their resource is a huge advantage. Besides, they can use the results of the project to evaluate future decision-making. As they were already interested in a routing and sensor system, they might be able to have a better knowledge of what to look for when they have go invest in a full-scale project. With no financial risk involved in the pilot, their experimentation capability increases significantly. Saving resources in their company means they are also helping our society and environment by having a more effective recycling system, they are very optimistic about this initiative.

9. Rambase

**Company (profile)**

RamBase is an ERP system owned by the Hatteland Corporation in Vats in Norway. The system started as a tool for manufacturing and warehouse within the Hatteland Corporation but has developed into a commercial system sold in several countries.

**Objective of the Project**

Since the 70s Hatteland have had a strategy to adapt and developed solutions that turns business challenges to an advantage. This has resulted in several solutions that give our customers an edge in the market.

RamBase, a product by Hatteland, was born in the cloud and delivered as SaaS already in 1992.

The RamBase ERP solution is specialized for businesses within manufacturing, distribution and auction. It is best suited for businesses that deliver to customers with strict requirements for quality and traceability, not only on business data and revision, but also documentation, test-results and correspondence.

The RamBase modules are fully integrated in one powerful system where everything connects.

The main goal of the project is to map the exciting limitations and find possible potentials for the ERP System of RamBase, provide a possible mock-up application that can use as a model in order to help RamBase managers.

**Case**

Rambase has some mobile possibilities, but it is interesting to elaborate innovative possibilities on how extended mobile computing can be utilised within some of the following possible areas.

* Sales and operations planning processes
* Forecasting
* Inventory management
* Customer integration practices
* Supplier integration practices
* Distribution planning for multi facility manufacturing and warehousing
* Service delivery in manufacturing organisations
* Project planning and execution in manufacturing organisations
* Benefit realisation –ERP-system implementation
* System implementation practices

**Final Report**

The final report of the project can be found in [here](http://epic.agu.edu.tr/wp-content/uploads/2020/10/FR_20_RambaseReport.docx).

**Evaluation**

The Rambase project group was fairly small compared to other projects and all group members were from the same time zone. That is why the group members emphasise that they did not have any communication issue during their work. It was not hard to schedule everything time wise because they only had a single time zone difference and even more than that two of the group members were studying in the same university.