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 second year EPIC projects as an inspiration for others. In 2019, there have been six projects carried by 19 students selected from 6 universities. At the beginning of the second year, the possible project themes, 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 theme 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 and supervisor evaluations are presented for each project.

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 have 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 2018

Project Name	Company	Supervisor	Students
Event Planning	NOKIA	Pawel Juziak (Nokia) Lukasz Zabludowski (UTP) Gülay Yalçın (AGU) Etto Salomons (SAXION)	Fatih Coşkun AGU Lars Hendriks SAXION
Descending Cities	AEG	Gülay Yalçın Alkan, AGU Hester van der Ent, UIS	Marzieh Natanj UIS Carlos Klazinga Saxion Hatice Nur Ağba AGU Thomas Breijer Saxion
Smart City Stavanger: Open Data	Stavanger Municipality	Jan Frick (UIS) Hilde Ness Sandvold (UIS)	Ahmet Sayici AGU Rizkika Widya Tarandeli UIS Valeria Utkina RTU
The Coffee Project	Cafès Cornellà	Ahmet Soran AGU Josep Solé Paret UPC Marc POUS (Cafès Cornellà)	Mansur Muaz Ekici AGU Carles JUAN UPC Martins KLAVA RTU
Coordinated Frequency Allocation Problem in Wi-Fi Networks	AirTies	Gulay Yalcin Alkan (AGU) Koojana Kuladinithi (TUHH) Rasmus L. Bruun (AAU) Şükrü Kuran (AirTies)	Murat Arisli TUHH Ozan Karaali AGU
Autonomous Vehicles	NOKIA ERICSSON	Oliver Blume (NOKIA) Maciej Mühlesien (Ericsson) Daniel Plöger (TUHH) Gülay Alkan (AGU)	Aamir Rashid Najar TUHH Andres Torres TUHH Lukas Buderath TUHH Muhammad Uzair TUHH Muhammet Soytürk AGU

In the following sections, the details of projects will be presented.


Erasmus+


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1. Event Planning

Company (profile)

Nokia is a Finnish multinational telecommunication, information technology, and consumer electronics company, founded in 1865. Nokia's headquarters are in Espoo, in the greater Helsinki metropolitan area.

Objective of the Project

There are a lot of events organized by Nokia to the internal & external society. There is a registration system missing to support it, so Nokia has to use the external platforms to arrange them. The customers of the platform would be Nokia employees or other participants such as students or other individuals not related with the company.

The objective of the project is to improve the event planning process and lower the timer that it cost to plan events and handle all submissions. We want to create it as generic and customizable as possible so we can distribute the platform to multiple stakeholders. The potential users for this product will be event planners of a company and people that want to join a company event

Case

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.

Final Report
The final report of the project can be found in here.

Evaluation
Students firstly found that Nokia's project was actually less challenging for them and they wanted to add various features to the project to make it more complex and compel but then the project forced them even more then they wanted. Despite this, their project has reached a satisfactory success. According to the team, creating a generic system has become more costly and compelling process than creating a company-specific system. As they expressed, from time to time, they had to postponed the tasks they expected to end early. However, due to the acceleration of their work and the increased working hours of both students, the project became available. In the end, when they faced with some bugs, it was not difficult for them to detect and solving these bugs didn’t force them because they say that they knew the system very well.

2. Descending Cities

Company (profile)

Antea Group is an international engineering and environmental consulting firm specializing in full-service solutions in the fields of environment, infrastructure, urban planning, and water.

Background

The Epic project 'Descending Cities' started as a request from Geert Roovers of the Antea Engineering Group (AEG). Over the past years AEG has done heaps of research on subsidence and wants to share its importance with the world, and we the project team have been tasked to provide a solution for 'raising awareness about subsidence'. 'Subsidence' is the vertical movement of soils. In the Netherlands, the main causes are: natural subsidence due to shifting of tectonic plates, Human influences like vibrations from heavy load-traffic, speed bumps, construction sites, caving mineshafts and the mining of minerals & the oxidation of peat due to the lowering of groundwater levels. What happens as a result can be seen in Gouda or Groningen? Gouda has problems with peat oxidizing and causes parts of the city to slowly sink. Groningen is experiencing earthquakes due to the mining of natural gas in the lower layers of the earth, leading to damages in the millions to houses.

Case

The client initially came to us with the question if we could make something to "Raise awareness about subsidence", but the target audience was not provided. We had some small-scale research in order for us to find the most relevant End User. We derived 3 possibilities: civilians, politicians or businesses/corporations. The biggest damage by subsidence is to buildings and infrastructure and the ones affected the most are civilians. Politicians are already aware of the problems it creates; most corporations and businesses already have these things covered. Civilians have more at risk as their house could also be their pension, they are at risk if they haven't saved up money for repairs. News reports showed that the civilian populace is still waiting for the government to take action. However, the Government has already taken leaps and bounds and it are the civilians that aren't prepared for the consequences. There are a million houses at risk of subsiding with repair costs up to €100,000 per house.

Final Report:

The final report of the project can be found in here.

Evaluation

Trying to get fitting studies to work together. In this case we were asked to develop an application with many unknowns. These unknowns are answered during development. Business administration has very little overlap with Software Engineering or Game Development, and made it very hard for this person to get a grasp on what they needed to do for the project. Also this project is a Non-Profit application, meaning it does not generate revenue. To create a business case around an app that is in the fetal stages of development and does not create income can be very difficult to achieve. The recommendation we have is: try to scope the needs of the project together with the possible applicants and make sure they have value to add to the project or product.

3. Smart City Stavanger: OPEN DATA

Company (profile)

is a city and municipality in Norway. It is the fourth largest city and third largest metropolitan area[6] in Norway (through conurbation with neighboring Sandnes) and the administrative center of Rogaland county. The municipality is the fourth most populous in Norway.

Background

For decades Stavanger has been relying on their economy on oil and gas sector as their economic driver. Thus, Stavanger, more than ever, has to be able to find new business opportunity to protect their economy in the future. This is like an effect when jobs created, the numbers of employment will increase, economic growth will be achieved.

Case

Providing the reasons above, it is wanted to increase the study on the exploitation of open data as smart city initiative. Open data has so much potential to be exploited. Stavanger municipality holds and collects data across category. As a city that put forward transparency, Stavanger compiles a wide array of data into one data pool for public consumption. These data are made freely available as the initiative in contributing to smart city concept. Albeit publicly accessible, it does not guarantee that data will be utilized by stakeholders even if they regard the data as a valuable set for their perusal. This is the challenge that government has to tackle in order to make open data function as it is aimed for.

Final Report:
The final report of the project can be found in here.

Evaluation
Each member within this project has different skills and background. They therefore needed to collaborate in order to do this project. They integrated their knowledges to solve the issues. What they had learned by doing this project is how collaboration and management are critical issue to solve. Each member had different approaches to solve the problem. From technical and entrepreneurial approach. Both are fundamental and had significant contribution for the project.

Keeping up with the trends of new technology, governments from around the world find as many as possible ways in order to improve the living standards of the citizen. The concept of Smart city is introduced as it is perceived as an effort to smart solutions

There have been some interviews, the result of findings from interviews has showed four type of barriers mentioned by our interviewees such as awareness, collaboration, technical and business, and motivation. These barriers hinder public to reap open data's thorough benefit to enable innovation.

Stavanger: The Open Data website contains more than 160 data sets. Most of the data collected from many regions come from the Stavanger region. There are also instant changes to the website that contains data in many areas such as environment, school, health and art. Here are some data sets: - Requirement profile - Kindergartens - Basic school education - Municipal health - Care - Social service - Water base - Fee rates - Church foundation - Transport - Fire and accident protection - Waste and refuse - Introduction scheme - Property tax - Fees - Nature management and outdoor life - Employment in municipality - Child welfare - Culture foundation The data sets above are from Statistic Stavanger, but are the most stable data on the website. The data sets other than these are not structural and annual, but contain some sensor data and are not easily understood by the local community.

4. The Coffee Project

Company (profile)

Cafès Cornellà supplies products, ingredients and systems to provide the hospitality sector with complete satisfaction through quality and profitability. We aim to be the preferred provider of coffee and become the specialist partner for the hospitality sector.

Background

The necessity to improve the working conditions of coffee exporting countries combined with the high demand of this product in the world opens a great opportunity to work hand in hand with technology. In the case of the high-quality coffee, where production, field and manufacturers need to be tracked, it's the perfect scenario to bring up state of the art tracking technologies to improve the trust and transparency. The goal of the project will be not only to track coffee manufacturers, exportation and further steps but also to show all of this with transparency and traceability to the high-quality coffee drinkers. This project aims to enable them to reward coffee producers meanwhile they taste a perfect espresso.

Case

Blockchain side has been implemented with Hyperledger Fabric, a permissioned network where only the participants that have been invited can write in the Blockchain. In the project students have used Convector and Hurley. The first one is used to code the smart contract and the second one to deploy a development network to test it.

Mobile apps aims to be able to display all the information about the coffee supply chain, the students have developed a mobile application in Android and iOS. The coffee consumer can scan the barcode on the coffee invoice in the coffee shop via a smartphone application. After that, the application retrieves all the information such as;

- Coffee quality index
- Characteristics of the coffee
- Location, altitude, average temperature and farmer of the farm
- The route map from farm to coffee shop
- Timeline of the coffee beans

from the blockchain network as transparent and reliable. Also, a rewarding system considered to reward the farmer directly from the mobile application by cryptocurrencies. So, if the consumer wants to send a donation to the farmer, he/she can send it directly through the application. But this part of the project couldn't finish.

A student was working on the Business Process Model (BPMN) and he was going to do the data and information flow analysis for the Coffee Project. But he dropped-out the project because of his personal problems. But this didn't affect the process of the project.

Final Report:
The final report of the project can be found in here.

Evaluation:
Each of member planned his time by himself and worked independently. They decided for deadlines and made the video calls on Google Hangouts bi-weekly to discuss about the process and to decide the future works.

Team expressed that they didn't faced a big challenge or conflict in group. There have been some dropping-out tasks but it had no effect on the development process of the project.

They also expressed that the teaching materials which is on the EduSpace was good, but not so useful. Because they are so basic and fundamental things and, in their opinion, everybody, who joined this kind of international project, should have already know them. On the other hand, the seminar in Barcelona was found very useful in terms of getting to know other team members, their strengths and weaknesses, their competencies etc. Also, it was found great for understanding the project clearly.

The summer collaboration was found highly productive and very efficient. They've proceeded much faster and qualified then that they did in online collaboration.

The team also, we went to the customer which is the Cafès Cornellà to get some feedback about the application. Meeting with the customer face to face was very productive, we learned some misunderstandings in the app flow. Meeting was very informative according to students and they expressed that they learned about the coffee journey from farm to coffee shops, coffee industry and market etc.

Students also expressed that they gained new perspectives, wider worldview and the project was a great opportunity for them to being in close collaboration in an international environment and solving real world problems.

5. Coordinated Frequency Allocation Problem in Wi-Fi Networks

Coordinated Frequency Allocation Problem in Wi-Fi Networks

Company (profile)

AirTies is provider of wireless communication equipment designed for the residential and small business market. The company's equipment ensures maximum Wi-Fi speed and coverage in every corner of the home, flawless installation, ease of management, and small, elegant form factor for a convenient location in the home. AirTies is the most widely deployed provider of Wi-Fi Mesh solutions to operators around the globe.

Introduction

A Wi-Fi network is managed by an access point (AP) which selects a single operating frequency among several possible frequencies. Due to the extremely saturated condition of the Wi-Fi frequencies, correct selection of this operating frequency becomes very important for the performance of the Wi-Fi network. This leads to “frequency allocation problem”. This paper will discuss a solution for frequency allocation problem.

Motivation

In recent years the popularity of wireless LAN hotspots has increased drastically. This is the reason why, today a lot of public places such as airports, cafeterias, metro stations and even complete city centers are equipped with many APs in order to offer wireless connectivity everywhere. For instance, we can look at the Figure 1 which shows the hotspot development areas in the city of Hamburg, Germany. Hamburg represents itself on its official website as a hotspot city. It offers one-hour free surfing in the internet at many locations. Further locations like the tourist centers around the port will be equipped with hot spots in near future

Challenge

As the wireless LAN hotspots become more popular at the same time the increased density of access points has started to highlight the shortcomings of the IEEE 802.11 standards. Since no standard frequency allocation method exists for APs, a large majority of APs is using default channels settings which is leading to inefficient use of the already crowded spectrum in the ISM (Industrial, Scientific and Medical) bands. The situation is especially critical in the 2.4 GHz band due to the small number of non-overlapping

channels available and the coexistence problems with microwave ovens, cordless phones, baby monitors many other wireless technologies which operate on the same channel.

Final Report:
The final report of the project can be found in here.

Conclusion:
In this project, the frequency allocation problem tried to be solved with adapted Global-Coordination algorithm. Basically, this algorithm uses clear channel assessment from access points and takes receives packet drop rates as input to compare different channels using CPLEX to solve FAP problem. The project has been simulated in NS3 network simulator with defining different scenarios which uses log distance propagation loss model, such as in real-life loss. In theory NS3 simulator gives the CCA results to algorithm and takes the new channels as input. To meet the requirement, we have fed the inputs manually and completed our research.

Evaluation:

Student expressed that EPIC gave them the opportunity to work on NS3 simulator which is one of the most important networking simulators in the industry. They have also learned valuable information regarding the wireless communication networks and their management. For example, they said they have learned that it is better in industrial point of view to use a centrally managed algorithm instead of a distributed algorithm.

6. Autonomous Platooning

Cooperative Adaptive Cruise Control (CACC) in Platooning

Company profiles

Nokia is a Finnish multinational telecommunication, information technology, and consumer electronics company, founded in 1865. Nokia's headquarters are in Espoo, in the greater Helsinki metropolitan area.

Ericsson is a Swedish multinational networking and telecommunications company headquartered in Stockholm. The company offers services, software and infrastructure in information and communications technology for telecommunications operators, traditional telecommunications and Internet Protocol (IP) networking equipment, mobile and fixed broadband, operations and business support services, cable television, IPTV, video systems, and an extensive services operation.

Case:

Many vehicles communicate over one medium. Since robust communication between the vehicles is necessary project aims to implement different medium control schemes and evaluate their performances. Among existing systems, CSMA (Carrier Sense Multiple Access) attempts to determine whether another transmission is in progress before initiating a transmission but it suffers from packet collisions and random delays. TDMA (Time Division Multiple Access) allows several vehicles to share the channel by dividing signal into different time slots but it requires synchronization and it is not very flexible when number of platoon changes.

Autonomous Platooning Utilizes: Road utilization, fuel consumption, safety, travel experience. Corporative adaptive cruise control (CACC) provides: fast reaction time, information shared among cars, safer travel with collision avoidance, constant intravehicular distance. The project aims to use CACC in autonomous platooning.

Final Report:
The final report of the project can be found in here.

Evaluation:
Students expressed that EPIC was overall a great experience for them. Working with different academicians was particularly good chance for the ones who wants to continue in academia.
Concrete recommendations based on evaluations for the Autonomous Vehicle group:

- Schedule could be arranged according to academic calendar of team members from different universities.