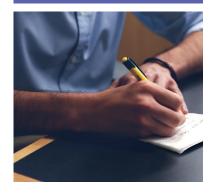# S2S Science 2 Society

PAE course – Applied Engineering Project

A university course where students are introduced to innovation in business, Agile and LEAN principles through the development of an applied engineering project motivated by companies' technical challenges.

CO-LOCATION

Contact

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Main actors

- UPC – Universitat Politècnica de Catalunya
- Undergraduate students from Computer Science School
- Companies (i.e. CA Technologies)

PAE is an optional course of the Computer Science Bachelor at the Universitat Politècnica de Catalunya (UPC) with two main objectives: training students to build their own solutions to real industrial/societal challenges, and narrowing the gap between industry and students.

Students improve their soft-skills, technological stack and business vision through the development of an innovative project in close collaboration with a co-located company. To foster entrepreneurship, companies act as consumers of the solution, providing regular feedback and helping them to shape their proposal with a business-oriented vision.

Process Main Stages

STAGE 1 – TEAM FORMATION
In the team formation stage, the companies independently decide which problem will be proposed to PAE's students. During the first class of PAE, companies introduce their businesses and explained their industrial/societal challenges. Students then choose the project in which they would like to participate per their own motivations and interests. At the end of the second week, students and companies are already paired and then they can proceed with the project definition and execution.

STAGE 2 – PROJECT IDEATION AND IMPLEMENTATION
The project ideation and implementation stage comprise several regular face-2-face meetings between students and the company they chose in stage 1. During the first meetings, students and companies may reshape their projects to better-fit students and business goals, as well as set a preliminary, reasonable roadmap of implementation. Once the project is coined, team members are free to organize work among themselves. Besides, periodical meetings are scheduled so students would get constant feedback from the company and coaching on how to add business value to their proposals.

Parallel to the students-company meetings, PAE's teachers help the students to define their solution, roadmap and find the most optimal technical stack for its implementation.

STAGE 3 – EVALUATION
During the last week of PAE, an evaluation of all the projects is conducted. Students show their solution and business proposal to the rest of the classroom and companies' representatives. Students are mainly assessed on this presentation, and not only based on the quality and maturity of the solution. Hence, PAE's students are expected to show a clear alignment of the solution and the industrial problem, as well as provide a business vision. The results of PAE's projects may be exploited and disseminated by both companies and students.

Touchpoints & Bottlenecks

TOUCHPOINT 1 – FACE2FACE MEETINGS DUE TO CO-LOCATION
The main touch point of PAE are the regular face-2-face meetings between companies and the students. Every two weeks, students visit the company office and discuss about the status of the project. As mandated by Agile and LEAN principles, these meetings have also the purpose of evaluating the progress,

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providing feedback from customers, prioritizing the work to be done in the following two weeks, and reshaping the project's scope or ambition if necessary.

Thanks to the co-location of the company research team in the University, informal meetings may occur any time during the project execution, which reinforce communication and facilitate the removal of project's roadblocks. Students feel more integrated in the business world and company culture.

There are only two plenary meetings in which all stakeholders are present: the kickoff meeting and the closure of PAE. Nevertheless, interaction between industrial stakeholders is minimal. During the kickoff meeting, companies present their problems to the students, and they choose the project in which they want to participate. In the closure of PAE, the students present their projects and solutions, whereas companies act as spectators that might give feedback to any project.

During PAE, teams may meet with PAE's teacher to ask for technical assistance. During the first weeks of PAE these meetings are mandatory to provide an initial guidance, but it is expected that guidance is reduced as the project progresses.

Success Factors / Barriers

SUCCESS FACTORS
The main success factors of PAE are the motivation of the students, a trustful relationship between students and company's representatives, and a continuous coaching from PAE's teachers and companies driven by the co-location of companies in the university.

From the company side, it is important to align the outcomes of the students' project with their business goals. In general, companies use this opportunity for validating early-stage ideas or assessing viability of the project.

BARRIERS
As for the barriers, students may feel overwhelmed with the definition of the project as companies propose problems not broadly discussed in the academia, but the continuous collaboration help in shaping the project to satisfy stakeholders' goals. Besides, PAE is conducted in combination with other subjects of the Computer Science Bachelor and, hence, time is very limited and efforts are significantly impacted by student's motivation.

Conclusion

We have run PAE during the first quarter of the academic year 2016 – 2017, and the feedback provided by the students highlighted the lessons learnt thanks to the close collaboration with companies, especially in the case of CA Technolgies, co-located in UPC. In particular, students appreciated learning how to collaborate in a business environment and

not only in new technological stack. Besides, all students commented that they felt they produced an outcome useful for the company. Unfortunately, one of the teams felt a bit alone as the people chosen by the company to interact with them did not have enough technological knowledge in the topic.

DO
- Project must attract students' attention and be aligned to business and societal needs.
- The project scope must be feasible for undergraduate students and doable during its limited time.
- Project scope should be broad enough to give students space for shaping the project to their own objectives and interests.
- Companies must choose representatives motivated by the subject and project scope, with interest in coaching students.
- Foster innovation and leadership among students by providing them with minimal technical guidance.
- Companies should commit to PAE and be reachable to students.

DON'T
- Don't leave students alone.
- Don't make a very generic project proposal, as students may feel overwhelmed by the uncertainty and the broad spectrum of possibilities.
- Don't use students as an extra resource of the company.