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PROJECT PROCESS MANAGEMENT IN A STUDENT-DRIVEN LEARNING ENVIRONMENT

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ABSTRACT

"TheFIRMA" is a project-based learning environment in the Information and Communication Technology (ICT) unit of Turku University of Applied Sciences (TUAS), Finland. The project assignments in theFIRMA provide students with an active way of learning new skills and increasing knowledge. In addition, students gain a real-life twist in their studies in terms of real customer projects. Customers of theFIRMA are typically local small or medium sized enterprises in need of a small project related to ICT field. The assignments include, for example, web-development, small testing projects, mobile app prototypes, marketing material design, requirements analysis and even organizing Lego robot workshops for children. When the number of projects and students in the FIRMA started to increase, a more organized structure to handle the situation needed to be established. Since the academic year 2016 – 2017, a course called ICT Services and Projects was harnessed to bring an organized structure into theFIRMA's operations. In addition, the course integrates project work done in theFIRMA into the curriculum of ICT unit's degree students. This paper describes how project work in theFIRMA is integrated in the regular curricula of the ICT related Bachelor's degree programs at TUAS. Moreover, this paper describes the lessons learned and improvements of the ICT Services and Projects course as well as the continuous improvement of theFIRMA's project process.

KEYWORDS

Learning environment, Learning process, Project-based learning,
CDIO Standards: 3, 5, 6, 7, 8

INTRODUCTION

TheFIRMA is a project-based learning environment at the ICT unit of Turku University of Applied Sciences (TUAS). TheFIRMA is student-driven, meaning that it has a student CEO managing operations, student project managers managing projects, a student marketing manager and even student system administrators taking care of computers and networks. Moreover, students are involved in real customer projects (Määttä et al., 2016; Määttä et al., 2017; Roslöf, 2016; Säisä et al., 2017). The FIRMA offers students an active learning

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environment with various learning opportunities covering all parts of the C-D-I-O core (Crawley et al., 2007). Figure 1 illustrates various projects and activities in theFIRMA.

Figure 1. TheFIRMA's projects include workshops, Lego robot building camps and virtual reality games. Time management is essential.

TheFIRMA was established 2015 by combining previous project-learning environments of the ICT unit of TUAS together (Määttä et al., 2016; Säisä et al., 2016). The learning environments that preceded theFIRMA had relatively small number of students at a time. Therefore, the management and organization of these environments were lightweight and they did not really need a formal project process. This paper presents briefly theFIRMA's project process. Moreover, this paper describes how a course called ICT Services and Projects has been utilized in getting more students to study in theFIRMA and in handling the "big mass" of students.

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THEFIRMA BENEFITING LOCAL COMPANIES AND CITIZENS

TheFIRMA does not only benefit our students, it also offers local enterprises various ICT-related projects at an affordable price. Especially, very small enterprises (whose main area of expertise is not ICT, but for example hairdressing, accounting or retail) may not be able to use the services of ICT subcontracting companies but would still need such technical expertise that they do not have themselves. TheFIRMA can offer various services to these entrepreneurs: not only web pages or other technical projects, but also innovation workshops where students innovate for example new marketing possibilities, design new graphical image, or conceive ideas that would help the business to grow or take a leap to digital era.

In general, customers are very understanding of the fact that theFIRMA's projects do have a relatively long schedule in order to enable students enough time to learn not only necessary technical skills, but also soft skills. However, some customers may need a project delivery faster than theFIRMA can offer, or the proposed assignment is outside theFIRMA's scope. Therefore, co-operation with local ICT companies is needed and, sometimes, the customer is handed over to these professionals. Moreover, ICT businesses can present their operations or recruitment needs to theFIRMA students thus finding potential new employers, interns or thesis workers. For example, innovation workshops where students innovate or solve problems for companies offer them a better view to the students' skills so they can use the event as a recruitment opportunity in addition to regular job interviews.

TheFIRMA offers services also to private citizens. Citizen's helpdesk offers free support in using computers, tablets or smartphones. Students working in the citizen's helpdesk also fix computers (for example remove viruses, install new software or update computers). Help desk is managed by student project manager who is a TUAS degree student. The helpdesk employees are mainly local vocational college students who are doing their internship.

THEFIRMA BENEFITING STUDENTS

To students, theFIRMA offers an active way to learn new skills and to gain credits. In addition, students benefit a great deal when working in theFIRMA. Participating in real customer projects seems to increase students' motivation towards the topic compared to working on (even relatively similar) assignments on a regular course. Moreover, for student project managers the real customer projects cause a very different pressure to do their job compared to regular course assignments. Figure 2 shows a student project manager at work in theFIRMA premises.

In theFIRMA's projects, students have the opportunity to learn communication skills with real customers, time management skills, team-working skills, problem-solving skills and even language skills due to working in a multicultural environment. In addition, students learn how to orient newcomers into theFIRMA practices and projects, manage customer relationships, assess the quality of their own work and peer review fellow students' work.

As well as soft skills, students also have the possibility to deepen and broaden their technical knowledge. Students have the opportunity to work in various projects for various customers sometimes learning quite deep skills from the used tools and technologies. Especially student system administrators, who maintain theFIRMA's networks and computers, have the opportunity to work in such a realistic environment that would be hard to replicate on a regular course. Figure 3 depicts students working in theFIRMA.

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In theFIRMA's projects, students start from conceiving the idea, continue to design and implementation phases and in several projects they can even be part of the operation phase. For example, administrating the computers, servers and networks in theFIRMA premises or giving short-term maintenance or training for customers cover the operation phase of CDIO. Therefore, theFIRMA fulfills all the CDIO framework's phases and produces skilled students who can handle the complex requirements of the working life.

Figure 2. TheFIRMA is student-driven, thus giving project management responsibility to student project managers.
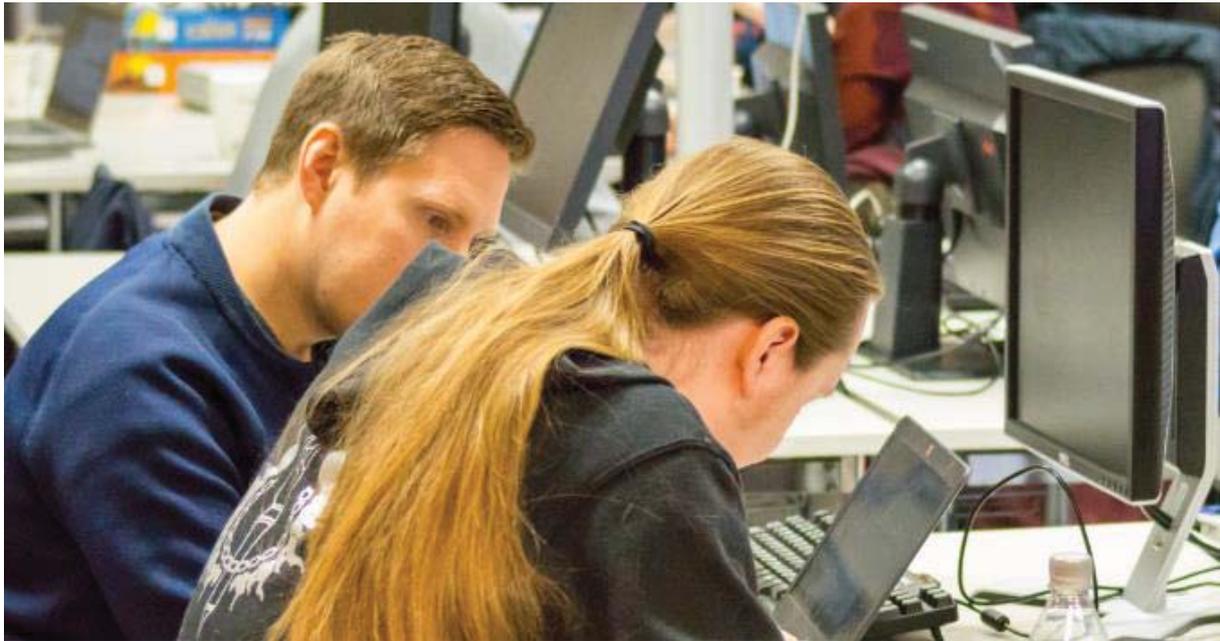
Figure 3. Students work in project groups in real customer projects.

THEFIRMA'S PROJECT PROCESS - ENABLING GROWTH

The purpose of a project process is to improve the quality of work. Often this aim is twofold: First, how to deliver customers good quality projects and second, how to increase the staff's knowledge. As theFIRMA operates like a small ICT company, it also has a project process. However, as theFIRMA is not a real company but a learning environment at TUAS, in addition to quality process we also need a learning process (Määttä et al., 2017). The purpose of the quality process is to provide theFIRMA's customers with good quality projects whereas learning process is used to give students credits and grades thus supporting their professional growth. Students define project specific learning goals at the beginning of each project, track their working hours during the project and at the end of the project assess whether the learning goals were met.

Since theFIRMA was established, the amount of students and projects has grown gradually, thus making several challenges and features of such an environment visible. TheFIRMA operates all year round and does not follow the same schedules of the academic year than regular courses at TUAS. For example, students can start in theFIRMA at any time and they can leave theFIRMA at any time. Moreover, students participate in different number of projects (which start and end at different times) and work different amount of hours getting different amount of credits. Therefore, theFIRMA is like a small company that is constantly in a severe human resources crisis. As we consider this the normal operation mode and even embrace the freedom from schedules of the regular academic year, it does require a good process how to handle this.

Course Tackling Challenges

Harnessing the 15 credits ICT Services and Projects course tackles some of the challenges. Majority of the students in theFIRMA study there within this course, and only a few students

stay there longer. Therefore, using the course and its structures for giving credits and grades helps us to manage a larger amount of students. Currently, this course consists of three parts: attending guest lectures and ICT related events, technical certification (Microsoft Technology Associate (MTA) certification) and project work in theFIRMA in customer projects. Attending guest lectures and ICT related events increases students' knowledge about local ICT businesses and enables networking with other students and local ICT companies. Technical certification and project work in theFIRMA aim at increasing students' technical skills.

Students can start the ICT Services and Projects course at any time and finish it within one calendar year. The course has no regular or fixed schedules thus requiring a lot of activity, responsibility and initiative from students. ICT Services and Projects course or theFIRMA in general have very little to do with "normal" classroom teaching. There are many ways to study the course, most project work is done in theFIRMA's projects, but sometimes also in the ICT unit's research projects, in co-operation projects with other universities or in the students own projects (for example, a web site for family business, time management system for a hobby club and so on). It is challenging for theFIRMA's staff members to stay in contact with the students when they are spread in so many projects. Thus, this gives students a lot of freedom but also a lot of responsibility to follow their own progress or contact their teacher in case of problems they cannot solve by themselves.

Course Causing More Challenges

Yet, we noticed several drawbacks in the ICT Services and Projects course's setup during the first implementation of the module. First, some students struggled in the technical certification part. Second, student motivation and professional attitude varied a lot in the project work part. Third, some students were not able to finish the course during one academic year. Thus, students struggling with their technical skills as well as motivation and professional attitude were usually the students who did not finish the course within the planned course duration; and some did not finish the course at all.

Since the academic year 2016 – 2017, the ICT Services and Projects course is offered as a free choice course for all students of TUAS. This gave the course a lot more visibility at TUAS and as a result, the number of students on the course suddenly rose. However, approximately half of the students who started the course never finished it. Students did not seem to know what they signed up for, or maybe they overestimated their skills in time management or underestimated the requirements of the course. Moreover, the nature of the course and theFIRMA's customer projects (that is, freedom comes with responsibility) seemed to surprise many students.

Because so many students (all allocated to customer projects) suddenly disappeared from the course (and from theFIRMA), our human resources crisis did not get any easier. We had to put some internal development projects on-hold in order to properly resource all customer projects. Moreover, as well as teaching staff, also student project managers had to spend (and in some cases: waste) a lot of time to try to reach the students who just disappeared without any notice.

On a regular course, students quitting the course is naturally undesired. However, on a course involving real customer projects students lacking motivation and professional attitude is obviously an even more significant challenge. When some project members do not accomplish their tasks, show up in meetings or just quit the project (even without any notice),

student project managers' burden increases and a lot of teacher intervention is required. Moreover, it also puts theFIRMA's project process in test: how do we handle the constant human resources crisis and are still able to deliver theFIRMA's customers good quality projects in time.

Lessons Learned

Due to the challenges on the ICT Services and Projects course, several changes have been made: We now offer more information about the course, have added pre-assignments to test motivation and improved theFIRMA's project process. For example, students are provided with more information about what kind of skills are required from students who choose the course. That is, students who rather sit in classroom or are not yet prepared to take direct responsibility of their own learning or professional growth realize that the course is not suitable for them.

After the first implementation of the course, two mandatory pre-assignments were added. A student is not assigned to any project work before a teacher accepts the both pre-assignments. The pre-assignments test student's motivation, knowledge and time management skills. Moreover, the assignments also make students to think about software project management and the role of a team member in a project. We have noticed that if students are not motivated enough or have limited skills to take initiative, they have difficulties in starting or finishing the pre-assignments. In this case, they would also have difficulties in being productive project members in a real customer project. Hence, well-made pre-assignments predict that students are capable and responsible enough that they can be placed to a real project.

The first implementation of the course also caused several changes to theFIRMA's project process. First, the orientation practices for new students in theFIRMA needed to be revised. Instead of burdening the student project manager to guide newcomers, the student CEO started to orient new students using an orientation checklist tool. We also had to take a more prompt policy into use what comes to students quitting or changing projects. After two failed attempts to reach a student or student not showing up in agreed meetings without an acceptable explanation means that student is not given a third chance. Students were also noted that the ongoing project could not be changed just because "it is not interesting enough". Having a professional attitude towards the "not so interesting" projects is nevertheless valuable skill in working life as well.

CONCLUSIONS AND FURTHER WORK

This paper introduced a project based learning environment, theFIRMA, and how project work is integrated into the curriculum. The FIRMA is a good example of a learning environment that is able to provide active learning opportunities covering all the aspects of the C-D-I-O core model. Moreover, this paper presented lessons learned how to manage students in such a versatile and dynamic environment.

Currently, one part of the ICT Services and Projects course is technical certification, which means that all students on the course have to pass an MTA certification exam. These exams are closely related to ICT subject field and, thus, they easily exclude business or arts students from the course even if theFIRMA projects could greatly benefit from that kind of

knowledge as well. In the future, the MTA exam will not be a mandatory requirement on the course.

One of the challenge of the human resource management is that even if theFIRMA's projects do not follow the regular academic year's schedule, majority of students still want to start in theFIRMA in September when the semester starts or in April – May, when their internship period starts. ICT Services and Projects course does allow any schedule and the aim is that the student flow would be more balanced throughout the whole year. So far, this has not happened and it is left as future work to even the peak seasons of the number of participating students.

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Sanna Määttä is a lecturer in the ICT unit of Turku University of Applied Sciences. She holds Doctor of Technology and Master of Science degrees in digital and computer systems from Tampere University of Technology (Tampere, Finland). She is also one of the responsible teachers in theFIRMA, mainly concentrating on developing and improving the quality and learning processes of the FIRMA as well as theFIRMA competence track for third and fourth year students.

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