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Agile Project Management in University-Industry Collaboration Projects

Marika Eve Katariina Säisä, ICT Unit, Faculty of Engineering and Business, Turku University of Applied Sciences, Turku, Finland

Katariina Tiura, ICT Unit, Faculty of Engineering and Business, Turku University of Applied Sciences, Turku, Finland

Rita Matikainen, ICT Unit, Faculty of Engineering and Business, Turku University of Applied Sciences, Turku, Finland

ABSTRACT

Both disciplinary and interdisciplinary knowledge is needed in order for a student to succeed as a professional after graduation. Interdisciplinary knowledge, such as project management skills are important in working life regardless the competence area. In order for a student to gain competences relevant for working life, both traditional and agile project management frameworks should be a part of their studies – in theory and in practice. In this article, a case study is presented on the integration of an agile project management framework into university-industry collaboration projects. First, the methodologies used in theFIRMA are introduced. Thereafter, the activities and the roles of theFIRMA are described and an externally funded R&D project is presented. Finally, the experiences of past and current activities are discussed, and future development thoughts are presented.

KEYWORD

Agile Project Management, ICT, Project-Based Learning, R&D Learning Environment, SCRUM

INTRODUCTION

According to The Project and Portfolio Management Landscape survey by Innotas (2015, p. 3), over 50% of the IT-projects fail. Over one third of the respondents say that resourcing is top challenge in their organization. Prioritizing and alignment are the next two most popular challenges in project management.

Both disciplinary and interdisciplinary knowledge are needed in order for a student to succeed as a professional after graduation. Interdisciplinary knowledge such as project management skills are important in working life regardless the competence area. In order for a student to gain competences relevant for the requirements of the working life, both traditional and agile project management frameworks should be a part of their studies – in theory and in practice.

According to 10th Annual State of Agile Survey from VersionOne, 82% of the 4 452 respondents use Scrum. The survey respondents consist of 108 countries and more than 14 industries including IT software development, product development, operations, human resources, executives, and sales and marketing. (The 2015 State of Scrum Report). According to PMI´s 9th Global Project Management Survey (2017, p. 10), 71% of organizations use the agile project management approaches for their projects sometimes, often or always. These surveys indicate that agile project management framework is widely used in industry and therefore, ought to be part of the university curriculums.

TheFIRMA is a student-driven learning environment of the ICT unit in Turku University of Applied Sciences (TUAS). Project office operates like a real company offering IT services and

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development projects for both TUAS international customers as well as external customers, such as SMEs. Theory gained in classes is put into practice when students are solving practical challenges given by customers. Students tend to work more systematically and accurately when the teaching of different professional skills alongside disciplinary knowledge is integrated into the business context (Mejtoft, 2016, p. 689).

In this paper, the focus is set to present a case study on integration of agile project management framework into university-industry collaboration projects. First the methodologies used in theFIRMA are introduced. Thereafter the activities and the roles of theFIRMA are described and externally funded R&D project is presented. Finally, the experiences on the past and current activities are discussed, and future development thoughts are presented.

AGILE PROJECT MANAGEMENT

Project management knowledge areas consist of: 1. Integration management; 2. Scope management; 3. Time management; 4. Cost management; 5. Quality management; 6. Human Resources management; 7. Communications management; 8. Risk management; and 9. Procurement management. All of the project management knowledge areas consist of variety of different phases such as planning, monitoring, and ending the project. (Richman, 2006, pp. 13-15). Even though the approach and the methods of the traditional and agile project management frameworks are different, the same kind of project management knowledge is needed in order to succeed in projects. According to the FLUX report (2014, p. 5), leadership and management skills are the two most important qualities that HR decision-makers think need to be developed in employees to drive growth over the next five years. Next most important skills are as follow: interpersonal, innovation/creativity, resilience, technical, sales and client management skills.

Agile project management has been a rising trend for several years as an IT project management method. In the field of IT technical solutions and customer requirements change rapidly, so the need for agile method has been obvious. Several IT-companies use different agile project management ways to manage the project. Scrum is one of the most used ones (The 2015 State of Scrum Report). Scrum methods are based on the Manifesto for agile software development: individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation and responding to a change, over following a plan (Manifesto for Agile Software Development). The roots of Scrum go back to year 1993 when Jeff Sutherland, John Scumniotales and Jeff McKenna used SCRUM methods for the first time in Easel Corporation (Denning, 2011).

SCRUM METHODOLOGY

The Scrum Framework consists of small set of values, principles and practices (Rubin, 2013, p. 35). There are three different roles in the Scrum framework: the Product Owner, the Team and the Scrum Master. The product Owner is responsible for representing the requirements of everyone concerning the project as well as projects resulting system. In addition, the Product Owner makes sure that the prioritizing the items in Product Backlog. The self-managing and self-organizing Team is responsible for developing functionality. The Scrum Master is responsible for Scrum Process, for training the Scrum methodology for team members and for ensuring that everyone follows Scrum rules and practices. (Schwaber, 2004; Rubin 2013, p. 15-17).

Scrum is an iterative and incremental framework for projects where the development is done in cycles of work called Sprints. The Sprints are timeboxed with a specific end date and each iteration should not take longer than one month. The Team commits to complete the chosen items by the end of the Sprint. The chosen items do not change during a Sprint. (Deemer, Benefield, Larman & Vodde, 2010, p. 4-5).

Scrum is a management, enhancement, and maintenance methodology where software product releases are planned based on the customer´s requirements, time pressure, competition, quality, vision and resources (Sutherland, 2011, p. 57). The Scrum methodology focuses on team empowerment, sprint based scheduling and planning and periodic client feedback. The team manages its own work and reviews the internal processes after each sprint. The main idea is to continuously improve the processes and results of the team. A set of tasks are chosen from the projects backlog in the beginning of each sprint. Thus, team decides and controls the work they are planning to do during the upcoming sprint. In case that some of the work is not done during the sprint, unfinished tasks will be returned to the backlog. Projects client gives feedback after each sprint and if the work is not accepted by the customer, the unfinished work will be returned to the backlog (Ferreira&Martins, 2016; Sutherland, 2014).

In order to implement a successful project, it ought to be done project in agreed time within the allocated budget and desired quality standards. Main benefits of using Scrum are improved return on investment, reduced costs and fast results (Rubin, 2013, p. 6-7). Scrum was designed to provide transparency to both team members and those outside of the team. For example, a manager can go to a Scrum board and see the state of the team and the project within the seconds. (Sutherland, 2011, p. 137). The accurate estimates in the beginning of the project are in key role, when aiming at successful and timely completion on a project. In Scrum the most difficult task is arrive at approximate estimates since the estimation transform an individual activity to a group activity. (Agarwal & Majumda, 2012, p. 97). In addition, there are different ways to measure the Scrum team. For example, a velocity is the measured capacity of the team to deliver value. However, the measurement is not of an individual, but of the team velocity. Project planning and especially scheduling can be done using team velocity. For example the length of the project can be projected on how many story points a team can deliver in one sprint. However, teams cannot be directly compared with each other and the estimation is only for a certain team. (Davis, 2013, p. 125-127).

Even though Scrum is constantly spreading as a project management methodology, there are also challenges when using Scrum. For example, code quality, lack of Scrum training and interruption of the team work ought to be considered when the Scrum methodology is chosen to be the project management framework. (Akif & Majeed, 2012, p. 2). The performance measurement for monitoring Scrum based projects is important in order to evaluate the efficiency. The Team uses Burndown Chart where the estimated work is calculated on a daily basis. The metrics could also include views from three stakeholders: IT management, Team members and customers. (Mahnič & Vrana, 2007, p. 243). In addition, there is a conflict between a traditional project organization and agile project organization. The Scrum method introduces two manager roles; the Product Owner and the Scrum Master. Increasing management overhead is likely to cause a conflict between new and old management roles (Vilkki, 2010). Particularly large organizations face challenges when it comes to Agility and therefore are more in the pretending to do Scrum phase (James, 2010).

THEFIRMA LEARNING ENVIRONMENT

TheFIRMA is a learning environment of the ICT Education and Research Unit of Turku University of Applied Sciences. The student-driven project office operates like a small company providing development projects to both university internal and external customers. Typical assignments include website designs, small-scale database applications, and end user training sessions. (Säisä, Määttä & Roslöf, 2017, p. 234).

Student-driven project office has an internal organization. The student CEO is responsible for general administration, staffing and selling activities. The student project managers coordinate the customer projects, and lead the teams and team members are focused on implementing the customer projects. Depending on the individual interests and competencies, the students can focus on different ICT engineering topics, such as website design, network administrations, graphics and software testing.

TUAS staff mentor the students when needed, help with the negotiations with customers and make sure that the learning goals are met during the projects. (Roslöf, 2016, p. 427). TheFIRMA and Hot Potato projects are based on the customer needs and thus, the goal and the scope of each project vary a lot. Agile project management methods are mainly used in development projects, because they suit the best for that purpose. TheFIRMA has chosen Scrum as its agile project method, since it is one of the most used methods also in the industry.

Majority of the students working in theFIRMA are studying in the ICT-focused Bachelor of Engineering or Bachelor of Business Administration degree programs. Students have two ways to enter theFIRMA: they can either do their internship in theFIRMA or they can attend "ICT Services and Projects" course that contains 7-10 of project work in theFIRMA. (Määttä, Säisä & Roslöf, 2016, p. 273). Work done in the customer projects of theFIRMA is integrated in the curriculum so that the students gain credits for the introductory course, work placement, thesis or separately agreed courses if the contents of the customer project is similar to contents and learning objectives of this certain course. In addition, it is possible to complete tailored advanced professional studies in theFIRMA as well (Säisä et al., 2017, p. 238).

In addition to customer projects, theFIRMA participates in externally funded R&D projects, where the focus is set on digitalization of SMEs. "Hot Potato" project (2017-2018) creates development services with a lever to meet the unique needs of SMEs in such a way the content fits to the adaptability capability of the SME. The levers are digitalization (including knowledge work, work flow), gamification (including learning, training, and user satisfaction), and knowledge management (including management methods and objects in relation to productivity and well-being at work). The purpose of these rapid experiments is to inspire and motivate the staff and management in the target companies to persevering development practice using collaborative experiment-oriented culture. The briefcase is the concrete product that enables the efficient dissemination of the lever-based tool for increasing productivity and work-being at work. The briefcase is used by the SMEs to evaluate and develop their performance and manage the change process. During the Hot Potato project, there will be 50 customer pilots done in co-operation with Turku University of Applied Sciences, University of Turku and nationally companies in Finland. The project is funded by partner universities, companies and European Social Fund. Students in theFIRMA will actively participate in the customer pilots as well as other tasks of the project, such as organizing three events for 200 companies. (Säisä et al., 2017, pp. 240-241).

SCRUM PROJECT MANAGEMENT IN THEFIRMA

Agile project management is a great way to lead these rapid experiment projects done in cooperation with the companies. The main goal of the rapid experiments is not to design too carefully the entire change process for the company beforehand, but actually try something new, and if the experiment seems to fit for the company´s purpose, then the focus is set to apply the chosen experiment to the company´s processes. Obviously, if the experiment does not seem to fit for the company´s purposes, it can be easily abandoned and changed for a new rapid experiment. When the project is carefully planned beforehand, but the testing phase implies that the results are not actually those that a company is looking for, then the long-lasting planning phase took too large portion of the whole project. In Hot Potato, focus is set to rapid experiments. The Scrum project methodology works well with these projects.

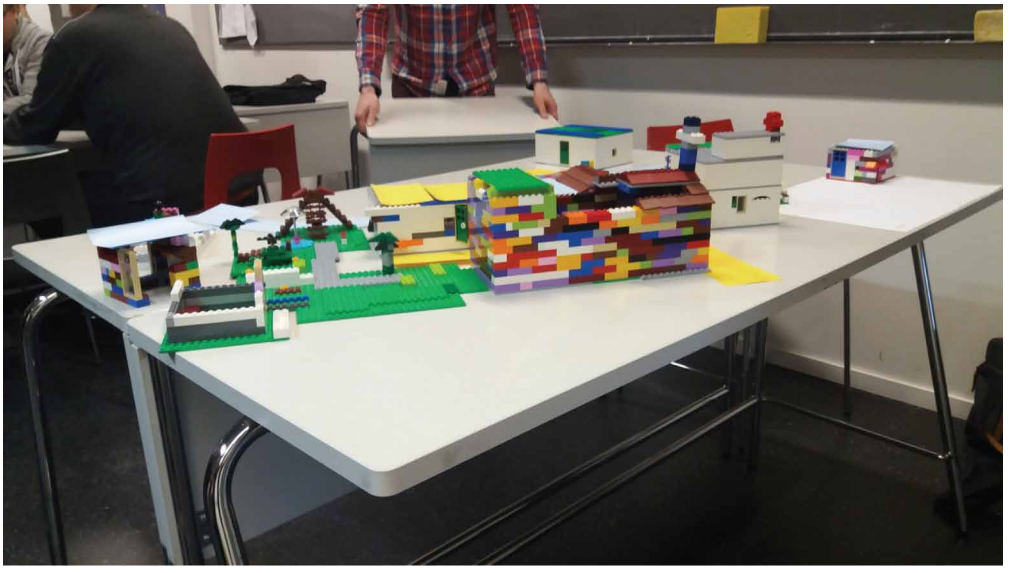
In the beginning of the project work, half a day of Scrum is taught for students. After a short theory, students are divided into teams and the practice of Scrum is taught via Scrum Lego simulation. The main idea of the game is to design and implement a town based on a product owner's needs. Figure 1. shows the Lego city built by students in spring 2017. The Scrum master makes sure that all the teams are able to do their best. The town is mainly build of Lego bricks. All the teams are building the same city aka the same product. The Lego city is ought to be built in three iterations of

7 minutes each. Once the teams have built or almost built the city in three iterations, all of the players understand the basics of the Scrum framework. After the game, students are more confident to use Scrum as a project management method in their projects. (Krivitsky, 2011).

In the projects where Scrum methodology is used, TUAS staff member is usually the Product Owner and thus, aware of the customer´s needs. Scrum Master is chosen in the beginning of the project among the students. The Scrum Master focuses on making sure that the processes of the Scrum are being followed properly. The Scrum Team consists of junior and senior level students that concentrate on implementing the project and meeting the needs of the customer. In order for this set of roles to work, the Product Owner has to fully understand the needs of the customer in order to communicate the needs for the Team. The Scrum Master has to understand the methodology of the Scrum in order to facilitate the processes and environment for the Team. Finally, the Team has to be motivated to commit to the Scrum framework and to the customer project.

According to the former experience, Scrum was found to be a useful tool to ease up the transition from the planning phase to the rapid prototyping and implementation phase. In addition, using Scrum strengthens the commitment of the Product Owner and potential users to the development process. (Kulmala, Luimula & Roslöf, 2014). According to our experience in theFIRMA, the most efficiency of using Scrum in the customer projects, is reached when the students work full-time during the summer work or internship. Working full-time in the customer projects enables students to do deeper co-operation with the team and therefore accelerate the work flow and improve the sprints. However, during the academic year students work in theFIRMA 10-15 hours per week on average. When the team members have different schedules, the mutual time for the whole team to work together is only couple of hours per week. This leads to a situation, where the team has to efficiently communicate about the project and divide the tasks between team members in order to proceed with the customer project. As a Scrum Masters perspective, the work is ought to be done within teams. Student´s separate schedules forces the work to be done more as individuals than in teams.

Figure 1. The Lego city built by students in Spring 2017



DISCUSSION AND CONCLUSION

In this paper, integration of agile project management into university-industry collaboration projects has been described and discussed. It seems that the clear short-term goals and schedules enhance engagement of the students to project work and thus, enhances their learning and motivation. Learning environment theFIRMA has been operating in its current form for two years now and the experiences using the Scrum methodology are promising. Externally funded R&D project enables universities to do wider co-operation with industry and thus, more suitable projects for students to enhance their knowledge and relevant skills. The Scrum methodology suits well especially in R&D projects there the focus is set on rapid prototyping and experimenting.

The feedback from the students about using the agile project management in theFIRMA is mainly positive. According to the feedback, in the field of interdisciplinary skills, students are more confident about working in tightly scheduled project and they are able to work more goal-orientated. Especially teamwork and communication skills have improved during the project working. In the future, industry expects engineers to be technically capable, but also to have project management skills as well as constant passion to learn more.

Naturally, there are also development ideas to consider in order to improve the project management in the learning environment. Scrum Masters are usually senior level students who have been working in different customer projects already and have gathered technical and social knowledge in project work. This leads to fact that Scrum masters are also in advanced stage of their studies. Currently most of students that work in theFIRMA are in the first or second year at their studies. The group of students that are in the advanced stage of their studies is a lot smaller. This leads to the fact that the senior student group is not large enough to manage the projects and share their knowledge with all the junior students working in theFIRMA. In the future, the goal is to also expand the senior team so the senior level students would not have that many projects to manage and they would have more time on knowledge sharing and mentoring junior students. In addition, in the future more focus is set to engage the customers to the Scrum processes in order to make sure that the meeting and feedback of the Sprints are done in agreed Sprint schedule.

The efficiency of the project management is quite difficult to measure. Projects vary, skills of the participating students in different projects vary and participation level of the customers vary. In order to evaluate the efficiency of chosen project management method, quality metrics should be carefully planned. However, currently the feedback from the students as well as from the customers have been mostly positive. If considering the idea of the learning environment theFIRMA, the main idea is to enhance the learning by doing. To successfully implement a project with traditional Waterfall or agile project management method, a student needs to have same kinds of knowledge areas. The difference between these methods is the way how the project is operated, coordinated and managed. Especially in the field of IT, a student needs to understand both methods in theory and in practice. The main idea of the Scrum methodology is to constantly develop further the team's operation. However, in university projects it is not possible for the same team to work together in several projects. Therefore, the main focus using Scrum in University-Industry cooperation projects is to get the basic experience on how to use the Scrum project management practices in projects.

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Marika Säisä is a lecturer in the ICT unit of Turku University of Applied Sciences. She holds a Master of Science in Technology degree from University of Turku (Finland). She is a responsible project manager in theFIRMA, mainly concentrating on customer relations and mentoring students with customer projects. She has participated in several national externally funded projects. Currently she works as a project manager in Inside the Box and Hot Potato.

Katariina Tiura is an alumni of the ICT unit of Turku University of Applied Sciences, majoring in Information and Communications Technology. During her studies, she has been an active student in theFIRMA, working as a student CEO and student project manager. Currently, she works as a project manager in CGI.

Rita Matikainen is a project engineer in the ICT unit of Turku University of Applied Sciences. She holds a Bachelor of Science in Technology degree from Turku University of Applied Sciences (Finland). She is responsible HR manager in theFIRMA, mainly concentrating on HR, customer relations and mentoring students with customer projects. Currently she works as a project engineer in Inside the Box, Hot Potato and TRY OUT! projects.