


Students' Perception of a Postgraduate Course in Agile Project Management Aimed at Developing Soft Skills

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Abstract. During the last decades, teachers have observed with attention and interest, but passively, the technology and its use in classrooms; In times where digital transformation has completely changed our society. Teaching-learning methods are evolving in combination with new technologies, due to the daily use of the technology to which students are immersed. And traditional educational environments are no longer enough for students to develop a set of necessary skills in a global, complex, and highly competitive environment. While the technical capabilities of professionals are valued in the industry, social skills are a differentiating aspect that organizations demand today. Understanding and working under a framework like Scrum, whose philosophy is raised on values and principles oriented towards teamwork, becomes essential. We presented the general design of an elective course of the Specialization in Technological Management program of the Faculty of Engineering. The primary competence was the comprehension of the Scrum framework from a project management perspective. The course design was based on promoting the Scrum pillars and values through teamwork, continuous feedback, and using some gadgets to stimulate students' participation. Finally, we show the results obtained from the survey applied to students when they finished the course. We also discuss opportunities for improvement, and conclusions of the process.

Keywords: Education Technology · Gadgets · Soft Skills · Agile Project Management

1 Introduction

In the contemporary world, the development of projects is a common practice in different fields since it allows to reach the proposed objectives with higher quality in complex scenarios [26]. Scrum Initially, it focused on software development, but because it accelerates the productivity of work teams thanks to its ability to overcome difficulties quickly, it has become an essential tool for any manager. And one of the main reasons for agile adoption in organizations was to improve team collaboration and increase software quality and customer satisfaction [7,22].

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Good practices help team members to maintain the workflow. A typical scenario in projects is that a member of the team loses focus of their work, either because they focus too much on the details or because they have distractions that affect their work, the practices suggested in Scrum promote that this type of situations does make [23].

Once this new boom was detected in the way the projects are managed, the elective course was proposed. Through the professional elective courses, the faculty has the possibility of generating updated and booming content pertinent to the academic program. Through this document, we present the guidelines that were taken into account for the design of the elective specialization course following the University educational model [4, 9].

2 Background and Course Content

In February 2001, seventeen people met in Snowbird (Utah, USA) to discuss an emerging trend called light processes. As a starting point and fundamental basis of agile methodologies, the agile manifesto was drafted and published. The manifesto emphasizes four central values that software development must support [14]:

“We are discovering better ways to develop the software, doing it and helping others to do it. Through this work we have come to appreciate: Individuals and interactions about processes and tools. The software runs on extensive documentation. Collaboration with the client on contractual negotiation. Response to the change about following a plan. That is, although we value the elements on the right, we value more those on the left.”

This manifesto involved agile pioneers who defined their agile methodologies: Scrum, Method of Development of Dynamic Systems (DSDM), Design Methodology Constructor (CDM), Crystal Clear, Kanban, XP, among others [14]. Ken Schwaber and Jeff Sutherland formally defined Scrum for two reasons. The first one because it is an agile model oriented to the management of projects in general (not only to software development projects), and the second because it is an easy model to understand. The challenge was to ensure that students during the elective course understood the values and principles required to implement these types of models.

The creators of Scrum define it as a framework in which teams of professionals can address complex and adaptive problems while delivering products of the highest possible value, productively and creatively. Scrum is also easy and lightweight, as summarized in Fig.1. This framework defines three principles that support the implementation of empirical process control: transparency, inspection, and adaptation. The first mentioned principle refers to the visibility of the status of the process and all relevant aspects for Scrum users. The second is about the shared and detailed review that each member does to obtain quality. And the third refers to the process of making incremental and systematic changes based on the consensus of the team [23].

A Scrum Team consists of three roles: Scrum Master, Product Owner, and Development Team. The Scrum Master (SM) is the person who knows the most about Scrum, is a facilitator who removes obstacles and who is in charge of guiding the Scrum Team under the framework of work. The Product Owner (PO) is the representative of the client, so it is the interface between the client and the Development Team. He is empowered to make decisions and on his/her shoulders is the success of the product or not. The Development Team (DT) is responsible for constructing the solution based on the requirements stated by the PO. It works autonomously, so it has bargaining power [23]. Fig.1 resumes the Scrum Framework, and it allows us to visualize the subject of the course.

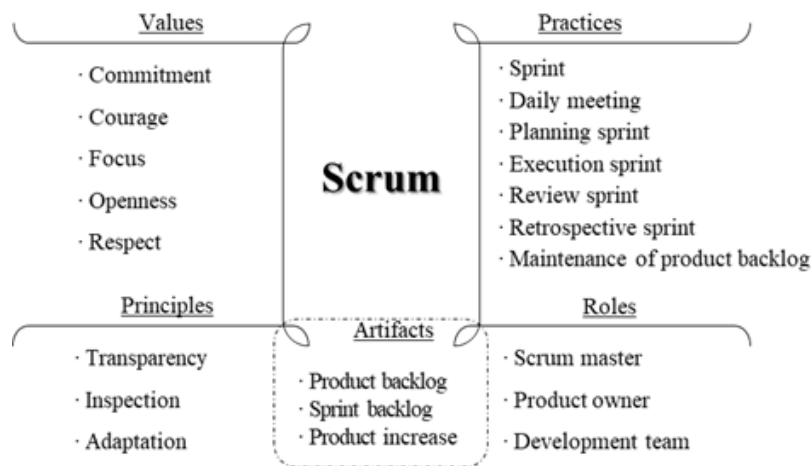


Fig. 1. The Scrum framework: The course subject-matter

Scrum explicitly defines five fundamental values that professionals must assimilate and experience for the principles of the framework to materialize and generate a work environment based on trust and collaboration between people. These values are commitment, courage, focus, openness, and respect. One of the biggest challenges to master Scrum is that the development teams are really a team, and the organization empowers them so that over time, they self-manage.

3 The Proposed Course

The Department of Systems Engineering of the Faculty of Engineering enriches and updates the curricula with professional electives that provide students with specific competencies of their profession. The market that is governed by the principles of project management has given a glance to agile models that energize the work of the teams, and even more that keep them motivated [20]. We

design a course to students can experiment Scrum framework through its values, principles, and practices; reinforcing in each iteration the basics of agile models.

Since the philosophy of a competencies-based education should be oriented in the design of learning activities, that means experiences that allow the content to be addressed by the need generated by the event, instead of guiding the courses to the content teacher [9]. The course was designed focused on a pedagogical strategy based on continuous feedback between peers, teamwork, and support of educational tools such as role-play clicker evaluation, and classroom project. All this, to allow graduate students to have a space to work in a team, perform with a particular role and follow up on their project are pedagogical activities that enrich their learning. The course configuration was designed for five sessions of 8 hours.

3.1 Pedagogical strategies and their inclusion in the classroom

The pedagogical strategies are the actions carried out by a teacher to facilitate the training and learning of specific competencies in students [17]. For the design of the elective course, a set of activities were critically chosen to reinforce the nuclear competence, orienting significant actions that will give the students the ability to identify and experience the selected agile model [16,17,20]. During the learning process, different techniques and teaching methods were used to achieve a common goal: a high level of education in the processes of training students at the university level. Below are the pedagogical strategies that framed the design of the elective course.

Continuous feedback Feedback is a process that helps provide information to students about the competencies they develop: about what they know, do, and how they act. The feedback allows us to describe the thinking, feeling, and working of the students in their environment and therefore enable them to know how their performance is and how it can be improved in the future [17].

Feedback is an integral part of formative assessment as it provides crucial information to make adjustments in the teaching-learning process for students to achieve the proposed objectives. It emphasizes the need to be aware of the competencies of students for giving them specific answers, and motivate them, so they continue in the process [10,17]. Feedback is a way to support student learning, providing guidelines to help them bridge the gap between their current and their desired levels [2].

This is why the feedback process must be: (1) immediate, (2) continuous, and (3) relevant. By relevant feedback, it is understood that the comments given to students allow them to know where they are, what they need, and what they have to do to achieve their learning goals. The feedback process should support the learning process since its performance in each of the development areas will depend on this [10].

Teamwork It is a model that articulates the work activities of a social group around a set of goals and results to achieve. This concept implies an active interdependence between the members of a group that shares and assume a work mission [13]. It promotes interaction, collaboration, and solidarity among members, as well as negotiation to reach agreements and deal with possible conflicts [12]. Another benefit is that teamwork teaches you how to have interpersonal skills. Working with others to coordinate schedules, meet deadlines, and make decisions will strengthen your relational interactions. A team can also improve the outcome of a project because you can take advantage of each one's unique strengths. The emotional support offered by the members of the group, is an additional benefit [13].

Other essential teamwork skills include emotional intelligence, active listening, adaptability, collaboration, conflict resolution, and commitment. You may have all the technical knowledge and skills in the world, but not being willing and able to cooperate with your co-workers can be a red flag for an employer [5,12,26].

Educational Tools Within the activities planned for the course, specific pedagogical techniques were included to reinforce the competence that was raised from the beginning (see Table 1).

* The photographic evidence was something that was implemented in other courses and that brought positive results. It was included as a pedagogical technique by the same dynamic that was sought to create within the elective course.

4 Results and Discussion

As part of the quality system, the University surveys students to evaluate all courses. The objective of this is to collect the data as an instrument to measure the level of acceptance of students by asking the extent to which they agree or disagree with a particular statement related to the development of the course. Given the above, we used the perception of the students (collected in the survey) to try to measure how different pedagogical elements influenced the class.

The teaching evaluation is applied through a web portal which, is supplied by The University. Different aspects of the course as methodology, theoretical and practical contents, technical tools, are evaluated, and a quantitative assessment is calculated on a scale between 0 and 100 points. It is expected results above 80 points; otherwise, a teacher improvement plan will be made.

The data collection process was carried out for two weeks. We had a medium response rate of 68,4% in the first survey, and 47,4% in the second one. That means thirteen and nine valid questionnaires of a total of nineteen enrolled students, respectively. The descriptive statistics of the applied surveys are presented in Table 2. There was a total of twenty-one questions in the questionnaire restricted to a range of 1 to 5 (in Likert scale), corresponding to five categories: Strongly disagree, Disagree, Neither agree Nor disagree, Agree, and Strongly Agree.

Table 1. Didactic Elements and Gadgets included in the course

Element	Description	Justification
Role-play	One or more students play a certain role, and this implies, students assume the responsibilities related to it.	This technique is useful to manage scenarios in which it is necessary to take different positions to improve their understanding [18].
Scrum Poker	It is a consensus-based, and gamified technique, used mostly for estimating effort or relative size of user stories. [22].	The use of apps in the classroom combined with gamification is one of the most effective way to engage students in their own learning process [8, 19, 24].
Evaluation with clickers and Socrative	They are devices that allow to obtain information from the audience in a quick and simple way [25]. It consists of an emitter (clicker) and a receiver [15]	Increase student participation, their attention and interest during the class. It provides immediate feedback [21].
Classroom Project	The project is a learning strategy that articulates the theory and the practice during the training process of professionals [13].	As a learning strategy, it helps to relate contents. It puts into practice what has been learned up to that moment and reinforce all other pedagogical techniques [17].
Exposition On YouTube	It is that technique that consists mainly in the oral presentation of a topic. Its purpose is "to transmit information" about a topic, promoting understanding.	When done after a group work to explain how they were organized, what they did and how they felt; facilitates individual and group feedback. It encourages discussion and understanding of a topic [1, 9].
Group picture* With Camera phone	Photographs are taken during the course and at the end of a team activity. All team members must appear in the photographs.	It forces them to know each other and break the ice. It generates stronger bonds, because they must pose together and show the work done.

Among the twenty-one questions, variables 1, 2, 3, 17, 19 were used to collect data of class agreements and clear rules. Variables 4 and 21 try to measure if students feel that they acquire the competence. Variables 5, 6, 13, 16 try to measure the perception of soft skills development, such as communication and leadership. Variable 15 is the perception of the relevant use of technological tools and devices. The variable 18 tries to measure the perception regarding the feedback given in class. The variable 20 attempts to measure the perception

of the success of teamwork. And the other variables measure the perception of acquired hard skills.

To analyze these responses which are restricted to a 5-point Likert scale, The average value of 3 implies a neutral position for a specific variable of the survey. Therefore, the average value of less than 3 for any question implies that question is oriented in the "disagree" perception, and greater than equal to 4 is oriented in "agree" perception. However, we cannot conclude whether the students improve their soft skills with the course.

Table 1 shows the questions that make up the survey applied to the students of the University and the average obtained in each item. For this particular course, 13 of the 19 students enrolled in the class were surveyed, with an application rate of 68.4%.

Table 2 shows the summary of the application of the evaluation of the elective course by the students of the first 2 courses offered in the academic program in the Faculty of Engineering for specialization programs in the area of project management.

When we graph the results obtained from the twice offered by the Scrum course, we got the curve shown in Fig.1. In the results obtained in the second application of 2016-M8, it can be observed in Fig.1 that the average increase slightly concerning the values obtained in the first application made in the period 2016-1 M2.

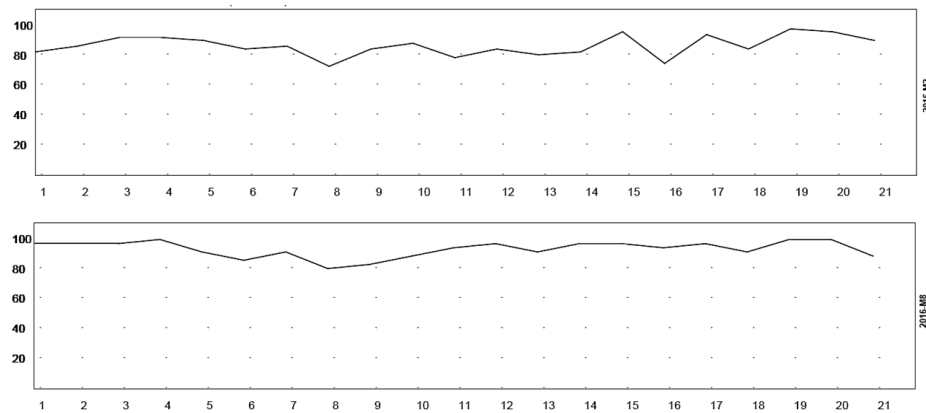


Fig. 2. Results of two teaching evaluations

The number of students enrolled in the 2016-2 M8 period is equal to 2016-2 M2, but the application percentage was lower in the second period. Fig.2 comparatively shows the results of the two periods: the upper graph shows the first measurement of perception, and the lower graph, the measurement of the following period. The horizontal axis represents the variables that were included in the survey, and the vertical axis shows the average value of the students' percep-

Table 2. Questions asked in the survey

Variables	Questions
1	I understood that this unit of study is important for my professional training
2	I was able to recognize the skills that I had to develop in this course
3	I agreed with the academic commitments that I had to assume
4	I identify new knowledge and concepts
5	The teacher encouraged discussion and reflection on different topics
6	I was able to establish different opinions regarding theories and models
7	I could understand, analyze, compare, and explain different kinds of resources (documents, graphics, cases, audiovisual and technological, among others)
8	I was able to support orally and in writing, as a means of argumentation and critical reasoning.
9	In class, I searched, collected and analyzed information for troubleshooting
10	The teacher allowed me to demonstrate results in evaluative tests such as questionnaires, comprehensive reading, summaries, use of mental maps, interpretation of cases; among other learning strategies.
11	The teacher made possible the use of argumentation, through the use of debate, review, criticism, essay, business intervention, analysis from cases; among other learning activities.
12	The teacher generated new approaches, results and innovative proposals, through the construction of projects and new products
13	The teacher stimulated my entrepreneurial and entrepreneurial attitude.
14	The teacher encouraged my critical and analytical thinking
15	The teacher used technological tools for my training
16	The professor promoted reflection against ethical dilemmas
17	The teacher acted consistently with the agreements established
18	The teacher checked the learning processes in a timely manner and fed them back
19	The teacher had good relations with the students
20	The teacher generated various participation spaces for group work
21	I consider that I developed the competencies raised in this course

Table 3. Results of two periods

	2016-1 M2	2016-2 M8
Average	86.81	93.52
Surveyed	13	9
Enrolled	19	19
Application	68.4%	47.4%

tion in each question. We can see the results for both, the first and the second evaluation, the highest score (above 90 points) is for teamwork (variable 20), the appropriate use of technological tools (variable 15), and the development of communication skills (variable 5). The exciting thing is that we made some adjustments in the course between one period and the next; For example, regulating the time of each activity, changing the order of some events, and making the teacher more strict in his role as moderator, resulted in the perception of variables of interest such as 13, 16 and 18 increased.

5 Conclusions

In the region, the adoption of standards and good practices for the management of projects is getting stronger; for that reason, the elective course for graduate students is oriented towards the use of the Scrum framework. It proposes to take advantage of the teamwork and application of soft skills, and that can be developed even while applying another standard or methodology of work in projects.

Nowadays, professionals want to be certified because a certificate offers an endorsement from the entity that issues it. In the labor field, this is the way you guarantee that you have specific knowledge or skill. However, a certification of a role in Scrum does not guarantee that a professional has the soft skills that are required, but it surely assures that he/she knows the Scrum framework and role functions.

When comparing the results of the two evaluations, the importance of maintaining a continuous improvement which requires updates in thematic contents, the strategies, and learning activities is ratified. This update considers the results of the students' feedback, and teachers committee criteria to guarantee the quality and development of competencies defined in the syllabus of the elective course.

For future work, it is expected to be able to include more technology that stimulates interaction between students and the engagement with their learning, as evidenced in projects such as [3, 18, 24]. However, the big challenge is to measure not only the students' perception but also really evaluate the skills they develop, as Oriol suggests [17].

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