

# SCRUM: FROM RUGBY TO TEAMWORK IN HIGHER EDUCATION

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Rugby is a sport admired for its particularities and teachings for life in society. Despite being a collective sport with physical contact, it has a code of ethics and a set of values that differentiate it from other sports: Respect, Integrity, Passion, Solidarity and Discipline. A Rugby player is expected to be a team worker, have courage and loyalty. It is an inclusive sport: 15 players each with specific responsibilities and different functions. There are places for everyone: the small /agile, tall, fast, strong or the combative can be a 9, 4, 15, 1 or 6 respectively. Each element has to know the rules well and do their part of the game, always following the indications of the coach. A player has to encourage team-mates: everyone has their importance in the whole. Each team wants to advance on the field and score points. One of the ways to restart the game is the scrum: can occur when a player drops the ball forward or makes a forward pass, for instance. The teams have a maximum of 30 seconds to form. After the referee's orders for "crouch, bind and set" that the ball may be introduced by the scrum half of the non-offending team on the floor by the center line until it leaves the tunnel formed by the first rows and skidded by the feet of the hooker. There are many other specifics that are important for scrum like the variation of the modality: rugby XV 8, sevens 3, training levels (some don't exist, or form with 5 or 7). The principles of rugby scrum have been used for project management, particularly in software development, which has been widely studied. The items initially intended for a project are defined but may change. The scrum team are usually 6/10 people, one is the product owner and another the scrum master. The product backlog is divided into n sprints, each containing a sprint backlog defined at the beginning of each sprint in a sprint planning meeting where the entire team must be present and where the Product Owner will be the one who prioritizes the tasks to be included in this list. There must be a Daily Scrum every day where each team member presents what has been done, possible problems and takes their commitments for the day. At the end of each sprint, a Sprint Review Meeting is held to present the implemented features, the Sprint Retrospective is updated, the Release Burndown Chart is updated and planning is started for the next sprint. As in Rugby, the teams are small, there is a commitment to the position of each in the group, the motivational factor is very important and the rules are to be met without any malicious discussion between the various elements. Each one knows that for a sprint to succeed everyone has to be able to meet the stipulated for "their position". Teamwork is often used as a form of application of knowledge and evaluation in university. There's several teaching experiences using scrum principles with clear advantages: delivery times, group motivation and commitment/accountability of each element, as well as records of work. Some of these experiences include the use of EduScrum which is an application of the methodology to the teaching. This article intends to evaluate some of these documented experiences, drawing conclusions for the success of using scrum as a basis for teamwork in units as introduction of computer programming in higher education to decrease the abandonment rate and the failure rate.

Keywords: SCRUM, Computer science, University, teamwork.

## 1 THE RUGBY SCRUM

Rugby is a sport that most people admire for their particularities and teachings for life in society. Despite being a collective sport with physical contact has a code of ethics and a set of values that differentiate it from other sports: Respect, Integrity, Passion, Solidarity and Discipline [1]. From a Rugby player is expected teamwork, courage and loyalty. Arguing with the referee does not happen - otherwise it is strongly punished and mistreated by everyone. The rugby player does not stay on the ground complaining about the opponent and asking for a foul - a rugby player tries to get up to continue to perform his position and is expected by the team and coaches. Rugby is an inclusive sport: there are 15 players in a team of XV, each with specifics, responsibilities and different functions. There are places for everyone: the small / agile, the tall, the fast, the strong / robust or the combative can be a 9, 4, 15, 1 and 6 respectively (scrum half, second line, a full-back, a prop and a flanker). Each element has to know the rules well and do their part of the game, always following the indications of the coach. A player has to encourage team-mates because everyone has their importance in the whole who is the team or in the limit the game. The objective of each team is to advance on the field and score points; the conquest is always using a back pass and the offensive tack. Players should know the laws of the game as the characteristics of the ordered formations (scrum), alignments (Lineout), mauls and rucks [2].

One of the ways to restart the game is the scrum (orderly formation). According to Law 19 of the set of rules defined by the World Rugby 2018 (former International Rugby Board, IRB), scrum can occur when a player drops the ball forward, makes a forward pass, there is an offside, among other possible situations. In these cases the scrum is positioned as close as possible to the infraction and the ball is introduced by the non-offending team giving an advantage to regain possession of the ball.

The scrum is formed in the area indicated by the referee who defines the intermediate line parallel to the test line. The teams have a maximum of 30 seconds to form. An orderly formation in XV rugby normally consists of eight players: a first line (left prop, hooker and right prop), a second line (usually with four players, usually 6,4, 5 and 7) and finally a third line (8) in the end position. The abutments should be attached to the abutment that holds the abutments with both arms, while the players of the second line should cling to the abutment in front of them and the player (s). The last player must hold the second two middle lines with his arms. It is only after the referee's orders for "crouch, bind and set" that the ball can be introduced by the training medium of the non-offensive team on the ground by the center line of the formation played until it leaves the tunnel formed by the heads and healed by the feet of the players.

Obviously there are many other specifics that are important for scrum / rugby: the variation of the modality: rugby XV, sevens (3 players in the scrum), training levels (some do not even exist, others form 5 or 7 players), cases of rotation of orderly formation, for example.



Figure 1. Forming a scrum [2].

## 2 THE PRINCIPLES OF SCRUM IN SOFTWARE DEVELOPMENT

The manifesto for agile software development was born in 2001 and was signed by 17 personalities. This manifesto aims "By developing and helping others develop software, we have come up with better ways to do this. Through this process we began to value: Individuals and interactions rather than processes and tools; - Functional software more than comprehensive documentation; - Collaboration with the client rather than contractual negotiation; Respond to change more than following a plan. That is, although we recognize value in the items on the right, we value the items on the left more." [3].

Scrum is a form of agile approach. The principles of rugby scrum have been removed for project management, particularly in software development, which has been widely studied. The features initially intended for a project are initially defined but may undergo changes [4]. The teams (scrum team) are usually made up of 6 to 10 people, one of which is the product owner and another the scrum master. The product backlog is divided into n sprints, each containing a sprint backlog defined at the beginning of each sprint in a meeting (sprint planning meeting) where the entire team must be present and where the Product Owner will be the one who prioritizes the tasks to be included in this list. There must be a Daily Scrum every day where each team member presents what has been done, presents problems and takes on commitments for the day. At the end of each sprint, a meeting (Sprint Review Meeting) is held to present the implemented features, the Sprint Retrospective is updated, the Release Burndown Chart is updated, and sprint planning is started completion of the project. As in Rugby, the teams are small, there is a commitment to the position of each in the group, the motivational factor is very important and the rules are to be met without any malicious discussion between the various elements. Each one knows that for a sprint to succeed everyone has to be able to meet the stipulated for "their position".

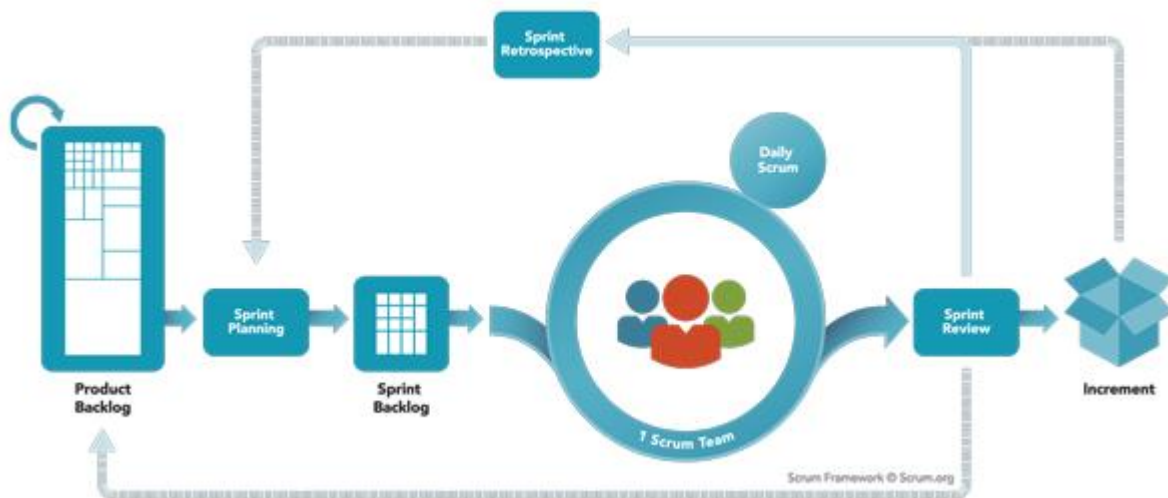


Figure 2. Scrum Framework [4].

### **3 SCRUM AS A BASE OF TEAMWORK IN HIGHER EDUCATION**

Teamwork is often used as a form of application of knowledge and evaluation in various curricular units in higher education. There have been some experiences of using scrum for project management in university teams, namely in units related to software projects. The advantages are clear: delivery times, group motivation and commitment / accountability of each element in its own teaching / learning process. At the same time there are records of what is being done by each element of the group. There are several teaching experiences using scrum principles. Some of these experiences include the use of EduScrum [5] which is an application of the scrum methodology for teaching (initially for Dutch students in grades 7-12).

One of the experiments studied [6] aimed at the coordination of work in the development of a practical project in the discipline of Software Engineering, during a semester, of students of the sixth period of the Bachelor's Degree in Information Systems of the IFBA campus Vitoria da Conquistano semester of 2015. In this case the class of 20 students was divided into 3 teams that used GitHub, and also resorted to Google Docs, Skype, Hangouts, Facebook and Trello. In this article we report the creation of maturity in the division of tasks and greater communication and collaboration among those involved.

The article "Use of Agile Methods and Problem-Based Learning in Software Engineering Teaching: A Report of Experience" [7] reports the experience of a group of 18 students divided into 4 groups, adopting a pedagogical approach using PBL (problem based learning) and the agile SCRUM method. The discipline was Software Engineering II of the Information Systems course at the Institute of Exact Sciences and Technology (ICET) of the Federal University of Amazonas. The authors report difficulties but also say that "the students' practical experience has allowed them to identify challenges and solutions during the project, as well as to have a vision of how practical experience in a real project helps the team to have a better understanding of theories, practices, methods, processes and tools that involve Software Engineering".

Gouveia et al. report a good experience with students of the Technical Course in Informatics in a Private Teaching Institution in the city of Curitiba [8]. According to the authors, "This experience obtained great results when employed in an interdisciplinary practice, where all teachers from four disciplines and students got involved. A web tool (Visual Studio Online) was used to help with the management and control of development stages. Which allowed the creation and updating of activities, analysis of the continuous performance through Kanban and Burndown and registration and monitoring of information by all involved. "

## 4 CONCLUSIONS

This document is used as the basis of the preparation of the group work of a discipline of introduction to programming in the first year of a degree in Computer Science. In addition to the study of agile techniques, namely the understanding of scrum, several examples of similar methodologies have been studied in educational institutions. All these experiences report improvement in the maturity of the students, as well as the division of the tasks accompanied by the records of the same ones.

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