Teaching Agile Software Development Competences

The Agile Competence Pyramid

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Abstract—Agile methodologies have come a long way over the last decade. Several recent surveys [1], [2] show that agile methodologies like Scrum, Extreme Programming and, more recently, Kanban have successfully been adopted by many companies to develop software. However, the same surveys show that only few of the agile practices are used and even fewer are applied consequently and thoroughly. This is to a great extent due to the lack of skilled personnel. Although teaching agile software development has drawn some attention in recent research and has been discussed in several papers, we do not yet seem to be able to “deliver” the appropriately skilled personnel. What is the reason for this, and more importantly, how can we improve the situation? In this position paper we propose a more holistic approach for teaching agile software development, in which the required agile practices and values are not only integrated theoretically but also practically applied and repeated until they become a habit to students and software engineers.

Index Terms—Agile, Software Development, Education

INTRODUCTION

Many IT-companies and -departments have adopted agile software development. In the Swiss Agile Study [2], a survey conducted by the authors, these findings have been confirmed. More than half of the participating companies are using an agile methodology – Agile has become mainstream!

Unfortunately, this also has a significant impact on the agile team constitution. The early adopters of agile approaches were all highly mature and technically skilled experts in their fields. They had internalized the agile philosophy, were very productive and produced high quality results. Today’s agile teams, however, are “normal” software teams, with architects, seniors and juniors in one team, and many of them are not yet familiar with the agile philosophy. Even though those teams have improved in software development to some extent, they are far less productive than the early adopter expert teams. Survey results show that quality has partially even gone down and overall costs increased. One reason for this is that many of the important agile practices are not applied as thoroughly [2] as the agile pioneers proposed.

In this position paper we will analyze the situation on the industry and education side in more detail to find out which engineering and management skills are missing and propose the “pyramid of agile competences” as a guideline to teach these skills. We will suggest a holistic teaching approach, which integrates the necessary agile skills and the core agile values, into the education of agile software development.

THE STUDY

The study, conducted among almost 140 Swiss IT companies and almost 200 IT professionals, clearly shows the benefit of agile companies in much faster time-to-market; better change responsiveness and much more satisfaction with the process, as compared to traditional plan-driven companies. On the other side, it also shows that there are some difficulties in improving the quality and maintainability of software.

A look at the concrete practices applied, shows that typical agile management practices like iteration planning, or time-boxing are applied by most of the agile companies, while some very important agile technical practices like Test-Driven-Development (TDD), or Continuous Integration and continuous quality control with metrics are still not standard in many companies.

One reason for this could be that the developers just lack the relevant competences and skills. These skills and competences are discussed further in the following chapter.

THE AGILE COMPETENCE PYRAMID

The “pyramid of agile competences” in Figure 1 divides the needed skills and competences into three major categories:

Mastering the technical skills or engineering practices, builds the foundation for being able to develop high quality software. These engineering practices are especially defined by eXtreme Programming [6] and include best practices like unit testing, clean coding [3], test-driven development [7], collective code ownership, continuous integration and the like. Engineering practices are mostly competences that refer to the single individual.

On the second level come the agile management practices. They define how agile projects are organized and run. Agile management practices include iterative planning, short release cycles, small releases, strong customer involvement and highly interactive teams. Management practices are typically team aspects, which require the appropriate social competences.

On top of these competences come the agile values, which are articulated in the agile manifesto [4] and are based on characteristics like mutual respect, openness, and courage.
Based on these engineering practices, the following module Software Project Management, focuses on management practices like iterative and incremental development, and values like openness and interaction [9]. This course teaches the agile management approach by applying a modified version of the Scrum City game [10] in teams of six students.

The feedback from the students to both courses has been very positive. They especially like the very practice oriented approach provided by the case study and the game.

B. An Integrated Teaching Approach

In 2012, a Software Engineering course was taught at Zurich University of Applied Sciences, which was designed to give the students a good working knowledge of agile software development. The course was a typical 16-week semester class in the last year of the undergraduate level (B.Sc.). In this course, the students applied agile engineering- and management practices and special attention was paid to agile values, i.e. it was designed with the pyramid of agile competences in mind.

In Scrum teams of six to eight students, computer games were developed while strengthening the students’ agile software development skills. An evaluation shows that the concept of this course was well received, and that participants learned a great deal about agile methodologies while having fun.

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REFERENCES