BOARD # 365: Empowering Junior Faculty and Students within an Engineering Department using an Agile Approach

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IUSE-RED: Empowering Junior Faculty and Students within an Engineering Department Using an Agile Approach

Abstract

In academia, hierarchical structures often create rigid dynamics, where senior tenured faculty exert significant influence over junior, non-tenured members and students. This top-down approach can stifle the growth and collaboration of junior faculty and students. Scrum, an Agile approach designed for flexibility and self-organization, contrasts sharply with this rigidity. Over the last four years, the Electrical Engineering and Computer Science department at Embry-Riddle Aeronautical University has implemented Scrum in faculty service teams to improve their teamwork and productivity.

By analyzing the application of Scrum in four different departmental service teams, it was found that the Scrum process fostered a sense of empowerment, which encouraged greater involvement. This increased participation led to the growth of capabilities, particularly among younger faculty and students. As their skills developed, the teams' overall performance improved, resulting in higher productivity and more equitable contributions across all teams. Furthermore, workload equity fostered an improved sense of belonging within the department's culture, reinforcing collaboration and inclusivity. This cultural shift ultimately reflects the broader positive impact of Agile methods across various industries, driving both individual and collective growth. By examining four teams, we can assess how Scrum influences faculty members' and students' professional development and empowerment, potentially leading to a more dynamic and collaborative academic environment. Finally, by implementing Scrum, academic teams—including faculty and students—can experience a fairer and more empowering environment. Scrum encourages self-management, accountability, and continuous improvement.

I. Introduction

In academia, hierarchical structures often create rigid dynamics, where senior tenured faculty exert significant control over junior, non-tenured members and students [1, 2]. This top-down approach can stifle the growth and collaboration of junior faculty and students. Scrum, an Agile approach designed for flexibility and self-organization, contrasts sharply with this rigidity. By implementing Scrum, academic teams—comprising junior faculty, senior faculty, and students can experience a fairer and more empowering environment. Scrum encourages self-management, accountability, and continuous improvement [3]. This paper discusses the result of four teams performance, indicating how Scrum influences faculty members' and students' professional growth and empowerment, potentially leading to a more dynamic and collaborative academic environment.

II. Background

In alignment with the goals of this paper, this section defines the Scrum process used in academia. The key benefit of Scrum to this work is the reduction of hierarchy within teams; therefore, the issues associated with hierarchy are also defined.

Scrum

Scrum is a project management framework that is popular in Software Engineering disciplines and has expanded to other Engineering disciplines as a technique [3]. Scrum has been shown to improve team productivity and customer satisfaction in industry settings [4, 5].

A Scrum Team comprises a Product Owner, a Scrum Master, and Developers [3]. The Product Owner has the final say on the features necessary for a product. In their role, they help streamline communication between external stakeholders in the project and the Scrum Team. The Scrum Master is the steward of the Scrum practice. They ensure that the Scrum process is being followed optimally by the team. Developers is a broad term encompassing all team members involved with creating any element of the backlog within a Sprint. A Scrum Team is a small team with 3-10 team members. Despite the presence of the different roles, a core component of the Scrum process is that there is no hierarchy on the Scrum team, and everyone is expected to have an equal say.

At the beginning of each Sprint, which is a period of 1-4 weeks, the Scrum Team meets and moves items from the Product Backlog to the Sprint Backlog. The Sprint Backlog defines the work that will be completed during the Sprint. Progress is noted through a daily 'Stand Up' meeting. In the Stand Up, each developer communicates their progress on their assigned tasks and any roadblocks. The Scrum Master and the Scrum Team work together to alleviate any roadblocks. At the end of the Sprint, the goal is to complete all Sprint Backlog items. The work done is reviewed in a process known as the Sprint Review. The team also participates in a Sprint Retrospective, which discusses how well the Scrum process works and how it can be improved. The cycle of Sprints continues until the product is finished.

Academic Department Hierarchy

There is a natural hierarchy in academia, with those with more experience, aka senior faculty, holding more power [2]. As with any team, a hierarchy can affect the work done by the team. When looking particularly at departmental service, the hierarchical nature of academia can affect the work done in different ways, depending on the organization's culture. In some cases, there is evidence that senior faculty can pass off certain service expectations to junior faculty [1]. This aligns with the assumption that junior faculty must "pay their dues" and take unpleasant or time-consuming tasks. The imbalance of service expectations can also affect minority populations [6]. Alternatively, due to perceptions that service is less important than research or teaching, senior faculty mentors may advise junior faculty to avoid service outside of their area of expertise, service that has a time commitment, and service that lacks visibility [7].

All of these scenarios can negatively impact group work. A team without major hierarchical influences, where the workload is shared evenly, is preferable. Having a flat hierarchical structure in publication leads to the retention of junior researchers, which may also hold true for other academic group activities [8]. Additionally, a group with mixed expertise leads to various

knowledge transfer and mentoring paths. This can replace a less viable traditional mentoring framework, where junior and senior faculty members work in 1:1 pairs [9].

III. Project Description

This work looks at four service teams using Scrum framework. These teams were diverse in their hierarchical composition based on seniority. Teams included junior and senior faculty; one team involved significant student participation. A commonality in all teams is that they were all successful in completing the goal of their service project.

The analysis focuses on the relationship between hierarchy and workload. Under the Scrum process, the amount of effort that each task the group requires and the person responsible for completing the task are diligently logged in the backlog. This information was extracted from Scrumwise, the Scrum management platform used by the project, and analyzed to determine the hierarchy-related workload trends [10].

IV. Findings

The velocity trends for each team, or the amount of effort completed during each Sprint, are depicted in Figure 1. In Team 1, at the beginning, the Senior faculty members were completing more effort than the junior faculty members. However, this effort evened out as the semester progressed. Team 4 shows the same process, but in reverse, with the junior faculty initially completing more, but the load balanced out. For Team 2, the junior faculty members were initially completing most of the work, but the senior faculty members increased their efforts to match them. Team 3 included student involvement, which allowed the students to increase their productivity over the semester, which reduced the load for all other faculty members. The velocity trend for each of the four teams increased over each Sprint, showing increased productivity throughout the process.

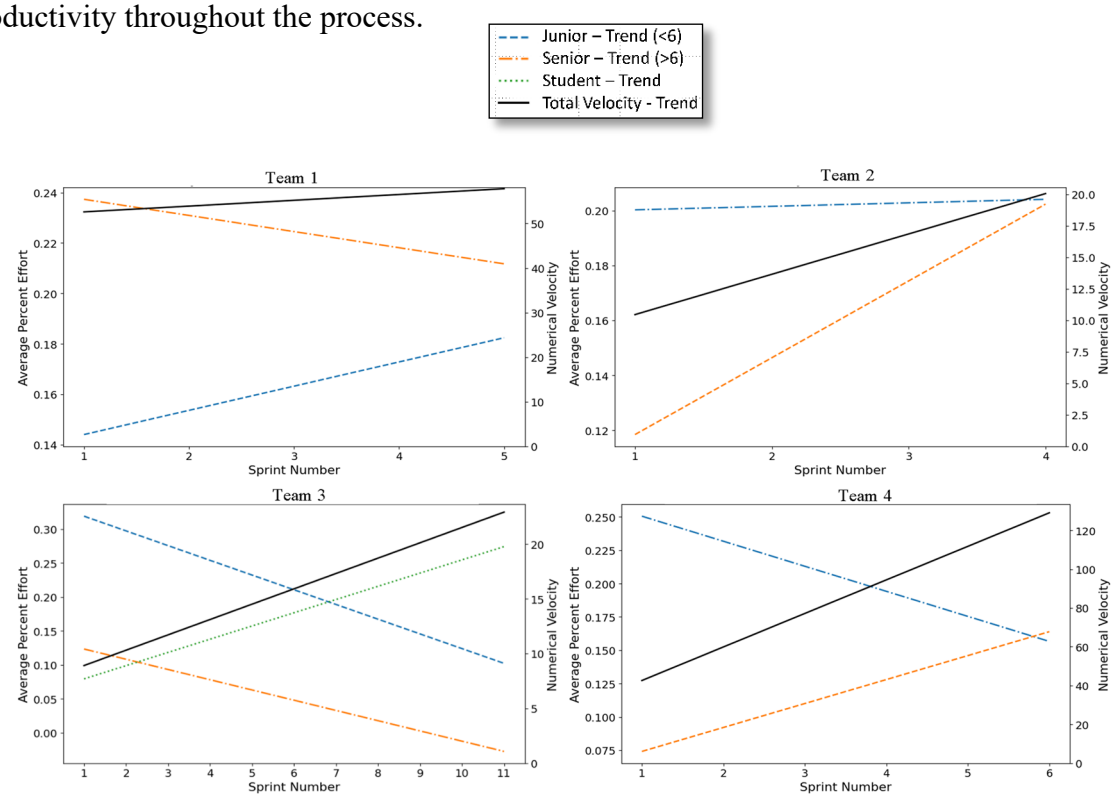

Figure 1. Velocity trends for four Scrum teams.

It is important to mention that the product of each team and the composition of teams are different, however, every team is composed of experience and inexperience team members as it relates to the product of the team. For example, Team 1 worked on faculty rewards and incentives and included five faculty. Team 2 worked on faculty recruiting and search and included five faculty. Team 3 worked on department marketing, and it included four faculty and three students. Team 4 worked on research and funding, and it included five faculty.

From these statistics and observations, four potential benefits of the lack of hierarchy in Scrum have been extracted.

Key Takeaway: Fair Play

When work effort averages among all team members, the team can obtain more overall effort. This can be seen in Teams 1, 2, and 4, in which the workload is not balanced at the beginning of the project but balances out. This suggests that everyone is contributing equally.

Key Takeaway: Involvement Leads to Growth

In Team 3, including students empowered the students to take on more responsibility throughout the semester. As student team members became more competent and learned more about the required processes, they greatly assisted faculty in reducing their workloads. The potential for future collaboration between students and more faculty can empower departments to achieve more of their goals while also fostering relationships with the student population.

Key Takeaway: Better Knowledge Transfer

For junior faculty to accomplish as much as the senior faculty, they must seek guidance and knowledge from senior faculty. This is represented by Team 1, in which the junior faculty could take a greater portion of the workload as knowledge was transferred between faculty members. This highlights the possibility that Scrum can encourage knowledge transfer that rivals or exceeds traditional mentorship.

Key Takeaway: Reducing Burnout

Ensuring every team member pulls their weight can reduce the individual workload for high achievers. An unbalanced workload can lead to resentment and overwhelm in the high achievers, leading to burnout and reduced productivity. In Teams 1, 2, and 4, the trend was for all groups to move towards an equal share of the workload.

V. Conclusion

By applying Scrum in four different departmental service teams, the Scrum process fostered a sense of empowerment, which encouraged greater involvement. This increased participation led to the growth of capabilities, particularly among younger faculty and students. As their skills developed, the teams' overall performance improved, resulting in higher productivity and more equitable contributions across all teams. Furthermore, workload equity fostered an improved sense of belonging within the department's culture, reinforcing collaboration and inclusivity.

This cultural shift ultimately reflects the broader positive impact of Agile methods across various industries, driving both individual and collective growth.

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