Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #47891

Academic Service Projects Best Suited to Scrum: A Service Committee Case Study

Lynn Vonderhaar, Embry-Riddle Aeronautical University

Lynn Vonderhaar is a Ph.D. student in the Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University in Daytona Beach, FL, USA. Lynn is conducting research with her peers on the use of Scrum to manage departmental committee projects.

Alexandra Davidoff, Embry-Riddle Aeronautical University - Daytona Beach

Alexandra Davidoff is a Master's student in Software Engineering at Embry-Riddle Aeronautical University. Alexandra's research explores the use of Agile Scrum in academia.

Sarah A Reynolds, Embry-Riddle Aeronautical University - Daytona Beach

Sarah is a Ph.D. student in Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University, with a focus on Software Engineering and Education.

Dr. Omar Ochoa, Embry-Riddle Aeronautical University - Daytona Beach

Dr. Omar Ochoa is an Associate Professor in the Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University.

Dr. Massood Towhidnejad, Embry-Riddle Aeronautical University - Daytona Beach

Massood Towhidnejad is Director of NextGeneration ERAU Applied Research (NEAR) laboratory, and Professor of Software Engineering in the department of Electrical, Computer, Software, and Systems Engineering at Embry-Riddle Aeronautical University. His res

Academic Service Projects Best Suited to Scrum: A Service Committee Case Study

Abstract

Scrum is a project management technique developed for software engineering that has shown great ability in maintaining project flexibility, quality, and customer satisfaction. It has been primarily used in industry, where team members have few projects, projects are uni-disciplinary, and team members often have similar areas of expertise. The Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University has recently implemented Scrum in its faculty service committees. The scope and application of projects in the faculty service setting varies from the traditional industry setting. This work aims to determine what aspects of a project make it suitable to be managed by a Scrum framework. In annual faculty interviews and recorded Scrum meetings over three years, there were many discussions about the projects best suited to Scrum. In total, ten projects were analyzed over three years. This paper analyzes the recorded interactions to determine the projects best suited for Scrum and their characteristics so that this work can serve as guidance for adapting projects to Scrum in a wide variety of domains.

This research determined that inherently iterative projects are well suited to Scrum because of Scrum's flexibility to adapt to changing requirements. Therefore, as requirements changed, the Scrum Team (i.e., the "committee") was able to adjust its goals and tasks to meet those needs. It was found that complex, multi-disciplinary projects are also well suited to Scrum because the project tasks are easily split among team members based on areas of expertise. More complex projects have more tasks, and teams benefit from breaking the goals into smaller tasks to fit within a sprint. Additionally, with more complex projects, the overhead of adapting to Scrum was balanced by the increased efficiency brought about by using the Scrum framework. However, Scrum did not benefit certain projects. Scrum teams that did not find Scrum effective had tasks that were not easily divisible or lacked a clear goal to work towards. When a Scrum team's tasks were often small and took little time, it felt as though the Scrum overhead took more time than the tasks themselves, making Scrum frustrating to follow.

Keywords – Scrum, faculty service committees, departmental project management

I. Introduction

Scrum has gained popularity for improving team productivity and customer satisfaction with the finished product [1, 2]. It came to popularity in a software development environment, but this work explores its effectiveness for other teams that could benefit from a productivity boost, namely, university faculty service committees. Service is a key component of faculty positions in academia that can enhance the university experience for both faculty and students [3].

Participation in departmental service committees shows dedication and commitment to the continuous improvement and advancement of the department.

However, according to the collected internal faculty interviews, departmental service committees often fall short of their goals due to work stagnation. The benefit of service tasks is often undervalued. Service is not seen as a contributor to a tenure application to the department, college, and institution, causing junior and senior faculty alike to neglect their service duties in favor of other efforts [3]. Trends in the majority of universities have shifted to focus on research achievements when considering tenure promotions, often considering mentoring and service as less important than research in obtaining tenure [3]. Therefore, projects that increase faculty workload that are not related to their research are often neglected as it is deemed an inefficient use of their limited time [4, 5, 3].

To combat this phenomenon, the Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University implemented Scrum as the project management technique for its service committees for five years and gathered data on its effectiveness. Overall, Scrum improved the productivity of the committees and increased their success rate in achieving their service goals. However, the department found that some service committee projects are better suited to the Scrum framework than others. This work analyzes the successes and failures of Scrum in various types of service projects to identify the project characteristics that are best suited to Scrum. This work helps promote Scrum to projects outside of software development and allows teams in academia and beyond to benefit from Scrum.

II. Background

The use of Scrum as a project management technique has been found to improve the productivity and outcomes of team projects. The purpose of this work is to identify the project characteristics that are best suited to Scrum to illustrate its benefits to non-traditional teams, e.g., faculty service committees.

A. Faculty Service Committees

Service is one of the three pillars of tenure-track faculty positions in academia [3]. The goal of service is to combine the expertise of the faculty members to improve the department, college, and institution as a whole [3]. Some examples of potential service contributions are as follows:

- Participation in departmental service committees, such as a faculty search or student recruitment committee.
- Serving as a program or degree advisor.
- Serving as a member on a thesis or dissertation committee.
- Participation in a college-level or institution-level senate committee.
- Participation in institution-level administration searches.
- Advising a student organization [3].

Other service opportunities available to faculty span department-level, college-level, and institution-level activities. Such services are key to continual program and university improvement. Additionally, participation in service opportunities by both junior- and senior-level faculty facilitates junior faculty to network and learn from their more experienced peers, allowing the success of the institution to continue through generations of faculty [3]. Therefore, participation in and success of service committees is crucial to the growth of the department, college, and institution. This paper focuses on the impact of managing departmental projects with Scrum in faculty service committees in order to determine when Scrum may be an effective technique for managing the committees.

B. Scrum

Scrum is an agile development process traditionally used in software engineering and provides a lightweight format for project management [6]. Scrum teams divide their work into short time frames called sprints, which can be one to four weeks long [6]. At the beginning of each sprint, the team chooses tasks from a full list of necessary tasks, known as the product backlog, to be completed within that sprint, thereby forming the sprint backlog. As tasks are completed throughout the sprint, this effort is shown in a burndown chart.

There are three roles on a Scrum team: Product Owner, Scrum Master, and team member [6, 7]. The Product Owner is the liaison between the customer and the rest of the team. The Product Owner determines which tasks belong in the product backlog and prioritizes tasks for completion. The Scrum Master is the steward of the Scrum process and is therefore responsible for running the meetings and removing external obstacles for the team. The rest of the team comprises developers who complete tasks towards the project's completion.

At the start of each sprint, the team holds a sprint planning meeting to choose tasks from the product backlog to place on the sprint backlog [6]. To help them in this process, they assign an estimate to each task of how much effort it will take to complete the task. The team needs to have accurate effort estimates to ensure the workload for the sprint is appropriate. Throughout the sprint, the team holds daily stand-up meetings, approximately 15 minutes long, during which everyone on the team gives an update on task status and addresses any challenges preventing the completion of tasks [6, 7]. At the end of each sprint, the team holds two meetings: the sprint review and the sprint retrospective [6]. The sprint review discusses what was completed during the sprint and any changes in task priorities that should be addressed in the next sprint. The final meeting of the sprint is the sprint retrospective, which is a discussion of the performance of the team relative to the Scrum process [6]. This meeting's discussion topics may include, but are not limited to, productivity, team interactions, problem-solving strategies, necessary tools for future work, and the accuracy of effort estimation. The full Scrum process is shown in Fig 1.

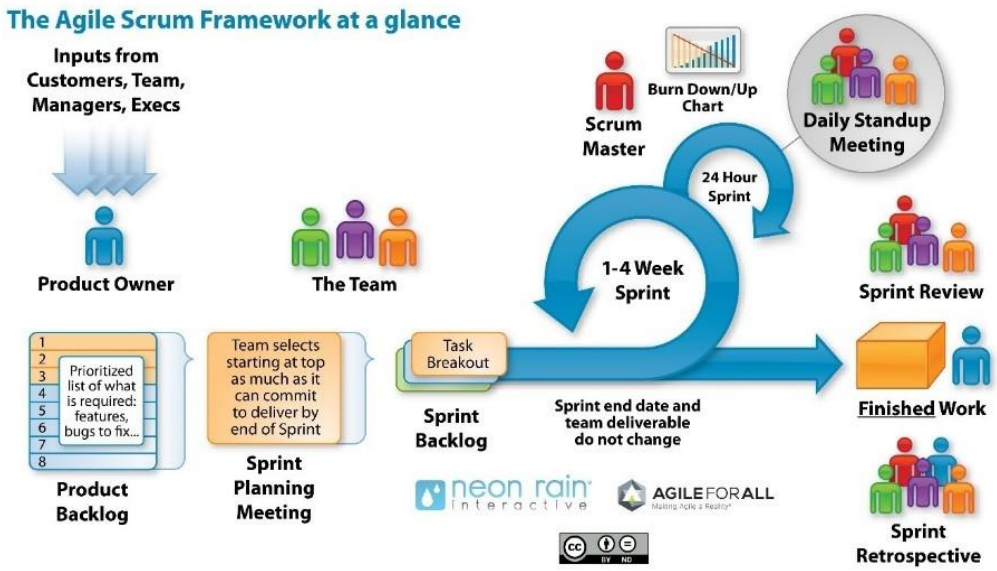

Fig 1. The Scrum process [7].

III. Method

The data for this research was gathered via recordings of the Scrum meetings and a series of annual faculty interviews in 2020, 2021, and 2022. The authors, a third party to the data collection, then analyzed the data and recorded findings in codebooks. Codebooks facilitate qualitative data analysis and were used for analyzing faculty interviews and Scrum team meeting recordings during this research [8]

A. Gathering Data

This research was conducted in the Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University in Daytona Beach, Florida. The project applied the Scrum project management framework to departmental service committees to improve their effectiveness, success, and member morale. For the purposes of this experiment, the departmental service projects were all managed using Scrum for five years. Scrum meetings (e.g., sprint planning, daily stand-ups, and sprint retrospectives) and faculty interviews were conducted, recorded, transcribed, and anonymized. The first year involved a pilot program with few participants, and data for the final year is currently being collected. Therefore, the research presented in this paper is based on the preliminary results of years two through four. The department service projects and descriptions through these years are given in Table I.

Table I. Department committees throughout the project.

Team	Description
Year 2 – 2020-2021	
Curriculum - Graduate	Updating the class listing, order, and content for the M.S. degree in Software Engineering (SE).

Curriculum - Undergraduate	Updating the class listing, order, and content for the B.S. degrees in Computer Science (CS), Computer Engineering (CEC), Electrical Engineering (EE), and SE.
Recruitment	Marketing the department to increase student enrollment and improve retention.
ABET Adherence	Addressing the shortcomings identified during the most recent ABET visit.
Year 3 – 2021-2022	
Curriculum	Updating the class listing, order, and content for the B.S. degrees in CS, CEC, EE, and SE. This is a continuation of the work from the previous year.
Faculty Search	Searching for, interviewing, and hiring new faculty.
Graduate Recruiting	Marketing the department to increase student enrollment in the department's graduate degrees.
Program Review	A university program review for B.S. degrees in CS, CEC, EE, and SE, and M.S. degrees in SE, Systems Engineering, Cybersecurity Engineering, Electrical and Computer Engineering (ECE), and Unmanned Systems.
Year 4 – 2022-2023	
Asset-Based Course Culture	Identifying ways to encourage students to use their unique talents to thrive at Embry-Riddle Aeronautical University.
Rewards and Incentives	Identifying methods to encourage faculty to participate in departmental projects.

Each team had a designated Product Owner and Scrum Master, with the rest of the team consisting of approximately three to five members. Teams were required to use the online Scrumwise platform to house their product and sprint backlogs, but as the project progressed, some teams adopted a new platform for their backlogs. Teams were also encouraged to follow the traditional Scrum process as closely as possible. However, certain changes were made to accommodate the academic environment. Due to scheduling constraints and faculty bandwidth, teams were expected to have stand-up meetings at least twice per week rather than daily. The use of these meetings was left to the discretion of the teams. Some used them as stand-ups, while others hosted longer meetings to combine stand-ups with sprint planning or sprint retrospectives. Additionally, Sprints generally lasted two weeks, which maximized the number of Sprints to be completed over a semester while still allowing for progress to be made within a Sprint.

The data collection consisted of two parts:

1. Recording the Scrum meetings for each of the Scrum teams to analyze the effectiveness and efficiency of the meetings.
2. Recording the annual faculty interviews to gather individual perspectives on the effectiveness of Scrum over a traditional committee management style.

B. Analyzing Data

After collecting the data, the recordings were transcribed, and analysis could begin. Data analysis was completed using codebooks based on the faculty interview and Scrum meeting recordings [8]. The codebooks were separated by year, and faculty interviews were analyzed separately from team meetings. However, the same codes were used for faculty interviews and Scrum meetings, and the results were synthesized to depict each team accurately. Table II provides the codes that were used in the analysis and a description of them and their significance. Each code was chosen to analyze the following questions:

- Were the teams following true Scrum?
- Did the teams understand Scrum? How was this understanding or misunderstanding affecting their usage of it?
- Was Scrum effective for each team?
- How did the use of Scrum for the teams affect the department culture?

For this project, special attention was paid to see how each code related back to the effectiveness of Scrum.

Table II. Codes used for data analysis.

Code	Description	Significance
Hierarchy	How Scrum can affect junior faculty. Any mention of faculty hierarchy.	Does the inherent non-hierarchical structure of Scrum encourage junior faculty to participate more?
Scrum considerations	Team member considerations of Scrum. Is it helpful?	Analyzing benefits, drawbacks, successes, and challenges.
Scrum process understanding	Team member understanding of Scrum processes (backlog, point delegation, sprints, standups etc.). Include references to them using scrum processes.	How well did the faculty understand the Scrum process? How did this reflect in the effectiveness of Scrum for the project?
Scrum role understanding	Team member understanding of Scrum roles (Scrum Master, Product Owner, etc.)	How well did the faculty understand the Scrum roles? How did this reflect in the effectiveness of Scrum for the project?
Scrum meeting efficiency	Team members follow a structured meeting process. Team members prioritize meetings. Team members share concerns about meetings.	How well were the teams working together? Did they follow the rules of the stand-up meetings? Were they staying on track?
Scrum modification	Team members modify scrum to better suit the needs of the team.	How did the team need to change Scrum to make it fit their project and team members?

Adapting to Scrum	Team members adapt their schedules/workflows to fit in their team's work for the Sprint.	How well did Scrum work for the academic setting?

The codebooks aligned well with the questions being asked during the faculty interviews. Therefore, direct quotes were easily used to support the codes. However, the faculty interview codebooks also summarized further analysis of the quotes and trends among faculty. Meanwhile the Scrum team meetings were more complex to code but also provided a more direct view into the effectiveness of Scrum for the department. These codebooks mainly consisted of direct quotes from the meetings, and additional observations and analysis about meeting efficiency could be gleaned from the meeting recordings.

IV. Results and Discussion

Based on the data collected during Scrum meetings and faculty interviews throughout the case study, this analysis showed that some projects are more suited to Scrum than others. While overall data trends suggest that Scrum was helpful in maintaining consistent progress throughout the semester, the data also suggests that Scrum was not the right management technique for some projects. For instance, projects with indivisible tasks were not suited to Scrum, e.g., every faculty search committee member had to review every candidate rather than dividing candidate material among committee members. The findings are shown in Table III. For each Scrum team, Table III gives a rating of the overall effectiveness of Scrum, a reasoning for why Scrum worked, and the evidence in the data that supports that reasoning. The evidence presented in Table III is not the only evidence present within the data but is considered to be the representative evidence for the collected data.

Table III. Scrum effectiveness by Scrum team

Scrum Team	Scrum Effectiveness	Reasoning	Evidence
Curriculum – Graduate (Year 1)	Effective	• Iterative nature • Divisible tasks • Utilization of individual expertise (multi-disciplinary)	"Two things [that attributed to the team's success]. One is, we have four people who were interested in actually doing this change. So, there was commitment to improving the curricula and then the other was, like I said, the process was helpful by breaking the tasks down into small, bite sized chunks."
Curriculum – Undergraduate (Year 1)	Effective	• Iterative nature • Divisible tasks	"What works well of course is you have just what you'd expect, you have these fairly small tasks, so you have a four-hour task, or a six-hour task and you have two weeks to get it done basically and that seemed to fit. Because as you know, Scrum

		• Utilization of individual expertise (multi-disciplinary)	assumes that you're available to work on the product all the time, none of us are. So, we adapt it to the part time work. But things got done, and that's what is different sometimes than non-Scrum, where you just say, "Okay, here's our goal," and we don't actually break down the steps to the goal.”
Recruitment (Year 1)	Effective	• Divisible tasks	“When you have your task and your name over there and you have to deliver, you are going to do it. So, what can you [do]? And then if you don't do it, you're not doing your work, and it doesn't look good. And then, so you have to do it. So, it's like incentive to get those points or whatever that you have to perform the tasks and everything.”
ABET Adherence (Year 1)	Effective	• Divisible tasks	“I think that the Scrum process made [committees] really fruitful. So, as I mentioned, we had tasks that were clear and implementable. So, we had…The way we put together a task where, can you really accomplish it? Can we really get it done? What resources do we need? So, the task division and also breaking down them into feasible chunks was the most important one. The other thing was obviously having the Scrum board. So, the Scrum, it makes everything visible so that everybody knows who’s working on what. So rather than some people doubling their work or people not knowing really what to do, which is most of the time that in committees that I’ve been a part of. We had really clear goals for every week.”
Curriculum (Year 2)	Not effective	• Lack of clearly defined goals • Negative attitude towards Scrum • Backlog not kept updated	“Scrum works really well when everyone kind of has a coherent goal and we know what the goal is. This case, we don't know what the goal is. Everyone has a different opinion of what would be a good solution, and basically we're stuck.”
Faculty Search (Year 2)	Not effective	• Indivisible tasks	“…why we do it in software engineering is because we can get rid of the process to speed up the response to change by

		• Too much overhead for the project scope • No rapidly changing requirements	leveraging the expertise. But in the department, that's not the same. We don't have requirements that change that fast…I struggle to see the full benefit of this as someone who's been doing it for many years."
Graduate Recruiting (Year 2)	Moderately effective	• Divisible tasks • Clearly defined goal • The project was not complex enough to see deeper benefits	"…[Scrum] helps us, basically, [at a] basic level, it helps us in keeping track of what we planned and then see who is assigned to it, and who is responsible for finishing it, and completing, and reporting, and everything. So, it's a process that gives us, it's like a planning tool, planning and monitoring tool, that gives us the means to know what we need to do and when to do it, and maybe also learn something out of it through the retrospective."
Program Review (Year 2)	Effective	• Divisible tasks • Utilization of individual expertise (multi-disciplinary)	"…I was really surprised. I'd done those program reviews in the past…and then it was [a] before the deadline effort, on many times. But [with] this one…we had the schedule, and we followed it with deliverables, and then the activities in the backlog, and everything that was completed. So, it really helped in doing the entire effort over the semester rather than before the deadline." "I spent some time to identify then compare those schools for the hardware related programs such as Bachelor of Science in Computer Engineering, Electrical Engineering, and the Master of Science in Electrical and Computer Engineering…and then [the other members], they will pick up the software-related side of the computer science, software engineering, and the Master of Science of Software Engineering."
Asset-Based Course Culture (Year 3)	Not effective	• No clear goal	No relevant quotes from faculty interviews. Evidence is based on observing committee Scrum meetings.

Rewards and Incentives (Year 3)	Moderately effective	• Divisible tasks • Iterative and continuous • Too much meeting overhead	"The team worked wonderfully. I am happy with it. We have results. We have products. That's good... it's too many meetings, but that's how scrum is. We promised that we're going to do scrum, and that's what scrum is. It's not perfect in the academic environment, but it still has advantages that it keeps you engaged, so I know we work differently based on that."

The analysis of this data is divided into two perspectives. First, it focuses on overlapping trends between different teams to determine the most popular justifications for and against Scrum's effectiveness. Then, it takes a team-specific approach, allowing this work to determine the major factors for Scrum effectiveness in individual cases.

Certain aspects of Scrum benefit team progress. Eight of the 10 teams found that they benefited from dividing tasks that turned overarching goals into actionable steps. Four of the Scrum teams also found that through this division, they could assign tasks to individuals in alignment with everyone's expertise, which led to more efficiency. Four of the teams found that the iterative nature of Scrum was beneficial, as they could make consistent progress toward their goals while also adapting to changes in their project goals. One team reported that Scrum encouraged them to define a clear goal to work towards.

Additionally, there were a few hindrances to the success of using Scrum as a framework. Despite the lightweight aspect of the Scrum framework, two teams found that following the Scrum process entailed too much overhead, which detracted from the actual work. Similarly, one project's members felt that their work was too simple and straightforward to benefit from Scrum. A different team noted that the lack of changing requirements prevented them from benefitting from Scrum.

Eight of the teams found that the Scrum framework was able to positively affect their work to some extent. The recruiting teams only found Scrum to be moderately effective because while the members had no inherent issues with Scrum, they believed the overhead to be too time-consuming given the relatively small amount of work required for their team. However, program review and curriculum teams found Scrum effective because they were large, iterative projects with clear goals that were divisible and multi-disciplinary. Breaking down complexity seemed to be the most influential effect of Scrum.

It is of interest to take a closer look at the two teams that specifically found Scrum to be ineffective. The faculty search team did not find Scrum effective because each team member had to review each candidate's material, so the work was not divided, but rather team members all worked on the same tasks. Additionally, as shown in Table III, one faculty member noted that Scrum helps projects stay flexible to meet changing requirements. However, the faculty search

team did not have requirement changes, so one of the most important benefits of Scrum was not utilized. Interestingly, the asset-based course culture team did not find Scrum effective because they were unable to define a clear goal, making task definitions and assignments difficult.

From this analysis, there are a few key points that define a project well-suited for Scrum:

1. Project tasks need to be divisible among team members.
2. Project workload must exceed the Scrum overhead.
3. Optimal projects are multi-disciplinary to utilize the unique talents of each team member.
4. Projects must have a clearly defined goal.
5. Preferably, the project will have rapidly changing requirements.
6. Ideally, the project will be iterative and continuous in nature.

These six factors help indicate which projects are well suited to the Scrum management technique. Although Scrum might not be the right management technique for some projects, some key takeaways from Scrum can be helpful for any project, including:

1. Maintaining regular meetings to encourage continual progress.
2. Defining the team's goal or goals at the beginning of the project.
3. Providing regular updates on accomplishments to encourage accountability.

These three key takeaways do not need to strictly follow Scrum guidelines. They can be adjusted to fit the needs of the project and team. However, in any form, these key takeaways encourage continual progress toward a common goal, which is beneficial for any team.

V. Related Work

Literature includes many examples of case studies where Scrum was implemented in non-traditional settings, e.g., globally distributed projects or in non-traditional projects [9, 10, 11, 12]. Streule, et al. implemented Scrum in the construction industry and analyzed the artifacts to evaluate the technique's effectiveness [10]. Streule et al. and this work both evaluate Scrum in non-traditional settings. However, the guidelines provided by Streule et al. are constrained to the construction industry. In contrast, this work provides a more general look at teams and which projects should or should not utilize Scrum.

Hron et al. survey Scrum adaptations in the literature and organize adaptations into six categories: combination, pre-development, method guidance, procedures artifacts and roles, multiplicity and tools [13]. The survey and corresponding analysis discuss how Scrum can be adapted to fit the needs of a specific team. However, the survey does not indicate which types of projects are best suited to Scrum, as this work does.

Some work has explored the effectiveness of Scrum or whether Scrum is the best project management technique as compared to other agile methods [14, 15, 16]. Vladimirovich Orlov, et al. and Muralidharan compare Scrum to other agile methods to determine which is the best [14,

15]. In either case, the authors found that it depends on the team and the project, but neither discuss what project characteristics are most influential in the success of Scrum. Meanwhile, Weerakoon evaluated ways to improve the efficiency of Scrum but did not discuss projects not suited to Scrum [16].

VI. Future Work

This work presents a case study for project characteristics that are best suited to Scrum in Academia. However, it does not go into depth about adapting projects to Scrum. There is significant literature regarding adapting Scrum to fit teams and projects [9, 10, 11, 12]. For some of the projects discussed in this work, alterations to the goal and perspective of the teams may have allowed Scrum to be more effective. For example, these projects may have benefitted from more assistance in defining team goals or breaking down the goals into incremental tasks. Future work in this area should explore how the lessons gleaned from this work can improve existing practices of adapting Scrum to projects in Academia. Additionally, an in-depth analysis of factors that contribute to the success of the effective scrum teams, outside of project characteristics, would further benefit the adoption of Scrum into both faculty and student projects. Such factors may include faculty familiarity with Scrum, the effectiveness of the Scrum Master and Product Owner, or the engagement of team members.

Future work also includes creating a model involving the three key takeaways discussed in this work so that teams can more easily adopt these takeaways into their project management scheme. The model will explore adaptations to the key takeaways to ensure their flexibility to many team and project types. Future work will include case studies to validate the proposed model. One such case study will analyze how to adapt the proposed method for administrators or other faculty that have multi-semester projects.

VII. Conclusion

The purpose of this paper was to use a case study to explore the characteristics that make a project well-suited to using the Scrum project management technique. The case study used Scrum to manage faculty service committees for five years in the Department of Electrical Engineering and Computer Science at Embry-Riddle Aeronautical University. The data included three years of recording Scrum meetings and faculty interviews, which were analyzed to evaluate the effectiveness of Scrum for each team. Based on this analysis, there are seven characteristics that make a project well suited to Scrum as a management technique. Without those characteristics, a project may still thrive when using Scrum but may not see its full benefits. However, even if a project is ill-suited to Scrum, there are still three key takeaways that can be adapted to any project management scheme: maintaining regular meetings to encourage continual progress, defining the team’s goal or goals at the beginning of the project, and giving regular updates on accomplishments to encourage accountability. Future work includes aligning with literature on better adapting Scrum to fit ill-suited projects and creating a model based on the three key takeaways to help teams adopt the takeaways into their management scheme.

VIII. References

[1] T. Javdani Gandomani, H. Zulzalil, A. Azim Abdul Ghani, A. Baker Md. Sultan and M. Ziaei Nafchi, "Obstacles in Moving to Agile Software Development Methods; at a Glance," *Journal of Computer Science,* vol. 9, no. 5, pp. 620-625, 2013.

[2] G. van Waardenburg and H. van Vliet, "When Agile Meets the Enterprise," *Information and Software Technology,* vol. 55, no. 12, pp. 2154-2171, 2013.

[3] H. L. Pfeifer, "How to be a Good Academic Citizen: The Role and Importance of Service in Academia," *Journal of Criminal Justice Education,* vol. 27, no. 2, pp. 238-254, 2016.

[4] J. Tagg, "Why Does the Faculty Resist Change?," *Change: The Magazine of Higher Learning,* vol. 44, no. 1, pp. 6-15, 2012.

[5] E. Gratz and L. Looney, "Faculty Resistance to Change: An Examination of Motivators and Barriers to Teaching Online in Higher Education," *International Journal of Online Pedagogy and Course Design (IJOPCD),* vol. 10, no. 1, 2020.

[6] K. Schwaber and J. Sutherland, "The Scrum Guide," 2020.

[7] T. B. Hilburn and M. Towhidnejad, "Chapter 10: Using the Scrum Development Process," in *Software Engineering Practice: A Case Study Approach,* New York, Chapman & Hall, 2020.

[8] K. M. MacQueen, E. McLellan, K. Kay and B. Milstein, "Codebook Development for Team-Based Qualitative Analsyis," *Field Methods,* vol. 10, no. 2, 1998.

[9] M. Paasivaara, S. Durasiewicz and C. Lassenius, "Using scrum in a globally distributed project: a case study," *Software Process: Improvement and Practice,* vol. 13, no. 6, pp. 527-544, 2008.

[10] T. Streule, N. Miserini, O. Bartlomé, M. Klippel and B. García de Soto, "Implementation of Scrum in the Construction Industry," *Procedia Engineering,* vol. 164, pp. 269-276, 2016.

[11] A. Azanha, A. R. Tiradentes Terra Argoud, J. Batista de Camargo Junior and P. Domingos Antoniolli, "Agile project management with Scrum: A case study of a Brazilian pharmaceutical company IT project," *International Journal of Managing Projects in Business,* vol. 10, no. 1, pp. 121-142, 2017.

[12] F. Ramadhan Maulana and T. Raharjo, "Identification of Challenges, Critical Success Factors, and Best Practices of Scrum Implementation: An Indonesia Telecommunication Company Case Study," in *The 2nd International Conference on Sciences and Technology Applications (ICOSTA),* Medan City, Indonesia, 2020.

[13] M. Hron and N. Obwegeser, "Scrum in practice: an overview of Scrum adaptations," in *Proceedings of the 51st Hawaii International Conference on System Sciences,* Waikoloa Villiage, Hawaii, USA, 2018.

[14] E. Vladimirovich Orlov, T. Mikhailovna Rogulenko, O. Alexandrovich Smolyakov, N. Vladimirovna Oshovskaya, T. Ivanovna Zvorykina, V. Grigorevich Rostanets and E. Petrovna Dyundik, "Comparative Analysis of the Use of Kanban and Scrum Methodologies in IT Projects," *Universal Journal of Accounting and Finance,* vol. 9, no. 4, pp. 693-700, 2021.

[15] N. Muralidharan, ""Is Scrum The Best Of Best?"," *International Journal of Engineering Research and Applications,* vol. 10, no. 12, pp. 1-7, 2020.

[16] H. Weerakoon, "Analysing and evaluating the effectiveness of the SCRUM methodology for successful project management," in *AIP Conference Proceedings*, 2024.