Journal of Information Technology Education: Research

An Official Publication of the Informing Science Institute
InformingScience.org

JITEResearch.org

Volume 19, 2020

IMPROVING BUSINESS PRODUCT OWNER COMMITMENT IN STUDENT SCRUM PROJECTS

Corey Baham | Oklahoma State University, Stillwater, OK, USA | corey.baham@okstate.edu

ABSTRACT

Aim/Purpose	The purpose of this study was to explore and test several improvements for incorporating the Business Product Owner (BPO) role in student software projects using Scrum.
Background	As the popularity of Scrum has grown, its roles and ceremonies have been utilized in student software projects, yet one of the more challenging roles to implement in the academic context is the role of BPO. Consequently, although the BPO role is central to Scrum, this role is lacking in many student Scrum projects.
Methodology	Both quantitative and qualitative data were collected at a large university in the U.S. to assess the effectiveness of attempted improvements in incorporating the BPO role in 32 student Scrum projects.
Contribution	This study is among the first to theorize and examine the bottom-up selection of BPOs where team members select their own BPOs as a unique project requirement. This study extends current theory to expand the development team roles when BPOs are unable to articulate requirements during co-creation activities. This study also informs us of the impact of BPO attributes on team member perceptions and it demonstrates how BPO engagement can be improved in student Scrum projects.
Findings	The findings suggest that BPO engagement can be improved by (a) formalizing the BPO selection process through time-limiting responses, screening, and contractual agreements, (b) starting the BPO initiation process through co-creation activities (e.g., user story workshop), and (c) expanding the development team's role in defining and prioritizing features during the BPO execution process through mutual steering.
Recommendations for Practitioners	Based on the findings, practitioners are recommended to educate BPO's concerning their role and its impact on the Scrum team.

Accepting Editor Kay Fielden | Received: January 23, 2020 | Revised: March 20, March 27, April 21, 2020 | Accepted: April 26, 2020.

Cite as: Baham, C. (2020). Improving business product owner commitment in student Scrum projects. *Journal of Information Technology Education: Research, 19,* 243-258. https://doi.org/10.28945/4549

Recommendations for Researchers	Researchers are recommended to develop and test additional mechanisms to facilitate ongoing BPO engagement.
Impact on Society	Higher education needs to explore more ways of involving practitioners in student projects.
Future Research	Future research should explore ways of reducing BPO attrition in student Scrum projects.
Keywords	agile software development, Scrum, business product owner, IS education

INTRODUCTION

Scrum, the most widely used agile software development (ASD) method (Version One, 2018; West et al., 2010), and its roles and ceremonies have been utilized in student software projects (Masood et al., 2018; Wagh, 2012). However, one of the more difficult roles to implement in the academic context is the role of the Business Product Owner (BPO) (Baham, 2019). Despite the popularity of ASD methods in industry and the increased attention from Information Systems recruiters and executives, current Systems Analysis and Design (SAD) textbooks provide limited knowledge on how to implement ASD (May et al., 2019) and overcome specific challenges such as incorporating the BPO role in student projects. The growing adoption of ASD methods (e.g., Scrum) suggests an interest in the potential benefits of ASD (e.g., increased productivity, faster time to market, higher software quality). Unfortunately, the assimilation of new roles is often overlooked in the pursuit of such benefits. While the extant literature has identified the ideal knowledge and skillset of a BPO, many organizations struggle with determining who should be the product owner, as they don't know how to relate this new role to existing roles in the organization (Oomen et al., 2017). More understanding is needed concerning how to improve BPO selection, initiation, and execution, particularly when their participation is voluntary. In this study, we seek to answer the research question:

> *How can Business Product Owner selection, initiation, and execution be improved in student software projects?*

As a complement to prior research on implementing ASD in the classroom (Baham, 2019; Masood et al., 2018), this paper discusses lessons learned when attempting to incorporate the BPO in hands-on student software development projects using Scrum. Over one year, quantitative and qualitative data were collected to understand student experiences in selecting and working with BPOs. The paper concludes with data analysis and recommendations for incorporating BPOs in future projects. This paper contributes to the scholarship of application literature by detailing how the BPO role has been incorporated and improved in the classroom, providing empirical results of multiple course projects, and providing pedagogical recommendations for future implementations. The solutions described herein are replicable, grounded in theory and best practices, and recommended based upon actual experiences.

LITERATURE REVIEW

The Scrum framework (see Figure 1) created by Sutherland and Schwaber (2016) describes a way to solve complex problems through a collaborative process. Scrum involves the interaction between the development team, Scrum Master, and BPO roles. Figure 1 denotes the areas where BPO involvement was called for in this study. Details concerning what Scrum entails can be found in the references provided (Abrahamsson et al., 2002; Rubin, 2012; Schwaber, 1995; Sutherland & Schwaber, 2016).

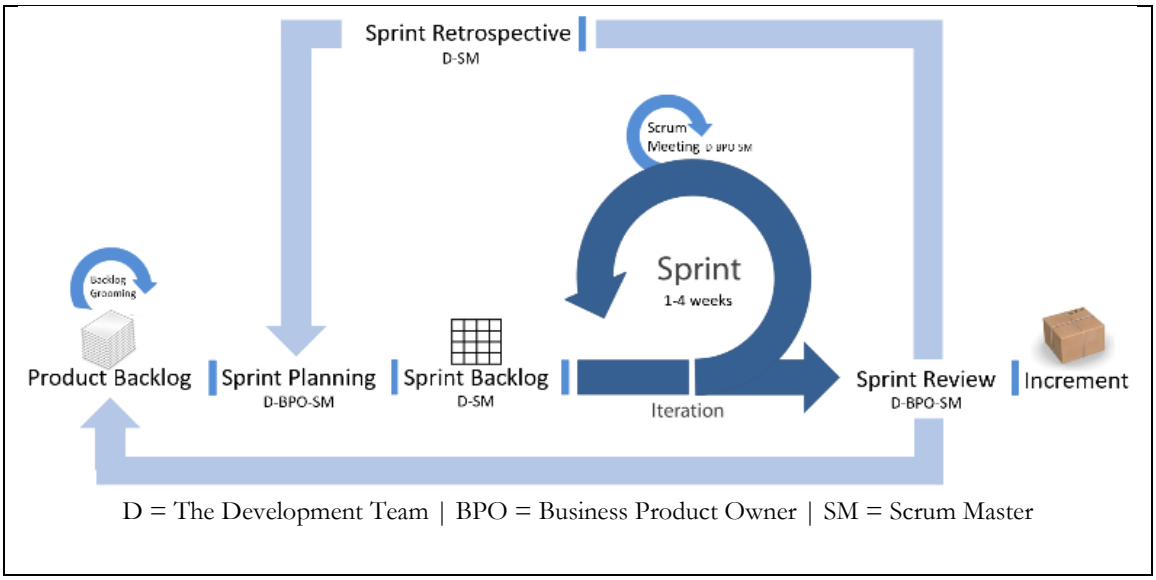

Figure 1: The BPO in the Scrum Workflow

The BPO is a key stakeholder who is responsible for working with the Scrum team to ensure product increments are delivered to the satisfaction of the business customer. The BPO is said to maximize the value of the product resulting from the work of the development team for the lowest number of working hours (Deemer et al., 2012; Sutherland & Schwaber, 2016). The BPO also clarifies the priority of the work items in the product backlog, which is a prioritized feature list for the product. High customer involvement in ASD projects is needed to aid in knowledge sharing and understanding user requirements. Therefore, an ideal BPO should be respected and empowered to make decisions, be available to the team, understand the interest of the business it represents, and be able to communicate effectively. Thus, the BPO plays a pivotal role in Scrum projects.

Prior research points out that SAD textbooks contain little content on ASD methods (May et al., 2019). Although useful, some of the education literature on using Scrum for software development in the classroom excludes the BPO role (May et al., 2019; Yue et al., 2009) or lacks important details concerning how the BPO role can be implemented in the classroom (Cleland & Mann, 2003; Jiménez & Cliburn, 2016). Recent ASD papers in the education literature describe ASD implementations and student feedback in various courses (Lang, 2017), including several capstone projects (Hoskey & Hoskey, 2016; Mahnic, 2011). This literature emphasizes the importance of understanding the differences between ASD projects in the classroom setting compared to industry. Although only a dearth of research discusses the role of BPO in student software projects specifically, approaches to incorporating the BPO role in previous studies were reviewed. Wagh (2012) allowed different team members to assume the role of BPO. The author notes that more effective management of ASD roles was needed, as almost half the team members felt that roles were not properly defined. Baird and Riggins (2012) employed a strategy of keeping the BPO involved at "arm's length" by using the instructor as a proxy in order to guide students through the software development process without bogging down the client with excessive requests. However, the results suggest that overall satisfaction scores could have been higher with more customer involvement. Masood et al. (2018) modified the role of BPOs by using collective rather than dedicated BPOs. Interestingly, having multiple BPOs in some cases reduced meeting times with BPOs. Among their recommendations are conducting ceremonies face-to-face when possible, sourcing local BPOs with adequate availability, and using online tools to simplify team communication. This work is intended to complement previous papers on implementing ASD in a classroom setting by providing tips based on real-world experience concerning how to incorporate the BPO role. The literature cited in the literature review and methodology sections helped

us to develop a theory base for incorporating the BPO role into Scrum projects in the classroom setting using a three-phase solution of selection, initiation, and execution.

This study builds on the extant literature by, first, specifically exploring issues concerning the implementation of the BPO role in student Scrum projects. The BPO, which is a fundamental role in Scrum, is excluded from some implementations of Scrum in the classroom. This study details how BPOs were selected, introduced to the team, and worked with throughout the project. Second, after an initial semester of student Scrum projects, this study describes two rounds of improvements to BPO engagement. This study presents recommendations and tips for overcoming challenges in incorporating the BPO role in student Scrum projects based on 32 hands-on projects involving over 100 students.

METHODOLOGY

SETTING AND PROJECT OVERVIEW

Our setting is a large, public university in the United States. The SAD course is taken by juniors and seniors who are primarily Information Systems majors or minors. Students are expected to apply the concepts learned in the prerequisite courses (e.g., basic programming, web development) to SAD. Scrum was implemented wholesale (i.e., including all its roles and ceremonies) (Overhage & Schlauderer, 2012) to provide students with an example of how all the roles and ceremonies work. Modifications were limited to those that adapted Scrum to the classroom without compromising its core tenets. Project groups consisted of 3-4 students who were responsible for delivering a web application that integrated with a database.

Local business representatives ("real BPOs") rather than instructors or students were preferred for the BPO role to provide students with real-world experience. In a few cases, the instructor or a person with experiences related to a given project served as a simulated BPO. For teams that built applications for existing businesses, business owners or company stakeholders were a natural fit for the BPO role. For other teams, the instructor, teaching assistant, or individuals with specific expertise or experience beneficial to the team were chosen. These individuals enabled the team to simulate the BPO role. In no cases were BPOs fellow students enrolled in the same course, which is different from previous work (Jiménez & Cliburn, 2016; Mahnic, 2011; Wagh, 2012).

BPOs are expected to provide direction and priority to requirements, review iterations of the software, provide feedback through the project, and contribute to the team evaluations (Masood et al., 2018). In the context of the classroom setting, some modifications are required to work within the constraints of the semester timeline, student skill level, and BPO availability (Baham, 2019). In this study, BPOs were asked to be available to students for 5-10 minutes at least twice a week, for the Scrum meeting and Sprint Review presentation. Face-to-face attendance was preferred, followed by virtual attendance via video conferencing, and, last, video recording and sharing the meeting footage, which was the least preferred option for updating the BPO. In cases where the least preferred option was necessary, BPOs were asked to provide feedback in 72 hours after reviewing the footage. Forms were developed to guide and solicit BPO feedback efficiently. Table 1 summarizes the BPO responsibilities as follows:

Table 1: BPO Responsibilities

Scrum Ceremony	Level of Participation Preferred	Weekly Task (One-week Sprint)
Sprint Planning:	Participation using asynchronous communication	Prioritize user stories; weekly
Scrum Meeting:	Live attendance encouraged	Review footage (only if not present)
Sprint Review:	Live attendance encouraged	Complete product review form
Sprint Retrospective:	Participation not required	n/a

The Scrum projects in this study are fully functional applications rather than prototypes. Thus, BPOs introduced actual user requirement changes rather than simulated changes. Student projects were made up of seven approximately one-week Sprints. Each week students were expected to deliver a minimum viable product. Working with a BPO provides business students the opportunity to build software in a way that incorporates continuous feedback from their clients. At the end of the semester project, the software was given to the customer for deployment.

COLLECTING STUDENT FEEDBACK

Data were collected over three semesters across four sections of SAD. Modifications were made to the project approaches from the information gathered in the previous semesters. Twelve projects were executed in the first semester, eight in the second, and twelve in the third. Both quantitative and qualitative data were collected throughout the course to assess the effectiveness of incorporating the BPO role in student Scrum projects. One hundred thirteen students from four sections of the course were invited to complete the survey (see Appendix A). Of these, 94 students who began the survey completed it (88% response rate). In the next section, we discuss the study results including how student feedback and lessons learned were incorporated between semesters and the identification of ongoing challenges is provided.

RESULTS

We used descriptive analyses to assess the perceptions of the use of a BPO in student projects. Figure 2 provides the mean scores in semesters 1, 2, and 3. For the quantitative questions, students were asked questions associated with each of the research measures, which were answered using a five-point Likert scale ranging from 1-Strongly Disagree to 5-Strongly Agree. A mean of 4 or above suggests that, on average, students at least "Somewhat Agree" with the statement. A mean of 2 or below suggests that, on average, students' perceptions range from "1-Strongly Disagree" to "2-Somewhat Disagree." A mean of 3 is a neutral response ("3-Neither Agree nor Disagree"). These questions measured perceptions of student's current BPO and perceptions of the BPO in general.

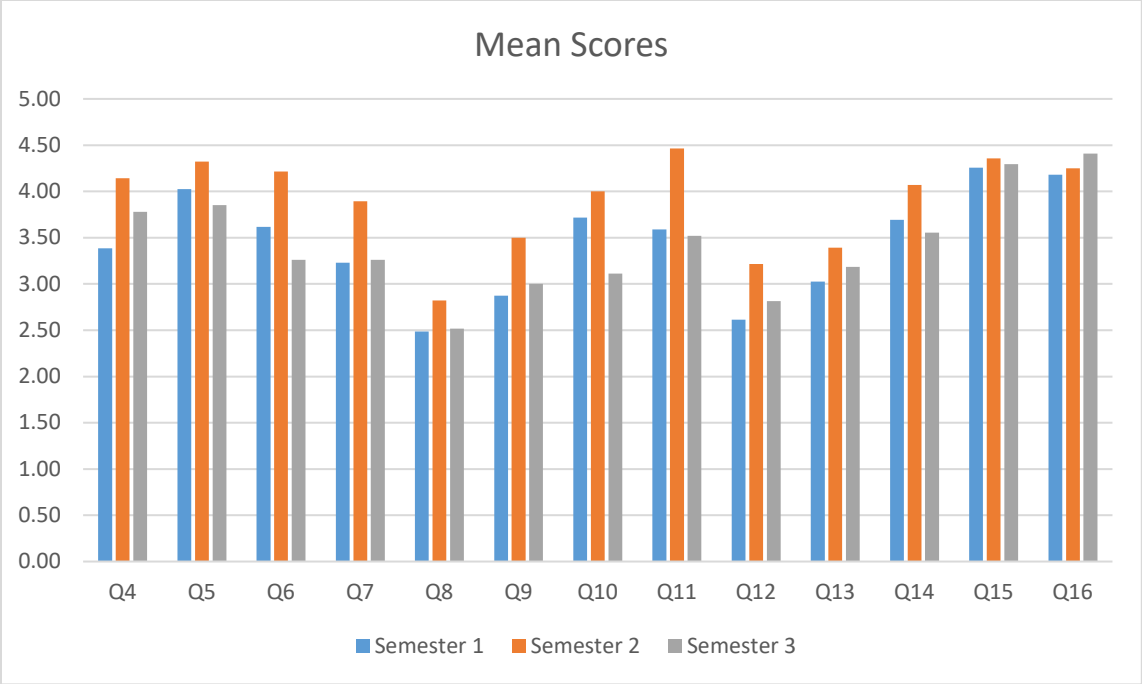

Figure 2: Mean Scores Across Semesters

Questions Q1-Q3 gathered background information about the BPO (e.g., name, company name, position). Questions Q4-Q13 assessed the respondent's perceptions of their current BPO ("Our BPO ___"), while questions Q14-Q16 assessed the respondent's perceptions of the BPO role in general.

> **Q4-Q13.** Q4 …had a vested interest. Q5 …was competent. Q6 …was available. Q7 …provided clear directions. Q8 …maintained the product backlog. Q9 …prioritize the product backlog. Q10 …provided useful feedback. Q11 …feedback was incorporated. Q12 …played a critical role in the success or failure. Q13 …helped make our app better.
>
> **Q14-Q16**. Q14 Having a BPO gave me a better understanding of the BPO roles and responsibilities; Q15 I feel comfortable working with a BPO at a future job. Q16 The BPO role is a valuable role on a software team.

Table 2: Semester 1 and 2 Comparison

	Overall Mean Score	Lowest Mean Score	Highest Mean Score
Semester 1	3.44	2.40 (Q8)	4.26 (Q15)
Semester 2	3.90	2.82 (Q8)	4.46 (Q11)
Semester 3	3.40	2.52 (Q8)	4.41 (Q16)

Questions (Q8) related to BPO maintenance of the product backlog had the lowest averages ranging from 2.40-2.82, as shown in Table 2. In contrast, questions (Q15-Q16) related to the respondent's comfort level in working with a future BPO and the value of the BPO had some of the highest averages ranging from 4.26-4.36 and 4.18-4.41, respectively. BPOs with the lowest averages tended to be disengaged, leaving the team with little to no feedback, direction, or a sense of what they wanted. BPOs with the highest averages were said to be available and involved in the maintenance and prioritization of the product backlog. The highest-rated BPOs were those that showed a vested interest in their product by taking ownership of tasks such as maintaining the product backlog.

After incorporating some lessons learned from the first semester to the second, each item's average increased and the overall averages increased from 3.44 to 3.90. Interestingly, mean scores for the third semester rarely improved over the second semester due to some BPO absenteeism over the semester and student's heightened awareness of its effects. Despite some less flattering perceptions of their current BPO (Q4-Q13), Q16 had the highest mean score in semester 3. This observation is explained by the qualitative data, which suggests that despite varying averages in perceptions of BPOs, respondents were able to note the ideal characteristics of a BPO and those that would have helped their efforts.

Questions Q17-Q18 asked students to describe the characteristics that make up a good BPO and ways the BPO role can be maximized in an academic setting. These questions solicited qualitative data by asking students to explain their answers in short answer form. The open-ended responses facilitated deeper insights into students' overall perceptions of the BPO role moving forward. For Q17, the most frequently mentioned characteristics were a high level of interest, investment, and involvement; clear communication; readily available; provides consistent feedback; knows what they want/has a clear vision. Below are a few examples:

> "Someone who is available, involved, interactive, with enough background on the subject of the project to provide constructive feedback to give direction to the team."
>
> "Communicates well, provides feedback, assists in bettering the project."

For Q18, most students felt that the best way to maximize the BPO role was to identify business owners that were interested, available, and willing to engage with the team throughout the project. Students in the third semester showed an increased understanding of the ideals of the BPO role evidenced by richer descriptions of how the BPO could have been maximized and a higher average test score than previous semesters (78%, 80%, and 84%). Also, understanding Scrum and the product were seen as positives. Explanations indicated that the students most preferred working with an actual business owner, while a few felt that simulated BPOs such as teaching assistants were a better choice because they might be more available and more likely to stay engaged:

> "If the BPO is a business owner, it gives great experience to students of expectations in a real-world SDLC"
>
> "I think [a simulated BPO] is the best route. Our BPO was an actual person and was very hard to contact at times we needed feedback."

These results suggest that incorporating the BPO is useful for teaching students about the importance of the BPO. Even in situations where the BPO was not highly involved, students still were able to identify BPO characteristics were lacking and how such characteristics could have helped their effort. By incorporating the BPO role, students gain practice in looking to the customer for vision, direction, and prioritization of the product backlog items, and also learn how to move the project forward when BPO communication is lacking.

A greater effort should be made to help students get paired with an exemplary BPO and help BPOs understand their role. Below are two student responses that express this sentiment:

> "Make sure the BPO knows the limitations of the class and can guide us to an admirable outcome"
>
> "Make sure the BPO has an active interest in the project."

DISCUSSION

In this section, the incorporation and attempted improvements to BPO implementations in student Scrum projects is discussed across a three-phases: selection, initiation, and execution.

BPO Selection (Agreement)

Because of their central role, BPOs should be carefully chosen so that students can benefit from working with a person who is invested in the project and willing to provide timely feedback. Before selecting a BPO, students learned about the responsibilities of the BPO role. With BPO availability at a premium, some modifications are necessary to vet properly and onboard BPOs within the constraints of a student project (i.e., semester timeline, class times). Significant challenges in the first semester of projects came from unengaged BPOs and many who, although stated their satisfaction with the design, failed to deploy their web applications. The former did not maintain involvement with the team. Several teams reported BPOs that did not respond to email messages and canceled meetings. One student suggested selecting individuals with "a clear schedule or enough time to meet [with the team] and provide feedback." The latter hesitated to deploy their web applications most commonly due to its perceived costs.

Lessons learned during BPO selection and modifications

After the first semester, modifications to BPO selection were made to minimize the risk of teams getting stuck with a BPO that did not communicate adequately or provide timely feedback. First, BPOs were asked to give their verbal consent to actively participate for the entire 9-week (7 Sprint) duration of the project within the first two Sprints. Second, potential BPOs were made aware at the start of the project of the implementation costs associated with their software applications, such as hosting costs. In prior experiences, many BPOs were hesitant to deploy their web applications because of their unwillingness to incur the implementation costs. Because of the changes listed above, the number of web applications deployed increased by twelve percent.

During the second semester, students stated that BPO responsibilities could be translated effectively via a written agreement. This stipulation should be firm as noted by many of the respondents:

> "[Create a] form with responsibilities and expectations of a BPO"
>
> "Making them actually communicate and not ignore students."

A major differentiator between BPOs that were highly involved versus those that were not was the willingness to complete written documentation. Therefore, after the second semester, the completion of a more formal written agreement was required for potential BPOs so that they understand the expectations and responsibilities of the role. The BPO contract agreement (see Appendix B) explained to potential BPOs that students would agree to build software applications only if the BPO agreed to meet with students weekly (or in approved cases bi-weekly) over the project timeline, ours being 9-weeks. Potential BPOs were given one week to sign the BPO contract. Despite its effectiveness in filtering out non-respondents and verbal respondents who did not sign off on their participation as BPO upfront, the use of the BPO contract alone did not lead to more enduring BPO commitments throughout the project.

Recommendations for BPO selection in future projects

Moving forward, additional actions could be taken to maximize the BPO selection process. An analysis of the data showed that BPOs who normally interacted with one or more team members outside of class (avg. 4.05 vs. 3.41) (e.g., work supervisors) and BPOs who were ready to host their app after the 9-week development tended to score higher on most BPO measures (avg. 3.87 vs. 3.41). Concerning the former, frequent interactions with BPOs led to informal discussions about user requirements and preferences that kept communication flowing. Concerning the latter, BPOs that were unable or unwilling to incur implementation costs were not incentivized to be highly involved in the project. The BPO's agreement to incur implementation costs for live app deployment upfront could be made a hard requirement.

Additionally, future amendments to the contract could make the potential BPOs commit to mandatory training with their perspective teams, if feasible. A notable drawback to such a change is that it takes up more time during the project, which is already only seven, one-week sprints.

BPO Initiation

After each project was outlined at a high level, a user story workshop (Cohn, 2009) was conducted with each team and their BPO. BPOs were strongly encouraged to attend a user story workshop either in person or virtually. This provided BPOs an overview of the project, restated the expectations, and gave a sense of the overall goal of the project. The user story workshop commenced with the creation of the original version of the product backlog, which marked the project's official kickoff. Major challenges during the first semester projects came from ensuring method knowledge for those BPOs that were unable to attend the user story workshop.

Lessons learned during BPO initiation and modifications

After the first semester, an attempt was made to communicate the results of the user story workshop to those who were unable to attend and solicit their immediate feedback. Students shared their user stories with the absent BPOs via message apps, and some BPOs were able to reply during class or shortly after class, while others did not reply until days later. After the second semester, the BPO solicitation process was started earlier in the semester so that BPOs that attended the user story workshop were ready to sign the contract. Consequently, all BPOs that were in attendance clarified and signed off on the initial scope of work. Most importantly, the user story workshop provides an avenue for co-creation of the project requirements, which was more effective than information sending.

Recommendations for BPO initiation in future projects

ASD surveys consistently point to the importance of adequate training for ASD teams (Version One, 2018). In line with this recommendation, instructors should take time to introduce and educate BPOs on the Scrum framework, their role, and the ceremonies. The extant literature suggests that training facilitates method knowledge, and ongoing coaching helps to deepen knowledge long-term (Senapathi & Srinivasan, 2014). Finding ways to educate BPOs within the course constraints may be challenging, but if successful, could yield significant benefits for project teams. One idea that was not tested in this study is developing a short training video for BPOs that briefly outlines how Scrum works along with the importance of the BPO role and how their contribution enhances the product. One recommendation is to discuss the feedback schedule upfront so that BPOs expect to receive frequent requests for feedback and can respond accordingly. Overall, instructors should verify that BPOs understand the continuous customer involvement model of ASD methods.

BPO Project Execution

The execution phase describes the application of Scrum in building software incrementally. Here, the team should gain practical knowledge of how the dynamics of working with a BPO work. At the end of each Sprint, teams were expected to deliver a product increment in accordance with its stated Sprint Goal, which was described by user stories in the Sprint Backlog. Overall, teams completed user stories in the order specified by the BPO. Although contributions varied from BPO to BPO, many BPOs did not consistently maintain the product backlog as measured by Q8. This item (Q8: "Our BPO maintained the product backlog.") contained the lowest average across all respondents of any single item in our survey at 2.61 out of 5. The failure to maintain the backlog is likely a function of a lack of training (mentioned in the last section) and coordinating around the academic constraints. Adaptations to traditional Scrum roles and ceremonies like meeting weekly rather than daily (i.e., Scrum meetings) were necessary to fit the classroom setting (Masood et al., 2018). While meeting weekly and communicating over message apps was enough for BPOs to prioritize the product

backlog according to business value, the meeting frequency and work proximity was not enough to have the BPO take a more active role in the project.

Lessons learned during BPO execution and modifications

After the first semester, the team's ability to communicate with the BPO was reassessed because several respondents indicated that they had not met or communicated directly with the BPO. In these cases, communication with the BPO went through a single group member. Therefore, in addition to other forms of communication such as email, it was mandated that BPOs be added to the team's communication platform (e.g., Slack, Group Me) during the second-semester projects. These platforms helped the team to stay connected with the BPO in between meetings and overcome some of the spatial limitations of face-to-face meetings. Additionally, having the entire team on one platform promotes open communication between all members. Because the BPO is often more connected to one member, without a central platform there is a tendency for communication with the BPO to go through that one member.

Recommendations for BPO execution in future projects

Because most BPO involvement was voluntary and not a term of their employment, a combination of economic, social, and psychological motivations may be needed to keep them engaged (Etgar, 2008). BPOs that were perceived the most favorably saw the project as a way to fulfill an economic need (low-cost website), had a collaborative mindset, and enjoyed team interactions. Future implementations of Scrum in the classroom should seek such individuals.

While communicating over message apps helped all members to have access to the BPO when needed, relying on asynchronous communication was not enough to have the BPO take a more active role in the project. Thus, more synchronous communication could help to improve team communications. For some teams, this meant meeting before class at an agreeable time for the BPO. Additionally, future BPO implementations could have the iterative BPO report sent to the instructor rather than the students who may be more prone to be ignored.

Current theory suggests that the BPO should define and prioritize the features, but many BPOs were inexperienced with software development. Although the co-creation of product design and features is coveted in many situations, co-creation may not be useful for understanding customer needs that are difficult to articulate (Cui & Wu, 2016). In accordance with our findings, we recommend expanding the development team's role in defining and prioritizing features during the BPO execution process when the BPO is unable to fulfill these responsibilities.

In summary, this project stimulated discussions about BPO concepts of which students may not have otherwise had a clear understanding. In addition to the text presented in this section, the main points reported by students are summarized below. They have said this project:

> (1) Helped them gain hands-on experience working with a BPO while using Scrum, which enhanced their knowledge of the BPO position.
>
> (2) Help them feel confident about working with a BPO at a future job.
>
> (3) Helped them identify ideal characteristics in a BPO and ways to maximize the role in an academic setting.

PEDAGOGY

PROJECT AS A PEDAGOGICAL TOOL

The approach described in the previous sections has pedagogical value concerning the use and effectiveness of incorporating the BPO as a mechanism to teach students about how the role works within the context of software development. The course project moves BPO and Scrum concepts

beyond abstract concepts to a deeper understanding. The data suggests the use of the BPO as a pedagogical tool for teaching students about the dynamics of the development team-BPO relationship. To stimulate a deeper understanding, students should include in their project report a discussion about the characteristics of an effective BPO that they learned by analyzing their projects. Those concepts include the following:

(1) Explain three distinct roles and responsibilities that BPOs possess;

(2) Describe the characteristics that make up a good BPO;

(3) Describe how the BPO role might be maximized; and

(4) Discuss any conditions that impacted scope changes.

STUDY LIMITATIONS AND FUTURE RESEARCH

As with all studies, this one has limitations. First, this study is limited to a single instructor and a single institution. Although these factors limit generalizability, the findings in this study confirm findings in previous studies on the characteristics of a BPO and the effectiveness of using BPOs in student Scrum projects. Future work could look at extensions to the BPO role in industry such as the role of product manager. Second, the classroom setting forced some modifications to the BPO role to deal with the semester timeline, student skill level, and BPO availability. Students were tasked with finding three potential BPOs. Some students favored the idea of instructors recruiting, vetting through, and assigning all BPOs. Having students secure their own BPOs introduced more options as groups of 3-4 drew upon their networks to identify potential candidates. Future research can underscore additional ways of identifying and selecting BPOs.

CONCLUSION

This study contributes to the literature by detailing how BPOs have been incorporated in the classroom wholesale, providing empirical results of multiple BPO implementations and attempted improvements, and providing pedagogical recommendations for future implementations of BPOs in Scrum projects. In summary, we found that BPO engagement can be improved in voluntary situations by (a) formalizing the BPO selection process through time-limiting responses, screening, and contractual agreements, (b) starting the BPO initiation process through co-creation activities (e.g., user story workshop), and (c) expanding the development team's role in defining and prioritizing features during the BPO execution process through mutual steering. Current theory, focusing on the organizational context, describes the top-down selection of BPOs where managers issue BPOs to software teams. This study is among the first to theorize and examine the bottom-up selection of BPOs where team members select their own BPOs as a unique project requirement. Appendix C summarizes the attempted BPO improvements. In relation to our results, recommendations for future research are as follows:

- Require BPOs to Attend Training via Formal Agreement
- Have BPOs to Submit Iterative Reports to the Instructor
- Use Documentation to Monitor Engagement

In working on this project, students were asked to integrate previous knowledge and add new knowledge as they encountered new challenges. Additionally, many business students may eventually participate in software projects in future jobs. Thus, the social and technical skills promoted here can help them to have better communication with IT professionals. In some cases, absentee BPOs led to complaining. Therefore, instructors should have contingencies in place such as having teaching assistants or other pre-selected BPOs fulfill the role if needed. Overall, the trial and error of identifying and selecting, working with, and modifying the approach to incorporating BPOs in student projects have produced a growing list of suitable BPOs, and the findings of this study suggest some pedagogical benefits for students.

REFERENCES

Abrahamsson, P., Salo, O., Ronkainen, J., & Warsta, J. (2002). Agile software development methods: Review and analysis. *Proceedings of Espoo 2002*, Finland. https://www.vttresearch.com/sites/default/files/pdf/publications/2002/P478.pdf

Baham, C. (2019). Implementing scrum wholesale in the classroom. *Journal of Information Systems Education*, *30*(3), 1.

Baird, A., & Riggins, F. J. (2012). Planning and sprinting: use of a hybrid project management methodology within a CIS capstone course. *Journal of Information Systems Education*, *23*(3), 243–257.

Cleland, S., & Mann, S. (2003). Agility in the classroom: Using agile development methods to foster team work and adaptability amongst undergraduate programmers. *Proceedings of the 16 Annual NACCQ*, 49-52.

Cohn, M. (2009). *Succeeding with agile: Software development using scrum,* Addison-Wesley.

Cui, A. S., & Wu, F. (2016). Utilizing customer knowledge in innovation: Antecedents and impact of customer involvement on new product performance. *Journal of the Academy of Marketing Science*, *44*(4), 516–538. https://doi.org/10.1007/s11747-015-0433-x

Deemer, P., Benefield, G., Larman, C., & Vodde, B. (2012). *A lightweight guide to the theory and practice of scrum (Version 2.0).* https://scrumprimer.org/scrumprimer20.pdf

Etgar, M. (2008). A descriptive model of the consumer co-production process. *Journal of the Academy of Marketing Science*, *36*, 97–108. https://doi.org/10.1007/s11747-007-0061-1

Hoskey, C., & Hoskey, A. (2016). Cultivating sprightly students: Using agile development in an information systems capstone course. *Proceedings of the Information Systems Education Conference*, Galveston, TX, U.S., November 10-12, 88–99.

Jiménez, O., & Cliburn, D. (2016). Scrum in the undergraduate computer science curriculum. *Journal of Computing Sciences in Colleges*, *31*(4), 108–114.

Lang, G. (2017). Agile learning: Sprinting through the semester. *Information Systems Education Journal*, *15*(3), 14.

Mahnic, V. (2011). A capstone course on agile software development using scrum. *IEEE Transactions on Education*, *55*(1), 99–106. https://doi.org/10.1109/te.2011.2142311

Masood, Z., Hoda, R., & Blincoe, K. (2018). Adapting agile practices in university contexts. *Journal of Systems and Software*, *144*, 501–510. https://doi.org/10.1016/j.jss.2018.07.011

May, J., York, J., & Lending, D. (2019). Play ball: Bringing scrum into the classroom. *Journal of Information Systems Education*, *27*(2), Article 1.

Oomen, S., De Waal, B., Albertin, A., & Ravesteyn, P. (2017). How can scrum be successful? Competences of the scrum product owner. *European Conference on Information Systems*. Retrieved from http://aisel.aisnet.org/ecis2017_rp/9

Overhage, S., & Schlauderer, S. (2012). Investigating the long-term acceptance of agile methodologies: An empirical study of developer perceptions in scrum projects. *45th Hawaii International Conference on System Sciences*, 5452–5461. https://doi.org/10.1109/hicss.2012.387

Rubin, K. S. (2012). *Essential scrum: A practical guide to the most popular agile process.* Addison-Wesley.

Schwaber, K. (1995). Scrum development process. *OOPSLA'95 Workshop on Business Object Design and Implementation.* Austin, TX.

Senapathi, M., & Srinivasan, A. (2014). An empirical investigation of the factors affecting agile usage. *Proceedings of the 18th International Conference on Evaluation and Assessment in Software Engineering*, 10. ACM. https://doi.org/10.1145/2601248.2601253

Sutherland, J., & Schwaber, K. (2016). *The scrum guide. The definitive guide to scrum: The rules of the game.* https://www.scrumguides.org

Version One. (2018). *12th Annual State of Agile Survey*. https://explore.versionone.com/state-of-agile/versionone-12th-annual-state-of-agile-report

Wagh, R. (2012). Using scrum for software engineering class projects. *2012 Agile India*, 68–71. https://doi.org/10.1109/agileindia.2012.17

West, D., Grant, T., Gerush, M., & D'silva, D. (2010). Agile development: Mainstream adoption has changed agility. *Forrester Research*, *2*(1), 41.

Yue, K.-B., De Silva, D., Kim, D., Aktepe, M., Nagle, S., Boerger, C., Jaun, A., & Verma, S. (2009). Building real world domain-specific social network websites as a capstone project. *Journal of Information Systems Education*, *20*(1). https://www.researchgate.net/profile/Dilhar_De_Silva/publication/228684965_Building_Real_World_Domain-Specific_Social_Network_Websites_as_a_Capstone_Project/links/02e7e52cdc81460843000000.pdf

APPENDIX A

BPO SURVEY

Business Product Owner Name:
Position:
Name of business:

1. Have you ever met your BPO (via video chat or in person)? (Circle one)
   Yes.

   No. Explain: _____
   _____

2. How often did you meet with your BPO? (Circle one)
   Weekly

   Bi-weekly

   Monthly

   Once or twice

   Never

   Explain:
   _____

3. Is your business BPO *real* or *simulated*? Real = An employee of the company that you are developing your app for. Simulated = All other persons providing feedback. (Circle one)
   Real Simulated

Questions 4-13 are specific questions about your BPO.

4. Our BPO had a vested interest in the success of our app.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

5. Our BPO was competent.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

6. Our BPO was available when needed.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

7. Our BPO provided clear directions to the team.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

8. Our BPO maintained the product backlog.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

9. Our BPO prioritized the product backlog according to business/customer value.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

10. Our BPO provided useful feedback throughout the project.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

11. Our BPO's feedback was incorporated into the software design.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

12. Our BPO played a critical role in the success or failure of the overall project.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

13. Having a BPO helped make our app better.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

Questions 14-18 are questions about the BPO role in general.

14. Having a BPO gave me a better understanding of the BPO roles and responsibilities.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

15. I feel comfortable working with a BPO at a future job.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

16. The BPO role is a valuable role on a software team.

A	B	C	D	E
Strongly agree	Mostly agree	Neutral	Moderately disagree	Strongly disagree

17. In your opinion, what characteristics make up a good BPO?

_____

18. In what ways might the BPO role be maximized in an academic setting?

_____

APPENDIX B

BPO AGREEMENT EXAMPLE

Dear Perspective Business Product Owner (BPO):

The department of *X*'s Systems Analysis and Design is offering the opportunity for you to have your business website developed in exchange for your participation as a BPO. As a representative of your business, the BPO plays a pivotal role in the web development process. Basic BPO responsibilities are as follows:

- Be available to the team when needed (approximately two 5-10 minute sessions a week)
- Provide clear direction to the development team
- Prioritize (and re-prioritize) and maintain the list of features that you want
- Provide useful feedback throughout the project

BPO engagement is major part of what makes our process a success. Thus, we require a written agreement of you committing to meeting with/making yourself available to your team twice a week (minimum) for the next nine weeks. Your team will meet to discuss your website every *X and Y* (e.g. Tuesday and Thursday) from approximately *Z* (e.g. 10:30-10:40am). We encourage you to *join in* either physically or virtually. On *X*, if you are unable to attend the meeting in-person, the team will provide you with a quick update on their progress (5-10 minutes). Similarly, on *Y*, the team will provide you with a video demoing your software and ask for your feedback in a short form. Finally, we expect that your website will be ready for deployment at the end of the project. Please be aware of the implementation costs such as acquiring a domain and paying hosting fees (approximately $100/year), which are separate from our free design services. Enclosed is a project scope statement with a tentative overview of your project. Please review and sign the bottom of the statement to agree to the working terms listed above.

APPENDIX C

ATTEMPTED BPO IMPROVEMENTS

Table-C1: Attempted BPO Improvements

Semester / Problem	Attempted Improvement to BPO Selection	Result
1a / Students spent too much time pursuing unresponsive potential BPOs.	Require verbal consent within 2 weeks of the initial request for participation.	Highly effective: Students were able to move on quickly from non-respondents.
1b / BPOs did not host apps due to hosting fees.	Make BPOs aware of implementation costs upfront.	Moderately effective: Students gained a better sense of those who were ready to implement a website in 9 weeks.
2a / Some respondents verbally agreed to participate as BPOs but did not make themselves available throughout the project.	Require a signed written agreement within 1 week of the initial request for participation. The agreement outlined the responsibilities of the BPO role.	Highly effective* (for BPO selection; non-effective for sustaining commitment): Students were able to move on from non-respondents and verbal respondents who did not sign off on their participation as BPO.

Semester / Problem	**Attempted Improvement to BPO Initiation**	**Result**
1a / Absentee BPOs missed the project overview and the development of the initial product backlog	An attempt was made to communicate the results of the user story workshop to those who were unable to attend and solicit their immediate feedback via message apps	Moderately effective: Although the workshop results were sent, some BPOs failed to provide feedback in a timely manner via message apps.
2 / Some groups were unable to secure a BPO before the user story workshop.	The BPO solicitation process was started earlier in the semester so that BPOs that attended the user story workshop were ready to sign the contract.	Highly effective: All BPOs that attended the user story workshop signed the BPO contract. Every group secured a BPO before the workshop.
Semester / Problem	**Attempted Improvement to BPO Execution**	**Result**
1a / Some team members had little to no contact with the BPO. BPO communication went through only one team member.	Students had to provide proof of their BPO's presence on their messaging apps	Moderately effective: All team members had a direct line of contact to the BPO, but some students were still hesitant to reach out to the BPO.

BIOGRAPHY

Corey Baham is an Assistant Professor of Management Science and Information Systems at the Spears School of Business at Oklahoma State University. He completed his PhD in Information Systems and Decision Sciences from Louisiana State University. His current research focuses on agility in IS development, systems recovery, and firm dexterity. His work has been published in the *Journal of Management Information Systems, Communications of the Association of Information Systems* and major IS conference proceedings.