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# **A Three Cohort Study of Role-Play Instruction for Agile Project Management**

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## **ABSTRACT**

Agile Project Management methods and processes that emphasize action and feedback over planning continue to gain prominence for Information Systems projects. This topic is an ideal candidate to lead the evolution of project management instruction from teaching “about” to learning “how to.” This paper describes a role-play simulation to instruct students in Agile project methods. This simulation is inspired by the Scrum Software Development Process and has as its goal to teach key Agile project management competencies using first hand experiences. A study of efficacy across three cohorts of students is presented to contrast the role-play instructional method with reading and lecture.

**Keywords:** Active learning, Agile, Project management, Role-play, Simulation

## **1. INTRODUCTION**

This paper describes a role-play simulation to instruct students in Agile project methods. This simulation, called “Scrummy,” is inspired by the Scrum Software Development Process (Rubin, 2013) and has as its goal to teach key Agile project management competencies using first hand experiences. Agile approaches such as Scrum, XP, and Lean are increasingly common processes to deliver software and information systems.

Common project management books teach “about” Agile, including definitions, concepts, tutorials (Devedzoc and Milenkovic, 2011), and anecdotes (Schwaber, 2004). These resources support lecture-guided presentations and passive learning of explicit knowledge (Geist and Myers, 2007). A variant involves guest speakers from industry who relay a variety of historical experiences and anecdotes that breathe life to otherwise static concepts (Poston and Richardson, 2011). However, students are easily distracted by the vision of flexibility and individual autonomy emphasized by evangelists of Agile approaches and lose sight of the importance of the structure provided by specific Agile project management practices. The apparent contradiction of structure with flexibility is more easily assimilated as a dialectic by novices experiencing these practices first hand.

While Agile methods have been prescribed for extended duration student projects (Mahnic, 2012), capstone courses (Baird and Riggins, 2012), and student consulting projects (Heroit et al., 2008; Pollard, 2012), these assignments are best suited for integrating competencies established earlier in the curriculum as opposed to introducing new skills. An introductory primer is needed to establish a foundation that

prepares all team members to participate fully from the onset of either academic or real-world projects.

To guide students through early learning, we adopt role-play whereby students are participants in the context of a real-time story. The role-play instructional method emphasizes competency development and concept understanding through the act of doing to improve learning outcomes (Vold et al., 2010). In addition, role-play scenarios provide a setting for peer learning where students interact to clarify ideas and solve problems (Boud, 2001). This method is a particularly good match for Agile project management that values tacit knowledge over explicit knowledge.

This role-play simulation was designed for a cohort of Health Informatics students at a major metropolitan university. Many of the students have had either clinical training or clinical experience. Simulation is a widely used instructional method for procedural skills within the health sciences (Nestel et al., 2011) and is gaining traction among STEM disciplines (Chen et al., 2011; Streicher et al., 2005), collaborative programming (Auer, Juntunen, and Ojala, 2011), software refactoring (Foster and Ruiz, 2010), and plan-driven project management techniques (Sullivan, 1993; Tachikawa, Maruyama, and Nakamura, 2013). However, many STEM simulations are staged within a technology mediated environment, while Agile is rooted in a value system that emphasizes face-to-face interactions. As a result, face-to-face role-play simulations that include rich communication and interaction experiences (Andersson and Andersson, 2010) align nicely with the philosophical views that inspire Agile methods.

This paper is organized as follows: Section two identifies instructional preparation and describes the Scrummy Agile role-play activity. Section three identifies target learning

objectives for undergraduates and variants for graduate students. Section four presents a study of efficacy demonstrated through multiple cohorts. The concluding section provides discussion and summation.

## 2. PREPARATION AND “SCRUMMY” ROLE-PLAY EXERCISE

The Scrummy role-play is devised for a semester-long IT Project Management class in a university setting. This role-play is best conducted after students are acquainted with concepts such as project charters and requirements. The iterative Agile approach can be introduced as a risk mitigation strategy to manage the inevitability of scope creep and requirements change. Approximately 30 minutes of class time should be allocated to summarizing the Scrum Software Development process (Rubin, 2013) and its key roles as a prototypical Agile process (VersionOne, 2016).

The “Scrummy” role-play exercise adapts the Scrum Software Development process in an abbreviated form to allow students time to experience the roles and process mechanics within the time constraints of a classroom setting. After providing a summary of the Scrum Software Development process as noted in Appendix A, the Scrummy roles and Scrummy process should be described.

### 2.1 Scrummy Roles

Team sizes may vary from four to six individuals, with five being ideal. This role-play exercise involves three roles: (1) one product owner, (2) one scrum master, and (3) two to four team members.

### 2.2 Scrummy Process

Teams will perform the project in a series of 30 minute “sprints” to deliver a solution/product. Each sprint will unfold in a predictable/repeatable set of timed steps:

- A. **Sprint Planning:** Five minutes to identify the goal and activities for the upcoming sprint (what to deliver). Individuals should select their own tasks from among those identified (there is no dictator running Agile projects).
- B. **Execution:** Ten minutes to do work (this may be individual or in sub-teams if multiple people are collaborating).
- C. **Product Build:** Five minutes to consolidate your product.
- D. **Delivery & Feedback:** Five minutes to present your product and get feedback.
- E. **Retrospective & Review:** Five minutes to identify (at least) one thing you need to improve in your process (sprint retrospective) for the next sprint and to assimilate feedback from product presentation and product owner as you continue to build your product (sprint review).

### 2.3 Running the Role-play

Teams are formed with self-assigned roles. The following instructions guide students to organize and launch the simulation:

- Teams are composed of four to six students (five is ideal).
- This activity will use PowerPoint or some other presentation tool as well as Internet access.
- As a team, select roles for each member. Each student will maintain the same role throughout the simulation.
- This is a “role-playing game.” Pretend you are that person, and act so the game unfolds smoothly.
- Send the product owner on behalf of the team to the instructor for additional instructions and information.

The assembled product owners are provided an information package for each participant. The package includes a one-page summary of the Scrummy process (Appendix B.1), a one-page project charter (Appendix B.2), and a description of their role with guidelines for their participation (Appendices C.1, C.2, and C.3). Product owners return to their team, distribute the packages, and begin the first sprint.

To facilitate a timely progression through each step, the instructor should maintain and display a countdown timer. For the first sprint, this can be done in increments for each step of the Scrummy process with an announcement for each transition. In subsequent sprints, the classroom countdown timer measures the full sprint duration (30 minutes) with scrum masters managing transitions for their team.

After each sprint, one team will present their product. The full class participates in the question and answer session to generate feedback for that team and vicariously for all teams. The instructor may also provide feedback to help guide the product. This serves as a collective *Sprint Review*. Following the full-class presentation and feedback session, product owners are again collected to receive supplemental instruction (Appendix C.4). Product owners return to their team to continue with a team-specific sprint review where product adaptation is discussed to integrate feedback. A Sprint Retrospective allows teams to discuss process improvements. A new sprint begins as the team transitions to a Sprint Planning meeting.

### 2.4 Sample Project and Adaptation

**2.4.1 Sample project charters:** The charter (Appendix B.2) is delivered as completed and approved. Consistent with the Agile philosophy, this charter is a brief document including *vision*, *mission*, and *benefits*. In addition, a set of *objectives* helps guide the initial stages of product development.

The project charter leads teams to develop a PowerPoint presentation to train other students to measure and understand their own blood pressure. This topic is aligned with the healthcare theme that underlies the Health Informatics curriculum and seeks to achieve emotional interest of the participants. When adapting this simulation for students in alternate degree programs, instructors should carefully select a topic to quickly engage the students.

**2.4.2 Simulation phases and requirements change:** The simulation takes place in four phases. Phase 1 is 30 minutes of preparation. This includes the introduction of generalized Scrum, the Scrummy process, the simulation project charter, and gathering of teams. Phase 2 is the first sprint and a product presentation by one team. Allowing 5 minutes for presentation followed by 5 minutes of questions and feedback, this phase

will consume about 40 minutes. Phase 3 includes the introduction of minor requirements changes (Appendix C.4) and lasts about 30 minutes. Phase 4 includes additional requirements refinement, including some that contradict earlier feedback (Appendix C.5). An optional Phase 5 involves a significant new requirement (determining a student's temperature) that constitutes scope-creep not aligned with the charter (Appendix C.6).

The requirements change provided in the product owner instructions of Appendix C can be mixed and reordered. This allows introduction of the scope creep requirement (temperature) earlier and withdrawal in subsequent sprints. By manipulating user feedback, the instructor can simulate the back and forth nature of requirements change during a project. This leads students to experience how the iterative approach responds to evolving requirements.

**2.4.3 Adapt to alternate class duration:** The Scrummy role-play was developed for a class which meets once a week for two hours and thirty minutes. This allows ample time to present the generalized Scrum process, introduce the simulation and project charter, have teams select roles, distribute information packets, and run three sprints. This activity can be divided across two sessions where the preparation and role assignment occur in one session and performing sprints occurs in a second. Adaptation for a class with three fifty-minute sessions may be possible by delaying delivery and feedback (step D) to the start of a subsequent class and thereby deterring offline progress that could undermine the intended timebox.

### 3. LEARNING OBJECTIVES

#### 3.1 Undergraduate Students

The Scrummy role-play seeks to accomplish these learning objectives:

- 1) Understand key Agile project concepts including: backlog, iterative development, sprint, and time boxing,
- 2) Understand the common roles in Agile projects including product owner and scrum master.
- 3) Explain the purpose of Agile processes including Sprint Planning Meetings, Sprint Reviews, and Sprint Retrospectives.

#### 3.2 Graduate Students

This simulation can also be used for graduate students who typically have work experience in IT project teams. In this setting, the role-play becomes a first-person case study to explore these alternate learning objectives:

- 1) Explain how iterative project processes help expose requirements and manage risk associated with changing requirements.
- 2) Identify and categorize new project, product, and organization risks to which Agile projects are susceptible.
- 3) Describe the characteristics of leadership required in an Agile project.

- 4) Estimate the duration of the project based on velocity measured after the first and second sprints (this learning objective requires additional preparation to carefully build the product backlog and estimate use-cases).

### 4. MEASURING RESULTS AND DISCUSSION

A formative assessment has been provided to all students as an electronic, web-based questionnaire (Table 1). Responses were coded with numeric values of 1 for Definitely-not, 2 for Probably-not, 3 for Probably-yes, and 4 for Definitely-yes. The result is an ordered scale with higher values reflecting greater student self-efficacy and command of the associated concepts.

Data was collected from three cohorts of students. Data for the first group was limited to post-role-play self-efficacy. Data for the second group included both a pre- and post-role-play self-efficacy providing indirect evidence of instructional effectiveness. As the cohort included students under age 18, data was collected anonymously and not matched (needed IRB approval without guardian consent at the host institution). Data for the third group included pre- and post-role-play self-efficacy, as well as aligned questions from an exam.

#### 4.1 Cohort 1

The first cohort to participate in the Scrummy role-play involved a class of 41 students. Some students opted out of this study, resulting in a usable sample of 29 participants. Table 1 identifies the formative assessment questions presented to students following the role-play exercise with descriptive statistics.

The first seven questions involve topics addressed by the role-play. The last five questions involve topics covered only in the textbook and standard lecture. Students expressed the highest self-efficacy of role-related concepts addressed in questions 3 and 4. Self-efficacy is also relatively high for the remaining knowledge level concepts addressed in questions 1, 2, and 5. Self-efficacy is somewhat weaker for the concept of "project retrospective" addressed in question 6. It appears some students are not differentiating the similar concepts of "project retrospective" and "project review" (confirmed by question 7).

Knowledge level concepts covered in the textbook and lecture are addressed in questions 9, 10, 11, and 12. Self-efficacy for these concepts is more varied. The lowest self-efficacy is reported for the concept of burn-down charts, which may be attributed to a lack of a-priori context. In the case of Question 9 (daily standup meeting), students may infer from the label sufficient context clues to guide rapid assimilation of this concept. Similarly, the label "velocity" in question 12 allows students to appropriate pre-existing ideas to this domain. In contrast, pre-existing knowledge is less helpful for the idea of a burn-down chart (question 11), making this concept somewhat more difficult to assimilate. The outlier for this cohort is the concept of Epic/Theme (question 10). This concept was covered using a conventional textbook and lecture approach at least a week prior to the role-play. Student confidence for this concept may be explained by multiple clarification questions asked by students at the time this material was presented.

Questions 7 and 8 involve more nuanced concepts. These relate to the purpose and function of certain recurring meetings. Interestingly, students report markedly higher self-efficacy for Question 7 that involves concepts covered in the simulation

Statement of Knowledge [1=Definitely not, 2=Probably not, 3=Probably yes, 4=Definitely yes]		Method	Mean (N=29)	St. Dev (N=29)	Variance (N=29)
Q1	Do you know what a Sprint is?	role-play	3.55	0.632	0.399
Q2	Do you know what a Planning Meeting is?	role-play	3.59	0.733	0.537
Q3	Do you know what a Product Owner is?	role-play	3.62	0.561	0.315
Q4	Do you know what a Scrum Master is?	role-play	3.66	0.614	0.377
Q5	Do you know what time-boxing is?	role-play	3.59	0.568	0.323
Q6	Do you know what a project retrospective is?	role-play	3.24	0.830	0.690
Q7	Do you know the difference between an end of sprint project review and an end of sprint project retrospective?	role-play	3.17	0.848	0.719
Q8	Do you know the difference between Planning Poker and a Sprint Planning Meeting?	lecture	2.90	0.860	0.739
Q9	Do you know what a Daily Standup meeting is?	lecture	3.34	0.769	0.591
Q10	Do you know what an Epic/Theme is?	lecture	3.52	0.634	0.401
Q11	Do you know what a Burn-down Chart is?	lecture	2.76	0.912	0.833
Q12	Do you know what velocity is?	lecture	3.31	0.660	0.436

Table 1. Cohort 1

than for Question 8 which involves concepts covered only in the text and in traditional lecture.

Student feedback from the first cohort inspired an enhancement of the role-play to include a pre-role-play questionnaire for cohort 2. In addition, data from a few exam questions were collected for cohort 3 to inform effectiveness of this instructional method.

**4.2 Cohort 2**

Cohort 2 involved 59 students. Pre and post self-efficacy scores were collected from this cohort using the same survey instrument as cohort 1. All answers were anonymous, and responses were not matched to the informant. Table 2 provides the mean self-efficacy scores both prior to the Scrummy role-play (N = 52) and after (N = 59). A two-sample t-test for unpaired data samples with unequal variances was calculated (Stata, 2013) to provide a statistical test of the hypothesis that

the students gain Agile process self-efficacy during the simulation. In all cases, statistically significant evidence suggests self-efficacy improves.

The pre-simulation self-efficacy scores are relatively high for the knowledge level concepts associated with questions 1, 2, 3, 4, and 5. Self-efficacy increases and approaches the top of the scale after the role-play activity. Students report a lower pre-role-play self-efficacy for the concepts of project retrospective and project review (questions 6 and 7), yet in both cases the post role-play self-efficacy approaches the top of the scale.

Concepts delivered through reading and lectures are associated with questions 8 through 12. Except for daily standup meetings (question 9), a-priori self-efficacy is equivocal. While the self-efficacy grows with reading and lecture, students do not report levels as high as those experienced during the role-play. One exception is “daily standup meetings” associated with question 9. Self-efficacy for

Statement of Knowledge [1=Definitely not, 2=Probably not, 3=Probably yes, 4=Definitely yes]		Method	Pre-Sim Mean (N=52)	Post-Sim Mean (N=59)	H: post - pre > 0 t-score (p-value)
Q1	Do you know what a Sprint is?	role-play	3.25	3.97	5.607 (<0.0000)
Q2	Do you know what a Planning Meeting is?	role-play	3.21	3.86	5.213 (<0.0000)
Q3	Do you know what a Product Owner is?	role-play	3.33	3.97	6.342 (<0.0000)
Q4	Do you know what a Scrum Master is?	role-play	3.04	3.92	5.855 (<0.0000)
Q5	Do you know what time-boxing is?	role-play	2.90	3.83	6.464 (<0.0000)
Q6	Do you know what a project retrospective is?	role-play	2.54	3.90	9.267 (<0.0000)
Q7	Do you know the difference between an end of sprint project review and an end of sprint project retrospective?	role-play	2.12	3.78	10.862 (<0.0000)
Q8	Do you know the difference between Planning Poker and a Sprint Planning Meeting?	lecture	2.23	3.56	7.518 (<0.0000)
Q9	Do you know what a Daily Standup meeting is?	lecture	3.60	3.93	3.577 (0.0003)
Q10	Do you know what an Epic/Theme is?	lecture	2.35	3.49	7.515 (<0.0000)
Q11	Do you know what a Burn-down Chart is?	lecture	2.12	3.39	7.352 (<0.0000)
Q12	Do you know what velocity is?	lecture	2.44	3.50	5.959 (<0.0000)

Table 2. Cohort 2

Statement of Knowledge [1=Definitely not, 2=Probably not, 3=Probably yes, 4=Definitely yes]		Method	Pre-Sim Mean (N=42)	Post-Sim Mean (N=39)	H: post - pre > 0 t-score (p-value)
Q1	Do you know what a Sprint is?	role-play	2.50	3.69	7.232 (<0.0000)
Q2	Do you know what a Planning Meeting is?	role-play	3.14	3.62	3.455 (0.0004)
Q3	Do you know what a <u>Product Owner</u> is?	role-play	3.19	3.72	3.522 (0.0004)
Q4	Do you know what a <u>Scrum Master</u> is?	role-play	2.33	3.67	6.913 (<0.0000)
Q5	Do you know what <u>time-boxing</u> is?	role-play	3.24	3.69	3.465 (0.0004)
Q6	Do you know what a project <u>retrospective</u> is?	role-play	2.76	3.62	5.148 (<0.0000)
Q7	Do you know the difference between an end of sprint <u>project review</u> and an end of sprint <u>project retrospective</u> ?	role-play	2.17	3.23	5.429 (<0.0000)
Q8	Do you know the difference between <u>Planning Poker</u> and a <u>Sprint Planning Meeting</u> ?	lecture	2.71	3.41	3.745 (0.0002)
Q9	Do you know what a <u>Daily Standup meeting</u> is?	lecture	2.69	3.28	3.158 (0.0011)
Q10	Do you know what an <u>Epic/Theme</u> is?	lecture	2.81	3.10	1.502 (0.0686)
Q11	Do you know what a <u>Burn-down Chart</u> is?	lecture	2.98	2.97	-0.0088 (0.5035)
Q12	Do you know what <u>velocity</u> is?	lecture	2.93	2.92	-0.0312 (0.5124)
Two sample t-test with unequal variances of unpaired samples (one-tailed test of significance).					

Table 3. Cohort 3

this concept starts relatively high and increases. One explanation may be the highly descriptive label assigned to this practice, which is largely self-evident.

#### 4.3 Cohort 3

Cohort 3 involved 45 students, with 42 participating in the pre-role-play survey and 39 participating in the post-role-play survey (same instrument as cohort 1 and 2). In addition to collecting self-efficacy, exam questions were administered to test knowledge and comprehension.

Table 3 provides the mean self-efficacy scores both before and after the role-play. A two-sample t-test for unpaired data samples with unequal variances provides a statistical test of the hypothesis that the students gain self-efficacy during the simulation. The data provides strong statistical evidence ( $p < 0.000$ ) that self-efficacy improves with the simulation. For the role-play activity, the “compare and contrast” comprehension concepts (question 7) remain the most challenging. Even with the relatively low starting point, self-efficacy for these concepts is higher than most of the concepts communicated through reading and lecture. The exception is the concept of “daily standup meetings,” which has a highly descriptive label.

Several weeks after the role-play activity, a multiple-choice exam was administered to this cohort testing their knowledge on many project management topics. Table 4 identifies questions specific to Agile project management.

Each of these questions was graded on a four-point scale, with multiple-select/multiple-answer questions qualifying for partial credit, while the questions with only one correct choice received either full credit of four points or zero.

Table 5 provides summary scores for each of the exam questions and shows the alignment to self-efficacy scores. There is no matching of self-efficacy to exam scores because the pre-/post- role-play questionnaires were collected anonymously. However, the aggregate exam scores support the self-efficacy learning levels. Overall, students performed better on exam questions covering concepts experienced during the role-play than they did for concepts delivered by reading and lecture.

It is worth noting that the high self-efficacy for “Epic/Theme” did not translate to retained knowledge in the exam. The same can be said for the concepts associated with Agile vision and philosophy (commonly identified with the Agile Manifesto), which were not part of the self-report questionnaire.

X1: Identify all the formal roles within the typical Agile project ( <i>select all that apply</i> )	
a) Burn-Down Reporter	d) Development Team Member ☺
b) Scrum Master ☺	e) Product Owner ☺
c) Senior Supplier	f) Time Keeper
X2: Select the items below that are valued in the Agile systems development philosophy ( <i>select all that apply</i> )	
a) Working Software ☺	c) User Collaboration ☺
b) Comprehensive Documentation	d) Following a Plan
X3: Which of the following is <b>not</b> an accurate characterization for Agile project requirements?	
a) A user story includes a brief description of how to test the requirement to verify it has been achieved/completed	
b) A user story may encompass multiple use cases	
c) A user story includes benefits achieved by the requirement so that different requirements can be prioritized relative to each other	
d) A use case is a collection of project epics ☺	
X4: Which of the following are common practices for Agile projects? ( <i>select all that apply</i> )	
a) Risk Poker	d) Daily Standup meetings ☺
b) Time-boxing ☺	e) Approved design specifications
c) Sprint Retrospectives ☺	
X5: In Agile projects the _____ helps forecast when a project will end.	
a) CMM-I	d) velocity and burn-down charts ☺
b) BAC index	e) Pareto charts
c) Cost Performance index	
☺ denote correct answers	

Table 4. Agile PM Exam Questions

Statement of Knowledge [1=Definitely not, 2=Probably not, 3=Probably yes, 4=Definitely yes]		Method	Post Sim Mean (N=39)	Mean Exam Score for specific questions (N=44)				
				X1	X2	X3	X4	X5
Q1	Do you know what a <u>Sprint</u> is?	role-play	3.69					
Q2	Do you know what a <u>Planning Meeting</u> is?	role-play	3.62					
Q3	Do you know what a <u>Product Owner</u> is?	role-play	3.72	3.41				
Q4	Do you know what a <u>Scrum Master</u> is?	role-play	3.67					
Q5	Do you know what <u>time-boxing</u> is?	role-play	3.69				3.34	
Q6	Do you know what a <u>project retrospective</u> is?	role-play	3.62					
Q7	Do you know the difference between an end of sprint <u>project review</u> and an end of sprint <u>project retrospective</u> ?	role-play	3.23					
Q8	Do you know the difference between <u>Planning Poker</u> and a <u>Sprint Planning Meeting</u> ?	lecture	3.41					
Q9	Do you know what a <u>Daily Standup meeting</u> is?	lecture	3.28					
Q10	Do you know what an <u>Epic/Theme</u> is?	lecture	3.10			1.45		
Q11	Do you know what a <u>Burn-down Chart</u> is?	lecture	2.97					3.09
Q12	Do you know what <u>velocity</u> is?	lecture	2.92					
Agile values & philosophy (test question not in pre/post questionnaire)		lecture			2.23			

Table 5. Cohort 3 Post-Sim and Grades

### 5. CONCLUSIONS

This paper presents a role-play simulation as an instructional method for Agile project management ideas and processes. The exercise can be run in a single, two-hour thirty-minute classroom session or in two sessions of half that duration. With

these time constraints, the simulation intentionally excludes certain concepts such as daily standup meetings. In addition, the simulation excludes project metrics such as burn-down charts.

This study comparing two instructional methods does not describe a protocol for the reading and lecture method. The reading and lecture treatment is uneven across cohorts. As a

result, comparison and interpretation of lecture related concepts across cohorts should be done with caution. With that in mind, the culture of stand-and-deliver lectures is well established. Criticisms of the lecture method are common in the literature and often treat lecture as a homogeneous method. The lecture related results presented here can be interpreted as part of that tradition.

The use of this role-play exercise with three student cohorts has been studied and demonstrates the comparative efficacy of role-play over traditional reading and lecture for the concepts of Agile project management.

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**Appendix A: Generalized Scrum Overview**

Figure A is provided to the class as a visual aid accompanied by a step-by-step summary of the generalized Scrum process before presenting the abbreviated “Scrummy” process.

**A.1 Scrum Roles:**

The *Product Owner* is responsible for a vision of what s/he wants to create. During the project the product owner will prioritize features (often collected in a Product Backlog), provide clarifying information (e.g., elaborating on use cases) and authoritative product feedback, and determine when the product is complete. The product owner is also a liaison to project sponsors, stakeholders and isolated user communities.

The *Scrum Master* is responsible for the mechanics of the Agile process. This includes: serving as a time-keeper; scheduling and facilitating key meetings such as the sprint planning, daily standup, sprint review and sprint retrospective; coordinating the product delivery, managing product backlog and collecting user feedback. The Scrum Master also manages process related artifacts such as the sprint backlog, issues list, burndown charts and velocity progress metrics.

*Team Members* are responsible for performing the tasks that create the project’s product. Members self-select tasks based on skills, confidence and interest.

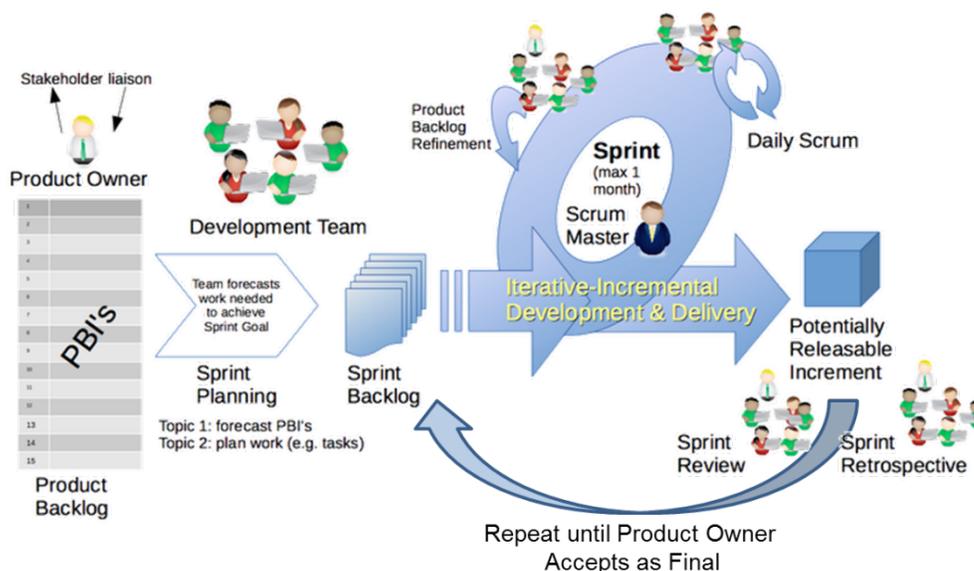
**A.2 Scrum Process:**

Agile projects begin after a project charter is approved. The Product Owner’s vision is decomposed, refined and ordered through a process called *grooming* into a set of discrete *user stories* that become *Product Backlog Items*. A *Sprint Planning Meeting* provides estimates in terms of relative time and effort, then selects backlog items to be addressed in the next sprint, thus creating a *Sprint Backlog*. Just-in-time design of these items takes place as team members select activities they will perform during the next sprint.

Following the Sprint Planning meeting the team begins a time boxed development sprint, typically lasting two weeks (alternate duration “time boxes” are appropriate for some projects). During the fixed duration sprint, teams perform the activities to create, develop and otherwise enable the product features associated with user stories identified in the sprint backlog. A short Daily Standup Meeting (often 15 minutes) takes place at the start of every workday with all project participants. This meeting highlights progress, difficulties and provides information relevant to the whole team. While not itself a problem-solving meeting, the daily standup will expose issues that may subsequently lead to problem solving activities. At the end of each sprint, an instance of the product suitable for use and examination by the user community is assembled. This instance of the product is employed to educate the product owner and users, trigger feedback, and where appropriate, perform useful organization work.

Following each sprint, a series of meetings take place. A Sprint Review meeting focuses on product feedback to influence refinement and evolution of the product during future sprints. The Sprint Review may lead to new or altered product backlog items as feedback is translated into new user stories. A Sprint Retrospective meeting focuses on project and process improvement. The Sprint Retrospective may lead to alternate resource assignments, different sequencing of tasks, changes to tools, or other process related adjustments to improve the team’s performance in subsequent sprints. Finally, a new sprint begins with its Sprint Planning Meeting and the process restarts with a new sprint.

A key role for the product owner is to assess and accept the overall product. This assessment includes liaison with other stakeholders to assure ongoing alignment with organization objectives, including allocation of resources (time, people, money, facilities, etc.). The project concludes when the product owner either accepts a final product or disbands the project.



**Figure A: Scrum Process (figure adapted from Mitchell, 2015)**

## **Appendix B: Scrummy Project**

### **B.1 Scrummy Process**

#### Preparation:

- Teams are composed of four to six students (five is ideal).
- Adjust seating so students within a team are adjacent.
- This activity will use PowerPoint or some other presentation tool as well as Internet access. Now is the time to get multiple computing devices up and running.
- Each student will need a few pages of blank paper and a pen/pencil (for taking notes and organizing ideas during the activity).
- As a team, select roles for everyone. Each student will maintain the same role throughout the full simulation.
- This is a “role-playing game.” Pretend you are that person and act (fictitiously if needed) so that the game plays out smoothly.
- Send the Product Owner on behalf of the team to the instructor for additional instructions and information.

**Roles:** (Play your role through communication and action and other team members do the same.)

- Product Owner
- Scrum Master
- Team member (two or more)

The Scrummy process is as follows:

You will have a series of 30 minute “sprints” to deliver your solution. Each sprint will unfold in a predictable/repeatable set of timed steps:

- A. Sprint Planning:** 5 minutes to identify the goal and activities for the upcoming sprint (what to deliver). Individuals should select their own tasks from among those identified (there is no dictator running Agile projects).
- B. Execution:** 10 minutes to do work (this may be individual or in sub-teams if multiple people are collaborating).
- C. Product Build:** 5 minutes to consolidate your product.
- D. Delivery & Feedback:** 5 minutes to present your product and get feedback.
- E. Retrospective & Review:** 5 minutes to identify (at least) 1 thing you need to improve in your process (sprint retrospective) for the next sprint and to assimilate feedback from product presentation and Product Owner as you continue to build your product (sprint review).

### **B.2 Blood Pressure Project Charter**

#### Blood Pressure Project Charter

##### Project Charter

**Vision:** Our students can be the healthiest student population in the world.

**Mission:** Teach all students how to measure blood pressure and know what a healthy range is and why this matter.

**Benefits:** By equipping students to measure each other’s blood pressure and understand what this means, students will pursue a healthier lifestyle, live 10% longer, make 30% more money and donate 10% more money to the alumni association.

You will use a series of 30 minutes “sprints” to build a PowerPoint to train students how to determine a patient’s blood pressure.

Identify tools needed to accomplish the training and very precisely document the process.

##### Objectives:

1. Create a PowerPoint presentation (the PowerPoint file is your “product”) that can be provided to students to achieve the benefit statement.
2. Primary objective: PowerPoint will be used by students to learn how to measure blood pressure.
3. Secondary objective: PowerPoint will help students understand blood pressure and their health.
4. Create the “product” using the Agile process “Scrummy.”

## Appendix C: Role Instructions

### C.1 Scrum Master

#### Scrum Master

Perform these tasks through verbal communication, influence and participation.

Your job is to guide your team to accomplish the task using elements of our Scrummy process.

- Enforce the timed increments.
- Make sure team members are volunteering to take on tasks they choose themselves.
- Try to encourage the overall activity to be subdivided into task units that can be worked on individually or in small sub teams when possible.
- Have the product owner help choose which activities should be completed first.
- You cannot tell team members how to do their tasks – it is up to them to figure it out.
- Make sure there is something to present at the end of the time sprint. Partial work is fine, but you must have something to show the stakeholders/ users!
- Expectations for sprint 1: Document tools needed to measure blood pressure. If you have time identify three or four things that need to be covered in the instructions.
- Expectations for the second and subsequent sprints: Gradually through a series of sprints you will build a product to meet the project objectives & requirements.

Be aware that the Product Owner should provide guidance on what your stakeholders/customers/users want. This means the product owner can set priorities and has the final say in the team about what the requirements really mean.

### C.2 Team Member

#### Team Member

Your job is to contribute ideas and work units that can be assembled into the finished product. Don't let anyone assign you a task, but you should volunteer for at least one task each sprint. Pick the tasks you want to work on that you believe will advance the project the most in the current sprint.

If you cannot complete a task you signed up for in the current sprint, provide partial work. Remember, each sprint must have something to present to your stakeholders/users at the end.

If you don't have specific expertise in the tasks, consider pairing up with another team member work jointly and help them work faster. You may also use your judgement - make something up that you think may be correct.

Document what you think is correct then allow the feedback session to identify problems and guide correction.

- Expectations for sprint 1: Document tools needed to measure blood pressure. If you have time identify three or four things that need to be covered in the instructions.
- Expectations for the second and subsequent sprints: Gradually through a series of sprints you will build a product to meet the project objectives & requirements.

You may use the internet to obtain information you do not know personally. Remember you have very little time to create your deliverable, so don't spend all your time searching. **YOU MUST ADD SOMETHING TO THE PRODUCT EACH SPRINT!**

### C.3 Product Owner – Sprint 1 supplemental instructions

Product Owner

Avoid volunteering to do tasks. You can talk and conduct research, but other team members should be doing work to deliver components of the product.

Your role includes prioritizing tasks. When the team is struggling to decide where to start or what to work on first, you need to provide guidance. Decide, pick something and say the team should start with the item you identify as the most important. Even if you are unsure, you must provide clear decisions for the team (don't worry about being wrong, do worry about taking too long to decide). Be careful, your role is to prioritize, but **do not dictate**. Don't force the team to do it your way. Allow for the possibility that doing one less important task first may indeed help create the more important task faster.

- Expectations for sprint 1: Document tools needed to measure blood pressure. If you have time identify three or four things that need to be covered in the instructions.
- Expectations for the second and subsequent sprints: Gradually through a series of sprints you will build a product to meet the project objectives & requirements.

You have some information that the rest of the team does not have. The quality of your team's product will be evaluated on how effectively the product incorporates these ideas.

- The presentation must identify the tools needed (e.g., stethoscope, watch, etc.).
- The presentation should identify the process as a series of steps (step 1: have the patient sit down, step 2: remove clothes from student's left arm, etc...)
- Your team is assigned students in music history department as your customer – they know NOTHING about healthcare. It is your job as the product owner to represent the needs of these students, so the final product will work for them.
- You will have new requirements at the end of each sprint. Only you have these requirements and you must communicate them to the team, so they deliver the correct product in the end. **Come visit the instructor while the project team is in step C (Product Build) of each sprint.**

### C.4 Product Owner – Sprint 2 supplemental instructions

Product Owner

Here are some requirement clarifications. Inform the team during the current Sprint Review.

- The PowerPoint "product" should be 3 slides in length (no more, no less). (Put contributor names in the notes portion of the PowerPoint slide, or in small print at the end – create a product suitable for actual use.)
- The presentation must be very specific about the steps to take. Instructions like "use stethoscope" are not good enough. How do you hold it? How firm should it be pressed into the patient's flesh? Where on the patient's body do you put it? When you are counting, beware that your music student will want to know if this is  $\frac{3}{4}$  time, or  $\frac{4}{4}$  time, or something else that has no meaning for measuring blood pressure. Your instructions must make sense in the language of these customers. Your music student customers know NOTHING about this process and it is your job to make sure the product works for them.

### C.5 Product Owner – Sprint 3 supplemental instructions

Product Owner

Here are some requirement clarifications.

- The PowerPoint product may be 4 slides long:
- 1 slide to document materials needed
- 1 slide to document the health implications of blood pressure
- 2 slides to document in very precise detail the steps needed to measure blood pressure using the tools identified.

### C.6 Product Owner – Sprint 4 supplemental instructions

Product Owner

Here are some requirements clarifications.

- Add 1 slide to document the process for measuring patient body temperature.

Note: The fourth sprint is optional. This change represents a notable change in scope and serves as an example for classroom discussion regarding scope-creep that diverges from the spirit of the project charter.





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