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Agile Development in Instructional Design: A Case Study at BYU Independent Study

Alyssa Jean Erickson

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

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ABSTRACT

Agile Development in Instructional Design: A Case Study at BYU Independent Study

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Agile development is a software development methodology that originated in 2001 (Beck, et al.). It has since gained wide recognition and use in the software industry, and is characterized by iterative development cycles. Organizations outside of the software industry are also finding ways to adapt Agile development to their contexts. BYU Independent Study (BYUIS) is an online education program at Brigham Young University that provides online courses at the high school and university levels. In April 2016, BYUIS implemented the Agile development process to the design and development of online courses. This thesis is a case study that looks specifically at the adoption of Agile at BYUIS, from its implementation in April 2016 to the time of this study in summer of 2017.

The question this qualitative study seeks to answer is as follows: how and why did the adoption of the Agile development methodology to instructional design practices at BYUIS reflect or differ from the 12 principles of Agile development? To answer this research question, the researcher used multiple data sources: semi-structured interviews with three administrators, two production team managers, and three instructional designers; surveys for BYUIS student employees (i.e., scrum team members) after each week of observation; and field note observations of three Agile scrum teams for two weeks each. The data from each of these sources was analyzed through a descriptive coding process and then organized into a thematic network analysis.

The Results section analyzes evidence from the interviews, surveys, and observations that reflect or differ from each of the 12 principles of Agile. The Discussion addresses three main issues of implementing Agile at BYUIS: how to accommodate for part-time schedules, the complexity of working on different projects, and how to facilitate communication in scrum teams if co-location is not possible. It also looks at how these three issues could be manifest in other organizations and introduces potential solutions. The researcher then presents suggestions for future research on Agile in instructional design or other contexts.

Keywords: Agile development, iterative, scrum team, sprint, instructional design

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CHAPTER 1

Introduction

Organizations are constantly striving to find the most efficient ways to develop products. Businesses and teams in many sectors test out strategies to increase the speed and quality of their output. Naturally, when a strategy or methodology functions well for one organization, others may adopt parts of it to their own situation. Agile development is a software development methodology that has been implemented by many software companies, gaining recognition in that sector since its inception in 2001 (Beck et al., 2001a). Agile development is characterized by small, iterative development cycles and frequent feedback from stakeholders. Instructional designers have recently begun incorporating Agile development principles. Specifically, in the realm of e-learning and online course development, the Agile development methodology has great potential to increase workplace and stakeholder satisfaction, the overall quality of products, and the speed at which they are released.

BYU Independent Study (BYUIS) is an online education program at Brigham Young University that develops online courses at the high school and college levels. In April 2016, BYUIS began using Agile principles in its course development process. This implementation of Agile development stemmed from challenges in using traditional processes and instructional design (ID) models that were linear and rigid. The intention of implementing Agile was to encourage greater accountability and collaboration across stakeholders and teams. This was anticipated to positively impact the quality of the courses, the speed at which they were developed, and the overall work environment. Before this can be explored, the degree to which Agile development has been implemented must be determined. Thus, this thesis seeks to answer

the following question: how and why did the adoption of the Agile development methodology to ID practices at BYUIS reflect or differ from the 12 principles of Agile development?

CHAPTER 2

Literature Review

This literature review will take a broad look at common models used in instructional design and at the history and characteristics of Agile development, followed by how Agile principles have been adopted in other industries including instructional design. It will then transition to Agile development in the context of BYU Independent Study.

Instructional Design Models

Although hundreds of instructional design (ID) models have emerged since the 1970s, almost all of them have similar elements to those proposed by the ADDIE framework. ADDIE stands for “analyze,” “design,” “develop,” “implement,” and “evaluate,” and it is a widely-used and -recognized instructional design model; it is often thought of as an overarching, umbrella term for other models (Molenda, 2003). Although it is commonly discussed and referred to by instructional designers, ADDIE is not found often in formal instructional design literature. In fact, rigorous investigation finds that the acronym ADDIE cannot be traced back to one source or origin (Molenda, 2003). ADDIE has been passed down through generations and is used in many instructional design contexts as a guiding model. The acronym stands for analyze, design, develop, implement, and evaluate. These steps are sometimes presented in a systematic, linear way and many instructional designers criticize this inflexibility (Kruse, 2002).

When ADDIE is interpreted linearly, the rigidity of its steps potentially puts its user at risk of having limited time and resources to adapt or to evaluate. One strength of ADDIE is that it draws attention to the necessity of planning before beginning a design. In ADDIE, most thinking and planning occurs in the analyze stage (Malamad & Torrance, 2016), which is followed by designing and developing the product. However, in a linear approach the last step of

ADDIE, evaluation, is often rushed or ignored. Oftentimes in a setting where multiple instructional products are being developed, once the product is released in the implementation stage, little time remains before the next project begins in the ADDIE cycle. This can result in overlooking or rushing through the last step, evaluation. Without adequate evaluation, instructional designers would not have an opportunity to reflect and apply important principles from their last project to their future designs.

Contrary to this linear rigidity, many prominent instructional designers such as Branch and Merrill (2011) argue that ADDIE was meant to be flexible and iterative. Instead of boxes and arrows leading from left to right in each step of ADDIE, instructional designers must be able to switch from one step to another when new information requires them to jump forward or backward and to make adjustments. Linear models are made for a world that does not change quickly or often, which is not the reality in instructional design (Malamad & Torrance, 2016). A linear approach also deters a design team from reflectively implementing what they have learned along the way, because altering the project would often cost too much once it has progressed past the implementation stage (Torrance, 2014b). An over reliance on linear instructional design models can result in committing time and money to a plan that will not work in the long run. However, when instructional design models like ADDIE are viewed as iterative and flexible, time and space are provided for necessary changes.

Several ID publications and books center on using iterative approaches and models. In this discussion, iterations refer to making frequent adaptations to a design based on feedback. Rapid prototyping is an accepted, iterative ID model that emerged from the software industry. It is concerned with efficiency, and it centers around frequently creating, releasing, and adapting software (Tripp & Bichelmeyer, 1990). In addition, design-based research (DBR) is a series of

approaches to ID that emphasize the importance of researching in naturalistic contexts and continually making iterations to a design (Barab & Squire, 2004). DBR acknowledges the messy nature of design and the need to frequently implement feedback. Another example is the model SAM, introduced in Michael Allen's *Leaving ADDIE for SAM* (2012), which calls for iterative methodologies to replace ADDIE.

Leading scholars in ID have published their own models based on learning theory and the belief that the models should be flexible. Flexibility implies willingness to go forward or backward within a set of steps to make changes before continuing. One of these models is Robert Gagné's Nine Events of Instruction, originally published in 1992, in which there are nine instructional steps for a teacher or instructional designer to follow. Although the steps are often interpreted linearly, Gagné explicitly states that the order of the steps can be changed in order to adapt to the instructional context (Driscoll, 2000). In his *First Principles of Instruction*, David Merrill sought to connect the overabundance of ID theories and models by finding their common principles that can be applied to different programs and practices (2002). Although some of the principles, such as the activation, demonstration, application, and integration have an implied order, the model is not presented linearly. Instead, the model is problem-centered and adaptable to the learner (Merrill, 2002). Both of these models show that approaching instructional design flexibly allows for important changes that are specific to instructional needs.

Other leaders in the field of instructional design emphasize that design knowledge is inside the designer, not the design model (Boling, Howard, Rowland, & Smith, 2012). They emphasize that rather than following a method like ADDIE because it is what other designers use, designers should trust their own experiences. This promotes creativity and is a different view of what a model should do. Although the model may give the instructional designer a basic

structure, it is not a set of requirements; the model is an adaptable framework. Instructional designers with this outlook take pieces from their experiences and from differing sources that fit best in the problem they want to solve. Iterative and flexible instructional design models allow designers to apply their experience and encourage new knowledge to inform changes along the way.

Agile Development

The software industry has experienced a similar tension between rigid, linear models and more iterative, flexible processes. From the mid-1900s until the turn of the century, software developers used non-iterative and sequential processes to create and release their products. The most prominent among these was coined the Waterfall method in 1970 by Winston W. Royce (Hughey, 2009). This is called the Waterfall method because the process flows steadily downward through each stage of the software development process. Like ADDIE, the Waterfall method is broken into a set of linear steps. This logical pathway from the beginning to the end of a project appealed to many software managers; they could measure progress by milestones and accurately estimate time and money costs. However, if clients could not adequately describe their desires at the beginning of a project, the developers often did not create what the client had envisioned. By the end of the Waterfall process, it was too late or too costly to begin again.

Many software professionals recognized that a new, iterative software development process was needed, and Agile development emerged as a well-accepted and highly effective solution. In February 2001, the idea of Agile development was formalized by a group of software and management professionals meeting at the Snowbird Ski Resort lodge in Utah's Wasatch mountains. Seventeen people from differing management and software development

backgrounds agreed on four principles of Agile, which they called the Agile Manifesto (Beck et al., 2001a):

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

To achieve the principles of the Agile Manifesto, these developers emphasized teamwork and frequent iterations. They welcomed feedback from stakeholders and changes in requirements, even late in the process (Beck et al., 2001b). These principles are achieved through face-to-face collaboration and by organizing tasks into manageable chunks of time. Teams in the Agile process are called “scrum teams”; in the sport of rugby, a scrum occurs when the teams pack closely together and interlock with their heads down. Traditionally, scrum teams meet daily for less than 15 minutes, standing close together in a huddle. The team consists of stakeholders and a member of every team that is involved in the final product. Their time is organized into “sprints,” which are periods of 1-2 weeks where the team has established fixed goals and uses all of their resources to meet those goals. The end of a sprint often marks the release of a version of the product, which is then used to receive feedback from stakeholders to plan the next sprint (Ascent Advisor, 2016).

Since 2001, an increasing number of software developers and companies have adopted Agile principles. The results of a Hewlett Packard survey taken in 2015-2016 revealed that Agile is becoming the norm amongst their software developers. Teams using a pure Waterfall approach were in the minority. Of the over 600 professionals surveyed, two-thirds identified their team as either pure Agile or “leaning towards Agile” and 24% as “hybrid,” or using some Agile

principles (Jeremiah, 2016). A larger-scale survey called the State of Agile has been conducted for over a decade, and its number of respondents increased from fewer than 1,000 in 2006 to almost 4,000 in 2016. Of those respondents, 95% had implemented Agile development methods, and only 1% had identified difficulties with implementing Agile (State of Agile, 2016). Both anecdotal accounts and statistical correlations show positive relationships between Agile development in the workplace and employee perceptions of their job characteristics, autonomy, and satisfaction (Riemenschneider, Thatcher, & Tripp, 2016).

Additionally, Agile development is extending beyond typical software development companies. For instance, the farm equipment company John Deere switched to an Agile approach for software development in September 2010. This implementation stands out among others, because it was immediate and large-scale: hundreds of software developers were impacted. The company initiated this shift because they wanted closer collaboration between teams, bringing all stakeholders—including engineers, customer support personnel, testers, and marketing team members—into meetings. The Agile processes were used on a variety of projects, including software for tractor displays and programming tractor pathways to be within an inch of their course. John Deere saw many positive results within just a year (Thibodeau, 2012). As a result of this shift, the time to production at John Deere was reduced 20% and employee engagement increased by almost 10% in 2011. This also improved efficiency in other important ways, including a 42% decrease of field resolution time and a 50% decrease of warranty expenses (Holdorf, 2012).

Although Agile has been used in atypical software contexts, Agile development has only just begun to emerge as a viable instructional design method. As mentioned previously, rapid prototyping is an iterative ID model that emerged from the software sector. However, in its

proposed form in the literature, rapid prototyping in ID does not include collaboration in teams or use elements of ADDIE (Tripp & Bichelmeyer, 1990). Most of what has been published specifically for Agile development in instructional design comes from Torrance Learning, a company that builds face-to-face, blended, and online learning solutions using Agile development principles and helps other companies to adopt the same principles. Torrance Learning does not call to dispose of traditional instructional design models like ADDIE, but rather to see them in a different light. Megan Torrance, the CEO of Torrance Learning, explains this as follows:

Instructional designers familiar with ADDIE don't need to abandon their project-planning strategies or the vital stages of the ADDIE approach in order to adopt an Agile approach. You can complete the various steps more quickly and cycle through them several times, with the goal to build usable (though not necessarily beautiful and perfect) iterations that can generate useful feedback from project stakeholders, and a superior final product that you complete on time and on budget. (2014b, para. 38)

Because Agile development was created for the software industry, not all principles may be directly transferrable but are likely to be modified for an ID context. For instance, Torrance Learning has called its ID process LLAMA: Lot Like Agile Methods Approach. Primary differences between LLAMA and software-based Agile emerge from the fact that learning objectives guide instructional design instead of software user requirements and that instructional designers are more likely than software developers to be working on several projects simultaneously (Torrance, 2014a). Other instructional design contexts will likely require similar adaptations to the Agile development approach, but the iterative and collaborative principles of Agile are likely to remain the same.

Agile Development at BYU Independent Study

BYU Independent Study was founded at Brigham Young University in 1921; it transitioned from paper-packet courses to providing online courses in the late 1990s, becoming one of the pioneers in online distance education. Over the years, BYUIS has produced hundreds of online courses for high school and college students. As of May 2017, BYUIS employed 615 people, with 53 employees filling full-time administrative and staff positions. Of these, BYUIS has a team of 15 highly trained instructional designers, each of which has a portfolio of courses that they are responsible for based on their subject specializations. Production teams at BYUIS include quality control, editing, illustration, animation, video, programming, corrections, and instructional design assistants. Each team has a team manager and several student employees. The information in this section comes from my role as a graduate student employee at BYUIS and from administrators and designers at BYUIS.

Traditionally, BYUIS has used parts of ADDIE and Waterfall processes when developing courses. Under this linear approach, a course would systematically move from team to team in a given order. To illustrate this process, designers generally followed these steps when developing a course from beginning to end:

1. The designer created the course proposal and the course outline, which delineated points like the major sections of the course and how many assignments it would contain. This step falls under the analysis stage of ADDIE.
2. The instructor, sometimes referred to as the content expert or the professor, worked independently to develop the whole content for the course, including lessons, assessments, and scripts. To make sure the instructor sent the content in the timely manner, the designer sometimes had to follow up with the instructor via email or phone.

3. Upon receiving the course content, the designer determined the amount of reorganization or revision needed, depending on the quality of content provided by the instructor.
4. The editing team edited the course content as a whole, with two rounds of editing and a manager's review. They passed it back to the designer and the instructor for approval of the editorial changes. Meanwhile, the illustration and animation teams would be creating the images, illustrations, videos, and animations for the course.
5. The editing team or instructional design assistant team would then create the HTML files and load them into a testing area on the Learning Management System, BrainHoney.
6. The quality control team went through two rounds of testing, giving the designer the opportunity to make corrective changes.
7. The course would then be opened for student enrollment.

This Waterfall approach functioned for BYUIS for years but had some distinct disadvantages. It did allow for the courses to be developed in a predictable, homogeneous process. The quality control phase mimicked the implementation and evaluation phases of ADDIE and gave useful feedback to designers. However, several common issues arose in this systematic, linear approach. Under the Waterfall approach, BYU faculty and BYUIS employees had little to no consideration for deadlines, and courses could sometimes take several years in production. This made it difficult to predict the time and money costs of a given course. As the project passed from one stage or team in the process to the next, the course would have to wait until the receiving team had capacity to begin that project. This caused delays because every team was working on several concurrent projects. In addition, each designer had a portfolio of courses and went through different steps of the Waterfall approach for several courses simultaneously. This juggling act on the teams and for the designers made it difficult to keep the

process moving forward for all of the courses at once. Finally, passing around the course as a whole and only receiving feedback at the end of the process made it close to impossible for designers to find time to make important changes.

In April 2016, a newly hired Assistant Director of Instructional Design implemented the Agile development methodology at BYUIS. Implementation began after all team managers and designers were trained at a series of workshops by Ascent Advisor. The intent of this implementation was to use Agile development to improve some of the common issues that arose under the Waterfall and ADDIE processes. One of the primary differences between the linear process and Agile was a focus on frequent iterations and feedback between the instructor, the designer, and their scrum team (see Figure 1). Scrum teams at BYUIS consisted of a designer and a student employee from each team (e.g., editing, quality control, illustration). This adoption of Agile began during the spring and summer 2016 terms at BYU, which was ideal for Agile development because many student employees chose to work full-time for those months. This schedule allowed designers to more easily organize brief, daily meetings with the student employees to report what they finished the day before and to plan what they would do by the next meeting.

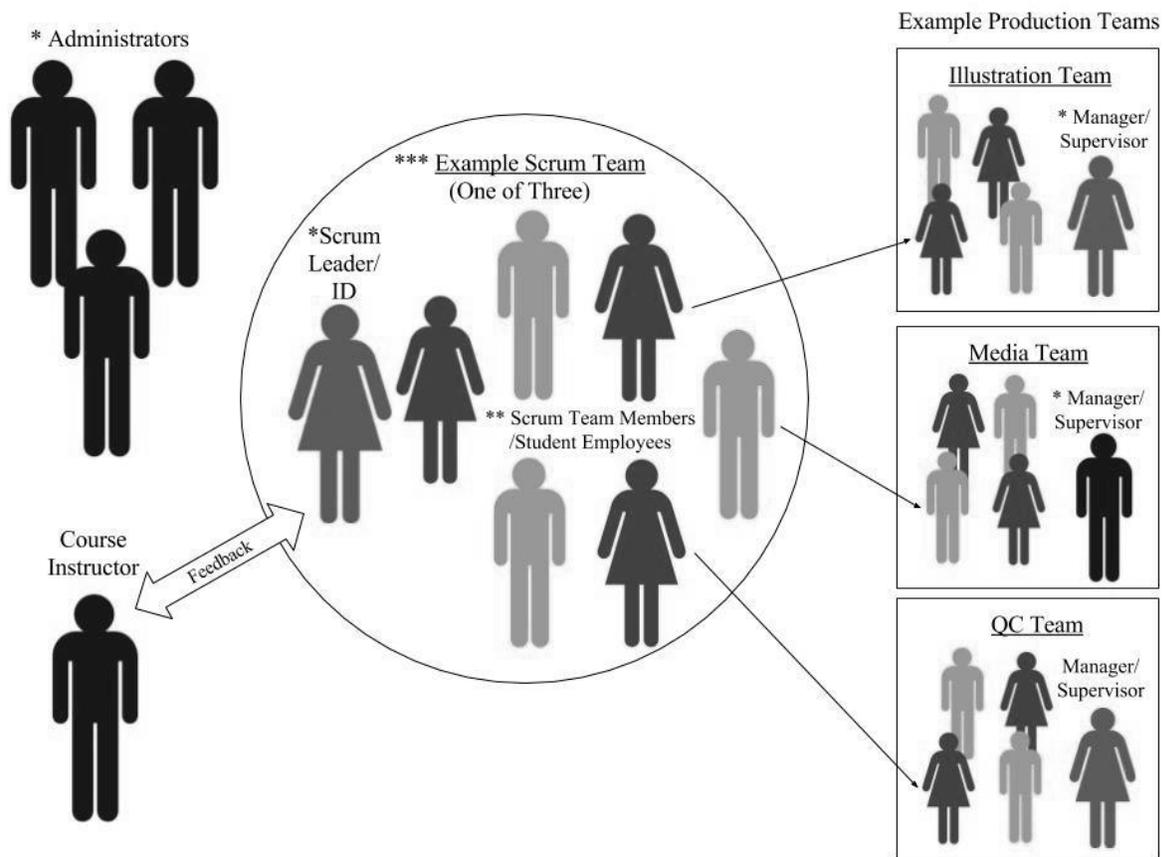


Figure 1. Diagram showing how feedback is sent from the scrum team leader/designer to the instructor, the structure of typical scrum team at BYUIS, and the various production teams that scrum team members come from. *These individuals were interviewed. **These individuals filled out the survey twice (once per week). ***I observed three scrum teams, for two weeks each.

In Agile, the designers divided courses into segments to be worked on during predetermined time periods called sprints. This replaced the step of waiting for the instructor to provide all of the course content at the beginning of the process. Teams set sprints as one- or two-week periods in which the scrum team completed a group of tasks. In any given sprint, a scrum team worked on the content previously provided by the instructor, perhaps a lesson or two at a time, depending on the course's length and the overall timeline. During the current sprint, the instructor wrote the content for the next sprint. At the end of the sprint the designer would send the products completed by the scrum team to the instructor for feedback. Between each

two-week sprint, the designer could choose to have one-week “jog”, which was a week dedicated to implementing feedback from the instructor, reviewing the last sprint, and planning the next sprint. Most teams chose to follow the weekly sprints without a jog week in between.

This Agile development process persisted for the entirety of spring and summer terms in 2016 and was continued as much as possible with the change of student schedules in the fall and winter semesters. During the spring and summer terms in 2017, this thesis sought to understand how BYUIS has implemented Agile development principles and the reasons for modifications in an ID context. Additionally, it used qualitative research methods to describe the impact of Agile on course quality, efficiency, and employee satisfaction. Existing literature itself does not contain sufficient examples to understand the ID-Agile relationship; this thesis seeks to provide a case study that is rich in detail and transferrable to other ID contexts.

CHAPTER 3

Method

For this thesis, I conducted a case study at BYUIS using qualitative research methods. The case study was concerned with the use of Agile development principles in an instructional design context at BYUIS. In Robert E. Stake's book *The Art of Case Study Research*, he provides the following definition: "Case study is the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances" (1995, p. xi). A case study is largely characterized by the boundaries that a researcher establishes to isolate its context. The boundaries in this case study were set by BYUIS, but more specifically were drawn around the design and development teams that resided in a building south of BYU campus. Another part of BYUIS did not fall within the boundaries of this case study, because they focused on customer support and other parts of the organization and were located in a different building on campus.

Case studies are a popular research method in many subject areas such as business, law, and the social sciences; by setting clear boundaries, the cases spark discussion and application to other situations. Case studies gather information from multiple sources, including artifacts, surveys, interviews, and observations in order to understand the situation as fully as possible (Merriam, 1998). I not only observed scrum teams, but I also administered surveys to the student employees, or scrum team members. In addition, I interviewed administrators and managers of production teams to see how Agile worked in their context and for their student employees. My goal was to explain the context of Agile at BYUIS to help readers reflect on how Agile principles could apply—or not apply—to other contexts.

Context

This research study was conducted during the spring and summer semesters at Brigham Young University, or from May to mid-August 2017. In this case study, I wished to first capture a broad picture of how Agile development is currently being used at BYUIS. To do this, I selected 5 administrators and production team managers, which were a criterion sample based on their unique perspective at BYUIS. I interviewed the Associate Director, the Assistant Director of Instructional Design, and select production team managers, based on how they have needed to adapt their previous processes in response to Agile. Based on my analysis of this broad picture, I selected three scrum teams in a purposeful convenience sample; the considerations that guided this choice were the schedule of the scrum team meetings, the subject area, and the designer's desire to participate (Creswell, 1994, p. 127). I expected that the scrum teams would interact in different ways, so the resulting variety would allow me to compare and contrast the teams rigorously and meaningfully. The intent was for readers to see how Agile principles may be applied and adapted to their specific ID context, by seeing how and why BYUIS adapted certain principles of Agile; this transferability was the purpose of the qualitative research (Merriam, 1998).

Research Design and Data Collection

In my use of case study, I used surveys, interviews, and observations. At the end of June 2017, I received IRB (Institutional Review Board) approval to begin my research. At that time, I began to contact administrators at BYU Independent Study: the Associate Director and the Associate Director of Instructional Design. They were aware of my research because of previous conversations, and they both scheduled an interview with me that week. My interviews with the Multimedia Systems Administrator, the Media Team Manager, and the Illustration Team

Manager occurred during the next six weeks, the same time period that I observed scrum team meetings.

Once I obtained permission from the designers of three scrum teams, I planned to spend two weeks with each team (see Figure 2). Two weeks was the approximated length of one sprint in Agile development and would help me to see the team working on a pre-determined set of tasks. During the first week of July, with the permission of Designer 1, I began to attend Scrum Team 1's meetings. I learned that they met just twice a week, on Tuesdays and Thursdays. After spending two weeks, or four days, attending Scrum Team 1's meetings, I spent two weeks with each of the other two scrum teams. The other scrum teams did not have a regular scrum meeting on every weekday either; instead, Scrum Team 2 met Monday through Thursday and then had a sprint-planning meeting on Fridays, and Scrum Team 3 met Tuesday through Friday. Thus, I was able to observe a total of seven meetings for Scrum Team 2 (due to a Monday holiday) and eight meetings for Scrum Team 3.

Team 1: Weeks 1-2 Met T/Th	Team 2: Weeks 3-4 Met M-Th	Team 3: Weeks 5-6 Met T-F
Attended 4 meetings total	Attended 7 meetings total	Attended 8 meetings total

Figure 2. Timeline of scrum team observations.

I observed their interactions as a scrum team and how they applied traditional Agile principles. I took field notes that were descriptive and reflective, in order to gather data from observations of interactions in each scrum team meeting (Creswell, 1994, p. 152). At the end of each week, I gave printed surveys consisting of seven short questions to the scrum team members. Three questions required short answers and four were Likert scale responses (see Appendix A). The survey was distributed right after the last scrum meeting of the week for two

weeks; two surveys per team member provided more data and some insight into student scrum member's perceptions from one week to the next. The purpose of these surveys was to measure student employee perceptions of how their scrum team was working, to what extent they felt they contributed to the team, and their overall attitudes about their scrum team process.

My interviews were face-to-face and semi-structured, with guiding questions that could be modified if they were not applicable or if another question was more appropriate for the interviewee (Cohen & Crabtree, 2006). One set of interviews occurred with 5 administrators and production team managers at BYUIS. I also interviewed the designers, or leaders of the scrum teams, after two weeks of scrum team interactions. All interviews were recorded and transcribed. The interviews with administrators and production team managers focused on their perception of how Agile development was working in the BYUIS context compared to the previous Waterfall method (see Appendix B). I anticipated that one interview with each designer after two weeks of observations and surveys would present an opportunity for discussion that was specific to their scrum team's needs. These interviews reviewed the data from the student surveys, sought to understand the designer's perceptions and attitudes towards Agile, and discussed the extent to which their team applies Agile principles (see Appendix C). Table 1 summarizes data collection procedures and their purposes.

Table 1

Summary of Data Collection Procedures and Purposes

Data	Number	Purpose
Field note observations	One per scrum team meeting, 19 total	Agile process and interactions in each of three scrum teams
Short surveys	Two per student employee in scrum team, 26 total	Perceptions, contributions, and attitudes over two weeks
Interviews with administrators and production team managers	Five	Perception of how Agile works in the BYUIS context
Interviews with instructional designers (scrum team leaders)	One per designer, three total	Discussion, clarification, application of Agile

Participants

The participants in this study were the administrators, production team managers, instructional designers, and student employees at BYUIS. I selected my interviewees based on their involvement with Agile and their specialty; the administrators were heavily involved in the implementation and evaluation of Agile development at BYUIS. They had a special interest in the perspective of production team managers because of the managers' important role in creating media for the online courses. I interviewed three administrators and two production team managers, for a total of five interviews. Additionally, I interviewed an instructional designer from each of the three scrum teams, after having observed the team and collected the surveys. Scrum teams typically had 5-8 participants total, which included the designer as the scrum team leader and student employees as the scrum team members. I chose the three scrum teams based on which teams are actively meeting and were willing to have me attend the meetings. By choosing three scrum teams for the case study, the total number of participants would likely fall

between 20 and 30 people. My relationships with BYUIS personnel may have increased the likelihood that they would agree to participate in the research process. Nevertheless, surveys, interviews, and observations were only conducted after having received informed consent from all participants.

The informed consent forms delineated the time that would be taken and the potential risks for surveys and for interviews. Names of the participants were not included in the study; rather, each participant was assigned a pseudonym to protect their identity (see Table 2). This helped to minimize the risk of discomfort for student employees taking the surveys; they would worry less about sharing honest opinions because their answers were anonymous. Interviews with administrators and production team managers were limited to 15-30 minutes. The weekly surveys for student employees were limited to seven questions and usually took each participant less than ten minutes to complete. Interviews with designers were 30-45 minutes after observing the scrum team during the previous two weeks. I informed the administrators, production managers, and designers of how their interviews would be used and I assured them that honest opinions were welcome and adaptations to using Agile in their context would not compromise their position.

Table 2

Pseudonyms

Pseudonym	Job Title	Job Type
Allen	Associate Director of the Academic Services Department	Administrator
Ben	Assistant Director of Instructional Design	Administrator
Connor	Multimedia Systems Administrator	Administrator
Dan	Media Team Manager	Production Team Manager
Emma	Illustration Team Manager	Production Team Manager
Felicia	Instructional Designer	Scrum Team Leader
Gina	Instructional Designer	Scrum Team Leader
Henry	Instructional Designer	Scrum Team Leader

Analysis of Data

To analyze data, I used descriptive coding followed by a thematic network analysis (Attride-Sterling, 2001). After the data was collected, I organized it into common themes. I used descriptive coding for the interview transcripts, my primary source of data. For descriptive coding, I first split the interview transcripts into short phrases or passages that addressed just one concept. Then I assigned a word or two that summarized the concept to each short phrase or passage. Next, I extracted the passages and organized them by concept in a separate document (Saldaña, 2009). In that document, I created a thematic network by first placing the concepts from descriptive coding into basic themes that encompassed the concepts that appeared throughout the interviews. I categorized these basic themes into more abstract organizing themes that encompassed them, and finally chose a global theme that tied all of the organizing themes together (Attride-Sterling, 2001). This was presented visually in a mind map, on which I will

elaborate in the results section of the research study (see Appendix D and Appendix E). I hoped that this thematic network analysis would help researchers to form a mental model of how topics and themes relate and in moving from mere text to interpretations (Attride-Sterling, 2001). For the Likert scale data in student surveys, I moved the data to a spreadsheet and made basic calculations, such as comparing the average ratings of each scrum team in each category. I then integrated these comparisons into the thematic analysis as secondary data. I also used observations and the survey short answer responses as secondary data, to support or refute different themes.

Rigor

I worked to ensure rigor and trustworthiness in this study through negative case analysis, member checking, peer debriefing, triangulation from multiple data sources, and maintaining an audit trail (Lincoln & Guba, 1985). As I worked with my data, I searched for instances that did not support or even contradicted patterns that were found in the remainder of the data. I expected that this negative case analysis would provide some of the most compelling insights. For member checking, I sent a paragraph summary of each interview via email to the administrators, production team managers, and designers and asked for their feedback. Second, I sent each interviewee the final manuscript, giving them time to respond with their comments so I could make final changes before submitting the report. Member checking increases credibility by returning to the original informant to ensure that their perspective is expressed accurately (Goulding, 2002). Additionally, I found an impartial colleague who was not connected to the study. In this process of peer debriefing, also known as analytic triangulation or an external audit, I spoke candidly with my colleague about my biases and role as a researcher. I then asked the colleague to review my thematic analysis from the observations, surveys, and interviews as

well as my final report (Merriam, 1998). They looked for points that are overemphasized or underemphasized, general errors, and bias. Interviews, observations, and surveys from three teams provided multiple data sources. This triangulation showed that the themes I found were from more than one source and supported one another (Creswell, 1994). Finally, I maintained a reflexive journal, which contained my thoughts, key communications, and decision points throughout the entire research process.

Researcher Assumptions

As a student employee and team lead of other student employees at BYUIS for over three years, I had an insider's perspective as I conducted this study. Although I was not placed in a conventional scrum team, several of the student employees I supervised had been or were part of scrum teams. My perception of Agile development at BYUIS was quite positive because of the feedback that I informally received from the student employees I supervised. My inside perspective would give me a better understanding of this case study than an outside researcher because of my relationships with BYUIS employees and my prior knowledge of the processes. However, my position as a student employee at BYUIS had the potential to either cause me to emphasize or deemphasize issues or problems that arose in Agile implementation. Despite my prior experience, I sought to step back and understand how the implementation of Agile was working as a whole and how it compared to traditional Agile principles and practices. I believe that my methods allowed me to gather the information necessary to provide a holistic outlook on this issue.

CHAPTER 4

Results

As I went through descriptive coding of the interviews and then began to put my codes into basic themes, I saw many connections to the 12 Principles of the Agile Manifesto. This is not surprising, because the 12 principles were written to accompany the Agile Manifesto and to provide guidance to organizations who are implementing Agile (Beck et al., 2001b). For this reason, the 12 Principles of the Agile Manifesto became the global theme in my thematic analysis and for the following results. Using the 12 principles to organize my results helped to answer my research questions, looking at the extent to which BYUIS has adopted Agile development principles and why. The global theme, the 12 Principles of the Agile Manifesto, comes from all three data sources: the interviews, the observations, and the student surveys. The interviews are the primary data source, but will be supported and refuted by the secondary data sources, the observations and the student surveys. The following section explains how Agile implementation happened historically, from the point of view of the interviewees. Understanding the intentions of the leaders who implemented Agile will set the stage for discussing to what extent BYUIS has implemented each of the 12 Principles of the Agile Manifesto.

Historical Intentionality of Agile Implementation

In their interviews, the Associate Director of the Academic Services Department, Allen, and the Assistant Director of Instructional Design, Ben, provided details about the beginning stages of Agile implementation at BYUIS. Allen explained, “What spawned it was the idea that we could look at any number of projects or courses and they seemed to just be lingering . . . though progress was . . . generally being made, it was awful hard to track and see that progress.” Allen was looking for an Assistant Director of Instructional Design who had background

experience with Agile. Ben had this experience and was given the responsibility to create a pilot test for Agile and train others in the organization about Agile. The Multimedia Systems Administrator, Conner, met with Allen and Ben to decide how to begin this implementation. They, in turn, met with each individual discipline manager to talk about their area of expertise. Allen explained that they then consulted with instructional designers and the production teams to create a model of what happens in the course of Agile and how the model would apply to their course design and development process.

The pilot test began in February 2016, with two instructional designers who worked together to lead a team of student employees. The designers were trained by Ben, who also provided support and guidance throughout the process. After the scrum team had met for a couple of months, Ben interviewed each member of the scrum team to understand their attitudes towards Agile and to better understand how their projects were progressing. From this pilot test, he was able to anticipate how different members of the scrum team would react to Agile. For example, the editing team member was resistant to Agile because the editors were accustomed to receiving their work from a course all at once, rather than in smaller segments or sprints. Other scrum team members had positive experiences in the pilot test. In particular, the quality control team member felt empowered because she took a proactive role in the pilot scrum team. Within a few months they finished a couple of projects with the Agile methodology.

Using the pilot test as a guide, in April 2016 Ben proceeded to conduct trainings for the other full-time employees at BYUIS. The group trainings included other administrators, managers of production teams, and instructional designers. Each stakeholder received an Ascent Advisor training booklet, which contained the Agile principles, guidance for scrum teams, and other definitions and tools to aid companies in understanding and implementing Agile. Other

materials at the group trainings tailored Agile development to the specific needs of BYUIS. For example, the Independent Study Development Process was a diagram that showed every stage of the process of developing a course, including sprints, and each team that would be involved along the way. Other diagrams looked even closer, showing what a typical sprint would look like and who would be responsible for each part of the sprint (see Figure 3). These materials sought to help stakeholders to understand Agile in a concrete way and to see their roles in each stage of the process.

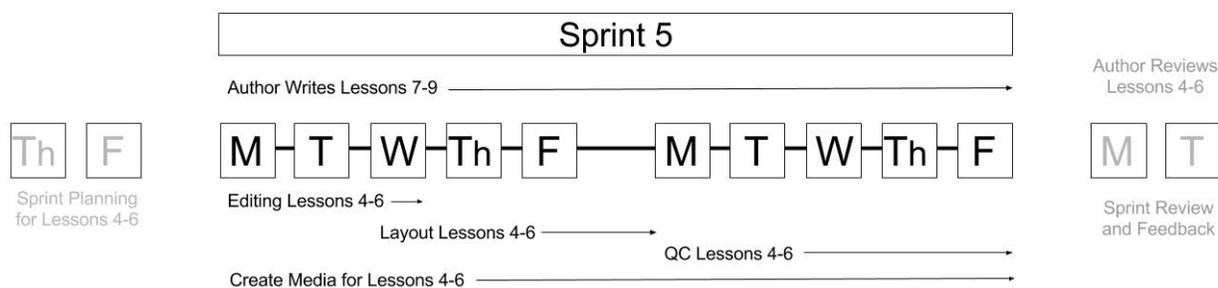


Figure 3. Diagram showing the process outlined for a typical sprint.

The initial Agile implementation included training instructional designers to have (1) a kick-off meeting and (2) a media meeting when beginning the development of a course. Ben explained, “now we explicitly have at the beginning of each course, a kick-off meeting with the faculty or the high school teacher, explaining the Agile development process.” At that kick-off meeting, the instructional designer and instructor also created a detailed outline of the components of the course, which included learning outcomes, learning activities, and media needs. The instructional designer then scheduled a media meeting with the course instructor and the managers of the illustration, animation, and media/video teams. The purpose of this media meeting was to have a face-to-face discussion to set realistic expectations regarding what media could be created for the course.

By the time the trainings ended, administrators and instructional designers had decided which courses would be moved to the Agile process first. Then the designers were assigned scrum team members. These scrum team members were student employees and typically included at least one IDA (instructional design assistant), one editor, one QC (quality control) specialist, and one artist. One or two instructional designers acted as the “scrum master” or leader. These first scrum teams emerged in the spring and summer semesters of 2016, a year before this study was conducted.

12 Principles of the Agile Manifesto

In total, I interviewed five administrators—the Associate Director of Academic Services Department, the Assistant Director of Instructional Design, the Multimedia Systems Administrator, the Media Team Manager, and the Illustration Team Manager—and three instructional designers. The interviews explored both a broader definition of Agile and specific aspects of Agile. Many of the statements from interviewees, supported by my own observations and student employee survey results, either reflect or differ from one or more of the 12 Principles of the Agile Manifesto.

1. Customer satisfaction. “Our highest priority is to satisfy the customer through early and continuous delivery of valuable software” (Beck et al., 2001b). The interviewees spoke of two different customer groups: (1) the students who take the courses (not to be confused with student employees who are scrum team members) and (2) the instructors who choose to lead these courses. The students of these online courses were not explicitly mentioned often in the interviews. This could be due to the nature of the questions, which focused most on the interviewee’s perspective of how Agile works within the organization. Students as customers were rarely mentioned in the scrum team meetings as well; the structure of those meetings often

focused intentionally on current projects and individual progress of scrum team members. However, I observed that the everyday decisions of student employees and instructional designers did implicitly focus on the students who would be the customers. There seemed to be an unspoken understanding that delivering courses on time and creating valuable online learning experiences were ultimately to satisfy the students' need to successfully learn.

Some interviewees discussed how they worked to satisfy student customers in their learning. Henry talked about how working in sprints had made it more difficult for the editing team to maintain consistency from lesson to lesson. Before Agile, they handled the course all at once. He said that consistency is important for students. "It just takes out a little bit of the cognitive load if you know what to expect when you open up each page." He then went on to say that other issues, such as readability and quality of assessment questions, are first priority because of their impact on students. Additionally, in talking about the purpose of Agile, Conner emphasized students as the customer as he talked about the production teams' priority to "work together for what meets the student needs and student learning in a way that's affordable and economical and feasible."

Instructors of the online courses are another type of customer because they have a keen interest in the quality of the course. Instructors are Subject Matter Experts (SMEs) that provide the content and feedback on each stage of the development process. Ben talked about how the process of working with the instructor under the Waterfall model differed from Agile. After creating a course outline with the instructional designer, the instructor was in charge of putting together all the content for the course at once. While the instructor worked to write and collect all of the content, the designer and other BYUIS employees waited. Once the instructor sent the content, it was the instructor's turn to wait. Ben commented, "The [instructor] never saw the

course until the course was live, which would take whatever amount of time it would take.” With the shift to Agile, however, the instructor was updated on the progress and state of the course at the end of each sprint and had multiple opportunities to offer feedback. This early and continual delivery of course content to the instructor allowed them to provide feedback, which would likely increase the value of the course.

Another change that sought to satisfy the instructor as a customer was the establishment of media meetings, because they helped to set expectations that could be met. Emma spoke about how in the Waterfall model there were some misconceptions about the capacity of the various media teams. She described that sometimes instructional designers would meet with instructors and talk about an array of media options to only find that what they proposed was not realistic for the budget or the timeline. The Art Director and other media managers would then have to say “no” to some options that the instructor was initially excited about and that the instructional designer said was possible. In contrast, the Agile media meeting brings the instructor, instructional designer, and the media team directors together in one room to set realistic expectations. Now, the Art Director describes this meeting as satisfying the instructor because the meetings are “more a ‘yes’ thing, when they happen,” and the media teams can follow through on creating valuable media for the course.

The continual delivery of valuable products to the instructors through sprints and the more realistic expectations established by the media meetings have helped improve relationships with the course instructors. Felicia, who used to be an instructor of a course, spoke about the difference she has seen in the instructor’s conference. She said that in the past, the “instructor’s complaint has been that instructors don’t know their instructional designer,” but now there is more interaction, and instructional designers are “more open about changes.” She concluded,

“[The instructors] have been more emotionally involved, and more has been expected of them as a result.” Corroborating this, Allen said that from his perspective, one of the main improvements with Agile has been the improved relationship with instructors of the courses. These improved relationships help the instructors to work with BYUIS stakeholders to deliver a more valuable course to the students, the paying customer.

2. Welcome changing requirements. “Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage” (Beck et al., 2001b). Embracing change is a key mindset in Agile development because the sprint and scrum team models are iterative, and iterations build a designated space and time to proactively respond to change. Ben commented, “When we go into development, the author, the instructional designer, and the scrum team now [begin] working lesson by lesson, getting the content from the [instructor], putting the content into the learning management system, and then reviewing things iteratively.” Between each sprint, there are opportunities for stakeholders to provide feedback and to change the aspects of the course that are not working. Prior to looking at how Agile processes harness change at BYUIS, it is important to observe how the organization reacted to change as a whole. The implementation of Agile itself required processes at BYUIS to change and affected almost all of the teams. Allen remarked that “our culture here is not real conducive to change.”

Some resistance to changing to iterative Agile methodologies came from production teams, whose work does not as easily fit into the Agile framework. The Media Team Manager, Dan, commented that he has “been here now for 12 years and we move from one thing to the next trying to figure out what’s best.” The student employees on his team were not put into scrum teams, because the video editing and animation processes required them to work together

on their own specialized team. The Illustration Team Manager, Emma, did have students in scrum teams. She resisted this change, because she was better able to control and manage the projects that her student employees worked on under the Waterfall methodology. The editing team was mentioned frequently as resisting the change to iterative development, because they were accustomed to editing all of the lessons in a course at once. Henry explained: “They do a lesson and then in the afternoon, they do maybe another lesson from the course. It’s their bouncing around which makes it harder to be consistent [in tone and voice] for them.”

Furthermore, Ben discussed how some the resistance to Agile implementation came from instructional designers who were not accustomed to the iterative development process. He said,

There are some, though, that they . . . still prefer, you know, the old approach. The old approach is easier. So for example, I have some designers that have said, ‘It is easier, really, if you have the author deliver all the content at once. Then we can design the course and develop everything that way.’ Yes, I agree it would be easier, but it wouldn’t be Agile. Okay? And it wouldn’t be iterative.

Despite this initial resistance to change, many of the instructional designers and employees talked positively about the iterative nature of Agile. Dan mentioned that some BYUIS employees had worked in Agile environments in the past and already favored it. One instructional designer, Henry, said, “I think a lot of the designers wanted to move to something like this because it allows us to see what the end product is going to look like much quicker.” Gina began working at BYUIS when Agile was implemented. Although she did not fully experience the change from the previous Waterfall method to Agile, she expressed that her perception was that it decreased the bottlenecks, or waiting time between phases of the project. Henry talked directly about how he and some other designers, “were excited that we could get

something finished before we get through all the content, so that way we can have a better sense for how to better make changes later on in the process.” This frequent delivery of course lessons and sections allowed designers to better welcome changing requirements at any point in the process.

Ideally, iterations allow the scrum team to catch necessary changes early in development. One of the common phrases in Agile, which appeared frequently in interviews, is “fail early, fail often.” This was a part of the initial implementation; Ben expressed that “a lot of the success of the project was because—again, fail often, fail fast, and learn from the mistakes and then you don’t repeat the mistakes again.” Henry mentioned that feedback from the instructor helped the editors on his scrum team to make changes early on, rather than needing to go back at the end. The administrators recognized the importance of failing early and often too; Conner said “they can find the mistakes early and get them fixed so that something doesn’t continue to perpetuate throughout all the lessons rather than just the first couple as they’ve gone through. I think that’s been very . . . successful.”

Designers also recognized the need to make changes, even late in the development process. Gina commented, “If there’s corrections that need to be made, if there’s a call from an author or a professor or somebody that needs help—you deal with it right now, you don’t wait.” Even if changes are requested by the instructor late in the process of development, the designers know they need to be flexible and make the changes.

In my observation of scrum teams, the designers and scrum team members were continually trying to find ways to improve their processes. One scrum team in particular underwent several changes during the period of two weeks. They had been tracking tasks on their board, with tasks on sticky notes aligned with the individual scrum team member who was

assigned. The three designers proposed that the board focus more on individual team members working together on the same projects, and they showed a prototype of what their board should look like. They asked for feedback from the team and later that week started to implement their new way of tracking progress on the board.

Some students mentioned changes to their scrum team being a positive thing, but overall did not discuss how Agile processes harness change to ultimately benefit the customer. Despite some initial resistance, most stakeholders at BYUIS welcomed changing requirements, whether early or late in the process.

3. Deliver working products frequently. “Deliver working products frequently, from a couple of weeks to a couple of months, with a preference for the shorter timescale” (Beck et al., 2001b). The iterative nature of Agile at BYUIS also meant that ideally, at the end of a short amount of time the team had a working product to deliver. To deliver working products frequently, all stakeholders at BYUIS would need to be aware of and focused on deadlines. At BYUIS, portions of the course were delivered to the instructor during the sprint cycles, but there was also a final deadline where the course was released to the student customers. This principle can be analyzed in two ways: (1) frequent delivery of working sections of a course to the instructor through sprints and (2) frequent delivery of working courses to students.

Many employees at BYUIS discussed this principle in context of releasing portions of courses during sprints and specifically, that what is delivered is not perfect, but it functions. This principle was central to how the Illustration Team Manager, Emma, defined Agile. She stated, “everybody has got a piece of the pie, and they’re all kind of working on it at the same time, and then at the end of the sprint or time period it’s done to a certain point. It’s not maybe finished per se, but it’s at least working, right? It’s met its basic goals.” Similarly, Gina expressed that “the

ideal process is a self-selected team chooses a project, gets together in a sprint planning meeting, and says, ‘We’re going to get this much of it done and we’re going to have a deliverable at the end of the sprint.’” Henry also focused on having a deliverable, but he described it as splitting a large project into chunks, which are then packaged into sprints: “And those sprints, by the time you finish it, that chunk is completely ready to be consumed by the end user.” And finally, Felicia talked about how “once it’s out, it’s still—in its nascent form,” implying the need for continued work and improvement.

These understandings of the value of frequently delivering working products aligned with Ben’s emphasis on establishing the time and the scope when setting up a course outline and deadlines with instructors. Gina also asserted that “we’re going to set our goal to get X accomplished in the amount of time that we have.” Under the new payment schedule, there were four main deadlines for instructors: (1) finishing the design plan or course outline, (2) finishing 50% of the course content, (3) finishing 100% of the course content, and (4) releasing the live course. Half of the payment for the first three deadlines was contingent upon the instructor delivering their working products. The instructor helped to create these enforced deadlines, and then they and the scrum team would communicate back-and-forth to decide on the scope of what they could accomplish in that time period. Pablo explained: “We are expecting [this iterative process] to fulfill the contract. So that is something that we have been able to implement, both with university and high school faculty. . . . I think that it has helped move the projects along better.” These enforced deadlines for frequent delivery of portions of a course helped create benchmarks for the course as a whole to be released on time.

Interviewees said they were more aware of deadlines and how the deadlines helped to get the finished course out on time. Even though the course might not be as polished as it could be,

Felicia, an instructional designer, stated: “As compared to Waterfall—Agile is more deadline-aware, it’s more ‘let’s get something out and continue working on it,’ which is more aligned with instructional design anyway.” Although instructional designers like Felicia felt more aware of deadlines throughout the project, some feedback from the interviews implied that these deadlines were not always communicated to the student employees. Emma expressed her concern that some of the student illustrators on her team were not aware of deadlines. She said: “The students are like, ‘I don’t know when things are due. I don’t have a deadline.’” One reason for this was that the type of project assigned to a student employee did not always align with the sprint deadlines. From my observations, there was a common understanding that deadlines and delivery were valuable but there were varying explanations as to why they were valuable.

Ideally, the presence and awareness of more deadlines would increase efficiency, as teams worked to deliver working products frequently. Many employees attributed minor efficiencies at BYUIS to the deadlines throughout sprints. Ben explained how during the Waterfall method, what really slowed down the course development were the waiting periods while the projects were waiting to be picked up by the next team. He commented, “The projects should be faster because [there is] less wasted time when the project is not progressing.” While there is no numerical evidence to show that Agile has caused course development to be more efficient, many employees implied that there was at least a correlation between Agile and increased efficiency. Allen stated that “maybe some minor efficiencies that have come out of it. Maybe some minor speed-turnaround things that have happened.” Conner added, “And so you have less of that kind of bouncing around and a little more focus. I don’t know that things are necessarily a ton faster overall, but I think it’s much more organized and more systematic than it was previously.”

In sum, the deadlines established by Agile processes have made it possible for BYUIS to deliver working products more frequently than in the past. Felicia mentioned a book that some of the instructional designers had read, which talked about the profitable nature of frequently delivering a working product. She said, “I think the difference has been an awareness that . . . you’re not really making money, you’re not really benefiting anyone until you get your product out there.” There is greater emphasis on deadlines and on the value of delivering portions of courses and the course as a whole in a timely manner. Some interviewees hypothesized that this helps to increase efficiency in small ways, but in later discussion of other Agile principles, we will look more closely at efficiency.

4. Work together daily. “Business people and developers must work together daily throughout the project” (Beck et al., 2001b). Many interviewees expressed that meeting daily is one of the most positive changes that had come with Agile. However, as mentioned in the Methods section, even during the spring and summer semesters, all of the scrum teams did not meet every day. One team did meet four times a week and then had a sprint-planning meeting on the fifth day. Another team met twice a week and the other met four times a week. Some instructional designers did not have scrum teams during this time because the projects for their courses did not necessitate all of the members of a scrum team. Student schedules, which were part-time for most of the year, were often mentioned as a barrier to having daily meetings. Overall, stakeholders agreed that even if they were not able to meet with the entire scrum team daily, that the increased number of touchpoints with their student employees helped with accountability.

Reasons varied for teams who were not able to meet daily. When I observed her scrum team, Felicia felt that a daily meeting was not necessary for the student employees in her group

because they were working on different projects. Additionally, some of her students scrum team members were working only afternoon hours and were not able to attend the morning meetings. She stated that “I have maybe one IDA that I’m constantly working with. We’re working on the same project. . . . There are two or three members that are coming in and working on this or that . . . so that makes it a little bit tricky.” I observed that the student employees on her team were comfortable with checking in with her and asking questions, even if there was not a scrum meeting that day. Henry said that he felt that his team was doing well with the daily stand-up meetings. From my observations, his team had chosen that they did not want a meeting on Mondays. Gina also talked about how she thought her team was doing well with the daily stand-up meetings at the time of the interview, but she expected the daily meetings to become more difficult in the upcoming fall semester.

Student employee schedules were described as one of the greatest hurdles to Agile implementation. The part-time, fluctuating hours of student employees were a stated concern with all interviewees: administrators, managers, and designers alike. Allen stated, “And so there are comings and goings of our students, to take care of their student obligations. . . . Not having somebody there full-time that’s working as a committed member of a team, as a full-time employee, presents issues.” I observed that even during the spring and summer semesters, students often were gone for vacations at different times. The BYUIS culture encouraged student employees to put their schooling first, which meant that during the fall and winter semesters, students may work fewer hours during a week when they have exams or other schooling responsibilities. Ben explained how this makes it difficult for instructional designers to find a common time for scrum team meetings. “During the fall and winter, they become extremely part-

time. There's not any set schedule for that, so the designers were having almost an impossible time of even finding half hour during the whole week where they could be with everyone."

All three data sources pointed to how having a daily meeting or touchpoint helped some student employees to feel more accountable for their work, but other student employees felt it was not necessary. In their survey responses, several students mentioned how the daily meetings helped them to feel accountable. One student wrote, "It keeps us accountable both to our instructional designers and to our team members to have to report on how we've used our time." However, other students commented on how apart from meeting with their team daily, they didn't interact with them at any other time because they were working on unrelated projects. One illustrator wrote, "I don't feel that my responsibilities/tasks are as heavily related to the overall scrum as others. My daily attendance may not be needed." A couple of students suggested that their team have fewer daily meetings, perhaps every other day. One of the underlying reasons for daily meetings not feeling necessary was the fact that employees were working on different projects, so they were reporting but not collaborating in meetings. The issue of working on different projects will be addressed in principle #10.

The importance of accountability was also noted by the interviewees. Reflecting on how the fall semester would make daily meetings more difficult, Gina determined that she wanted to have a daily touchpoint with each student on her team. She said, "even if that doesn't end up happening in a stand-up meeting . . . I think it's very important to have a touchpoint with every team member at least every other day, if not every day." Emma agreed and pointed to "teaching the students to be more responsible" as one of the best things about Agile. They needed to attend meetings and report on their progress and to learn to communicate with the team if they were behind on a project. She hoped that this would prepare them for future jobs as illustrators who

take initiative and are accountable to clients. However, she said, “But my biggest takeaway is . . . if this is the way we’re going to do it, if the teams are supposed to meet, the teams are supposed to meet.” Although Ben emphasized that instructional designers should decide how to conduct their team meetings, he still viewed daily meetings as crucial. When student employees only met with the designers when they came in to work, he stated that this is “not really the way to do Agile, okay. There’s no cohesiveness of the team, there’s . . . very little taking initiative and responsibility.” Others similarly saw that this eliminated the advantages of having a team, such as unity and negotiating responsibilities. Despite this, some instructional designers acknowledged that it was not realistic during some semesters to have a daily scrum meeting, so they wanted to either meet fewer times a week or simply have a daily check-in with each student.

5. Build projects around motivated individuals. “Build projects around motivated individuals. Give them the environment and support they need, then trust them to get the job done” (Beck et al., 2001b). Many stakeholders and students expressed that the daily scrum team meetings contributed to morale and unity. Allen expressed that scrum team meetings were beneficial “for some of the areas that maybe in the past did not really . . . have a . . . feeling of belonging, belonging to a process.” Feelings of belonging often result in greater feelings of motivation. Agile development helped to provide a better environment and more support to all employees by giving them a clearly-defined process as they contributed to their respective teams. Other stakeholders also recognized these positive outcomes. Interviewees noted that team members formed more relationships, felt like their ideas were listened to, and felt empowered in their individual field of study as they implemented Agile.

Forming relationships with other people helps teams to feel more invested and to be more unified. Although she wished that members of her team could work on the same project

simultaneously, Felicia stated that “one of the other benefits of scrumming is just the emotional element, the motivational element, the human element that gets put into the work.” Scrum teams under Agile created an environment for individuals to receive support from one another. Dan commented on the importance of continuously interacting with other employees: “I really believe that morale actually goes up because you are constantly collaborating. You feel like you have new people that care, you’re all working on the same project, you’re invested. I think that creates relationships.” In comparing two teams, Conner observed that the team that closely adhered to Agile principles was much more cohesive than the team that did not. Reflecting on the survey responses of his scrum team, Henry talked about finding a balance between encouraging unity and getting sidetracked during scrum team meetings. Several of the students mentioned that the team could get distracted by side conversations; however, other students mentioned how the meetings help them to improve relationships. One student commented, “I also think it’s nice to have relationships with everyone on the team, because that facilitates collaboration when problems arise.” Henry decided that he would talk with his team about how they could be more concise while still building relationships and unity.

All members of a scrum team are more likely to feel motivated if they feel like their perspective and ideas are valued and listened to. Felicia made extra efforts to meet with the TAs of the language courses who work in another building; although they were not officially part of a scrum team, she started to meet weekly and face-to-face with them. She found that the design or development end of BYUIS had not talked to them in the past. As a result, they felt that the organization as a whole did not value their opinions. Felicia worked to mend the relationship and to implement their ideas when she could, or else explain why the changes could not be implemented. She remarked,

I think it also changes their perspective of going from “nobody listens to me” to “wow, my ideas are valued and what I say actually can make this organization better, can improve the student experience. That doesn't mean that everything that I suggest is going to be accepted, but it will be listened to.” So that has made a huge difference.

From my observations, Gina frequently asked her team for feedback. Towards the end of every meeting, she would ask if they had what they needed to be successful and if they needed support in their tasks, and she listened carefully to the student employees' responses. Oftentimes, student employees would linger after the meeting to talk with Gina about their tasks. As mentioned previously, Henry and the other instructional designers in that scrum team presented a new way to organize projects on the board, and they asked for the students' input throughout the process. Overall, all three scrum team meetings had a conversational feel, where all students had a chance to speak and to ask questions.

Another motivational aspect of Agile is that it trusts each specific discipline within the scrum team to get the job done, and even to help others on the team. This can empower team members that previously did not see how their particular skillset contributed to the course as a whole. The QC member of the pilot scrum team felt empowered by her role on the scrum team. She caught errors early on in the course, and this was recognized by her team members. As an administrator that oversaw the production teams, Conner expressed the importance of recognizing the contribution of each team member. He emphasized the need “to make sure that the individual disciplines aren't skipped or minimized. It's easy to see—some of the most important ones are editing and QC, and those are some of the ones that are least appreciated.”

The motivational element of Agile has not only impacted student employees, or scrum team members, but also the full-time employees. Felicia talked specifically about how Ben, the

Assistant Director of Instructional Designer, had supported her as an instructional designer. I observed Gina's enthusiasm for the Agile development process and for meeting with the student employees in her scrum team. I also noted that Emma felt stressed by some Agile processes, because it changed the functions of the illustration team dramatically. She did acknowledge some positive results, such as greater student accountability, but she felt unsure about how she would manage the students with upcoming structural changes in the company. BYUIS had several upcoming changes, such as moving employees from two buildings to a new building and giving production teams like animation and illustration more responsibility. Felicia concluded her thoughts about Agile by saying, "the more it's embraced as an organization, the easier it is for me to follow it." Other full-time employees expressed their hopes that BYUIS would continue to support Agile processes, such as scrum team meetings, with the upcoming changes.

6. Face-to-face conversation. "The most efficient and effective method of conveying information to and within the development team is face-to-face conversation" (Beck et al., 2001b). Scrum team meetings were meant to bring every member of the team into the same room or space. The word "scrum" comes from the sport rugby, implying that members of the team are physically close together and pushing towards the same goal. Ben elaborated on this concept: "A lot of this is really how do you build the team dynamics? Why is it called a scrum team? Because in rugby, you are all together . . . literally." Although scrum teams at BYUIS meet physically for daily meetings, the scrum team members were not co-located (i.e., they did not work throughout the day in the same room as the rest of their team, but rather with other employees in the same discipline). The importance of being together physically and face-to-face was emphasized by many interviewees.

One simple reason for meeting face-to-face is that it presents opportunities for discussing ideas. The benefits of face-to-face discussion could include getting new ideas from others, finding flaws in a plan, and keeping every member of the team involved. From the perspective of an instructional designer, Felicia expressed, “I loved the idea when we adopted it . . . I really enjoy talking through ideas. I have a hard time just at my desk, making such big decisions by myself. I really like to run them by someone else.” Connecting to previous principles, many students expressed that scrum team meetings helped them to form relationships with teammates they otherwise would not have known. Students were also more likely to ask questions when there was a time and space set aside for it. Many student employees said that a positive result of face-to-face scrum team meetings is simply being aware of what other team members are doing. This awareness and accountability would diminish if the team did not meet face-to-face.

Media meetings in Agile were a prime example of the advantages of face-to-face conversation. As discussed in principle #1, media meetings helped to establish realistic expectations and a mutual understanding between the media managers, the instructional designer, and the instructor. Before media meetings required these stakeholders to meet physically, there were misunderstandings about the media needs for a course and how they could be met. In media meetings, the media managers had a voice to give recommendations for media based on their expertise. Discussing media in a physical location helped them to negotiate how much work each media team could handle. Dan remarked, “That media meeting became a great asset for our company that came out of Agile development, . . . pulling everybody together in one room.”

Despite these advantages seen in media meetings, some stakeholders observed that the face-to-face communication in scrum team meetings seemed inefficient, redundant, or

unnecessary. For example, almost all student employees or scrum members had a supervisor who was not their scrum team leader. Thus, there sometimes was a double need for students to communicate: once to their supervisor and once to their scrum team leader for each task. Felicia commented that this was not necessarily a bad thing, but that she perceived that it sometimes “takes more time or it leaves some ambiguity.” Students whose tasks did not overlap with other teammates’ tasks often wrote feedback that implied that they did not need to be at the face-to-face meetings and that it took them away from their work. Felicia expressed that similarly, sometimes communicating her ideas took too much time because of the background information needed to understand her thought processes.

At the time of the interviews, BYUIS was just months away from moving into a new building across campus, which caused some concern about whether scrum teams could be co-located. Used here, co-location refers to having each member of a scrum team permanently reside in the same room. In the building during the time of this research, scrum team members worked at a desk in a room with their supervisor and other student employees who had the same position (e.g., animators, editors). Thus, scrum teams were not co-located, or in the same room each day, and the scrum team meetings were the only opportunity to come together physically. With the transition to a new building, Ben and Allen proposed that scrum team members would be permanently co-located in the same room. They later found out that this new setup was not approved. Ben explained his fear that productivity might decrease with this change, “wherever the resources stay separate from the designers in their own room, even if it’s just down the hall.”

Employees felt unsure of how the transition to the new building would impact their team. Gina said, “It’s going to be interesting to see, when we move to the new building, how that works. . . . The setup for that building is not team-based. It’s still more Waterfall-based. So I

don't know how it will turn out.” Despite this, the transition itself will help connect BYUIS employees as a whole because they were originally located in two different buildings: design and development teams in one building, and customer support and testing teams in another building. With both sets of employees moving to the same building, some employees such as Henry “hope . . . that by moving there, we will be able to have [everyone] part of those standing meetings to some extent.” Ideally, being in the same building will improve the efficiency and effectiveness of communication between the user end of the product and the development end.

In sum, the advantages of face-to-face communication are almost common sense but were especially important for Agile at BYUIS. As Dan stated, “physical locations are key for Agile development.” If a team did not meet physically, then they were not a scrum team. Even if a team had scrum team meetings, these meetings were difficult to have every day because of student schedules. Being permanently located in the same room would help team members to communicate with and help one another, even if they were not all present for the daily scrum meeting. Without co-location, these part-time employees may be less likely to feel unified and to update or help one another, which could result in falling behind on sprint deadlines. Communicating face-to-face is simply more effective and efficient than other means. Co-location would allow face-to-face communication to happen more often, especially when student schedules become busy and make daily scrum meetings difficult.

7. Working products. “Working products are the primary measure of progress” (Beck et al., 2001b). Before Agile implementation, administrators struggled to track progress; Allen commented that “it was . . . difficult to be able to track progress, though progress was—you know—generally being made, it was . . . hard to track and see that progress.” As has been discussed in previous principles, at the end of a sprint the scrum team should deliver a working

product. The term “working” simply means that it functions for the user, but it does not necessarily mean that the product is perfect. Perhaps it could be more aesthetically pleasing, but the product has the necessary components to be used (i.e., it is working). When a team can deliver these working products on time, there is tangible evidence that they are progressing. Quality influences the extent to which a product is “working.” Generally, Agile processes at BYUIS had increased its stakeholders’ perceptions of the quality of courses. However, with the focus on frequently delivering working products, some tensions between quality and efficiency arose.

Instructional designers attributed their perceptions of increased quality to different factors. Felicia talked about how she felt the quality of courses had increased and that much of that was due to support from Ben. She stated that he “allowed me time to do necessary background work that really laid the foundation for a better course.” Felicia also believed that her meetings with course stakeholders helped to increase the quality of the course. For example, as she collaborated with ASL TAs and instructors, Felicia found that “they are so invested as a group that they have basically taken the courses and made them really like ten times better, and are continuing to do so.” Henry talked about how before Agile, he was not aware of what the next person in the process was going to do, so he did not know what level of quality he would need to deliver for that next step. Henry stated that he felt like Agile had “closed the feedback loop.” To explain this, he gave this example:

I get the first lesson, I send it on to the editor, the editor is like, “Hey, [the instructor] missed this, this, this, and this.” I take it back to the [instructor], they fix it, and then when they get lesson two from the [instructor], they’ve already made some of those changes and I know what to look for as it comes through too.

His comment implied that increased efficiency positively impacted quality of the course because the sprints gave them an opportunity for feedback and to make important changes in the course.

Other interviewees mentioned that media meetings helped increase the quality of the courses but that you have to balance quality with other factors. Media meetings were frequently cited as increasing the quality of the media elements in the course. Dan discussed how stakeholders in the meeting have an opportunity to bounce ideas off one another to decide what would work best for the course, given its unique constraints or quality concerns. The media managers could make suggestions based on factors like quality, budget, and time. Here, Dan stated, “You can’t have all three of those in media. You get two of the three, usually. So I was there to provide alternatives, if needed, or past experience of things that we worked on.”

This tension between quality and other factors existed not only in producing media for the course, but also in the other aspects of course development. The fast-paced environment established by sprint deadlines has the potential to be detrimental to the quality of the product. Dan remarked, “I think that efficiency can increase, but I think it sometimes is at the sacrifice of quality.” As has been discussed, the editing team struggled to adapt to Agile processes because of the nature of their work. Allen stated, “Strong opinions on the part of those that were responsible for editing [said] that it was impossible to do what we were asking them to do. That one could not do a quality edit . . . in an Agile environment.” They felt that working in sprints with portions of the course would be detrimental to its quality. Interestingly, the students did not mention how their scrum team meetings impacted the quality of the courses they were working on. Perhaps this is because quality was a guiding force that underlaid their work at all times but was not talked about explicitly, or perhaps quality was not emphasized to student employees as much as efficiency and speed.

Henry also acknowledged that from his perception, efficiency in some areas had increased, but in some areas had decreased and affected quality. For instance, although editors could catch errors earlier in the process, working one lesson at a time sometimes made lessons inconsistent. Going back to check formatting or something else in a previous lesson took more time and required students to re-learn how to do it for future lessons. However, if the re-learning step was skipped, then parts of the course would not be consistent. Although it may have “worked,” Henry commented on how inconsistency can hamper the student’s learning because they do not know where to expect certain elements of the content. Inconsistency reflected lower quality, but it would not prevent the lesson from “working.” Thus, while Agile emphasized efficiency through its frequent feedback cycles, stakeholders at BYUIS recognized that this could negatively impact quality. However, even lower quality products can be “working” products, which still show progress because they keep the Agile process moving forward.

8. Sustainable development. “Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely” (Beck et al., 2001b). As the Agile process moved forward, the hope was that it would help every stakeholder to move forward at a constant pace. This was often talked about in terms of how Agile contrasted with the Waterfall method. Waterfall was seen as inconsistent and as having many waiting periods that would sometimes result in bottlenecks. Allen expressed how Agile has helped employees to work at a more constant pace:

The idea of our having courses hang on forever that are just kind of sitting there, waiting for the next person to do their thing to that course, and having kind of a backlog of courses that are in the pipeline—I believe that that’s been reduced, at least in a reasonable way.

Many other stakeholders had the same opinion: Agile helped them to work more consistently. However, others commented on how parts of the Waterfall process are still present at BYUIS. Additionally, some student employees were not able to maintain a constant pace because of the nature of their work, unless their supervisor found extra tasks for them. Ben talked in detail about how Agile was meant to eliminate waiting periods during the development of a course. In Waterfall, the instructor signed a contract to write the entire course. Ben explained, “During all the time when the author was writing the content, no one else was doing anything.” Similarly, while a course was in development, the different teams would work on the whole course at once. This could take a lot of time and cause other teams or the instructional designer to not know how the course was progressing. Conner described the Waterfall process as “throwing things over the wall and waiting for someone else and waiting and waiting. And when it comes back to you, you’re so far on something else that [the new task is] very disruptive.” Gina expressed that although she did not work at BYUIS while they used the Waterfall process, she was grateful that “we’ve got the different people on the team working with it as we build rather than ‘I build it, now I hand it off to you and I don’t even think about it again until I get your report back.’” Ben described how Agile, with its sprints and scrum teams, eliminated those waiting periods, resulting in more sustainable development (see Figure 4).

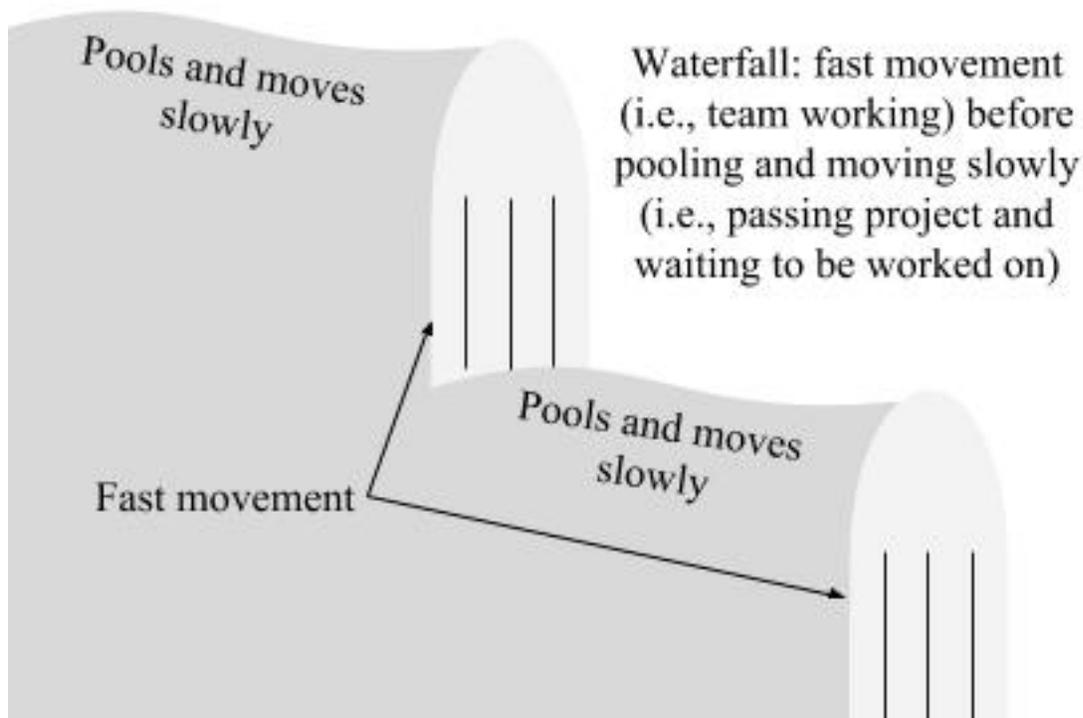


Figure 4. Diagram showing the concept of the Waterfall method and the waiting periods that occur between working periods.

At the same time, other interviewees mentioned the aspects of Waterfall that had survived out of necessity. Dan commented, “I believe there are some aspects of Waterfall that have survived during this whole Agile process. And when I say that, it’s because I participated in one, right? It never really changed for me.” As the Media Team Manager, Dan did not have his team or the animation team join the scrum teams. Rather than co-locating their student employees with scrum teams, these managers chose to remain in their own team to work together on projects that often required multiple student employees in that specialization. In contrast, Emma’s illustration students were included in the scrum teams and Agile processes. She remarked that her students would frequently run out of things to do in their scrum team and then ask her what they could work on for a short amount of time. “Because then they have to go back [to their scrum team]. Well, I don’t have three-day projects a lot of times. So then it’s, ‘Well, okay, start this and then

hopefully I can get you back to finish it or maybe I can get somebody . . .” At that point, it would be Emma’s responsibility to figure out how to finish those projects that were partially completed. She expressed that the Waterfall process gave her more control over the pace at which projects were finished.

A couple of instructional designers and students talked about how tasks were sometimes not aligned with the sprint but are rather just given out to keep students busy. Gina said that from the students’ perspective, “It’s more ‘just keep me going, I want to make sure I have stuff to keep me busy,’ rather than the ideal of choosing how much I think I can accomplish and then pushing myself to accomplish that.” She would often ask her students if they had enough to keep them going, because the sprint tasks would take varying amounts of time for students to finish. One student wrote,

I think the nature of this process is that sometimes there’s more work to do than other times. For example, I work in Quality Control. Once lessons have been written or edited, I generally have several tasks to complete at once. Sometimes, however, I end up waiting several days for a lesson to be ready to go through QC.

Ben encouraged scrum team members to help one another with tasks when they finish their own tasks early or if someone else is behind. Although student employees mentioned that they receive help and input from their scrum team during their scrum team meetings, I did not observe conversations about scrum team members helping one another with projects outside of the scrum team meetings. A couple of interviewees talked about how this would not work for their students because they were not trained enough to help with another discipline, such as editing or QC.

In some ways, Agile has enabled stakeholders to maintain a more constant pace because sprint cycles reduce the waiting periods and bottlenecks experienced while using the Waterfall process. However, instructional designers sometimes needed to keep their scrum team members busy with other things. Additionally, some teams still favor Waterfall because of the nature of their specialization.

9. Technical excellence and good design. “Continuous attention to technical excellence and good design enhances agility.” Although course quality has been discussed in terms of showing progress by delivering working products, course quality should be addressed on a higher level as well. Going beyond whether or not a product “works,” this higher level looks at technical excellence and good design. Instructional designers at BYUIS often graduated from master’s or doctorate programs in instructional design or they came with a strong teaching background. From my perspective, they seemed to have a sense for what good instructional design looked like. Other stakeholders came from professional backgrounds in their respective specialties, such as video production, animation, illustration, and editing. Although student employees were carefully selected and hired, they were still in school and needed continuous support from their supervisors in order to attain excellence, or high-quality work. Certain parts of Agile have helped BYUIS to increase the excellence of their courses, but some of the quality is dependent on supporting student employees who are not yet professionals in their respective fields.

Conflicting factors influenced the stakeholders’ perceptions as to whether or not this excellence was being attained. Agile allows designers to focus on just a few projects at a time. Collaboration can result in greater creativity and excellence, and all of the instructional designers reflected on how they were working to improve scrum team meetings. This willingness to make

changes based on feedback in the scrum team and for the project as a whole shows that stakeholders were striving for excellence. However, as discussed before, for various reasons some stakeholders believed that some aspects of Agile decreased the level of course quality. One potential barrier to course quality, which was present with or without Agile, was the fact that scrum team members are part-time student employees who are not always at a professional level in their discipline.

In addition to the part-time nature of student schedules, part-time students generally were not as specialized or highly trained in their field. Dan mentioned how the instructional designers who worked in Agile previously were in a context where all team members worked full-time. They were not only accustomed to working with people who were consistently at meetings but who were also professionals in their field. Felicia said, “I don’t know how another organization would do [Agile], though, unless you're working maybe with professionals who don’t need that training on the side.” Student employees did need the training on the side, especially if they were expected to help other scrum team members with their tasks, which they are encouraged to do if another team member was not going to meet a deadline. Dan commented that “they are so collaborative and they want to help each other, but I think sometimes quality is sacrificed because they do help each other.” For example, a student who is an instructional design assistant can try to help another student in charge of quality control, but perhaps they do not have the training and background knowledge to do as good a job. Thus, technical excellence can decrease when scrum team members help each other to meet deadlines or to be more efficient.

Having scrum teams that were composed of student employees especially impacted production teams like editing, illustration, animation, and media/video. These specializations required extensive background knowledge and experience as well as guidance from managers.

Dan, the media team manager, talked about the difference between a student who was studying the same subject as their team's specialty (e.g., video, animation) and students who was studying something different:

We have some of the greatest students on the planet, who are very smart and they get a lot of things done, and honestly I couldn't do my job without them, but there is a difference between a student that's going to school for a certain profession and then my team, who has an entirely different profession and I can only hire a certain amount.

The editing, illustration, and animation teams typically only hired students who were already in the corresponding university program. The university programs for illustration and animation only admitted students after a rigorous application and selection process, and students in the editing minor also had to apply for admission. This better prepared these students for a position on that respective team at BYUIS. From there, the student was placed on a team where their supervisor could mentor and train them in their discipline.

The hope was that with supervision from professionals in their respective fields, student employees would be more likely to pay attention to technical excellence and good design. Emma talked about how her job was to oversee the quality of the products her student illustrators produce. Even though assigning these students to scrum teams allowed instructional designers to take on some of that responsibility, she commented that when "when I'm not overseeing them nearly as much, then some of [the quality] slips through the cracks." Gina expressed confidence in her student employees: "We've got a really good group of students that are all sharp, and they know what they need to do, and they do it very well." I observed that she made extra efforts to help her student employees and to follow up with them when they ran into barriers with their work. Agile gave a time and space for instructional designers to support their scrum team

members. Supervisors could play an important role in checking quality and providing training, even if their student employees were part of a scrum team. Continual attention to the quality of what is produced by both full-time and part-time employees certainly increases the value of Agile.

10. Simplicity. “Simplicity—the art of maximizing the amount of work not done—is essential” (Beck et al., 2001b). Models such as Agile are often implemented to simplify processes that are bogged down by paperwork or unnecessary tasks, and BYUIS was no exception. Agile simplified the design and development process of online courses at BYUIS. Organizing tasks into sprints allowed them to make changes throughout the process, rather than having to go back at the end to make significant changes. Media meetings got key stakeholders in one room to determine the simplest ways to meet the needs and expectations of the instructor and student clients. Sprint planning meetings, when they happened, helped scrum team members to decide how to divide the work in a way that would give everyone just the right amount of work to do, without any overlap.

Despite these ways that Agile has simplified processes, one of the most prevalent comments from instructional designers and student employees alike was about the added complexity of having scrum team members work on different projects. Felicia defined the Agile ideal as “we’re working towards a project, where we’re all working on it together and we’re all aware of what each other is doing,” focusing on the fact that all members of the team should be collaborating and focusing on the same project simultaneously. When student employees were focused on a different project than the rest of their team, then they were merely reporting what they have done. They could be less likely to connect their own work to others, to offer solutions or help to teammates, or to feel invested in the scrum team meetings. Focusing on the same

project can simplify the development of the course because the team is better able to collaborate and work together, finding solutions to improve their work.

Instructional designers described their own contexts, and how the demand for changes in multiple courses made it difficult to focus on just one project as a team. Like software developers, instructional designers, by necessity, juggles multiple projects at once. Gina stated, “We just haven’t had the setup to be able to do that . . . We miss some of the value of doing Agile, because we have multiple courses going live at any given time.” As corrections for the course came in, or instructors from a whole portfolio of courses demanded attention, instructional designers had to find a way to balance multiple projects. Gina continued,

Choosing one project and focusing on just one project for the sprint . . . that’s almost impossible in this setting because there’s always something that comes up from one of the other courses or something else that needs to be dealt with, and sometimes those things—they’ve got to be done right now.

Because scrum teams were working on multiple projects at once, the teams were less able to help each other solve problems. Some students wrote about this same issue in the student survey: “With everyone working on different projects, there doesn’t really seem to be any functional ‘team,’ and we could reap the same benefits by just having daily check-ins with our designers.” As Henry read through his team’s response to the surveys, he made a goal to change how the meeting would be conducted. Like the other scrum teams I observed, each scrum team member had a chance to speak, but usually it was just a report on what they had accomplished since the last meeting. Based on his team’s comments, Henry reflected, “We could probably use scrum team time a bit more efficiently—talk about roadblocks we’re having instead of just a report of what we’re doing.” Even if they were working on different projects, the scrum team

could still had the potential to provide support for one another (e.g., one team member completed a similar task and had some tricks for how to simplify the task).

Additionally, Henry’s and Gina’s scrum teams made a dedicated effort to simplify how students tracked their progress on tasks. Henry’s team wanted to decrease the complexity of having tasks for various projects distributed between team members’ names on the tracking board. Instead, it would be organized according to the project with team members signing up for portions of project on the same piece of paper (see Figure 5). With this method, the team could more easily see how the project would come together. He said, “And how we’re approaching things to try and apply—align more with focusing on projects instead of just tasks for people. Tasks for people is moving more towards a Waterfall kind of approach.” Gina reorganized her board in a way that put similar projects closer together, so that students could see how their tasks related to one another.

<u>AUTHOR AND FEEDBACK</u> Projected: Actual:		<u>LESSON AND STORY POINTS</u> Projected: Actual:	
<u>QC</u> Projected: Actual:			
<u>DESIGN</u> Projected: Actual:			
<u>MEDIA</u> Projected: Actual:	<u>ART</u> Projected: Actual:	<u>EDIT</u> Projected: Actual:	
		<u>ACCEPT</u> Projected:	

Figure 5. Layout of one-page tracking board used by Henry’s team during my observations, organized by portions of the project instead of by person.

Finally, with upcoming organizational changes, some interviewees mentioned how they would need to be selective about the projects they took. Their role would expand and cover more parts of the larger Continuing Education division: not only BYUIS, but other large events and organizations like EFY (Especially For Youth) conferences. With this growing need for simplifying and maximizing work not done, the iterative Agile process has the potential to help stakeholders. However, the nature of the work that BYUIS and even Continuing Education as a whole do requires that several projects demand the team's attention at once. Instructional designers and other stakeholders will need to find ways to still have the team work together simultaneously on parts of projects, so that they can simplify how they track the progress of multiple projects.

11. Self-organizing teams. “The best architectures, requirements, and designs emerge from self-organizing teams” (Beck et al., 2001b). Although I have talked about scrum teams, I have waited until now to discuss to what extent the teams are self-organizing. A self-organizing scrum team asks for input from every member of the team, rather than letting the team leader make all of the delegations and decisions. The team works within boundaries and constraints that are placed by the scrum team leader, negotiating how to take on and divide challenges. The scrum team leader is present to subtly direct their team if one team member is domineering, if the team is hitting barriers, or if the team is heading in the wrong direction. Within the Agile context at BYUIS, opinions and ideas were openly shared and considered in all of the scrum teams I observed. One scrum team in particular applied this principle of self-organizing teams effectively by having a sprint planning meeting with the opportunity for scrum team members to negotiate which tasks they would work on. Other scrum teams gave students decision-making roles and did their best to foster an environment where students had a voice.

Gina's scrum team met at the end of each week in a "sprint-planning meeting" to decide what would occur in the next week. Gina gave an example of the type of conversation that would occur:

"I'm going to take this piece and I think I can get it done in this amount of time," and then the other team members say, "Well, last time you [gave] us a chunk this big, it took you this amount of time. You might want to revise how long you think it's going to take."

Although Gina was there to guide the discussion and to give suggestions if the team was going in the wrong direction, she let the members of her scrum team make decisions. The scrum team members sometimes referred to the sprint planning meeting when they talked about their tasks and how close they were to finishing those tasks.

Other scrum teams showed respect and asked for their student employees' input, but did not have a formal sprint-planning meeting each week. As discussed previously, Felicia felt that because her team members were working on different projects, they could not collaborate and brainstorm in the same way. Simply reporting progress had some value, such as increased motivation and getting help from Felicia. However, they were not self-organizing because they were usually assigned tasks. Henry's team underwent several changes during the two weeks I observed, such as changing the board and adding story points to projects, but these were initiated by the instructional designers. The instructional designers did ask for the team's input, and several student employees asked questions and brought forward concerns about the new tracking system. Although her teams had the sprint-planning meetings, Gina acknowledged that the team members did not always self-select tasks or negotiate. She said she would like "self-selection as to who does what piece of that and how long it's going to take and some negotiation," but that

it's something "we don't normally actually do." She sometimes assigned tasks to members of the team who needed something to do, rather than letting them select the tasks.

In some instances, I observed instructional designers encouraging their students to proactively find solutions. In one instance, a member of Felicia's team went above-and-beyond the task, using her own background knowledge about languages to catch errors in the course. This student proposed her changes and the other students in the team listened with interest and interjected their own comments and questions. Felicia showed appreciation and accepted the student's changes. The role of the students in this group was very proactive. On Gina's team, one student editor proactively found a solution to a problem in the HTML code, and Gina told the team that this solution would be put into a template and used for future courses. During scrum team meetings, Gina and the other instructional designer in the room praised many solutions that students found as they worked on their individual tasks.

In other instances, the instructional designers needed to provide pushback or extra guidance for the team members as they made decisions. As has been discussed, Henry's scrum team tried a lot of new things during the two-week observation period. He and the two other instructional designers explained the rationale for their new way of organizing projects on the board, and then opened the time up to the team to ask questions and present concerns. One student asked if they could keep the old board going while transitioning to the new one, and they agreed. As the instructional designers were asking each team member to estimate the amount of time their part of the project would take, one editor presented a larger chunk of time than the other teammates. Henry pushed back and asked the editor more questions, to see if the time estimate was accurate. This caused a little friction, and Henry spoke with the editor after the meeting to make sure that they understood each other and were on good terms. In one meeting,

Felicia talked with her team about chunking theory, the fact that people can usually recall around seven pieces of information, and how it could apply to vocabulary in a language course. One student proposed that you can compartmentalize even further (e.g., seven chunks within seven chunks). Felicia listened and was respectful to his ideas, but she pushed back, citing her research and experience teaching vocabulary to language students.

Despite the barriers to having a self-organizing team, the instructional designers did have control over the environment they created in their scrum team meetings. Gina found a way to have sprint-planning meetings where students had some say in the projects and tasks they would take on, but she admitted that students could not self-select tasks as much as the ideal.

Nevertheless, I observed each designer give responsibility and decision-making power to the students in their scrum teams. They also pushed back on ideas when needed, and were firm, but respectful. The dynamic was as self-selecting as it could be in a context where students worked on different projects.

12. Reflection. “At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly” (Beck et al., 2001b). Throughout the interviews, the participants often reflected on how Agile was working in their context. The administrators at BYUIS recognized the need to reflect on how they can be more effective. Conner commented, “Anytime you have something, you need to review it. . . . Instead of just mumbling under your breath, you’ve got to be very straightforward and say, ‘We need to fix this. How can we fix this?’” This candid approach is ideal, and some participants acknowledged that they thought that reflection should happen more often. Allen said, “There has been ongoing conversations—few and far between, sometimes—between [Ben] and myself about how well we are implementing, who’s doing what, how are the teams doing.” I collaborated with Ben throughout the process of

planning and conducting the research, to ensure that what I was looking for aligned with what the administrators at BYUIS would find most informative and useful for reflection.

Several interviewees made comments about how they wanted to hear what other people in the organization thought about Agile. Since its implementation, this thesis was the first main effort to analyze, from multiple perspective, how the implementation of Agile has worked. Allen, as the Associate Director of the Academic Services Department, had already conducted a couple of reflective surveys for instructional designers and student employees who were on scrum teams. However, there was no data that brought together student and full-time perceptions of Agile. He said, “I’d be real interested to see what others think.” A couple of the instructional designers made comments about how they would be interested to see how Agile was being implemented by the other instructional designers, and what their perceptions were. Gina said, “I don’t know, maybe other groups are doing better than our group, but we don’t do it near as . . . close to the ideal.”

Many of the participants commented that they were glad that the research for this thesis was being conducted, so they could reflect and improve their own processes. During her interview, Felicia talked about how she enjoyed answering the questions because it caused her to think about her own design process within Agile development. Dan remarked, “I’m glad that we’re conducting discussions about it. I think it’s great to follow up. It’s great to talk about it. It’s great to ask questions about how did it help or didn’t help.” Since Dan commented earlier in his interview about how he had seen several implementations of new models at BYUIS, he seemed to especially value the opportunity to reflect on how Agile was working. Henry’s final comment in the interview was “When you’re implementing Agile, the default is to fall back to where you were before, and so there has to be active effort in evaluating what you’re doing.”

A couple of the interview questions asked about the interviewee's opinion regarding the extent to which BYUIS has been able to implement Agile principles, and their hopes for moving forward. A couple participants expressed that BYUIS needed to strive to implement Agile fully, rather than just partially. However, this perspective was usually tied to one aspect of Agile that they felt needed to be emphasized. When talking about her students, Emma felt frustrated that their scrum teams would sometimes not meet or have work for students to do. She said, "But if we're going to Agile, you've got to stick to the plan. You can't do halvesies or sort-ofs or Waterfall with a nod to Agile." Felicia talked about how the scrum team members assigned to her team were not consistent and did not work together on the same projects. She commented, "I don't think the partial scrum works as well, I think it has to be the full [scrum process]. . . . I would love to see it move that way even more." Sandy recognized that her team did not follow the ideal, and estimated that they have a 50% fidelity to Agile principles, at the most. Administrators hoped to implement Agile as fully as possible but also acknowledged the factors that would prevent a complete fidelity to Agile principles. Allen stated, "Whether it's the production issues that I shared earlier or the physical facilities or the team membership itself, [they] have all had to be adapted to our environment here. That doesn't allow us to be able to completely implement Agile as it might be more purely envisioned."

Other participants were of the opinion that BYUIS should take the parts of Agile that worked for them, and adapt where needed. Emma and Felicia agreed that implementing Agile has benefitted BYUIS, even though the implementation was partial. Felicia noted, "I think the benefits, without even adhering to the correct process of maybe scrumming, or Agile, is that just by communicating about what's going on, there's some benefit there." Dan and Gina emphasized the importance of moving forward with the best parts of Agile. Dan said, "I think that we'll carry

over pieces and I think we'll carry over positives from Agile. . . . Has it worked better than other things? Yes. That's why I think it will continue in some form or some degree." At the conclusion of her interview Gina said, "It is very difficult to reach the ideal when you don't have the ideal circumstance, but that doesn't mean that you can't take the good ideas and incorporate them to make the processes . . . more effective and get things done more efficiently."

When asked about his hopes for Agile in the future, Ben stated, "I actually hope to continue seeing the scrum teams being implemented, being able to figure out ways to tackle these problems, keep that in changing the culture, and empowering the people." Henry expressed that Agile is applicable to BYUIS completely because you can choose to apply its principles and adapt where needed. He said:

I think we can apply all of the methodology here, because it's . . . not like a process, necessarily, that's uber-defined. . . . I can't see anything inside of the Agile methodology that is [non-applicable] to our organization. Our instance of it may look different than other organizations, but that's it.

Every organization will need to apply Agile differently based on their unique contexts and needs. My hope, as the author, is that this research will provide an opportunity for stakeholders at BYUIS and Continuing Education to see Agile from multiple perspectives and to reflect in a way that will inform future decisions. Additionally, I hope that the reader will learn from this case study how Agile can be applied in other contexts, including their own.

Summary of Fidelity

Table 3 provides a summary of the main points and considerations for each of the 12 Agile principles. It also assigns a low, medium, or high level of fidelity based on those considerations. This is one possible interpretation of the results of this study. Please be aware

that this thesis is meant to be qualitative research, not an evaluation. Similar summaries have been done in the literature, to enable interpretation of a research study, replication, and comparison between research studies (Riboldi, 2000). Assigning a level of fidelity to each principle does not imply that complete fidelity is the goal, but rather can inform BYUIS stakeholders of the current status of Agile and give detailed information about how their actions reflect or differ from Agile principles.

Assigning a value of 0 to Low fidelity, 1 to Medium fidelity, and 2 to High fidelity, BYUIS has an overall 13/24 or 54.17% fidelity in implementing Agile principles to its instructional design context.

Table 3

Summary of Fidelity of the 12 Principles of Agile

Agile Principle	Level of Fidelity	Considerations
1. Customer Satisfaction	Medium	Online students were only seeing the final course and not the iterations. They were not often mentioned in scrum team meetings. However, online instructors were highly involved in giving feedback between sprints for each version of the course. Stakeholders reported that instructor satisfaction was much higher.
2. Welcome changing requirements	Medium	Some interviewees mentioned continued resistance to change as an organization. Despite this, some interviewees also talked positively about how the iterative Agile process allows them to catch mistakes early and to adjust accordingly. Others recognized the need to be flexible and make changes even later in the process if needed.
3. Deliver working products frequently	High	Stakeholders understood the purpose of sprints and delivering portions of the course to the instructor frequently. Overall, employees perceived that courses as a whole were more likely to be released on time because of greater attention to deadlines throughout, but no data supports or contradicts this.
4. Work together daily	Medium	None of the scrum teams met every day of the week, often due to part-time student schedules. All saw value in having frequent touchpoints and keeping scrum team members accountable.
5. Motivated individuals	High	Many students and interviewees cited feelings of belonging, being listened to, and being empowered in their discipline. However, some student employees felt they weren't needed at scrum meetings.

6. Face-to-face conversation	Medium	All data sources pointed to advantages of meeting face-to-face in scrum teams and media meetings. However, the teams were not and will not likely be co-located.
7. Working products	High	Even with the tension between efficiency and quality, some cited ways quality had increased because of face-to-face meeting and iterations. Other saw quality sacrificed in contexts like editing, but the products still “worked.”
8. Sustainable development	Medium	The backlogs created in the Waterfall method had been reduced, making the workflow more consistent. However, data sources showed that students often were looking for things to do because their workload varied.
9. Technical excellence and good design	Medium	This looked beyond the product merely “working.” Many student employees were highly qualified but they still need supervision and training. Sometimes the Agile mindset of scrum team members helping one another decreased quality.
10. Simplicity	Low	Agile helped stakeholders to identify what needs to be done and to stay organized. However, it was hard to focus on just one or two projects because there were many different courses that need attention at once.
11. Self-organizing teams	Medium	Most teams did not have a sprint-planning session where team members negotiate and select the tasks they can take on. Nevertheless, many student employees actively participated in meetings. Designers recognized good work but also pushed back when needed.
12. Reflection	Low	Interviewees stated that reflection on Agile had been rare, but that they were interested to see the results of this case study.

CHAPTER 5

Discussion

Prior literature has shown the advantages of using iterative instructional design models and the positive impact that Agile development has had in many organizations, even outside of the software industry. As mentioned, many organizations implemented a hybrid version of Agile, adapted to their context. The primary reason I conducted this research was to illustrate through case study the implementation of Agile development at BYUIS and how/why they adopted certain Agile principles to their context. I also hoped to create an opportunity for BYUIS to reflect on their implementation of Agile and how to use the process moving forward. The negative case analysis, shown throughout the Results when evidence from my data sources differed from Agile principles, exposed some issues that may arise when organizations implement Agile. The following section addresses three primary issues found in implementation of Agile at BYUIS: part-time schedules, working on different projects, and co-location. It then introduces potential solutions and looks at how these issues could manifest themselves in other organizations.

Part-time Schedules

As mentioned in the Results section, one of the greatest barriers to fully implementing Agile development at BYUIS was the nature of student employee part-time schedules. Students worked part-time, with the exception of the spring and summer semesters from when they have the option to work full-time. Brigham Young University puts a heavy emphasis on mentoring students and providing student employment for students. BYUIS is part of this culture and encourages students to put their schooling first. Consequently, student schedules were often

unpredictable due to classes and school responsibilities, making it difficult for instructional designers to find a common time for their entire scrum team to meet.

In his interview, Ben proposed a solution to this scheduling problem. He suggested that when BYUIS hires a student employee, that they would hire them for a specific shift (e.g., morning or afternoon). BYUIS had been flexible with student schedules in the past, allowing student employees to choose the times and days they work. A shift time would enable instructional designers to choose a scrum meeting time within the shift, ensuring that most or all student employees could attend. Additionally, students could be required to plan ahead more for exams and other school responsibilities, letting their scrum team leader know in advance if they will miss a meeting. However, requiring students to commit to a stricter schedule could be resisted by students and managers because of the BYUIS culture that encourages student employees to prioritize their academic life.

Even if student schedules prevent scrum teams from meeting every day, thus not abiding fully to the Agile principle, there is still value in meeting consistently one or more times a week. Before Agile, student employees at BYUIS did not often meet or see how their duties contributed to the project as a whole. Face-to-face meetings, regardless of frequency, allow student employees to stay accountable for their work and to see the project progress. The scrum team leader, or instructional designer at BYUIS, needs to be accessible and approachable to team members so that they feel comfortable bringing up roadblocks or concerns even if there is not a daily meeting. They could set up a more informal daily touchpoint with each team member, which could be anything from an instant message to a quick conversation.

This issue of working around unpredictable schedules can be seen in various ways in other organizations. For instance, many organizations have part-time or contract employees that

may be part of a scrum team. Having these types of employees presents a number of issues. If part-time, contract, or distance employees are accustomed to having a flexible schedule they might resist coming, whether in person or virtually, to daily scheduled meetings. Additionally, the focus on daily meetings could introduce some negative power dynamics, potentially sending a message that full-time employees are favored because of their ability to attend scrum team meetings daily and in person.

Organizations will need to decide how they can set expectations early if they expect part-time, contract, or distance employees to attend scrum meetings. The scrum team may need to schedule its meetings around their work schedules or require them to work during certain hours. If this isn't possible, the organization may need to consider other ways for the part-time, contract, or distance employees to report their progress to the scrum team. The scrum team leader would need to find another way to have a daily touchpoint with these employees, making sure they had an open communication channel that would allow them to express concerns. Their status as distance or part-time should not diminish their voice in the scrum team.

Working on Different Projects

When considering the fidelity to which BYUIS implemented Agile development, another issue to grapple with was the fact that scrum team members were often working on different projects. Scrum team meetings sometimes felt like an opportunity to report but not to collaborate or to help one another. Instructional design differs from typical software contexts because it is not possible to focus on just one or two projects at a time. Much of this is not within a designer's control, because they have multiple courses and projects to handle. Some courses may be in the design and development stage, while others are live courses that simply need updates or edits.

To address this issue, designers should continue to be selective about which projects require a scrum team. From my observations, a scrum team is only needed if the designer is starting a new course or doing a major redesign of an existing course that requires student employees from several production teams. Otherwise, they can assign projects and set deadlines for individual student employees in the previous waterfall style. Some student employees (e.g., illustration) also felt that they were not needed at scrum team meetings; a designer should only require student employees whose duties interrelate to attend the daily meetings. A daily touchpoint or consistent contact with students would continue to be important, but the student employees would not have to meet with one another unless they were working on the same or related projects in a course.

To help students to see their contribution to the progression of a course, instructional designers could adopt a new approach to tracking projects, similar to that of Henry and his team. Rather than organizing the tracking board by individual student employee and their various tasks, the tracking board could be organized by course or project. Each member of the scrum team would add their contributions to a designated section of the visual course. This would help all team members to see the progression of the course as a whole, as well as the specific contributions of each other team member. Seeing how their tasks interrelate could also help team members understand how they can help other team members with their tasks.

Other organizations will also need to be selective about which projects are best suited for the Agile development process. If a project only requires one or two employees to edit a product or to create something simple, then a more traditional project management approach might be appropriate. On the other hand, large projects that require multiple team members and that can be split into several “chunks” are ideal for Agile. However, the use of Agile can become complex

when various projects are at different stages of completion.

If an organization uses Agile for a project, it should be clear how each team member's responsibilities contribute to the project as a whole. A board organized by project can help individual team members to see how their work contributes to the whole. Organizing it by person risks focusing more on who is making the most progress rather than how the team can work together to make the project progress. An organization also needs to thoughtfully consider which employees absolutely need to attend the meetings; these employees would be only those whose responsibilities affect others on the project or are interrelated. No organization wants to use employee time on meetings that are not applicable to them.

If an organization has the same team members working on multiple projects together, then it may be appropriate for a scrum meeting to cover the progress of more than one project. However, the team would need to clearly split the meeting time to focus on each project individually or risk overlooking parts of the projects that may need attention. In general, the organization needs to consider the Agile principle of simplicity and try not to overcomplicate the process by reporting on too many projects at once.

Co-location

The change of location that would occur just a few months after this study was guaranteed to impact the future of Agile at BYUIS. The layout of the building, especially how teams would be organized, initially had the potential to let scrum teams be co-located. However, Ben mentioned that it was more likely that specialized teams would be located together, thus separating the scrum teams as before. Even if it is not possible for scrum teams to sit in the same space throughout the day, the open floorplan of the new building could still help create a more

collaborative environment. Specialized teams will not be confined to a room; the absence of walls and doors to get to their team has the potential to remove collaborative barriers.

Additionally, moving the two separate BYUIS groups into one building is likely to increase collaboration between groups. Previously, the design and development teams (the focus of this study) were located in a building south of campus and the customer-facing teams were located in a building northeast of campus. Instructional designers or other employees no longer need to walk twenty minutes to meet in-person with someone in customer support; in the new building, they will be able to simply walk down the hall to collaborate with other teams. The Results section talks about how two instructional designers, both Felicia and Henry, already had recognized ways that these other employees could be part of Agile.

Being in the same building as the other teams in BYUIS presents the opportunity to include their employees in scrum team interactions. Originally, Ben proposed that one of the scrum team members would be a Tutoring Services Lead. Unfortunately, due to the distance between the two buildings, the Tutoring Services Lead was not included in scrum meetings. They would have been responsible for gathering the materials and resources necessary to prepare the tutors for the launch of the course. The Tutoring Services Lead would know the common problems students have in certain type of courses and could have helped to prevent these issues.. Additionally, they are likely to have subject matter experience or expertise, which could aid the team when the instructor is not readily available. Felicia, who is the designer of the language course portfolio, had already been walking up to the other building to meet weekly with language TAs in a pseudo-scrum team. With all employees in the same building, other instructional designers may find opportunities to meet on a regular basis with other stakeholders of the course, such as Tutoring Services Leads.

Henry proposed an idea for how to have a separate scrum team for the phase after design and development, just before launching a course. There are several BYUIS full-time employees who are involved in the process of making final checks and preparations before the course goes live (e.g., the TA supervisor, the instructor support supervisor, and the registration supervisor). If an instructional designer moved from their scrum team to a new scrum team made up of these stakeholders, preparing to launch the course could go more smoothly, and this new team could reap the same benefits of collaboration and morale as the scrum teams with student employees.

Finally, another idea to consider is whether virtual co-location is possible. Digital tools, such as Slack, could be used to compensate for having scrum team members in separate rooms during the day. For certain questions or issues, digital tool functions (e.g., instant messaging) can replace the act of turning to someone in the room to ask a question. Additionally, part-time student employees may not have overlapping schedules with their scrum team members, so a digital tool would allow them to ask a question or send an update immediately, knowing that their team member would see their message the next time they came into work. Digital tools could provide a good enough communication channel for most issues, and the more pressing issues could be addressed at the scrum team meetings. Whether or not the new building will enable scrum teams to meet together, having all BYUIS employees in one building still has the potential to encourage interaction within scrum teams, customer-facing teams, and stakeholders of the course-completion process.

Like BYUIS, it may be difficult for other industries to change the organization of their office spaces to make permanent co-location in scrum teams possible. However, these organizations can still consider how their workspaces are influencing interactions between scrum team members. They should check if there a gathering space for the scrum team, where they can

be vocal and track progress on a board. If not, the organization can try to find or create a space for the scrum team to meet and feel comfortable communicating.

If co-location is not possible, an organization would also want to analyze how communication occurs outside of a scrum team meeting. If scrum team members are not located in the same room throughout the day, then they do not have the opportunity to ask questions across the room or to ask for assistance from a neighboring scrum team member. They need to have a way to receive feedback and to ask questions quickly. The building layout can sometimes create physical barriers, discouraging employees from walking from their office space to someone else's. Open floor plans and doors can help, but a culture that welcomes questions and collaboration is essential. If employees use digital means to communicate with other scrum team members outside of the scrum team meeting, the organization needs to make sure they use appropriate digital tools and have a culture that makes prompt replies a priority.

Like BYUIS, many organizations may find that a new group of people is involved in bringing a project or product to completion. All industries can consider whether a second level of scrum team would benefit their process. A question to consider is this: To release the product, who else would need to be involved? Those who would need to be involved could form another scrum team that also uses sprints and Agile methods to release the product. Bringing these people into the same physical space to collaborate could streamline the implementation process. Even if an organization cannot fully adhere to the Agile principle of co-location, they can still make their current office space more conducive to collaboration.

Future Research

BYUIS is now located in their new building, and with the new location comes other organizational changes. These changes are likely to have greatly altered the extent to which

BYUIS can apply Agile principles in their context. Future research could look at how organizational changes impact fidelity to Agile principles at BYUIS. BYUIS may also like to evaluate other aspects of their course development process.

Another potential path for future research could include how digital tools can be utilized in organizations that cannot adhere completely to Agile principles. For example, is a video conference call scrum meeting as effective as face-to-face? How can asynchronous digital tools be used for communications, when a team cannot co-located throughout the day? Do online tracking boards work as effectively ones that physically hang in the location where scrum teams meet?

Since BYUIS is not the only instructional design organization that uses Agile process in course development and design, it could be profitable to do similar case studies in other instructional design contexts. Multiple case studies could be compared and contrasted in a cross-case analysis, which could help readers to more fully understand how Agile works in an instructional design context. It would shed light on whether deviances from Agile principles are due to the organization's processes or simply to the nature of instructional design in general.

Finally, like BYUIS, many organizations adopt a hybrid model of the Agile process and methodology. It would be interesting to measure attitudes about the importance of fidelity to Agile principles. To what extent do they believe they should adapt their own processes to adhere to Agile principles, and where do they allow for more flexibility? Does Agile development need to be "all or nothing," or does its value increase when it can be adapted to the needs of an organization?

CHAPTER 6

Conclusion

Agile development is a methodology that is being adapted by many different organizations, even outside of the software sector. This case study looked specifically at how a distance education organization, BYU Independent Study, implemented Agile principles into their instructional design and development processes. Multiple data sources helped determine to what extent BYUIS implementation of Agile aligned or differed to the 12 principles of Agile and why. I assigned a low, medium, and high level of fidelity (0, 1, and 2 points, respectively) to each Agile principle based on my findings, giving BYUIS a total implementation score of 13/24, or 54.17%. Three issues for them and for other organizations to consider are how to accommodate for part-time schedules, the complexity of working on different projects, and how to facilitate communication in scrum teams if co-location is not possible.

My hope is that the results of this research will be an opportunity for all readers to reflect on their own development processes and that it will be considered by administrators and other stakeholders at BYUIS. As Henry mentioned in his interview, rather than seeing Agile as an all-or-nothing methodology, an organization can apply its principles in different ways and to different degrees. Although not all Agile principles can be completely adhered to in this instructional design context, BYUIS can choose to keep the most applicable and advantageous parts of Agile as they continue to provide distance education to high school and university students.

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APPENDIX A

Weekly Survey for Student Employees

According to interactions in meetings **this week** and to the best of your knowledge, explain how Agile development is used in your scrum team. *If you don't know what Agile development is, then just describe how your scrum team works.* Please limit your answer to 2-3 sentences.

What are the positive effects of meeting with your scrum team? Please limit your answer to 2-3 sentences.

What could be improved? Please limit your answer to 2-3 sentences.

In the table below, indicate your agreement with each statement by marking an X in the corresponding box.

	Strongly disagree	Disagree	Slightly disagree	Slightly agree	Agree	Strongly agree
This week, our scrum team met deadlines and individual team members helped each other as needed.						
This week, opinions and ideas of all scrum team members were listened to and considered.						
Scrum meetings positively impact your efficiency.						
Scrum meetings positively impact your motivation.						

APPENDIX B

Semi-Structured Interview Questions for Administrators and Production Team Managers

Sit down and begin the recording. Review the important points of the informed consent form, including the fact that they will be assigned a pseudonym and that their expressed opinions will not affect their position at BYUIS. Remind them that the interview will not exceed 15-30 minutes. Begin by proceeding through these questions in order; however, if the administrator or team leader starts to talk about important points that are not included in these questions, be flexible and be willing to probe deeper on those points. If they do not relate to or have a response to one of these questions, clarify the question or move on.

1. Can you explain the process of transitioning from the previous Waterfall approach to Agile?
2. What differences do you see between the previous Waterfall approach to course development and Agile?
3. To what extent does BYUIS implement Agile development principles as you understand them?
4. What prevents Agile development from being fully implemented in your context?
5. Have your perceptions of efficiency and of course quality changed with Agile? What could be improved?

Following the interview, stop the recorder and thank the administrator or production team manager for their time. Tell them that you will transcribe the interview and write a summary of the interview that includes direct quotations and send it to them for their feedback (i.e., member checking).

APPENDIX C

Semi-Structured Interview Questions for Designers

Sit down and begin the recording. Review the important points of the informed consent form, including the fact that they will be assigned a pseudonym and that their expressed opinions will not affect their position at BYUIS. Remind them that the interview will not exceed 30-45 minutes. Begin by proceeding through these questions in order; however, if the designer starts to talk about important points that are not included in these questions, be flexible and be willing to probe deeper on those points. If a designer does not relate to or have a response to one of these questions, clarify the question or move on.

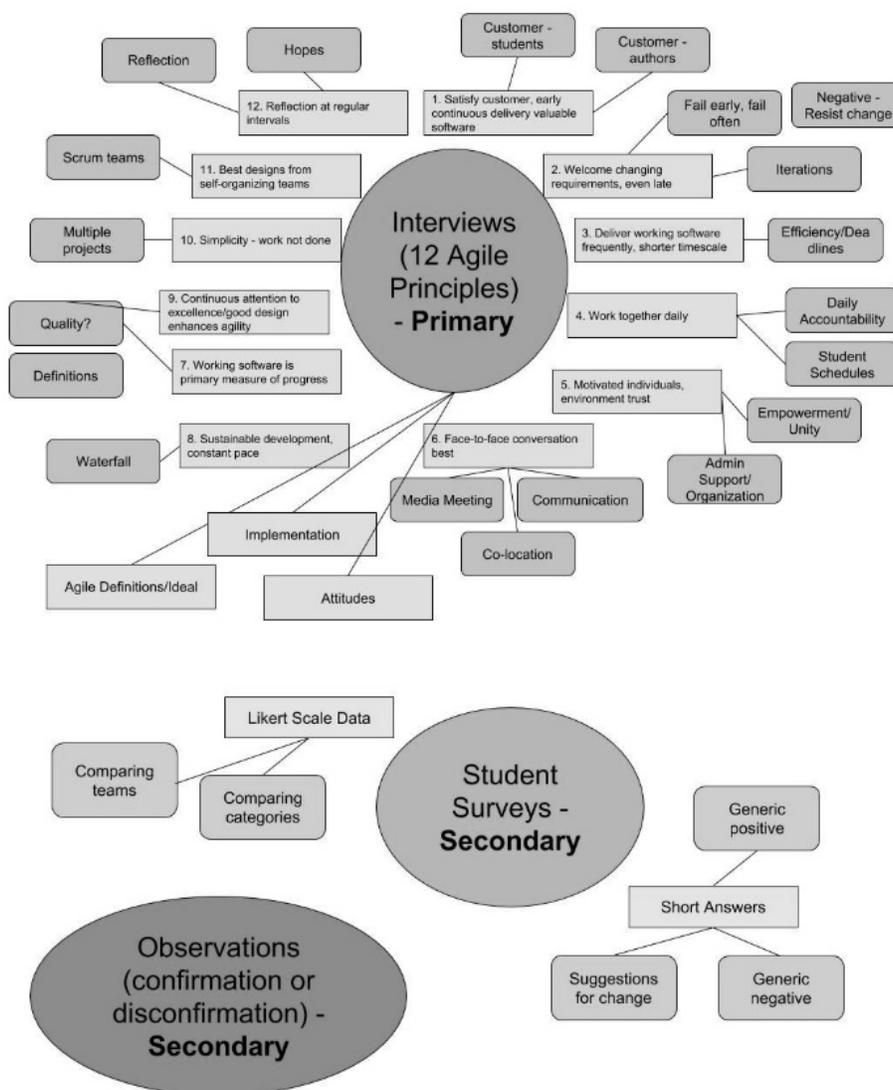
1. What is going well in the Agile process for your team? What could be improved?
 - a. Reflection on student employee responses.
2. How do you define Agile development?
3. To what extent does your team implement Agile development principles as you understand them?
4. What prevents Agile development from being fully implemented in your context?
5. What differences do you see between the previous Waterfall approach to course development and Agile?
6. Have your perceptions of efficiency and of course quality changed with Agile? What could be improved?

Following the interview, stop the recorder and thank the designer for their time. Tell them that you will transcribe the interview and write a summary of the interview that includes direct quotations and send it to the designer for their feedback (i.e., member checking).

APPENDIX D

Thematic Network Analysis, Initial Version

Following my descriptive coding for themes, I began to see connections to the 12 principles of Agile as organizing themes and came up with this initial thematic network analysis. The next page shows how I adjusted the organization of the themes in the final version of the thematic network analysis.



APPENDIX E

Thematic Network Analysis, Final Version

The final version of my thematic network analysis, which framed the Results of this case study.

