Agile Course Design: Multi-University Faculty Collaboration to Design the MIS Course for an Online MBA Program

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ABSTRACT

This paper outlines a collaborative course design process to develop and implement a required IS course in an online cohort-based MBA program using principles of *The Agile Manifesto*. The primary goal of this study is to analyze how students in traditionally developed courses and those in collaboratively developed courses differ. Specifically, we sought to reduce variability in student satisfaction across multiple sections offered by instructors who hail from different universities. We compared three semesters of students who took the course before (n = 101) and after (n = 162) use of the agile course development process. We found less variability in student evaluations in the 'after' group as compared to the 'before' group, providing support that the agile course development process provided a more consistent and similar experience for students. The second goal is to evaluate changes in student evaluations, comparing 'before' and 'after' groups. We did not expect to see substantial improvement since all instructors already received very high evaluations. Scores for all questions on the student evaluations increased after using the agile process, but the increases were not statistically significant. The final goal is to prepare an agenda for future research on agile course development based on components of *The Agile Manifesto* that were not used in the course development process. Opportunities include: comparing the agile course development process to other methods; adding more targeted questions to the student survey to better gauge changes in student satisfaction; partnering with alumni, current students, and industry to develop more relevant course material; and extending the process to other contexts.

Keywords: Agile course development, Collaborative course design, Online degree, Graduate course, Course evaluation, Curriculum design & development

1. INTRODUCTION

Public state universities continue to face stiff competition and reduced funding, requiring novel approaches to recruit and retain students. Colleges that offer the MBA program, in particular, are undergoing a paradigm shift. While traditional U.S. MBA programs have seen reduced applications (Selingo, 2018), online MBA programs have experienced rapid growth. In 1988, only three U.S. programs offered fully online MBA programs; in 2020, *U.S. News & World Report* ranked 335 online MBA programs (Online MBA, 2020), leading to increased competition and a "crowded and commoditized" (Byrne, 2018) product. Costs for MBA programs are substantial, with students spending, on average, about $80,000 (Dumont, 2018). Clearly, programs must find a way to stand out from the competition.

Along with a crowded market, MBA programs contend with a rapidly changing student population – increasingly mobile, with diverse work experiences (Mast et al., 2018), and with different online learning styles (Min et al., 2018). If we fail to engage potential MBA students, they may revisit the buyer's market.

One area where programs may stand out from competitors is through relevant, interesting, and consistent courses. While courses are usually designed by individual faculty members, consistency challenges may emerge when numerous instructors teach the course, particularly if the instructors are from different universities. Complexity increases with changes in delivery format (face-to-face, hybrid, and online), use of different course management systems, varying degree requirements, and rapid textbook updates amidst the reality of decreased funding for public universities. Facing such challenges, we sought to discover if collaborative course development techniques would improve course delivery of an information systems (IS) course in the online MBA program – one spanning numerous instructors from several universities and across several semesters. We chose to use a novel approach to design and develop the course: an agile collaboratively developed course (ACDC) design process. Agile concepts are not new, but

applying them to academic course design and development is a fresh approach.

The context of this analysis is a required IS course in an online MBA program offered by a statewide consortium of five public universities from which faculties are drawn to deliver the course in a completely online format. In general, 3-4 sections of the course are offered in each of the three semesters of a calendar year. A typical class is 30-40 students who are working professionals with 3-10 years of work experience.

Repenning, Kieffer, and Repenning (2018) note that the use of the agile method outside of software development has yet to be proven. Here we take a first step toward using an agile curriculum design and development approach for the IS course in an online MBA program. This approach meets the call for collaborative efforts between universities, as recommended by Mat, Noor, and Mohemad (2018), with similarities to the inter-professional team model proposed by Varagona et al. (2017). Through collaboration, we sought to "balance unpredictable and predictable specifications" (Pinar, Valabik, and Cagiltay, 2009, p. 233) in the course development process. Course development contains a mix of well-defined steps (e.g., quizzes, coverage of information in chapters) and non-routine tasks (e.g., objective grading, solving student problems). In such an environment, cross-training and collaboration are likely to lead to increased flexibility and the ability to adapt quickly as needed (Repenning, Kieffer, and Repenning, 2018). These outcomes are beneficial for scaling up in times of growth and for adjusting to natural changes in staffing, such as attrition or reassignment.

In this study, five faculty members from three universities worked together to develop an improved, consistent, and relevant IS course in an online MBA program that is cohort-based and follows an accelerated path to degree completion. The champion of the ACDC approach was the course coordinator, who was significantly involved in the development and passionate about the value of the course itself, qualities recommended for success in ACDC opportunities (Varagona et al., 2017). We outline an ACDC development process to assess the consistency of course delivery and evaluate changes in

student satisfaction. We begin with a discussion outlining agile course development.

2. AGILE COURSE DEVELOPMENT

In recent years, the term "agile" has expanded from being exclusively used in software development toward mainstream management strategy, with the idea to use agile practices in all areas of the organization (Staying Agile, 2019). We concur and move toward a method of collaborating across universities, with diverse faculty members, while using components of an agile course development process. We believe that having members from different backgrounds is a strength for our agile course development, as Varagona et al. (2017) suggest, and not a weakness. We reviewed relevant literature and the oft-cited *Agile Manifesto* (The Agile Manifesto, 2001) to guide the course development process as we collaborated.

Very little research examines what we are proposing – faculty-to-faculty and university-to-university collaborations to design, develop, and implement a consistently applied IS graduate course. Collaboration in the classroom is not new for students; for years, paired programming techniques have demonstrated better results than individuals who work alone (Chen and Rea, 2018). However, few studies have looked at how faculty members may "pair" together in collaborative course development opportunities, even though Durdu, Yalabik, and Cagiltay (2009) suggested that multi-university collaborations may be particularly important for making use of the best resources in online course development. While Trammell and colleagues (2018) described the process of cross-university collaborative course design for one undergraduate required course, they did not apply the process to other courses, graduate or not. Similarly, Linden (2018) used a Scrum process to facilitate introductory programming courses, giving students more perceived control over their environment. Outside of IS, the field of instructional design has begun to apply software engineering principles to course design with some success (Adnan and Ritzhaupt, 2018). However, research is limited and is applied across multiple course contexts and numerous disciplines, leading to fragmented and non-cumulative results that may suffer from low external validity. A research agenda, based on sound analysis of current and future course development opportunities, may provide starting points to discover the value of integrating agile into course development endeavors.

This research assesses course materials developed using an agile approach while evaluating consistency across multiple sections of the IS course in the MBA program, as reflected by less variability in student evaluation scores. A secondary goal is to assess increases in student evaluations. While some may question why higher student evaluations were not a primary goal, our situation was unique in that instructors already had very high scores on student evaluations (>4.0/5.0), irrespective of individual performance expectations, tenure status, rank, or other methods of categorizing a diverse group of professors. Even so, we felt compelled to analyze student evaluations to assess potential improvements after using the ACDC process and encourage others to do so as well. In addition, as the third goal of this project, we sought to outline a much-needed research agenda for the future, which will allow researchers to

focus on areas of the agile method in course development in a repeatable, less-fragmented manner.

As we thought about agile components to use in the course development process, we considered the 4 values and 12 principles of *The Agile Manifesto* (http://agilemanifesto.org/). The values include individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change over following a plan. The values of *The Agile Manifesto* help to set the context for our project, as described in the next section.

2.1 Values
The *first value* calls for natural interactions between people working together in a group. In the ACDC process, we allowed instructors to develop curriculum based on their passion, as opposed to content mandated by the textbook. Thus, we chose the professor best suited to develop content for modules, and then we used the best-of-the-best assignments, discussion boards, and tests. Since professors focused on areas in which they had expertise and passion, the interactions were natural between the professors. The above supports our idea of developing the course in terms of modules where the best person develops the module in an area where s/he has superior knowledge, skill, and/or experience.

The *second value* of *The Agile Manifesto* is an emphasis on working software over comprehensive documentation; similarly, we sought to publish each of our individual modules as quickly as possible, but while ensuring the quality of the product, as opposed to reviewing and approving individual modules on a silo basis. All faculty members reviewed each of the modules in a shared "sandbox." Our sandbox was similar to the series of prototypes used by Durdu, Yalabik, and Cagiltay (2009) to decrease errors and increase usability. Students were not beta testers; other faculty members were.

The *third value* is customer collaboration over contract negotiation. For our purposes, the customer is multi-faceted and includes: 1) different home universities, colleges, and departments; 2) current students; 3) alumni; 4) the business community; and 5) accrediting boards. While we did not collaborate with outside customers, we treated the instructors as internal customers, seeking to produce high-quality work with few errors.

The *fourth value* is responding to change over following a plan. IS curriculum, in particular, must be ready to adapt to changing technology tools, techniques, and updated guidelines for software engineering, programming, database development, and social media, among others; thus, we sought to develop a course that exhibits currency while covering all required components of the course. As described in the next section, after using components of *The Agile Manifesto* values to form our team and set ground rules for interactions, we then used the 12 principles to outline hypotheses tested in this study. Further, we also identify propositions associated with the principles to be used as input for a future research agenda.

2.2 Agile Principles and Hypotheses/Propositions
The *first principle* emphasizes the satisfaction of the customer. We focused primarily on delivering consistent student perceptions across sections. In limited prior research evaluating collaborative course development, Aiken et al. (2016) showed

that students in collaboratively designed courses have higher levels of satisfaction and rated professors higher than other students. We believe that in our case, students will more consistently respond – in a positive way – to end-of-course evaluations, thus reducing variability among instructors teaching the course. Further, we evaluated the student responses to see if Aiken and colleagues' (2016) findings would be repeated in our unique instance where instructors already receive very high scores. Thus, using student satisfaction with the course and student satisfaction of the instructor as a surrogate for the customer, we hypothesize:

Hypothesis 1a: Students in the ACDC will demonstrate more consistency of satisfaction with the course than students in the traditional course.

Hypothesis 1b: Students in the ACDC will have more positive ratings of satisfaction with the course than students in the traditional course.

Hypothesis 1c: Students in the ACDC will demonstrate more consistency in satisfaction with their instructor than students in the traditional course.

Hypothesis 1d: Students in the ACDC will have more positive ratings of satisfaction with their instructor than students in the traditional course.

The **second principle** requires participants in the agile process to embrace changing requirements at any stage; thus, faculty members need to be flexible and fast to be agile (Repenning, Kieffer, and Repenning, 2018). While we were unable to test this principle in the ACDC, future researchers may assess the following proposition:

Proposition 1: Faculty members using the ACDC process respond more quickly to errors in the course than those using a traditional course development process.

The **third principle** states that project groups should deliver products with higher frequencies, akin to the delivery of "small releases" that Arimoto, Barroca, and Barbosa (2016, p. 218) suggest. In addition, products (courses) should be deployed in a manner that is rapidly scalable (Adnan and Ritzhaupt, 2018). While we did not have enough data to test this principle, we recommend testing the following proposition:

Proposition 2: ACDCs will be delivered on time or early more often than those designed using the traditional course development approach.

The **fourth principle** states that stakeholders and developers should collaborate closely on a daily basis. Through interaction and communication among the course development team, a collaborative environment is likely to be achieved (Arimoto, Barroca, and Barbosa, 2016). When collaborative efforts include industry partners, it is more likely that the curriculum will align with business needs (Tan, Nakata, and Paul, 2018). For instance, current IS industry needs include data analytics, business intelligence, and information security; thus, collaborating with industry partners who are leaders in the field

may be beneficial. Further, collaborating with the student stakeholders may also be beneficial, allowing course developers to engage with stakeholders who will actually take the course and who may have different expectations and needs than industry partners. While we were not able to test the fourth principle, we propose:

Proposition 3: ACDC teams who collaborate with industry partners, current student stakeholders, alumni, accreditation agencies, and/or Advisory Boards will be more effective than ACDC teams who do not collaborate and/or traditional course development teams who do/do not collaborate.

The **fifth principle** states that all stakeholders and team members should remain motivated and be given the support they need for optimal project outcomes. In IS-related fields, in particular, quickly changing technology complicates course development (Parker, Patton, and O'Sullivan, 2016). Students want and need the latest technology and support when problems arise, but faculty members may have inadequate training to prepare effective online course delivery (Scoppio and Luyt, 2017); as a result, universities should be prepared to fund professional development opportunities for faculty members who seek to be effective online course developers, as recommended by Kio, Lau, and Virgina (2017) and Rhode and Krishnamurthi (2016). A partnership between faculty members and instructional designers may offer improved course development (Durdu, Yalabik, and Cagiltay, 2009). In addition, funding for student access to relevant tools, such as SAP University Alliance, is costly. In an ACDC model with multiple faculty members and spanning several universities, support for online course development becomes more complex. Thus we propose:

Proposition 4: ACDC teams who receive adequate resources will be more likely to achieve success using the ACDC process than ACDC teams without resources and/or traditional teams with/without resources.

The **sixth principle** states that face-to-face (F2F) meetings are the best way to communicate. We considered the following interactions: faculty-to-faculty (as part of the ACDC team), faculty-to-student (F2S) interactions through the course management system, student-to-student (S2S) interactions within groups, and student-to-student (S2S) interactions beyond their own groups. While we concede F2F meetings provide rich data in all interactions, they are not available in contexts such as ours. Simply stated, it is difficult to find a time for students to meet face-to-face; similarly, daily meetings between students and faculty members are difficult to schedule due to geographical, time, and situational contexts. Varagona et al. (2017) recognized the difficulty of finding a suitable time and location to meet, and this is particularly true for diverse teams of students and faculty members from different universities. In recognition of limitations that may make F2F interactions difficult, Mast et al. (2018) recommend monthly meetings and engagement opportunities for faculty members to promote the team process. As virtual classes become even more of a reality, inclusions of options to meet virtually should be explored in the context of *The Agile Manifesto*. Careful research

into how geographically dispersed teams are able to overcome challenges of in-person meetings through the use of technology is thus an interesting avenue of future research, and we propose:

Proposition 5: In a completely online instructional environment, faculty teams who use effective communication strategies will be more likely to achieve success using an ACDC model, as compared to ACDC and traditional teams who do not communicate effectively.

Applying the **sixth principle** to the student viewpoint becomes complicated, particularly when the course and program are offered completely online and when students and faculty members are widely dispersed. We contend that, even in the virtual classroom, there are interaction opportunities and that using an ACDC process will naturally lead to more such opportunities. Since online courses lack the F2F feedback and participation of in-person classes, we should consider how to engage students using S2S and S2F interactions (Wu et al., 2016). Further, like many MBA programs, we use group work as an important component of the program. Thus, we recommend extending engagement to include within-team interactions along with interactions with other students outside of their normal teams, both in the ACDC and traditional contexts. Research has shown that courses that are more interactive tend to have higher student performance (Dishman, 2018; Pour et al., 2018) and that properly designed group projects positively influence student motivation, student and group cooperation, and other interpersonal skills (Johs-Artisensi and Olson, 2017; Shin, 2018). Elements that humanize the course, including providing opportunities for numerous interactions among and between students and faculty members, have been shown to improve student performance (Dishman, 2018; Pour et al., 2018). Thus we evaluated responsiveness and timeliness of interactions between the faculty and students using the following hypotheses:

Hypothesis 2a: Students in ACDCs will more consistently agree that the instructor was timely in responding to requests than their peers in courses developed in a traditional manner.

Hypothesis 2b: Students in ACDCs will more positively agree that the instructor was timely in responding to requests than their peers in courses developed in a traditional manner.

Hypothesis 2c: Students in ACDCs will more consistently agree that grades were returned in a timely fashion than their peers in courses developed in a traditional manner.

Hypothesis 2d: Students in ACDCs will more positively agree that grades were returned in a timely fashion than their peers in courses developed in a traditional manner.

Hypothesis 2e: Students in ACDCs will more consistently agree that the level of interaction with the instructor was appropriate as compared to students in courses developed using a traditional method.
Hypothesis 2f: Students in ACDCs will more positively agree that the level of interaction with the instructor was

appropriate as compared to students in courses developed using a traditional method.

Hypothesis 2g: Students in ACDCs will more consistently agree that they received constructive feedback on their returned work than students in traditional courses.

Hypothesis 2h: Students in ACDCs will more positively agree that they received constructive feedback on their returned work than students in traditional courses.

The **seventh principle** states that the measure of success is a final working product. We defined a final working product as one where: a) a course plan is followed and b) course materials add value beyond the text. By using the ACDC, we sought more consistent results across professors, semesters, and universities; further, we evaluated changes in student satisfaction. Thus, we hypothesize:

Hypothesis 3a: Students in ACDCs will more consistently agree that the course plan is followed as compared to students in traditional courses.

Hypothesis 3b: Students in ACDCs will more positively agree that the course plan is followed as compared to students in traditional courses.

Hypothesis 3c: Students in ACDCs will more consistently agree that the course materials add value beyond the text than students in traditional courses.

Hypothesis 3d: Students in ACDCs will more positively agree that the course materials add value beyond the text than students in traditional courses.

The **eighth principle** involves sustainable development, where teams and stakeholders are able to maintain a constant and ongoing pace with updates to the course, technologies, and/or requirements delivered promptly and with high quality. While sprints may take place throughout the agile process, a long-term pace that can be sustained across all faculty members and all universities is desired (Arimoto, Barroca, and Barbosa, 2016). Faculty members often carry heavy teaching workloads (Varagona et al., 2017) across and within universities and must negotiate workload models that will sustain long-term course development. Since we only compared faculty members over a short period of time, we were unable to compare before and after components of sustainable development. Thus, we propose:

Proposition 6: Faculty teams using ACDCs will practice better sustainability of the pace of development as compared to their peers using traditional methods of course development.

The **ninth principle** expands on the definition of agility, noting the importance of technical excellence and proper design. For course development, unambiguous assessment mechanisms are needed since online students lack the feedback normally received from faculty members in a F2F setting (Chang, 2010). Clear guidelines have the added benefit of

improved management of course content and design. Agile processes need refinement over time, with regular testing to ensure high quality (Arimoto, Barroca, and Barbosa, 2016) and continuous improvement over time. Similarly, effective online courses must be error-free and secure (Dishman, 2018; Pour et al., 2018) for all sections. Thus, we hypothesize:

Hypothesis 4a: Students in ACDCs will more consistently agree that the course has clear grading guidelines than students in traditional courses.

Hypothesis 4b: Students in ACDCs will more positively agree that the course has clear grading guidelines than students in traditional courses.

The ***tenth principle*** says that simplicity is essential, with minimal rework. The reuse of common elements makes financial and practical sense (Durdu, Yalabik, and Cagiltay, 2009; Parker et al., 2016), particularly with multiple instructors who are geographically dispersed. The same has also been proposed as an essential method of increasing the availability of open resources (Arimoto et al., 2016), to capitalize on faculty members' areas of expertise (Kio, Lau, and Virginia, 2017; Mast et al., 2018), and as a method of applying the agile approach to instructional design (Douglas, 2006). Adnan and Ritzhaupt (2018) suggest that the development of small, reusable modules could be successfully applied to instructional design. While we were unable to gather sufficient data to analyze before and after perceptions of success, in the traditional and ACDC models, we propose:

Proposition 7: ACDC teams will practice more reusability among course elements than teams using the traditional method to design courses.

The ***eleventh principle*** states that self-organizing teams are most likely to develop the best designs and meet requirements.

Hoda, Noble, and Marshall (2012) assert that self-organized teams must have a balance between freedom to make decisions and expected team responsibility; further, they suggest that self-organizing teams, which by their definition possess a variety of skills, are not appropriate when the amount of change is small. In our study, we needed highly qualified professors working in self-organized teams to create updated individual modules based on areas of expertise, as recommended by Mast et al. (2018). However, it is vital to avoid a silo approach to course development (Varagona et al., 2017). While our sample was too small to collect perceptions of quality before and after implementation of the ACDC, we propose:

Proposition 8: Self-organizing faculty teams using agile methods of designing curriculum will develop better designs than self-organizing faculty teams using traditional methods of course development.

The ***twelfth and final principle*** states the importance of regular refinement and modifications to improve efficiency. Pour et al. (2018) recommend a review of course materials at least once a semester, while Arimoto, Barroca, and Barbosa (2016) called for iterative modeling and testing and making small changes to improve part of the solution delivered. While our before and after teams were too small for testing, we propose:

Proposition 9: Faculty teams using ACDC models will make modifications to the course more often than traditional course development teams.

Table 1 shows Hypotheses 1a-4b for the relevant principles of *The Agile Manifesto*, while Table 2 shows Propositions 1-9, outlining a future research agenda for courses developed using an agile methodology.

Agile Principle Applied to Course Development	Hypotheses *Compared to their peers in courses developed in traditional manners, students in ACDCs will…*	Measured by
1 – Customer satisfaction is our highest priority 2 questions	*Hypothesis 1a:* Demonstrate more consistency of course satisfaction. *Hypothesis 1b:* Exhibit more positive ratings of course satisfaction. *Hypothesis 1c:* Demonstrate more consistency in instructor satisfaction, *Hypothesis 1d:* Exhibit more positive instructor satisfaction.	Reduced variability: Overall, this course was a very effective learning experience. Q3 (Hypothesis 1a) Overall the Instructor was effective. Q9 (Hypothesis 1c) Improved student evaluations Overall, this course was a very effective learning experience. Q3 (Hypothesis 1b) Overall the instructor was effective. Q9 (Hypothesis 1d)
6 – Communicate F2F as often as possible. 8 questions	*Hypothesis 2a:* More consistently agree that the instructor was timely in responding to requests. (Q4) *Hypothesis 2b:* More positively agree that the instructor was timely in responding to requests. (Q4) *Hypothesis 2c:* More consistently agree that grades were returned in a timely fashion. (Q7) *Hypothesis 2d:* More positively agree that grades were returned in a timely fashion. (Q7) *Hypothesis 2e:* More consistently agree that the level of interaction with the instructor was appropriate. (Q5) *Hypothesis 2f:* More positively agree that the level of interaction with the instructor was appropriate. (Q5) *Hypothesis 2g:* More consistently agree that where appropriate, returned work contained constructive feedback. (Q8) *Hypothesis 2h:* More positively agree that where appropriate, returned work contained constructive feedback. (Q8)	Reduced variability between sections: The instructor was timely in responding to my requests. Q4 (Hypothesis 2a) Grades were returned according to expectations outlined in the syllabus. Q7 (Hypothesis 2c) The level of interaction with the instructor was appropriate for this course. Q5 (Hypothesis 2e) Where appropriate, returned work contained constructive feedback. Q8 (Hypothesis 2g) Improved student evaluations: The instructor was timely in responding to my requests. Q4 (Hypothesis 2b) Grades were returned according to expectations outlined in the syllabus. Q7 (Hypothesis 6d) The level of interaction with the instructor was appropriate for this course. Q5 (Hypothesis 6f) Where appropriate, returned work contained constructive feedback. Q8 (Hypothesis 6h)
7 – Measure of success is a final working product 2 questions	*Hypothesis 3a:* More consistently agree that the course plan is followed as compared to students in traditional courses. *Hypothesis 3b:* More positively agree that the course plan is followed as compared to students in traditional courses. *Hypothesis 3c:* More consistently agree that the course materials add value beyond the text than students in traditional courses. *Hypothesis 3d:* More positively agree that the course materials add value beyond the text than students in traditional courses.	Reduced variability between sections: The course plan was followed. Q1 (Hypothesis 7a) The course materials added value beyond the text. Q2 (Hypothesis 7c) Improved student evaluations: The course plan was followed. Q1 (Hypothesis 7b) The course materials added value beyond the text. Q2 (Hypothesis 7d)
9 – Continued focus on technical excellence and proper design 2 questions	*Hypothesis 4a:* Students in ACDCs will more consistently agree that the course has clear grading guidelines than students in traditional courses. *Hypothesis 4b:* Students in ACDCs will more positively agree that the course has clear grading guidelines than students in traditional courses.	Reduced variability between sections: The course grading criteria were clear. Q6 (Hypothesis 9a) Improved student evaluations: The course grading criteria were clear. Q6 (Hypothesis 9b)

Table 1. Hypotheses: ACDC Development vs. Traditional Course Development Process

Agile Principle Applied to Course Development	Proposition	Suggestions for Measurement
2 – Embrace change to meet customer demands.	*Proposition 1:* Faculty members using the ACDC process respond more quickly to errors in the course than those using a traditional course development process.	Compare ACDCs to traditional course development: • Speed of responding to errors • Ability to scale up when needed • Adoption of new textbooks without problems
3 – Deliver projects early, as quickly as possible.	*Proposition 2:* ACDCs will be delivered on time or early more often than those designed using the traditional course development approach.	Compare ACDCs to traditional course development: • Were all components, including modules, assignments, quizzes, and discussion boards, delivered on-time or early? • How many components delivered on-time or early?
4 – Business people and developers need to work closely together.	*Proposition 3:* ACDC teams who collaborate with industry partners, current student stakeholders, alumni, accreditation agencies, and/or Advisory Boards will be more effective than ACDC teams who do not collaborate and/or traditional course development teams who do/do not collaborate.	Compare the effect of industry partners in ACDC vs. traditional design: • Industry input leads to a more relevant curriculum • Collaboration with accreditation agencies improves learning outcomes • Consultation with Advisory Boards for more relevant courses • Link with current, former, and future students to gain input into curriculum
5 – Keep stakeholders and team members motivated, and give them the support they need.	*Proposition 4:* ACDC teams who receive adequate resources will be more likely to achieve success using the ACDC process than ACDC teams without resources and/or traditional teams with/without resources.	Compare ACDC teams with resources to ACDC teams without resources and/or to traditional course development with and without resources: • Do more resources equate to more success? • Does more funding for professional development opportunities lead to more success? • Does access to current technology products lead to more success? Does more travel funding lead to more success? • Does integration of relevant/updated technologies into the course lead to more success? • Does instructional design support lead to success?
6 – Communicate F2F as often as possible.	*Proposition 5* In a completely online instructional environment, faculty teams who use effective communication strategies will be more likely to achieve success using an ACDC model, as compared to ACDC and traditional teams, and who do not communicate effectively.	Comparisons of outcomes with/without F2F interactions: Do agile teams have better outcomes with more/less/the same amount of F2F communications as other agile teams and/or other traditional course content development teams?
8 – Use sustainable development at a constant and ongoing pace.	*Proposition 6:* Faculty teams using ACDCs will practice better sustainability of the pace of development as compared to their peers using traditional methods of course development.	Compare the sustainability of ACDCs vs. traditional course development time to: • Implement new components, including assignments, discussion boards, and quizzes • Implement changes to components • Resolve errors • Integrate new faculty members into the team
10 – Practice simplicity, maximizing the work that is not done.	*Proposition 7:* ACDC teams will practice more reusability among course elements than teams using the traditional method to design courses.	Comparison of ACDCs to traditional course development in terms of reusability: • Consistency of sections across instructors, semesters, and universities, with a similar look-and-feel • Use of similar widgets and icons consistency
11 – Self-organizing teams are likely to develop the best designs and meet requirements.	*Proposition 8:* Self-organizing faculty teams using agile methods of designing curriculum will develop better designs than self-organizing faculty teams using traditional methods of course development.	Comparison of ACDC designs vs. traditional course development designs: • Student experiences with and without ACDC design • Student opinion regarding course design

Agile Principle Applied to Course Development	Proposition	Suggestions for Measurement
12 – Regularly refine the course.	*Proposition 9:* Faculty teams using ACDC models will make modifications to the course more often than their traditional counterparts.	<u>Comparisons of ACDCs to traditional course development:</u> • Course updates after the semester starts and ends • Course updates in response to student comments

Table 2. Proposed Research Agenda: ACDC vs. Traditional Course Development Process

3. METHOD

3.1 Survey

All students in all sections of the course were invited to participate and received an online link to access the survey (instructions to students and the survey instrument are shown in the Appendix). Reminders were sent to encourage high response rates. All student responses were blinded, and IP addresses were not collected. We had a unique opportunity to compare using the same set of instructors teaching the same course in the online MBA program. The instructor team was highly motivated prior to the ACDC process and used a traditional method of developing curriculum; thus, we were able to compare apples to apples.

The student survey is similar in format and structure to the traditional end-of-course evaluations. Students were asked to evaluate nine statements regarding the course and instructor, using a Likert Scale of 1 = "Strongly Disagree" to 5 = "Strongly Agree." Student evaluations were completed by the last day of class prior to final exams. Faculty members received course evaluations after grades were posted. The nine survey questions were used to test hypotheses to assess the effectiveness of using components of the agile method for course development.

3.2 Participants

We did not gather demographic information for the anonymous course evaluations but do know a few general characteristics of the students. The program is cohort-based and follows an accelerated path to degree completion. Prior to beginning, the students attend an in-person seminar and select groups; these groups are used throughout the program. All students in the program have a Bachelor's degree along with two or more years of professional business experience; they must meet admissions requirements – which vary among the participating universities – but which include good undergraduate GPAs and GMAT scores. Admission requirements for the before and after students were essentially the same.

During the Fall, Spring, and Summer semesters before the implementation of the ACDC, 101 students responded to the course evaluation request; for three semesters after implementation (the following Fall, Spring, and Summer), 162 students responded to the course evaluation request.

Overall response rates were high, as shown in Table 3, with 87.1% and 61.1% of students in the before and after groups completing the survey. These response rates are higher than typical student evaluations in online classes, which range from 50-60% (Weimer, 2016); very low response rates may bias the data (Goos and Salomons, 2017) which is not a significant problem in this study. We are unsure why the after group had a lower response rate than the before group; there were no

significant changes in survey delivery, although there were more students, applications, and enrollees in the program.

Semester	Response Rate (Before)	Response Rate (After)
Fall	85.0%	44.8%
Spring	92.1%	91.7%
Summer	70.0%	55.7%
Overall	87.1%	61.1%

Table 3. Response Rates

4. RESULTS

When determining the success of the ACDC process, we collected and carefully reviewed student evaluations, as recommended by Mast et al. (2018), to assess the effectiveness of the changes we made. Most distributions of student ratings are non-normally distributed, with more positive ratings than negative ratings (Linse, 2017), and with almost all responses either 3, 4, or 5 on a 5-point scale, following a similar positive skewness seen in typical student evaluations (McCullough and Radson, 2011). Thus, our data had multiple indications of non-normality, requiring additional investigation.

4.1 Normality Assessment

Prior to testing the hypotheses, we had to assess normality. Two methods to evaluate normality are skewness and kurtosis. In general, for skewness and kurtosis, researchers propose that non-normality is likely at absolute scores of 1 or higher (Bulmer and Herzberg, 1979; Hair, 2017), 1.5 or higher (Tabachnick and Fidell, 2013), or up to 2.0 (George and Mallery, 2010); further, the absolute values of all of the individual items should be less than 2 to support normality (George and Mallery, 2010; Tabachnick and Fidell, 2013).

4.1.1 Skewness. Our sample showed significant departures from normality, with absolute values of skewness ranging from 1.7 to 3.4, and with 11 of the 18 scores at or above 2. With the heuristics previously discussed, our distribution is likely to be non-normally distributed.

4.1.2 Kurtosis. While many researchers report on kurtosis, they likely mean the *excess* kurtosis, which should be close to 0; for simplicity, we report the excess kurtosis in our assessment and use the term kurtosis for simplicity. The kurtosis in our study ranged from 2.2-14.7, too high for all of the researchers mentioned previously, indicating that we likely have a leptokurtic distribution with more extreme values than found in a normal distribution (Hopkins and Weeks, 1990). The skewness and kurtosis values, along with our awareness that student evaluations are typically non-normally distributed, led

us to conclude that our sample is not likely to be normally distributed. Thus, we investigated transforming the data.

4.2 Transformation

The first goal of our paper is to assess variation among instructors. When estimating variances, in particular, a distribution that is not normal may have a significant effect on the analysis and may lead to erroneous conclusions (Box, 1953); thus, we chose to transform the data with the hopes of obtaining a normal distribution.

We transformed the data by creating a reflective variable, taking the log of the reflective variable, as well as squaring the reflective variable. The log transformation provided the best results by cutting the skewness to a range of 1.0-2.3. With several individual scores at or above 2, however, there continues to be a high likelihood that our sample is non-normally distributed.

Similarly, after transformation, kurtosis was cut substantially with a range from 0.78 to 0.96, values which are close to 1, indicating that the transformed kurtosis has an improved chance of failing to reject the null hypothesis that the sample is normally distributed; unfortunately, the skewness is less clear-cut. Moreover, we know that, historically, student evaluations tend to be non-normal. Further, some authors (Robert, 2018) suggest cautious use of transformed data. Thus, we tested the original data, which is likely non-normally distributed, and the transformed data, which has more likelihood of being normal, to discover differences in means.

4.3 Hypothesis Testing and Analysis

For the original data, Levene's test indicated unequal variances ($F = 4.0$ to 7.4, $p = 0.002$ to 0.047) with the after responses

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($M = 4.51$ to 4.77, $SD = 0.6$ to 1.1) exhibiting less variance than the before responses ($M = 4.27$ to 4.64, $SD = 0.6$ to 0.8). When we tested the transformed data, which is more likely to be normally distributed than the original data, Levene's test again indicated unequal variances ($F = 3.2$ to 11.8, $p = 0.001$ to 0.074), with the after responses ($M = 0.14$ to 0.3, $SD = 0.3$ to 0.5) exhibiting less variance than the before responses ($M = 0.2$ to 0.4, $SD = 0.3$ to 0.4). Thus, testing was consistent, whether the data was transformed or not. These results demonstrate support for Hypotheses 1a and 1c; 2a, 2c, 2e, and 2g; 3a; and 4a, as shown in Table 4.

Since we were unable to obtain a normal distribution, we ran the non-parametric Kruskal-Wallis Test, which does not require normality, to assess for differences in mean scores on student evaluations. Overall, no differences were indicated between student evaluations before and after the ACDC was implemented (Chi-square = 0.003 to 4.6, $p = 0.214$ to 0.96, df = 1), failing to support Hypotheses 1b and 1d; 2b, 2d, 2f, and 2h; 3b; and 4b, as shown in Table 4. While the before and after evaluations showed no statistically significant differences, it is of note that all of the after scores were higher than the before scores. Before scores ranged from 4.27 to 4.64 (out of 5), while after scores ranged from 4.51 to 4.77. While the increases were not statistically significant, they may be practically significant, in that improvements shown in the range between before and after may help faculty members achieve higher ratings on annual reviews and better reviews for promotion and tenure. Taken together, these results indicate that the use of the ACDC process was positively associated with improved consistency across sections, instructors, universities, and semesters, but was *not* associated with statistically higher student evaluations.

Hypothesis	Before, n = 101		After, n = 162		
As compared to their peers in courses developed in a traditional manner, students in the ACDC will:	Mean	Standard Deviation/ Variance	Mean	Standard Deviation/ Variance	p-value
Hypothesis 1a: Be more consistently satisfied with the course. (Q3)	4.37	1.007	4.51	0.790	0.028*
Hypothesis 1b: Be more satisfied with the course. (Q3)		1.014		0.624	NS
Hypothesis 1c: Be more consistently satisfied with their instructor. (Q9)	4.48	1.010	4.60	0.743	0.020**
Hypothesis 1d: Be more satisfied with their instructor. (Q9)		1.020		0.552	NS
Hypothesis 2a: More consistently agree that the instructor was timely in responding to requests. (Q4)	4.33	1.141	4.51	0.821	0.002**
Hypothesis 2b: More positively agree that the instructor was timely in responding to requests. (Q4)		1.302		1.217	NS
Hypothesis 2c: More consistently agree that grades were returned in a timely fashion. (Q7)	4.39	0.106	4.54	0.066	0.023*
Hypothesis 2d: More positively agree that grades were returned in a timely fashion. (Q7)		0.011		0.004	NS
Hypothesis 2e: More consistently agree that the level of interaction with the instructor was appropriate. (Q5)	4.38	1.103	4.56	0.780	0.002**
Hypothesis 2f: More positively agree that the level of interaction with the instructor was appropriate. (Q5)		1.217		0.608	NS
Hypothesis 2g: More consistently agree that where appropriate, returned work contained constructive feedback. (Q8)	4.53	0.095	4.65	0.058	0.037*
Hypothesis 2h: More positively agree that where appropriate, returned work contained constructive feedback. (Q8)		0.009		0.003	NS
Hypothesis 3a: More consistently agree that the course materials add value beyond the text. (Q2)	4.27	1.104	4.48	0.813	.010**
Hypothesis 3b: More positively agree that the course materials add value beyond the text. (Q2)		1.219		0.661	NS
Hypothesis 4a: More consistently agree that the course plan is followed. (Q1)	4.67	0.763	4.77	0.595	.047*
Hypothesis 4b: More positively agree that the course plan is followed. (Q1)		0.582		0.355	NS

Table 4. Hypotheses and Results

4.4 Research Agenda for ACDCs

Table 2 shows each of the propositions which form potential opportunities for research on using components of the agile method when designing course materials and are inputs to a research agenda for testing agile course development. **Principle 2** suggests that teams must embrace changing requirements and is associated with the following proposition:

Proposition 1: Faculty members using the ACDC process respond more quickly to errors in the course than those using a traditional course development process.

We were unable to test this proposition in our study. However, there are clear future research opportunities to assess the effectiveness of using an ACDC process to improve the timeliness of error correction as compared to using a traditional course development process. For instance, researchers could compare teams using the ACDC process to teams using traditional course development processes. Does the ACDC team respond more quickly to errors in the course, textbook, etc., reaching resolution more quickly than traditional course development teams? When students do report an error, how quickly do ACDC teams respond, as compared to traditional teams?

Principle 3 recommends early delivery of projects, or delivery as quickly as possible, given the resources available and the context, with the following proposition:

Proposition 2: ACDCs will be delivered on time or early more often than those designed using the traditional course development approach.

One way to evaluate this proposition would be to simply compare development time for ACDC teams and traditional teams, for the same or a similar course. Were all components available to students on-time or early? Does one group perform better than another? For instance, using the course management system, was everything available online at the beginning of the semester? If not, by what date was everything available? Did the ACDC team develop courses faster than those using a traditional method?

Principle 4 recommends that business people and developers (ACDC teams) should work closely together to deliver a superior product, as described in the following proposition:

Proposition 3: ACDC teams who collaborate with industry partners, current student stakeholders, alumni, accreditation agencies, and/or Advisory Boards will be more effective than ACDC teams who do not collaborate and/or traditional course development teams who do/do not collaborate.

This proposition offers an intriguing opportunity to compare ACDC teams to other ACDC teams and to traditional course development teams. Clearly, the stakeholders have different perspectives, and each of them may exert varying impacts and influences on the final course delivered. For instance, industry stakeholders may want students to achieve learning outcomes that meet organizational needs, while current students may desire to learn technology concepts and skills associated with job availability. In contrast, alumni may have different ideas of what is needed in the marketplace based on more experience. Advisory Boards may take a more regional perspective, if they are all drawn from the same area, while accreditation boards require certain elements of all universities that wish to be recognized (e.g., AACSB, SACs), often with a worldwide perspective. ACDC teams who are able to collect input from multiple perspectives may deliver a better product than ACDC teams who do not gather multiple perspectives. The product delivered can be assessed for relevance and the ability to achieve learning outcomes. It is likely that some collaborations are more effective than others when developing ACDCs, and future research could offer evidence on which groups are the most important collaboration opportunities when developing a relevant and rigorous curriculum.

Principle 5 recommends that stakeholders and team members should stay motivated and receive the resources needed, which guided the development of the following proposition:

Proposition 4: ACDC teams who receive adequate resources will be more likely to achieve success using the ACDC process than ACDC teams without resources and/or traditional teams with/without resources.

For instance, do ACDC teams who receive more support perform better than ACDC teams without sufficient resources and/or traditional teams with/without sufficient resources? Does funding for development opportunities and/or travel lead to better course designs, as opposed to ACDC teams without those resources? What happens if we compare traditional course development teams with and without funding to ACDCs with and without funding? Similarly, do professional development opportunities lead to more frequent integration of current technologies into the course as opposed to ACDC teams without such opportunities and/or traditional course development with/without professional development opportunities? By analyzing the link between resources and success, limited budgetary monies may be applied to the collaboration opportunities which are more beneficial.

Principle 6 advocates for frequent communication, with most of it being F2F. However, this principle is not available to online degree programs. Thus, we modified it, adding the following proposition:

Proposition 5: In a completely online instructional environment, faculty teams who use effective communication strategies will be more likely to achieve success using an ACDC model, as compared to ACDC and traditional teams who do not communicate effectively.

The goal here is to determine if it is possible for agile course development teams, in an online-only environment, to find effective ways of communicating – beyond F2F – and develop superior course content. Learning how different types of ACDC teams compare to ACDC teams who have substantial F2F contact would be interesting and might show that F2F communication, while laudable, is not required in agile course development. Indeed, as Millennials and tech-savvy professors come into academia over time, how do they use technology tools, such as WebEx, Slack, Teams, Zoom, etc., to overcome

the hurdle of F2F meetings? Perhaps technology has now developed effective methods of communication beyond F2F. Comparing courses developed with and without the agile method, and with instructors of varying generational groups, may provide interesting insights into alternative methods of communication in line with current technology capabilities, that may be as effective (or even more effective) than F2F.

Principle 8 affirms that agile teams should have a sustainable process that is able to be maintained over time at necessary rates. Hence, we proposed:

Proposition 6: Faculty teams using ACDCs will practice sustainability of the pace of development as compared to their peers using traditional methods of course development.

To investigate this proposition, we recommend comparing ACDC teams to traditional teams. How long does it take to add new components to the course management system, such as assignments, discussion boards, and quizzes? Are ACDC teams faster to integrate changes or updates into their courses as compared to traditional course development teams? When errors are identified, do ACDC teams resolve the error faster than their traditional colleagues? In addition, when textbook changes are made, how quickly is all of the information updated using the ACDC process as opposed to traditional course development?

Further, in terms of sustainability, can new faculty members be integrated into the ACDC team faster than in traditional teams? If so, it may ease the transition of new faculty members into an ACDC team, which helps them get up to speed faster than in traditional course development teams. Further, by working at a constant pace that is not comprised of too many "innovation sprints" (Ma and Morris, 2017, p. 92), is the ACDC team better able to scale, if needed, due to increased demand? In the COVID-19 pandemic, for instance, many universities moved their courses completely online, sometimes with only a few days to plan. Is an ACDC team better able to quickly respond to similar challenges? It may be interesting to evaluate if ACDC teams are more effective at designing F2F, hybrid, or completely online courses. In an environment that changes rapidly, using components of the agile method may prove superior to the traditional method; testing this proposition may provide key insights for deciding whether to move to an agile course development process.

Principle 10 emphasizes that agile teams should practice sustainability, maximizing the work that is done. Thus, we proposed:

Proposition 7: ACDC teams will practice more reusability among course elements than teams using the traditional method to design courses.

One method is to evaluate the consistency of elements across instructors, semesters, sections, and universities, with a similar look-and-feel, selecting the best elements from teammates to capitalize on strengths. Comparing other elements, such as widgets and icons, may provide evidence that ACDC teams practice reusability more often than their peers in traditionally developed course teams, and that the reusability leads to higher quality, more sustainable course development.

Principle 11 asserts that self-organizing teams are likely to develop the best designs, with the following proposition:

Proposition 8: Self-organizing faculty teams using agile methods of designing curriculum will develop better designs than self-organizing faculty teams using traditional methods of course development.

We suggest comparing ACDC designs against traditional course development designs. For instance, students may be surveyed about their opinion on the designs used in both types of classes, and then those opinions can be compared. Further, faculty peers may evaluate ACDC designs vs. traditional designs, providing another way to assess potential improvement in quality.

Finally, *Principle 12* calls for regular course refinements which maximize efficiency, which leads to the following proposition:

Proposition 9: Faculty teams using ACDC models will make modifications to the course more often than traditional course development teams.

ACDC teams, we propose, will remain vigilant, ensuring a high-quality product, more often than their counterparts, using the traditional course development model. An analysis of refinements during the semester, particularly when errors are found and resolved, may show that ACDC teams deliver better results over time.

Taken together, these propositions outline a research agenda for the future, evaluating whether agile course development teams are effective, better than their traditional counterparts, more sustainable and if we can apply the components of *The Agile Manifesto* to the course development process.

4.5 Overall
Our analysis supports that the use of ACDC teams provides a more consistent learning experience for students across numerous components. As such, it may be worth investigating if we should be using components of the agile method in multiple course development contexts. While students did not show statistically significant increases in satisfaction on the end-of-course evaluations, all of the results were higher.

5. DISCUSSION

5.1 Relevance to IS Education
We described a method of course development based on principles from *The Agile Manifesto*, seeking a more consistent learning experience across diverse professors, semesters, and universities. Our results indicated that students in the after group were more consistently satisfied with the course, the instructor, and all other items measured on the course evaluations as compared to the before group. The analysis also showed numerically higher raw scores for all items on the student evaluations after the ACDC was implemented, although these higher scores were not statistically significant. Further, even though we had little to no F2F meetings with the students, we still demonstrated improved consistency in perceived S2F interactions after implementing the ACDC. As colleges now

offer classes in numerous formats, F2F interaction simply is not possible for all students. Our study suggests that ACDC teams of professors, who work together to develop curriculum, lead to greater engagement and high levels of interactivity even in the online classroom and with diverse professors and universities. While we focused on designing a graduate-level IS course in an online MBA program, we believe that the ACDC process could be used in other IS classes, at the graduate or undergraduate level, and in different formats, such as F2F, hybrid, and online.

In this study, the instructors all received very high evaluations already – it is a requirement to teach in the online MBA program. It may be worthwhile to investigate whether an agile course development process may improve student satisfaction where instructors receive average (or below average) course evaluations. In fact, using an agile process for course development may be more helpful to instructors who tend to have less-satisfied student evaluations.

Using the ACDC format to develop a curriculum does not, however, mean that faculty members will be spending more time on course development than the traditional format. There are two reasons for this outcome: 1) faculty members design in their areas of expertise and 2) reuse saves time. We recommend forming an agile team with diverse experiences, areas of teaching interest, and areas of research interests. By forming an agile team with a mix of diverse areas of expertise, instructors may devote substantial time to doing what they enjoy and understand. For instance, in the graduate online IS course, one team member may work on project management, another on business intelligence, and others on security and ethics. When new courses are being prepared or major changes to a course are proposed, teams may need to undergo innovation sprints to rapidly move the course development process along; however, the need for sprinting should be minimized through proper planning and support from administrators. If it is not possible to find talented, passionate faculty members to teach modules, instructors may have to take an area that is not their favorite, which might lead to less enjoyment of the course development process, and potentially less effective implementations.

Reusability is a concept that is taught throughout IS programs; applying it to course design is therefore a practical and theoretical extension. Not only does the reuse of arrangements allow students to focus more on content rather than formatting, it also allows for quicker training for faculty members new to the course. Collaboratively developed rubrics and assignments can also be used, capitalizing upon group strengths and best practices. While we found improvements in consistency after implementing components of an ACDC process in an IS course in an online MBA, IS educators could investigate if agile methods of course development could improve evaluations and promote consistency for courses that typically receive poor reviews – large introductory courses, programming courses of any size, etc. Even if the entire ACDC process is not implemented, using components of the agile method to develop courses may improve consistency and evaluations, meet accreditation standards, and integrate suggestions from industry, accrediting boards, and current and former students.

5.2 Relevance to the IS Profession
While the ACDC model introduced has clear applications to IS educators, it also offers potential for the IS profession. We demonstrated improved consistency in student evaluations across different contexts; similarly, industry customers may have higher levels of satisfaction with organizations when an agile, collaboratively designed team is used to leverage existing relationships. Moreover, many professionals working in IS already have experience using agile processes; thus, forming agile, collaborative teams may lead to similar successes in industry.

The reusability of ACDC is readily transferrable to organizations. Reuse saves time and money while avoiding rework. Moreover, establishing opportunities for interactive tasks between geographically distant employees may save travel expenses and time while achieving similarly good outcomes. We encourage future research that examines the implementation of online IS training programs in organizations where agile, collaborative processes are utilized to develop curriculum.

5.3 Future Opportunities
This research provides numerous future opportunities. Professors in other IS courses could use this model and assess the outcomes. Adding a group member trained in instructional design to a motivated, agile team of subject matter experts may lead to even better outcomes. Instructional designers understand how to develop and implement courses that are appealing, functional, and pleasing to the eye. IS educators, by contrast, have diverse areas of expertise within the field and may have little experience with designing courses that are engaging and relevant for students.

Future opportunities may include the use of Scrum or other project management tools to improve agile course development and enhance cooperative learning opportunities (Sharp and Lang, 2018). Additionally, gamification of some portions of the course may improve student engagement (Tae, 2018); the opportunities for gamification may extend to any type of course development model.

Moreover, educators could engage with industry partners and meet current expectations for coverage of topics such as big data, data analytics, and business intelligence. Further, offering access to current, relevant technology may improve outcomes. For instance, SAP offers academic licensing, certificate options, and pre-designed assignments to allow students to experience how to use a relevant technology tool. Generally speaking, students want timely, relevant technology tools they can put on their resume quickly. Similarly, industry organizations are looking for graduates who have experience working with the latest technology products. By engaging students, industry groups, organizations, and Advisory Boards, great potential exists to use an ACDC process to create relevant, engaging student activities. Additionally, by designing more relevant and engaging courses, the desirability of the program may increase, thus providing an advantage over the numerous competitors in the online MBA space.

5.4 Limitations
Our study is not without limitations. While we used the agile context for course development, other approaches to course development include the active learning model proposed by Riordan, Hine, and Smith (2017) which increased interest in information systems but had conflicting results on student satisfaction and perceptions of learning. Evaluating different

approaches used by various teams of motivated instructors may prove valuable when seeking to develop superior content.

While we had a high response rate and over 250 student participants, it is still possible that our data is atypical. Further, we must use care when assuming that the students who self-selected to participate in the study are representative. We believe, however, that the high response rate, along with the relatively long time period studied (three semesters before and after ACDC), lends support that the sample is representative. Additional analysis over a longer time period might yield valuable insights. Moreover, it would be helpful to follow up with students several years after graduation to ask their thoughts on the course now that they are further along in their careers, although we recognize the difficulty of finding graduates after they leave the program. Including administrative personnel in future projects might allow additional insights into how we could longitudinally assess future graduates of our programs.

In addition, the ACDC process that we evaluated only implemented 4 of the 12 components of *The Agile Manifesto*: Principles 1, 6, 7, and 9. Thus, our data supported that at least those four components were positively associated with improved consistency among course sections. However, future research should assess if the use of all components of *The Agile Manifesto* would promote improved scores on student evaluations, or if the time and effort to implement additional principles is worthwhile, given the potential impact. Further, we provide a research agenda for future research analyzing the effectiveness of agile components that we did not measure.

An ACDC initiative of this nature, with a larger sample of students, may establish statistically significant increases in student satisfaction as measured with the end of course survey. However, in programs where the faculty members are required to receive high scores on student evaluations as a precursor to teaching in the program, there may be few statistically significant differences. Even when we attempted to normalize the data, we were unable to show differences in student responses to the survey questions. Although student satisfaction scores increased in the after group, our motivation and driving force was to reduce the variability of student satisfaction across course sections so that faculty resources could be more elastic in resource deployment decisions. In other words, when statistically significant increases in student satisfaction are the primary goal, the efficacy of the ACDC method, especially in the context of our investigation, remains unresolved. Clearly, more research with larger groups, where data can be normalized through transformation, is needed, as outlined in the proposed research agenda.

6. CONCLUSION

IS courses continuously need to be updated because of changes in industry and technology. Working in a collaborative fashion is one way to potentially improve course and instructor effectiveness in a sustainable manner while delivering consistent content across diverse contexts. The primary goal of this project was to assess consistency among a multi-section, multi-university, and geographically dispersed faculty and student group. The ACDC process we introduced here showed increased consistency across sections, with a robust sample of about 250 students, from three semesters before and three semesters after implementation. Thus, the primary assertion of

this project, that implementation of an ACDC process is positively associated with improved consistency, was supported. The second goal of this project was to evaluate changes in student evaluations after implementation of the ACDC process. While all student evaluation scores increased over time, the results were not statistically significant, likely because of the already high scores the professors in this group received. Future research could provide more clarity on this issue. The final goal of this project was to present a research agenda for components of the agile process we did not evaluate. We look forward to future research that evaluates the effectiveness of using agile components in course development.

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Appendix. Instructions to Students and Survey Instrument

The [Online] WebMBA Course Evaluations are open and available. Please be sure to complete this information as soon as possible and that you are completing the form for the correct professor and course. You will select the response that best answers each question. You must click the Submit button at the bottom of the form to record your answers. Your answers are anonymous and will not be shared with faculty until grades have been submitted. Your participation helps us improve the quality of the WebMBA and we appreciate your feedback. This information is collected before finals and grades in order to receive more honest feedback.

Student Survey (first nine questions answered via a 5-point Strongly Disagree to Strongly Agree scale)

1. The course plan outlined in the syllabus was followed.
2. The course materials added value beyond the text.
3. Overall, this course was a very effecting learning experience.
4. The instructor was timely in responding to my requests.
5. The level of interaction with the instructor was appropriate for this course.
6. The course grading criteria were clear.
7. Grades were returned according to expectations outlined in the syllabus.
8. Where appropriate, returned work contained constructive feedback.
9. Overall the instructor was effective.
10. What aspects of the course provided the most positive (effective) learning experience?

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