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**AN ANALYSIS OF FACTORS THAT IMPACT DIFFUSION AND ADOPTION  
OF DIGITAL BADGES**

by

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A Dissertation Submitted to the Faculty of  
Old Dominion University in Partial Fulfillment of the  
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## **ABSTRACT**

### **AN ANALYSIS OF FACTORS THAT IMPACT DIFFUSION AND ADOPTION OF DIGITAL BADGES**

Kimberly L. Carey  
Old Dominion University, 2017  
Director: Dr. Jill Stefaniak

Digital badges are electronic icons used to recognize learning or participation in activities. Open digital badges offer the additional affordance of embedded metadata that can link to the criteria for earning the badge, evidence of the skill, and other information including issuer details. Badge systems have prompted instructional designers to consider teaching and learning in new ways. Open digital badges offer an alternative and innovative approach to pedagogy and assessment (Grant, 2016).

This qualitative multi-case study examined digital badge programs being used at three higher education institutions, at the course level, the department level, and the university level. The study sought to explore the adoption of badges in higher education using Rogers' (2003) innovation diffusion theory to identify factors associated with the adoption process in order to provide contextual insight into factors that impede and facilitate successful implementation of badge systems. Rogers established that there are five specific characteristics of innovations (relative advantage, compatibility, complexity, trialability, and observability) which are attributed to varying rates of adoption (2003).

Rogers (2003) indicated that the innovation attributes of relative advantage, compatibility, observability, and trialability positively impacted innovation adoption. In the current study, through data collected from interviews, questionnaires, and extensive archival document analysis, the main factors found to facilitate diffusion and adoption of badges were

compatibility of the badge program with the institution's values and needs, observability of the value of badges both internally and externally, and relative advantage of badges grounded by a clear purpose that is communicated to stakeholders. Trialability was not shown to play a significant part in the successful adoption of the badge programs in this study.

Rogers (2003) found that the innovation attribute, complexity, negatively impacted innovation adoption. The results of the current study also attributed factors related to complexity as barriers to successful adoption of badges in each of the three cases. Specifically, the current study found that usability issues, increased faculty workload, and a lack of understanding of the badges' purpose and value were the main factors which negatively impacted badge adoption. The goal of this study was to provide insight on best practices to those interested in implementing badge programs in order to optimize success of badge program implementation.

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This dissertation is dedicated to the memory of my father, Robert L. Carey. My dad always took the time to teach me the practical things that an independent woman should know. It is because of him that I have never doubted my ability to pursue and achieve my academic goals.

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A special thanks to those who agreed to let me study their badge programs for this study. I cannot express how grateful I am for their willingness to provide valuable data related to their systems. I appreciated the time spent answering my emails, promoting my study, allowing me to interview them, and making my survey available to the badge system users. I could not have done this without all of their help.

I want to thank my supportive mother, brother, and sister-in-law for continually cheering me on throughout my many years as a non-traditional student. I also thank my amazing daughters, Nicole, Alex, and Regan, for putting up with all of my nights and weekends in front of the computer. May each of you always see the value in education and take advantage of the opportunities available to you.

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## CHAPTER I

### INTRODUCTION AND LITERATURE REVIEW

Digital badges are electronic symbols used to document achievement or skills mastered such as course completion, professional development participation, or training completion. Open badges are digital badges that provide additional information via metadata in order for viewers of badges to verify issuer details, evaluation criteria, and evidence such as the actual work product used to earn the badge (Parker, 2015).

Digital badging is a relatively new concept, and the topic is broached with varying opinions as to how badges can best be purposed. Literacy professor, James Gee, first proposed the idea of digital badges used as credentials in 2007. Badges used as micro-credentials started gaining traction in 2011 when the MacArthur Foundation provided financial support to Mozilla to create the open badges infrastructure (Grant, 2016). Digital badges now cross multiple fields and are used in informal learning settings, corporate settings, government settings, and in all levels of education from K-12 to higher education. Typically used for non-tangible representations of skill achievement and accomplishments, the efficacy of badges in educational settings is still being explored.

There is debate as to whether digital badges are effective pedagogical tools and for what purpose they are best suited, such as rewards, incentives, assessment, or skill recognition (Grant, 2016). One use for digital badges is to acknowledge content mastery and knowledge acquisition. Digital badges can also be used as virtual credentialing systems to showcase acquired skills and recognize achievements. Implications related to badges used as credentialing systems include the importance of standardization in order to provide credibility for badges awarded for skill acquisition and achievement recognition.

Badge design and implementation processes are reliant on the purpose of the badge system and the context in which it will be used. Implementation is variable across institutions as a result of the uniqueness of each badge system, so factors such as badge system type, purpose, platform, and scope must be considered and a plan for diffusion must be constructed. In order for a new innovation, such as badges, to be successfully implemented and accepted, factors such as organization culture, participant experiences, and communication processes will also need to be taken into account by those introducing the innovation. The framework established by Rogers (2003) to describe innovation diffusion can be applied to badge system implementation in order to better understand what drives successful adoption of badges. Badges are an innovation that has not been widely adopted yet, and an analysis of the constraining factors that impact adoption can be helpful to understanding why this is the case. Rogers' (2003) provides a framework from which to dissect badge adoption through the examination of the innovation's attributes and its rate of adoption.

This study sought to explore the adoption of badges in higher education institutions using Rogers' (2003) innovation diffusion theory to identify factors associated with the adoption process. The focus of the study was to explore three different badge programs in higher education and to provide contextual insight into factors that impede and facilitate successful implementation of badge systems.

### **Conceptual Framework**

The conceptual framework for the study is based on Rogers' (2003) innovation diffusion model. Rogers' model provides a framework for understanding how new innovations are introduced, communicated, and adopted by society over periods of time. Time is viewed from

three angles: the innovation-decision process of an individual, the innovativeness of the adopter, and the rate of adoption. The innovation-decision process is defined by Rogers (2003) as:

The process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision. (p. 475)

Innovations which involve larger systems rather than just a few individuals take longer to adopt due to the complexity of the decision process involving more people. The adopter categories in which individuals can be sorted are: innovators, early adopters, early majority, late majority, and laggards. These categories classify members of a social system according to their innovativeness (Rogers, 2003).

Rogers established that there are five specific characteristics of innovations (relative advantage, compatibility, complexity, trialability, and observability) which are attributed to varying rates of adoption. Fliegel and Kivlin (1966) concluded in their seminal diffusion study that the attributes of innovations identified by Rogers can be predictors of diffusion. Innovations which individuals view as having more relative advantage, compatibility, trialability, and observability, yet less complexity are expected to have higher adoption rates. Rogers (2003) strongly suggests that potential adopters should determine the measure of degree that an innovation contains an attribute. Therefore, a case study approach which involves subjective perceptions of adopters is appropriate for the study of badge system adoption.

The future of higher education may benefit from open badges used as electronic, mobile credentialing systems that reach beyond the walls of the traditional university (Carey, 2012). Badges hold value as a system for potential employers to validate skills aside from content

mastery and to allow learners to reflect upon and track their own soft skills (Parker, 2015). Gamrat, Zimmerman, Dudek, and Peck (2014) tested a digital badge system's capability to support custom professional development opportunities. They refer to digital badges as "microcredentials" which represent knowledge and skills acquired by the badge holder. The authors based their study on the theoretical framework of customized decision making to allow teachers choice in which professional development activities they pursue. The researchers partnered with NASA and the National Science Teachers Association (NSTA) to design a badging system they call Teacher Learning Journeys (TLJ) and conducted a collective case study to answer their research questions focused on badging and customized decision making. Their findings, which indicate enhanced teacher productivity and fulfillment, are intended to guide design principles of badges used in workplace learning settings.

Potential benefits of open badges are promoting lifelong learning and providing a format to showcase skills and achievements acquired outside awarding educational institutions and beyond the immediate badge holder community (Goligoski, 2012). Badges are cataloged in a digital backpack which serves as a dashboard that enables badge owners to determine privacy settings and where they will publish their badges, such as on personal websites and professional networking sites.

One specific area of interest is using digital badge programs in higher education. Questions arise regarding if digital badging programs are more effective for lower division courses, and if there is a difference in learning outcomes when learners are required to participate in a badging program versus if participation is optional. Some believe digital badges are only effective when used as rewards for lower-level rather than higher-level skill acquisition (Abramovich, Schunn, & Higashi, 2013). Others suggest using badging programs as a way to

teach the required curriculum for an entire college course, rather than using badges as a supplement to the curriculum (Randall, Harrison & West, 2013). They suggest that giving students a choice in which badges they want to complete will promote autonomy and motivate them to learn.

There is a noticeable shortage of empirical research on the use of badges which may partially be attributed to their relatively short existence. Few empirical studies (Abramovich et al., 2013; Gamrat et al., 2014; O'Connor & McQuigge, 2013) on badges exist. Much of the existing literature (Abramovich et al., 2013; Goligoski, 2012; Reid, Paster, & Abramovich, 2015) primarily discusses digital badges in terms of motivation in traditional and non-traditional learning environments. In web searches, many articles can be found referencing badges for credentialing purposes in the workplace to show evidence of skill acquisition, but many are not from peer-reviewed sources (Grant & Shawgo, 2013).

There is a notable lack of discussion in the literature on diffusion and adoption of the open badges movement. An understanding of what factors drive the adoption of badges used in higher education could help those involved in badging to capitalize on the potential use of badges and successfully implement programs. The framework established by Rogers (2003) to describe innovation diffusion can be applied to badge system implementation in order to better understand what drives successful adoption of badges.

In order to capitalize on the potential uses of badges, badge system designers need to know what constitutes a well-designed badge program. To maximize successful diffusion of badges and program implementation, badge designers must know what considerations need to be made in order to improve rate of adoption. Badge system designers need guidelines on how to effectively implement and sustain badge systems in higher education settings.

## **Literature Review**

The two areas of literature reviewed for this study were digital badges and the diffusion and adoption of innovations. This section begins with a general discussion of digital badges and then introduces the impact of badges on motivation. The literature review then develops more specific explanations of the utility of badges, especially in the field of higher education. The section of the literature addressing digital badges closes with a discussion of how badges afford opportunities for learner choice. The final section of the literature review focuses on the diffusion of innovation theory while laying the theoretical foundation of the study.

Mozilla Open Badges (2016) is a free and open online environment which provides an infrastructure for learning recognition and verified accomplishments to be collected in one place and showcased to multiple individuals and organizations. Data are integrated into each badge which correlates with the badge issuer and the criteria upon which it was evaluated. Mozilla Open Badges provides free software that allows users to earn, create, issue, and verify digital badges (Goligoski, 2012).

### **Badges in Higher Education**

One specific area of interest is using digital badge systems in higher education. There are indicators that badges should be skill-based rather than participation-based for higher-level learners (Abramovich et al., 2013). Questions arise whether digital badges are more effective for lower division courses, and if there is a difference in learning outcomes when learners are required to participate in a badging program versus if participation is optional. Some believe digital badges are only effective when used as rewards for lower-level, rather than higher-level, skill acquisition (Abramovich et al., 2013). Others suggest using badging programs as a way to teach the required curriculum for an entire college course, rather than using badges as a



supplement to the curriculum. Randall et al. (2013) suggest that giving students a choice in which badges they want to complete will promote autonomy and motivate them to learn.

### **Motivational Effect of Badges**

Badges awarded for participation may be less meaningful than skill-based badges, as suggested by Abramovich et al. (2013). This is not surprising when one considers the extensive amount of motivation literature in the field which favors intrinsic over extrinsic motivation (Deci, 1971; Martinez, 2010; Randall et al., 2013). The research study by Abramovich et al. (2013) showed that the type and purpose of the badge will impact motivation and learning. They found that badges impact both intrinsic and extrinsic motivation and that the effects of badges vary across learner ability, prior knowledge level, and badge design. Deci (1971) found that monetary rewards used as extrinsic motivators actually decreased intrinsic motivation while verbal praise used as extrinsic motivation increased intrinsic motivation. These findings should be considered when determining the purpose of a digital badge program. Incentives should be avoided as well, as they are forms of extrinsic rather than intrinsic motivators. Martinez (2010) indicates there has been an increase in using extrinsic motivators in education and as a result, a decline in intrinsic motivation has occurred as a result of a system which relies heavily on rewards and incentives.

A recent study by Reid et al. (2015) found that badges were only slightly motivating for higher-level learners and even less motivating (in some cases, demotivating) for lower-level learners in undergraduate composition courses in which badges are tied to multiple course outcomes. Participants were identified with high or low expectancy-values and intrinsic motivation and attitudes toward badges were measured throughout a semester. The results supported findings from the motivation research which points to badges being more motivating

when used as intrinsic rather than extrinsic motivators such as rewards. The findings also supported prior research (Abramovich et al., 2013) indicating that the efficacy of badges is tied to the learner type.

### **Peer Review and Feedback Opportunities**

Badges hold potential to generate peer discussion and feedback opportunities (Hickey, Quick & Shen, 2015; McDaniel & Fanfarelli, 2015; O'Connor & McQuigge, 2013). Hickey et al. (2015) incorporated badges into a Big Open Online Course (BOOC) titled Educational Assessment. Peer discussion and feedback was a fundamental component of the course. Earned badges could be shared over social networks and email. Participants could also link their final work product along with peer endorsements and comments to the badge.

McDaniel and Fanfarelli (2015) examined digital badging used to provide feedback and reward in the online higher education environment. Badges were used in the study as a feedback mechanism which provided information related to performance. The study was designed to elicit both engagement-based and performance-based data through the implementation of a badging system in online sections of web design and graphic design courses. The researchers provide the complete data set along with the survey and badge descriptions, although they do not provide the results nor analysis of their data. The data set serves to supplement future empirical studies in order to increase sample size and statistical power. The researchers note the small sample size of 44 participants as a limitation in this study and offer justification for their methodology.

O'Connor and McQuigge (2013) conducted a pilot study to examine the impact of peer-reviewed badges in an online graduate course. Badges were issued for web skills in an emerging technologies course by peers, based on criteria which were different than instructor's evaluation criteria. Students had the option to publish and share their badges using web-based technology

such as in digital backpacks or on social media sites for prospective employers to view. The researchers hypothesized that peer-awarded badges would promote intrinsic motivation for participation in the course and support lateral learning and evaluation. Their findings showed “responsible engagement” of learners throughout the process which they feel warrants the further exploration of badges used as peer-reviewed evaluation. The researchers note that participants exceeded peer review requirements and provided meaningful feedback to each other while pointing out similarities to their own experiences. The researchers indicate that valuable peer feedback warrants continued use of badges in future courses. The researchers plan to follow up with participants in a longitudinal study to understand how badges impacted learning, the practical application of badges, and sharing of credentials two semesters after the study concluded.

### **Informal Learning Recognition**

Not all learning takes place in formal settings. Badges are one way to recognize learning that takes place beyond the walls of an institution, such as in workshops and during extracurricular activities. Badges allow for learning paths to be visual to learners through content sequencing and scaffolding. Granularity is one feature of badges that is attractive to those interested in documenting informal learning that results in new skills and experiences which transcripts and degree titles cannot fully describe (Ahn, Pellicone, & Butler, 2014). Additionally, badges can connect informal learning to formal learning recognition through validation of experiences such as museum visits (Gibson, Coleman, & Irving, 2016). The sustainable agriculture program at the University of California created a digital badge system that documents both informal and formal learning, inside and outside of the classroom, based on the program’s core competencies.

The badge system, winner of an open badge development competition sponsored by Mozilla (2016), is designed so that prospective employers are able to view evidence of applicants' skills via badges in an electronic portfolio format. Badge portfolios catalog completed courses, grades, skills, workshops, awards, and projects. Badge systems afford students the ability to customize their education goals and receive feedback from peers and instructors (Reconnect Learning, 2014). The future of higher education may benefit from open badges used as electronic, mobile credentialing systems that reach beyond the walls of the traditional university (Carey, 2012). A large amount of learning occurs outside of traditional classrooms, and badges are a way to recognize this informal learning (Wilson, Gasell, Ozyer, & Scrogan, 2016).

### **Course-Based and Program-Based Badges**

Credit-based badge systems in college courses, such as the one in the afore-mentioned Reid et al. study (2015), are still a rare form of badge use in higher education. Wilson et al. (2016) describe two badging systems at their university. The first badge system implemented at the individual course-level served as a pilot for a planned system to be implemented at the university-level and embedded in the school's learning management system. The university-based researchers reference Roger's (2003) innovation diffusion theory and highlight the role of early adopters for both badge systems. Chou and He (2016) conducted a mixed-methods study in a graduate program for teacher education to study the effect of badges on student participation and interaction. The experimental group participated in a course which integrated badges and the control group was a traditional course. The researchers found that badges increased student interaction, although it did not significantly impact participation. Findings suggest that badges

may be more useful in online courses that incorporate a read-write-reflect-comment model rather than courses that are already highly interactive such as project-based courses (Chou & He, 2016).

Faculty members at the University of Colorado have implemented badges at the course level and at the program level. Badges have been integrated into individual courses, and there are plans to incorporate badges into the university's learning management system. These faculty members identify as early adopters and see the value of badges beyond the classroom and as a mechanism to document professional development and to assist in outreach and marketing activities. Badges also have potential to strengthen traditional degree programs, to support competency-based programs, and to link badge earners to potential employers and professional organizations (Wilson et al., 2016); however, it is important for badging activities to be facilitated by instructors in order for badges to be effective pedagogical tools. Instructors can provide necessary scaffolding as needed, especially for lower-level learners (Ahn et al., 2014). Badge earners may need academic and technical support as they progress through learning activities associated with badges.

### **Badges as an Assessment Method**

Coastal Carolina University faculty have implemented a badge system used in the undergraduate composition courses. The online badge system serves as the assessment model for these particular English courses. The badge system provides a framework for consistency with course assignments and evaluations across multiple course sections and instructors (Reid et al., 2015). Wilson et al. (2016) also refer to the course-level badge system as assessment-based. Badges are used to certify skill mastery within courses in this badge system. The authors warn that weak assessment threatens the validity of badges. The authors share other challenges that arise when badges are used in higher education. Some of the challenges include lack of support

and buy-in, absence of program vision, and failure to align badge programs with university missions, as well as technical difficulties within badge systems.

An assessment platform was also developed by educational technologists at Purdue University using an e-portfolio system called “Passport”. This assessment platform aligns outcomes to challenges and incorporates scaffolding. Well-designed badges can provide a form of alternative assessment which supports collaboration and engagement (Parker, 2015). Poorly designed badges which are awarded when competencies are not completely met are a threat to badge validity within the badge system and in the wider badge community. Weak assessment can adversely impact a university’s reputation (Wilson et al., 2016). In summary, badges afford multiple types of assessment such as instructor, peer, and self-assessment (Gibson et al., 2016).

### **Micro-Credentials and Professional Development**

Both Parker (2015) and Yu, Dyjur, Miltenburg, and Saito, (2015) indicate that badges hold value as a system for potential employers to validate skills aside from content mastery and to allow learners to reflect upon and track their own soft skills. Gamrat et al. (2014) tested a digital badge system’s capability to support custom professional development opportunities. The authors refer to digital badges as “microcredentials” which represent knowledge and skills acquired by the badge holder. They based their study on the theoretical framework of customized decision making to allow teachers choice in which professional development activities they pursue. Micro-credentials can serve as skill documentation within an institution or with the inclusion of metadata, they can be made visible to other institutions in the form of open badges.

Open badges can be used in higher education as a tool when teaching soft skills such as communication, decision-making, time management, leadership, problem-solving, etc. The

University of Central Oklahoma identifies soft skills they expect graduates to demonstrate and uses badges to document and track these skills in addition to grades (Gibson et al., 2016; Parker, 2015). Badges hold potential to provide a method of credentialing skills. Badges verify skills mastered through informal and formal learning experiences. Micro-credentials can be used to document professional development at workshops and other trainings in order for university staff, faculty, and graduate students to catalogue their professional learning experiences (Yu et al., 2015). Wilson et al. (2016) suggest badges used as micro-credentials could position universities as credentialing institutions.

Possible forums for badges include the use of digital backpacks to collect and showcase skills to prospective employers (Goligoski, 2012). For example, Wilson et al. (2016) envision a badge system used in Master's level courses where badges are used as micro-credentials in student online, professional portfolios. The authors also see potential for badges used to forge partnerships with employers and professional organizations.

Yu et al. (2015) describe a planned pilot study on the impact of a digital badges program at a Canadian University. Badges used as micro-credentials allow for criteria-based professional learning documentation rather than just participation-based certificates. Learners demonstrate a skill or knowledge attained at a professional development session and the badge can contain the artifact of the accomplishment along with the criteria for earning the badge. The pilot badge program at University of Calgary includes two courses, Course Design Program and Teaching Online Program, in which participants can earn badges. The Course Design Program requires participants to create a new course or revise a current course. Badge program participants are expected to create course outcomes and develop instructional and assessment activities to meet the course outcomes. The Teaching Online Program runs for four weeks and requires

participants to facilitate and create online learning activities. Participants can display earned badges on their university profile, export them to Mozilla's Open Badges Backpack, or display them on LinkedIn (Yu et al., 2015). The literature points to the interest in badges used as micro-credentials and more specifically to badges used in faculty development programs in higher education. This interest warrants further exploration into micro-credentials and faculty development, especially extending the literature base to include more empirical studies on the topic.

### **Learner Choice Affordances**

A survey of the literature and research on badging reveals that several theoretical constructs can be associated with badges. Self-regulated learning theory asserts there are benefits to encouraging learners to plan, set goals, monitor, and evaluate their learning processes (Zimmerman, 1990). Self-regulated learners have the propensity to know when they have mastered a skill. These types of learners are proactive and seek out needed information to support their learning. They are able to overcome learning obstacles and adapt as needed in order to be successful while taking responsibility for their own learning and achievement. Allowing learners choice, such as in which badges to earn, increases a sense of autonomy and may increase motivation. In fact, setting goals can be an integral part of a digital badge program which is designed using a hierarchical model where learners progress through increasingly more challenging levels of content while earning badges as evidence of mastery along the way, similar to the program described by Randall et al. (2013). The authors explain the design, development, and implementation of badges in an instructional technology course in a teacher preparation program. Badges in this system were used as skill-based credentials awarded for mastery, but the authors discuss the potential to use badges for more abstract concepts such as higher order-



thinking and creativity. The badging systems described by both Randall et al. (2013) and Yu et al. (2015) describe micro-credentialing as a method for learners to develop their individual learning pathways based on their own interests and goals. This affordance of choice is one of the attractive features of digital badges.

### **Diffusion and Adoption**

Innovations are ideas, practices, or objects which are regarded as new by individuals or groups. Rogers' (2003) innovation diffusion model offers a framework for understanding diffusion, which refers to how new innovations are introduced, communicated, and adopted by society over periods of time. Adoption can be seen as innovation acceptance driven by individuals' beliefs about the innovation. The innovation diffusion theory was constructed using a meta-analysis of various innovations in multiple contexts.

Diffusion of an innovation includes five stages (awareness, interest, evaluation, trial, adoption) which must be considered when one considers new innovations in education. Guba (1968) stresses the need for an adoption plan, a strategy for diffusion, when one plans to introduce and diffuse a new innovation. The author proposes that the diffuser should consider five factors in order to devise a successful strategy. The first factor is diffusion techniques which include modes of diffusion through telling, showing, helping, involving, or training others on the innovation. The second factor to consider when drafting a diffusion strategy is the nature of the adopter. The adopter may be considered a rational person, an untrained person, an easily persuaded person, an economic-minded individual, a politically influenced person, a bureaucrat, or a professionally obligated individual.

Guba (1968) describes the third factor as assumptions concerning the end state of the adopter and how the diffuser wants the innovation adoption process to impact the adopter, such

as to be more skillful, better trained, more knowledgeable, etc. The fourth factor to take into account when creating a diffusion strategy is assumptions about the diffusing agency. The diffusion strategy must be one that the agency has the capabilities and resources to carry out in order for the innovation to be fully implemented and adopted.

The fifth and final consideration is assumptions about the invention (innovation). In other words, consideration of the actual attributes of the innovation is recommended (Guba, 1968). Rogers (2003) established that there are five specific characteristics of innovations (relative advantage, compatibility, complexity, trialability, and observability) which are attributed to varying rates of adoption. The characteristics are defined below (pp. 15-16):

1. Relative advantage is the degree to which an innovation is perceived as better than the idea it supersedes.
2. Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters.
3. Complexity is the degree to which an innovation is perceived as difficult to understand and use.
4. Trialability is the degree to which an innovation may be experimented with on a limited basis.
5. Observability is the degree to which the results of an innovation are visible to others.

Rogers' (2003) states that there are four elements in the diffusion process: the innovation, communication channels, time, and the social system. Innovations which individuals view as having more relative advantage, compatibility, trialability, and observability, yet less complexity

are expected to have higher adoption rates. Communication channels are the means in which the innovation messages travel between individuals. Mass media is pointed to as the quickest way to diffuse innovation information, but research shows that most adopters rely more on first-hand accounts from peers who have already adopted the innovation when considering the decision of whether to try an innovation.

The third element, time, is viewed from three angles: the innovation-decision process of an individual, the innovativeness of the adopter, and the rate of adoption. Time is a difficult variable to measure accurately in some innovation research studies, due to its frequent reliance on individuals' memory of when they first were introduced to an innovation and when they accepted or adopted the innovation. Rogers (2003) also notes that innovations which involve larger systems rather than just a few individuals take longer to adopt due to the complexity of the decision process involving more people. The adopter categories in which individuals can be sorted are: innovators, early adopters, early majority, late majority, and laggards. The fourth element, the social system, may be individuals, informal groups, organizations, or subsystems.

Hall, Loucks, Rutherford, and Newlove (1975) discuss innovation adoption in terms of the human nature to either accept or resist change. The authors describe themselves as practitioners and adoption agents who have found through their research that the innovation decision is a process that each individual experiences differently. The innovation-decision process is defined by Rogers (2003) as "the process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea, and to confirmation of this decision" (p. 475). Hall et al. (1975) propose that variations

between users must be behaviorally accounted for in order to effectively describe the adoption of innovations.

The Levels of Use Chart was established to explain this variation in individual use of innovation by categorizing the various decision points in the adoption process. Levels of Use is described by Hall et al. (1975) in their Concerns-Based Adoption Model. The eight levels are used to categorize individuals' observable use of an innovation. The levels are: non-use, orientation, preparation, mechanical use, routine, refinement, integration, and renewal. The levels are further divided into seven categories or functions which individuals perform as they use an innovation. The categories are: knowledge, acquiring information, sharing, assessing, planning, status reporting, performing. Each level is categorized by a clear decision point in the process. The decision points for each of the levels is as follows (p. 115):

- A. Takes action to learn more detailed information about the innovation.
- B. Makes a decision to use the innovation by establishing a time to begin.
- C. Changes, if any, and uses are dominated by user needs.
- D1. A routine pattern of use is established.
- D2. Changes use of the innovation based on formal or informal evaluation in order to increase client outcomes.
- E. Initiates changes in use of innovation based on input of a coordination with what colleagues are doing.
- F. Begins exploring alternatives to or major modifications to the innovation presently in use.

The Levels of Use Chart provides a reliable and valid way in which to operationalize the concept of innovation use. The authors state that individuals do not usually use an innovation

efficiently until four or five attempts. The authors envisioned the Levels of Use framework to guide innovation adoption and assist diffusers in developing strategies when introducing innovations in order to increase adoption success (Hall et al., 1975).

### **Diffusion and Adoption in Instructional Design**

According to Agarwal (2000), Rogers' diffusion of innovation theory has been a major influencer of information technology acceptance research. The author refers to the theory as a "process of uncertainty reduction" and confirms that information technology innovation research has substantially and successfully supported the theory (p. 89). Many aspects of Rogers' model have influenced technology acceptance models which came afterwards.

Lee, Hsieh, and Hsu (2011) use the theory of innovation diffusion combined with a technology acceptance model to explain the adoption of e-learning systems in the business setting of Taiwan. The authors used Rogers' (2003) five elements of the innovation (relative advantage, compatibility, complexity, trialability, observability) to examine motivation to use the e-learning system. The authors describe the complementary aspects of each theory which allow for a successful combination of the innovation diffusion theory and the technology acceptance model when conducting research. The authors chose the innovation diffusion theory as a foundational one for their research due to its successful application in fields such as sociology, education, communication, marketing, agriculture, and information technology.

Baltaci-goktalay and Ocak (2006) use the innovation diffusion framework to explain teachers' rate of adoption for instructional technologies, such as web conferencing, chat, discussion forums, and learning objects used in the online classroom. Full implementation of an innovation is suggested to be five years and the +three steps in the process are identified as "visioning, planning, and financing". Buc and Divjak (2015) write about innovation diffusion in

higher education and specify the focus is on e-learning implementation which encompasses educational technology such as massive open online courses (MOOCS).

Rogers' (2003) theory of innovation diffusion has been applied to various types of situations and in many types of fields. For example, some of the case studies presented by the author are diffusion of the internet, medical drug adoption, HIV awareness programs, cell phone adoption, laptop computer diffusion, and others. The model can be followed to study any current innovation in any setting imaginable. With the advent of so many technology tools and innovations being diffused so frequently through mass media channels, it is important for diffusion scholars to have a framework in which to analyze new web tools and other technology tools. It is equally important for instructional designers to have diffusion research from which to draw before incorporating the newest and shiniest tool into instructional materials before understanding the adoption curve and other elements of the innovation diffusion process.

### **Purpose of Study**

The purpose of this study was to identify and analyze the factors that impact the diffusion and adoption of digital badges used across higher education institutions. The intent was to identify challenges and solutions in badge system implementation so that others can learn from the experiences of badge users from three higher education institutions. The study examined the adoption of digital badges from the lens of the five attributes (relative advantage, compatibility, complexity, trialability, and observability) in order to trace the rate of adoption of open badges through three higher education institutions. The goal of the study was to provide insight on best practices to those interested in implementing badge programs in order to optimize success of badge program implementation. Using the innovation diffusion framework, challenges and

solutions surfaced and assertions about best practices for badge system implementation were drawn.

### **Research Questions**

The following research questions guided this study:

1. What are the factors that facilitate diffusion and adoption of badges by higher education institutions?
2. What are the challenges that impact diffusion and adoption of badges in higher education?
3. What factors impact the innovation-decision process of badge system implementation within higher education institutions?

### **Significance of Study**

This study traced the diffusion and adoption process of digital badge system implementation across three universities that are purposing badges in various ways. The study results are intended to identify factors that positively and negatively impact diffusion and adoption of digital badges used in higher education institutions. The data provide insight to innovators as they design and plan the implementation of badge systems, and the results provide badge enthusiasts a framework for successful badge system implementation. The results also provide a point of reference for how to successfully implement a badge system by showing factors that positively and negatively impact badge system implementation.

The findings suggest how to move the innovation-decision process forward through potential barriers and challenges, and offer solutions and suggestions based on lessons learned from the individual case studies. The findings indicate a need for understanding the potential uses of badges outside of the awarding institutions as badge users seek to have their earned

badges recognized beyond college walls and in professional settings. The across-case study findings also inform instructional design practice by formulating recommendations for badge program implementation.



## CHAPTER II

### METHODS

This chapter describes the research design, research questions, participants, instruments, and data collection procedures for this study. The chapter concludes with an explanation of the analysis techniques used to answer the research questions.

#### **Research Design**

This study employed a qualitative, multiple case study methodology, also called collective case study, consisting of a contextual examination of badge programs used in three different higher education institutions. Institutions which are using badges in various ways were studied in order to widen the scope of experiences and increase the relevance of the results to other institutions. The cases included: a university using badges in undergraduate writing courses for credit purposes; a university using badges in graduate instructional technology courses for skill certification; and a university using badges in graduate teacher education courses for purposes of peer feedback. A case study approach allowed for participants to share their experiences and knowledge in a way that may inform others in similar contexts who are interested in implementing a badge program.

Existing badge programs from three higher education institutions served as the case studies for the qualitative research. Creswell (2013) recommends no more than four cases for an in-depth analysis of a collective case study. The three institutions were studied systematically in order to increase reliability. Data were collected consistently across the three institutions and aligned to Rogers' (2003) five innovation attributes (relative advantage, compatibility, complexity, trialability, and observability). Data were triangulated using three methods: questionnaire for badge users, interviews with those responsible for designing, implementing,

and managing badge programs, and an archival document analysis of each successfully adopted badge program.

The research design best suited for this study was the case study approach due to the emphasis on analysis of multiple cases (Hays & Singh, 2012). Multiple perspectives were drawn from in order to understand the phenomenon of badge diffusion and adoption. The researcher used an inductive method of analyzing emerging ideas and themes chosen by consensus and collected through interviews and document analysis (Creswell, 2013). The case study methodology allowed for research to be collected in the natural environment and context in which the badge systems operate and for contextual assertions to be constructed from the data collected. The multiple case study approach developed an in-depth analysis of multiple cases and allowed for multiple sources of qualitative data to be collected (Creswell, 2013).

### **Participants**

A purposeful sample was obtained for this study. The researcher previously gained entry into the badging community as a result of conducting a previous research study on the topic of digital badges. This prior study had allowed the researcher to make contacts and build relationships with prominent members of the badging community. Entering the field and gaining access to participants is an important feature of qualitative research (Hays & Singh, 2012). The researcher approached three professional, academic contacts from higher education institutions currently running badge programs and invited them to participate in this study. Questionnaire participants were badge users and adopters of these existing programs. For the purposes of this study, the term *badge user* refers to badge earners (students or faculty) or badge issuers (faculty). For the purposes of this study, the term *adopter* refers to those responsible for designing,

implementing, and managing badge programs. Inclusion criteria for questionnaire participation included at least one of the following:

- Current participation in a badge program (students or faculty)
- Previous participation in a badge program (students or faculty)
- In process of planning or designing badge program
- Currently implementing a badge program
- Managing or scaling an existing badge program
- Prior design or implementation of badge program.

Interviews were conducted with faculty responsible for implementing the badge programs at the institutions. These activities include design, implementation, and management of badge systems. Inclusion criteria for interview participation included at least one of the following:

- In process of planning or designing badge program
- Currently implementing a badge program
- Managing or scaling an existing badge program
- Prior design or implementation of badge program.

The primary contact for each case study was requested to provide archival documents to the researcher in order to complete the archival document analysis portion of the study.

### **Instruments**

Moore and Benbasat (1991) describe an instrument developed to measure information technology innovation adoption and diffusion within an organization. The researchers indicate that information technology researchers have begun to study implementation issues in their field using the innovation diffusion theoretical foundation. These studies have a strong focus on user perception being an influencer of adoption success (Moore & Benbasat, 1991). The proposed

study also had a strong focus on user perception through the use of interviews and questionnaires.

Moore and Benbasat (1991) developed an instrument and tested its reliability and validity using judges and four rounds of sorting the items by construct (Appendix A). The researchers incorporated several constructs (voluntariness, image) in addition to Rogers' (2003) five attributes of innovations. The resulting instrument uses scales that extract quantitative data. The researcher used Moore and Benbasat's (1991) instrument as a guide for creating questionnaire and interview items by adapting the scaled items to open-ended items for the qualitative study. The use of a research-based and tested instrument increased validity in the current study. Additionally, the researcher requested that one of the authors review the instrument prior to the start of study.

Table 1 provides the definitions for each of Rogers' (2003) attributes along with samples of open-ended items which were modeled after Moore and Benbasat's (1991) items. The items are separated by construct in order to illustrate how the instrument was adapted.

Table 1

*Adaption of Moore and Benbasat's Instrument Using Rogers' Innovation Attributes*

Innovation Attribute	Definition	Adapted Item
Relative Advantage	Degree to which an innovation is perceived as being better than its precursor	Describe what you see as the advantages and/or disadvantages of the badge system used at your university
Compatibility	Degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters	Explain how the badge system is or is not compatible with your preferred approach to learning
Complexity	Degree to which an innovation is perceived as being difficult to use	Explain if the badge system is easy or difficult to use and how this impacts your use of the system
Observability	Degree to which the results of an innovation are observable to others	Describe how the badge system allows you to publish and share earned badges and how this impacts your perceived usefulness of badges
Trialability	Degree to which an innovation may be experimented with before adoption	Describe any opportunities you had to experiment with the badges before formally using the system

**Questionnaires.** The electronic questionnaire contained eight open-ended questions (Appendix B). The questionnaire items addressed each of Rogers' (2003) five innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. Before distribution, the questionnaire instrument was reviewed by a badge expert in order to check for validity. The electronic questionnaire was piloted with two individuals in order to check for technical glitches and usability. A link to access the questionnaire along with the IRB approved information sheet was provided via email to the three primary contacts at each university so that they could post the announcement in their learning management systems or on the badge

websites for badge users. Participants were advised that results would be reported anonymously without personal identifying information collected.

**Interviews.** The researcher created a structured interview script containing 10 open-ended questions (Appendix C) aligned to Rogers' (2003) five innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. The structured interview format increased instrument reliability due to the fact that each of the participants were asked the same questions in the same chronological order (Hays & Singh, 2012). All participants were advised that results would be reported anonymously without personal identifying information.

**Archival Documents.** Non-intrusive data from badge programs at the three institutions was requested. Digital archives in the form of electronically provided documents and audio-visual materials were the source of data for archival document analysis in order to provide a rich contextual description and deeper analysis of each case study's badge program. The researcher requested archival data and documentation such as meeting notes related to badge system design and roll-out, planning documents, design artifacts and prototypes, training materials, and evaluation documentation (Appendix D). Audiovisual materials such as badge system platforms and public websites were also examined. Additionally, a review of the associated research and articles for the badge programs took place. Data were supplied by the researcher's three primary contacts at each of the institutions.

## **Procedures**

This study employed a qualitative, multiple case study methodology comprised of data collection through examination of archival data, badge user questionnaires, and interviews with those responsible for the design, implementation, and management of each of the three

institutions' badge systems. This study was reviewed and approved by Old Dominion University's Institutional Review Board prior to collecting any data.

Badge users of systems managed by the researcher's three main contacts were invited to participate in the questionnaire phase of data collection. The same questionnaire was used for each participant at each of the three institutions to ensure that all participants are asked the same questions for consistency and reliability. A link to access the questionnaire and information sheet was provided to the primary contacts at the institutions in order for them to disseminate to students and faculty who are participating or have participated in badge programs at the institutions.

Interviews were conducted by the researcher with badge adopters using the audio function of Google Hangouts. Each participant signed the approved Informed Consent for the interview. The same interview script was used for each participant at each of the three institutions to ensure that all participants were asked the same questions to increase reliability. Interviews were recorded to avoid information recall issues and transcripts were sent to respondents for verification of accuracy. This step is referred to as member checking and is an extra measure to maximize trustworthiness (Hays & Singh, 2012). In addition, member checking was implemented at a higher level during the analysis phase when key contacts were asked to verify initial codes and themes in order to determine if the researcher was correctly interpreting data.

An independent, professional transcriber transcribed the recorded interviews. The transcriber signed a confidentiality agreement before the recordings were uploaded to the shared Dropbox cloud between the transcriber and researcher. Personal identifying information was not

recorded on transcripts or elsewhere in order to protect anonymity. The researcher used a password-protected computer and university email account throughout the study.

Non-intrusive data collection took place through archival data retrieval of textual and audio-visual documentation related to the badge systems' design, development, and implementation phases. Data were supplied by the researcher's three primary contacts at each of the institutions. Data which contained personal identifying information was not requested, accessed, or reviewed. Audiovisual materials such as badge system platforms and public websites were also examined. The archival data analysis was an important aspect used to provide context for each of the cases. Context is embedded in the case study approach (Creswell, 2013).

### **Data Analysis**

Within-case analysis was conducted first, and then a cross-case analysis took place to check for theme consistency, similarities, and differences across cases (Creswell, 2013). Questionnaire items were sorted and categorized by the constructs noted by Moore and Benbasat (1991): voluntariness, relative advantage, compatibility, image, ease of use, result demonstrability, visibility, and trialability. These constructs were then aligned to the following innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. Table 2 exhibits the alignment of Moore and Benbasat's (1991) terms with Rogers' (2003) terms first presented in 1962.



Table 2

*Construct and Attribute Alignment*

Moore & Benbasat's Constructs	Rogers' Innovation Attributes
Voluntariness	Compatibility
Perceived Usefulness	Relative Advantage
Learning Approach	Compatibility
Image	Observability
Ease of Use	Complexity
Result Demonstrability	Relative Advantage
Visibility	Observability
Trialability	Trialability

Rate of adoption relates to the speed of an innovation's adoption. Relative advantage, compatibility, trialability, and observability are positively related to innovation adoption rate, and complexity is negatively related to adoption rate (Rogers, 2003). Responses were categorized by construct/attribute and recorded on an Excel spreadsheet using participant and case number for anonymity purposes. Responses were reviewed, memoed, segmented, and coded. Similar responses were combined so as to chunk common responses and to derive the main themes.

Transcribed interview responses were sorted and categorized by the following innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. Responses were categorized by attribute and recorded on an Excel spreadsheet using participant and case number for anonymity purposes. Responses were reviewed, memoed, segmented, and coded. Similar responses were combined so as to chunk common responses and to derive the main themes.

Archival data were sorted and categorized by one of the following document types: meeting notes or memos related to badge system design and roll-out; design artifacts and

prototypes; course syllabi, assignments, and rubrics; professional development and training materials for badge users; badge system evaluations; research and articles related to the university's badge program.

The innovation attributes (relative advantage, compatibility, complexity, trialability, and observability) served as priori codes for each piece of data and emergent coding was used as other codes surfaced. Information was categorized and recorded on an Excel spreadsheet using assigned case number (A, B, C) for anonymity purposes. Information was reviewed, memoed, segmented, and coded. Similar information was combined so as to chunk common information and to derive the main themes. Table 3 summarizes the methodology used for the qualitative study.

Table 3

*Summary of Methodology*

Research Question	Variables	Data Collection Source	Data Analysis
1. What are the factors that facilitate diffusion and adoption of badges by higher education institutions?	Badge system type, badge system purpose, badge platform, program adoption time, participant experiences, university culture, communication processes	Questionnaire Interview Script <u>Archival Data:</u> Textual & audio-visual electronic documents and badge websites	Within-case analysis Cross-case analysis
2. What are the challenges that impact diffusion and adoption of badges in higher education?	Badge system type, badge system purpose, badge platform, program adoption time, participant experiences, university culture, communication processes	Questionnaire Interview Script <u>Archival Data:</u> Textual & audio-visual electronic documents and badge websites	Within-case analysis Cross-case analysis
3. What factors impact the innovation-decision process of badge system implementation within higher education institutions?	Badge system type, badge system purpose, badge platform, program adoption time, participant experiences, university culture, communication processes	Questionnaire Interview Script <u>Archival Data:</u> Textual & audio-visual electronic documents and badge websites	Within-case analysis Cross-case analysis

## **Trustworthiness Strategies**

The qualitative research tradition chosen for this study was a case study approach using purposeful sampling to showcase various uses of badges in the field of higher education. The case study approach allowed for detailed descriptions of each case's embedded context. The trustworthiness strategy, coherence, refers to the selection of a research tradition best suited to a study (Hays, 2012). The number of cases studied was appropriate and fulfilled sampling adequacy. The role of the researcher was one of objectivity and free of bias, since the researcher is a non-practitioner of badging and solely a researcher of the movement.

Triangulation of data methods was built into the study through the use of multiple forms of data: interviews, questionnaires, and an in-depth analysis of archival documents. One case at a time was analyzed systematically to incorporate the trustworthiness strategy of dependability. Initial codes and transcripts were sent to the participants for verification, a higher level of member-checking, in an effort to attain confirmability and authenticity. This type of member checking also works to establish credibility, a form of internal validity, for the study (Hays, 2012). The researcher kept a field journal which was coded and cross-referenced with the results of the other instruments. Additionally, a data collection and analysis plan was created and followed so that consistency and organization allowed for a thick description of each case.

The findings are not meant to generalize to an outside setting; however, the findings within each case and the contextual similarities and differences between the cases are highlighted, so that others may make their own decisions about the relevancy to their own situations. The purpose of this research meets ethical validation criteria in that it is intended to inform practice (Hays, 2012).

In the following chapter the results of the data analysis are presented for each case in a narrative report with contextual description, discussion of categories and themes identified, and anonymous direct quotations from research participants. Tables will illustrate each of the innovation attributes (relative advantage, compatibility, complexity, trialability, and observability) and a summary of associated themes that emerged for each of these attributes/categories for each case will be provided. Each case study will be discussed individually and described in-depth in order to present a deep understanding of each case and to present a thick description.

## CHAPTER III

### RESULTS

This chapter presents each case study individually and describes the contextual details of the badge programs run by each institution. The within-case analysis will describe the results of the interviews, questionnaires, and archival document analysis in the context of each case and be examined through the lens of Rogers' Innovation Diffusion Theory. Table 4 provides an overview for the context of each case study's badge program. The selected cases provide an opportunity to view three different sizes badge programs which have been implemented and scaled in different ways. The three cases represent systems which are ever-evolving and this analysis offers a snapshot in time of the three badge programs.

Table 4

*Organizational Framework for Context of Badge Programs*

Case Study	Badge Context	Badge System Purpose	Credit-based	Platform	Scale
A	Graduate-level education technology & science courses	Peer review & community building for lateral learning	N	Initial: BadgeOS  Current: Credly	Course-level
B	University undergraduate composition courses	4 <sup>th</sup> credit hour in undergraduate writing program	Y	In-house website	Department-level
C	University-based open badge platform	Graduate level instructional technology courses; open to outside institutions and individuals	N	Initial: WordPress hack  Current: In-house designed-open source	University-level & beyond

## Case A Analysis

Table 5 illustrates the type and number of data collected for Case A.

Table 5

*Summary of Data Sources for Case A*

Interviews Conducted		Document Types Analyzed	
Program Administrator	1	Design Artifacts	5
		Course Syllabi, Assignments, & Rubrics	5
		Research & Articles Related to Badge Program	1

This case study describes a single-user badge system operating at the course-level. The badge program has been in operation for five years. The intention of the inclusion of such a small program is to illustrate that it is possible to successfully run a badge program on a very small scale. The data were provided by the professor for the program which serves graduate students in emerging technologies courses and science educator courses. Data collected included an in-depth interview with the professor who developed and implemented the badge system. Archival data, including textual and audio-visual materials related to the badge system, were also collected and analyzed. The electronic questionnaire was promoted by the participant in both spring and summer courses, although no badge users submitted a completed questionnaire.

**Contextual description.** Case A is the smallest of the three badge programs studied. Although limited in scale and operated at the course-level, this case illustrates that one individual can design and implement a badge system. Additionally, it is important to note that the other

cases also began at the course level during the piloting phases. The professor/participant, who is also the course developer, of the graduate course designed the system using an open source platform for badges and implemented it five years ago in an emerging technologies course to increase student interactions with one another and for the use of peer feedback on assignments. The participant explained, "...rather than simply having them read about badging, I wanted them to experience it".

The incorporation of badges used as peer review has increased participation and "richer comments" on the discussion boards along with an enhanced sense of community in the courses. The participant noted that students seemed to work harder and produce better quality technology projects when the badges were implemented. In this particular program, the professor generates the badges once students have evaluated each other's work and provided feedback. The students then vote on who should receive the badges based on criteria of aesthetics, navigation, end user, and clear purpose. This added element of competition has also been a positive contribution to the courses as well. Participation is required as part of the class assignments and expectations. The participant believes that these "lateral learning" benefits are well worth the added workload which is part of the manual process which requires time.

The participant had been introduced to the concept of digital badges by a former dean. Being an independent innovator, the participant decided to try incorporating badges into an instructional technology course for teachers. The participant described the pilot phase as a semester trial in which the positive gains convinced the participant to adopt the badge innovation by formally implementing the program the following semester. The initial platform used to create and issue the badges was BadgeOS (2014). The participant indicated that the system malfunctioned early on in the program, so the badge system was moved to Credly (2017), an



open source platform for designing, issuing, managing, and analyzing badges. This is from where the system currently operates.

***Relative advantage.*** The main themes which surfaced for the innovation attribute of relative advantage were direct experience, competition, and community. The design of the system supports a peer review framework where students evaluate each other's technology projects and offer critical feedback to one another. Peer feedback on the badge assignments offers affordances of what the participant terms, lateral learning, as described below:

My real goal was to ... get them to know each other; they are either soon-to-be teachers, or they are people in education environments, where they are developing learning. I've always felt that getting to know others in the class was important, and getting to see the work of others.... I wanted them to ... actually go and look at the work of one another. I also wanted them to learn about badging, which was just coming out, and it was a good way, as I perceived it, for people to get awards for work they were doing that might not necessarily give them ... course credit.

(Program Administrator01)

***Compatibility.*** These lateral learning benefits, including modeling and community building, were the main themes for the innovation attribute, compatibility, and were mentioned several times during the interview:

They get to know each other's work; they get to know each other's background, because they've looked at someone else's work. They are learning from the model of somebody else's work, so I see many subtle, what I call lateral benefits....

They grow from learning; they sense a stronger sense of community, because they do the badging. (Program Administrator01)

The badge system has an informal evaluation process, aside from a published, mixed methods action research study conducted to determine the impact of the badging system. One way that the badge system is evaluated is in terms of participation and the tenor of the comments on the discussion boards.

The participant explained:

It really ... was that first paper that I wrote that really made me see that it was working [for] students to visit each other, care about each other. Their critiques were ... graciously put, but you know, a lot of them pointed out things that I didn't want to point out as an instructor.... My criteria were not quite as high as theirs. It ... was an intro course; I wasn't going to evaluate them on whether their website was ... elegantly designed. I just wanted to see, could they start it? Could they put a picture in it? Could they put some content in it? But in their peer reviews, they went to a higher level.... I found that if they are actually working to another audience than the instructor, they usually put more effort into it. If it's just going to the instructor, I often see that my students don't work as hard. (Program Administrator01)

**Complexity.** The participant noted that there are no reported usability issues for the students when they claim and export their badges, however, a recurring theme throughout the interview was that of increased faculty workload. The increased time and effort required to run the badge program is the main theme categorized under the innovation attribute, complexity. The badge system is separate from the learning management system, which is a limitation and time consideration.

The participant offered this comment related to usability:

I have to do extra work with the spreadsheets, and then I have to go generate the badges; ... it's not turnkey for me, but I feel that the outcome is sufficiently high, that it's worth the extra work. So lessons learned, it's more work than just the discussion board, but the lesson was, I felt that the students did a better job because of the badges, and ... that's a big part of teaching. (Program Administrator01)

**Observability.** The innovation attribute, observability, is built into the system that is built to support peer review and modeling of technology projects. After reviewing each other's projects, the students vote for which of their peers should win 1<sup>st</sup> through 3<sup>rd</sup> place. The Google Form voting ballot allows the professor to export data to a Google Sheet and calculate votes and analyze the data. Once the winner is calculated, an email that announces the winners is generated for the class. The professor sends the badge link to the winners, and they can navigate to the Credly website and claim their badge. Then they can export their badges to social media sites, such as LinkedIn, for future employers to view.

The participant commented:

So, they will have a perception of one application of a badge. In the emerging technology course, I give them an overview of badging, and I talk about the variety of uses. Because that's the purpose of that course, I talk about how we are using a kind of specific subset of a badge -- not necessarily the most common one. They are learning about badging, ...so they get an experience with the badging process. They get an experience with giving a badge to somebody, or determining whether they think the person is qualified for the badge. They may earn a badge

themselves, especially in a course where I give them some background on badges, they get a better perspective on the badging movement. (Program Administrator01)

***Trialability.*** The final innovation attribute, trialability, was tied to the pilot phase where the participant began to notice the outcomes of better work being produced and “richer comments” on the discussion board. The downside to the implementation was again noted as the added faculty workload. The badge program studied in this case, uses badges in a specific way that may not be the most common application. This case study is a window into just one way that badges are being used. The participant believes that, “used judiciously, [badges] can encourage a type of social interaction you might not get otherwise”.

The program administrator supplied visual and textual information necessary to understand the context of the case. A sample of the archival documents which were analyzed for Case A is shown in Table 6. The documents helped provide a visual for what the program administrator had described in the interview. For example, it was useful to the researcher to actually see what a badge voting ballot looked like and to understand how usability may have been addressed by reviewing tutorials and job aids. The document analysis phase helped form the description of the context of the case study.

Table 6

*Case A Samples of Document Analysis Themes Categorized by Innovation Attribute*

Data Source	Code	Relative Advantage	Compatibility	Complexity	Observability	Trialability
Badge voting ballot template	Design artifacts			Criteria		
Example badge project	Design artifacts				Challenge	
Tutorials for projects	Training materials			Technical support		
STEM Badge winner announcement template	Design artifacts				Competition	
Job Aid: website creation project	Design artifacts			Technical support		
Journal article	Related research and articles				Visibility Notoriety	
Badge project description & rubric	Course assignments & rubrics			Criteria		

**Factors facilitating the diffusion and adoption of badges.**

*Technical ability and open-source badge systems.* The case study participant who implemented this badge system has a strong set of computer skills. The nature of teaching instructional technology courses, exposes one to new technologies and positions one to experiment with new technologies in order to stay current in the field.

The participant described the pilot and implementation:

I think originally, I had used a software called BadgeOS, which was open-source. I figured out on my own how to generate the badges. I think you had to go a little more into the coding level, but it wasn't that difficult and you could generate the badges and push them out that way. I developed my own criteria ... with each badge.... So that was my first pilot one. I haven't changed much, it's just that the software itself -- the open source, you know, being attended to by volunteers, got broken; it wasn't working for a while. Someone told me about Credly, and I went over to that, and that's pretty user-friendly. (Program Administrator01)

**Challenges impacting the diffusion and adoption of badges.**

*Increased faculty workload and time.* The participant admits the burden of added work and more time spent on grading assignments and other tasks related to the badge system management. The participant has heard that some learning management systems, such as Blackboard, are now incorporating badge system functionalities into their systems, but this particular university uses Moodle. The participant conceded that even if Moodle afforded badges, the system likely would not work to the participant's satisfaction.

The participant explained:

I have seen big learning management systems, and by the time they implement something, it's not usually what I want anyway, so I'd probably still keep on doing my own thing. I found it to be just a very useful process.... I'd say it takes me two hours for each course when I have a badge vote. I might do that four times in one course, and one time in another.... I see the value to it, so I put the extra work in, but I do find myself grumbling, saying ... 'if I just didn't do this, I would

be finished instead of working till 10 o'clock every night'. ...So, the manualness of the way I have to work is a limitation. I don't think too many faculty would be willing to put the time in that I do, until it's more turnkey. (Program Administrator01)

### **Factors impacting the innovation-decision process of badge system implementation.**

*Autonomy and content area.* The professor who implemented the badge system in this case study operates with a fair amount of autonomy within the department. This program administrator has the flexibility to explore new ideas without constricted oversight and without layers of approval needed to implement new ideas. The program administrator has a reputation within the department for trying out new technologies, and perhaps it is more accepted, and even expected, since the professor's content area includes instructional technology.

The participant shared the following:

...I work independently. If I had to work with an instructional designer—I tend to have my own ideas—I've been in this field for a very long time. Sometimes I'll run up against their being a little more resistant than I am.... [I] didn't have barriers there. It became quite clear to me [that badges] became a really good adjunct to my work.

### **Case B Analysis**

The data collected for Case B is summarized in Table 7 below.

Table 7

*Summary of Data Sources for Case B*

Interviews Conducted		Questionnaires Returned		Document Types Analyzed	
Program Administrator	2	Faculty	8	Material related to badge system roll-out	3
		Students	8	Design artifacts	2
				Course syllabi, assignments, & rubrics	5
				Training materials for badge users	4
				Badge system evaluations	1
				Research & articles related to badge program	4

This department-level case study included in-depth interviews with the program administrators ( $n = 2$ ) of the three-year-old badge program. The interview questions were sorted and categorized under the five diffusion attributes. The data from the responses were coded and main themes were identified. The interview responses provide detail about the innovation adoption process and provide depth to the contextual description of the case.

**Contextual description.** Case B presents a use of badges that is rare in education, in that the badges are used for skill assessment and comprise the fourth credit hour of undergraduate composition courses. This use of badges is unique in that the badges are tied to credit, tuition, and faculty salaries. Leadership in the composition department of the university implemented badges to assure that consistent instruction across the many sections of the courses that form the undergraduate writing courses. They had noticed there was an achievement gap and that



students were not receiving consistent instruction across sections. The number of sections is very high, and there are many adjuncts teaching these courses.

The solution was to incorporate a badging program in order to unify composition courses and ensure students were receiving instruction central to the intended course learning outcomes. The badge system solution came about at a time that the traditional 3-credit hour approach was being questioned, and the department head was interested in incorporating a digital, multi-modal element into the courses.

The badging program is embedded into the English 101 and 102 courses which make up the first-year writing program at the university. English 101 includes eight badges and English 102 includes six badges. The badge assignments are worth 18-24% of the course grade and assigned at the course instructors' discretion in order to allow for instructor choice. Some instructors embed the badge assignments into coursework and some assign the badges separately. Assignments consist of instructional content, multimedia explanations, examples and the assignment to demonstrate the skill.

The badge program in this case study undergoes the most formal evaluation process of the three cases studied. The annual, intensive evaluation is a "mini-study" conducted each summer at the close of the academic year. Multiple faculty members participate as members of the evaluation team. Three random writing samples are collected from each section, and the committee evaluates the samples using a standard rubric that measures the learning outcomes. This process informs decisions about which badges need to be revised or emphasized more in class. Survey data from the instructors is also collected and analyzed. The program administrators believe that the badge system will continue, since all stakeholders are on board

now, they are committed to the fourth credit hour, and the multimodal component has been ingrained in the system.

**Implementation Decision: Relative Advantage.** The badge website was designed by the primary contact for this case study who currently maintains the system. One program administrator took on the role of ensuring pedagogical soundness. In the fall of 2013, one of the program administrators first heard about badges, and soon afterwards suggested badges as a potential solution to the issues the writing department was facing. The department chair fully supported the idea and required that all faculty for the upcoming semester resubmit their letters of intention to agree to the badge program being implemented in the courses they would teach. There was strong faculty resistance at first, because they were being asked to fundamentally change the way they had been teaching, some of them for many years. Conversely, the administration was excited; they saw the initiative as innovative and progressive. During the initial phases, one of the program administrators was pitching the badge program all across the campus, while the other program administrator was building the system and sorting through technical issues. One program administrator stated, “It was really hard. We got a lot of resistance from our faculty.... We had to convince people that this was a smart way to teach writing”

**Pilot Phase: Trialability.** The pilot phase was very brief and informal. One of the program administrators had implemented a badge system with a small class of five or six students over half a semester while at another university so that they could be sure that Credly (2017) was integrated properly with WordPress (2017). They wanted to be sure that the “infrastructure and technology work[ed]” before the full-scale implementation went live almost overnight in the fall of 2014. Some initial issues with the implementation were that faculty were

unable to locate their students' work. One participant stated that "...there could be 3000 student submissions for all kinds of different badges, and if you are a faculty member, you just want to find your students or a specific badge". They needed a way to organize the submissions, so a drop-down menu was created with faculty names so that students could choose their instructor's name when submitting their badge assignments. They learned quickly that students do not always know their instructor's name or how to spell it correctly, so simply having the student type in the instructor name was not a viable option, hence the drop-down menu was created.

***Publishing & Sharing: Observability.*** Since the badges are tied so specifically to the learning outcomes for the class, they have found that students do not typically share the badges externally, although it is an option. Students can create a profile on Credly and then share the badge to social media sites, but typically the badges are not shared outside of the program. The value of the badges is internal rather than external in this particular case.

One participant explained:

...we use badges very differently. We don't really see students sharing them externally, and that's one of the major questions that we have for digital badges, which is how do we get students to engage with these badges and share them publicly? (Program Administrator01)

***Learner Benefits: Compatibility.*** Badges make course learning outcomes visible to students and faculty, and they emulate best teaching practices. The actual badge is less important than the delivery of the content which is "pedagogically sound".

A participant said:

The badges focus on our key student learning outcomes. So, they are getting an explanation of the skills and strategies; they are getting an example of them being

put to use.... In ... my view, this is best teaching practices.... We are situating a concept, [and] we are giving an example of the concept in use. (Program Administrator02)

***Institution Benefits: Compatibility.*** The benefits to the institution are increased visibility and notoriety from press, published articles, and research studies. The site is also public, so other departments at the university are able to access it. This is one of the benefits of the system not being outsourced. One participant remarked, “Well institutionally, they are very much supportive of the program. I think they mostly like it for its innovation ... and it's gotten quite a bit of press and some notoriety, so they of course like that”.

The participant also shared:

...we know of other courses in different disciplines and subjects that actually use our site for their own courses.... They might implement the researching badge in the history course, so it's a wonderful resource for instructors, and it's all in-house. (Program Administrator01)

***Usability: Complexity.*** It is certainly a bonus for both faculty and students that the system is mobile friendly; however, there are some limitations. One of the major usability issues is the lack of integration of the badge system into the learning management system. One usability issue was resolved early on with the addition of the faculty name dropdown; this solved the issue of students not remembering their instructor's name or misspelling it. The usability issue related to lack of sorting capability was mentioned and is an ongoing problem that likely will not go away due to the platform's constraints. Instructors are unable to segregate badge assignments into specific sections and add due dates for the work. One participant said,

“...there's been no way for us to organize submissions into different sections, and that's something that a lot of students -- a lot of faculty members would have liked to have seen”.

**Implementation Challenges: Relative Advantage.** In order to have some consistency with the images of the badges, the program administrators asked the graphic design department to design a badge that reflected the university and the writing program so that it was easily recognizable and easy to change the name of the skill that it was certifying. Faculty buy-in was mentioned again by both participants as an implementation challenge. “[Program Administrator01] was kind of focusing on building the site and making sure it was working and seeing how students were reacting to it, and I was really busy crafting arguments and getting buy-in from people.” (Program Administrator02)

**Student and Faculty Perceptions.** Data were also collected from questionnaire participants ( $n = 16$ ). The participants included both students and instructors who use the badge system in the classroom. The questionnaire items were sorted and categorized under the Moore and Benbasat (1991) instrument traits and Rogers' diffusion attributes as noted by the section headings below. The data from the responses were coded and main themes were identified.

**Voluntariness: Compatibility.** The change in initial faculty resistance became apparent in reviewing responses to this item. Several instructors indicated that they felt the system was imposed and they resented the change early on in the implementation, but that their initial resistance has lessened and even disappeared over the last couple of years. One faculty member even shared, “At first I resented it, but I have come to embrace its effectiveness”. Another said, “When the badges were first required, I thought the system was imposed and the requirements meddlesome. Now I've come to accept it all, and I think it's reasonable and basically good”.

This questionnaire item also is the point where the student perception of “busy work” first surfaces. Another faculty member shared, “Students clearly need the badges but often do not see the value and consider the badges busy work”.

***Perceived Usefulness: Relative Advantage.*** Questionnaire participants were asked about the advantages and disadvantages of the badge system. The advantages included the affordance of uniform instruction across multiple sections and faculty and basic writing skill enforcement. The disadvantages were noted in terms of the badges assignments being time-consuming for students to complete and for faculty to grade. Other concerns were the difficulty tracking student submissions and the fact that the badge system is not integrated into the learning management system. Table 8 below sorts the participant responses by advantages and disadvantages.

Table 8

*Perceived Usefulness of Badge System*

Advantages	Disadvantages
I think the badge system helps bring a thread of uniformity into the instruction. This is good uniformity because the English department can know each student in freshmen composition courses is being exposed to the same basic material, regardless of instructor or textbook.	I think it is helpful to those who don't have a basic knowledge of the English language, however it takes a lot of time to complete and for the work we put in I would hope there was a greater pay off represented in our required papers.
...one advantage is students become stronger writers because of the content.	Students see it as busy work if it isn't strongly connected to class or paper assignment. Students also don't take the badges seriously and often have to redo the assignment which means way more grading for the instructor.
[The badges are] building blocks to assignments practicing crucial skills	
Since the system is electronic students can work on badges on their own and in places of their choosing. I can grade anywhere there is Internet and don't have so many papers to bring back and forth.	The main system disadvantage is there is no deadline function, so I have to keep track (with 4 classes) of times of submissions.

***Learning Approach: Compatibility.*** Most of the participants responded that the badge system is compatible with their own learning style. Students mentioned that the badges helped reinforce basic writing skills, and they appreciated the online component. Instructors explained how they were able to incorporate the badge assignments into their current assignments relatively easily. A faculty member shared, “At first, I felt the badges were learning in isolation with no real world connections. However, as the system has become more embedded in my syllabus, I now tailor badge assignments to work with current writing assignments”. Another faculty member stated, “I use the badge system in tandem with assigned readings/writing

assignments and this helps reinforce my approach to learning”. A student explained, “Personally I am a hands on [sic] visual learner therefore it works for me. There are examples that help you with the topic, so I am able to see what they are looking for”.

Another response included:

It is compatible, because I incorporated it into the assignments I was already teaching, and it reminds me not to overlook or de-emphasize some of the very fundamental yet essential elements of composition. We can let the content of what we're teaching overshadow the emphasis on composition if we're not careful, and the badge system is a solid and consistent reinforcement of basic concepts.

(Faculty01)

**Image: Observability.** The badges in this case primarily have internal value, and it was clear that most participants could not see the value beyond the classroom, nor did the responses indicate they all had a clear understanding of potential uses for badges in other contexts. There were some mixed emotions in response to the questions about how the badge system could impact their value as a prospective employee. One student stated, “I am a [expletive removed] writer, [so] this could make me look worse to employers”. While another student shared, “... I cannot imagine having copies of my badges will in any way aid in the selection process”. Similarly, a faculty member stated, “Unless a potential employer is heavily invested in a badge system that is tied to employee pay raises I am not sure badges from one employer would be important to an [sic] potential employer”. To the contrary, a faculty member said, “I think that publishing /sharing the badges could illustrate writing and critical thinking skills as well as willingness to finish a project to completion. All of these are valuable assets to potential employers”. Another faculty member offered, “I think the badges clearly validate their



effectiveness and therefore would show a potential employer the value of incorporating a system with proven success”.

***Ease of Use: Complexity.*** When asked about whether the badge system was easy or difficult to use, participants again mentioned the badge system not being linked to the learning management system. Most of the students stated briefly that the badge system was “easy to use”. One faculty member mentioned that the first few years proved to be more difficult in terms of system use, but its “much smoother and less onerous now”.

***Result Demonstrability: Relative Advantage.*** When asked how participants would communicate to others the benefits or limitations of the badge system, the benefit of common instruction across sections was again mentioned. One faculty member expressed that “the badge system gets students recognizing and using the same discourse throughout both courses. It also allows for instructors to focus on more specific writing issues”. Another faculty member remarked, “the main benefit is that it gives students a chance to really see what goes into writing in a more organizational way. The limitation is that it does take up a lot of your time in grading”.

***Visibility: Observability.*** When participants were asked how publishing and sharing their badges impacts their perceived usefulness of badges, the lack of external value was again cited. One faculty member communicated that “there's nothing tangible to show for their work which they can use on curriculum vitae, resume, or social media as proof of a student's skill set”. Another faculty member brought forth an interesting proposition by stating “... if we REALLY had evidence attached to badges, and we utilized them (like had them countersigned by other instructors), then they might be meaningful”.

***Trialability.*** Participants were asked if they had opportunities to experiment with the system before formally using it. Most of the participants briefly indicated that they did not;

however, three answered that they had a trial run with the badges on a limited basis. One student had used badges as extra credit prior to implementation. A faculty member shared that there was no “trial and error time”, but there is ongoing flexibility with “tweaking” the badges.

One faculty member noted:

We were given a mini-badge to complete before the system went live, but as I mentioned above, our system is constantly being rethought and reinvented. But as an instructor there weren't many opportunities for us to test the system beforehand. (Faculty03)

**Archival Documents.** Data were also collected through an extensive archival data analysis of textual and audio-visual materials related to the badge system design and roll-out. The data collected were categorized under the five diffusion attributes and main themes were identified. Table 9 below shows a sampling of some of the documentation analyzed. The identified themes were cross-checked against the themes from the interviews and questionnaires, so this method provided data triangulation.

A review of the past faculty surveys in chronological order from 2014 to 2015 showed a definite pattern in the lessening of faculty resistance over time. This was echoed in interview and questionnaire responses, so having access to the actual surveys that documented faculty perceptions was of particular interest to the researcher. The document analysis phase provided a holistic picture of the badge program and interestingly traced the program from when the program administrators first presented the idea to the stakeholders through a video pitch. The documents also supported the fact that there has been much faculty training and faculty involvement during evaluations throughout the life of the badge program.

Table 9

*Case B Samples of Document Analysis Themes Categorized by Innovation Attribute*

Data Source	Code	Relative Advantage	Compatibility	Complexity	Observability	Trialability
Demonstration video to pitch idea (2013)	Badge system roll-out material	Buy-in				
Badge icons branded with university logo & skill	Design Artifacts				Consistency	
Badge introduction Prezi (2014) for faculty	Professional development and training materials for badge users	Buy-in				
Faculty surveys (2014-2015)	Badge system evaluations		Resistance			
Faculty webpage-technical FAQs & classroom resources links	Professional development and training materials for badge users			Technical support		
Journal article Book chapter Online articles	Related research and articles				Visibility Notoriety	
BadgeOS Award						

**Factors facilitating the diffusion and adoption of badges.**

*Alignment to learning outcomes.* The program administrators have managed to design and implement a successful badge program which is tightly aligned to the expected learning outcomes for the two courses, English 101 and 102. The mention of course learning outcomes surfaces multiple times in responses from those interviewed and surveyed, as well as the archival documentation. This indicates that learning outcomes are the focus of the badge system and at the forefront of the stakeholders' minds. A faculty member stated, "The badges are highly effective and focused learning objectives/skill sets that create a common thread throughout the first year composition courses to ensure all students are learning the necessary skill sets for college level writing".

Another faculty member indicated:

I think the actual skills showcased in each badge are compatible with first year writers as they begin to uncover what is expected of them as academic writers. I like that the badge system gives us an opportunity to focus on each of these skills.

(Faculty07)

A program administrator explained that, "...we always talk about our digital badges in terms of making our course learning outcomes visible", and this became apparent in a review of the responses as well as the badge purpose and description in the course syllabi.

*Instructional Consistency.* Another purpose for implementation as well as benefit of this badge system is the affordance of consistent instruction across sections. With many sections and adjuncts teaching the English 101 and 102 courses, some type of calibration is needed. The importance of consistent instruction is recognized by participants in the following quotes. One faculty member said, "I also think that it really ... created unification while maintaining

flexibility. I also think that it ensures students a more unified experience in first-year composition, while still maintaining a lot of instructor autonomy...”. Another faculty member explained, “[Advantages are] consistency and shared content among all sections of first-year writing courses. Understanding among faculty that students in later courses have learned or at least been exposed to fundamental concepts of composition”. Still another faculty member remarked, “The badges are prefabricated materials you can adjust for your instructional needs, and they allow a sort of common ground for instruction”.

Another response included:

... on average, I would say we have between 70 and 80 instructors every semester teaching those classes. So there's a big variation in terms of how they are teaching those courses and then what exactly they are measuring. So even though the course learning outcomes are the same for everyone, not everyone was teaching the same exact way. And they shouldn't teach the same way, but we wanted to make sure that everybody was getting the same course learning outcomes.

(Program Administrator01)

The learning outcome aspect is closely tied to the consistency of instruction aspect as noted in one quote above. A review of the data from the faculty surveys, workshop, and training materials during the document analysis also revealed this focus on consistent instruction across sections.

***Formal evaluation involving multiple stakeholders.*** This particular badge program has a rigorous and formal evaluation process in place which allows for input from multiple stakeholders. The trainings, workshops, and surveys in which the instructors participate supports a sense of shared ownership of the system rather than an imposed program in which they have no

power to help improve. One faculty member indicated, “We discuss [badge] issues within our department at monthly meetings”.

A participant describes the evaluation process:

.... A committee gets together at the end of the academic year and evaluates all of this writing, using a standard rubric that we've developed.... They sit down in a room, and ... they go through and evaluate it with the rubric, and then we measure that against the student learning outcomes and ask whether or not they are meeting it.... It's much easier now to pinpoint what exactly the students are not getting. We consistently have issues ... with some of the higher-level learning, such as synthesizing and analyzing, and critiquing -- those are often kind of big areas that we see students fall short in. It's easy now to see that, because we look for those things specifically in their writing, and if it's not there, if synthesizing is just not there in their research, then we can go back and we can tell faculty, ‘we need to emphasize the synthesizing badge even more’, or ‘we need to go back and revise that badge even more, so that it helps students use it in their writing’. (Program Administrator01)

The archival document analysis also uncovered Google Docs with comments from instructors and the badge program manager tracing communication during the badge revision process. Faculty surveys and suggestions were also part of the documents reviewed. It is clear that the evaluation and badge revision process is a joint effort between multiple stakeholders. This approach led one participant to share, “I think the design of our digital badge system is ever evolving as we continue to use it”.

**Challenges impacting the diffusion and adoption of badges.**

*Technical limitations.* It was noted that the website rarely crashes and that the system operates without malfunctioning for the most part; however, there are some functions that many of the participants would like built into the system. Additionally, many participants noted the inconvenience of not having the badge system integrated into the learning management system. Students must log into separate systems to submit the badge assignments, and instructors must navigate the two systems to locate assignments and grade them. The limitations of the platform prohibit the section sorting and deadline capabilities which many would appreciate as well.

Below are participant quotes that validate these concerns:

Now of course, we have other requests from instructors like, they would love to have it separated out by section, and they would like to have due dates and cut off dates to ... make sure their students couldn't submit something after a date, but ... we can't put parameters like that into it.... While you might want to have your summarizing badge cut off tomorrow night at midnight, maybe someone else needs to still use it, so we can't do that. We're trying to balance that flexibility for all instructors, but at the same time, making their lives easier to actually use the system. (Program Administrator01)

All submissions are compiled together and you can search for your own students, but it would be easier if the set-up was something closer to Moodle, where teachers only see their own students and the gradebook is integrated into the system. (Faculty06)

One faculty member expressed, “I loathe the way our badge system is separate from our course management system. Submissions and subsequent re-submissions are often difficult to manage and grade. I believe some sort of cohesive site or implementation would behoove our students”. Another conceded, “It's fairly easy to use. Searching for an individual student, within the WordPress framework as it is now, is not as easy as it ought to be”. The archival document analysis review also showed faculty surveys which mentioned some of the same concerns. It is important to note that there was also much evidence of ongoing trainings and faculty resources such as technical FAQs and other faculty support resources housed on the website and in the documentation reviewed.

*Avoiding student perception of busywork.* The questionnaire responses from both students and instructors showed the importance of closely tying the badges to assignments rather than assigning the badge activities separately. Although the purpose of this is to give instructors more flexibility, one instructor said that, “students see it as busy work if it isn't strongly connected to class or paper assignments”. One student offered, “it is an easy homework for professors to give, but can be awkward to link to current topic”. One instructor offered this remark, “The students often think of the badge work as ‘busy work’ [although] they are couched as a valuable part of the course”. Another instructor shared this, “To students it can feel like busy work, and for faculty members it's time consuming, especially in the first few years of implementation”. One student said that the badges are “required, so it feels inconvenient to work on badges as well as our other class work”. The instructors seem to understand that the badge assignments are to support basic skill and learning outcome attainment; however, some students seem to feel that the badges were extra or unnecessary work. It was suggested that when instructors take the time to closely integrate the badge assignments into current assignments, the



students see them as more relevant. The importance of the instructor's attitude towards the badge system was also mentioned, "If the instructor becomes invested and excited about the badges, the users will also. If not, the badges can easily become busywork".

**Factors impacting the innovation-decision process of badge system implementation.**

*Importance of buy-in and lessening of faculty resistance.* There was a strong indication of a change in faculty resistance from the time of implementation until the current time. This theme surfaced time and time again and was even pronounced in the archival document review. It is clear that the program administrators had the full support of the university behind the decision to implement the badge program and add a fourth credit hour for the badging activities, but the faculty were not all on board at first.

A participant remarked:

I would say our biggest hurdle to the entire implementation was getting buy-in from faculty ... it was a big ask -- we were asking them to completely rethink the way that they were teaching these courses -- the same courses that they might've been teaching for a decade. We were asking them to retool that course. So, faculty buy-in definitely was the biggest barrier in the beginning.

(Program Administrator01)

Comments from the questionnaire participants, showed some faculty members admitting their lessening resistance as time went on; for example, "At first, I resented it, but I have come to embrace its effectiveness". Another faculty member reflected, "The badge system was difficult to use in the first 2-3 years, but it has been tweaked, so it's much smoother and less onerous now". Another faculty member added, "At first I felt the badges were learning in isolation with

no real world connections. However, as the system has become more embedded in my syllabus, I now tailor badge assignments to work with current writing assignments”.

Finally, there was this:

.... I was in on the development of the program, so I was supportive throughout its implementation, but there were many faculty members who were resistant to the system and the idea of a heavily weighted outside element becoming a compulsory component of their course. I could certainly understand their resistance. The first year or two was rocky for the program as a whole.

(Faculty01)

Of course, it is also vital to receive buy-in from the students as well, as noted by one instructor, “You have to take the time to incorporate these badges as meaningful connections to your larger projects. Without this, students won't buy in and you will be stuck forever grading, and your evaluations may lean more negatively”. The following quote concludes this case study analysis and illustrates how the badge system has positively impacted students’ writing abilities:

It is a rewarding validation when students successfully complete a badge, and I also receive feedback from students stating how much the badges helped them become better writers. Many students state that they never learned these skills before and are more confident when completing a badge successfully--which then translates into more effective writing and critical reading. (Faculty07)

### **Case C Analysis**

The data collected for Case C is summarized in Table 10 below.

Table 10

*Summary of Data Sources for Case C*

Interviews Conducted		Questionnaires Returned		Document Types Analyzed	
Program Administrator	4	Faculty	2	Material related to badge system roll-out	5
		Students	4	Design artifacts	12
				Course syllabi, assignments, & rubrics	1
				Training materials for badge users	5
				Research & articles related to badge program	2

This case study of a badge program operating at the university-level included in-depth interviews ( $n = 4$ ) with those responsible for the design, implementation, and management of the badge program. The interview questions were sorted and categorized under the five diffusion attributes. The data from the responses were coded and main themes were identified. The interview responses provide detail about the innovation adoption process and provide depth to the contextual description of the case.

**Contextual description.** Case C traces the adoption of the badge program using the initial system which was implemented four years ago, and the current system on the new platform that rolled out at the beginning of 2017. The system was updated due to the badge program growth, and so others outside of the university could access it as an open source option for badges. The primary purpose of the badge program at this institution is to support technology integration courses in the teacher education program. The current focus is on

providing pre-service teachers with technical skills using badges that are “chunked into categories”. Some of the badges act as prerequisites to the course, so they must be earned before starting the class. Then there are other badges that are linked to the class assignments.

A participant explained:

They can get a grade and not get a badge; they can get a B on an assignment and not get the badge. We only issue the badges for mastery level work, and we do let them resubmit, even after the semester's over. So if they want to redo their project, they can resubmit and get a badge. And they are basically graded by the different instructors of the course -- the technology course. I supervised a course, hired grad students to help teach it. They were the ones that reviewed and created the badges, ... [and] they issue them to the students. (Program Administrator01)

The education technology classes serve approximately 20 different education majors who need “technology training that is specific to their subject area”. A program administrator explained that badges allow instructors of the course to “compartmentalize” projects that are specific to each subject area. The instructors who teach the various sections of the course each have a group of badges in which they specialize, so the badge assignments can be graded by a person who “has expertise in that area”. This approach supports learning that is more personalized and customized for the students in the various programs.

***Implementation Decision: Relative Advantage.*** Although the initial system did not require approval outside of the department and was run “as a hack out of WordPress”, it continued to grow, so they designed the newest site with the college dean’s approval and support. The new system is their current badge “repository and issuer”. The badge system is available to individuals, higher education institutions, and school districts searching for a

platform in which to use badges. The system designers and administrators in this case study have a fair amount of technical ability, which may play a significant role in its ability to success and scalability.

***Pilot Phase: Trialability.*** There was not a formal piloting phase when the department first started using badges. A couple of instructors tried the badges out in a class one semester, and they liked the results well enough that they extended the use of badges to the other sections by the next semester. One of the lessons learned during the initial implementation was that creating badges for all of the content areas included in the secondary education teacher preparation courses was not possible for the design team. They soon learned to make use of subject matter experts (SMEs) sourced from undergraduate students in specific content areas such as science majors. The designers took on the role as instructional design “mentors” to these undergraduate students who offered their content knowledge expertise in return.

***Publishing & Sharing: Observability.*** The badges are pushed out to Mozilla’s Backpack (2016) where students can manage them in collections they create or share them to social networking and career sites.

A participant shared:

So, after badges are approved and showing that the student or the person who has completed this badge and that they've done everything the badge requires them to do, it's approved, and then they can export that to their Mozilla backpack. And then in Mozilla backpack, they have the options and the choices to show which ones are public and which ones are not. (Program Administrator02)

***Learner Benefits: Compatibility.*** One of the program administrators shared that one of the benefits of badges in this particular system is that “learners get an opportunity to see a variety

of different tools and different technologies that are out there”. Additionally, it affords the students an opportunity to decide which of the different tools they would actually like to use in their teaching practice.

A participant also described the following benefit to students:

I mean I think there's also this benefit that they can get recognition for their specific skills. I had one student email me and say, ‘Hey, my principal wants to know what [technology] skills I have...; can you tell him?’ I said, ‘...show him your badges!’...It does give students the recognition of their skills. (Program Administrator01)

Another participant describes a benefit of the badges to students:

They can have a lot more agency in choosing what particular technologies they want to learn. I also think that it's useful for them because badges are kind of ... competency based; we require evidence for those badges. It really gives them a great portfolio that they can show to potential employers. (Program Administrator03)

***Institution Benefits: Compatibility.*** The benefits to the university are marketing-related, since the badges are branded with their university logo. The way the system is set up allows for alumni to earn badges even after they graduate. This is a form of alumni support and continuing professional development for students. Furthermore, the badges are endorsed by and branded with a major, national, professional association in the field of educational technology. This particular case has not experienced notable faculty resistance.

However, this participant remarked:

... one of the things we are continually learning, is how important it is to persuade the students that this matters. That's something we're still learning every semester, ... [X badge system] has a couple things that we're trying to fix on it to help improve this idea of really selling the students. For some reason, the idea of badges is not always easily understood. The value of badges are not easily understood by students all the time. I think part of it is that it's not fully understood by ... employers, and so as employers become more cognizant of what they represent, I think that students will see the value in it, but I think that's something that we learned early on and that we are continually kind of learning and struggling with. (Program Administrator01)

**Usability: Complexity.** Usability issues have arisen and been addressed throughout the years, where possible. One of the main challenges has been that the badge system is not linked to the university's learning management system. This causes frustrations for both students and faculty and creates what one program administrator refers to as a "pain point". Other participants cited issues of glitches in the search function, along with problems with "permissions" settings, lack of instructor notification on resubmissions, and filtering issues. Also, students have reported issues when trying to export badges to Mozilla Backpack (2016).

**Implementation Challenges: Relative Advantage.** The initial challenge during the design phase for this case was creating a system to issue badges. System designers were able to come with a system that would work by using a "third-party plug-in".

One participant described other types of challenges:

I think one of the biggest challenges that we run across is keeping up with the pieces, the elements, the requirements of the badge as different systems and tools update.... [Also,] phasing badges out that are no longer -- maybe that tool has gone away or it's an updated tool and we need to say, okay, now we have new requirements, but we don't want to just go in and change the requirements in one batch, because if the badge has been issued to others and the requirements change, then that's a problem because the metadata showing what one user has done versus another one -- It can get kind of messy and complicated. So, kind of keeping up with that and this idea of badges expiring or not expiring -- that's a challenge. (Program Administrator02)

Another challenge noted was the “clunky” use of the system for students and faculty due to two separate systems and lack of integration into the learning management system. According to one participant, “we just haven't had the development opportunities yet to be able to do that”.

**Student and Faculty Perceptions.** Data were also collected from questionnaire participants ( $n = 6$ ). The participants included both students and instructors who use the badge system in the classroom. The questionnaire items were sorted and categorized under the Moore and Benbasat (1991) instrument traits and Rogers’ diffusion attributes as noted by the section headings below. The data from the responses were coded and main themes were identified.

***Voluntariness: Compatibility.*** Most participants perceived the badge system favorably, although a few had no opinion, and one thought that badges are neither “necessary or helpful”. The associated assignments are required, but submitting the assignment for a badge is not required. One participant stated that since students must “follow all of the steps anyway for the



assignment, [they] might as well submit the badge”. One student explained, “It is optional for assignments but lets us know the guidelines to follow to complete the assignment. I really like it because it takes me step by step to complete a quality assignment and then I get a badge for it!”

Another participant shared:

It was required for my [X] class. It introduced me to badges which was nice because it's good to be able to show specific technology skills that you have mastered to future employers and that I can keep earning badges regardless of if I have a class for them. (Student02)

***Perceived Usefulness: Relative Advantage.*** Participants cited both advantages and disadvantage in the use of the badges. One participant said badges were a “good way to introduce [students] to what badges have to offer. Table 11 below illustrates the main points.

Table 11

*Perceived Usefulness of Badge System*

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Options for student choice</li> <li>• Management of grading across sections</li> <li>• Step-by-step guides for projects</li> <li>• Easier to differentiate instruction</li> <li>• Relevant experiences</li> </ul>	<ul style="list-style-type: none"> <li>• Site goes down/technical issues</li> <li>• Difficult to figure out on own</li> <li>• Multiple systems</li> <li>• Unsure of badge relevance</li> </ul>

***Learning Approach: Compatibility.*** When asked if the badge system was compatible with the participants' preferred approach to learning, many felt that the "hands on", step-by-step methodology of the badge assignments was indeed compatible. It was noted by a participant that the system "facilitates students learning on their own all sorts of things that [the teacher] cannot teach them..., and it invites self-direction". Another participant shared that the lack of integration into the learning management system made teaching difficult, but that the badge concept was compatible with his or her "approach to teaching".

***Image: Observability.*** Questionnaire participants (faculty and students) were asked how sharing/publishing badges could impact how potential employers may value them as an employee. Most participants felt there would be a value to the badges in the job application process, especially for jobs "with specific requirements with technology", because they would be able to see the earned badges. One of the participants indicated, "I don't think [employers] know much about what badges are yet, but if they are shown how to access the metadata in a badge it can be great for communicating the evidence for what people know". Another participant shared, "It definitely makes me more valuable. I am glad that people get to see them. I am also surprised by how in depth they are. It makes me feel like what I did was worth it and not just busy work". A similar reaction was, "Depending on the industry and company, it may have a positive impact. I don't think it would have a negative impact in any situation". One participant seemed to grasp the usefulness of open badges and said, "Employers don't just have to take my word for my computer skills. They can look at my badges and know exactly what badges I've completed and thus what skills I have mastered with certain technologies".

***Ease of Use: Complexity.*** The participants were asked if they thought that the badge system was difficult to use, and the most popular response was that it was easy to use due to the

step-by-step instructions. One student admitted, “It is easy to use in general, but sometimes it uses terms that I have to google etc. to understand what it's asking. A little more guidance on some things would be awesome!”

A participant explained further:

[X system] is still under development, so there are definitely glitches for both teachers and students. Especially on the back end, things are a little clunky still if you're not really familiar with how it works, and there are several issuer features that still need to be developed. (Faculty02)

***Result Demonstrability: Relative Advantage.*** The participants were asked how they would communicate the benefits or limitations of the system. Limitations noted were that many people outside of the institution still do not know about or understand badges. One participant described the need for a lot of teacher support throughout the process. Another similar response was, “... it gives me step by step instructions which I like since technology is something that I don't feel very adequate in. It's not compatible in that sometimes I don't understand the steps and it offers no support”. A faculty member shared a change in perception, “At first I felt the badges were learning in isolation with no real world connections. However, as the system has become more embedded in my syllabus, I now tailor badge assignments to work with current writing assignments”.

A participant shared this benefit:

Badges are great because they allow you to display the micro-skills that you actually have, along with evidence that you really have that skill. They can also be endorsed by organizations, which, depending on the prestige of the organization,

could potentially carry a lot of weight. Badges are limited because they still are not widely understood or accepted as credentials. (Faculty02)

**Visibility: Observability.** When asked how the badge system allows the participants to publish and share earned badges and if this impacts their perception of the badges usefulness, some participants stated that they did not know how to do this; others observed that it was possible, but not easy. Others seemed to have no issue with publishing and sharing to profiles. One participant thought that “it's cool to publish them to Mozilla Backpack”. Other responses described the badges future use for employment, such as, “the publishing factor is very nice for future employment opportunities and thus makes badges useful to me”, and “open badges allow me to display my badges in a variety of social media and personal portfolio venues. This could be useful for my future career”.

**Trialability.** Participants were asked to describe any opportunities they had to experiment with the badges before formal use, and a few either did not take the opportunity or did not have the opportunity to use badges on a trial basis. One participant said, “As an instructor, I had the opportunity to explore and complete the requirements of several badges before having to issue them.” Another one admitted that there are many badges available in the system, but this participant had not yet taken the time to view “the vast variety of badges”.

**Archival Documents.** Data were also collected through an extensive archival data analysis of textual and audio-visual materials related to the badge system design and roll-out. The data collected were categorized under the five diffusion attributes and main themes were identified. Table 12 below shows a sampling of some of the documentation analyzed. The identified themes were cross-checked against the themes from the interviews and questionnaires. The document analysis process showcased the badge creation and roll-out processes through

design artifacts such as a storyboard template and usability testing documented through videos and Google Docs. The documents showed ongoing collaboration, communication, and badge evaluation among program administrators. Further, a chronological review of the documents traced the timeline of the initial platform that was used in addition to the current platform being used now. The careful documentation of the program administrators allowed the researcher to follow the badge program as it was scaled.

Table 12

*Case C Samples of Document Analysis Themes Categorized by Innovation Attribute*

Data Source	Code	Relative Advantage	Compatibility	Complexity	Observability	Trialability
Feature Request List (Google Doc)	Badge system roll-out material			Usability fixes		
Usability testing (video & Google Doc)	Design artifacts			Piloting		
Storyboard Template	Design artifacts			Instructional videos		
Journal article & Book chapter	Related research articles				Visibility Notoriety	
Badge Removal & Replacement Priorities List	Design artifacts		Reversioning			
New Badges Announcement	Roll-out material	Buy-in				

**Factors facilitating the diffusion and adoption of badges.**

*Badge content and presence of technical skills.* The fact that the badge program primarily supports secondary teacher preparation degree programs and is linked to an technology integration course for teachers may have some bearing on the lack of student and faculty resistance to the use of badges in the courses. The high level of technical ability which the badge system designers possess also works in the favor of this case. Their technical skills afforded the designers to tailor a badge system to their needs and to scale it for use by other entities outside the institution. The archival document review traces the collaboration and communication of designers throughout the implementation and management of the badge system. The documents illustrated the focus on not only the instructional components of the system, but also the technical aspects and the attention that was given to the issues that arose. Examples include Google Drive folders containing planning sheets, badge feature request list, badge URL library, and badge edit lists.

*Explaining badge purpose and potential benefits outside the institution.* Several of the questionnaire participants referred to the benefits of the step-by-step instructions for the badge assignments, but the purpose of using badges in the courses was unclear to some students. As mentioned earlier, an interview participant who is a faculty member also noted that students do not always understand the reasoning behind using the badges, how to publish and share the badges, and how they could be useful outside of the institution. Some of the responses included, “I don't get why we do them and I don't think any future employers will care” and “I know it's possible [to share badges] but I don't really know how”. Not understanding the purpose, benefits, or potential uses of badges could impact perception and buy-in for students.

### **Challenges impacting the diffusion and adoption of badges.**

*Technical limitations.* The fact that the badge system is not linked with the learning management system is a recurrent theme in this case. This limitation is what one program administrator of the badge system refers to as a “pain point” in their badge system. This factor weighs so heavily, that the participant noted it could even impact the badge system’s future “if the pain point for the students was too high.” There were also questionnaire comments from participants noting frustration with navigating separate systems. The archival document analysis retrieved various documents describing “usability fixes” such as Google documents tracking screen shots of error messages and a Google doc shared between the design team with a running list of edits to make. There were responses related to the lack of learning management system integration and the searching and filtering issues related to usability:

A lot of students love the [badge] idea; a lot of students aren't really sure why it matters; they are kind of annoyed that they need to go to the separate website to get the badges versus just turn everything into the learning management system.  
(Program Administrator01)

In the site itself, parts of the usability problems that we've had have been searching and filtering. So, open searches -- if you don't type in the exact words, it's really hard to find things. And filtering -- there is a system where you can go in and filter so you can filter for a specific type of badge ..., and sometimes the tagging is done incorrectly.... (Program Administrator02)

**Factors impacting the innovation-decision process of badge system implementation.**

*Autonomy and institution support.* The program administrators of this badge system had autonomy and technical skills to create, test, and implement a badge system with limited approval required and with no apparent backlash from the instructors of the courses. There was really no one they needed to persuade to implement the initial system, aside from making the department chair aware. As they outgrew the first platform and needed funding for the new system, the designers were able to create a new platform to better suit their needs, and at that point, they “got more and more permission to do more and more things with it”. A participant explained that the new badge system has “been approved all the way up to the Dean's office, and they are very excited about it and supportive of it”.

**Chapter Conclusion**

The analyses for each of the three cases was presented in this chapter. Each case began with a contextual description informed by the interview responses. Then the questionnaire responses and main themes were discussed using the document analysis as support for theme identification. In the final chapter, the insights are gleaned across the three cases in order to show multiple perspectives. A summary of emerged themes from the cross-case analysis is presented in narrative form. The research questions are restated and the pertinent findings are discussed in relation to Roger's (2003) diffusion attributes. Implications for practice are constructed based on the interview participants' suggestions for badge program implementation. Implications for research as a result of the study are also discussed.



## CHAPTER IV

### DISCUSSION

This chapter includes the cross-case analysis and draws assumptions about badge program implementation while focusing on the contextual nature of each case. The focus is not on the similarities and differences between cases; rather it explores each case's uniqueness (Stake, 1995). Although similarities or differences among the cases are mentioned, the emphasis is on the thick description of each case so that others may draw their own conclusions through the analysis of the rich details presented (Stake, 1995). The five innovation diffusion attributes are discussed in terms of how the data collected support Rogers' (2003) assertion that the innovation attributes of relative advantage, compatibility, observability, and trialability positively impact the diffusion and adoption process, while the attribute of complexity negatively impacts the diffusion and adoption process. The themes identified from the field journal note analysis were a final cross-check to confirm themes when considering answers to the research questions. The findings from the cross-case analysis are used to answer the research questions and address implications for practice and further research.

#### **Answers to the Research Questions**

**What are the factors that facilitate diffusion and adoption of badges by higher education institutions?**

*Ongoing involvement of multiple stakeholders (Compatibility).* Case B has a particularly formal evaluation process in place for their badge program. This may be due to the fact that tuition, faculty salaries, and course credit is tied to the badge assignments in this program. The faculty members have an opportunity to provide feedback through surveys and the badge revision process. The badge program's success in meeting the course learning outcomes

is measured by an evaluation committee at the end of each academic year through a structured process. The committee evaluates random writing samples from each course section using a rubric. Revisions are made to badge assignments based on the results of the evaluations. Allowing for the input of students through surveys and informal feedback, and from faculty through surveys and staff meetings, proves to be a way for all parties to take ownership in the program rather than the system being something in which they have no control or voice. It is vital that all stakeholders see a meaningful impact made by the badge system in order for the system to be manageable and sustainable (Hamson-Utley & Heyman, 2016). Case C also extensively tracked needed revisions for badges as evidenced by the archival documents reviewed.

*Establishing roles and outsourcing tasks (Compatibility).* Tapping into the talents of students, staff, or faculty in the department or college can be an efficient way to outsource tasks, technical skills, design support, and content creation. Case B has leveraged a way to outsource its need for subject matter experts through the use of undergraduate students who major in areas in which the badge designers are not experts, such as the hard sciences. It is useful to establish and fill roles as the design team is forming in order to determine skill needs and consider outsourcing possibilities.

*Awarding badges with external value (Observability).* The inclusion of metadata in the badges provides a method of linking evidence to the badges. Metadata which links to the actual work product created and the evaluation criteria met to achieve the badge can be attached to badges. Additionally, the badge can be linked to the awarding institution and contain an expiration date for which certain skills might need to be renewed. Case C awards badges which have an external value given that they showcase technology skills that could be useful to

promote during job application processes. It is important that the institution communicates the potential benefits of badges outside the awarding institution and provides instruction and support with how to export, publish, and share badges from their platform. Open badges can provide employers and college boards specific information about candidates' skills which could aid in the selection process (Wilson et al., 2016). Only Case C awards badges that could be of value outside the awarding institution. However, until employers more widely recognize open badges as evidence of applicants' skills, we may be at an impasse where micro-credentials are concerned.

### **What are the challenges that impact diffusion and adoption of badges in higher education?**

*Usability issues (Complexity).* The primary usability issue which was described in all three cases noted the use of two different systems to operate the badge program. Lack of integration into the learning management system (LMS) causes usability issues for both faculty and students. For these three cases, the value that badges add has outweighed the inconvenience of navigating multiple systems. Cases B and C also noted issues with sorting badges by section, since their badges serve multiple courses and sections. Case A runs as a single-user system and for only a handful of courses, so the sorting issue was not present, but the lack of integration into the learning management was discussed. There are open-source badge systems available as well as the options of customizing, through add-ons, or creating an original system solely to meet the institution's needs; however, there are financial and technical issues related to these decisions. McDaniel and Fanfarelli (2016) compared custom and commercial frameworks, and they recommended a close consideration of financial resources, technical abilities, system requirements, and learning objectives before making a decision on a badge system framework.

***Increased faculty workload (Complexity).*** Increased faculty workload since the time of badge system implementation was a common theme among all three cases. Rigorous badge assignments increase evaluation time, and as Case A's participant noted, running the badge program takes a lot longer than just grading the discussion board. It takes time to pitch, design, develop, promote, implement, and manage a badge program. The three cases have seen instructional benefits due to the implementation of badges, and participants from each case made it clear that they are committed to keeping the badge systems running in their programs.

***Lack of understanding badge purpose and value (Relative Advantage).*** Comments from some questionnaire participants in both Case B and Case C stated that they did not understand the purpose of badges nor how the badges would ever be of value outside of their courses. These types of comments point to lack of "buy-in" for some participants. The interview participants from both Case B and Case C could clearly articulate the purpose of the badges in their programs, but an interview participant from Case B admitted there is likely no external value for their badges, because the focus is on internal, programmatic value. An interview from Case C conceded that not all students understand the value, and that not all outside employers see the potential value either. As one of the 14 questionnaire participants from Case B noted, if the instructor is not excited about the badges, the students will not be excited about the badges either. One way to communicate the purpose of a badge system is to align it with a current university initiative or theme (Hamson-Utley & Heyman, 2016). If the recommendations from this study for successful badge implementation were summed up into two words, they would be purpose and value. These two themes were clearly reiterated throughout the entire study and across all cases.

**What factors impact the innovation-decision process of badge system implementation within higher education institutions?**

*Clear purpose for badges as a solution (Relative Advantage).*

Although some believe that badges are “not a digital gold star” and do not work well as an extrinsic motivator, they can be used to boost performance, participation, and communication as described in Case A. Case B models how badges can be indicators of benchmarks and how they can create unification while maintaining flexibility and instructor autonomy. Badges can be shaped & reshaped based on assessment results and programmatic needs. Case C illustrates how institutions can partner without outside institutions and offer badges as extracurricular or competency-based instructional components. The important factor is to have a clear purpose in mind and be able to answer the question, “why digital badges”? Wilson et al. (2016) suggest a shared vision for the badge system that involves multiple levels at the institution. They also suggest badge system alignment to the university mission in order to drive support at multiple levels.

*Institution support and faculty buy-in (Compatibility).* One similar thread which weaves through each case includes the importance of “buy-in”. Case A shows that one person with a bit of autonomy and some technical skills can fully design and implement a badge system at the course level without having to convince anyone to support it. Case C exhibits how a few tech-savvy individuals with an interest in badging can design and implement a system that eventually is outgrown, rebuilt, and scaled with full support of the college. Case B required many layers of institution support and faculty buy-in. This particular case shows how a lot of hard work and commitment can create a badge system that is implemented, strongly resisted, and finally accepted and even embraced by faculty members.

One of Case A's interview participants stated:

Initially we referred to it as the fourth credit initiative, because it added this credit hour to these courses which didn't really seem like a big deal to us, because we figured, it's going to be extra work for students to be doing all of these things and it would be extra work for faculty, but what we didn't really factor in was just the ripple effect it would have across the university. I mean it affected everything from obviously student schedules, to tuition, to financial aid, to faculty compensation; I mean all of these things are changed now, because rather than these three credit courses, faculty teach four credit courses. (Program Administrator01)

Recruiting participation from multiple stakeholders at all levels is a valuable way to launch a new initiative (Wilson et al., 2016). Including multiple stakeholders in the design and implementation phases of a new badge program can create a sense of ownership for all those involved. Faculty and student buy-in is crucial to a badge program's success. Questionnaire and interview participants from the cases mentioned the importance of creating opportunities for buy-in repeatedly.

Rogers (2003) indicated that the innovation attributes of relative advantage, compatibility, observability, and trialability positively impacted innovation adoption. The main factors found in this study to facilitate diffusion and adoption of badges were compatibility of the badge program with the institution's values and needs, observability of the value of badges both internally and externally, and relative advantage of badges grounded by a clear purpose that is communicated to stakeholders. Trialability was not shown to play a significant part in the successful adoption of the badge programs in this study. Although each of the three cases ran

very informal and brief pilots, allowing badge users to experiment with badges before formally earning badges did not seem to make a difference, nor did the questionnaire respondents indicate experimentation would have been helpful.

Rogers (2003) found that the innovation attribute of complexity negatively impacted innovation adoption. The results of this study also attributed factors related to complexity as barriers to successful adoption of badges in each of the three cases. Specifically, the study found that usability issues, increased faculty workload, and a lack of understanding of the badges purpose and value were the main factors which negatively impacted badge adoption.

### **Limitations**

This study focused on three higher education institutions to provide data using a case study approach. Other types of institutions and organizations using badges were not studied. Rogers (2003) describes other factors, besides the five specific characteristics central to this study, that can influence diffusion and adoption of innovations. This study did not analyze personal characteristics of adopters or change agents in an effort to classify their adopter categories. Further, organizational innovativeness was not measured in this study. Instead, the unit of measure was the innovation (badges) and the focus was on the attributes of badge programs that facilitate and impede diffusion and adoption.

Sampling adequacy and validity could have been increased with an opportunity to hear more perspectives through analysis of an additional case study. The lack of questionnaire responses from Case A is a significant limitation for this study. The program administrator in Case A made the questionnaire available to badge users (students) in one spring and in one summer course. There were no responses, even after a reminder was sent. In fact, the researcher followed up with each of the program administrators, who were primary contacts for the other

cases, and requested additional promotion of the questionnaires. Case B seemed to have an uptick in responses after the reminder, and this case ended up with the highest number of returned questionnaires. Perhaps the numbers would have been closer to 50 for Case A and 100 or more for Cases B and C if the potential had been met.

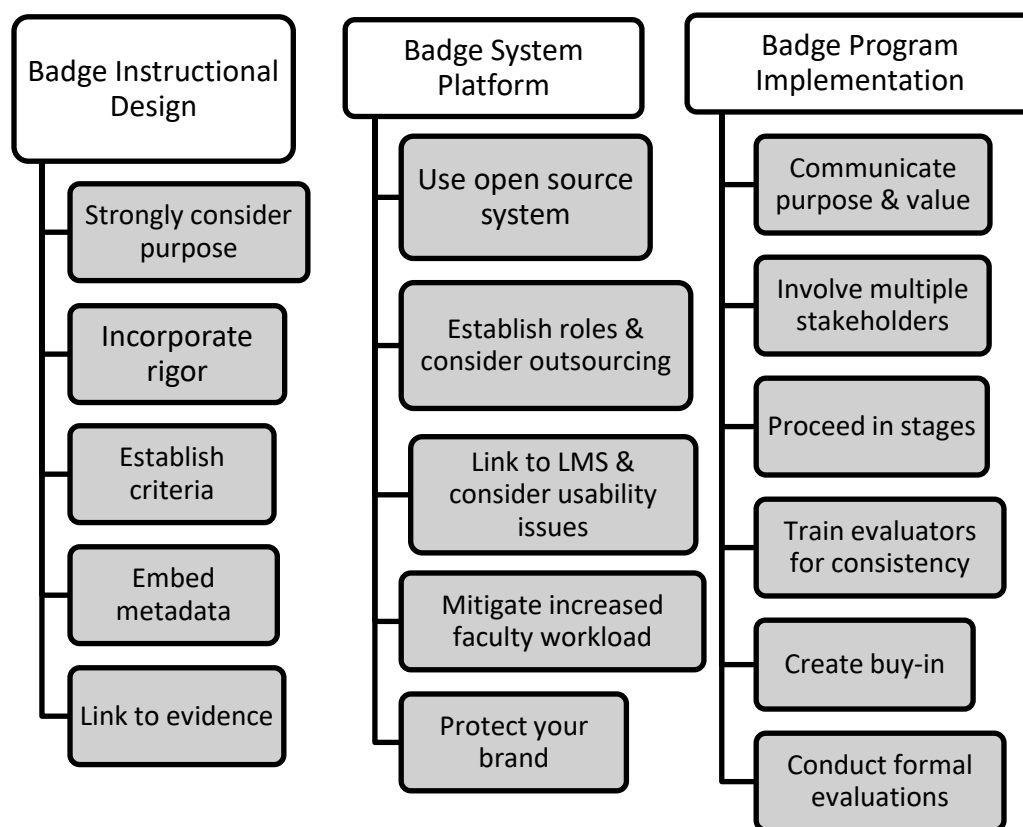
A likely reason for the low response rate across all cases is that the questionnaire was optional for badge users, rather than a required part of the course for students. The timing of the questionnaire release may also have impacted the quantity of responses. The program administrators were at the end of their spring semesters and only had a limited amount of summer classes in which to promote the questionnaire. Additionally, the questionnaire was in the form of open-ended questions, rather than a closed-ended survey which could have been completed more quickly. The researcher did consider that this instrument choice could be a limitation when designing the study, but opted for the opportunity to capture richer data by the use of open-ended questions. Many comments were made in the questionnaires that went beyond what a closed-ended survey could capture, but the quantity of completed questionnaires was clearly impacted.

Another significant limitation to the study is that on-site observations were not conducted by the researcher due to geographical constraints. All communication and data collection took place via email and electronic communication platforms, so rich data could have been lost in the process. The abbreviated length of the study was also a limitation to consider. Finally, due to the limited nature of the case study methodology, results are not generalizable to larger populations due to the contextual nature of this particular study.



## Implications for Practice

A conceptual framework (Figure 1) for successful badge program implementation is provided below. The framework was created to illustrate the main themes identified from the interview and questionnaire responses. The framework divides the recommendations into three categories which emerged from the cases' data: badge instructional design, badge system platform, and badge program implementation.



*Figure 1.* Framework for Successful Badge Program Implementation

The Badge Instructional Design category contains recommendations related to the badge instructional components. One of the strongest messages from the participants was to consider the purpose for using badges and to be certain that badges are the right tool to achieve that

purpose. The learning activities associated with the badges should be meaningful, which means they should be robust and linked to evidence such as the final work product. Directly tying badges to learning objectives is an effective strategy. The badges can be made more valuable by also embedding the criteria that was met to earn the badge.

The Badge System Platform category comprises recommendations related to ensuring the badge platform is manageable and sustainable. When starting a new badge program, it is a good idea to use one of the open source badge systems available and to start out with a simple plan, possibly at the course level. If the badge system is too difficult to use or increases faculty workload beyond reason, the users will resist adopting the new system. The value of using the badges must outweigh the increased workload. One way to share the workload and to involve multiple levels of stakeholders is to outsource roles to students or other faculty who have expertise in areas such as graphic design, information technology, or specific content areas.

The Badge Program Implementation category consists of recommendations for successful badge program roll-out and evaluation processes. Purpose and value are two of the most important considerations for using badges, and these foundational attributes must be communicated to everyone involved from the beginning of the implementation process. Building in an evaluation plan which involves multiple stakeholders also is integral to the badge program's success, sustainability, and possible scalability.

When asked about suggestions for those considering the design and implementation of a badge system in higher education, Case A's participant suggested the use of backwards design. A systematic focus on student learning outcomes is one affordance of badges (Reid & Paster, 2016). In other words, consider the expected outcome and then determine if badges can support that outcome.

A participant from Case B shared:

I would say to really think about the ways [badges] can allow you to enact the best practices in your field. I think that we've done a nice job by inviting people to contribute to the badges, have input on the badges, to reshape them during regular revision opportunities, that we've really been able to invite more community involvement and community ownership over the product, over the badges themselves.... I think really questioning the affordances of a particular technology and what it can allow and what it can invite and letting your pedagogical goals drive the decisions that you make. (Program Administrator02)

A participant from Case C said the following:

I think that it's really good to have it be robust and rigorous, but not so overwhelming that no one would ever actually do it. And to think about the type of metadata that they want to have, the displays, the type of evidence that they want to have to show that a user has actually accomplished these things. How they are going to implement? Who does reviewing? [Is there] any kind of training that needs to be done, so everyone reviews the same way or is it fairly straightforward on how that's going to be done? (Program Administrator02)

The idea of building rigor and challenge into badge assignments is a recurring theme in this study. Rigor not only makes the badges more instructionally sound, but it also increases credibility and value outside the awarding institution. West and Randall (2016) argue the importance of rigor for open badges and maintain that two components must be present in badge design in order to ensure rigor. The first component is to establish strong criteria for those to

earn the badge. The second component is to support interrater reliability by establishing consistent badge evaluator practices.

If a badge program is designed to support programmatic needs and has more benefits for the instructors than the students, perhaps the consideration of including metadata in order to increase external value would be beneficial to students. Of course, for students to understand the value, potential use must be explained to them. Additionally, exporting and sharing to public sites must be explained and supported by the system. Aside from that, potential employers must understand and value badges, and that is not always the case. Grant (2016) claims that most badge earners do not claim or display their earned badges in a public repository and that these factors would need to change in order for badges to become more widely valued.

**Alignment of purpose and value.** The two prevalent themes that continually resurfaced in this study were badge value and purpose. The recommendations from badge participants emphasized the importance of creating badges with internal and external value in order to maximize buy-in. The recommendations also emphasized the importance of a comprehensible purpose for the badges. Complexity negatively impacts badge diffusion, so increased faculty workload and usability issues need to be mitigated and the benefits of the badges need to offset increased workload. Table 13 aligns the themes of purpose and value to Rogers' (2003) innovation attributes by showing how each recommendation supports building in purpose and value to badges. Strategically aligning badge systems to purpose and value and communicating these aspects of the system to stakeholders supports successful badge system implementation.

Table 13

*Alignment of Purpose and Value to Innovation Attributes*

Innovation Attribute	Purpose & Value
Relative Advantage	Communication of purpose Demonstration of value Badges as a solution
Compatibility	Involvement of stakeholders Established roles & outsourcing Institution support Faculty buy-in Student buy-in
Complexity	Increased faculty workload Usability issues
Observability	Claimed & shared badges
Trialability	Opportunity to experiment

**Badge implementation suggestions.** Interview participants were asked for suggestions they have for those considering badge program implementation, and their responses are categorized below.

**Consider badge purpose.** The primary theme for participant responses was to “ask why digital badges?” when considering the use of badges. Participants indicated that those considering the implementation of badges should think about how badges can support the intended learning outcome goals and how badges can enact best practices in the field. It was suggested that designers of badge systems let pedagogical goals drive the decisions. It was also recommended that those responsible for implementation communicate to users the badges’ purpose and utility outside of the awarding institution. Gamrat, Bixler, and Raish (2016) also argue the importance of considering purpose when designing badges. As with other technology

tools, badges should not be used just for the sake of using badges, yet they should be the best tool for which to achieve a particular learning objective.

***Consider badge design.*** The participants made suggestions related to badge design. The suggestions included to incorporate sound criteria that can be verified by evidence via metadata embedded in the badges. It is important to make badges valuable, so they will be intrinsically motivating. Badge designers should ensure that badges represent real skills and that they are robust & rigorous, but not overwhelming. Participants shared that it is beneficial to invite stakeholders to contribute during the process to instill a sense of ownership over the product in order to increase buy-in. Wilson et al. (2016) also recommend participation at all levels when initiating a badge system. Badge designers should also consider how to invite community involvement in the badge program. One tip was to protect the institution's brand with the use of logos on the badge icons. Another recommendation was to determine if badges would expire and be renewable. Gamrat et al. (2016) also describe badge expiration dates. As technology evolves, particular tool functions may become obsolete, so expiration dates can ensure that badges remain relevant.

***Consider technical aspects.*** It was recommended for those interested in implementing a badge system to start out small and keep it simple. It is important to question the affordances of available technology and limitations of the platform and users. It is wise to use an existing open-source badge platform and to proceed in stages. McDaniel and Fanfarelli (2016) also describe the benefits of using an existing commercial badge system. Finally, when drafting the implementation plan, it is recommended to provide faculty training to ensure grading consistency. Interrater reliability is key to ensuring that badge activities maintain rigor and credibility.

*Strategies to add purpose and value to badges.* When designing badges, the first step is to be able to articulate how badges will address an instructional or curricular need. A strategy to add purpose and value to badges during the instructional design phase is to tie badge assignments directly to course learning outcomes and let pedagogical goals drive the decisions. Another strategy to add value for students is to include metadata in the badges to increase claiming and sharing of badges to external sites.

When deciding which badge system platform to use, a sound strategy to mitigate increased faculty workload and potential technical usability issues is to start out small, proceed in steps, and use an open source badge platform. Another strategy to add purpose and value is to establish roles and outsource tasks in order to increase buy-in and share the workload.

When considering a new system, such as badges, it is vital to closely consider how the decision to implement will impact the course, the students, the faculty, the resources, the department, and the college as a whole. General Systems Theory describes how decisions, such as a badge system implementation, can affect the organization (or institution) at all levels and impact employees, resources, processes, etc. (Richey et al., 2011). This theory is illustrated by Case B, since the decision to implement badges affected everything from “student schedules, to tuition, to financial aid, to faculty compensation”. As one participant in Case C noted, it is also important to think about how the system will be implemented and how badges will affect training.

The two main themes identified throughout this study are the importance of considering badge purpose and incorporating value. Table 14 suggests strategies to add purpose and value for badges and addresses these strategies from each level of the Framework for Successful Badge Program Implementation.

Table 14

*Strategies to Implement Badges with Purpose and Value*

Implementation Framework Categories	Strategies to Add Purpose & Value
Badge Instructional Design	<p>Tie badge assignments directly to course learning outcomes</p> <p>Let pedagogical goals drive the decisions</p> <p>Create rigorous badge assignments</p> <p>Embed metadata in badges which link to criteria and final work product</p> <p>Consider the course and content area when deciding to use badges</p> <p>Consider if badges should have expirations dates</p>
Badge System Platform	<p>Use an open source system to minimize faculty workload and usability issues</p> <p>Link the badge system to the LMS to minimize faculty workload and usability issues</p> <p>Consider affordances of technology available</p> <p>Consider the technology skill level of those involved with badge system design and implementation</p> <p>Establish roles and outsource tasks to decrease faculty workload</p>
Badge Program Implementation	<p>Solicit stakeholder participation throughout each phase of implementation</p> <p>Invite community involvement</p> <p>Clearly communicate how badges are a solution to an instructional or curricular problem</p> <p>Demonstrate to faculty and students how badges can be shared externally</p> <p>Devise a badge program evaluation and badge revision plan</p> <p>Conduct ongoing faculty training to ensure grading consistency across multiple course sections</p>



## **Future Research**

The existing body of badge literature includes empirical studies related to motivation (Abramovich et al., 2013; Reid et al., 2015) and badges used as peer review in college courses (O'Connor & McQuigge, 2013) and teacher professional development programs (Gamrat et al., 2014). More empirical research is needed from which we can draw to improve practice and establish theory. Drawing upon the main themes from the current study, purpose and value, future research could focus on how a clearly communicated purpose and perceived value of badges may impact motivation to earn and share badges. Suggestions for future research include a need for comparative studies related to platforms and also usability studies. Additionally, there appears to be a need for more case studies and current published program information, so those interested in badging systems can explore and connect with similar institutions and organizations that are using badges. Knowing where to look for example badge programs could provide a framework for those making design and implementation decisions for new badge programs.

More research is necessary to establish the need for a common framework or standardization of badges, especially those badges used for credentialing. Possible research studies could address the impact of badging on professional development and employment. For example, if badges are used by potential employers it will be important to understand how the job application process may shift in particular fields, and how human resource professionals will evaluate applicants through the digital badge lens. These are instances where standardization could provide a common language and framework in which human performance practitioners and training personnel could practice. The long-term impact of badge systems has not been explored due to the relatively small number of years of badge existence, but as time goes on, it will be possible to study the long-term effects of badges in specific contexts. Exploratory

research which helps define learning pathways and common frameworks for badges needs to be conducted if we are to unlock the potential of badges used as micro-credentials.

This multi-case study focused on three higher education institutions to provide data from badge programs purposing badges at the course-level, the department-level, and the university-level. Studies including badge programs in other higher education institutions could be conducted to give more insight into other contexts, including uses of badges in university libraries and faculty development programs. Other studies could include other innovation diffusion factors as noted by Rogers (2003) such as attributes of adopters or change agents, organizational innovativeness, diffusion networks, and communication channels. Further research could examine cases from the perspective of the Levels of Use (Hall et al., 1975) or the Contextual Analysis (Tessmer & Richey, 1997) frameworks. Tessmer and Richey (1997) describe contextual analysis as a form of “structured problem solving” (p. 103) based on participant experiences and knowledge.

## **Conclusion**

Rogers’ (2003) asserted that the innovation attributes of relative advantage, compatibility, observability, and trialability positively impact the diffusion and adoption process, while the attribute of complexity negatively impacts the diffusion and adoption process. The cross-case analysis showed factors which positively impact diffusion and adoption of badges in higher education institutions. Ongoing involvement of multiple stakeholders increases buy-in and promotes a sense of ownership in the institution’s badge program. It is important that program administrators establish roles early on in the design and development stages of the system. Drawing upon faculty and student areas of expertise, and considering how tasks and roles could be outsourced, can create a “win-win” situation for all involved. Awarding badges with external value also increases buy-in for badge users and optimizes the capabilities of open badges.

The cross-case analysis also distinguished factors that negatively impact diffusion and adoption of badges in higher education. Usability issues can hinder user perceptions of badge usefulness and create apathy in attitudes towards the badges. It is also important to think through possible technical limitations of stakeholders as well as limitations of the proposed badge system. It would be wise to use an open-source badge system and try a small pilot in order to test for usability issues up front. Increased faculty workload can also be a point of contingency in badge system implementation. An unreasonable amount of increased faculty workload, without increased compensation, could make successful badge adoption untenable. A recommendation would be to consider how additional workload could be mitigated either through automatic grading by the badge system or the use of teaching assistants for grading purposes, system maintenance, etc. The analysis showed that a lack of understanding of the purpose and value of the badges also contributes to resistance of both faculty and students. It is paramount for the purpose of the badges to be clearly communicated to both faculty and students. It is also vitally important for the faculty members to communicate the possibilities that badges hold outside of the issuing institution, if the badges contain valuable metadata and evidence of marketable skills. The program administrators should not assume that all faculty members are aware of the utility of open badges. Responses on the questionnaire indicated that not all faculty participants were clear on what badges had to offer outside of the awarding institution.

The cross-case analysis showed that there are factors which positively impact the innovation-decision process of badge system implementation in higher education. A clear purpose for badges as a solution to an instructional or curricular problem can support the need for badge system implementation. In more than one instance, participants recommended a close

consideration of why badges are the optimal solution when making a decision to use badges. Institution support and faculty buy-in weigh heavily into the innovation-decision process, especially when the proposed badge program is designed to support multiple courses, sections, degree programs, or departments. One must consider the various layers of approval needed at a particular institution and formulate a solid proposal which outlines the need for the badge system in order to warrant approval. Additionally, one interested in badge system implementation should carefully consider the impact on faculty workload and determine how that additional work could be mitigated or justified. When drafting an implementation plan, one should consider how to include faculty in each aspect of the development, implementation and evaluation processes in order to capitalize on opportunities to increase faculty buy-in.

If a badge program is designed to support programmatic needs and has more benefits for the instructors than the students, perhaps the consideration of including metadata in order to increase external value would be beneficial to students. Of course, for students to understand the value, potential use must be explained to them. Additionally, exporting and sharing to public sites must be explained and supported by the system. Aside from this, potential employers must understand and value badges as well, and that is not always the case. The future of badging holds promise, and it will be interesting to see how it evolves and takes hold in various settings.

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## Appendix A. Moore and Benbasat Survey Instrument

### List of Items by Construct

#### *Voluntariness*

1. My Superiors expect me to use a PWS.
2. My use of a PWS is voluntary (as opposed to required by my superiors or job description).
- 3.\* My boss does not require me to use a PWS.
- 4.\* Although it might be helpful, using a PWS is certainly not compulsory in my job.

#### *Relative Advantage*

- 1.\* Using a PWS enables me to accomplish tasks more quickly.
- 2.\* Using a PWS improves the quality of work I do.
- 3.\* Using a PWS makes it easier to do my job.
4. The disadvantages of my using a PWS far outweigh the advantages (See Note a.)
5. Using a PWS improves my job performance.
6. Overall, I find using a PWS to be advantageous in my job.
- 7.\* Using a PWS enhances my effectiveness on the job.
- 8.\* Using a PWS gives me greater control over my work.
9. Using a PWS increases my productivity.

#### *Compatibility*

- 1.\* Using a PWS is compatible with all aspects of my work.
2. Using a PWS is completely compatible with my current situation.
- 3.\* I think that using a PWS fits well with the way I like to work.
- 4.\* Using a PWS fits into my work style.

#### *Image*

1. Using a PWS improves my image within the organization.
2. Because of my use of a PWS others in my organization see me as a more valuable employee. (See Note a.)
- 3.\* People in my organization who use a PWS have more prestige than those who do not.
- 4.\* People in my organization who use a PWS have a high profile.
- 5.\* Having a PWS is a status symbol in my organization.

#### *Ease of use*

1. I believe that a PWS is cumbersome to use.
2. It is easy for me to remember how to perform tasks using a PWS. (See Note a.)
3. My using a PWS required a lot of mental effort.
4. Using a PWS is often frustrating.
- 5.\* My interaction with a PWS is clear and understandable. (See Note a.)
- 6.\* I believe that it is easy to get a PWS to do what I want it to do.
- 7.\* Overall, I believe that a PWS is easy to use.
- 8.\* Learning to operate a PWS is easy for me.

#### *Result Demonstrability*

- 1.\* I would have no difficulty telling others about the results of using a PWS.

- 2.\* I believe I could communicate to others the consequences of using a PWS.
- 3.\* The results of using a PWS are apparent to me.
- 4.\* I would have difficulty explaining why using a PWS may or may not be beneficial.

#### *Visibility*

1. I have seen what others do using their PWS.
  - 2.\* In my organization, one sees PWS on many desks.
  3. I have seen a PWS in use outside my firm. (See Note a.)
  - 4.\* PWS are not very visible in my organization.
  5. It is easy for me to observe others using PWS in my firm.
- I have had plenty of opportunity to see the PWS being used. (See Note b.)  
I have not seen many others using a PWS in my department. (See Note b.)

#### *Trialability*

1. I've had a great deal of opportunity to try various PWS applications.
  2. I know where I can go to satisfactorily try out various uses of a PWS.
  3. A PWS was available to me to adequately test run various applications.
  - 4.\* Before deciding whether to use any PWS applications, I was able to properly try them out.
  - 5.\* I was permitted to use a PWS on a trial basis long enough to see what it could do.
- I am able to experiment with the PWS as necessary. (See Note b.)  
I can have PWS applications for long enough periods to try them out. (See Note b.)  
I did not have to expend very much effort to try out the PWS. (See Note c.)  
I don't really have adequate opportunities to try out different things on the PWS. (See Note c.)  
A proper on-the-job tryout of the various uses of the PWS is not possible. (See Note c.)  
There are enough people in my organization to help me try the various uses of the PWS. (See Note c.)

#### *Notes*

- a. The indicated items were all deleted as the result of the first factor analysis and hence were not in the final scales.
- b. The indicated items, which were deleted after the initial test, are suggested as candidates for inclusion in any expanded scale.
- c. The indicated items, which were not in the final instrument, had item-scale correlations less than 0.40 in the initial test and are suggested as secondary candidates for lengthening the scale.
- d. \* indicates items suggested for inclusion in any "short" scales.

## Appendix B. Questionnaire

### *Voluntariness*

1. Please explain if the badge system is optional or required and how this impacts your perception or use of badges.

### *Relative Advantage*

2. Describe what you see as the advantages and/or disadvantages of the badge system used at your university.

### *Compatibility*

3. Explain how the badge system is or is not compatible with your preferred approach to learning.

### *Image*

4. Describe how sharing/publishing badges may or may not affect how potential employers may see you as a more valuable employee.

### *Ease of use*

5. Explain if the badge system is easy or difficult to use and how this impacts your use of the system.

### *Result Demonstrability*

6. Please explain how you would communicate to others the benefits or limitations of the badge system.

### *Visibility*

7. Describe how the badge system allows you to publish and share earned badges and how this impacts your perceived usefulness of badges.

### *Trialability*

8. Describe any opportunities you had to experiment with the badges before formally using the system.

### Appendix C. Interview Script

1. What is your job title?
2. Describe the current badge system at your university.
  - a) Who are your participants and is participation required?
  - c) What was the reason or purpose for implementation?
  - d) What was your role during the design & implementation?
  - e) How long has the badge system been in use?
  - f) How do you evaluate the success of your digital badge program?
3. Describe the decision process for implementation of your badge system.
  - a) When did you first learn about digital badges being used in higher education?
  - b) Who had to be persuaded to implement the program?
  - c) When did members of your institution decide to implement badges?
  - d) When was the badge system actually implemented?
  - e) Do you believe that the current badge system will continue to be used?
4. If applicable, describe the pilot phase before the system was fully implemented.
  - a) How long was the pilot phase?
  - b) Who participated in the pilot?
  - c) What were the lessons learned during the pilot?
  - d) Are badge users able to experiment with the current system before formally participating?
5. How are badges published and shared in your digital badge program?
6. What do you perceive to be the benefits for the learner associated with the use of badges in your system?
7. What is the benefit of the badge system for your institution?

8. Describe any issues associated with usability of the badge system.
9. Please describe any barriers or challenges associated with your badge system design and/or implementation phases.
10. What suggestions do you have for those considering the implementation of a badge system in higher education?

## Appendix D. Archival Data Request

Please refer to the following list in order to provide available documentation related to your badge system. Please email documents and information to:  
Kimberly Carey <khale005@odu.edu >

- Meeting notes or memos related to badge system design & roll-out
- Planning documents
- Design artifacts
- Prototypes
- Badge website URLs
- Badge system platform login information
- Course syllabi
- Course website URLs
- Professional development and training materials for badge users
- Badge system evaluations
- Research and articles related to the university's badge program
- Metrics related to badge completion and sharing on social networks

## **Appendix E. Informed Consent Document**

### **Interviews**

#### **OLD DOMINION UNIVERSITY**

**PROJECT TITLE:** An Analysis of Factors that Impact Diffusion and Adoption of Digital Badges

#### **INTRODUCTION**

You are being asked to participate in an interview to engage users of digital badges in higher education. You are being asked to participate in this study because you have experience with digital badges. The purpose of this study is to identify and analyze the factors that impact the diffusion and adoption of digital badges used across higher education institutions. The purposes of this form are 1) to give you information that may affect your decision whether to say YES or NO to the use of your data collected during your participation in this study, and 2) to record the consent of those who say YES to allowing the researchers to use and analyze the data collected in this study.

#### **RESEARCHERS**

Responsible Principal Investigator:

Jill Stefaniak, PhD, Assistant Professor, College of Education, STEM Education & Professional Studies

Investigators:

Kimberly Carey, MEd Secondary Education, PhD Graduate Student in Instructional Design and Technology

#### **DESCRIPTION OF RESEARCH STUDY**

The purpose of this study is to identify and analyze the factors that impact the diffusion and adoption of digital badges used across higher education institutions. The intent is to identify challenges and solutions in badge system implementation so that others can learn from the experiences of badge users from three higher education institutions. The goal of the study is to provide insight on best practices to those interested in implementing badge programs in order to optimize success of badge program implementation.

Participating in this interview will take approximately forty-five minutes of your time. During the interview, you will be asked questions related to your experiences with digital badges. The interview will be audio-recorded; however, you will not be referred to by name to protect your identify.

#### **RISKS AND BENEFITS**



**RISKS:** The risks to you will be minimal. There is a risk of the release of personal identifying information. Any documented information or recordings will be secured and confidential. The information and recordings will be destroyed once the data has been aggregated and the study is complete.

**BENEFITS:** Your participation may help inform the design of digital badges in the future.

### **COSTS AND PAYMENTS**

There will be no costs to you for participation in this research study. The researchers are unable to give you any payment for participating in this study.

### **NEW INFORMATION**

If the researchers find new information during this study that would reasonably change your decision about participating, then they will inform you.

### **CONFIDENTIALITY**

All information obtained about you in this study is strictly confidential unless disclosure is required by law. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you.

### **WITHDRAWAL PRIVILEGE**

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time.

### **QUESTIONS**

If you have any questions about this study now or in the future, you may contact Jill Stefaniak at the following phone number: 757-683-6696 or at [jstefani@odu.edu](mailto:jstefani@odu.edu). If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should contact Dr. Petros Katsioloudis, Chair of the Darden College of Education Human Subjects Review Committee, Old Dominion University, at [pkatsiol@odu.edu](mailto:pkatsiol@odu.edu) or 757-683-4305.

### **VOLUNTARY CONSENT**

By signing this form, you are saying several things. You are saying that you have read this form or have had it read to you, that you are satisfied that you understand this form, the research study, and its risks and benefits. The researchers should have answered any questions you may have had about the research. If you have any questions later on, then the researchers should be able to answer them:

Kimberly Carey	Dr. Jill Stefaniak
206-940-6398	757-683-6696

If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should contact Dr. Petros Katsioloudis, Chair of the Darden College of

Education Human Subjects Review Committee, Old Dominion University, at pkatsiol@odu.edu or 757-683-6696.

And importantly, by signing below, you are telling the researcher YES, that you agree to allow the collection and use of your data in this study.

\_\_\_\_\_  
Participant's Printed Name

\_\_\_\_\_  
Participant's Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Parent / Legally Authorized  
Representative's Printed Name

\_\_\_\_\_  
Parent / Legally Authorized Signature

\_\_\_\_\_  
Date

(If participant is a minor or incapacitated adult)

### **INVESTIGATOR'S STATEMENT**

I certify that I have explained to this participant the nature and purpose of this research, including benefits, risks, costs, and any experimental procedures. I have described the rights and protections afforded to human subjects and have done nothing to pressure, coerce, or falsely entice this subject into participating. I am aware of my obligations under state and federal laws, and promise compliance. I have answered the participant's questions and have encouraged him/her to ask additional questions at any time during the course of this study. I have witnessed the above signature(s) on this consent form.

\_\_\_\_\_  
Investigator's Printed Name

\_\_\_\_\_  
Investigator's Signature

\_\_\_\_\_  
Date

## **Appendix F. Information Sheet**

### **Survey**

#### **OLD DOMINION UNIVERSITY**

**PROJECT TITLE:** An Analysis of Factors that Impact Diffusion and Adoption of Digital Badges

#### **INTRODUCTION**

You are being asked to participate in a survey to engage users of digital badges in higher education. You are being asked to participate in this study because you have experience with digital badges. The purpose of this study is to identify and analyze the factors that impact the diffusion and adoption of digital badges used across higher education institutions. The purposes of this form are 1) to give you information that may affect your decision whether to say YES or NO to the use of your data collected during your participation in this study, and 2) to record the consent of those who say YES to allowing the researchers to use and analyze the data collected in this study.

#### **RESEARCHERS**

Responsible Principal Investigator:

Jill Stefaniak, PhD, Assistant Professor, College of Education, STEM Education & Professional Studies

Investigators:

Kimberly Carey, MEd Secondary Education, PhD Graduate Student in Instructional Design and Technology

#### **DESCRIPTION OF RESEARCH STUDY**

The purpose of this study is to identify and analyze the factors that impact the diffusion and adoption of digital badges used across higher education institutions. The intent is to identify challenges and solutions in badge system implementation so that others can learn from the experiences of badge users from three higher education institutions. The goal of the study is to provide insight on best practices to those interested in implementing badge programs in order to optimize success of badge program implementation.

Participating in this survey will take approximately thirty minutes of your time. In the survey, you will be asked questions related to your experiences with digital badges. Your personal identifying information will not be recorded to protect your identify.

#### **RISKS AND BENEFITS**

**RISKS:** The risks to you will be minimal. There is a risk of the release of personal identifying information. Any documented information will be secured and confidential. The information will be destroyed once the data have been aggregated and the study is complete.

**BENEFITS:** Your participation may help inform the design of digital badge systems in the future.

### **COSTS AND PAYMENTS**

There will be no costs to you for participation in this research study. The researchers are unable to give you any payment for participating in this study.

### **NEW INFORMATION**

If the researchers find new information during this study that would reasonably change your decision about participating, then they will inform you.

### **CONFIDENTIALITY**

All information obtained about you in this study is strictly confidential unless disclosure is required by law. The results of this study may be used in reports, presentations and publications, but the researcher will not identify you.

### **WITHDRAWAL PRIVILEGE**

It is OK for you to say NO. Even if you say YES now, you are free to say NO later, and walk away or withdraw from the study -- at any time.

### **QUESTIONS**

If you have any questions about this study now or in the future, you may contact Jill Stefaniak at the following phone number: 757-683-6696 or at [jstefani@odu.edu](mailto:jstefani@odu.edu). If at any time you feel pressured to participate, or if you have any questions about your rights or this form, then you should contact Dr. Petros Katsioloudis, Chair of the Darden College of Education Human Subjects Review Committee, Old Dominion University, at 757-683-4305 or [pkatsiol@odu.edu](mailto:pkatsiol@odu.edu).

## VITA

**Kimberly L. Carey**

### EDUCATION

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Old Dominion University, PhD candidate

Instructional Design and Technology (ABD)

Dissertation: An analysis of factors that impact diffusion and adoption of digital badges

Northern Arizona University, M.Ed.

Secondary Education (2011)

Northern Arizona University, B.A.S.

Public Agency Administration (2008)

Yavapai College, A.A.

Associate of Arts (2006)

### PROFESSIONAL EXPERIENCE

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Course Faculty, Teachers College

2013 – Present

Western Governors University, Salt Lake City, UT

Capstone course facilitator for graduate students in M.Ed. Instructional Design, M.Ed. Learning Technology, and M.S. Curriculum & Instruction degree programs. Develop supplemental instructional materials; monitor academic progress; train faculty; design & conduct professional development sessions for faculty.

Secondary English Teacher

2010—2013

Connections Education, Baltimore, MD

Taught English 11, English 12, AP English Language and Composition, and AP English Literature and Composition. Coordinated Professional Learning Communities. Developed and conducted workshops for teachers. Analyzed data to determine intervention strategies. Conducted marketing and recruiting sessions.

Secondary English Teacher, Guidance Counselor

2005-2010

Kestrel Schools, Prescott, AZ

Taught English 11 and English 12. Evaluated curriculum and employed curriculum mapping. Developed new courses. Trained staff and conducted professional development. Wrote grants and implemented new instructional programs. Provided academic advising for grades 9-12. Evaluated transcripts; built student schedules; monitored individual graduation progress; provided financial aid education; and assisted with college planning.