Organizational Decision Making Related to Instructional Technology at Small Liberal Arts Colleges and Universities

A DISSERTATION
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

William Frederick Vandover

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Darwin D. Hendel, Advisor

June 2013

Acknowledgements

I want to thank my family for years and years of support as I worked my way through this degree. Mom, Dad, Elise, John, and Rosie, you frequently reminded me that I would finish this, especially when I did not know if I had the stamina to do so. Thank you. I also want to thank my mother- and father-in-law, Kathy and Henry Hanka, for their support and help with our children when I frequently had to disappear in order to work on this dissertation.

I want to thank my adviser, Dr. Darwin Hendel, for his many years of patient guidance as I slowly worked my way through the doctoral process, most of it while working full-time. I would also like to thank the other members of my dissertation committee: Dr. Arthur Harkins, Dr. Charles Miller, and Dr. Kem Saichaie.

I owe a great debt to Dr. Dennis Trinkle, Dr. John Schlotterbeck, and Dr. John Dittmer, my mentors from DePauw University, for their guidance after I finished college. I expressed an interest in working in higher education, and their advice put me on the path to where I am now.

I must thank Dr. Gavin Foster, who taught me so much about instructional technology and the culture of higher education.

I want to thank my friends and colleagues at Macalester College. This study would not have been possible without the insight and support you provided. In particular, I want to thank Dr. Brad Belbas for his feedback on drafts of this dissertation, his willingness to serve as the peer validator for this study, and his advice on negotiating the dissertation process.

To my many colleagues in the instructional technology community, thank you for your insight, collaborative spirit, and friendship. We have the best time exploring this constantly evolving profession together.

Lastly, I want to thank Monita Mohammadian Gray. I do not remember exactly when we became graduate school co-conspirators, but this process would have been even more intimidating had we not been able to share ideas, challenges, and outright panic with each other.

Dedication

To Milena and Leo, neither of you were born when I began my doctorate, but having you two in our lives as I crossed the finish line made completing it that much sweeter.

To Stephanie, you have been right there with me through the many ups and downs of this *long* journey, a journey which started just a few weeks after we were married in 2005. I could not have finished this without your support and love. I love you more than I can ever adequately say.

Abstract

This study examines the factors that influence the creation, purchase, and selection of free instructional technology. Specifically, this study uses the RIPPLES Model to examine the perceptions and reflections of instructional technology directors and staff members with regard to the Resources, Infrastructure, People, Policies, Learning, Evaluation, and Support available to instructional technology creation, purchasing, selection, and implementation at their institutions. Thirteen participants at seven small, residential liberal arts colleges and universities in the United States were located using peer nomination technique. The higher education instructional technology community was asked to nominate instructional technology staff members at institutions that were exemplars of building home grown instructional technology tools, purchasing instructional technology tools, implementing open source instructional technology tools, or utilizing free web-based instructional technology tools. The findings are based on interviews of approximately one hour with each of the thirteen participants. An interview protocol based on a previous interview protocol developed by Dr. Daniel Surry, the creator of the RIPPLES Model, was utilized. Creswell's three-step data analysis process was utilized to find categories of responses related to decision-making regarding instructional technology from the perspective of instructional technology directors and staff members are discussed. The Resources, People, Policies, and Evaluation dimensions of the RIPPLES Model provided the most salient findings about organizational decision making regarding instructional technology. The findings of the

study provide small, residential liberal arts institutions with very useful comparison cases as they are considering the types of instructional technologies to explore and implement. The study also provides valuable information about how instructional technology staff groups are structured and the effects of staffing models on interactions with faculty members.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

Information technology (IT) has become a major component in the operation and administration of postsecondary institutions in recent decades. Financial data, personnel information, personal data, research and development data, and other critical areas of institutions utilize information technology as the mechanism for creating, storing, and disseminating information and knowledge that is essential to the basic functions of institutions (Goldstein, 2004; Goldstein & Katz, 2005; Kvavik & Katz, 2002).

Among students, the use of technology is seemingly ubiquitous even before they begin postsecondary education. They own cell phones, laptop and desktop computers, and mobile devices (such as iPods and iPads), usually concurrently (Macgill, 2007). They are frequent users of the Internet, and they are increasingly more frequent users of social networking sites such as Facebook (2012) that allow individuals to create and upload content as well as create and maintain social relationships (Lenhart, Madden, Macgill, & Smith, 2007; Macgill, 2007) . The result is that they arrive at college with the expectation of at least a moderate amount of technology use in their college courses (Salaway, Caruso, Nelson, & Dede, 2007).

Demand for the use of IT in courses – instructional technology – is not coming solely from students. There are calls for higher education to increase its use of instructional technology coming from educational researchers, policymakers, and business leaders (Albright, 1999). Blustain, Goldstein, and Lozier (2001) called for increased instructional technology not solely for students, but also as a means for nonprofit colleges and universities to maintain competitiveness in a modern educational landscape that includes new technology, for-profit universities, and an increasingly global economy into which students are entering. Primarily, though, instructional technology is portrayed by proponents as a positive endeavor that can improve student learning and outcomes, increase access, improve academic program flexibility, and improve student career prospects (Bialo & Sivin-Kachala, 1996; Birman, 1997; A. W. Chickering & Ehrmann, 1996; Flowers, Pascarella, & Pierson, 2000; Lane, 2009; Oblinger & Hawkins, 2005).

Forms of Instructional Technology: Home-Grown Instructional Technology Tools

One of the primary forms of instructional technology used in higher education courses is Learning Management Systems (LMS) such as Blackboard, Moodle, and Desire2Learn (“Blackboard”, 2009; “Desire2Learn”, 2009; “Moodle.org”, 2009). An LMS is a centralized Internet-based content delivery system that is specifically designed for faculty and students to use in the process of teaching and learning. LMS frequently have tools to organize class content and activities, allow synchronous and asynchronous communication, assess student work, and assign and distribute grades (Morgan, 2003).

For many institutions, an LMS may be the only form of instructional technology offered, but they are often one of many instructional technology tools that an institution may make available. Some of these additional tools come in the form of home-grown instructional technology tools. Home-grown instructional technology tools emerge from scenarios such as when an anatomy professor at a private research university is having difficulty teaching medical students about the anatomy of the human pelvis. Seeing an opportunity, the professor speaks with the instructional technology staff at the institution about creating an online tool that helps students better understand and master the anatomy of this region of the body. In collaboration with the faculty member, the instructional technologists lead the development of an instructional technology tool that allows students to learn about the human pelvis through passive and active learning activities. After its launch, the application is widely utilized by the faculty member as well as colleagues at the institution and other institutions and is largely applauded by students as a helpful, improved method for visualizing and learning about this anatomical region (Vandover, 2007). This example is a brief description of a home-grown instructional technology tool that the researcher helped develop at Washington University in St. Louis in 2004.

For the purposes of this literature review, a home-grown instructional technology tool will be defined as an instructional technology tool or application that is developed by an institution of higher education to meet a pedagogical need, often one not met by an LMS. Home-grown instructional technology tools would normally not be purchased from an outside software or instructional technology vendor. They would be created by an instructional technology designer or developer, by a faculty member, or by collaboration between these individuals (Hanley, 2001). Examples of home-grown instructional technology tools include “VideoANT” (“Welcome to VideoANT”, 2009), a home-grown instructional technology tool developed by the College of Education and

Human Development at the University of Minnesota that allows users in and outside of the university to annotate any online video, “Student’s Guide to the Pelvis and Perineum” (Muldoon, 2004), the online tutorial for medical students noted above, and PocketKnowledge (“Welcome to the Social Archive of Teacher's College”, 2009), an online archive that Teacher’s College-Columbia University users can use to upload and tag documents and media assets.

There is very little aggregate information about how institutions of higher education in the United States evaluate and select their instructional technology. One source comes from EDUCAUSE, the primary higher education information technology association consisting of 1,997 member institutions (“About EDUCAUSE”, 2012), which produces many documents and reports on instructional technology in higher education. Each year, EDUCAUSE collects data from its member institutions for its “Core Data Service Report”, an online database of information about the technology practices, structures, and financing models that member institutions can query and analyze for their own information technology benchmarking purposes. The data are reported by Carnegie classification of institutions, by control or affiliation (public, private, nonprofit, for-profit, etc.) as well as aggregate information across all institutions (Grajek & Arroway, 2012).

Within “The EDUCAUSE 2011 Core Data Service Report”, the use of instructional technology at institutions was explored, but at a descriptive statistical level. Institutions were asked if they are deploying any of 21 types of instructional technology tools listed in the survey. These instructional technology tools included: mobile applications, e-books, lecture capture, document management systems, gaming, and others. The purpose of having institutions choose which tools they are deploying was to gauge where these tools are on a continuum that ranges from experimental to transitioning to mainstream (Grajek & Arroway, 2012, p. 30).

The Core Data Service also asked respondents if their institutions are deploying commercial or open source LMS. Sixty-nine percent of the institutions surveyed utilize a commercial LMS, such as Blackboard ("Blackboard", 2009), while 16 percent utilize an open source LMS such as Moodle ("Moodle.org: open-source community-absed tools for learning", 2009). Interestingly, private institutions that solely grant bachelor's degrees are the only type of institution to utilize open source LMS more than commercial LMS (Grajek & Arroway, 2012, p. 31).

Beyond the EDUCAUSE reports that are available, there are limited sources of data on instructional technology development in U.S. higher education. The annual "Horizon Report", one example, highlights information technology tools that show great promise in the realm of instructional technology ("2012 Horizon Report", 2012). Many of these applications are home-grown instructional technology tools that have been created by staff and faculty members at institutions, and the information provided is an overview of each application and where one can view them. Another example is the Campus Computing Project ("The Campus Computing Project", 2010), an annual survey of the role of information technology in higher education. From executive summaries and information available on their website, the annual surveys use quantitative and qualitative data to gather descriptive data about information technology trends on campuses that participate in the survey (approximately 600 campuses annually) ("Campus Computing Project", 2010).

Forms of Instructional Technology: Cloud Computing-based and Open Source Instructional Technology Tools

In a November 2008 statement, the Washington State Board for Community and Technical Colleges (SBCTC) released a Strategic Technology Plan. In it, the Board stated that

> the private sector and public, open source communities have developed applications and hosting services for online learning, student services, and administration that include automatic updates that continue to add functionality. We will not try to do what others can do better, faster, and for less money. We will shift our best and brightest IT staff from software developers to integration experts who tie together best-of-breed applications. ("Strategic Technology Plan: For Washington State Community and Technical Colleges", 2008)

In one motion, the Board was recommending that community and technical colleges in the state of Washington alter their human and capital instructional technology resources from designing and building home-grown instructional technology tools to using existing and freely available technology tools to satisfy instructional technology needs.

This is a marked departure from past trends for institutions of higher education. In the past, instructional technology tools used on university and college campuses were either proprietary products that were purchased and implemented locally (or system-wide), or were home-grown instructional technology tools that were built for the local campus environment and then hosted and utilized locally, as explained above. The SBCTC's plan to re-orient its efforts from developing custom applications to adapting existing or emerging applications to the local environment exposes a stark shift in how institutions of higher education are undertaking the development of instructional technology.

While not known, the "best-of-breed applications" to which the SBCTC's plan referred likely includes utilizing cloud computing and open source resources in the place of fee-based instructional technologies. A relatively new phenomenon, cloud computing can be succinctly defined as "an emerging architecture by which data and applications reside in cyberspace, allowing users to access them through any web-connected device" (Horrigan, 2008). Within cloud computing, there are two basic types; utility cloud computing and application cloud computing. A common example of utility cloud computing is Amazon's "Amazon Web Services" (AWS) ("Amazon Web Services", 2012). AWS is a fee-based service that allows companies to rent banks of servers by the minute. Companies can rent these servers and install any necessary software to support their business activities. The cost to rent these servers when needed and then relinquish them when finished is much lower than investing in the physical and human infrastructure on their own (Armbrust et al., 2009).

Uses of application cloud computing will be the type to which this study refers. Application cloud computing are online tools that offer users the ability to utilize an application in addition to storing data related to that application. For example, Gmail.com (“About Gmail”, 2012) is a cloud-based e-mail application. Users access the application entirely through a web-browser. Nothing related to their Gmail is stored on their computer, giving them the freedom to access their e-mail from any web browser on any compatible web-enabled device.

A more vivid example of the possibilities that application cloud computing affords is Evernote (“Evernote”, 2012). Evernote is a cloud computing tool that allows registered users to aggregate, annotate, and share nearly any digital artifact, and then access those artifacts on their computer, cell phone, or other technology device. These artifacts could be a text note, a photograph of something or recording of a sound made with a cell phone, a web page, or a computer file, for example. Once captured, these artifacts can be tagged for organization, and Evernote’s built in tools make any recognizable text in the artifacts (even in photographs) searchable.

Cloud computing and open source tools are very recent developments in the realm of instructional technology, as evidenced by these anecdotal examples and by reports by EDUCAUSE, Horizon Report, and Campus Computing Project, but they must be included in any examination of instructional technology development and implementation because they are rapidly information technology use in higher education.

Forms of Instructional Technology: Commercial Instructional Technology Tools

The final arena of instructional technology tools that institutions utilize are commercial instructional technologies. Some of these technologies are physical devices, such as SMART Boards (“SMART: Products”, 2010), which allow users to digitally annotate and interact with the contents of a white board, and student response systems (i.e., “clickers”) (“Student Response Solutions”, 2010), which allow faculty to poll students in response to questions and instantaneously see the results. Other commercial instructional technologies are web-based instructional tools for which access is purchased (“PLATO Learning: Browse Our Products”, 2010).

Statement of Research Problem

There is a general lack of descriptive literature on the decision-making processes that determine what type of instructional technology tools are implemented within higher education in the United States. Institutions are creating home-grown instructional technology tools, as well as utilizing commercial, open source, and free instructional technology tools, but this landscape is largely unexplored beyond basic descriptive data about the types of tools being utilized.

Given the calls for more instructional technology, the need for increased funding for instructional technology cited by many CIOs at institutions throughout the United States (Goldstein, 2004), and frustrations voiced about LMS that do not accommodate diverse teaching and learning styles (Lane, 2008), it is essential that a body of literature exists that explores how institutions innovate, select, and implement instructional technology. This study will broadly explore the higher education context of instructional technology today, the literature on instructional technology innovation and implementation, the literature focused on the diffusion of innovations, and the extant literature focused on the innovation and diffusion of instructional technology in higher education. The study will continue with an analysis of interview data from 13 instructional technology staff members at seven liberal arts institutions in the United States. The study will conclude by identifying specific gaps in the literature on instructional technology in higher education that, when addressed, would close these gaps and enrich our understanding of how instructional technology is chosen and implemented in institutions of higher education.

Chapter 2: Literature Review

This literature review is divided into six sections:

The Higher Education Context of Instructional Technology begins by giving a brief overview of the technological landscape that has emerged in American higher education in recent years in order to set the context for this dissertation.

An Overview of Instructional Technology then defines what instructional technology is and portrays some of its historical and theoretical foundations.

Innovation Defined shifts the focus from instructional technology to the concept of innovation by explicitly defining the type of instructional technology innovation that will be examined in this study.

With instructional technology and innovation defined, the review then examines **Literature on the Diffusion of Innovation and Innovation Processes**, which covers a wide variety of topics far beyond instructional technology, in order to give the reader a broad understanding of the history and state of innovation research.

Literature Focused on Diffusion of Innovations in Higher Education, including Instructional Technology explores the small set of literature that explicitly explores diffusion of innovations in higher education. Again, much of this research does not examine instructional or information technology innovation in higher education.

Lastly, **Literature Focused on Innovation in Higher Education, including Instructional Technology**, examines the even smaller body of literature that explores innovation processes in higher education.

The goal of these sections is to build a strong foundation upon which this study of instructional technology development, purchase, selection, and implementation can be built.

The Higher Education Context of Instructional Technology

Institutions of higher education are experiencing increased pressure on many fronts in the 21st century: pressure to adequately prepare students for roles in a competitive global economy (Brainard, 2007), pressure to maintain and increase access to a diverse population of students (Twigg, 2005), and pressure to increase and improve educational offerings in a period of diminishing funds for educational programs, among many other challenges ("Higher Education in the High-Tech Age", 2005). Within this context, information technology is regarded as a vehicle for institutions of higher education to surmount these hurdles ("Welcome to the National Center for Academic Transformation", 2009). As a result, higher education has been making substantial investments in information technology as well as making significant efforts to collaborate with other institutions to gain cost efficiencies (Goldstein, 2007). By one estimate, higher education institutions in the United States spent approximately $7 billion ($3.4 billion for hardware, $1.6 billion for software, and $1.6 billion on "outside services") in 2006-2007 (not including information technology staff salaries), a 35% increase over the previous year. The average budget across all institutions was $1.4 million, with large institutions enrolling more than 25,000 students averaging $11.5 million for their technology budgets (Kiernan, 2006).

Even as a large amount of financial resources are being spent on technology, there is skepticism regarding the potential for instructional technology to be a transformative pedagogical tool in higher education. Many scholars see instructional technology as having failed in its initial forms in the early 21st century. Zemsky and Massy (2004) argued that the many private, for-profit instructional technology ventures that emerged in the late 1990s and early 2000s went defunct very quickly because they relied on three flawed assumptions: 1) an "if we build it, they will come" mentality; 2) that students would take to e-learning "like ducks to water"; and 3) e-learning would force a change in the way we teach (Zemsky & Massy, 2004) . The private market, they argued, created more products than students and faculty were prepared to understand and weave into their learning and teaching. Ironically, they said, the only products to truly take hold were the commercial LMS that have been mentioned (Blackboard and WebCT, for example) and Microsoft's PowerPoint (Zemsky & Massy, 2004). Georgina and Olson (2008) concurred that the most prominent forms of technology used by faculty in their courses are LMS and PowerPoint.

For faculty, the requirements for promotion and tenure have strayed little from the "teaching, scholarship, and service" model that has defined academic promotion for decades, giving them little incentive to explore or develop (alone or with other faculty or staff colleagues) novel forms of information technology that have the potential to positively impact student learning. Ayers (2004) noted that pre-tenure faculty members largely shy away from utilizing technology in humanities scholarship out of fear that it would reduce their ability to not only achieve scholarship milestones in their tenure process but achieve them in a way that tenure committee members saw as appropriate. Arabasz, Pirani, and Fawcett (2003) noted that the variance in the acceptability of engaging in the use of instructional technology by pre-tenure faculty across different institutions can be quite dramatic. At some institutions, they found, tenure committees will favorably factor in the use of technology in teaching while the institutions will offer release time, while at others, pre-tenure faculty will be told in subtle terms that traditional scholarship is the tried-and-true path to tenure, not novel forms of teaching or scholarship. Despite these challenges to the use of technology in their teaching, faculty affirm their interest in it, though they are not afraid to admit that the institution should take the leading role in teaching how to utilize it in their courses, as Georgina and Olson (2008) found in their survey of over 200 College of Education faculty members at fifteen institutions.

For faculty members and institutions, instructional technology also represents a formidable challenge to traditional policies on the ownership of classroom content. Before the proliferation of information technology in higher education, Ulius (2003) stated,

> academic tradition and case law favored the position that faculty members are generally granted full rights over the printed course content and academic materials they create. This ‘textbook model’ arose from the realization that institutional ownership of faculty members’ printed works (including textbooks,

> articles, lecture materials, and other publications) could ultimately lead to censorship by restricting the distribution and dissemination of new or controversial ideas. (p. 62)

Institutions may not be as willing to cede ownership of online course materials to the faculty members who create them. In the past, the creation of scholarly and course materials was done solely by faculty. In the age of information technology, the creation of instructional technology assets not only requires more institutional resources (staff support, computer hardware and software, etc.), but the results of faculty work developing instructional technology tools has the potential for profitable reuse or commercialization. Therefore, ownership of instructional technology assets and content will continue to be a contentious issue as more postsecondary education moves online. Ulius (2003) and Alger (2002) urge institutions to define specific policies that denote instances where faculty and the institution have ownership over online academic resources, such as course websites built by faculty and applications built in a collaboration between faculty and staff, to name a few.

These issues and debates surrounding instructional technology are being cited to provide a broad context and background on instructional technology rather than to include them in this study. To do so would go beyond the specific focus of the study, which is to examine how institutions are developing, evaluating, and implementing various kinds of instructional technology tools.

An Overview of Instructional Technology

Instructional technology has been defined in several ways since the term was first used in the 1960s. It has been partly defined as the use of physical and technological devices to display and portray instructional material to students (Reiser, 1987; Saettler, 1968). As each one of these technology media became more affordable and widely adopted, they have been utilized in primary, secondary, and postsecondary educational settings. Since the beginning of the twentieth century, these instructional technology devices have largely followed the developmental arc of broader technological developments. In short, modern instructional technology began with portable instructional exhibits of artifacts and other physical objects, continued on to film (still and motion picture), radio, and television, and finally into the realm of computers (Cuban, 1986; Saettler, 1968).

Instructional technology is not defined solely by the instructional content and the physical devices used to convey it. Instructional technology is also defined as the methods that are employed to design instruction and how individuals learn, which is also referred to as instructional design (Reiser, 1987). During the twentieth century, many different theories of learning emerged, which influenced the design of contemporary instructional technologies. During the 1920s through 1940s, the behavioral learning theories of Ralph Tyler and B. F. Skinner (among many others), who believed that learning was an observable behavioral process that could be reinforced within students through different curricular and environmental interventions, were among the earliest learning theories to influence the design of instructional technology devices. Examples of these devices included multiple-choice machines that did not allow a student to continue a test until they chose the correct answer (Driscoll, 2006; Saettler, 1990).

In the 1960s and 1970s, a shift towards cognitive psychology and theory took place. Based on the psychological theories of Piaget and others, cognitive theorists were more concerned with understanding internal mental processes – how individuals perceive, construct memory, and solve problems – and viewed individuals as active participants in the learning process rather than viewing individuals as passive recipients of information. With cognitive theory, instructional technology facilitates activities such as problem solving and the recall and synthesis of existing knowledge (Driscoll, 2006; Saettler, 1990).

In the 1970s and 1980s, Schema Theory and Cognitive Load Theory emerged as popular learning theories. Schema Theory is based on the idea that humans learn by storing information in systematic bundles called schemata. As individuals learn and experience more, they develop more complex schemata (Driscoll, 2006; Saettler, 1990). Cognitive Load Theory is based in the idea that learners only have a certain amount of cognitive capacity to process and store information, which complements Schema Theory in that learners can reclaim cognitive capacity by creating more complex schemata (Driscoll, 2006; Saettler, 1990).

Since, the 1980s, instructional technology and instructional design have moved away from purely psychological foundations of learning. Situated Learning Theory, for example, states that learning takes place in the context of a community. Individuals learn by becoming immersed in the practices of a community, by influencing the practices of the community and by forming relationships with new and existing community members (Driscoll, 2006; Saettler, 1990).

While there are still more theories of learning that affect instructional design and instructional technology, Constructivism is a recent body of theory that has influenced instructional technology. Constructivism is defined by the learner using their past experiences and existing knowledge to produce new meanings in their present environment. As such, in Constructivism, teachers become facilitators and learners are immersed in "authentic" activities associated with a discipline (Driscoll, 2006; Saettler, 1990).

No single theory of instruction or learning is being emphasized as the correct theory in this review. Instead, this overview is intended to portray the breadth of theories from which instructional technology staff members draw as they create, select, and purchase various types of instructional technology tools.

Innovation Defined

A widely-used definition of innovation comes from Everett M. Roger's *Diffusion of Innovations* (2003). Originally printed in 1962, *Diffusion of Innovations* is considered a seminal work in the field of innovation and diffusion studies. Rogers defined innovations simply as "an idea, practice, or object that is perceived as new to an individual or another unit of adoption" (Rogers, 2003, p. 137). Other scholars have argued that there are multiple kinds of innovations. For Celsi and Wolfinbarger (2002), there are three types of innovations – continuous, dynamically continuous, and discontinuous – depending on their relative advantage over other innovations and the degree to which an innovation affects the behavior of the unit adopting it. Continuous innovations do not significantly affect either. They are incremental versions of previous innovations (Celsi & Wolfinbarger, 2002). Dynamic innovations offer significant technology advancement over previous innovations, but they do not dramatically alter the behavior of the adopting unit (Celsi & Wolfinbarger, 2002). Only discontinuous innovations significantly alter the behavior of the adopting group). Lastly, Levine (1980) offered that innovation is such a relative phenomenon that any activity or product that is established and old to one organization or social unit can be entirely novel and innovative to another organization or social unit (pp. 3-4).

For the context of this review, an instructional technology innovation is defined as a home-grown instructional technology tool that is intended to be a departure or improvement on previous instructional technology tools utilizing technological or design features that are new to the designer and/or to the user.

Literature on the Diffusion of Innovation and Innovation Processes

The amount of literature related to innovation, especially the diffusion of innovations in various settings, is quite extensive, though the field of study itself is rather new. Again, Rogers's (2003) theories of diffusion have largely defined this field of study. As he defined it, diffusion is "the process by which (1) an innovation (2) is communicated through certain channels (3) over time (4) among the members of a social system" (Rogers, 2003). One of Rogers's contributions was to take existing studies of diffusion that were not widely known or utilized and build upon them to create the elements of this Diffusion of Innovation Theory. Ryan and Gross (1943) provided Rogers with important categories of innovation adopters – innovators, early adopters, early majority, late majority, and laggards – while Tarde (1903) provided Rogers with the S-shaped diffusion curve that innovations follow as they are adopted in social systems.

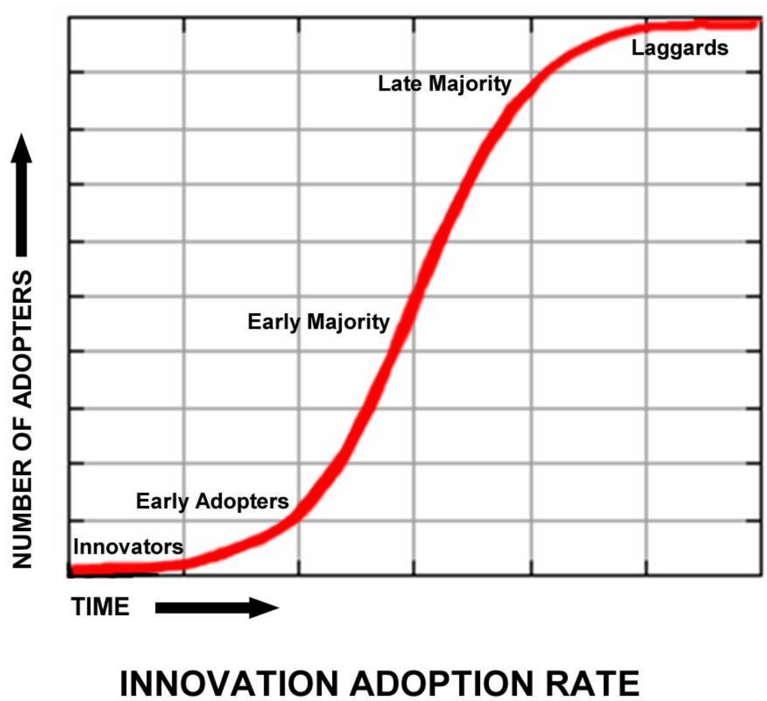

Figure 1. Tarde's (1903) Diffusion Curve with Ryan and Gross's (1943) Innovator Categories (("Why Don't Good Ideas Fly? What Youth Ministry Can Learn from Innovation Research", 2005)).

Rogers's primary interest was in the diffusion and adoption process of innovations, though not how innovations originate in the first place, and much of his Diffusion of Innovation Theory reflects this primary interest. The main components of the theory are Perceived Attributes of Innovations (Relative Advantage, Compatibility, Complexity, Trialability, Observability) and the Innovation-Diffusion Process (Knowledge, Persuasion, Decision, Implementation, Confirmation) (Rogers, 2003). Rogers did not assume innovation was a given, though, but that innovation occurs through an Innovation-Development process that consists of:

1) Recognizing a Problem or Need
2) Basic and Applied Research
3) Development
4) Commercialization
5) Diffusion and Adoption
6) Consequences
(Rogers, 2003)

This process of innovation development, however, focuses on the process of innovation taking place at the level of an individual. In the Basic and Applied Research period of the innovation-development process, a singular leader, not an organization, "develops an innovation and then convinces a manufacturing company to produce and sell the innovation … after the lead user has created a prototype of the new product" (Rogers, 2003). This description does not encompass the organizational processes that shape the development of the innovation. It is developed by individuals and then starts its successful or unsuccessful journey towards adoption.

Other scholars, such as Tornatzky in *The Process of Technological Innovation* (1990), have set out innovation and adoption structures very similar to Rogers. In his book, Tornatzky defined the Life Cycle of Technological Innovation as

1) Basic Research
2) Applied Research
3) Development
4) Testing or Evaluating
5) Manufacturing or Packaging
6) Marketing or Dissemination
(Tornatzky, 1990)

After the innovation has been created, it enters the user adoption process: Aware-Problems, Matching-Selection, Adoption-Commitment, Implementation, and Routinization (Tornatzky, 1990).

Tornatzky's Life Cycle of Technological Innovation and user-adoption phase closely resemble Rogers's Innovation-Diffusion Process and Innovation-Development Process. Unlike Rogers, however, Tornatzky acknowledged the non-linear and non-rational aspects of innovation development. Innovation could come after basic and applied research and actually spur the latter two activities, therefore "[i]t is better to think of it as a highly iterative process" (Tornatzky, 1990). He also highlighted concepts such as Incremental Innovation, which meshed into existing organizational structure, and Radical Innovation, which yielded new organizational structures (Nord & Tucker, 1987) . Tornatzky also acknowledged that innovation can take place in very isolated settings, often in parallel. "Innovation," he said, "often occurs without much awareness on the part of most participants of what is going on outside of their own spheres of activity….

We all live in our own worlds" (Tornatzky, 1990). Finally, Tornatzky argued that innovation research could and should focus on several organizational levels; "individuals as individuals, individuals enacting social roles, social groups, organizations, interorganizational links, aggregates of organizations [i.e., industries], [and] societies" (Tornatzky, 1990).

Zaltman, Duncan, and Holbek (1973) argued that innovations develop at an organizational level because organizations perceive that they have a performance gap or performance deficiency with negative consequences. The anxiety that this perception creates "unfreezes" creative elements of the organization that are related to the external environmental change that precipitated the gap in the first place, and therefore are suited to taking on the challenges it poses (Zaltman et al., 1973) . Zaltman *et al*. also highlighted very important elements of innovations that Rogers did not. They situated innovations in their native environment by describing important innovation attributes such as social and financial cost, efficiency, compatibility, point of origin, terminality, and susceptibility to modification, to name a few (Zaltman et al., 1973) . They also listed organizational characteristics that affect the innovation process: Complexity, Formalization, Centralization, Interpersonal Relations, and Ability to Deal with Conflict (Zaltman et al., 1973) .

Damanpour (1991) combined attributes and characteristics into "organizational determinants" that determine the relationship between an organization and innovation: specialization, functional differentiation, professionalism, formalization, centralization, managerial attitude toward change, managerial tenure, technical knowledge resources, administrative intensity, slack resources, external communication, internal communication, and vertical differentiation (Damanpour, 1991). These determinants have been utilized in subsequent research to measure the relationship between determinants, innovativeness, and organizational performance (Daft & Becker, 1978; Subramanian & Nilakanta, 1996) .

Other organizational studies and theories provide a helpful set of lenses with which instructional technology innovation can be analyzed. In particular, organizational research based on the Garbage Can Model of Organizational Choice put forth by Cohen, March, and Olsen (1972) and revised by Kingdon (1994) shows great promise for understanding how and why instructional technology innovation takes place in the postsecondary education setting. Cohen *et al.*'s original Garbage Can Model was based on the notion that organizations, particularly universities, are loosely coupled, organized anarchies (Weick, 1976). As organized anarchies, they are characterized by three properties: inconsistent and ill-defined organizational "preferences," little understanding of the organization's processes by its members, and varying participation by organizational members (Cohen et al., 1972) . From this definition of organizations as organized anarchies, Cohen *et al.* further described organizations as "a collection of choices looking for problems, issues and feelings looking for a decision situation in which they might be aired, solutions looking for issues to which they might be the answer, and decision makers looking for work" (Cohen et al., 1972) . Kingdon (1994) revised Cohen *et al.*'s original model to examine the process of decision-making in the federal government with what he called the Revised Garbage Can Model. This revised model had streams, similar to the original Garbage Can Model: Problems, Policies, and Politics. These three "streams," he found, flow independently through the federal government until an appropriate choice opportunity arises that allows an agenda item to gain momentum and potentially become policy.

Currently, the Garbage Can Model and the Revised Garbage Can Model have not been used as the conceptual framework for any general studies of innovation or instructional technology innovation. They are frequently used as frameworks for decision-making in political and educational arenas (McLendon, 2003). However, both models' concentration on problems, solutions, and organizational or governmental politics (and their haphazard development and coupling patterns) makes them attractive, if underutilized, frameworks for exploring how instructional technology innovation and implementation takes place in postsecondary education.

Literature Focused on Diffusion of Innovations in Higher Education, including Instructional Technology

As discussed earlier, most of the available literature about information and instructional technology innovation in higher education concentrates on the dissemination, adoption, and sustainability of existing innovations among faculty, staff, and students. A multitude of different approaches are used to analyze these activities. Kozma (1978), for example, conducted research on an initiative at the University of

Michigan in the late 1970s to increase the use of instructional technology by extensively training selected faculty members in the use of instructional technology in a time release, fellowship setting. This Faculty Fellowship Project deliberately took each fellow through the four phases of Rogers's Innovation-Decision process (Knowledge, Persuasion, Decision, Implementation, and Confirmation). Kozma noted activities such as how handouts were used to build knowledge about instructional technology innovations and buy-in among fellows (Kozma, 1978).

In a later paper, Kozma utilized several scholars' models of innovation diffusion, including Rogers (2003), Havelock (1971), Bess (1977), and Allen (1975) to analyze the impact of four factors (informal social network, formal social network, intrinsic reward, and extrinsic reward) on innovation adoption and diffusion. In the survey responses he received from 162 faculty (a 58 percent response rate), he found that all of these factors were significantly related to innovation adoption, with the formal social network (relationships with faculty development professionals, for example) being the most predictive of the use of technology innovations (Kozma, 1979).

Grunwald's (2004) unpublished dissertation is an explanatory examination of factors that predict faculty use of the Web in their teaching. Utilizing the National Study of Postsecondary Faculty 1999 data, Grunwald found faculty-level variables that predict their use of the Web in teaching (such as gender, status, rank, institutional IT ratings, teaching loads, and satisfaction with teaching duties, to name a few), and institutional variables that predict use (two-year vs. research institutions) (pp. 109-110). Overall, Grunwald found that time constraints, such as high teaching loads, were a barrier to use of the Web in courses, whereas professional development and high-quality IT infrastructure and support positively predicted use of the Web (pp. 109-110).

Nicolle (2005) noted that most of the studies of technology adoption by faculty examined social cognitive factors (attitudes and beliefs, for example) of the first of Rogers's two innovation adopter categories: innovators and early adopters. The technology adoption patterns among the majority of faculty who reside in the early majority, late majority, and laggard categories were not being analyzed. Nicolle's findings were that institutional and peer support were the most important factors in motivating these populations to include information technology in their teaching (Nicolle, 2005).

Spotts (1999) utilized interview data in his analysis of faculty use of technology to find that faculty want facilities in which to use technology (classrooms), training in how to use it, recognition for their use of it (especially in the promotion and tenure process), and time with which to learn existing technologies and explore new ones. Above all, he argued, they need to perceive the value of using instructional technology in their courses. The other factors are meaningless unless they perceive enough value in the technology to pursue using it.

Stansberry and Harris (2005) stressed the importance of organizational culture on the preferences of faculty for utilizing instructional technology in their courses. As they stated, "[i]f we merely consider the functional application of instructional technology without considering cultural and organizational aspects, we will continue to be unable to fully explain the dichotomy between faculty members who use instructional technology and those who do not" (p. 31). In their findings, Stansberry and Harris found that the culture at a Midwestern college of veterinary science had a high level of faculty use of instructional technology because technology-enabled classrooms were ubiquitous, the importance of quality teaching was stressed and backed up with incentives and consequences, and faculty could work with the instructional technology specialists at the college regarding how the technology for their course would be structured (p. 31).

The studies cited above exemplify that there is no shortage of literature on the diffusion, adoption, implementation, and sustainability of technology innovations among faculty, staff, and students in higher education. Many of these studies utilize Rogers's theories of innovation diffusion and the characteristics of innovations, with additions and modifications, as the framework through which the process of innovation adoption takes place. Not all examples in the literature rely on Rogers, though. Some utilize a feminist framework (Campbell, 2004; Clegg & Trayhurn, 2000), grounded theory (Kozma, 1985), or economic theory (King et al., 1994) to better understand why instructional technology is adopted and implemented in higher education institutions.

Literature Focused on Innovation in Higher Education, including Instructional Technology

There is a small body of literature that explores models and processes of innovation in higher education, the structures that are conducive to it, and the reasons individuals innovate. Some of this literature specifically examines instructional technology innovation, while some of it examines the creation and use of non-technological teaching innovations. The following articles were included in this literature review because they portray this small body of literature and offer models with which the innovation of instructional technology in higher education can be further investigated.

Davis, Alexander, and Hussain (1982) explained that innovations are frequently studied as products and processes. When they are studied as products, investigators generally attempt to identify the organizational characteristics that are related to their adoption and use. Researchers using this approach look for relationships between features of organizations – size, decentralization, and specialization, for example. The findings of these product-oriented studies are frequently contradictory and have prompted calls for examining innovations as processes to better account for their complexity.

Studies of innovations as processes tend to utilize the case-study method rather than quantitative statistical analyses of survey data, Davis *et al.* (1982) reported, and these studies tend to focus on the timing of various events. Using this approach, Davis *et al.* (1982) developed a four-stage innovation process: Consideration, Design and Development, Implementation, and Continuation. The success or failure of an innovation depends on certain behaviors and events that take place in each stage. Within each stage, four factors determine whether an innovation moves on successfully: Organizational Support, Innovation Characteristics, Innovator Activities, and Innovator Motivation (p. 571). Davis *et al.* also argued that there is a differential nature to each of these factors in different stages. For example, Organizational Support is more important during the latter stages of innovation, such as when a faculty member is trying to have an innovation implemented widely, than the earlier ones when they are developing it (p. 572).

The focus of Davis *et al*.'s (1982) study was an innovation called SLATE at Michigan State University. SLATE was a customizable multi-media platform that faculty could utilize in their courses and alter to fit their course objectives. Faculty would receive a grant to develop their SLATE from the University's Educational Development Program (pp. 572-573). In their study, 21 faculty participants who received SLATE grants were surveyed regarding 10 indicative behaviors and incidents for each of the four innovation factors. The participants also weighted each of the behaviors and incidents on a five-point scale and indicated the relative importance of each of the four factors (p. 574).

Davis *et al.*'s (1982) findings were that faculty members perceived their motivation as the most important factor during the early stages of SLATE innovation, while administrative and instructional design support emerged as more important in the latter stages of implementation (p. 583). The authors stressed that organizational innovation hinges on three inter-related factors; innovator motivation, innovator activities, and organizational support (p. 584). Davis *et al*. (1982) has been included as an example of how innovation can be studied as an ongoing organizational process, an approach that this study will follow.

Hannan, English, and Silver (1999) explored instructional innovation in an initial study of 221 staff members at 15 institutions in the UK in 1997 and 1998 that was structured to examine "the reasons why some staff become involved in innovation and begins an analysis of the institutional contexts in which innovation takes place" (p. 279). Hannan *et al.* utilized a broad definition of innovation – "methods of teaching and learning new to their own situation, their own course, department or institution" (p. 280) – that included technologically- as well as pedagogically-based examples.

The institutions they visited were chosen by examining lists of national innovation-award winners. They also sought to balance the geographical spread of the institutions they visited as well as the age (newer and older) of the institutions they visited. Rather than randomly sample individuals, they had each institution arrange interviews with the staff members who had been identified in the awards lists as innovators as well as any other individuals who were connected to curricular innovation.

A total of 221 interviews were conducted and documented primarily by notes but also by tape recorded backups. Supporting documentation was also collected that included information related to the innovators work as well as institutional policies on teaching and learning. After analysis of the notes, findings were presented to representatives of each institution that were visited at a conference.

Eleven different types of innovations were indicated by the interview responses. These included technology-based innovations (use of the Internet and computer-based learning), group- and team-based learning, problem-based learning, and peer-mentoring, to name a few (p. 281). One hundred three of the interviewees were asked why they innovate, to which they responded that they saw a need to improve teaching (34), a need to respond to changing student demographics (such as increasing numbers and lack of skills) (31), the demands of external agencies (21), and by the need to reorganize their teaching due to internal curricular and organizational changes (11) (p. 283).

The authors also noted that these innovators were very aware of the intersection of external pressures (budgets, resources, staffing, policy, structural/curricular changes, and technological changes) and internal pressures (their own teaching styles) and that innovation was a way to resolve these pressures. These innovators also stated they were emboldened in their efforts by previous experience with their innovation (20), support from within the institution (19), staff development (16), their own beliefs (13), the success of other institutions (12), their desire to make their work more interesting (8), and their own research (7). The authors also found that gaining seniority allowed interviewees to innovate (pp. 285-286). Interestingly, the innovators did not mention financial incentives as a motivator. These individuals were aware that funding and promotion would not result from innovative activities.

Like Davis *et al.* (1982), Hannan *et al.* (1999) examines innovation from a process perspective. They also examine organizational factors that enable or hinder innovation. Lastly, their study was included to show that a purposive participant selection method can lead to meaningful results in a smaller case study context.

In 2005, Hannan drew upon his initial research with English and Silver in 1999 to further define and describe institutional policies, structures, and cultures that support teaching and learning innovation (Hannan, 2005). He briefly stated the findings he, English, and Silver found in 1999 (Hannan et al., 1999). He also cited a 2000 study with Silver (Hannan & Silver, 2000) , which found the following factors that supported and obstructed innovation in teaching and learning:

Factors that Supported Innovation in Teaching and Learning

1. Innovators had encouragement and support department heads, units heads such as deans, or other individuals in authority;
2. The Institution had policies that established the importance of teaching in issues of promotion and the policy was reflected in the practices of the institution;
3. Individuals' colleagues and authority figures showed an interest in sharing and utilizing the results of innovation;
4. Innovators had access to resources at the department level or through a faculty development unit.

Factors that Obstructed Innovation in Teaching and Learning

1. Low opinion of the importance of teaching and learning in comparison with research;
2. Lack of recognition and interest in innovations by colleagues and authority figures;
3. Institutional policies and initiatives that preclude individualized innovation;
4. Overly bureaucratic procedures for program approval, funding, or resources;
5. Assessment and evaluation procedures that inhibit risk taking.
(Hannan, 2005, p. 976)

With the findings from these two previous studies in mind, Hannan returned to the original 15 institutions surveyed in 1997-1998 to survey as many of the original 221 innovators again to ascertain whether or not universities in the United Kingdom had become "more or less supportive of the attempts to improve methods of teaching and learning and in what ways" (Hannan, 2005, p. 976). One hundred fifty-three of these original innovators were found to be employed at the same institution. Seventy-six of them completed the new questionnaire for a response rate of 49.7% (Hannan, 2005, p. 976).

Hannan's findings were that there was no consensus that innovating was any easier in 2002 than it was in 1998, as two-fifths of the respondents replied that it was easier and two-fifths replied that it was not. Approximately half (54.7%) of the valid responses indicated that teaching and learning had a higher priority in 2002 than in 1997-1998 (p. 977). In addition to reporting descriptive statistics of responses, Hannan also discussed qualitative responses from surveys and interviewees. Some of the responses affirmed his and Silver's previous findings from 2000 regarding impediments to innovation. He noted that 18 out of the 26 respondents who gave reasons why they believed it was harder to innovate in 2002 than in 1997-1998 mentioned quality assessments (7) and increased regulations (3) as reasons for the shift (pp. 978-979). Fourteen of the 25 respondents who believed it was easier in 2002 to innovate elaborated on their responses. They gave reasons such as "developments at institutional and national levels," and "the influence of increased institutional support" (p. 979).

Ensminger, Surry, Porter, and Wright (2004) began their study with a critique of the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) that is frequently used as the framework for developing instructional technology. ADDIE, they stated, "provides little guidance on implementing a completed product or innovation. As a result, innovations designed to solve instructional or performance problems often fail during product implementation, resulting in the loss of time, effort, and money" (p. 61). In short, ADDIE excludes other actors during the innovation process, and, thus, is more predisposed to unsuccessful implementation.

Like Surry (2002), Ensminger and his colleagues briefly lay out the geography of Rogers's Innovation-Decision Process, Attributes of Innovations, and Adopter Categories. They also discuss other theories of technology implementation and adoption, such as Havelock and Zlotonow's (1995) CREATER model, which gives change agents implementation strategies via relationship development, resource identification, and problem/solution identification. Others included were Hall and Hord's (1987) Concerns-Based Adoption Model (CBAM), Stockdill and Morehouse's (1992) five factors (educational need, user characteristics, content characteristics, technological considerations, and organizational capacity (p. 57), and Burkman's (1987) five-step User Oriented Instructional Development (UOID) process, which focuses on identifying users, assessing their needs, incorporating their feedback in the product, and aiding in product adoption. Ensminger *et al.* also included two models of innovation implementation and organizational change from the business field: Kotter's (1996) process of organizational change and Klein and Sorra's (1996) factors that influence innovation implementation.

Ensminger *et al.* explicitly define adoption ("the initial decision to begin using an innovation" (2004, p. 62)) as being different than implementation ("the process of introducing an innovation into an organization and fostering its use" (2004, p. 62)). As such, they utilize Ely's Eight Conditions that Facilitate Implementation (Ely, 1990; Ely, 1999) as the framework for their study:

1. Dissatisfaction with the status quo: "an emotional discomfort that results from perceiving the current method as inefficient or ineffective."
2. Knowledge and Skills: "an assessment of the current level of skills and knowledge of the product users."
3. Adequate Resources: "the amount of resources currently available to successfully implement the innovation."
4. Time: "adequate time and compensated time for users to become educated and skilled in how to use the innovation."
5. Rewards or Incentives: "the existence of incentives that motivate users to employ the innovation, or rewards provided by the organization for those who do use the innovation."
6. Participation: "the involvement of key stakeholders in decisions that relate to the planning and design of the innovation."
7. Commitment: "the perception by users that the powerbrokers of the organization … actively support the implementation of the innovation."
8. Leadership: "an active involvement by immediate supervisors in assisting the users in implementing the innovation." (Surry & Ensminger, 2002, p. 2)

Ensminger *et al.*'s study was very similar to the study by Surry and Ensminger (2002) in that its goal was partly to determine which of Ely's eight conditions were considered more important by individuals who took a survey which asked them to choose the more important condition out of two in a questionnaire that paired each of the conditions together twice. Content validity was determined by seven scholars of adoption, change, and implementation. Their feedback was used to improve questions that were given below-average ratings.

The survey was administered to 179 instructional design participants in the U.S. who were selected from e-mail lists of individuals from this field (20 from K-12, 89 from higher education, 22 from business/industry, 9 from military, 11 from government, 12 self-employed, and 16 unknown) (Ensminger et al., 2004, p. 66) . Descriptive statistics and factor analysis were used to determine relationships between the conditions. Factor analysis (using the principal component method of extraction and varimax rotation) revealed that the four factors into which the eight conditions were reduced (Managed Change, Performance Efficacy, Rewards, and Resources) accounted for 73.3% of the variance in the combined factors. The authors decided that for a condition to load on a factor, it had to have an absolute value of .45 or more for one factor and not more than .45 for another (Ensminger et al., 2004, p. 68) .

Two factors – External Rewards (14.2% of variance explained) and Resources (14% of variance explained) – had only one condition load on them, while Managed Change (25.3% of variance explained) and Performance Efficacy (19.8% of variance explained) had two or more conditions (Ensminger et al., 2004, p. 68) .

Ensminger *et al.* did not draw far-reaching conclusions from their study. They believed that the technology inventory developed for the study served as a measure of an individual's "implementation profile," which researchers could use to "explore how the importance of eight conditions [by Ely] that influence the implementation of technology innovations" and how different kinds of technology influence the importance of each condition (Ensminger et al., 2004, p. 69) . They foresaw a practical use by those who are responsible for implementing innovations to better understand the importance of each condition within their organization and then develop strategies during implementation that are tailored to the tendencies of the organization.

In 2002, Surry conducted a survey of Deans of Education at Carnegie Research I and Research II universities (Surry, 2002). A total of 126 surveys, each containing 27 questions, were sent out. 61 were returned, 55 of which had usable data, for a response rate of 43.7%. Thirty-five (64%) were from Research I universities, while 13 (24%) were from Research II institutions (Surry, 2002, p. 5).

Survey items were classified into five categories: Planning and Support, Infrastructure, Expenditures, Integration, and Overall Impressions. Thirteen pairs of factors were paired to test for correlation, five of which were significantly correlated: Deans' Satisfaction with Technology Infrastructure and Technology Competency of Recent Graduates, Deans' Satisfaction with Technology Infrastructure and Faculty Efforts to Integrate Technology into their Teaching, Technology Expenditures in the Current Fiscal Year and Deans' Satisfaction with Technology Infrastructure, Technology

Expenditures in the Current Fiscal Year and Faculty Efforts to Integrate Technology into their Teaching, and Faculty Use of Technology and Technology Competency of Recent Graduates (Surry, 2002, pp. 6-7). The results of this study, according to Surry, point to the importance of an institution's technology infrastructure, not technical support, incentives for faculty, or training, is the key factor in integrating technology into curriculum (Surry, 2002, p. 8).

The results of the survey, as well as a review of relevant diffusion of innovation literature (Burkman, 1987; Ely, 1999; Hall & Hord, 1987; Rogers, 2003; Stockdill & Morehouse, 1992), led to the development of a new model for integrating instructional technology into higher education entitled RIPPLES (Surry, 2002). RIPPLES is an acronym for: Resources, Infrastructure, People, Policies, Learning, Evaluation, and Support (Surry, 2002, p. 8).

Resources are defined mainly as fiscal resources, of which Surry says, "most adoption and diffusion models assume that funding has already been secured and an innovation is available for adoption." This model begins with the perspective that "technology is expensive and colleges need to plan for adequate funding from the outset of the process in order to be able to acquire, utilize, maintain, and upgrade technology" (Surry, 2002, p. 8). Resources are further defined by Continuing Resources, those which come from dedicated sources each year, temporary resources, such as grant monies and donations, and resource allocation, which is defined by the process of "matching revenues and expenditures" such as balancing technology and personnel expenditures (Surry, 2002, p. 8).

Infrastructure is the technological infrastructure – hardware, software, facilities, and network – within an institution. Five components are required, according to Surry: teaching resources, production resources, communication resources, student resources, and administrative resources. Each of these can and should be "delivered at the desktop, workgroup, or unit level" (Surry, 2002, p. 9). Surry cited several concepts and studies that support the inclusion of Infrastructure in a model of instructional technology integration (Farquhar & Surry, 1994; Rogers, 2003; Stockdill & Morehouse, 1992).

People, Surry argued, play an essential role in technology integration. Their "needs, hopes, values, skills, and experiences … play a vital role in deciding if an innovation is successfully adopted" (Surry, 2002, p. 9). Shared decision-making and communication among stakeholders are two essential components (Ely, 1999).

Often, **Policies** at institutions inhibit the integration of new technologies, especially those related to faculty promotion and tenure policies. Instead of rewarding faculty, they dissuade faculty from implementing instructional technology (Surry & Land, 2000).

Learning and instructional goals can be enhanced in three ways by technology. First, it can positively affect pedagogy by giving students and instructors a more dynamic medium in which to interact. Second, technology offers increased opportunity for access to new populations and better access to learning resources for existing students. Third, technology can reduce costs by allowing more students to access an institution (economies of scale) or by reducing operating costs (Surry, 2002, pp. 9-10).

Evaluation of technology should take place on four levels. First, it should be evaluated in relation to learning goals. Second, the technology should be evaluated against other technological alternatives. Third, the integration plan of the technology should be evaluated to ascertain any factors that have facilitated or impeded its integration. Fourth, the return on the investment of the technology should be evaluated. All of these evaluation activities should take place continuously (Surry, 2002, p. 10).

From other studies (Farquhar & Surry, 1994; Stockdill & Morehouse, 1992; Surry & Land, 2000), it is known that four **Support** components are essential in any instructional technology implementation: training (information and formal), technical support, pedagogical support, and administrative leadership (Surry, 2002, p. 10).

A brief overview of RIPPLES in 2005 (Surry, Ensminger, & Haab, 2005) acknowledged that the model had not been tested yet, but that some studies have been conducted using RIPPLES as part of a conceptual framework since that time. Robertson (2007) conducted a study in 2007 of teachers' use of technology in their teaching practice in Australia's Vocational Education and Training (VET) program to better understand the frequency with which varying online teaching "functionalities" are utilized.

The use of 21 different functionalities (synchronous and asynchronous communication, automated assessment, etc.) were surveyed among Australian vocational teachers, with 138 replying to the survey (Robertson, 2007, p. 2). These frequencies were tested for differences among teachers who primarily taught in face-to-face settings compared to teachers who taught in primarily non-face-to-face settings. Using the RIPPLES model as a guide, Robertson wanted to further test the usefulness of newness, complexity (of the functionality), compatibility, and locus of control in explaining differences between these two groups (Robertson, 2007, p. 2).

Robertson's findings were that the four factors noted above were useful in explaining differences in the use of online functionalities between face-to-face and non-face-to-face teachers. Robertson reached this conclusion, though, without any inferential statistical analysis of his data. The differences in frequencies between the two populations alone were interpreted as evidence of the relevance of a factor for particular populations.

Benson and Palaskas (2006) used the RIPPLES model as a theoretical framework in their examination of the adoption and implementation of WebCT Vista, a commercial CMS that was subsequently acquired by Blackboard ("Blackboard", 2009), at Monash University, a global university with campuses in Australia, Malaysia, South Africa, and Italy ("Monash University", 2009). Benson and Palaskas began their study by citing other models of adoption and implementation that have been cited in this review (Burkman, 1987; Ely, 1990; Hall & Hord, 1987; Havelock & Zlotolow, 1995; Rogers, 2003; Stockdill & Morehouse, 1992) and grouping them into three broad categories. These three categories are: 1) models that focus on characteristics of the technology adopters (Burkman, 1987; Rogers, 2003); 2) models that focus on environmental factors of adoption and implementation; and 3) models that focus on the professed change and their associated conditions (Havelock & Zlotolow, 1995; Stockdill & Morehouse, 1992) .

The RIPPLES model was chosen over all others, though, because the others "often focused on one or more aspects of the process rather than the whole" (Benson & Palaskas, 2006) . The RIPPLES model "allows for the inclusion of key considerations that are not necessarily encompassed by other adoption models, such as the learning and teaching implications of the use of a learning management system (Benson & Palaskas, 2006). To take advantage of the RIPPLES framework, each aspect of the model was mapped to the evaluation framework with which the WebCT Vista implementation was evaluated. The mapped framework is shown below in Figure 2.

Evaluation Framework	RIPPLES Model Equivalent
Training and professional development issues	People; Learning; Support
Pedagogical issues	People; Learning
Staff and student support issues	People; Support
Administrative issues	Infrastructure; People; Support
Technical issues	Infrastructure; People; Support
Communication issues	People; Politics; Evaluation; Support
Overall response	People; Evaluation; Support

Figure 2. Benson and Palaskas: Mapping of RIPPLES Model to Evaluation Framework (2006).

Using qualitative data from interviews of staff and students collected over two semesters, Benson and Palaskas found the RIPPLES model to be useful and accurate for analyzing institutional innovations. "[I]t covers major factors that need to be considered in the higher education environment and its breadth allows other narrower models to be incorporated where necessary … in order to focus in more detail on specific aspects of the change process," they said (Benson & Palaskas, 2006). Similarly, Miller (2010) used the RIPPLES Model in a 2010 unpublished dissertation examining instructional technology adoption and implementation in post-secondary military institutions because it examines seven dimensions that are key to the adoption and innovation of instructional technology in higher education (Miller, 2010, p. 48).

Literature Gaps, Questions, and Implications for Research

This literature review assembled as much of the readily available literature on the innovation of instructional technology as part of a larger research agenda to explore the organizational decision-making process that is undertaken by institutions as they decide whether to innovate new instructional technology tools or utilize free or fee-based ones. Much of the literature has drawn on theories of innovation diffusion and technology adoption put forth by Rogers and Shoemaker (1971) and Rogers (Rogers, 2003) in their Innovation-Decision Process and Perceived Attributes of Innovations to explore technological, social, and organizational factors in the adoption and implementation of innovations (Burkman, 1987; F. D. Davis, 1986; Ely, 1990; Ely, 1999; Farquhar & Surry, 1994; Hall & Hord, 1987; Havelock & Zlotolow, 1995; Stockdill & Morehouse, 1992; Tornatzky & Klein, 1982; Van de Ven, 1986) .

This review suggests that there are several gaps in the innovation literature and the literature on the innovation of instructional technology. Mainly, the process of developing innovations that are being adopted and implemented is largely taken as a given. Tornatzky (1982) gave a fuller picture of the innovation process than Rogers, acknowledging its nonlinearity and organizational distinction from “another set of activities called dissemination” (p. 30). Still, Tornatzky did not put forth a framework or model for analyzing innovation that reflected the nonlinear, organizational factors he identified. Surry’s (2002) RIPPLES Model includes broad organizational aspects of instructional technology implementation (Ely, 1999) as well as personal (Burkman, 1987; Hall & Hord, 1987) and technological factors (Stockdill & Morehouse, 1992) that affect change in higher education. Because of its broad base of perspectives that it captures, Surry’s RIPPLES provides a strong analytical framework for understanding the innovation of instructional technology in higher education as well as the decision process that comes into play when deciding to use other free or fee-based instructional technologies.

Chapter 3: Research Methodology

This chapter describes the methodology that was used to explore instructional technology tool innovation, purchase, selection, and implementation in higher education and how it is changing as a consequence of institutional trends, societal trends, and information technology trends. The scope of the study, conceptual framework, context of the study, study participants, interview protocol, variables, research subjects, data collection, and data analysis will be described, as well as potential limitations of the study.

Research Questions

This multi-institution case study has been structured to address the following research questions:

1. What are the differences in instructional technology organizational structure at liberal arts institutions that develop home-grown instructional technology tools, institutions that purchase instructional technology tools, and institutions that utilize open source and free web-based instructional technology tools?
2. What is the relationship between the four types of instructional technology tools, organizational factors (e.g., the RIPPLES dimensions), and extra-organizational factors (e.g., instructional technology developments, information technology developments, and higher education marketplace developments)?

3. Of the different instructional technology models utilized at the participating institutions, do certain models tend to be associated with particular types of instructional technology tools?

Research Design

Qualitative case-study research methods were used to examine the subtle details of instructional technology decision making. Ultimately, the goal of this study was to chronicle the *process* of how instructional technology tools are developed, chosen for purchase, or chosen among open source and free web-based candidates, not the outcomes of those processes (Merriam, 1988, p. 19). Case study methods, more than qualitative methods, allow the researcher to see unique similarities and differences within and between institutions (Patton, 2002). Quantitative methods were also rejected because gathering sufficient respondents in order to collect a statistically valid dataset was a concern. The researcher also wanted to be able to identify factors affecting instructional technology that are not included in existing theories to emerge, and qualitative methods allow for that. Smaller scale case-study analysis, as Gerring (2007) stated, can be more useful than large sample studies at exploring subjects in new ways because large-sample studies "…generally allow for the testing of only a few hypotheses but does so with a somewhat greater degree of confidence, as is appropriate to work whose primary purpose is to test an extant theory" (p. 41). Lastly, there is skepticism among scholars such as Keller (1998), who stated that the overwhelming reliance on quantitative methods in higher education research is crippling needed efforts at institutional change, causing errors in judgment, and generating utopian proposals because they assume that persons are independent, unsocialized actors who are not shaped, conditioned creatures as well. Researchers frequently regard choice as free and rational when it is, in fact, fenced in and propelled (p. 267).

This researcher agrees with Keller that choice is “fenced in and propelled” during the innovation, implementation, and procurement of instructional technology in higher education by the RIPPLES Model factors as well as others that were identified in this research. Thus, this researcher also has the perspective that focused interviews and qualitative analysis afford the best opportunity to discover and make sense of how and why institutions make the choices that they do with regards to instructional technology.

This study does not follow one specific theory of how or why instructional technology innovation and use takes place. Surry’s (2002) RIPPLES Model is being used as a framework for structuring the interviews because of its breadth, but it is not being tested as a theory.

Study Setting

This study was conducted at seven small, liberal arts colleges and universities in the United States.[1] Why liberal arts institutions? Much of the literature on college students and student learning finds little evidence of differences between liberal arts institutions and other larger higher education institutions, especially in areas related to

---

[1] The selected institutions will fit the Carnegie Foundation’s “Baccalaureate Colleges-Arts & Sciences” and “Baccalaureate Colleges-Diverse Fields” classifications ("Carnegie foundation for the advancement of teaching: Classification description", 2010).

how students learn (Pascarella & Terenzini, 2005, pp. 170-171) . However, there is a relationship between size of institution and several meaningful educational outcomes, such as social engagement and educational attainment. Chickering and Reisser (1993) stressed that "empirical studies do demonstrate relationships between size and (1) institutional ethos and sense of community, (2) student involvement and participation, (3) faculty concern for students, and (4) persistence and retention" (p. 305). Pascarella and Terenzini (2005) also found in their review of empirical research on how college affects students from the 1990s that increased institutional size had a negative effect on social engagement and educational attainment (2005, pp. 386-387), citing Stoeker and Pascarella (1991). These differences in educational attainment can be seen in a 2008 National Science Foundation study that showed that, as a percentage of graduates, liberal arts institutions produced doctoral recipients at rates nearly identical to public, research-intensive institutions. In fact, five of the top ten baccalaureate-origin institutions of doctoral recipients were private, baccalaureate institutions when institutions were ranked by percentage of graduates who received doctorates between 1997 and 2006 ("Baccalaureate Origins of S&E Doctorate Recipients", 2008). These unique educational outcomes displayed by small, liberal arts institutions despite their small share of overall postsecondary enrollment – 5.4 percent of total student enrollments with an average student enrollment of 1,697 in 2010 ("Carnegie Foundation for the Advancement of Teaching: Summary Tables: Basic Classification", 2011) – indicate that a study of instructional technology among small, liberal arts institutions is appropriate.

As mentioned previously, private institutions that only grant bachelor's degrees, which is the institutional type inhabited primarily by liberal arts institutions, are the only type of institution to utilize open source LMS (53 percent of participating institutions) more than commercial LMS (33 percent of participating institutions) (Grajek & Arroway, 2012, p. 31). Liberal arts institutions are also increasingly characterizing their technology endeavors, and their effects on student learning and experiences, as unique from larger institutions. NITLE (National Institute for Technology and Liberal Education) ("NITLE - Advancing liberal education in the digital age", 2009) and Collaborative Liberal Arts Moodle Project (CLAMP) ("Collaborative Liberal Arts Moodle Project", 2009) are two voluntary organizations based on the proposition that liberal arts institutions face unique challenges in their structuring and use of information technology that larger institutions do not. NITLE is a voluntary consortium of small, liberal arts colleges and universities primarily within the United States, though there are some institutions from Canada and Europe in the consortium. NITLE's small staff offers networking, collaboration, and professional development opportunities for information technology professionals and faculty members at member institutions. CLAMP is a more recently chartered consortium of 40 American liberal arts colleges and universities that seek to improve and customize the Moodle LMS.

The purported differences between information technology use at liberal arts institutions and larger institutions, and these focused endeavors catering to information technology use at liberal arts institutions, underscore that a study focused on instructional technology within liberal arts institutions is a largely unexplored area for research.

Institutional Nominations

The institutions examined in this study were selected using the peer-nomination technique and criterion sampling. The peer-nomination technique was used to have instructional technology professionals nominate a limited number of small liberal arts colleges or universities that are creating or implementing the most innovative or effective instructional technology. The peer-nomination technique was selected because it has been found that the technique can provide high predictive validity when community members are asked to nominate the best (or worst) instances of a phenomenon (Schwarzwald, Koslowsky, & Mager-Bibi, 1999). For this study, after the nominations were made, the most commonly cited institutions were contacted in order to ascertain (using criterion sampling) whether each institution develops instructional technology in-house, purchases instructional technology, or utilizes open source or free web-based (Patton, 2002, p. 243) in order to address the first research question.

Participant selection began by sending e-mails to e-mail listservs that focus on liberal arts institutions or instructional technology. EDUCAUSE has two listservs that were targeted: SMALLCOL (820 subscribers as of March 22, 2010) and INSTTECH (1087 subscribers as of March 22, 2010) ("List Archives at LISTSERV.EDUCAUSE.EDU", 2010). NITLE offers two listservs that will be targeted: Instructional Technology and Information Services Leadership ("Join a Community", 2010). Lastly, MiNiT ("MiNiT", 2009), a community of Instructional Technologists in

Minnesota, was also targeted. The rationale for finding potential subject institutions through these particular listservs was that these listservs frequently-used collaboration spaces for directors of instructional technology and instructional technology staff members at many liberal arts institutions in the United States. These individuals have in-depth knowledge about which institutions in the U.S. are innovating instructional technology, which ones are using open source and free instructional technology, and which ones are purchasing it.

The e-mails to these listservs consisted of a series of questions asking respondents to nominate up to two small liberal arts institutions in the United States that are effectively utilizing custom built, purchased, open source, or free instructional technology resources (see Appendix A). The e-mails included a GoogleDocs Form so that nominations could be submitted online and immediately deposited into a spreadsheet, which aided frequency analysis for later selection.

Five institutional variables were used to aid in the choosing of the final 7 institutions that constituted the study sample: 2009 enrollment ("U.S. News and World Report: Education: Colleges", 2011), full-time faculty (as listed on the institution's website), 2010-2011 tuition ("U.S. News and World Report: Education: Colleges", 2011), fall 2009 acceptance rate ("U.S. News and World Report: Education: Colleges", 2011), and average SAT score (as listed on the institution's website). The goal of utilizing these particular variables was to end up with six to eight comparable liberal arts institutions. Enrollment and full-time faculty allowed similarly-sized institutions to be selected. Lastly, tuition, acceptance rate, and average SAT allowed institutions of approximately similar selectivity and accessibility to be selected.

Data Collection

Data collection began with e-mails on November 17, 2010 to the previously cited listservs, followed by a second e-mail on January 12, 2011. Sixteen institutions were nominated by 15 individual respondents. Each respondent was required to nominate at least one institution. Of the 15 respondents, only two nominated a second institution. The researcher's institution was not among the 16 nominated institutions. Ten of the respondents were willing to be interviewed about the activities at their institution, and five respondents declined to be interviewed because they were nominating other institutions or because they were recommending other colleagues at their own institution.

Data for four of the five institutional variables used to refine the nominations into the final sample (i.e., enrollment, full-time faculty, tuition, and acceptance rate) were collected added to the institutional data profiles. Average SAT score was dropped as a variable because several of the nominated institutions did not require the SAT as part of their admission process. Data for the full-time faculty variable was occasionally difficult to locate. In instances where the institution's website did not note the number of full-time faculty data, The Common Application website, an online college information and application site utilized by most liberal arts institutions in the United States, was consulted ("The Common Application", 2011).

Selecting Institutions from the Nominations

The 16 nominated institutions were randomly assigned the letters A through P for identification purposes during the study. Ten of the 16 institutions (Institutions A, B, C, D, F, H, K, N, O, and P) were nominated by members of the IT or instructional technology staff at the nominated institution. Institutions A, B, F, H, K, N, and O were nominated once by a member of their respective staff. Institutions C and D were both nominated by two individuals: a member of the IT and instructional technology staff, respectively, and individuals outside of the institutions. The remaining six institutions (Institutions E, G, I, J, L, and M) were nominated by external individuals.

Two institutions were eliminated from consideration as one (Institution P) is a dedicated college of art, while the other (Institution O) is a religious seminary. The specific academic focus and small enrollments of these two institutions made them incomparable to the other institutions in the overall sample. The academic foci, in particular, could have an effect on the kind of instructional technologies that these institutions are utilizing in their curriculum, making these technologies and the processes that led to their selection or development unique in comparison to the other nominated institutions.

A third institution (Institution N) was eliminated because of its enrollment and academic focus. This institution is a public university with three colleges (a College of Arts and Sciences, a College of Business, and a College of Education) offering bachelor's and master's degree programs on two campuses, including programs for part-time students in non-traditional college student populations (working adults older than 18-24 years old). It is classified as "Master's L" in the Carnegie Classification of institutions of higher education, indicating that the institution grants at least 50 Master's degrees and fewer than 20 doctorates per academic year ("Carnegie foundation for the advancement of teaching: Classification description", 2010). As with the two other eliminated institutions, this institution fell outside the scope of the study, which was to examine instructional technology innovation activities at institutions that define themselves as a residential liberal arts college or university. These institutions are categorized as Baccalaureate Colleges-Arts & Sciences in the Carnegie Classification system for awarding bachelor's degrees to 10 percent or more of their graduates each year, while awarding fewer than 50 master's degrees or 20 doctoral degrees ("Carnegie foundation for the advancement of teaching: Classification description", 2010).

Lastly, Institution M could not be considered for the sample because it was nominated by a former visiting faculty member for the ways in which a faculty member used a commercial software product available at the institution as an instructional technology tool. In effect, the nomination was based on the individual faculty member's use of instructional technology in teaching, not on the broader processes through which the institution selected and implemented instructional technology. This study is focused on organizational decision-making, not individual decision-making, regarding instructional technology. Therefore, this particular institution was not included in the sample.

The remaining 12 institutions all met the criteria of a small, residential liberal arts institution. Their enrollments ranged from 1,525 to 2,837 (see Figure 3 below). The number of full-time faculty ranged from 106 to 266 (see Figure 4 below). Published tuition rates for 2010-2011 ranged from $31,489 to $53,300 (see Figure 5 below). Fall 2009 acceptance rates were between 16 and 79 percent (see Figure 6 below).

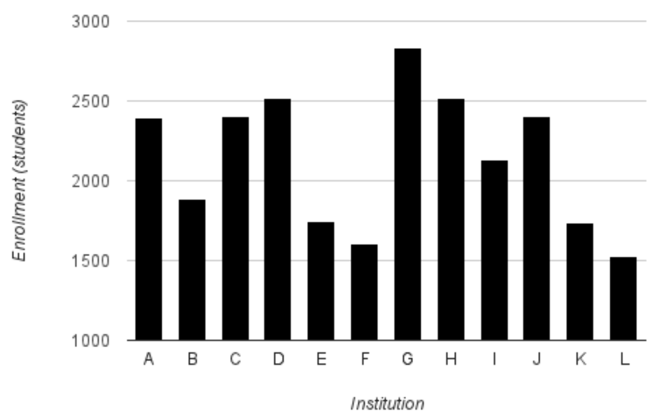

Figure 3. Fall 2009 enrollment at qualifying nominated institutions.

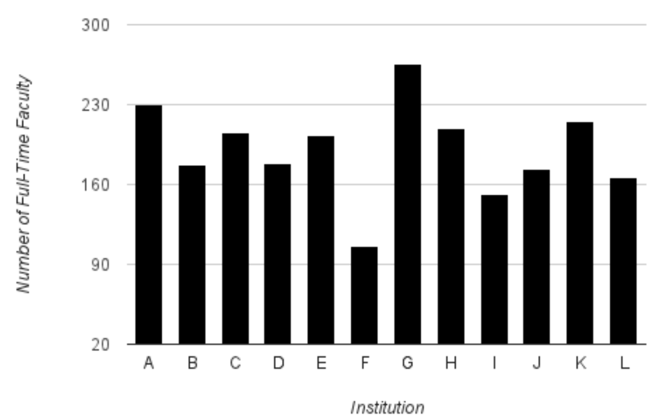

Figure 4. Number of full-time faculty at qualifying nominated institutions.

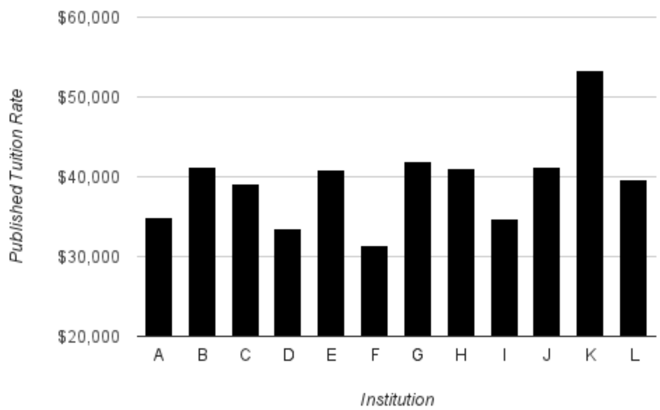

Figure 5. Fall 2009 published tuition rate at qualifying nominated institutions.

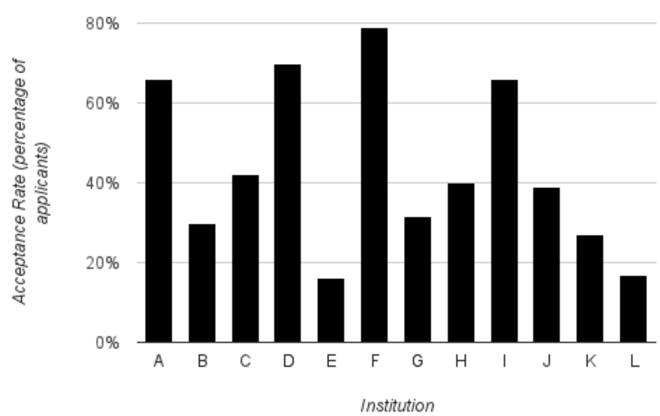

Figure 6. Fall 2009 acceptance rate at qualifying nominated institutions

These twelve institutions were a mix of institutions that, according to their nominators, were exemplars of the four instructional technology strategies portrayed in this study: home-grown instructional technology, open source instructional technology, freely available web-based instructional technology, and commercial instructional technology. As the results in Table 1 suggest, 6 of the institutions (A, B, D, G, H, and I) were nominated for exemplifying one quality. Four (A, D, H, and I) were nominated for their customization and use of open source instructional technology tools. Institution B was nominated for its use of commercial instructional technology tools. The remaining 6 institutions (C, E, F, J, K, and L) were nominated for multiple instructional technology strategies. Four were nominated for exemplifying two strategies: Institution F for open source and commercial instructional technologies, Institution J for home-grown and commercial instructional technologies, Institution K for open source and free web-based instructional technologies, and Institution E for home-grown and open source instructional technologies. Institution C was nominated for three instructional technology strategies (home-grown, open source, and free web-based instructional technologies). Lastly, only Institution L was nominated for its implementation and use of all four types of instructional technologies.

Table 1

Qualifying Nominated Institutions

Institutional Identifier	Instructional Technology Types at Institution Cited in Nomination	Selected	Selection/rejection reason	2009 Enrollment	Full-time faculty	2010-2011 Listed Tuition	Fall 2009 Acceptance Rate
A	Open Source	Yes	Use of open source tools	2,396	230	$34,905	66%
B	Commercial	Yes	Use of commercial tools	1,882	177	$41,280	30%
C	Home-Grown Open Source Free web-based	Yes	Use of home-grown tools Use of free web-based tools	2,406	206	$39,115	42%
D	Open Source	Yes	Use of open source tools	2,519	178	$33,480	70%
E*	Home-Grown Open Source	Yes	Use of home-grown tools	1,744	203	$40,862	16%
F	Commercial Open Source	Yes	Use of commercial tools	1,602	106	$31,489	79%
G*	Home-Grown	Yes	Use of home-grown tools	2,837	266	$41,870	32%
H	Open Source	Yes (selected for piloting the interview protocol)	Use of open source tools	2,516	209	$41,070	40%
I*	Open Source	No	Instructional technology type already represented	2,132	152	$34,810	66%
J*	Commercial Open Source	No	Instructional technology type already represented	2,401	173	$41,155	39%
K	Open Source Free web-based	Yes (selected but instructional technology staff were unable to participate in study)	Use of free web-based tools	1,738	215	$53,300	27%
L*	Home-Grown Open Source Commercial Free web-based	No	Instructional technology type already represented	1,525	166	$39,600	17%

* Nominated by individual not affiliated with the institution

The selection of institutions for the sample required a balancing of needing to represent the four types of instructional technology implementation strategies while also balancing the institutional variables that were added to the nominations (enrollment, full-time faculty, tuition, and acceptance rate). The two primary institutions selected for their use of home-grown instructional technology tools differed primarily in their selectivity. Institution E accepted 16% of applicants in the Fall of 2009, while Institution G accepted 32% of applicants in the Fall of 2009. Institution C, which accepted 42% of applicants in Fall 2009, was also selected for its use of home-grown instructional technology tools because only a few institutions were nominated as exemplars of this type of instructional technology.

Having ten institutions that were nominated for their use of open source instructional technology tools made selecting two institutions simple. Institutions A and D were selected and were very comparable across all of the institutional variables used. The two remaining instructional technology strategies – commercial instructional technology and free web-based instructional technology – were not nominated as frequently as home-grown and open source instructional technology. For free web-based instructional technology, Institution K was selected along with Institution C, which was also selected for its use of home-grown instructional technology. Institutions B and F were included in the sample for their use of commercial instructional technology.

Interview Protocol

The interview protocol consisted of an open-ended interview protocol, available in Appendix B, to capture the experiences and perceptions of instructional technology staff who were selected for the study sample. This protocol was developed because it allows for transparency of the questions being asked by those who read the study findings, variations between interviews are minimized, interviews are more focused, and comparative analysis of interview findings is easier (Patton, 2002, p. 346). The initial questions in the interview captured basic demographic information about the participants: gender, role at institution, years at institution, and years working within the field of instructional technology. This initial section will also explore the organizational structure of the instructional technology staff at the institution.

Next, Surry's (Surry, 2002; Surry et al., 2005; Surry, Jackson, Porter, & Ensminger, 2005) RIPPLES model was utilized to explore organizational, human, financial, and technology factors that affect processes in the development of instructional technology at the institution. Surry and Jasinski (2006) conducted a survey of innovative instructional technology practices in Australia in 2006 that was based on Surry's RIPPLES model. Professor Surry has made this survey available to me and has encouraged me to adapt it to my own research. The interview protocol has been modified for this study with Dr. Surry's approval (see Appendix C). The variables and factors captured in the interview protocol are explained in detail in Appendix D.

Lastly, in addition to the RIPPLES variables that were adapted from Surry and

Jasinski (2006) and Jasinski (2007), the final three sections explored the presence and impact of additional variables outside of the institution, such as broader information technology trends, broader instructional technology trends, and broader higher education marketplace trends.

Piloting and Improving the Interview Protocol

Institution H, which was nominated solely for its use of open source instructional technology, was examined first in order to test and improve the interview protocol. Institution H was selected because there were several institutions nominated solely for their use of open source instructional technology, whereas there were not as many exemplars of the other types of instructional technology. Also, Institution H represented a good approximation of the other institutions in its enrollment, number of full-time faculty, tuition, and acceptance rate.

The director of instructional technology at Institution H was interviewed using a preliminary draft of the interview protocol in order to gauge the effectiveness of the protocol structure and to also seek feedback from the participant. The primary finding during the pilot interview with the participant was that the interview protocol was focusing too heavily on exploring the reasons that institutions decided to create home-grown instructional technology tools. To correct this, the language of the protocol was broadened to more evenly explore the reasons that institutions utilize open source, free web-based, and commercial instructional technologies.

Institutional Review Board Process and Research Subjects

The standard Institutional Review Board (IRB) approval process was undertaken to gain approval for this study (see Appendix F).

The goal of this study was to learn more about how institutions are deciding to create home-grown instructional technology tools, select open source and free web-based instructional technology tools, and select commercial instructional technology tools. Therefore, the study focused on interviewing instructional technology directors and staff members at the identified subject institutions. Originally, additional stakeholders recommended by the interviewees were also going to be interviewed and surveyed. These additional stakeholders could have been faculty members, information technology managers or staff members outside of the instructional technology field, or other staff members. However, it was decided that this "any and all" approach would add considerable complexity to the analysis phase because it allowed research subjects to recommend individuals with varying roles and responsibilities that may not be directly related to instructional technology decision-making. That had the potential to make comparison among the participant institutions difficult, if not impossible. Therefore, instructional technology directors and staff members were selected as the sole research subject population for interviews.

Initially, the study was also going to include a survey of students at each of the selected institutions in order to ascertain whether the instructional technology tools at the institution are perceived by the students as having any effect on learning. However, as the interviews took shape, the focus repeatedly situated upon the processes through which instructional technologies were built, purchased, or selected. That is not to say that the effect of instructional technology on learning is not important. It is important and it is a factor in the implementation of instructional technology at these institutions. However, it was not critical to this study to ascertain the effect of instructional technology (or perceived effect) among students. This study was focused on learning more about the context and process through which instructional technology tools arrive at liberal arts institutions. With that in mind, students were not surveyed for this study. If anything, this study should help inform how to better ascertain the effect of instructional technology at liberal arts institutions because it will better understand how and why particular forms of instructional technology arrive at those institutions.

Once the institutional sample was chosen, the individuals at each institution who were included in the institutional nomination were contacted individually by e-mail or phone to determine their willingness to take part in the study. Individuals at all institutions were willing to take part in the study except for Institution K, leaving seven institutions in the sample. These individuals were also asked to recommend one other instructional technology staff member at their institution as a candidate for the study. These additional participants agreed to participate in the study, except for the recommended individual at Institution D. The result was a final participant group of 13 individuals representing seven different institutions, excluding the pilot participant at Institution H.

As outlined in Table 2 below, thirteen participants – five women and eight men – from seven nominated institutions were interviewed between April and July of 2011. The participants were divided between six directors of instructional technology, who manage teams of instructional technology staff, and six instructional technology staff members, who implement instructional technology tools or provide direct support to faculty, staff, and students. The one exception was at Institution C, where the chief information officer and director of instructional technology were interviewed, and at Institution D, where an instructional technology staff member was the only participant.

Table 2

Participant Demographics

Participant Identifier	Institutional Identifier	Gender	Instructional Technology Role	Years at Institution	Years in Field of Instructional Technology
1	A	Female	Director	4	12
2	A	Male	Staff Member	2	7
3	B	Female	Director	15	17
4	B	Female	Staff Member	12	17
5	C	Male	Chief Information Officer	11	11
6	C	Female	Director	7	11
7	D	Male	Staff Member	5	5
8	E	Male	Director	6	16
9	E	Male	Staff Member	4	8
10	F	Female	Director	10	10
11	F	Male	Staff Member	15	36
12	G	Male	Director	14	16
13	G	Male	Staff Member	18	6

Interview Process

All of the interview participants were instructional technology staff members at institutions in states other than the state in which the researcher was located. Phone interviews were selected as the interview medium rather than in-person interviews or an open-ended text survey tool administered via paper or on the Internet. In-person interviews were not feasible given the expense of traveling the large distances between the researcher's location and the location of each institution in the study sample. Of the four types of qualitative data collection types described by Creswell (2003), in-person and telephone interviews were cited as equivalent forms of interview methods with the same advantages (they are useful when direct observation is not possible, participants can provide historical information, and they allow the research to have control over the line of questioning) and limitations (the information is filtered through the interviewees views, the interviews are not done in the natural field setting, researcher bias may be present, and not all participants are equally articulate) (p. 186).

Free and inexpensive technologies were utilized to make the interview process more productive and nearly eliminate the cost of interviewing participants. Google Voice ("Google Voice", 2011) is a tool that allows users to make hands-free phone calls through their computer. This allowed the researcher to type notes while conversing with participants. An added benefit was that Google Voice calls to domestic phone numbers were free in 2011, so there were long distance phone call fees to make the phone calls.

Audio Hijack ("Audio Hijack", 2011) is an inexpensive software tool that captures the ingoing and outgoing audio on a computer. With this tool, the researcher was able to record the Google Voice phone calls directly to the MP3 audio file format. These MP3 audio files were then transcribed to Microsoft Word files to aid analysis of the interviews.

Each participant was asked to set aside one hour to complete the interview. However, some interviews took 90 minutes to two hours because the conversations were particularly rich and the participants were very candid.

At the beginning of each interview, each participant was read the Consent Information Sheet (Appendix E). For out-of-state interviewees, a request for a phone- or web video conference-based interview was made. Audio recordings of these interviews were recorded for later transcription.

Anonymity of the participants was maintained by exclusion of their names and institutions, and by the use of identifying numbers (Participant 1, Participant 2, etc.) in quotations and transcripts.

Data Analysis

Creswell's (2003) three-step data analysis process was utilized to analyze the interview data. First, the data were prepared for analysis through transcription of the interviews in their entirety and the collection of any notes taken during the interviews (p. 191). Next, each transcribed interview was read in order to gain an overall sense of all of the interviews (p. 191). Finally, the third step is to code the data into discreet portions and then find meaning later (p. 192). To accomplish this third step, each interviewee was assigned a record in a spreadsheet. In this record, interview data were coded by matching important incidents that the interviewee cites in their description of instructional technology decision-making to the categories of the RIPPLES Model and to the extra-institutional variables mentioned in Appendix D. The frequency with which each variable was mentioned was noted in the spreadsheet to aid in the reduction of the data to a more manageable format.

During the data coding process, Glaser and Strauss's (1967) Grounded Theory - "the discovery of theory from data" (Glaser & Strauss, 1967, p. 1) - was utilized concurrently to generate other categories that the data revealed as relevant to instructional technology selection in the liberal arts context but not found within the RIPPLES Model or the other extra-institutional variables mentioned in Appendix D. Furthermore, had the RIPPLES Model proven to be an inadequate conceptual framework for analyzing instructional technology selection in liberal arts institutions, Glaser and Strauss's four-stage method for analyzing data and generating theory would have been utilized instead in order to induce a useful theory of how instructional technology innovation and selection takes place. Their four stage data analysis method is:

1. Comparing incidents within the data and generating categories.
2. Integrating categories and their properties.
3. Delimiting the theory.

4. Writing the theory.

(Glaser & Strauss, 1967, p. 105)

To categorize each participant's responses, the entire interview protocol was mapped into a spreadsheet. Each row of the spreadsheet contained all of the responses for a particular participant. Each column contained a participant's responses to each of the corresponding RIPPLES sections. Each RIPPLES Model section component also had two additional columns next to it: a column for condensing the participant's responses to a particular dimension component, and a column for listing categories of responses for that dimension component. This structure of organizing each participant's responses in a spreadsheet format facilitated the discovery of categories of responses and the analysis process by allowing the researcher to vertically browse and compare participant responses within the same section of the interview protocol.

Validating Findings

According to Creswell (2003), validating findings is "seen as a strength of qualitative research" (p. 195). Of the several methods Creswell listed as means for validating findings, peer debriefing is the most logical for this study. Peer debriefing involves having a peer review the final study, raise questions that other researchers might raise about the study, and offer validation of the findings (p. 196).

A peer of the researcher who works in the field of instructional technology at a liberal arts institution volunteered to validate the study in a conversational format with the researcher using Brown's eight Standards for Judging Interpretive Research (1989, pp. 279-283). These eight standards and the validator's comments are as follows:

1. "The text selected to interpret is important in that it is relevant to the practice of life today" (Brown, 1989, p. 279). The validator commented that "it is…clear that [the] interviews were relevant and significant to the topic and the questions you were asking."
2. "The question the research addresses concerns how we are to interpret the meanings (intentions, conceptual orientations, and values) in a particular text within cultural tradition given the historical situation of the text" (Brown, 1989, p. 280).

   The validator remarked that in this second standard, "Brown…is addressing situations when a researcher is trying to interpret a situation that may be very different than the one that the researcher comes from, either culturally or linguistically. [The standard] is asking where you were located as a researcher in terms of being an insider to the experience, the language, the vernacular, and the systems [of the participants]." The validator wanted to make sure that the study clearly stated that the researcher was not directly involved in any of the participating institutions but involved in the field of instructional technology. The Data Collection section of Chapter 3 does state that the researcher's institution was not among the 16 nominated institutions. However, evidence of the researcher's background in instructional technology was not present. As a result, this information was added to an additional appendix (Appendix G).

3. "The meaning expressed by the author of the text is respected in the interpretation" (Brown, 1989, p. 280). The validator remarked that the third standard seeks to establish that

> [researchers are] not overwhelming the interpretation [of interview data] with [their] own meaning system, but…are trying to interpret what [the participants] are saying as much from [the participants'] perspective as possible. I certainly interpreted that, myself,…that you weren't superimposing your own value system and meaning system on top of what [the participants] were saying. You were trying, as much as possible, to look at what the data was telling you within the conceptual framework of the RIPPLES Model."

4. "The research reflects that interpretation has been made by interrelating the parts and the whole of the text" (Brown, 1989, p. 280). The validator affirmed that the dissertation was "not trying to draw big conclusions based on a tiny bit of data." The researcher pointed out that there were instances when a single participant mentioned a concept or phenomenon during an interview. That concept or phenomenon was noted in the findings, not as evidence of a larger trend, but simply as interesting, unique phenomenon. The validator did not deem this choice by the researcher as a problem, noting that "I recall [the researcher] being

very upfront about that," referring to the researcher's explicit explanation at the beginning of Chapter 4: Results of why single instances of a concept or phenomenon were discussed.

5. "The research reflects a search for an interpretation that is reasonable" (Brown, 1989, p. 281). The validator stated that "[the researcher] worked the interpretations within the systemic nature of the RIPPLES Model. That kept some boundaries around how possible it even was to be arbitrary."
6. "The research shows the researcher's familiarity with the topics which are the subject matter of the text and with cultural traditions and the historical-social context which shaped meaning in the text" (Brown, 1989, p. 282). The validator stated that this standard was amply established in the second standard.
7. "The researcher seeks to establish the validity of the piece of research through the informal logic of validation, i.e., argumentation" (Brown, 1989, p. 282). The validator was satisfied that this standard was met by the researcher providing the data from each section of the interview protocol, and then using the participants' words and perspectives as the components of the narrative describing the findings.
8. "The interpretation makes clear the meaning of the text (within cultural tradition) important for the conduct of life" (Brown, 1989, p. 283). The validator remarked that "any good piece of research is significant in that it contributes in some important way to knowledge in the profession and to the human needs and aspirations of people whom the profession seeks to serve". The validator went

on, saying that "[the researcher was] upfront about [the study] being a first stab at an area that has not had a lot of research, the scope of the findings, that it was intended to lay a groundwork [for future research], and took every opportunity to articulate that and reinforce it as [the research] went on."

Chapter 4: Results

Chapter 4: Results contains each section of the interview protocol and the overview of results within each of these sections.[2] The respective barriers and enablers related to each section, where applicable, are also discussed in each section. The Results sections are as follows:

- **Participants: Pathways to Instructional Technology Position**
- **Instructional Technology Delivery and Support Model**
- **Resources**
- **Infrastructure**
- **People**
- **Policies**
- **Learning**
- **Evaluation**
- **Support**
- **Information Technology Developments**
- **Instructional Technology Developments**
- **Higher Education Marketplace Developments**

[2] It should be noted that there are instances in this Results chapter where a reference to a topic or phenomenon cited by a single participant is discussed. A topic or phenomenon only referred to once by a participant is not necessarily evidence of a widespread trend, but the researcher found these single citations by participants to be worth mentioning because other instructional technology directors and staff members, as well as other researchers, may relate to or gain insight from reading about them.

Participants: Pathways to Instructional Technology Position

Two questions explored the participants' career paths to instructional technology and to their current institutions.

Overview of Results

Nine participants began working in the field of instructional technology at other institutions before arriving at their current institutions (Participants 1, 2, 3, 4, 6, 8, 9, 11, and 12). Four participants entered the field of instructional technology when they began working at or were already working at their respective institution (Participants 5, 7, 10, and 13). Four of the six instructional technology directors (Participants 1, 3, 8, 12) had doctoral degrees in traditional academic disciplines. The remaining two (6 and 10) had master's degrees. Four of the six instructional technology staff members (Participants 2, 4, 9, and 13) had master's degrees, some in traditional disciplines while others were in applied fields. Nine participants began working in the field of instructional technology at other institutions before arriving at their current institutions, while four participants entered the field of instructional technology when they began working at the institution. Participants 5 at Institution C and 10 at Institution F were exceptions, as they both began working in the field of instructional technology when they began working at their respective institutions. Participant 5 both started at Institution C and in the field of instructional technology in 2001 and became the chief information officer for the institution. Participant 10 started working in instructional technology support at Institution F in 2002 and assumed the director of instructional technology role in 2007.

Four (out of the six) instructional technology directors had their Ph.D. degrees in Russian language and literature (Participant 1 at Institution A), computer science (Participant 3 at Institution B), second language acquisition (Participant 8 at Institution E), and geophysics (Participant 12 at Institution G). Participants 1 and 12 were non-tenure track faculty members in their respective disciplines before transitioning to instructional technology positions. Participant 1 (Institution A) had initial experiences with instructional technology while teaching Russian language and literature in the mid- to late-1990s. "I started getting into technology and using it and working in some joint projects using video," the participants stated (Participant 1, Institution A). Beginning in 2000, Participant 1 was in three different roles at other small, liberal arts institutions before coming to Institution A to become the director of instructional technology. The participant supported the use of instructional technology as well as taught writing composition and Russian in these roles.

Participant 3 did not spend any time in faculty roles after completing a doctoral degree in Information Retrieval and Human Factors, a particular area of research in computer science "which is ironically extremely useful in my line of work", in 1994 (Participant 3, Institution B). Instead, Participant 3 spent two years between 1995 and 1997 creating workshops for researchers using a supercomputer facility before joining the instructional technology staff as an associate director at Institution B.

After completing an interdisciplinary doctorate in PhD in second language acquisition (combining aspects of second language acquisition, cognitive psychology, and educational technology) in 2000, Participant 8 was a senior lecturer in the Department of Linguistics and Applied Language Studies at a large public university until 2006. During that time, Participant 8 was also an assistant director for a center for language acquisition at that institution.

Before coming to Institution G in 1999, Participant 12 was teaching geology courses at a different liberal arts institution. Seeing the potential for instructional technology at a small institution, "I wrote a grant to the Culpepper Foundation … to start an instructional technology program at [the previous institution], and that got funded and basically gave me a position" (Participant 12, Institution G). He transitioned to Institution G in 1999 when the participant's partner, also a geologist, took a tenure-track faculty position there. Again, Participant 12 wrote a grant to a different philanthropic foundation to secure seed funding for an instructional technology program. During this time, Participant 12 was teaching some geology courses and doing research (Participant 12 at Institution G).

Neither Participant 1, 8, nor 12 spoke about why they stopped pursuing faculty positions in their doctoral fields. The teaching positions they occupied – writing fellowships and visiting assistant professor roles – suggest that they were unable to secure tenure-track faculty positions. Furthermore, they both were finding traction in instructional technology roles during their visiting faculty roles.

The two remaining instructional technology directors had master's degrees in applied fields. Participant 6 at Institution C had a Master's degree in journalism, which led to teaching multimedia and web design at a different institution. As other faculty members became aware of the participant's abilities with these technologies, Participant 6 was supporting colleagues' use of technology more and more. "I actually would get more excited supporting them and helping them with projects more than I was with grading my work from my students," and the participant came to the realization that they excelled at supporting the academic use of technology (Participant 6 at Institution C).

Participant 10 at Institution F, the final instructional technology director in the group of participants, had been at the institution since 2002. The participant started as an instructional technology staff member and recently completed a Master's of Education in Media and Design Technology.

Among the six instructional technology staff members, four had a master's degree. These master's degrees vary between those that were focused on applied knowledge that is directly relevant to the field of instructional technology – Instructional Systems Technology (Participant 2 at Institution A), English and Digital Media (Participant 9 at Institution E) – and those that were focused on disciplinary knowledge, such as Biology (Participant 4 at Institution B) and Computer Science (Participant 13 at Institution G). Participant 7 at Institution D had a Bachelor's degree and was a web developer in the retail industry for many years before joining the institution's instructional technology staff in 2007, so this participant was a relative newcomer to the field of instructional technology in a postsecondary setting. Lastly, Participant 11 at Institution F trained and served as an educational technologist in the Air Force for approximately twenty years before joining the staff at the institution as an instructional technologist in 1994.

Instructional Technology Delivery and Support Model

Four questions in the interview protocol explored the following aspects of instructional technology delivery and support at their institution: the staffing models utilized to provide instructional technology delivery and support at each institution, and the type or types of instructional technology that the institution tends to utilize (commercial, home-grown, open source, or free web-based). Responses to this set of questions address the first research question:

> What are the differences in instructional technology organizational structure at liberal arts institutions that develop home-grown instructional technology tools, institutions that purchase instructional technology tools, and institutions that utilize open source and free web-based instructional technology tools?

Overview of Results

There were two instructional technology organization models among the participating institutions: the expertise model and the liaison model. Four institutions (Institutions B, C, E, and F) utilize the expertise model, while the remaining three (Institutions A, D, and G) utilize the liaison model. Five of the seven participating institutions had five or more instructional technology staff members (excluding the director) (Institutions A, B, C, E, and G). The remaining two institutions (Institutions D and F) had two instructional technology staff members, with Institution D not having a director of instructional technology. At three institutions (Institutions A, C, and D), the IT and Library divisions were one organizational entity. As a result, instructional technology staff members at these three institutions were housed in the Library. At one institution (Institution B), the instructional technology staff members were housed in the Library but the IT unit was not part of the Library organizational structure. At the remaining three institutions (Institution E, F, and G), the instructional technology staff were housed centrally in an IT building. Open source and free web-based instructional technology tools were the most-preferred among the participating institutions, as evidenced by their use among six of the seven institutions (Institution A, C, D, E, F, and G).

Commentaries about Staffing Models.

Two staffing models were cited by participants from the study institutions: the expertise model and the liaison model. The expertise model focuses on each instructional technologist having a primary technological expertise that they make available to all faculty members at the institution. This expertise may be in video production, website or multimedia programming, Geographical Information Systems (GIS) production, or any number of technological tools that are frequently utilized in postsecondary teaching and research. Four of the study institutions (Institutions B, C, E, and F) were currently using the expertise model. Participant 6 (Institution C) described their approach to the expertise model in this way:

> We tend to specialize on a technology and then it doesn't matter what discipline has need for that – we would support them. So I may actually have two instructional technologists working with one faculty member for one class if … they're working on an [online] survey as well as Final Cut Pro [video editing software]. So instead of it being just one instructional technologist who needs to be a specialist in both of those technologies we would just tap the technologist who has that specialty. (Participant 6, Institution C)

As Participant 6 described it, the expertise model is a way to efficiently utilize the small number of instructional technology staff members, even though the needs of a class can occasionally require the support of more than one instructional technology staff member, as described above. Participant 6 also acknowledged that the expertise boundaries between the instructional technology staff members were not rigid and the sharing of knowledge was required in order to keep the number of instructional technology staff members on a project low. "[W]e do have a lot of overlap [and] a lot of cross training [between instructional technology staff members], so a lot of times it's not necessary to put … 2 different people [on one project], but we will if it warrants it," the participant stated (Participant 6, Institution C).

In general, the expertise model is a means to balance, as Participant 5 described it, an institution's need for a small core of information and instructional technology tools, and the need for specialized tools that departments or specific faculty members may want for their teaching or research:

> We … see a core platform of technology that is … institutional, that we learn, that we maintain, [and] that we encourage faculty to use and … work with…. [T]hen there's … [other technology] that's in the orbit of that core…. So what we find is that rather than trying to have a core with such gravitational pull that [everyone only uses it]…, [w]e try to find a way to keep these other things in orbit so there's some relationship between the core we provide and the sort of services that are available outside and that we can allow the flexibility for faculty and students and staff … to … dip their toes into the orbit where it's relevant and then have a set of policies and guidelines and support around when to do that and when not to do that. That's … been our attempted approach anyway. (Participant 5, Institution C)

The core technologies are the basic information technology and instructional technology tools utilized by the institution, such as Moodle, Microsoft Office, or Google Apps for Education, that everyone, by and large, is expected to use. Different use cases will arise for specific tools, such as GIS software, Internet or multimedia production, or data analysis software, for example, and the expertise in these areas among the instructional technology staff allow them to accommodate faculty members in any department that may want to utilize them. The expertise of each instructional technology staff member in their particular technology area gives them the ability to adapt to the changing tools and methods in that area.

The three remaining institutions (Institutions A, D, and G) utilized the liaison model. In the liaison model, each instructional technologist is usually charged with supporting the faculty members within certain disciplinary spheres, or within a particular grouping of departments that may not have a disciplinary similarity, rather than supporting particular types of instructional technology. At Institution A, the liaison model was utilized because "we try to enable the customers [(i.e., faculty members)] to learn how to do that themselves. We don't expect them to become programmers or developers, but we do have a kind of unwritten line in the sand, if you will, but that's the approach we take. We're all really generalists" (Participant 2, Institution A). Institution G, however, assigned its instructional technology staff members by disciplinary sphere – humanities departments, the social sciences departments, and the natural sciences and mathematics. The main reason for utilizing the liaison model at Institution G is because "we see a shift from supporting hardware and applications to supporting people, because the former are getting a little bit easier to deal with. [S]o…[we are] putting our people where they'll do the most good…, out of the hardware/software support and into the hands-on application support" (Participant 12, Institution G). The third institution (Institution D) had two instructional technology staff member serving all of the departments on campus.

The study participants indicated that each of these instructional technology staffing models dictate additional consequences for interactions between instructional technologists and faculty members. In fact, Participant 8 at Institution E stated that the liaison model had been utilized at Institution E until 2006, at which time the instructional technology group was shifted to the expertise model:

> Often the weakness of the liaison model is liaisons know a little bit about everything and not very much of anything. So you tend to have the [liaisons] … doing a lot of desk top support for faculty as opposed to more specialized support with using more specialized software and technologies for teaching and research. (Participant 8, Institution E)

The above participant maintained that broad technological expertise was not feasible. Instead, each instructional technologist had a cursory command of video production, web and multimedia programming, data mapping, and other necessary technology domains. This, in turn, led to "thin engagement" with faculty. Without deep technological expertise, the instructional technologists were not able to get beyond doing basic computer support for faculty to deeper interaction related to the creation and use of specialized tools for teaching and research.

Size and Location of Instructional Technology Staff.

Five of the seven participating institutions had five or more instructional technology staff members reporting to the director, which are described in Table 3. Institution A had seven instructional technology staff members, while Institutions B and C had five. Institutional E had 12 instructional technology staff members, the most among the participating institutions. Institution G was a close second with 11 instructional technology staff members reporting to the director. The remaining two institutions – Institutions D and F – had 2 instructional technology staff members. Institution F had a director of instructional technology above the two instructional technology staff members, while Institution D did not have a clear instructional technology group nor a corresponding director of instructional technology. Participant 7 (Institution D) reported to a director of software development, while the other instructional technology staff member (an Instructional Technology Librarian) reported to a head of research and instructional librarians.

All of the instructional technology staff members at the study institutions were located in one physical location, as is indicated in Table 3. This model of staffing instructional technologists was referred to by the study participants as "centrally housed", meaning the instructional technology staff had offices in the same building, frequently on the same floor in adjacent rooms or in one large office with cubicles separating them. At three institutions (Institutions A, C, and D), this central housing of instructional technology was in the institution's Library, as the IT and Library staff at these institutions were merged under one organizational unit. The instructional technology staff members at Institution B were housed in the Library but were not part of the Library organizational structure. The instructional technology staff members at the remaining three institutions (Institutions E, F, and G) were part of the IT organizational structure and were centrally housed in IT buildings.

Centrally housing instructional technology staff created challenges, making it "harder to maintain that intimate connection with what's going on in the different departments. It's something we're working to correct now. We're trying to find something that's in between" (Participant 8, Institution E). Different approaches were utilized to overcome this. At Institution B, the instructional technology staff "accommodate that … by pairing with the reference librarians who are liaisons to those [departments]" (Participant 4, Institution B). The reference librarians had inroads with faculty, and they provide knowledge of discipline-specific methods. At Institution C, Participant 6 stated that they overcame the challenge of central housing through two ways. The first was leveraging interactions with faculty, wherever they may take place, into personal relationships. "I go to the gym in the morning, and I [may] see … 4 faculty members and so they know me by name … from the gym, so they'll stop and ask me some questions which will then lead to some larger project" (Participant 6, Institution C). The other way the instructional technology staff created interaction with faculty members was through the institution's recently created center for scholarship and teaching. "[Instructional technology staff members] have been leading [instructional technology] sessions for faculty and also workshops at the Center. The directory of the center does try to filter [faculty] to us, and they have also posted some information on their website to … prompt people to think about [instructional technology use] and send them to us" (Participant 6, Institution C).

Preferred Types of Instructional Technology.

As the results in Table 3 indicate, six institutions (Institutions A, C, D, E, F, and G) were using open source and free web-based tools as the foundation of their instructional technology tools, in these cases in the form of the Moodle open source Learning Management System (“Moodle.org: Open-source community-based tools for learning”, 2009) and the free web-based Google Apps for Education (“Google Apps for Education”, 2011). For these institutions, the fact that these tools did not cost money to “purchase” (though they can have costs in the form of human resources to implement and maintain them) and did not require extensive programming by staff was very appealing. Participant 12, the instructional technology director from Institution G, summed their perspective on why these two platforms were preferred:

> Our overall philosophy is historically like a lot of places. [The institution] prides itself on doing more with less… So that means we necessarily take the track of trying to outsource as much as we can, [we] try to streamline as much as we can, [we] try to identify off the shelf products as much as we can and try to develop as little as we can because we just don’t have the programming staff to sustain any homegrown stuff. (Participant 12, Institution G)

Participant 1, the director of instructional technology at Institution A, echoed these sentiments and also portrayed how tools like GoogleApps for Education (“Google Apps for Education,” 2011) are freely available but also are an improvement over fee-based tools that require more training and knowledge on the part of users:

> [W]e’re at a real point of change on campus. It used to be [that] Dreamweaver [was required] to develop a website – you needed to know something about design. There was kind of a learning curve to the software itself. Now you can

> do Google Sites and put a site together in no time and it's point and click and it's easy to use. So along with the fact that we're being more aware of the limited funds that we have and how we use them, it's all kind of coming together that we're now on Google Apps too because [no longer need to] spend money. We don't need to do that to help support teaching and learning. We don't need money any more to be innovative. I hate to say that. (Participant 1, Institution A)

These perspectives affirm that the ability to reduce or eliminate the cost of critical instructional technology applications did not necessarily have a negative impact on the quality of tools available to faculty and students.

Furthermore, the ability to shed ownership and maintenance of instructional technology tools allows instructional technologists to focus more on supporting the pedagogy of faculty members. Participant 12 at Institution G offers explained this in saying that

> Sannier [(2008)] stated [that] email [hosted and maintained by institutions] has no kind of inherent value to the institution, so just get a tool that makes it work and then put your people to work on providing more direct and deeper support. That's what we're trying to do also. We see a shift from supporting hardware and applications to supporting people because the former are getting a little bit easier to deal with [as tools like Google Apps for Education are implemented] and so, again, in terms of putting our people where they'll do the most good, we're trying

> to get them out of the hardware/software support and into the hands-on application support. (Participant 12, Institution G)

As Participant 12 suggests, the free open source and web-based tools are allowing instructional technologists to better serve the teaching needs of faculty members and, thus, the mission of their institutions, all without increasing costs to the institution.

Unlike Institution G, Institution B had tended to use commercial instructional technology products rather than open source. Participant 3, the director of instructional technology at Institution B, provided critical insight as to why they avoided open source tools and avoided developing home-grown instructional technology tools outright for faculty members. In the past, staff members at Institution B developed Internet portal tools for the campus community. As Participant 3 described, the success of these tools, built by the web design group, prevents the web design group from supporting academic programs:

> [The web design group is] so busy with the programs they've written and updating them and getting requests for yet more programs because the one's they've written have been so successful. They're so busy with that stuff that they cannot support any academic uses of the web.… So they're sort of an object lesson in why not to [build home-grown tools] because you get so caught up in maintenance sometimes [that] it takes so much of their time that they can't make any significant progress on new projects. So we don't want to go there.

> [Therefore], we have been very careful to get [commercial] products where there is good vendor support. (Participant 3, Institution B)

In short, Participant 3 stated that if staff members were always engaged in the process of building and maintaining instructional technology tools and projects, “you can’t develop new frontiers” (Participant 3, Institution B).

Only one institution (Institution E) self-identified as preferring to build home-grown instructional technology tools. In their organization, the primary faculty interaction was between the faculty member and the director of instructional technology (Participant 8). Thus, the director of instructional technology was the person who, in a manner of speaking, “found business” for the instructional technology staff and often was an intermediary between faculty members and the instructional technologists. In fact, Participant 9, an instructional technology staff member from Institution E, remarked

> We, as a development team, … try to stay fairly well insulated from the [faculty] population we serve. But that’s by design so that when bugs arise in the software we’re not directly contacted by faculty. Because otherwise we’d have [individual] faculty hogging all our time. We’d rather have it triaged through [Participant 8, the director of instructional technology at Institution E]. (Participant 9, Institution E)

Interestingly, Participant 8 was the individual who argued that the liaison model fostered thin engagement between faculty members and instructional technologists while the expertise model fostered better interaction and led to more successful project outcomes.

From Participant 9's remarks, though, the interaction between instructional technologists and faculty was intentionally infrequent so as to allow the former to focus on application development. Participant 9 also indicated there was another instructional technology staff member who also helped manage faculty interactions. This other individual "deals mostly with the faculty. He's been here a really long time and understands their needs [and] how to handle things, let's say" (Participant 9, Institution E). These insights suggest that that there were cultural tensions between faculty and instructional technologists at some institutions that were expressed in the types of interactions instructional technology directors and instructional technology staff members had with faculty members.

The commentary about preferred instructional technology tools by the participants addresses the third research question: Of the different instructional technology models utilized at the participating institutions, do certain models tend to be associated with particular types of instructional technology tools? For this sample of institutions, the instructional technology model – expertise or liaison – did not appear to influence the type of instructional technology tools that were preferred. Six of the participating institutions (Institutions A, B, C, D, F, and G) preferred types of instructional technology tools – open source, commercial, and free web-based – that required little or no customization in order to be utilized. They were evenly divided between those institutions that utilized the expertise model (Institutions B, C, and F) and institutions that utilized the liaison model (Institutions A, D, and G). Institution E preferred to create home-grown instructional technology tools, and that institution utilized the expertise model. Therefore, the RIPPLES model dimensions in explored in subsequent sections of Chapter 4: Results more thoroughly address why the participating institutions had their particular instructional technology tool preferences.

Table 3

Instructional Technology Staffing at Participating Institutions

Institutional Identifier	Staffing Model	Number of Staff[a]	Instructional Technology Staff Location	Preferred Type of Instructional Technology[c]
A	Liaison	7	In Library (merged IT/Library)	Open source and free web-based
B	Expertise	5	In Library (separate IT and Library)	Commercial
C	Expertise	5	In Library (merged IT/Library)	Open source and free web-based
D	Liaison	2[b]	In Library (merged IT/Library)	Open source and free web-based
E	Expertise	12	In IT Building (separate IT and Library)	Home-grown (using open source platforms)
F	Expertise	2	In IT Building (separate IT and Library)	Open source and commercial
G	Liaison	11	In IT Building (separate IT and Library)	Open source and free web-based[d]

[a] Each institution had one instructional technology director unless noted otherwise.

[b] There was no director of instructional technology in the organizational structure of Institution D.

[c] The preferred types of instructional technology tools at the institutions were consistent with the types of instructional technology tools cited in the nomination unless noted otherwise.

[d] Institution G was nominated for its use of home-grown instructional technology tools by an external individual, but the participants at the institution stated that the institution prefered open source and free web-based tools.

Resources

Four questions about Resources made up the first section of the interview protocol that focused on the seven dimensions of the RIPPLES Model, provided an opportunity to talk with the participants about financial factors at their institutions that influence instructional technology. These questions explored the availability of financial resources for instructional technology procurement and implementation, the ways in which financial resources were used in instructional technology at participants' institutions, and the ways in which the financial climate at the institutions were a barrier or enabler to instructional technology. These responses, along with the responses to the remaining RIPPLES model dimensions and the three extra-organizational factors, address the second research question:

> What is the relationship between the four types of instructional technology tools, organizational factors (e.g., the RIPPLES model dimensions), and extra-organizational factors (e.g., instructional technology developments, information technology developments, and higher education marketplace developments)?

Overview of Results

Four participants (Participants 4, 5, 7, and 13) stated that there were few to no limitations on resources for acquiring software or hardware, but some stated that resource limitations become evident when the possibility of adding instructional technology staff was raised. Two participants (Participants 1 and 2) stated that the economic downturn from 2007 to 2009 had a negative impact on financial resources available for instructional technology. Two participants (Participants 8 and 9) stated that a core aspect of the profession of instructional technology is a drive to innovate and create new tools. Two participants (Participants 3 and 10) stated that expending resources for commercial tools and services on occasion can be preferable to using existing staff to create them in-house because doing the latter takes those staff members away from the central activities of their roles.

Resources for Tools, But Not Personnel.

Participant 4 at Institution B said that "my experience has been whenever we needed something if we could justify its use and there was not an existing resource already here that we weren't aware of, we were able to purchase or explore it or get a pilot going of it before we made a decision to outright purchase" (Participant 4, Institution B). Participant 7 at Institution D echoed that, stating flatly that "we've had a fairly easy time getting resources allocated. From a budgetary standpoint we've had very few constraints in that regard" (Participant 7, Institution D). Lastly, Participant 13 at Institution credited the prioritization of technology by the new president, saying "we've been very fortunate that even through the economic downturn the university has been forward thinking and looking to the future instead of the current…. Not every resource we want [is approved] but [instructional technology] has always been a little special in the sense that it tends to get a little bit more of what it wants" (Participant 13, Institution G).

Other participants portrayed a subtle resource landscape that was more complex than having enough or not enough resources. Participant 5, the chief information officer at Institution C, stated that there had never been a problem acquiring software or hardware for instructional technology. “From a financial resources perspective we generally get what we need to deliver the level of service that people want from instructional technology. From a human resource perspective, we’re very under resourced” (Participant 5, Institution C). In other words, there were resource barriers when efforts were made to add a new instructional technology staff. That, the participant said, posed a real challenge because there was a growing tension between the expectations of the senior administration that faculty would use technology in their teaching and scholarship and the reality that faculty needed staff support in order to do that:

> The [Google Apps for Education] model really isn’t getting us anything because we’re not having trouble with resources in a way that cloud services would mitigate. Our trouble is the people side. So going to [Google Apps for Education] still doesn’t help us add an instructional technologist…, unless we were able to outsource enough tools that I could let go of someone in systems and we hire them as an instructional technologist. (Participant 5, Institution C)

The current instructional technology staff had increasingly limited time to support the emerging needs of faculty. In the long run, “the college can’t change the culture [and increase] the demand [for staff support] without resourcing it properly” (Participant 5, Institution C). Participant 3, the instructional technology manager at Institution B, echoed this by stating that firm financial barriers did not appear until a project or initiative hinted at expanding instructional technology personnel:

> [The CIO] likes to say you can do anything you want to do but you can't do everything you want to do. Financially that's true but more importantly, from my perspective, personnel wise that's true. So we want to be careful not to try to embark on a program that we are not going to be able to support from a human perspective. And when I look at the cost benefit analysis of any project I start on the human side. I don't worry about the dollar side until I know the human side will work. So in a lot of ways the financial resources are not a barrier unless you include your abilities to get more personnel.… That is the one financial restriction that is pretty much solid. We cannot get more staff right now. (Participant 3, Institution B)

Participant 13, an instructional technology staff member at Institution G, stated that getting more software or tools was not a challenge, but "if we had more [resources] we've always been waiting for more people. It's a barrier but it's not like we have nothing" (Participant 13, Institution G).

It is difficult to discern any common elements between these four institutions that might explain the shared finding that getting resources for technology is not a problem. As described in Table 3, Institutions B and C both utilized the expertise model for their five instructional technology staff, but Institution B had its IT and Libraries in separate organizational units and relied on commercial instructional technology tools; Institution C had a combined IT and Library organization and preferred open source and free web-based instructional technology tools. Institution D utilized the liaison model for its two instructional technology staff members, it preferred open source and free web-based instructional technology tools, and the IT and Library were one organizational unit. Lastly, Institution G utilized the liaison model for its 11 instructional technology staff, it preferred open source and free web-based instructional technology tools, and its IT staff and Library were in separate organizational units.

The Effects of Recession.

Two of the study participants stated that the economic downturn from 2007 to 2009 had an impact on the financial resources available for instructional technology at their institution. That the recession took place recently – the study interviews were conducted during the summer of 2011 – allowed the participants to reflect upon the resource priorities of the institution with regards to instructional technology. A range of responses regarding the impact of the recession emerged. Both participants from Institution A stated that ample financial resources were available prior to the recession for funding an instructional technology tool if it had strong potential to positively impact learning:

> When I came on board in 2007, I felt like we had resources. If we wanted to try something we could probably find … funds somewhere to do it provided it had a lot of potential. So I … feel like … we started to have to, like everybody else,

> tighten things up a bit [after the recession] and it started to become much more of a factor in what we could provide. But I still think there [are ample resources] if we … could make a case for something being really, really useful. (Participant 2, Institution A)

The Importance of Innovation to the Profession of Instructional Technology.

Institution E also offered a different perspective on resources. The instructional technology group at Institution E had been deliberately moving away from purchasing software and tools to developing them in-house using open source technologies. In fact, the reason that Institution E was selected for the study sample was because the institution was nominated for its in-house instructional technology development. Saving money that would have been spent on commercial instructional technology tools was not the sole reason that the instructional technology staff moved to in-house development using open source methods, according to Participant 8. Financial savings were merely a side benefit. More importantly, Participant 8 said, instructional technology groups at liberal arts institutions "have a mission to be part of the innovation that drives what we do on campus." This participant views the drive to innovate as an important activity for instructional technology professionals, because otherwise, "you're saying is what we can do is restrained by what other people have thought of and created [in commercial products]" (Participant 8, Institution E). Participant 9, an instructional technologist at Institution E, echoed this in remarking that "one of the reasons why we prefer to go with open source is we can then customize and configure it as we see fit … without having to wait for [feature requests] to be performed by [the] software company" (Participant 9, Institution E). Furthermore, Participant 9 says that:

> [I]t's great that the proprietary software costs money because that makes the case for dropping it. [For example,] … we're moving to Moodle from Blackboard … in some sense because of the licensing fees associated with Blackboard…, but [that is] like icing on the cake for moving off of it. (Participant 9, Institution E)

In short, the cost of commercial tools conveniently facilitates the transition to these more customizable open source tools that the instructional technology staff members would rather work with anyway because open source fits their professional preferences to innovate.

Why Commercial Can be Preferable.

Institution E's perspective that part of the charge to liberal arts instructional technologists was to innovate was quite unique among the responses, even among other institutions that utilize open source tools. At Institution F, Participant 10 stated that they would rather pay for existing tools and help in customizing them:

> It's far more efficient for us to take advantage of stuff that's already been developed, even if we pay $30 or $50 [per hour] for … [a contractor] developer's time, which is often the case with the open source stuff. You may buy some plug-ins and things that cost some money but it's not very much and it's well worth it." (Participant 10, Institution F)

Expecting the existing instructional technology staff to customize instructional technology tools would pull them away from the main focus of their role, which was to facilitate the use of instructional technology in teaching and learning for faculty and students.

Participant 3, the instructional technology manager at Institution B, expressed a similar position:

> (Participant 3): [The CIO] spent a lot of time honing the instructional [technology] team to the point where they could really focus on pedagogy and instructional use of technology.
>
> (Researcher): So, if you're buried in the process of building and maintaining tools.
>
> (Participant 3): You can't develop new frontiers.
>
> (Researcher): And you can't be as focused on supporting pedagogy because you can't escape the technical maintenance and the development process.
>
> (Participant 3): Exactly. (Participant 3, Institution B)

The same reasons for avoiding the development of instructional technology at Institution F were cited by Participant 3 at Institution B: in-house development of instructional technology reduces the ability to instructional technology staff members from working directly with faculty and students on pedagogical challenges. One key difference between Participants 3 and 10 was that Participant 3 suggests a fundamental opposition to in-house development. Later in their interview, Participant 10 stated that "[i]f we had more staff we would do more in-house development," the participant said, "but the attitude here is to work leaner and smarter and sometimes smarter means we have to give up on some of those development things we'd like to do" (Participant 10, Institution F). Participant 10's comments suggest that the instructional technology staff at Institution F do not place a heavy emphasis on being able to innovate, unlike at Institution E.

These four participants at Institutions B, E, and F were describing positions for and against developing instructional technology that were not outlined anywhere in the higher education technology literature. Participants 8 and 9 described a professional focus on instructional technology innovation at Institution E that was not described by any other participants. There is no way to account for this difference of professional focus. The main difference between Institutions B, E, and F was that Institution E had the lowest acceptance rate (19%) for students who began in the fall of 2009, while Institution B accepted 30% of applicants and Institution F accepted 79% (See Figure 5).

Barriers Related to Resources

Three categories of responses related to Resources emerged as barriers to instructional technology at the participating institutions. Six participants stated that subtle resource barriers exist (Participants 1, 2, 6, 9, 10, and 13). Four participants stated that adding additional personnel was a regular resource barrier (Participants 3, 5, 10, 13). Two participants stated in this portion of the interview that a lack of faculty incentives for instructional technology innovation was a resource barrier at their institutions (Participants 6 and 8).

Five participants stated that while there were no overt resource barriers at their institutions, subtle barriers did exist. Participants 1 and 2 (Institution A) both reiterated that the recession of 2007-2009 had changed the financial climate, but not overtly so. Participant 1 was pleased, stating that the budget for instructional technology had been reduced slightly, but the situation could have been more severe as other peer institutions in the region had experienced. Participant 2 echoed that there was a clear tightening of budgets that a tool or resource could be acquired "if we found the right answer could make a case for something being really, really useful."

At Institution C, Participant 6 stated a similar resource climate constraint had emerged. The instructional technology group at that institution became aware of budget pressures but do not feel constrained by them. As part of an effort to be conscientious stewards of resources, they were very cost conscious in order to and made decisions accordingly. "When I say I'm not denied anything it's probably because I don't ask for the moon," the participant stated. "We make very conscious decisions about things. And if we can use a free tool, we will."

Participant 10 (Institution F) described that the administrators of their IT group offers resources for innovation and experimentation with instructional technology, but with limits. "They're not going to let us go out and spend $50,000 on an experiment, but they may let us spend $5,000 on an experiment," the participant said (Participant 10, Institution F). Participant 13 (Institution G) similarly stated that the institution "always [has] enough [resources] to be at least forward moving. We don't always have enough to do everything we want to do" (Participant 13, Institution G). The priority was given to instructional technology tools "that are out [already in existence out] there [and] work for us," the participant stated (Participant 13, Institution G). The institution had learned from experiences when web applications were built in-house. A web portal for faculty and students was developed by the institution in "the early 2000s when other [institutions] were building portals and…it was…doomed to failure and I see that as an example" of why in-house development of tools was not prudent (Participant 13, Institution G). Participant 13 will now do some small customization of Moodle, but

> I don't think I would be doing much of it if [Institution G] were not part of a consortium [(CLAMP)] working with Moodle and had some support that way. [So,] I'll branch out on my own and customize but for the most part we tend to take things that exist…. So we typically have used a lot of commercial products or free open source or cloud services to do what we want. (Participant 13, Institution G)

Lastly, Participant 9 (Institution E) described the institution as being in the position of having ample resources for instructional technology, which created a barrier situation, according to the participant. Institution E had switched Learning Management Systems three times in the last five years. "It's terrible for the [faculty] users to switch between these different learning management systems. We end up with a lot of push back…," the participant stated (Participant 9, Institution E). This frequent change in technology also did not allow the instructional technology group to engage in new and interesting projects for faculty because “it’s like the same project comes up over and over again” as their time was used for implementing and fine-tuning LMS before, during, and after transitions. While Participant 9 did not offer reasons for three LMS transitions in five years, it appears that part of the move was due to diminishing support for Blackboard by its vendor and the increasing cost for the product, according to Faculty Computing Committee meeting minutes that were openly available on the Internet. Furthermore, Institution E’s membership in a consortium with several other liberal arts institutions in the region played a role. The other institutions in the consortium had already or were soon to adopt Moodle, and given that the consortium offers students at any member institution access to all classes, it would not be unreasonable to speculate that having all consortium members switch to the Moodle LMS would make the sharing of academic resources between classes at the member institutions easier. The transition to Moodle was made with the recommendation of the Faculty Computing Committee at Institution E.[3]

Other participants cited very specific, unsubtle resource barriers to instructional technology innovation and implementation. Four participants stated that their institutions were encountering barriers to adding additional personnel. At Institution B, Participant 3 described how there were few resources barriers until a project hints that additional personnel will be needed. “I don’t worry about the dollar side [of a project] until I know

[3] The citation for this website has not been included in the bibliography because doing so would undermine the anonymity of the institution and the two participants from it.

the human side will work [with existing personnel]," the participant said. "So in a lot of ways the financial resources are not a barrier unless you include your abilities to get more personnel. We can't do that. That is the one financial restriction that is pretty much solid. We cannot get more staff right now" (Participant 3, Institution B).

At Institution C, Participant 5 described a similar constraint, but cast this barrier as a much wider challenge than for other participants. "We have a time honored tradition on campus," he said, "of throwing money at problems but not people. So I would say from a financial resources perspective we generally get [the tools] we need to deliver the level of service that people want from instructional technology. From a human resource perspective we're very under resourced." As a result, "the cloud model [of instructional technology] really isn't getting us anything because we're not having trouble with resources in the way that cloud services would mitigate." Furthermore, the institution began to change its priorities in 2011 in terms of tenure performance review, administrative performance, and evaluations. "The institution is now saying 'not only would we like [faculty] to use technology, but we expect it.' So now for me to say that we need more people to support the institution's change and culture is an easier thing." Ultimately, the participant said, "the college can't change the culture [and increase] that demand of its people without resourcing it properly [with more instructional technology staff]" (Participant 5, Institution C).

For Participant 10 (Institution F), a lack of financial resources was a continuous challenge in all areas, but particularly on personnel expansion. The inability to add personnel limits the institution's ability to develop instructional technology resources in-house that were a better fit for their environment. As stated above, "[i]f we had more staff we would do more in-house development," the participant said, "but the attitude here is to work leaner and smarter and sometimes smarter means we have to give up on some of those development things we'd like to do" (Participant 10, Institution F). Similarly, Participant 13 (Institution G) stated that the institution had "always been waiting for more people" (Participant 13, Institution G).

Two participants stated in this portion of the interview that a lack of faculty incentives for technology innovation was a barrier at their institutions. At Institution C, Participant 6 expressed that faculty do not get the kinds of incentives (course release or grants) to learn how to include technology in their teaching. "I do think we might go further if we could incentivize [faculty experimentation with instructional technology]," the participant stated (Participant 6, Institution C). At Institution E, Participant 8 went so far so to say that faculty members were punished for any failures in teaching innovation:

> [I]f they try something new [in their teaching] and it fails because it's new and they're figuring out how it works and the students are being asked to do something different than they've done before, they get punished for that. So I think the barrier to innovation is the lack of incentives for faculty to innovate. It has nothing to do with the technology. (Participant 8, Institution E)

Enablers Related to Resources

Three categories of responses related to Resources emerged as enablers to instructional technology at the participating institutions. Two participants described their resource environment as an outright enabler of instructional technology innovation and implementation (Participants 7 and 11). Two participants described overall changes in IT as creating enablers for instructional technology at their institutions (Participants 1 and 6). Barriers were also described as enablers by three participants (Participants 1, 2, and 4).

Participant 7 (Institution D) stated that "[w]e've had a fairly easy time getting resources allocated. Our CIO … has an open door with the president and has good support in the initiatives to implement open source as well as other instructional technologies. There are very few budgetary constraints" (Participant 7, Institution D). Participant 11 stated that Institution F's commitment to earmarking some of its IT budget for instructional technology testing and development was an enabler that other institutions do not enjoy.

Two participants described overall changes in IT as creating enablers for instructional technology at their institutions. At Institution A, Participant 1 candidly described how shifting to Google Apps for Education positively shifted the focus of the instructional technology staff:

> [Google Apps for Education] tools are easier [to use] but their use is more complex, so in that way we need to help faculty think through [how they are

> used]. We're becoming more creative and problem solving in a way … [whereas] problem solving used to be solving a glitch with software. (Participant 1, Institution A)

By getting beyond fixing software glitches, the instructional technologists were getting to the heart of what technology can do in a classroom. Participant 6 (Institution C) similarly described how the standardization of computers that faculty use creates a broad, well-supported platform for the instructional technologists, "so I don't have to worry that a faculty [member] doesn't have Photoshop on their computer because I know they do. It's built into the user services budget and it's taken care of" (Participant 6, Institution C).

Barriers were also described as enablers. At Institution A, Participants 1 and 2 described the leaner budget environment as an enabler. Participant 1 had the perspective that resource scarcity made the organization much more deliberate and prompted them to switch to Google Apps for Education, which had, as stated above, the positive effect of shifting their instructional technology support approach from developing and supporting large projects specific to a single faculty member to leveraging the Google Apps for Education tools for many faculty. It created an opening for dialogue with all faculty members, as it was "a great time to talk to faculty and see how we might design [their] courses in a way that's much better. It ended up being a blessing in that regard," according to Participant 1 (Participant 1, Institution A). Participant 2 was pleased that the lean resource climate spurred the institution to transition to the Moodle LMS, which, as a free open source tool, had many advantages over the commercial LMS the institution had been utilizing.[4] Participant 4 stated that Institution B also gives funding priority to instructional technology tools that can be utilized by the community. That was a barrier in that "ITS is only going to allocate resources to what will be campus-wide resources. That said, any sort of grant funding that comes in we will support to the best of our abilities to whichever ways are necessary, and I think ITS has been very creative about figuring out" how to support those projects (Participant 4, Institution B). In short, this resource barrier put instructional technology staff members in a position to collaborate very closely with faculty members on securing and utilizing grants for projects that did not impact the entire campus community.

As cited above, an important resource distinction that the participants made was between resources for software, instructional technology tools, or even for a programmer's time compared to resources for hiring additional instructional technology staff. The former were more easily attainable. No participant described a resource environment in which adding personnel was easily achieved, and each described it as a barrier. In response, six of the participating institutions (A, B, C, D, F, G) shifted away from building instructional technology to purchasing commercial products or utilizing largely maintenance-free tools such as Google Apps for Education, because doing so creates more opportunity for meaningful pedagogical interaction between instructional technologists and faculty as the need to develop and maintain instructional technology

---

[4] The Moodle LMS is free in that there is no cost to acquire the software, nor is there a licensing fee to operate it (2009). There are costs associated with running Moodle, such as the cost of a server to host the tool, but those are costs that an institution would likely bear anyway if it was hosting a commercial LMS product such as Blackboard (2009).

tools is reduced. Given the trend towards using commercial and open source tools among most of the participating institutions, Institutions E's deliberate shift to custom in-house development of instructional technology tools is all the more unique.

Infrastructure

The second set of interview questions about Infrastructure focused on the technological backbone that supports instructional technology at each of the selected institutions. The goal was to explore how the communication system, the data network, and the hardware and software environment affected instructional technology innovation and implementation. The questions also encouraged participants to comment on the relationships between the instructional technology staff and the over-arching network or IT staff who manage the overall technological infrastructure at each institution as a factor in how instructional technology.

Overview of Results

Twelve participants characterized the infrastructure at their institution as good or excellent (Participants 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12). One participant characterized the infrastructure at their institution negatively (13).

Commentaries on Strong Infrastructure.

Twelve participants stated that the infrastructure at their institution was good or excellent for both its technological stability and the strong relationship between the instructional technology staff members and the network staff members. Technologically, these eleven participants had consistently high praise for the state of the infrastructure. "The infrastructure is very solid and we have some good servers, and [the infrastructure staff are] moving to virtual machines[5] for those servers, so if they crash they are really easy to recover," according to one participant (Participant 3, Institution B). Participant 8 (Institution E), also stated that all of their servers on campus have been changed to take advantage of server virtualization capabilities. That participant's colleague stated that "[o]ur infrastructure's focus is standardization and reliability, but there's flexibility whenever some sort of change needs to happen" (Participant 4, Institution B). Participant 5 (Institution C) provided an in-depth description of the evolution of the campus network infrastructure at Institution C from a low point to its current, and stronger, state:

> [In] 2004, the campus wide infrastructure…was highly decentralized and mostly broken. So in that environment, it was really hard to get technology adoption because it was unreliable and unusable. We spent the first couple of years working on core infrastructure to mitigate that…. We culminated in 2007 when we completely redid the network infrastructure…. [W]e redesigned the entire network from the ground up: we renumbered everything we put all new routers and switches, we bought all standard equipment and…a really nice modern network infrastructure on which anything, that we thought, could come to us in

[5] A virtual machine or virtual server is the term used to describe an instance of a server environment running on a single physical computer alongside other instances of server environments as opposed to each server instance being run on a single, dedicated computer. Server virtualization has become a popular method for expanding network resources for an organization while also reducing the need to for purchasing additional server equipment and the paying for the corresponding power and space requirements needed to run and control the climate for those additional computers.

> the next few years would run. And so that platform…enabled some of the success in instructional technology because the network reliability is what it needs to be in order for people to do the kinds of things they want to do. (Participant 5, Institution C)

Participant 11 (Institution F) also described a transition period from a disorganized and ineffective infrastructure to a stronger infrastructure that more effectively serves the campus community:

> [W]hen I first got here the three sections of our IT division were pretty widely separated. The systems and networking [staff] were in one building, administration and help desk [staff] were in a different building, and instructional technology was over in the library. And when you're disassociated like that, there's all kinds of problems that could be solved that don't get solved. I would suggest that probably four years after I got here, this is about 2001, we moved into a new administration building as a combined IT group. At that point our ability to improve infrastructure and make decisions that were beneficial to all three groups was improved considerably. And I would say that for example the system and networking folks have been working over time to build a wireless infrastructure around campus which ties in to student use considerably. And in improving the backbone network structure around campus making it more reliable. They've also worked over time getting the exposure to viruses and things

> like that wrapped up to where we haven't had any major cases of virus intrusion in quite some time now. (Participant 11, Institution F)

In the case of Institution F, the reorganization of the three branches of the IT staff in one building facilitated the improvement of the technology infrastructure.

Three to four years ago at Institution G, the IT staff members were also moved to one building, and the move coincided with technology infrastructure upgrades. During the move, "[we] moved all of IT into a renovated library building on campus, and as part of that we basically added a couple wings onto the library…. [A] whole new server room [was] put in the basement and [now] we have gigabit Internet all over campus" (Participant 12, Institution G).

Criticism of Infrastructure.

Participant 13 (Institution G) characterized the infrastructure at the institution negatively for technological reasons connected to personnel. "[I]n terms of overall resources, we tend to be pretty lucky in terms of [the resources] we get," the participant said (Participant 13, Institution G). The problems arose when the instructional technology staff members wanted to experiment with new tools on institutional servers:

> As the network people have improved their management, they've reduced their services, if you will. It's been harder to get them to do [allocate server space for experimentation], because in the past they said, 'Oh yeah, we'll try that.' Now it's more, 'We'll try it when we can support it.' So it's…very frustrating for us…. [Recently] we tried to get a server [space for an] application, and I couldn't get

> even a test bed until I got the free time of two network people because they had to have somebody who could support the test bed and somebody to back [that person] up. So, we…gold plate our server support sometimes, and that makes it hard to do things. We're now looking at, and working with, outsourcing and hosting [test servers on commercial Internet service providers] to test something. I can do it for $20 a month [or less]. I can have a server out there and test things. I can't do everything I want [on those external servers], but we kind of get around it when we need to. (Participant 13, Institution G)

This participant was the only one of the thirteen to extensively criticize the infrastructure environment, although Participant 6 (Institution C) did state that "the level of security that [the network staff] deem necessary…[can be frustrating when scenarios arise]…like adjunct faculty who don't have network credentials three days before classes start and yet they need to get onto Moodle" (Participant 6, Institution C). However, that statement was made in a larger context of praise for an infrastructure that had "really fast [Internet] speed…, we have a really good team of people running our network,… and [faculty, staff, and students have] confidence in the network" (Participant 6, Institution C).

Barriers Related to Infrastructure

Two participants characterized their institutions' inability to procure high bandwidth Internet connections as infrastructure barriers (Participants 7 and 13). One participant stated that the institution's rural location creates support challenges when classroom instructional technology equipment needs servicing (Participant 10). One participant stated that personnel turnover in the infrastructure group creates a continuity challenge that affects instructional technology implementation as well as the relationship of IT with the entire campus (11).

Participant 7 (Institution D) specifically described the impact of the low bandwidth on instructional technology capabilities "the biggest barrier to instructional technology at [the institution]. [Because] we're not on the [interstate highway] corridor,…we need to beg, borrow and steal for bandwidth. And have worked hard to get to 140 megabits, whereas other schools can…lay back and sit on a gigabit of data. It's difficult to get a lot of external bandwidth here…. That's a pretty big barrier" (Participant 7, Institution D). Because of the low bandwidth, the use of video conferencing to connect to students studying off campus and taking courses off campus was a significant barrier. Otherwise, "from an [instructional technology] application development standpoint, we've pretty much been able to dictate what operating system we want to be on and what versions of applications we need to have supporting our instructional technology program. We really don't have any barriers" (Participant 7, Institution D).

Participant 13 (Institution G) faces the same bandwidth inadequacy barrier as Institution D, "especially now that we're…[in] the cloud with our mail off campus [and using more bandwidth]" (Participant 13, Institution G). That barrier was fading, as "we're getting some fiber into the [region] that will hopefully change things dramatically" (Participant 13, Institution G). These barriers were challenging, but "we're not as bad as some [institutions in the region]. Where I used to work,… it's [bad] so I know the difference between haves and have nots. [I]t's restrictive but it's not totally confining" (Participant 13, Institution G).

For Institution F, the rural location creates support challenges when classroom instructional technology equipment needs servicing, according to Participant 10. "[Institution F is in] a little bitty town…. The closest decent size town [with a classroom technology vendor] is fifteen to twenty minutes away by highway. [That vendor] is a one man shop and often not available to respond as quickly as we need…," the participant described (Participant 10, Institution F). To alleviate this barrier, the instructional technology team is opting to self-install and service their classroom technology. "[W]e're hoping that by setting up the model for the self installation,… we can service our own equipment faster and keep classrooms up and running longer and fix them when we need to much more quickly…" (Participant 10, Institution F). The obvious advantage of this model is that "if I can make the money go twice as far, I can…get twice as many [classrooms] done as I could if I paid someone to do it" (Participant 10, Institution F).

Lastly, the last infrastructure barrier cited was personnel turnover. Participant 11 stated that Institution F had as a strong infrastructure group, but "[w]e're struggling to keep that [strong infrastructure because]...as people come and go from organizations, the balances here [among the IT staff groups]…get shifted. We're in the midst of some of that now and we're struggling to keep it intact" (Participant 11, Institution F).

Enablers Related to Infrastructure

One participant stated that the strong state of the technology infrastructure gives users on campus confidence to trust that the network was stable (Participant 6). One participant stated that the infrastructure group and the instructional technology group had a very good working relationship (Participant 9). One participant stated how virtualization of core servers by the infrastructure group allowed the instructional technology group to offer dedicated server space to departments (Participant 12).

Most participants, as noted above, had overall praise for their campus technology infrastructure and the staff members who operate it. However, three participants cited specific ways in which the technological infrastructure and organizational infrastructure were enablers. Participant 6 (Institution C) described how the strong state of the technology infrastructure gives users on campus confidence to trust that the network was stable and reliable:

> When I came here, there were people who [said], '[D]on't ever put anything on the network drive because you never know if it's going to be up or down. If I'm going to use a smart classroom, I need to burn this to a CD or put it on a jump drive and walk it over because the network may or may not work when I get there.' And that's completely different now. People don't even think about the network going down. (Participant 6, Institution C)

Participant 9 (Institution E) stated that the infrastructure group and the instructional technology group had a very good working relationship. "They tend to be very responsive to our needs" the participant stated (Participant 9, Institution E). Lastly, Participant 12 (Institution G) described how virtualization of servers by the infrastructure group had created much more open space in their server room. Because of the available space, "faculty in biology who want to create a little computing cluster, which we're going to house in the server room in the empty space that we used to have all our servers in" (Participant 12, Institution G). Server virtualization freed up resources and space to better serve departments.

People

The five interview questions about the People dimension in the RIPPLES model explored several aspects of relationships and culture on the campuses of the participant institutions as they relate to instructional technology. These questions explored the interaction between instructional technology staff and faculty members and its ramifications on instructional technology, shared decision-making among the instructional technology group, the role of campus leaders in decisions about instructional technology, and the barriers and enablers related to People.

Overview of Results

Four participants noted that there was some form of a faculty technology advisory committee at their institution that influences instructional technology decisions (Participants 8, 10, 11, and 12). Three participants stated that administrators frequently give financial and policy support while occasionally advocating for instructional technology (Participants 5, 10, and 13). Three participants indicated that the institutional leaders and faculty were not involved in instructional technology initiatives (Participants 1, 2, and 8). Three participants stated that the instructional technology staff members at their institutions do the basic research about instructional technology tools and then make recommendations to their respective directors and then chief information officers (Participants 3, 4, and 6). One participant stated that the CIO at the institution decides what the instructional technology staff members will focus on (Participant 7). One participant stated that, at their institution, the instructional technology staff members will use group consensus to make decisions, though occasionally the CIO will prescribe a direction for the group (Participant 1). One participant stated that the instructional technology staff members focus their efforts on the technical feasibility of a tool or technology rather than the pedagogical application, while the instructional technology director takes on the responsibility of assuring the latter (Participant 8).

Instructional Technology Committees and Administrator Roles.

Four participants noted that there was some form of a faculty technology advisory committee at their institution. Participant 8 (Institution E) had been disappointed that the faculty committee that advises the instructional technology group on its goals “has been used more for policy [discussions] as opposed to providing or engaging with [the instructional technology group] intellectually to think about strategic initiatives, which is something I’d like to change” (Participant 8, Institution E). At Institution F, the three instructional technologists were members of the Instructional Technology Advisory

Group, which also includes faculty and library staff members. The Group "helps us bounce ideas off of [faculty] and have them help us form new directions. We only meet a couple times a year…[but] already it's worked out well," according to Participant 10 (Participant 10, Institution F). Participant 11, an instructional technologist at Institution F, also discussed how the Instructional Technology Advisory Group creates an environment where ideas and needs that were discussed at department meetings, which instructional technologists were not invited to attend, can be brought back to the instructional technology group and engaged. At Institution G, there was a committee on information technology in the faculty governance structure that considers major IT policy decisions. "Ideas get initiated by us," Participant 12 stated, "and if they have [potentially have] campus-wide effects then they have to go through this committee on informational technology" (Participant 12, Institution G).

Above the CIO level, three participants indicated that administrators frequently give financial and policy support while occasionally advocating for instructional technology. Participant 5 (Institution C) remarked that the institution's new president was increasing investment in IT:

> The cost of running the institution, a large part of that, comes from the cost of IT, and so [the new president's] focus has been rather than cut that cost, let's figure out how to make some real value out of that cost. And part of it has even gone to the Board level where we now have an IT Board subcommittee that did not exist

> in 2004 that helps provide that level of sort of strategic oversight, and help us advocate for positions and funding at a Board level. (Participant 5, Institution C)

Participant 10 (Institution F) remarked that the provost will work to help communicate new instructional technology initiatives to faculty "to make sure we have those lines of communication going out to the faculty because [directives about instructional technology initiatives] coming from the provost will probably be more seriously considered than if it's just an email from me" (Participant 10, Institution F). Institution G also had a new president who had created a shift in priorities regarding instructional technology. Before the new president, according to Participant 13, "the CIO [had] not been that involved [but had] been supportive over the years, but now with a new president [instructional technology] has become a big priority for [the CIO] and he's jumping right at it. [Now] we are putting out a lot of resources and taking some risks and trying some different things" (Participant 13, Institution G).

Three participants indicated that the institutional leaders and faculty were not involved in instructional technology initiatives. At Institution A, Participants 1 and 2 stated that the recently inaugurated new president and provost had given little attention to instructional technology and IT than the previous president and provost. "From the president's perspective, he probably came in and thought [that] IT is working well, but [began focusing on]…the path that the students are taking and the [curriculum] requirements and started looking at things at a much higher level and the focus [did not settle on IT]. And we didn't get as much attention as we might have under the previous administration," Participant 2 said (Participant 2, Institution A).

At Institution E, Participant 8 described how the assumption by the institutional administrators was that faculty will drive the instructional technology environment, but faculty members do not know what they want:

> [The mission of an institution's instructional technology service] needs to be defined not as just being responsive to faculty needs but also providing leadership, and sometimes it's a tricky dance because some faculty will say, 'IT shouldn't be providing leadership,' but at the same time it's really needed. And nobody else is stepping up to do it. (Participant 8, Institution E)

Participant 8 described this situation as a result of the overall lack of strategic discussions at the institution about what the institutional strategic objectives were and how IT and the instructional technology staff group should fit in with them. From the statements and perspectives of these three participants, the administrators of both institutions were not engaging instructional technology use at the institutions. At Institution A, the new president and new provost were focusing on evaluating other aspects of the institution, while the administrators at Institution E were assuming that the members of the faculty had sufficient knowledge of the field of instructional technology to effectively drive its implementation at the institution.

Research and Decision Making Patterns Regarding Instructional Technology.

At Institutions B (Participants 3 and 4) and C (Participant 6), the instructional technologists there will do the basic research about an instructional technology tool and then push up recommendations to their respective directors and then chief information officers, who make the decisions. Among the instructional technology staff, "[we] have debates and we have votes and there's points where ultimately we have the debates but ultimately [the CIO] makes the decision," Participant 3 said (Participant 3, Institution B). Participant 4 stressed the importance of the collaborative culture among the instructional technology staff, stating that "[i]f you don't have a collaborative nature or [believe in] the general philosophy that better things are accomplished by multiple people and multiple perspectives in the mix, then you don't stay here long" (Participant 4, Institution B). At Institution C, Participant 6 described how the instructional technology staff members evaluated "what [instructional technology tools are] going to be most compatible with our campus, and then once we come to a decision we usually just have these ongoing conversations [about them]…. [A]nd so then we come to a point where we feel pretty confident in a decision, [and]…it basically goes to [the CIO] for…a final decision" (Participant 6, Institution C).

At Institution D, the instructional technology opportunities to be explored were primarily set by the CIO, because "we have a CIO that is pretty far ahead of the game [so] initiatives start from there," meaning the CIO had an excellent understanding of trends in instructional technology as well as the needs of the faculty at the institution

(Participant 7, Institution D). That was not the only path by which initiatives take form, as there were "some initiatives that we put out there and say, 'This is the direction for us to go,' and [the CIO] lets us run" (Participant 7, Institution D). Institution A also uses a blend of these top-down and grassroots approaches. Their instructional technology group will use group consensus to make decisions, but "if it comes down [that] we're…split on things, then I'm going to end up making the decision. Or sometimes there are things where [the CIO] has said 'this is what needs to be done' or 'this is the direction we're going'" (Participant 1, Institution A).

The instructional technology group at Institution E had a unique amount of sovereignty. According to Participant 9, Participant 8, the instructional technology director who had a faculty background, "does a lot of the research regarding what…would be good to implement here at [the institution], and then [Participant 8 takes on the task of convincing] the faculty [to implement them]" (Participant 9, Institution E). Another factor leading to this approach, according to Participant 9, was the expertise among the instructional technology group:

> [T]he…programmer is really interested in developing for the iPhone and has worked on a two apps already for…the iPhone and the iPad…. The faculty weren't coming to us for [those technologies]. [T]hat is driven by…our interest and expertise within our group…. [W]e have this expertise, [so] how are we going to develop something using it that's appropriate for classroom use? (Participant 9, Institution E)

Perhaps Participant 8's interview remarks provide the most insight as to why the instructional technology staff at Institution E strives to lead the way for faculty rather than taking cues from faculty:

> [T]he assumption [among the institutional administrators] is [that] the faculty are going to drive what [the instructional technology staff create]…, but they don't…. [The perspective at many institutions is that] instructional technology staff should serve the faculty, and then you ask the faculty, "What do you want to do?" [The faculty response here is], "I don't know. What should we be doing?" (Participant 8, Institution E)

Barriers Related to People

Three participants stated that the lack of tenure incentives for experimentation and success with teaching with instructional technology were cultural barriers at their institutions (Participants 2, 6, and 8). Two participants noted that the transitions to a new president at their institution had been very disruptive to the instructional technology initiatives that had been emerging before the departure of the previous president (Participants 1 and 2). Two participants articulated that some faculty members do not view instructional technology staff as colleagues, and that was a barrier to instructional technology innovation, adoption, and implementation (Participants 8 and 9). One participant stated that since instructional technologists did not have faculty status (as librarians at the institution do), they were not brought into the course planning process from the beginning unless a faculty member believes there might be a specific use for instructional technology in the course (Participant 6). One participant stated that an increase in the student-to-faculty ratio disrupted the ability of faculty to devote any time to consider how to use instructional technology in their teaching (Participant 1). One participant discussed how the loss of a long-time previous director of instructional technology caused stagnation in the relationship between the instructional technology staff and faculty (Participant 10). One participant stated that the abrupt downsizing of the faculty impacted the ability of the instructional technology staff to engage with faculty, staff, and students (Participant 11). One participant stated that switching between three LMS in a three year time span created resentment of the instructional technology staff among the faculty (Participant 9). One participant remarked that the need to have an orderly IT environment represented a form of barrier to innovation and experimentation (Participant 4).

Three participants stated that the lack of tenure incentives for experimentation and success with teaching with instructional technology were cultural barriers at their institutions. Participant 2 (Institution A) lamented that the collaboration between instructional technology staff members and tenure-track faculty had no bearing on the tenure process. “We write faculty members a letter on request saying they worked with us, but it is not really a … component of the [tenure and promotion] process. And if somebody spent several hours creating a Moodle course it may not get the recognition it should,” Participant 2 stated (Participant 2, Institution A).

Participant 6 (Institution C) was concerned that tenured faculty were discouraging pre-tenure faculty from actively exploring instructional technology use in their courses. It was common for “those tenured faculty who’ve been here a while to actually discourage younger faculty in using technology” (Participant 6, Institution C). Participant 8 (Institution E) noted a similar pattern:

> I’ve had two young faculty member who are creative, [have] great ideas, [and] had been talking [to me] about putting together an interesting project they could use in their courses. I’ve had them come up to me a couple weeks later and say ‘I’ve been told that if I want to get tenure I can’t work with you.’ So that’s the impediment right there. The reality is the more innovative projects we’ve been doing here, I’ve had to shift to not just [tenure-track] but full professors who are at a stage where they’re very intellectually curious and they kind of don't care [about promotion ramifications because] nobody can touch them. (Participant 8, Institution E)

From Table 1, these three institutions (Institutions A, C, and E) had comparable numbers of full-time faculty (230, 206, and 203, respectively) and published tuition ($34,905, $39,115, and $40,862, respectively). They differed in their enrollment – Institution A had 2,396 students, Institution C had 2,406 students, and Institution E had 1,744 students) – and their acceptance rate; 66%, 42%, and 16%, respectively.

Participants 1 and 2 (Institution A) noted that the presidential transitions at their institution had been very disruptive to the instructional technology momentum that had been emerging. Participant 1 pointed out that the preceding president had been at the institution for approximately twenty-five years. The fact that the new president wanted to make significant changes to the institutional curriculum required extensive participation by the faculty, which took time and energy away from experimenting with and utilizing instructional technology. "So I think with the intellectual life discussions … there's been a lot of [faculty] time and effort put into that, and the faculty that [do] big [instructional technology] projects and push the envelope have been busy working on the [working groups for the new president]." Participant 2 comments were consistent with those of Participant 1:

> All of the different faculty committees that were put together for changing curriculum and changing campus spaces, and there were so many things going on at [the institution] with change, and it didn't really include instructional technology at all. It really brought a lot of the faculty members who were innovative and creative and doing the great things [with instructional technology] away from us and gravitating towards those initiatives. (Participant 2, Institution A)

Participant 8 (Institution E) very clearly articulated that some faculty do not view instructional technology staff as colleagues, and that cultural facet was a barrier to instructional technology innovation, adoption, and implementation at the institution:

> I would say there's a bit of classism between staff and faculty…on campus. So [it] can be a challenge…having IT staff be accepted as intellectual peers. And

> part of it is, I think, the history of IT in many cases. It's not typical to have people with [non-IT] advanced degrees [in IT]. My background is teaching, so I'll ask people tough questions and sometimes they really respond to that like, "Cool, I haven't thought of that." Other people it's like, "Who are you to be critiquing what I'm thinking?" So it just depends on the individual and their perspectives. (Participant 8, Institution E)

Participant 9, Participant 8's colleague at Institution E, also found it "difficult to engage some of the faculty. Now whether or not that [cultural divide] is something that truly is here or whether that's my own perception, I can't say for sure" (Participant 9, Institution E).

Participant 6, however, described a cultural division between instructional technology staff members and faculty that had clear practical implications:

> Within our culture, the librarians [are] included more in those conversations [about learning goals] and we are not because we don't have faculty status…. [S]o when it comes down to…trying to think about some of these learning objectives and goals that we're setting for the institution that are academic in nature, instructional technology is not included. So then what happens is the faculty members are going to start building their courses out…[and] we're still not… included necessarily, unless they say, 'Oh maybe I could do something with this technology to meet this goal. (Participant 6, Institution C)

Thus, some cultural divides between instructional technology staff members and faculty were not formally defined, as was the case for Participant 9 at Institution E, while some cultural divides were formally defined, as was the case for Participant 6 at Institution C. In both cases, they were barriers.

Participant 1 (Institution A) stated that the student-to-faculty ratio increased just as a new president started. Cuts were made to the number of one-course adjunct faculty positions and some support positions. At the same time, the entering class was much larger than average, growing from 650 students to 730 students. These two factors made it difficult for faculty to consider how to utilize instructional technology. "So there were more students [for the remaining faculty] to teach. It was a lot on their plates that prevented them from thinking about, 'Oh I need to carve out time to do a lot of technology,'" Participant 1 said (Participant 1, Institution A).

The two participants at Institution F (Participants 10 and 11) both had examples of transitions as barriers to instructional technology. Participant 10 discussed how the departure of a previous director of instructional technology who "was a great champion of [instructional technology] and was out there among the masses championing the cause all the time. And then when we lost [that] position someone else managed the department for awhile along with another department, and that person had no context for instructional technology, so then [the relationship with faculty] really stagnated." The departure of the initial instructional technology director, and the ineffectiveness of the interim director, damaged the trust that is necessary in the working relationship between faculty members and instructional technology staff.

Participant 11 alluded to a separate incident at Institution F that ended up impacting the instructional technology environment. The 162 full- and part-time faculty body was reduced by the equivalent of fifteen full-time positions. “[The reduction] happened fast and it was not something that faculty was ready for. That transition spilled over in our area in terms of having to deal with negative feelings from students, some of the staff, and some of the faculty” (Participant 11, Institution F). The incident was not directly tied to either the instructional technology staff or the use of instructional technology at the institution, but it impacted the ability of the instructional technology staff to engage with faculty, staff, and students.

One other set of transition barriers that caused strain in the People dimension was technical transitions. Participant 9 (Institution E) stated that “[s]ince I’ve been here [starting in 2008], …we’ve switched [LMS] systems from Blackboard…to Moodle, [and a major upgrade was made to] to Drupal [(2013), the web content management system for the campus]…. [A]ny time [faculty users] have to learn a new user interface, there’s going be [satisfaction] issues [among them]” (Participant 9, Institution E). While Participant 9 did not offer reason for the Blackboard to Moodle transition, a review of documents openly available on the website for Institution E revealed that the reason the LMS was changed from Blackboard to Moodle was due to Institution E’s membership in a consortium with several other liberal arts institutions in the region. The other institutions in the consortium had already or were soon to adopt Moodle, and given the fact that the consortium offers students at any member institution access to all classes, it would not be unreasonable to speculate that having all consortium members switch to the Moodle LMS would make the sharing of academic resources between classes at the member institutions easier. The transition to Moodle was made with the recommendation of the Faculty Computing Committee at Institution E.[6]

According to other openly available content on the Institution E website, the upgrade to the Drupal CMS at Institution E was done under the authority of the institution's CMS Oversight Group, a stakeholder group that consists of information system role representatives from IT, the library, web services, alumni and parent relations, and admissions. No faculty members were found among the membership of the CMS Oversight Group.[7]

One participant remarked that even the need to have an orderly IT environment represented a form of barrier to innovation in its own right. As the participant stated it, "We have to keep house. The maintenance and the sustainability and the reliability and the standardization that makes [the IT environment] possible are in and of themselves sometimes barriers to innovation and customization" (Participant 4, Institution B).

---

[6] The citation for this website has not been included in the bibliography because doing so would undermine the anonymity of the institution and the two participants from it.

[7] Similarly, a citation for the CMS Oversight Group at Institution E cannot be provided because it would also undermine the anonymity of the institution and the two participants there.

Enablers Related to People

A common theme noted by three participants was the growing number of faculty who were eager to explore instructional technologies for use in their teaching (Participants 2, 7, 8). Two participants discussed how the type of atmosphere and openness an instructional technology staff projects can foster (or hold back) faculty members who want to engage technology (Participants 2 and 6). One participant noted that the turnover of faculty due to professional departures and retirement was creating opportunities for faculty who were eager to explore instructional technologies (Participants 7).

A common theme noted by three participants was the growing number of faculty members who were eager to explore instructional technologies for use in their teaching. Institution A had "a lot of really creative, tech-savvy tenured faculty members who would come to us a lot" wanting to actively collaborate and share their experiences with using technology in their teaching (Participant 2, Institution A). Participant 2 did not discuss if those faculty members came to be "creative" and "tech-savvy" during the course of their tenure and promotion process, after which they felt comfortable to explore instructional technology more. However, the participant did say that the instructional technology staff members facilitated "peer-to-peer…training where faculty members would show other faculty members what they were doing, and that…[showed]…people…in the middle…what they can do [with the instructional technology] and then…get started" (Participant 2, Institution A). That statement indicates that pre-tenure faculty members who were interested in instructional technology were encouraged to explore the possibilities and draw from the successes of their colleagues.

Participant 2 (Institution A) also shared that the type of atmosphere an instructional technology group projects can foster or hold back faculty members who want to engage technology:

> If you have a bunch of developers and coders in there and all these super computers and it's located in IT specifically, then [faculty] are maybe a little nervous about going in there and asking for help. But if you put your lab in the library or the teaching learning center where the focus isn't on the [technology] but on supporting teaching and learning, [faculty] start to understand that the [instructional technology staff] aren't here just because of the technology. They are here to really help [them] become a better teacher or to help … students learn better. (Participant 2, Institution A)

Participant 6 (Institution C) further described how that trust was established between faculty and instructional technology staff:

> We tend to build personal relationships. [O]ne of us will help a faculty member with one thing, which then leads to other things, and leads to other conversations. So much of it is grass roots. We'll help a faculty member put up their personal web page in Word Press and meanwhile we have a conversation with them about how other people are using word press and blogging in their coursework. [I]t may not be that semester, maybe another semester, [but] they'll pop their head back up

> and say, 'You know, I'm thinking about teaching this class and I wonder if that Word Press thing might work for [a particular class project]….' That may lead to helping [that professor's] class with that, which then may lead to two of their colleagues. [S]o it all sort of builds on one another. (Participant 6, Institution C)

From their descriptions, a working relationship between faculty members and instructional technology staff members frequently develops slowly though a series of successful interactions. Those successful interactions lead to additional opportunities to collaborate on more complex teaching and research projects, and they become a form of social capital that affords instructional technology staff members entrée with other faculty members.

Participant 7 (Institution D) did specifically note that the turnover of faculty due to professional departures and retirement was creating a favorable instructional technology environment on the campus because the new "[faculty] coming in are more familiar with technology and really want to see [where it can go]" (Participant 7, Institution D). Institution E also had a similar core of interested pre-tenure faculty, but they were dissuaded from exploring instructional technology during their pre-tenure years, as Participant 8 noted above.

Policies

The next dimension of the RIPPLES model focused on instructional technology policies. Participants were asked seven questions (ranging from formal, documented policies and regulations to unwritten traditions and practices) to describe overall policies at their institution with regard to instructional technology, policies related to each of the instructional technology types being investigated in this study (commercial, home-grown, open source, and free web-based), ways in which they would change instructional policies at the institution, and the barriers and enablers related to current policies.

Overview of Results

Nine participants indicated that they experience an open, informal policy environment that did not encumber instructional technology exploration or implementation (Participants 1, 2, 4, 6, 7, 8, 9, 10, and 13). Five participants indicated that their institutions' policies pertaining to instructional technology were adequate (Participants 1, 3, 9, 10, and 13). Two participants mentioned the need for policies that increase the incentives for faculty to engage in instructional technology innovation (Participants 8 and 12). One participant stated that they would like to see policy changes that would increase the involvement of faculty in decisions about instructional technology (Participant 6). One participant wanted to see more power put in the hands of the instructional technology director (Participant 2). One participant stated that a formal policy barring the in-house development of instructional technology emerged from past tensions over innovation between the instructional technology staff and the IT infrastructure staff (Participant 3). One participant stated that their position of not developing instructional technology in-house was based primarily on the obvious limit to the resources available, and there was not on a formal policy preventing development

(Participant 12). One participant stated that cultural and organizational factors (the institution had a large programming staff that espouses developing open source tools) steer the institution away from commercial instructional technology tools (Participant 7). One participant stated that demand and need, not policy, dictate when a commercial instructional technology tool was purchased (Participant 8). One participant commented on how the policy environment regarding staffing, the quality of open source tools, and the ability of potential open source tools to integrate with existing student and financial data systems on campus affect choices to utilize or not utilize open source instructional technology (Participant 8). One participant stated that there needed to be policies that help guide when to use existing instructional technologies that were core to the institution and when to explore technologies beyond that core (Participant 5).

Open, Appropriate Policy Environment.

Nine participants indicated that they experience an open, informal policy environment that did not encumber innovation of instructional technology. Frequently, participants emphasized that a lack of policy in regards to instructional technology, or having “just enough” policy, was beneficial to instructional technology. Participant 1 (Institution A) said, “I wouldn’t say that policy is loose but I think there’s room for innovation and thinking outside the box” (Participant 1, Institution A). The participant further described that this loose policy environment did not create chaos because

> There’s a lot of open communication about, “Hey, I’ve been hearing faculty buzz about this. Should this be something we check into?’ There’s also [the CIO, who

> is] just a fantastic resource in understanding people and the campus, and so I wouldn't say it's policy dictating [what we do] as much as insight into what are people asking for [and exploring] (Participant 1, Institution A).

Participant 2 (Institution A) added details about the ways in which the loose policy environment created problems, adding that the approach "may have caused some miscommunication sometimes. And I think on one sense it's partially because we have six or seven [instructional technology] people spread out in different buildings and they didn't have an operational procedure or model for how we approached instructional technology" (Participant 2, Institution A).

Participant 4 (Institution B) described the policy environment as an evolving foundation that was altered to accommodate people and projects: "I would say our policies are there to give people enough information to understand how it is we can best provide whatever service for whatever it is they need.… [I]'ve never personally experienced if someone had a question or a problem with the policy or the way we were doing things. We go back and revise to accommodate" (Participant 4, Institution B).

Participant 6 (Institution C) found that the less formal policy landscape made their institution nimble: "It allows us to be very innovative [and] to do interesting work and gather the tools we need when we need them" (Participant 6, Institution C). Later in the interview, the participant described how this fluid policy environment allows decisions about instructional technology to be made according to the professional perspective of the staff and leadership rather than solely based on prescribed policies.

Participant 7 (Institution D) portrayed the instructional technology policy environment as shifting away from formality: "I think we're having … less policies and more … experimentation" (Participant 7, Institution D). Participant 8 (Institution E) also described the lack of policies pertaining to instructional technology both as a positive and a negative similar to Participant 1:

> [Having no policies] gives you certain latitude sometimes but there is no protection or support for what you're doing. On [the] one hand it allows us to do some innovative stuff but there are faculty [who] think what we're doing is not what they think we should be doing. Then it provides an opening for them to go to the administration and say, "Wait a minute. This is an inappropriate allocation of resources. You need to stop this." (Participant 8, Institution E)

Participant 9 (Institution E) did not describe a complete lack of policies pertaining to instructional technology. Instead, the participant described them as fluid and based on project parameters. "We sort of make them up as we go along to an extent. A lot of the policies and procedures for our development are dictated by the time we have available or by what tech is out there or appropriate," the participant said (Participant 8, Institution E).

Participant 10 (Institution F) also stated "[the] instructional technology [staff] by itself really doesn't have a lot of policies governing what we, do but they fall under the larger IT umbrella for policies. [Any decision to create instructional technology policies] would be handled quite easily internally within the IT dept, [and then] run past the VP and the provost" (Participant 10, Institution F).

Finally in this theme, Participant 13 (Institution G) echoed what other participants said. “We are still probably one of those places that don’t have a whole lot of policy. A lot is not written down and sometimes that’s…detrimental. But for our area it’s probably to our advantage,” the participant said (Participant 13, Institution G). The lack of policies pertaining to instructional technology affords the instructional technology staff the freedom to experiment and adapt to the needs of the faculty. However, it also puts a large amount of decision-making power in the hands of the instructional technology staff. So, while Participant 13 acknowledges that “we have certain mechanisms we’re supposed to work through and have to work through, but…we actually made the Moodle decision…with just one vote of the computing technology committee. No real policy that said we had to go to the faculty [for their approval to switch to a different LMS],” the participant stated (Participant 13, Institution G).

Adequate Policies Regarding Instructional Technology Selection, Experimentation, and Implementation.

Five participants indicated that their institution’s policies pertaining to instructional technology were adequate. Participant 1 (Institution A) was more concerned about the location of the instructional technology group than policies regarding types of instructional technologies. “[W]e’re down in the basement [of the library]. We’re not on anybody’s path anywhere. Even if they come to the library they’re maybe dropping off books or they’re looking in a stack. We’re … off the beaten path” (Participant 1, Institution A). The result of their isolated location was that having incidental, frequent interaction with faculty makes building consultative relationships with them more difficult.

Participant 3 (Institution B) had little to say on the subject other than “I’m actually pretty content with them the way they are just now” (Participant 3, Institution B). Similarly, at Institution E, Participant 9 was happy with the current policies as they relate to instructional technology innovation and implementation because “if it’s here I don’t notice it. I don’t see it as an impediment at all” (Participant 9, Institution E). Participant 10 (Institution F) was happy with the policy environment: “We have a real luxury here of not being in a very rigid environment. Other institutions might have a very set line of red tape to go through but we often don’t and that’s one of the advantages of being small” (Participant 10, Institution F). Lastly, Participant 13 (Institution G) was of the opinion that less policy was better because policies were frequently bent by exceptions, “so I’m one of those that doesn’t think much of policies…. I’d rather miss them and not have too many than the other way around” (Participant 13, Institution G).

Two participants mentioned the need for policies that increase the incentives for faculty to engage in instructional technology innovation. Participant 8 (Institution E) stated that they had

> not been put in a position where I have received more requests for doing innovative [projects] than we can handle. In fact, it’s on the other side. I’m trying to create stuff [and entice faculty to use it]. I would love to have that

> problem [of faculty] coming to me with these really cool ideas and we can't support it. (Participant 8, Institution E)

However, the incentive structure did not exist. The participant concluded the thought by saying that "technology [engagement by faculty] is not a hardware/software issue. [It] really is a cultural issue on campus" (Participant 8, Institution E).

Participant 12 (Institution G) stated a very similar thought that "most instructional technologists would say that if you could get technology innovation considered favorably in the promotion and tenure process that would really make our lives interesting. That would be a game changer because then you would have a lot more people willing to do a lot more interesting stuff" (Participant 12, Institution G).

Rationale for Avoiding Creating Home-Grown Instructional Technology Tools

At Institution B, Participant 3 stated that "we are not going to create our own tools that we will then have to later support and migrate…over time. That is a [written] policy. It's there." The policy emerged from past tensions over innovation between the instructional technology staff and the IT infrastructure staff.

> Anytime we would try to do something new, certain other teams in IT would get hysterical because we were committing them to a level of support that they could not possibly deliver. So we did have to work out some procedures to allow the innovation to occur without creating hysterics in the support people. I understand their point of view and at this point in the game I think they understand mine. [The IT infrastructure director] is coming from the 'it has to be solid and 100%

reliable' perspective. And I'm coming from the "we have to move forward with the new technologies and new ways of teaching" and that's going to be my bias. (Participant 3, Institution B)

Institution G's position of not developing instructional technology in-house was based primarily on the obvious limit to the resources available, and there was not on a formal policy preventing development. When faculty members who want to develop a tool approach the instructional technology staff, the instructional technology staff were forced to explain that "the person who has any of the skills to do this is knee deep in five other high priority projects, so we can't build things for you" (Participant 12, Institution G). The instructional technology staff also discourage faculty from enlisting students to develop instructional technology tools. "Faculty … often come from places where there are graduate programs, [and they] are used to having grad students around for…many…years so they can build a piece of software and then support it for a number of years. Our students are gone in four years and we are not able to pick up support for things that they might build," Participant 12 said (Participant 12, Institution G).

Policies and Momentum Related to Commercial Instructional Technology.

When asked about the existence of policies that relate to the purchasing of commercial instructional technology tools, only two participants chose to respond. Participant 7 (Institution D) stated that cultural and organizational factors steer the institution away from commercial instructional technology tools. The institution had a large programming staff in IT that were available for instructional technology programming, and they were "familiar with [open source development], so the maintenance and semantics of it are fairly simple. We don't feel like [we] are squandering resources trying to get open source to work right for [us]" (Participant 7, Institution D). Participant 7 also stated that "we are in a spot where our faculty have been trained to want [custom tools] and actually get it, and I think they would find it unacceptable to go back to the days where they might ask for something and we wouldn't be able to deliver because we were at the mercy of the commercial software provider" (Participant 7, Institution D). In other words, the instructional technology staff like the freedom to innovate open source platforms, and the faculty expect the customization that the instructional technology staff were able to provide with open source platforms.

The only remark that Participant 8 (Institution E) made about policies related to purchasing commercial instructional technology tools was that demand and need, not policy, dictate when a commercial instructional technology tool was purchased. At Institution 8, the instructional technologists need "to show demand or need and then it's a question of are the funds available? What are the needs for this? Is there justification for making this investment?"

Staffing Policies.

Participant 8 (Institution E) also commented on how the policy environment regarding staffing, the quality of open source tools, and the ability of potential open source tools to integrate with existing student and financial data systems on campus affect choices to utilize or not utilize open source instructional technology. Staffing restrictions were the first policy mentioned by the participant, meaning that the inability to hire additional instructional technologists or programmers to customize open source tools had an effect on the choice to utilize additional open source tools or not. The participant's next point was not related to policy but to characteristics of available open source tools. "There's trying to balance whether something open source is … adequately developed. [If not,] [w]hy would we choose that over something else?," the participant said (Participant 8, Institution E). Lastly, the participant indicated an institutional preference (not necessarily a policy) for tools that can integrate with existing student and financial data systems. "Is it," the participant said, "going to give us the opportunity to customize or integrate [with the institution's data systems]? Integrating with existing systems [is] a great value-added" (Participant 8, Institution E).

Other Policy-related Topics Raised by Participants.

One participant stated that they would like to see policy changes that would increase the involvement of faculty in decisions about instructional technology. Participant 6 (Institution C) hoped for this kind of policy change so that faculty could, in effect, help the instructional technologists turn down projects that typically get a large share of the modest resources available. "We have quite the culture of just saying yes and making it happen. So, I think if we involve the broader community it would be easier to say no because it wouldn't be our decision. It would be [the faculty's decision]" (Participant 6, Institution C).

One participant wanted to see more power put in the hands of the instructional technology director "so the climate…[is] such that we are going to talk about it [as a staff], hash it out, but in the end the director's going to make the decision and that's the way it's going to be and then move forward with it" (Participant 2, Institution A).

Participant 7 (Institution D) was not advocating for policies that would help better distribute finite resources. Instead, the participant stated that the instructional technology staff members would like policy changes that would allow instructional technologists to have regular access to faculty meetings in order to "talk to [faculty] about their technological needs and instruction, and then really be able to go at that from an innovative standpoint and come up with some solutions for it" (Participant 7, Institution D).

Lastly, one participant (Participant 5 from Institution C) advocated that there needed to be policies that helped guide when to use existing instructional technologies that were core to the institution and when to explore technologies beyond that core:

> [W]hat we need to do is help people understand when they can use which services and why. So, it's sort of like the rules of engagement for when to use the core and when to leave the core. Whether they're policies or just instructions more so than policies, when is it ok for me to work in Google Docs and when is it not? What kind of information can I put in my spreadsheet and what information should I not? If I'm doing fiscal analysis from a data set that the NSF has given me, am I allowed to use that in Google Docs or not? So it's not necessarily…policy, but I

> think it's just helping people know all the things that are available to them both institutionally managed and then commercially available. When do I use them, and why, and what are the reasons or the rules of engagement for when to use them and why I should or shouldn't use them? And I think that's where we're hurting. And I think that's where we could do more and should do more. (Participant 5, Institution C)

Barriers Related to Policies

Six participants stated that the policy environment for instructional technology at their institutions was not a barrier (Participants 4, 6, 7, 9, 10, and 13). Two participants portrayed their policy environments as not being neutral, neither barriers nor enablers (Participants 2 and 5). One participant said that the policy environment was not a barrier to instructional technology from the perspective of the instructional technology staff, but the faculty may not have had the same perspective about policy as it pertained to instructional technology (Participant 11).

Six participants stated that the policy environment for instructional technology at their institutions was not a barrier. These participants did not have strong or elaborate opinions on this matter. In response to the question of whether policies were a barrier to instructional technology innovation, exploration, and implementation, Participant 4 (Institution B) simply said, "Correct." Participant 6 (Institution C) responded similarly that the policy environment was not a barrier, as did Participant 7 (Institution D), Participant 10 (Institution F), and Participant 13 (Institution G). Participant 9's

(Institution E) opinion was that, “I don’t see [the policy environment] as an impediment at all” (Participant 9, Institution E).

Two participants portrayed their policy environments as not being neutral, neither barriers nor enablers. Participant 2 (Institution A) took a neutral stance, saying that the policy environment was neither a barrier nor an enabler, but considered this an artifact of the lack of direction from the instructional technology director and the CIO:

> Some of us might prefer to recommend Blogger and some of us might prefer to recommend WordPress. You didn’t have somebody say, “We’re going to do WordPress because of [its particular features].” That’s what I mean by policy. There wasn’t really anybody who made the final decisions. (Participant A, Institution 1)

Participant 5 (Institution C) characterized the policy environment as not being a barrier but as “slowing things down”:

> Part of the decision-making process doesn’t involve IT so sometimes what we have is people come to us after making bad choices. It would be better if we had some rules of engagement or some policies or procedures … so that they’re making smart choices so that by the time they come to us we’re not undoing a mess. We’re helping them advance (Participant 5, Institution C).

Lastly, Participant 11 (Institution F) made a distinction that no other participant made. From the perspective of an instructional technology staff member, policy was not a barrier to instructional technology, “[but] if you talk to faculty, they might have a different view. But from my standpoint, as a member of this team, I don't see any major barriers [within the current policy environment]” (Participant 11, Institution F).

Enablers Related to Policies

Two participants stated that their policy environment was conducive to innovation and experimentation of instructional technology (Participants 7 and 12). The final participant stated that a lack of extensive policy enables instructional technology because it gives the instructional technology staff the freedom to experiment (Participant 13).

Two participants stated that their policy environment was conducive to innovation and experimentation of instructional technology. Participant 7 (Institution D) answered a simple “Yes” to the question of whether the policy environment at the institution was conducive to innovation and implementation of instructional technology. The other was Participant 12 (Institution G), who said that “the overall policies as stated for instructional technology at [the institution] are to support exploration and learning, so it’s not like you can’t look at any technology.”

The final participant – Participant 13 (Institution G) – also stated that a lack of extensive policy enables instructional technology because it gives the instructional technologists freedom to experiment. The participant also said that the lack of policy preserves the time and resources that could be spent researching, crafting, and perfecting policies that would bump up against anecdotal scenarios that do not fit them. “We might need a little bit more [policy] to help us, but in general I find that…we spend so much time on some of these policies that are governed by special cases anyway" (Participant 13, Institution G).

Learning

The portion of the interview protocol pertaining to the Learning dimension of the RIPPLES model was to ascertain how student learning outcomes were taken into consideration by instructional technology staff and IT staff when a new instructional technology tool was being created or implemented. This section also explores how leaders of the institution seek information or require an explicit connection between student learning outcomes and new instructional technology tools.[8]

Overview of Results

Seven participants stated that learning was a central focus among the instructional technology staff when new instructional technology tools were being developed, selected, or implemented (Participants 1, 2, 3, 4, 10, 12, and 13). Five participants stated that administrators were an important ally in instructional technology staff members' efforts to facilitate learning (Participants 1, 2, 3, 5, and 10). Four participants held the position that institutional administrators were not engaged in discussions about the relationship between learning and instructional technology (Participants 6, 8, 9, and 12). Two

[8] The Learning dimension section does not include a barriers nor enablers section due to an oversight by the researcher. The RIPPLES-based survey example forwarded to the researcher by Dr. Surry, which he made available for adapation, was misinterpreted as not having barrier or enabler sections in the Learning dimension. Thus, when the survey was adapted for this study, the Learning dimension portion of the interview protocol did not have explicit barrier or enabler sections. This oversight was discovered during the editing process by Dr. Hendel, the researcher's advisor, but not deemed to be a threat to the findings.

participants stated that they were challenged by the concepts of learning and learning assessment, which are elusive concepts to capture, measure, and quantify (Participants 4 and 7). Two participants stated that student learning and learning assessment were not a central focus of the instructional technology staff because the faculty culture did not allow the instructional technology staff into conversations about it (Participants 8 and 11). One participant stated that student learning and learning assessment were not a central focus of the instructional technology staff as they develop instructional technology tools, but the staff would prefer to create instructional technology tools that facilitate higher-level learning and engagement (Participant 9).

Instructional Technology Staff Members Who Cite Learning as a Central Focus.

Seven participants stated that learning was a central focus among the instructional technology staff when new instructional technology tools were being developed, selected, or implemented. Participant 1 (Institution A) stated that their guiding principle was that "you don't want the technology getting in the way" (Participant 1, Institution A). In other words, the instructional technology should aspire to be so seamless, easy to use, and effective that the faculty and students spend their time focusing on the content of a course and little to no time on learning or negotiating the instructional technology tool. As evidence of this principle, the participant cited the migration of the institution to Google Apps for Education. Instead of spending valuable class time on teaching students technical skills to get them to a productive level of proficiency, the intuitive design of

Google Apps tools such as GoogleSites were "allowing [students] to focus more on actual creation of content. Collaboration, too, is becoming easier, [which is] the kind of things that we want facilitated" (Participant 1, Institution A). Thus, one way that a central focus on learning was maintained was by finding instructional technology tools that remove barriers between students, faculty, and the course content.

Participant 2 (Institution A) was honest in noting that "[i]t is really student learning that drives what we do without exception. And we do it wrong sometimes. We'll put together we think is really going to [improve learning] and it backfires," though the participant did not cite a specific example (Participant 2, Institution A). The participant was more interested in stressing that "getting the feedback from the faculty member and knowing not to use that tool again" is the important lesson for instructional technology staff members (Participant 2, Institution A).

At Institution B, the focus on learning at the instructional technology team level was reflected in the instructional technology process. "Everybody on my team is so focused on the student outcome," Participant 3 said, "which is the reason that we have this … labor-intense [instructional technology staff] model" in which the instructional technology staff members spend much of their time working with faculty members mapping the use of instructional technology in courses to the intended learning outcomes (Participant 3, Institution B). Once a course begins, the instructional technologists take part in courses to assure that the instructional technology was supporting learning as intended and also assisting students in the completion of the information technology-based projects in the course. Furthermore, the focus of the IT department was changed after the most recent institutional strategic plan so that “anything that IT does strategically has to match or support what the institution has in its strategic plan – rigorous education, learner directed education, and creating excellent communicators” (Participant 3, Institution B).

While Participant 3 provided a high level overview of the instructional technology staff focus on learning at Institution B, Participant 4, also at Institution B, provided some perspective at the ground level. Rather than the instructional technology staff being responsible for finding instructional technologies and ascertaining their potential impact on student learning, “[n]ew instructional technologies that we would consider implementing are usually coming from faculty or support requests. The majority of what we do is actually coming from the faculty or students” (Participant 4, Institution B). This approach was supported by the structured data reporting that was collected each year by the instructional technology group, which allows them to track the kind of assignments and activities they were supporting. Regardless of who was determining the student learning goals, which in the case of Institution B was the faculty, Participant 4 emphasized that

> it is really important that as instructional technologists we pay far more attention to that overall learning experience the student is having than to the individual instructional technology piece we’re pulling in. In other words, the emphasis

> should not be on, "Oh, this is a really cool tool. Do you think we can make it fit [the course activity]?" (Participant 4, Institution B)

Participant 10 described the process at Institution F in similar terms. Improving learning was always at the forefront of any new instructional technology selection, Participant 10 said. However, the scope of instructional technology tools under consideration, and how they were aligned with student learning, was broader than Institution B because of resource limitations:

> Finances and the need to work smarter and leaner makes it so [that] sometimes we can't do those little tiny specialty projects for a particular group because we just don't have the resources for it. I might not be able to take on a big project for Biology, but if [the project or tool] encompasses most of the sciences, that might [make it possible to justify the project or tool]. (Participant 10, Institution F)

Participant 12 (Institution G) described how learning was put at the forefront of the interactions between faculty and the instructional technology staff. First, "we definitely map [our instructional] technologies to [Chickering and Gamson's] "Seven Principles for Good Practice in Undergraduate Education" [(1987)]" (Participant 12, Institution G). Next, faculty who expressed interest in working with the instructional technology staff were asked about the learning goals of their course so that "if [they] want [to improve on the] time on task [dimension cited by Chickering and Gamson], [we can help them with instructional technology tools] that map to that. If [they] want [to improve on the] prompt feedback [dimension cited by Chickering and Gamson], [we can help them with instructional technology tools] that map to that" (Participant 12, Institution G). This process of connecting faculty learning goals to instructional technology tools that were mapped to Chickering and Gamson's "Seven Principles for Good Practice in Undergraduate Education" was a way to start a dialogue with faculty about the subject of student learning, which faculty were "a little bit reluctant to enter into in the first place" (Participant 12, Institution G). When Participant 12 was completing his Ph.D. in Geophysics, "nowhere did I have any courses on teaching or how to consider learning goals and developing assignments. It just wasn't part of the [graduate training process], and for most of our faculty, that's the truth, too. So the nice thing about technology is [that] it's safe ground in which to have those conversations" (Participant 12, Institution G).

While Participant 13 was at the same institution as Participant 12, Participant 13 described more of an evolving focus on learning among the instructional technology staff rather than the more fully formed focus described by Participant 12. Initially, "[having] any technology in the classroom [was considered] good, but we're really focusing now on what technology is really better for…our students [so that] we'll get accepted by faculty" (Participant 13, Institution G). Participant 13 hopes that by partnering with the Center for Learning, Teaching, and Research, the instructional technology staff can be viewed more as collaborators with useful knowledge to share about subjects like student learning "because one of the issues we've had is not just trying to get [faculty] to work on a project but getting faculty to buy in to things we're doing" (Participant 13, Institution G).

Participant 6 (Institution C) acknowledged that learning was important but was not always the central focus during the initial implementation of a tool. The participant illustrated this concept with the example of web conferencing software. From discussions with staff members on campus, the participant was aware that staff members in the Admissions, Financial Aid, and Alumni Relations offices, not faculty, were very excited by the possibilities the software offered. After some time, “I have a couple of faculty who I’ve already talked to who are going to try to begin using it [in courses],” the participant said (Participant 6, Institution C). From there, the participant said, “what’s going to happen is they are going to talk to [other faculty] about it and it’s going to grow” (Participant 6, Institution C). This was not to portray learning as being in the background, the participant said. “We kept all those [learning outcome principles] in the forefront of our evaluation [of the software], so that put us in the right position to support those learning outcomes eventually” when faculty elect to utilize it, the participant said (Participant 6, Institution C).

Administrators: Allies in Efforts to Facilitate Learning.

Five participants stated that administrators were an important ally in instructional technology staff members’ efforts to facilitate learning. Participant 1 at Institution A found that faculty members who had ascended to administrative positions were more effective advocates of instructional technology for facilitating learning because they “tend to be more aware of technology on … campus. They’re more knowledgeable about it. They’ve used it more” (Participant 1, Institution A). Participant 2 (Institution A) stated that the previous provost, a former faculty member, was "very gung ho about [instructional technology] and he would talk about it in meetings. He was definitely an advocate for it" and would encourage faculty with interesting ideas about how to utilize instructional technology in their teaching to connect with the instructional technology staff (Participant 2, Institution A).

At other institutions, the administrative stance towards instructional technology as a tool for facilitating learning had been laid out through policy and processes. At Institution B, Participant 3 described how the administration made learning a central part of the institution's strategic plan. So, "anything that IT does strategically has to match or support what the institution has in its strategic plan,…[which] is [focused on] rigorous education, learner directed education and creating excellent communicators" (Participant 3, Institution B). Beyond the strategic plan, Participant 3's responses did not indicate that institutional administrators take a role in advocating for learning in the instructional technology tools that were implemented. Conversely, Participant 7 at Institution D described how the IT department must submit an IT plan to the president's office every six months, "and a lot of that [plan] focuses around the guiding principles [of the institution] and some statements of how … [the department's plans are] going to enhance [learning]" (Participant 7, Institution D).

Interactions with Administrators Regarding Learning Outside of Policy.

Not all interaction between instructional technologists and administrators regarding learning takes place in the context of activities mandated in policy. At

Institution C, administrators address overall learning objectives for students, and then look to IT and instructional technology for ways to facilitate them. Participant 5 described how instructional technology was not spoken about by institutional administrators as a way to raise specific learning outcomes, such as writing proficiency. Instead, instructional technology and the IT department were viewed as resources to support the initiatives that result from assessments. "So, if one of the outcomes of the curriculum is visual literacy and we're not doing well there it seems like technology might help with that problem. But I think they would basically say, 'We've assessed [visual literacy] and we're weak there. Hey, IT, can you help?'" (Participant 5, Institution C).

Institution F was an environment where instructional technologists collaborate directly with institutional administrators on projects on an as need basis. "[W]e ran a pilot last year…as an experiment for first year students on starting the development of a portfolio process, and we collaborated with our people in the president's office…. [W]e were involved in the meetings with the faculty to discuss the program and portfolio, and we coordinated with the career development office and the technical implementation of that program" (Participant 10, Institution F).

Instructional Technology Was Not Part of Dialogue Concerning Learning.

Four participants held the position that institutional administrators were not engaged in discussions about the relationship between learning and instructional technology. Participant 6 (Institution C) stated that "they don't really ask [about facilitating learning outcomes]" (Participant 6, Institution C). With the growing emphasis on assessment of learning in higher education, the participant had taken to "pushing faculty when we do these instructional technology lunch sessions. One of the things I ask the faculty to make sure and mention or talk to when they are doing their presentations is how [the instructional technology they used] matched up to their learning objectives and how effective [the technology] was" (Participant 6, Institution C).

At Institution E, "there are no strategic [learning] objectives that are guiding what we're doing at an institutional level," according to Participant 8 (Participant 8, Institution E). Therefore, "their faculty are taking charge of learning outcomes or assessment, [as is] the instructional technology team …, mainly through [(Participant 8's)] knowledge and expertise," as Participant 9 described (Participant 8, Institution E). Participant 12, the director of instructional technology at Institution G, described a similar environment. "I'm pretty much the one who would ask … questions [about learning]. Most other directors don't [have the background] and I definitely over the last couple of years have given presentations at [conferences] on how to assess the effectiveness of technology in teaching and learning. So that's something that we're mindful of, but only in IT" (Participant 12, Institution G).

Learning Assessment as a Barrier and Disincentive to Collaborate.

Two participants stated that learning and learning assessment were elusive concepts to capture, measure, and quantify that they were challenged with. Institution B, as Participant 4 described above, was pushing to keep learning at the forefront of their instructional technology innovation and implementation, but “it’s very difficult in a well designed learning experience to actually figure out what part [of learning] was the instructional technology contribution and what was everything else,” the participant said (Participant 4, Institution B). That was one reason that the instructional technology team at Institution B paid “far more attention to that overall learning experience the student is having than the to the individual instructional technology piece we’re pulling in,” according to Participant 4 (Participant 4, Institution B).

Participant 7 (Institution D) also responded to this question by saying that it was difficult to ascertain how an instructional technology affected student learning. Rather than try to determine this solely on their own, the institution takes part in the MISO Survey, a survey of how faculty, students, and staff perceive library and computing services (“MISO: Measuring Information Service Outcomes”, 2012). “We look to [the MISO Survey] a lot as far as what kind of technologies we can bring to bear that would enhance the student [learning],” the participant said (Participant 7, Institution D).

Two participants stated that student learning and learning assessment were not a central focus of the instructional technology group because of the faculty culture. At Institution E, Participant 8 stated that “there’s not any institutional interest in actively studying learning outcomes because often it is misconstrued by faculty as [an evaluation of faculty effectiveness]. I’ve only had a few instances where there was genuine interest [by a faculty member] in doing that. Often that becomes an obstacle to…working with that [faculty member]” (Participant 8, Institution E). A similar faculty culture at

Institution F prevents the instructional technology staff from participating in discussions about learning in courses. Participant 11 was disappointed that "faculty are very, I don't want to say tight-lipped about those kinds of things, but it's kind of a closed group. They do more peer-to-peer [consultation about student learning among each other] than they do employing the instructional technologists to facilitate [student learning]" (Participant 11, Institution F).

The responses of Participants 8 and 11 portray two niches that instructional technology staff groups can move into with regards to assessment. In the case of Participant 8, the participant wants Institution E to be exploring the assessment of learning outcomes and the instructional technology group to play a role in that exploration. Faculty members at Institution E apparently do not want to engage in learning outcomes assessment, as evidenced by the participant's response. Broaching that topic with faculty members appears to make them less likely to collaborate with the instructional technology group.

Participant 11 described an environment at Institution F where instructional technology staff members were not part of any discussions about student learning outcomes assessment. Those conversations were conducted among the faculty. Furthermore, the small size of the instructional technology group at Institution F – three members, including the director – could prevent them from taking part in any discussions anyway. They appear to be straining to meet the basic instructional technology needs of the institution.

Participant 9, also at Institution E, stated that there was no overt inclusion of learning outcomes in the development of an instructional technology tool or project, though "[w]e do try to keep some [learning] outcomes in mind as we develop [tools]" (Participant 9, Institution E). Additional statements by Participant 9 indicated that the instructional technology staff do want to develop advanced instructional technology tools that prompt higher order learning, not merely online equivalents of paper activities:

> What does an online quiz do for [students]? It really doesn't do anything that a paper quiz doesn't do. It assesses what you can recall at that specific time and whether or not the quiz is good with good questions or [a] bad quiz. It's just…regurgitating knowledge you've consumed from the instructor. So as far as like that type of instructional technology, that's pretty bland and we try not to focus on those projects. To some extent, obviously we have to…. Students can consume the theoretical and…regurgitate it to the instructor. But can they apply it? [That] is the question, and that's where [the instructional technology staff] try to drive the technology. (Participant 9, Institution E)

However, Participant 9 did not describe how the instructional technology staff will "drive the technology". Will they do so in collaboration with the expectations of the faculty members with whom they work? As in earlier RIPPLES Model dimensions, Participant 9 again indicated that the instructional technology staff members at Institution E had a professional vision for the field of instructional technology that did not necessarily align with those faculty expectations.

Participant 5 (Institution C) stated that Institution C lacks a clear learning assessment approach. The participant stated that the instructional technology group tries "to [determine an instructional technology's impact on learning] based on our anecdotal information, or a sense of what's right, or some personal research we've done, but there's no institutional sort of rules or structure for this yet" (Participant 5, Institution C). For Institution C, a new core curriculum had been developed and approved by the faculty, giving the faculty and instructional technology group an opportune moment to actually assess learning, assess the impact of instructional technology on learning, and attain guidance for technology moving forward. Now that the new curriculum was in place, "we know what it is [the institution is] trying to do, so now [the institution and the instructional technologists] need tools to collect data over time and figure out how we're doing" (Participant 5, Institution C).

Evaluation

The interview protocol for the Evaluation dimension of the RIPPLES Model used three questions to explore how the participating institutions assess the relationship between student learning outcomes and instructional technology and the overall effectiveness of instructional technologies that were being implemented.

Overview of Results

Twelve participants indicated in their interviews that there was no formal program or structure for the evaluation of instructional technology at their institution but that evaluations of instructional technology were done anecdotally (Participants 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, and 13). Three participants stated that basic descriptive statistics about instructional technology were collected, such as how many students used it in a semester (Participants 3, 4, and 5). Three participants stated that they need additional knowledge in order to implement better evaluation methods (Participants 1, 3, and 12). Two participants stated that the evaluation efforts currently being undertaken were ineffective (Participants 4 and 6). Two participants stated that faculty members evaluate instructional technology (Participants 1 and 10). One participant indicated that the instructional technology staff members were not viewed as colleagues by the faculty, so the former were not able to take part in evaluation initiatives (Participant 10). One participant stated that national surveys that include data about instructional technology were used to evaluate instructional technology at their institution (Participant 5). One participant stated that their institution was not currently collecting any data about the effect of instructional technology on learning (Participant 7).

No Formal Program or Structure for Evaluation of Instructional Technology.

Twelve participants indicated in their interviews that there was no formal program or structure for the evaluation of instructional technology at their institution and they also indicated that the evaluation of instructional technology that was done anecdotally. At Institution A, Participant 1 indicated that the faculty members were free to evaluate the instructional technology in their courses as they please. There was no formal evaluation process. Part of the challenge, the participant stated, was that the instructional technology team needs more knowledge and resources about conducting effective evaluation. “My background is in Russian [language and literature]. It’s not in … gathering data [and statistically analyzing it], so we do the best job we can do, but [we need to be] be more aware of how to do that and how to evaluate things” (Participant 1, Institution A). Participant 2, an instructional technologist at Institution A, sought anecdotal feedback from faculty clients about how well the instructional technologies being used were working. “The way I approached it was really informal, especially for some of the smaller applications that I developed. At the very smallest level, I would call a faculty member halfway through [the semester] and say, ‘How is this working?,’ ‘How is it not working?’,” the participant said (Participant 2, Institution A).

Basic Statistics Collected by Instructional Technology Staff.

The participants from Institution B indicated that they collect descriptive statistics about the instructional technology activities in the courses they support. “I can tell you how many courses we support, how many students [a technology] touched, how many different technologies were involved in those courses. I can give you all kinds of basic descriptive statistics,” Participant 3 noted (Participant 3, Institution B). “Additionally we try to get the students and the faculty member to fill out a survey, or we do face-to-face interviews with the faculty member in which they evaluate their use of technology in the course,” the participant stated (Participant 3, Institution B). Beyond those descriptive and self-reported data, Participant 3 believed it would be very difficult to do effective evaluation of the impact of instructional technology learning because they cannot necessarily do experimental and control groups with small classes that may only be taught once a semester. Furthermore, the participant said, the institution did not have a basic understanding of classes that did not use instructional technology. “We can’t tell when [a learning outcome pattern] is due to a personality match. We don’t even know if one professor grades harder than another professor. Is that why these students look more successful?” (Participant 3, Institution B).

Participant 4, also at Institution B, candidly stated that the annual descriptive statistics and surveys of faculty that were collected about instructional technology were satisfactory. However, the participant sees a different need. “Where I think we don’t really work so well is in our coordinated academic support pieces. We’re still evolving and changing so much in our instructional technology and Library collaborative group effort,” the participant said (Participant 4, Institution B). This collaboration “needs to include this evaluation phase, [but none of the collaboration members are] really willing to put their neck on the block right now. And people need to be a little more invested to stick their necks out there for a real evaluation to happen” (Participant 4, Institution B).

Institution C was another institution that was collecting basic information about the effect of instructional technology in courses through an informal process, according to Participants 5 and 6. “We do have faculty evaluations at the end of the semester and we have faculty who use technology and then they have open ended questions that they’re permitted to ask in addition to the standard questions,” Participant 5 described (Participant 5, Institution C). In addition to this data, the institution takes part in two national surveys: the MISO survey (“MISO: Measuring information service outcomes”, 2012) and the COACHE survey (“COACHE: The collaborative on academic careers in higher education”, 2012):

> These national surveys give us some metrics in terms of satisfaction. So they’ll tell us if our faculty like Moodle or don’t like Moodle, or find blogging useful or don’t find blogging useful. But it’s more about assessment of the technology, not assessment of the outcome. We score pretty high on those kinds of things but it’s not really a good measure on whether or not it’s effective from the student learning prospective. (Participant 5, Institution C)

Participant 6, however, described the evaluation efforts at Institution C as lacking impact. “Why are we continuing to hold onto [instructional technology tools] that one person continues to use when maybe we need to kill it and use that money for something else or that time for something else? [W]ithout a [better] evaluation process, it makes it challenging to make the case that we should be able to let go of things,” the participant said (Participant 6, Institution C). There were risks to the instructional technology staff group climate if a major evaluation initiative was enacted, though. “[P]utting us under an evaluation puts us under a microscope, so it takes away some of our freedom to be able to do these…creative and innovative things more under radar. You know doing things under the radar is the way you really get attention,” according to the participant (Participant 6, Institution C).

At Institution E, Participant 8 noted that evaluation of instructional technology was quietly done on the side because “it can be perceived as something that’s evaluative [of faculty]” (Participant 8, Institution E). Participant 9’s experience with evaluation of instructional technology “tends to come in from the faculty. Anything we put up, if it’s rated as being good or useable or awful, the faculty do let us know about that as they try to adopt it” (Participant 9, Institution E).

Like the participants at Institution B, the participants at Institution F stated that collecting descriptive statistics about instructional technology use was easy and, as Participant 10 described, viewed as an appropriate evaluation of instructional technology tools. The instructional technology staff, however, was not the only unit within the institution interested in the effects of technology on teaching and learning. As Participant 10 described:

> The college got a grant…a few years ago and received some tablet PCs and other equipment. The Physics and Chemistry Departments use those in class. Faculty from the Education Department came in and evaluated that program for the grant. So that evaluation happened outside of IT…. We very easily can evaluate information related to course web usage where we have web logs and other data that we can analyze, but we don’t often have [the opportunity to investigate] tangible results of our work unless the faculty choose to share that with us. (Participant 10, Institution F)

Participant 10's comments revealed an additional aspect of institutional culture. When instructional technology staff members were not viewed as colleagues by faculty, they were not only excluded from conversations about how instructional technology should be implemented in a course, but they were also excluded from conversations about how to evaluate an implemented instructional technology tool. Participant 11's comments affirmed that the instructional technology staff members at the institution did not have a role in the learning evaluation process at the moment. In fact, the participant stated that "we don't see much of any results of those" (Participant 11, Institution F). So, the information collected from evaluations was not widely shared with the instructional technology staff. The participant was hopeful that will change, though. "We're helping to pick up that thread within the context of the faculty advisory group," the participant stated (Participant 11, Institution F).

Lastly, Institution G also collects basic descriptive data about the use of instructional technology. A survey was sent to faculty members each year that asks "what kind of technology they use in their courses and classrooms and what works and what doesn't," according to Participant 12 (Participant 12, Institution G). The instructional technologists also work closely with the institution's Center for Teaching and Learning to evaluate the effect of their jointly developed technology projects jointly:

> So if you go to the [Center] website you'll see video testimonials from students and faculty involved in these projects that talk about how doing a wikipedia editing assignment was different than writing a paper, or creating a podcast and

> how that forced them to consider audience in a different way than it would be if they just wrote the paper that was going to go to the faculty member and then into their trash can (Participant 12, Institution G).

Participant 12 acknowledged that these testimonials were an initial step into evaluation and that more robust methods and a broader scope must be applied. “We’re trying to get [faculty] … to collaborate with their institutional research [staff], if they have them, to assess instructional technology effectiveness at the institutional level, not just at the assignment level,” the participant stated (Participant 12, Institution G). Participant 13 also stated that they were good at collecting basic statistics and self-reported information, but they were “trying to focus on [the effects of technology] in terms of learning and not just [faculty or student preference]” (Participant 13, Institution G).

Institution D (Participant 7) was not currently collecting any data about the effect of instructional technology on learning. Participant 7 indicated that while nothing was being collected now, “we could get a [survey] from faculty and students on how well they feel the specific technologies we have or have not contributed to their teaching experience…. It certainly would give us more quantifiable data than we’ve got now.”

Barriers Related to Evaluation

Five participants indicated that the current evaluation climate was a barrier to instructional technology innovation and implementation at their institutions (Participants 2, 3, 4, 6, 12, and 13). Five participants described the current evaluation climate as neutral, neither a barrier nor an enabler (Participants 8, 9, 10, and 11).

Five participants indicated that the current evaluation climate was a barrier to instructional technology innovation and implementation at their institutions. Participant 2 (Institution A) was concerned that allowing each instructional technologist to anecdotally evaluate the effectiveness of the instructional technology they implemented was a problem. "We all have a way of doing this, but it hasn't been made into policy. [I] think that is something that the [director of instructional technology] was trying to…figure out the best way to do" (Participant 2, Institution A). The participant did, however, have confidence in the effectiveness of asking faculty about their learning goals for the course:

> I could usually explain to them why we need to [evaluate the technology] and they appreciate it after that…. They usually understand like, "Oh I see where you're going," and then we collaborate and put together some kind of an [evaluation] model where I have a way to access [information] at the end, almost like an end of course survey for just the technology aspect of it. (Participant 2, Institution A)

Both participants from Institution B stated that the current evaluation approach was a barrier because they cannot show faculty the significant difference in learning that instructional technology can make with their current lack of good evaluations. Participant 4 indicated that using experimental design methods to statistically compare how instructional technology was improving learning in comparison to other factors would be extremely difficult. "[P]art of me realized…how very low the probability of being able to get a real external design across a broad enough sample to be able to say anything with any level of probability," the participant stated (Participant 4, Institution B). Nonetheless, the lack of an effective evaluation approach was not hobbling efforts to recruit and work with faculty. "When we get a faculty member to work with us and see the outcomes the students create when they have our support, the faculty member is sold. All we need is that first chance. And we're getting enough of those first chances that we're really, really busy," Participant 3 stated (Participant 3, Institution B).

Participant 6 (Institution C) implicated faculty in the lack of robust evaluation of instructional technology's role in student learning. "Without any evaluation of the benefit of infusing technology, faculty aren't going to be convinced [to adopt it]. They will just continue with [the teaching style] they feel comfortable with and want," the participant said (Participant 6, Institution C). Still, a lack of an evaluation agenda gives the instructional technology staff a lot of freedom to experiment with different tools. "Putting us under an evaluation [policy] puts us under a microscope, so it takes away some of our freedom to be able to do these sort of creative and innovative things more under radar. You know doing things under the radar is the way you really get attention," the participant stated (Participant 6, Institution C).

Participant 13 (Institution G) also stated that they did not have the benefits of proving the effectiveness of their technologies on learning, but they also did not have the burden of constantly providing that proof. Still, the participant said, "We still don't have one survey that we do for every project which would [allow us] to compare and contrast [instructional technology tool use in classes], and then also keep this track record over time so we can say whether we're doing better or not" (Participant 13, Institution G).

Four participants described the current evaluation climate as neutral, neither a barrier nor an enabler. At Institution E, Participant 8 described one of the main benefits of implementing an evaluation of instructional technology as personal. "I mean it's more for me personally wanting to have evidence to substantiate why we're doing things," the participant said. Otherwise, it was of no current consequence because it's "not part of the formula that decides what we do and don't do so," the participant concluded (Participant 8, Institution E). As an instructional technology developer, Participant 9 stated a desire for evaluation as a means to improve their development cycle, not as a means for measuring student learning. "In any software development life cycle," the participant said, "ideally you would have a lot of upfront assessment, upfront design, and evaluation at the end. But that all goes out the window when you have to develop something rapidly" (Participant 9, Institution E).

Participant 10 (Institution F) had very little to say about evaluation as a barrier or enabler, other than that the lack of evaluation did not prevent the instructional technology staff from exploring new tools. Participant 11 was nearly as succinct. The participant described the evaluation climate at the institution in this way: "I wouldn't say it's a barrier. I would say it's more of a limiting factor. In other words, it [modifies] what directions we take in different areas" (Participant 11, Institution F).

Enablers Related to Evaluation

One participant described the current lack of an evaluation climate as an enabler to instructional technology innovation and implementation because it did not necessitate that the instructional technology staff must continually prove that each instructional technology tool improves learning by a specified amount. Participant 5 (Institution C) described how the lack of an evaluation approach was, at this moment, an enabler because it did not make the instructional technology beholden to a student learning outcome benchmark. “The thing we’ve been very careful with is to say that technology can be helpful and enabling but it might not be. We don’t want to get bogged down with this assessment process that says, [(as an example)], the 60% of our faculty that use Moodle had better student outcomes than the other 40% who don’t,” the participant said (Participant 5, Institution C). That can lead to mandates for faculty to use particular technology tools, which may not sit well with them. Still, “we do need to be able to determine through some metric whether what we’re doing is the right thing or not,” the participant said (Participant 5, Institution C). The participant would only want to use it to gauge how they were doing and its effectiveness, “but I wouldn’t want to use it as a way to mandate things” (Participant 5, Institution C).

Similarly, Participant 7 (Institution D) described the current lack of an evaluation climate as an enabler to instructional technology because it created a very open environment for exploration (Participant 7). “It doesn’t obstruct…[instructional technology innovation or implementation],” the participant said. To the contrary, it creates “a permissive environment” (Participant 7, Institution D).

The common characteristic between these two institutions was that they both prefer open source and free web-based instructional technology tools. In the experience of this researcher, the pace at which open source and free web-based instructional technology tools emerge requires a level of experimentation among instructional technology staff members before they were deployed among faculty members and a capacity for experimentation and tolerance for ambiguity among faculty members who were willing to adopt them early. If every instructional technology tool in use were required to immediately show its effect on student learning outcomes, that could be a disincentive to experimentation and early adoption.

Support

The final RIPPLES component, Support, used eight questions to explore the various ways in which barriers and enablers were related to the support given to instructional technology at the institution. There were four sub-components of Support that were explored: Training Support, Technical Support, Pedagogical Support, and Administrative Support and Leadership. Training Support was phrased in a manner to explore the amount of professional development support related to innovation of and implementation of instructional technology that instructional technology staff had at their disposal. Technical Support was intended to cover all aspects of technical support for all types of instructional technology implemented at the institutions, but most participants used it as an opportunity to reaffirm their comments from the Infrastructure section regarding support that instructional technology receives from the IT networking staff. Pedagogical Support was utilized as an opportunity to discuss the interactions that instructional technology staff and faculty members had. Lastly, Administrative Support and Leadership was phrased to be another opportunity to capture the participants' perspectives on how IT and institutional administrators support or do not support instructional technology at their respective campuses.

In this section, each subsection (Training Support, Technical Support, Pedagogical Support, and Administrative Support) only has a Barriers and Enablers subsection, as the participants were only asked about how each of these Support subsections were barriers and enablers to instructional technology selection and implementation at their institutions.

Training Support

Barriers.

Four participants indicated that cuts in budgets were a barrier to training (Participants 3, 8, 10, and 11). Three participants described time as the primary barrier to instructional technology innovation and implementation (Participants 1, 6, and 9). Two participants regarded expectations of developing professional training and development as a barrier (Participants 4 and 9). One participant described the high workload on instructional technology staff at liberal arts institutions as a training barrier but a factor in the organizational structure of instructional technology staff groups (Participant 6). One participant stated that location can be a training barrier to instructional technology (Participant 13).

Three participants described time as the primary barrier to instructional technology innovation and implementation. At Institution A, Participant 1 stated that because of the pace of work for the instructional technology group, it was very difficult to "carve [time] in your schedule to spend a little time learning something without interruptions" (Participant 1, Institution A). The participant indicated, though, that the group was able to compensate for this by intensely sharing information through email and in-person communication.

Interestingly, Participant 6 (Institution C) did not indicate a training barrier for the instructional technologists, but did indicate that the volume of work did not allow them to offer extensive training to faculty and students. "I wish we could do more in the way of training both their technical skills, but also more in the troubleshooting and analytical thinking…. I see faculty and students who don't know how to transfer their technology skills from one [application] to another," the participant said (Participant 6, Institution C). The lack of time prevents the transmission of knowledge to faculty and students, whereas most participants who voiced concerns about time as a barrier were referring to the lack of time to acquire knowledge.

Lastly, Participant 9 (Institution E) stated that the instructional technologists had ample financial resources to get training, but the pace of development did not easily allow the instructional technologists to get away from projects for conferences and events. "That being said, part of that [dilemma] is on the personnel to request that [time]," the participant said (Participant 9, Institution E). However, the expectation was solely on the instructional technologists to "do the research, find what you want to do, and then request time to do it" (Participant 9, Institution E).

Four participants indicated that cuts in budgets were a barrier to training. Participant 3 (Institution B) said "[t]he only thing that's a barrier about training support is that there is a limited budget unfortunately. It would be great to have more people go to more of these training opportunities" (Participant 3, Institution B). Otherwise, the IT department expectation that each instructional technology staff member have a deliberate professional development plan that includes trainings and conference presentations was an enabler, the participant said. Participant 3's praise of this approach contrasts with Participant 4's comments about training support barriers below. Participant 8 (Institution E) stated that the financial crisis bit into professional development funds, "but we try to stay active in regional and national conferences, both presenting and just attending…. We try and stay somewhat abreast on pedagogy stuff as well" (Participant 8, Institution E). Finally, at Institution F, Participants 10 emphasized that the limited budget at their institution allows them very few training opportunities:

> We are on our own. There are some training resources available to us. We have a trainer company that does technology training …, but most of that is entry level stuff anyway. It doesn't get into the deeper pedagogical stuff. I would say we

> learn the bulk of our training from all the listservs and [webinars] we participate in (Participant 10, Institution F).

Participant 11 did acknowledge the reduced budget for training and the increased reliance on self-training, but the participant did not view the training landscape as bleakly as Participant 10. "Although [the budget] has been reduced in recent years, I would say [it is] fairly strong. My associate and [Participant 10] have both been pretty active in this last year," the participant stated (Participant 11, Institution F).

Two participants regarded expectations of developing professional training and development as a barrier. As mentioned above, Participant 3 (Institution B) regards the requirement that instructional technologists develop a deliberate professional development plan as an enabler. However, a colleague, Participant 4, regards this expectation as a barrier. "It assumes that you are motivated and interested in growing. And it assumes you are motivated and interested enough that you will find those opportunities for yourself or ask your supervisor to help you find them," the participant said (Participant 4, Institution B). The participant also said that "there's a slight emphasis on presenting about what we're doing and how we're doing it at national conferences, so people in the past have been a little intimidated by that," though most colleagues push past this intimidation (Participant 4, Institution B). Perhaps Participant 3's position as the director led the participant to believe that this requirement inspired instructional technology staff members to push themselves professionally. Participant 4's statements indicate that these expectations had the opposite effect on instructional technology staff members.

Lastly, as stated above, Participant 9 (Institution E) described how each instructional technology staff member is largely responsible for researching and making the case for the professional development opportunities they want to pursue, but "when do you have the time to go to a conference?…[F]inding a conference and doing that [takes] self-initiative…[to] do the research, find what you want to do, and then request time to do it" (Participant 9, Institution 9). The participant's perspective was that there were ample resources to attend conferences and activities, but they were not given enough guidance on what might be the best opportunities for the professional development of each individual.

Participant 6 (Institution C) stated that keeping current on instructional technology trends was a barrier to instructional technology and suggested that it was one of the reasons the instructional technology staff operates under the expertise model. "We don't have necessarily [utilize the] liaison model because [the expertise model] allows us to get better at one technology [and] to be able to [work with more faculty and students]…. [Even then], I do wish we could support students and faculty more," the participant said (Participant 6, Institution C). The participant's perspective was that liberal arts institutions have small instructional technology staff units that cannot easily serve their constituents and stay abreast of technology trends at the same time. "We have to rely on…[colleagues] outside of our institution…. There's no way we could keep current without using the knowledge that other people have already gained," the participant said (Participant 6, Institution C).

Lastly, one participant stated that location can be a training barrier. Participant 13 (Institution G), said that the rural location of the institution did not allow the participant and the participant's colleagues to stretch training dollars as far as more urban institutions because the cost of travel from their location was high. So, while they get support and encouragement from supervisors to "keep [ourselves] educated and developing in our areas,… it's sometimes a little hard to get access to it because we are far off the beaten path" (Participant 13, Institution G). This barrier was another aspect of rural institutional locations, along with lower bandwidth in some rural areas, that creates challenges for instructional technology innovation and implementation.

Enablers.

Five participants cited the emphasis and support of training as an enabler of instructional technology innovation and implementation (Participants 2, 5, 7, 9, and 13). Participant 2 (Institution A) acknowledged that "the amount of funds that was available for professional development started to dwindle as [the recession] happened, but [those training opportunities are] still a major enabler in that the leadership really valued that" (Participant 2, Institution A). The opportunities for training simply shifted to virtual venues and events, but they were just as important in expanding their knowledge, the participant stated.

Participant 5 (Institution C) found that some of the most useful professional development opportunities came at events outside of the usual higher education technology conferences:

> It seems like sometimes when we go to things that are outside [the usual higher education technology conferences], it's almost like the bigger risk but bigger reward. So, we try to stay true to our traditions and our cohort and [attend some of those usual conferences], but we also try to reach a little bit, like go to Internet member meetings and learn about what's going on with R1 institutions and how they're doing research computing, and go to corporate sponsored things like Drupalcon or WordPress camps or whatever they might be. So I think we try to balance and try not to eat the same dog food all the time. I think that helps give it some perspective that other schools maybe are missing sometimes. (Participant 5, Institution C)

Participant 9 (Institution E) was another other participant who described a willingness of supervisors to allow instructional technologists to attend training and professional development events outside of the usual higher education technology conferences. "The support is there," the participant described, but "we have to ask for it to some extent" (Participant 9, Institution E).

The final three participants voiced that their institutions were maintaining and even increasing the opportunities for training, which was a clear enabler. Participant 7 noted that Institution D recently began an initiative to have 70% of the IT staff attend off-campus professional development events twice a year. "We've stuck with that and it seems to really [be improving] a lot of different areas including instructional technology," the participant said (Participant 7, Institution E). Participant 13 (Institution G) lauded the IT administrators for having "been firm and maintained a [strong training] budget throughout the good and bad times. I think that's been a focus to keep us educated and developing in our areas. We've got…new [colleagues] and they are getting resources, …time,…classes,…conferences, and whatever [else they need] to keep them up to speed," the participant said (Participant 13, Institution G).

Technical Support

Barriers.

Two participants stated that their local technical support resources can be a barrier to instructional technology innovation and implementation (Participants 1 and 13). Two participants stated that the varied support by vendors of their commercial instructional technology products was a barrier for them (Participants 3 and 4). One participant noted that the variable support of free cloud computing instructional technology resources by their hosts can be a barrier (Participant 2).

Two participants stated that their local technical support resources (i.e., the Infrastructure at their institutions) can be a barrier to instructional technology innovation and implementation. For Participant 1 (Institution A), "it really does depend on the [technical support] individual and if they have an understanding of users and what problems may come. Some people have blinders on and they do their job and they don't have the people contact, or they don't have the capacity to think in somebody else's shoes or communicate" (Participant 1, Institution A). Participant 13 (Institution G), as mentioned earlier, described the high bar set by the technical support group at the institution as a barrier to basic experimentation and testing:

> Sometimes I just need a server…. I don't need it to be backed up, but then it gets us involved in technical support, so we've got to have two support people available to support it, and it gets to be too much. So sometimes to have that rock solid support level it means it's very hard to get to do what you want. It's stable, it's nice, but, boy, it's not flexible or useful sometimes. It's like the ultimately safe airplane [that no one can] fly. (Participant 13, Institution G)

Ultimately, this high bar spurred Participant 13 and colleagues to simply purchase server space with a commercial web hosting service so that they could have a flexible space in which to innovate and test tools.

Two participants, both at Institution B, stated that the varied support by vendors of their commercial instructional technology products was a barrier for them. Participant 3, the director of instructional technology, stated that "it all depends on the current version [being supported by] their tech support, which varies over time" (Participant 3, Institution B). Participant 4 elaborated on this, saying that "vendors are not great at getting back to you in a timely fashion or fixing things until their next [application] upgrade. Our tech support here is great, but on some occasions a vendor fix has taken three months. When you're buying standardized solutions, you can't do things quickly with [vendors]" (Participant 4, Institution B). In other words, local technology support, no matter how excellent, cannot easily overcome vendors who are not responsive.

Lastly, one participant noted that the variable support of free cloud computing instructional technology resources by their hosts can be a barrier. Free cloud computing tools, such as GoogleApps for Education, can change quickly, and "[a]ll of a sudden everything changes and you've got people who are using [it] that are frustrated and calling us, and we have nothing" (Participant 2, Institution A).

Enablers.

Six participants were very clear in their belief that technical support teams within their institution's infrastructure who support the mission of the institution understand the value of instructional technology and enable it (Participants 3, 5, 6, 8, 9, and 10). Three participants cited communication and strong relationships between instructional technologists and technical support staff as a key enabler of instructional technology (Participants 3, 7, and 11). Two participants cited good support from the open source community as an enabler for instructional technology at their institutions (Participants 2 and 9). One participant stated that commercial product vendors were an enabler of instructional technology (Participant 12).

Six participants were very clear in their belief that technical support teams within their institution's infrastructure who support the mission of the institution understand the value of instructional technology and enable it. At Institution B, Participant 3 praised the technical support group for making support of the instructional technology tools an initiative. “The technical support team is always doing a balancing act, but the fact that instructional technology is a priority is clear, and they respect that and they do their damndest to be very, very prompt” when technical support of the instructional technology was needed, the participant said (Participant 3, Institution B). Participant 8 and 9 (Institution E) succinctly summed up their praise. Participant 8 stated that they had “a very mission driven [technical support] group. [They are] … very talented people who are smart and not bureaucratic” (Participant 8, Institution E). Participant 9 concurred that “people on campus as far as … web services or systems and networking, those guys are fantastic” (Participant 9, Institution E). Participant 10 (Institution F) also gave a concise assessment of the institution’s technical support: “We have a very committed systems and networking dept that helps with those technical challenges” (Participant 10, Institution F). Participants 5 and 6 (Institution C) simply stated that technical support was an enabler of instructional technology at their institution without elaborating.

Three participants cited communication and strong relationships between instructional technologists and technical support staff as a key enabler of instructional technology. Participant 3 (Institution B) stated that, in addition to its focus on the institutional mission, the technical support group excelled at maintaining strong communication lines between themselves and the instructional technologists:

> [The instructional technologists are] responsible for user support, [while the technical support group is] responsible for technical support, and the real issue is making sure we have good communication between the two teams and not

> anything else. It is so clear within the [IT] department that the academic program is a priority, so [the instructional technologists] really don't have a lot of trouble. (Participant 3, Institution B)

Participant 7 (Institution D) succinctly stated that "we've got strong relationships with other groups in IT and we get all the support that we need. There's really no place that's lacking there" (Participant 7, Institution D). Participant 11 (Institution F) attributed the effective technical support of instructional technology to the structure of the IT department, which no other participant did. "I believe [the excellent coordination of instructional technology and technical support] is part and parcel of the fact that we are an integrated department. The lines of communication are strong [because the technical support staff] are just down the hall [from the instructional technologists]," the participant said (Participant 11, Institution F).

Two participants cited good support from the open source community as an enabler for instructional technology at their institutions. Participant 2 (Institution A) cited the CLAMP community ("Collaborative liberal arts moodle project", 2009) as an asset that "we are really starting to see the benefits of" as part of the institution's use of Moodle ("Moodle.org: Open-source community-based tools for learning", 2009) (Participant 2, Institution A). Participant 9 (Institution E) had more generic praise of open technology user communities, saying that the support was out there, "[y]ou just have to know who to talk to, which forums to post to, and that sort of thing" (Participant 9, Institution E).

Lastly, one participant did say that commercial product vendors were an enabler of instructional technology. Participant 12 (Institution G) was satisfied that "we've got pretty good tech support from [commercial product vendors] and I can call them up with any questions I have" (Participant 12, Institution G).

Pedagogical Support

Barriers.

Three participants stated that there were a range of working relationships with faculty members that can be barriers to instructional technology (Participants 4, 8, and 10). Three participants believed that the reason that pedagogical support of instructional technology was a barrier because faculty members do not include instructional technologists in their curricular planning (Participants 1, 3, and 6). Three participants suggested that faculty did not have enough venues to share instructional technology experiences with each other or with instructional technologists (Participants 3, 4, and 13). One participant suggested that the physical location of instructional technology staff members affects the quality of the interaction with faculty members (Participant 13). One participant made the suggestion that faculty members lack the ability to give technical feedback about tools under development (Participant 9).

Three participants, two of whom had experience as faculty members, stated that there were a range of working relationships with faculty members, some of which were barriers to instructional technology. Participant 4 (Institution B) provided an excellent reflection on the give and take of these relationships:

> [How faculty view the instructional technology staff] varies based on the individuals involved and the extent of the relationship or interaction. Most faculty who work with us on core support projects see us as collaborators. I think you have to present yourself that way, as well. And if you don't present yourself as a peer and collaborator, then that may not necessarily be the relationship that will develop. I find that [the reticence to view instructional technologists as collaborators] a holdover from the 'techno geek' that would come out of their closet and fix the computer and run back in' model that technology was for so many years. For so long, technology was such a weird language, [it was] inaccessible, [and it was] hard for the average individual to understand the programming…. That's gone. So here's where I think the real need for us to act as peers and collaborators comes from. We need to be able to push back on the software that's being developed and change it and modify it to set learning goals and needs. (Participant 4, Institution B)

Participant 4 stressed that this typically tentative relationship between faculty and instructional technologists underscores the need for faculty and instructional technologists to interact so that these assumptions about how instructional technologists and technology work can be altered. "Having faculty come and look at what we're offering and be able to give us feedback break[s] the assumption that this is the only way instructional technology can be structured. They need to be able to feed into how they're using the technology and how we're going to change it. [Furthermore,] instructional technologists should be willing to modify and manipulate it as well," the participant said (Participant 4, Institution B).

Participant 8 (Institution E) echoed these perspectives, saying:

> You have some faculty that just are 'I want x, give me that' and they don't want any consulting or interaction at all about [the] application [of the tool in their course]. And then you have others who are interested in something who have seen something they think is cool but [approach with] 'Can we tell them more about it?'. And then we have some where it's … become a tradition … at the end of the semester [that] they call me and say 'We want to do something cool next semester. We have this one idea but what do you think?' In other words, 'feed us,' which is awesome. So we have the whole spectrum. (Participant 8, Institution E)

Participant 8 did not offer any opinions about how to improve the collaboration between faculty members and the instructional technology staff. Perhaps this suggests that, unlike Participant 4, Participant 8 and the instructional technology staff accept the less collaborative relationships with some faculty as intractable. Conversely, Participant 4 sounded eager to continue improving that collaboration.

Participant 10 (Institution F) also expressed that the institution had a range of relationships with different types of faculty members. "I think it's feast or famine," the participant said (Participant 10, Institution F). "It seems that we have the same few faculty who are always interested in teaching with technology and we have the same few faculty who are never going to give up their chalk for anything" (Participant 10, Institution F). Participant 10 singled out new adjunct faculty members and younger faculty members (presumably tenure-track and adjunct) as constituting most of the collaborations with faculty that the instructional technology staff at Institution F experience. "[These] adjuncts and younger faculty coming into campus for the first time will be the ones who consume the majority of our resources because they are coming out of environments where they're used to that already," the participant said (Participant 10, Institution F). The participant also made distinctions based on discipline. "Not surprisingly," the participant said, "the scientists are more interested in the technology than the humanities. But we do have a few in [the] humanities who are very interested in teaching with technology. But there are others who are not" (Participant 10, Institution F). The participant speculated it was because "they are older faculty. The ones who are not [interested in teaching with technology] have been here a long time and they are older faculty, and the way they've done [they done their teaching] is the way they've always done it and they see no reason to change" (Participant 10, Institution F).

Three participants believed that the reason that pedagogical support of instructional technology was a barrier because faculty members do not include instructional technologists in their curricular planning. Participant 1 (Institution A) voiced a concern that the independent nature of the faculty creates situations where "they'll be [using or creating an unsustainable instructional technology tool] and we find out after the fact" (Participant 1, Institution A). Rather than try to force their way into the planning, the participant speculated that having an intermediary collaboration space, “maybe something like a teaching learning center,” and working with the faculty development coordinator would be a mechanism that would allow the instructional technologists to enter into collaboration with the faculty members (Participant 1, Institution A).

Participant 3 (Institution B) also voiced a concern about faculty creating situations where the instructional technologists were called in to support an instructional technology tool that had been implemented but was cannot be sustained any longer. However, the situation could have been avoided, and a similar tool could have been implemented, through inclusion of the instructional technology staff members in the planning phase. Participant 3 believed that even something as simple as getting in the same room as a faculty members could have helped avert these situations. “Getting [planning info about faculty ideas and plans] is still the barrier. If we could get faculty to brainstorm in our presence, even into a recording device and send us the recording, it would be very helpful,” the participant said (Participant 3, Institution B).

Participant 6 (Institution C) frequently has the experience of having

> faculty look at me … dumbfounded when I say 'Oh this is great. You’re teaching two sections next semester. Have you considered that maybe you do the assignment one way with this group and different with the other group and see how their scores show up or see how well their papers come together because of the different tools they used?' They just look at me like I have four horns when I

> suggest that. It just hasn't ever occurred to them [that I can offer pedagogical advice]. (Participant 6, Institution C)

Participant 6 did not elaborate upon the reason for this cultural rift between faculty and instructional technologists, nor did the participant elaborate upon how to reduce it.

Three participants suggested that faculty did not have enough venues to share instructional technology experiences with each other or with instructional technology staff members. Participant 4 (Institution B) raised an interesting point that the problem was not simply that faculty and instructional technologists do not interact, and noted that

> the broad outreach efforts [for faculty input] need to be better designed and need to be programmed so people expect them,… understand what to expect, and come with [experiences] they want to put on the table as opposed to [the instructional technologists] asking, 'What do you think about this? What do you think about that?' I know lots of institutions have faculty fairs …, but those types of activities generate better results in part because faculty get to talk to other faculty, and that feeds into the process much better than us trying to talk to a group of faculty. (Participant 4, Institution B)

These observations complement those of Participant 4's colleague, Participant 3. Participant 3 admitted that "[g]etting [planning info about faculty ideas and plans for courses] is still the barrier. If we could get faculty to brainstorm in our presence, even into a recording device and send us the recording, it would be very helpful" (Participant 3, Institution B).

Participant 13 (Institution G) cited a basic lack of trust among the faculty towards the instructional technologists:

> It's been '[We faculty] are separate and what can you [instructional technologists] tell us about teaching?' We go to conferences and we know more about Generation x,y, z and all that and how that impacts who's in their classroom, and a lot of the professors will ignore it, but we still have to struggle to make that connection. (Participant 13, Institution G)

Participant 13 suggested that a Center for Teaching and Learning where faculty can interact with each other and instructional technology staff members was one potential answer for this lack of regard for the instructional technologists. The comments by Participant 13 and others about the potentially positive role a Center for Teaching and Learning can play in fostering interaction between faculty members and instructional technology staff members indicate an assumption that faculty positively regard these types of centers for teaching and learning. No literature on the subject of faculty member attitudes towards centers for teaching and learning was found to support or dispel this perspective among instructional technology staff members about them.

While Participants 3 and 4 advocated more interaction with faculty in the planning stages of their courses, Participant 6 (Institution C) stated that faculty members do not bring in instructional technology staff members at the conclusion of a project or semester. The Participant stated that "a lot of times we work with [a faculty member] all semester, or we work with their students, but we might not ever see the end product, and we may not ever have that follow-up conversation [about] 'how did it go?' It depends on who it is" (Participant 6, Institution C). Rather than wait for faculty members to explicitly open up that opportunity, the instructional technologists at Institution C were at a point where "we may be able to implement some things that would help us to be more diligent at circling back at the end [or] having a debriefing with the faculty member [or] getting them to answer questions about learning objectives and how well those were met, but it's still really an afterthought for the faculty" (Participant 6, Institution C).

Participant 13 (Institution G) was the only participant to suggest that the physical location of instructional technologists affects the quality of the interaction with faculty members.

> We are for the most part all in the library as an IT organization, which tends to be a good thing in [gathering] people together. We were all over campus before this and not in a good way. We were just wherever people could find room. So one of things we're doing [in the new space] is we're having office hours in the academic areas to sit around and be available up there. (Participant 13, Institution G)

Lastly, Participant 9 (Institution E) made the suggestion that faculty members lack the ability to give technical feedback about tools under development. "And to be fair to the faculty, they're not necessarily focused on giving [technical] feedback, but technical developmental critique would be useful to a developer," the participant said (Participant 9, Institution E). Thus, while faculty members frequently do not always feel comfortable trusting that instructional technologists know the subtleties and considerations of what it takes to teach in their discipline, instructional technologists do not necessary trust that a faculty member knows how to give substantive feedback about tools under development.

Enablers.

Three participants made arguments that faculty members' willingness to give ample feedback about instructional technology was an enabler (Participants 1, 5, and 7). Two participants stated that strong relationships with faculty members were an enabler (Participants 2 and 11). Two participants stated that they work with faculty members who view the instructional technology staff members at their institutions as collaborators, and it was an enabler (Participants 6 and 12).

Three participants made arguments that faculty members' willingness to give ample feedback about instructional technology was an enabler. Participant 1 (Institution A) was happy that

> faculty here are pretty comfortable giving us feedback, both positive and negative. If something isn't working they're going to tell us and tell us exactly why it's not working or why they don't want to use it again. So in that sense i think we have really good, clear communication from people. They don't feel like they have to say something because they don't want to hurt somebody's feelings or they're concerned about something else. They're pretty honest about things. (Participant 1, Institution A)

Participant 5 (Institution C) made a similar statement that there was an excellent informal system of feedback about instructional technology. "So the question was," the participant asked, "should the feedback become formal and to what degree should it get formal and how do we formalize it?" (Participant 5, Institution C) If it was not formalized, Participant 5 was confident that the staffing level was sufficient then they could scale up the informal feedback that instructional technologists currently gather. Similarly, Institution D also gathers information about instructional technology through informal one-on-one interactions between instructional technology staff members and faculty members. "I think it would be more beneficial to have some departmental time on a regular basis where we could talk about issues that are pertinent to that specific department," the participant said (Participant 7, Institution D).

Two participants stated that strong relationships with faculty members were an enabler. Participant 2 (Institution A) reported that "we have a very strong relationship with our faculty members, so because of that I think we're able to do more. Our faculty value our support a lot and really respect what we're doing and because of that we're able to do even more and have more" (Participant 2, Institution A). Participant 11 (Institution F) stated that the instructional technology staff members at the institution had built strong, informal relationships with faculty members. "It's a matter of getting out of the office here and visiting the campus people in different locations," the participant said (Participant 11, Institution F). "I have a natural venue for that in that I bop around to the different classrooms…. [Faculty members] see me at the door and a couple hours later one of them will say 'Oh by the way do you have a few minutes? I'd like to talk to you about something'" (Participant 11, Institution F).

Lastly, while some instructional technology staff members above described not being viewed as collaborators by faculty members as a barrier, two participants stated that they work with faculty members who view the instructional technology staff members at their institutions as collaborators, and it was an enabler. Participant 6 (Institution C) reported that

> For the faculty [with whom] we have really good relationships – definitely [it is an enabler]. I have a few faculty that we've worked with for multiple semesters and we continue to adapt and modify and continue to push things and get a better product and get better student engagement. And to be able to document it so for some faculty members is a beautiful thing. But it's just not across the board. (Participant 6, Institution C)

Participant 12 (Institution G) made a similar statement that "when we do work with faculty, … they are very supportive of that help. We'll get lots of positive compliments to [our supervisor] and to their Chairs on how helpful it was to work with [the instructional technologists]. So they need the help and they appreciate the help when they get it," the participant said (Participant 12, Institution G).

Administrative Support

Barriers.

Five participants stated that the Administrative Support they receive shows that the Administration at their institution values instructional technology to some degree, but each of these participants qualified their statement with additional details about how the Administrative Support they receive was lacking or was a barrier (Participants 1, 2, 6, 8, and 9).

No participants stated that the Administrative Support was an outright barrier. Five participants stated that the Administrative Support they receive shows that the Administration at their institution values instructional technology to some degree. However, each of these participants qualified their statement with additional details about how the Administrative Support they receive was lacking or was a barrier. Participant 1 (Institution A) stated that the participant wished “the administration would learn more about what we do, but I don’t know how we can do that. I think sometimes [the instructional technology here is] taken for granted, [that the administration thinks], ‘Yeah, that’s working…. It’s fine’” (Participant 1, Institution A). This observation informed an opinion held by the participant that faculty members frequently do not involve the instructional technology staff members in the technology innovation they undertake and only inform the instructional technology staff members after the fact. For these reasons, the participant believes that having a teaching and learning center would foster better collaboration between faculty, instructional technologists, and the faculty coordinator. Participant 2 (Institution A) contextualized what appeared to be the president and administrators taking instructional technology for granted:

> I really feel that the administration as a whole really does value what we are doing. We have just taken a back seat to all the other changes that are going on [due to the new president's initiatives]…. I really do believe that it's a priority [for the new president and new administrators], but I think the philosophy is that [the current instructional technology approach] is working right now and [they want to] focus on things that are at a higher level that maybe do need to be changed. (Participant 2, Institution A)

Like Participant 1, Participant 6 (Institution C) believed that the administrators do not fully understand what instructional technology was and what the instructional technologists do. "[The administration] say[s] they want people to be innovative and use technology but are they themselves?" the participant said (Participant 6, Institution C). "And are they building incentives or disincentives for people who choose to or not to?   A lot of times the … administration just kind of go … cowboy and [facilitate technology purchases] themselves, … instead of … coming back to the instructional technology group" (Participant 6, Institution C). Participant 6 gave an example of iPad and classroom clicker purchases among the faculty that were tacitly approved by the administration but were not made in consultation with the instructional technology staff members. "I just don't feel like the support is there across the board to be able to make some decisions and hold people accountable, and that comes back to the administration.

A lot of times they … just don’t even consider work that has already been done [on a certain technology by the instructional technologists]” (Participant 6, Institution C).

Participant 8 (Institution E) described the support received from the previous CIO. At the time of the interview with Participant 8 in the summer of 2011, the CIO position was empty. The former CIO “was a very strong advocate [who was] definitely trying to shield [the instructional technologists], preempt things on campus, and create a space for innovation to happen” (Participant 8, Institution E). From the tenor of Participant 8’s statements, the participant seemed resigned to the possibility that the next CIO may not be an advocate for instructional technology. Participant 9 (Institution E) did not have glowing praise for the administrative support for instructional technology. Like Participants 1 and 6, Participant 9 portrayed administrators as lacking knowledge about instructional technology at their own institution:

> Some administrators don’t necessarily understand the technology about which they are talking. They are armchair technologists, and we tell them 'If you want to implement that then it’s going to take 14 weeks of development and you yourself are going to have to input the data that’s necessary to get these … charts up and running.’ And it’s like 'Oh, I didn’t know it was going to take that long. Forget it then.’ (Participant 9, Institution E)

Enablers.

Two participants indicated that there was strong administrative support for instructional technology among the president, provost, CIO, and the vice president for business management (Participants 10 and 11). One participant stated that the administration was pushing for a cultural change to make digital scholarship and the use of instructional technology in pedagogy accepted parts of the scholarship and teaching components in the tenure process (Participant 5). One participant stated that the administrative support at the institution was subtle and in the background, but not a barrier (Participant 7). One participant stated the president and administration were giving ample support to the instructional technology staff because they perceive the latter as actively supporting the fundamental mission of the institution, which was improving student learning (Participant 12). One participant stated that the IT administrators understand the primacy of the academic program to the institution and recognize the focus of the instructional technology staff on it with their support (Participant 3).

Five participants described the Administration Support for instructional technology as a positive enabler. At Institution F, Participant 10 stated that the longtime CIO was a champion of instructional technology who sits in on higher level meetings, bringing back questions about technology or its application to the instructional technology group. Overall, the focus of the institution, and the administration, was on students and the learning environment, “[s]o if we’re making advancements in teaching and learning, then they’re always very supportive of that…. [I]f we can show how [a tool] can be used in a particular classroom or discipline,” then they get support (Participant 10, Institution F).

Participant 11 (Institution F) concurred with Participant 10, further describing how they receive strong from the president, provost, and even the vice president for business management. When asked how a vice president for business management plays a role in supporting instructional technology, Participant 11 replied that the Vice President "is instrumental in reorganizing work flow around campus depending on the changes in personnel that are going on. [The Vice President] has the responsibility to make sure that [these changes take place] in a constructive way that doesn't impact major programs around the campus," including instructional technology (Participant 11, Institution F).

Participant 5 (Institution C) stated that the administration at Institution C was pushing for a cultural change to make digital scholarship and the use of instructional technology in pedagogy accepted parts of the scholarship and teaching components in the tenure process. "I don't think that cultural shift could have happened from the ground up. We've been trying that for years with no success. It wasn't until the top down approach [was explored] that we saw some cracks so I think where we are is just right," the participant said (Participant 5, Institution C). This statement was a clear contrast to the Participant 6's questioning of how "[the administration says they want faculty] to be innovative and use technology [in scholarship and teaching], but are they themselves, and are they building incentives or disincentives for people who choose to or not to?" (Participant 6, Institution C). The beginnings of a cultural change at Institution C may be apparent to Participant 5, but they were not yet apparent to Participant 6. Participant 7

(Institution D) stated that “I never feel that anybody’s standing in my way, and that’s a nice feeling,” indicating that the administrative support at the institution was subtle and in the background, but not a barrier (Participant 7, Institution D).

Institution G had a new president begin recently, and Participant 12 related that “if [the president and administration] see you’re putting your resources towards the fundamental [mission] of the institution, which is improving student learning, then [your initiatives are] supported really, really well” (Participant 12, Institution G). Participant 13 elaborated about the change in culture and accountability that the new president fostered:

> People [in the instructional technology group] said right away, “[T]he good news is we’re going to have some attention, some resources. [The] bad news is suddenly we’re not this backwater where we work and a few people care and most people don’t.” Now we’re going to be visible and our performance is going to be measured and available for other’s to take shots at (Participant 13, Institution G).

These changes were positive for the instructional technology team, according to Participant 13.

Lastly, Participant 3 (Institution B) interpreted the question as an inquiry about IT administrators, not institutional administrators, so the participant’s comments relate to the former. Regarding them, “[the] team leaders in IT…understand the primacy of the academic program [to the institution], and [the instructional technology staff] get lots of support [due their focus on the academic program]” (Participant 3, Institution B). While this response does not directly address the administrative support from institutional administrators, this researcher still interprets this as enabling (albeit potentially tacit) administrative support for instructional technology by the institutional administrators. IT administrators would likely not support an instructional technology program that focuses on the academic program of the institution if the institutional administrators had conflicting goals.

The Final Three Sections

In addition to utilizing the RIPPLES Model to the study instructional technology decision making, a secondary goal of this study was to append additional questions about other developments that have played a role in the instructional technology environment at the participating institutions: Information Technology Developments, Instructional Technology Developments, and the Higher Education Marketplace. It should be noted that every participant did not necessarily provide their perspective on each of these last three sections. Some had insights on less than three of the sections. Some saw the three sections as a continuum, so they gave responses that applied to all three sections. Thus, Participants 1 through 13 may not be present in all three sections.

Information Technology Developments

Section 9 created a space for a dialogue about new or influential information technologies that had an impact on the types of instructional technology tools that these institutions were deploying. Six participants cited mobility and mobile devices as a key information technology that promises to affect instructional technology (Participants 1, 3, 4, 5, 6, and 10). Five participants stated that cloud computing and Web 2.0 services were a key development in the information technology sector that will impact instructional technology (Participants 2, 4, 6, 7, and 13). Three participants cited video conferencing and online learning as an important emerging trend in information technology (Participants 3, 4, and 10). Two participants stated that the emerging practices of digital humanities will have an impact on instructional technology (Participants 3 and 4). Two participants stated that changes in classroom technology were already having an impact on instructional technology (Participants 10 and 11). One participant stated that GoogleApps for Education and its open information architecture had a profound effect on the institution (Participant 12). One participant stated that eTextbooks and electronic textbook supplements were beginning to show increased adoption among faculty and students (Participant 3). One participant stated that the ability of virtual servers to host classroom management software made managing classroom technology much easier (Participant 11).

Six participants cited mobility and mobile devices as a key information technology that promises to affect instructional technology. Participant 1 (Institution A) anticipated that mobile devices will have a large impact on teaching and learning. In the near term, mobile devices were beginning to influence many aspects of technology at the institution. "One of the projects this summer [of 2011] is the network [team is] expanding the wireless on campus" to meet the demand for mobile connectivity on campus (Participant 1, Institution A). And the need for institutional apps was exposing the need for app development needs among the staff. For the time being, the institution was utilizing student interns to development institutional apps.

Participant 3 (Institution B) noted that the proliferation of mobile devices creates challenges for offering a consistent experience for students. This scares the overall IT group at the institution, as "[the members of the IT group] have no idea how they can guarantee any kind of consistent behaviors across all of these devices or how they could possibly support them, and they are really nervous about that. I don't blame them. I understand [their reluctance]" (Participant 3, Institution B). However, it will not stop the momentum towards this transition. Participant 4 (also at Institution B) did not echo the fear among IT staff, saying that "a cross-team committee has been looking at iPads, smart phone apps, and alternatives that could be pulled into education. They've pulled together web pages of resources that we're sharing out with faculty. I'm not sure where that's all going to go but there's an active group working on that" (Participant 4, Institution B).

Participant 5 (Institution C) applied the "core vs. external" perspective to upcoming information technology developments that the participant used to describe the institution's approach to instructional technology, in general. The engine behind information technology developments that will eventually impact higher education were the consumer expectations of students, the participant states. Students were pushed by "what's available, how quickly [can students do it], … what can [they] do, and where can [they] do it" (Participant 5, Institution C). Institutions were left to decide how much they can or should accommodate. As an example, the participant stated that in several years, students will arrive on campus with mobile devices that could potentially have access to commercial cellular data networks that are faster and more reliable than the wireless network that institutions can provide. Institutions will encounter a time when they will need to decide whether to maintain a wireless network when that happens. In general, the participant stated, "for each institution, it's going to be a strategic choice as to what those things are or are not, and I think that's really where the game is now. Institutions trying to figure out that matrix of what do we do and what do we not do, why do we do it, [and] does it all make sense" (Participant 5, Institution C). The future that Participant 5 envisions was "some sort of hybrid environment where there's some things the institution should do and rightfully own and rightfully manage, and other things not" (Participant 5, Institution C).

Participant 6 (Institution C) did not offer a high level assessment like Participant 5. Like other participants, the participant was more concerned with how to meet the challenge of making course content available to faculty and students through mobile devices. As such, the participant stated that the web development team within IT "is trying to get everything lined up so we can develop our own web services…that can be consumed by wherever we need it to be" (Participant 6, Institution C).

Participant 10 (Institution F) emphasized the likelihood of mobile devices affecting instructional technology, but the participant also reiterated the challenges that rural institutions face and the question of what the future holds for them. Cell phone network coverage was very limited in the institution's vicinity, emphasizing the need for a strong wireless network maintained by the institution. "Unless you're connected to the wifi network," the participant said, "mobile computing is painful" (Participant 10, Institution F).

Five participants stated that cloud computing and Web 2.0 services were a key development in the information technology sector that will impact instructional technology. Participant 2 (Institution A) described how the emergence of this trend "really pushed us to look at all the tools that are out there" before recommending any to faculty and students (Participant 2, Institution A). Participant 2 described being wary of the risks of cloud computing tools. "We were burned a couple times," the participant said, "when we recommended … [a cloud-based service] and it [ceased to] exist, and all the people who had files in them lost them" (Participant 2, Institution A). Having access to free tools can be a great opportunity, "but you also have to consider how much support [is available and the tool's sustainability] because it's not really free. You just don't have to pay that subscription cost" (Participant 2, Institution A).

One of the concerns that Participant 4 (Institution B) had about cloud computing tools focused on helping students understand how to use them in concert with the tools that were developed by or hosted by the institution. "[S]tudents [do not] understand they have all this Google space and maybe they could use the storage we're providing [on campus] just for those things that aren't going to nicely load up to the [Google] area," the participant said (Participant 4, Institution B). Thus, the implementation and fostering of fluency with cloud computing tools will require the attention of instructional technology staff as they become part of the information technology landscape.

Participant 6 (Institution C) stated that the institution was in the midst of many initiatives at the time of the interview, “mostly in the administrative side,” and that cloud computing and Web 2.0 tools were a large part of those initiatives (Participant 6, Institution C). Many administrative functions were in the process of being redefined and delivered with recently developed, cloud-based information technologies, such as a document scanning and sharing system, and a mobile-accessible central institutional data repository.

Participant 7 (Institution D) was excited to report that “the announcement of the Chromebook availability is…enormous…from an infrastructural stand point, which has an enormous cascading effect [on] IT” (Participant 7, Institution D). The Google Chromebook, which the institution was examining as the preferred laptop for students, was a laptop computer that operates entirely within the computing cloud. There are no programs installed on the computer. All of the tools that run on the Chromebook reside in Google’s computing cloud. The result was a very fast, secure computer that was updated automatically by Google, and the cost for a student to rent the computer can be $20 per month (“Introducing the Chromebook”, 2012).

Lastly, Participant 13 (Institution G) sounded a cautionary perspective on cloud computing, just as Participant 2 did. Cloud computing, the participant said, “is one of the biggest [emerging trends] because it provides resources, but it also splits your resources in certain ways. It makes it hard to say that the institutional technology 'lives' in one resource" (Participant 13, Institution G). Participant 13 also stated that the cloud had a tendency to shift. "Just when we got to the point where we were getting things consistent for people," the participant said, "now they're getting to be inconsistent again [because cloud resources shift and change]. People like consistency and we like consistency, but you can't always provide it [in the cloud computing realm]" (Participant 13, Institution G).

Three participants cited video conferencing and online learning as an important emerging trend in information technology. Participant 3 (Institution B) was satisfied to see how quickly guest lecturers and speakers were being brought in via various video conferencing tools. "It is so much less expensive to bring somebody to campus that way. In addition, it's much easier to fit their schedule if you can bring them to campus that way," the participant said (Participant 3, Institution B). The participant speculated that video conferencing could be the medium that allows inter-institutional departments to form. "I can see on a liberal arts campus, where small is the watch word, [where] some of these departments are going to be restructured where they don't try to keep all of the [academic] specialties within a single campus," the participant said (Participant 3, Institution B). For Participant 4 (Institution B), the benefits of video conferencing were clear – for interviewing job candidates, for bringing in outside speakers – yet the challenge was "trying to find ways to meet all those different video conferencing needs without having fifteen or twenty different [technology] solutions that all have to be supported by somebody, somehow" (Participant 4, Institution B).

Participant 10 (Institution F) was the only participant to foresee an online learning initiative at their institution using the video conferencing platform. Institution F, the participant said, was considering offering summer courses to their students online. There had been recent meetings about how "our students are leaving in the summer [and they] are taking classes at local community colleges to fulfill their basic requirements" (Participant 10, Institution F). The administrators at Institution F want to assess whether online courses can be offered so that the students maintain their connection to the institution over the summer and their revenue dollars stay with the institution. "That's a conversation that recently got opened up … [and it] surprised the daylights out of me that we might actually be going for some online classes next summer," the participant said (Participant 10, Institution F). These conversations about online courses were being spurred by the financial challenges at the institution, "where before you would have been ridden out on a rail for even thinking it" (Participant 10, Institution F).

The two participants from Institution B stated in this section of the interview that the emerging practices of digital humanities will have an impact on instructional technology. Participant 3 stated that digital humanities will emerge slower than other developments, but it is coming nonetheless. As it does, it will "definitely increase our needs for digital asset storage…. We're going to need some high performance computing resources that have lots of storage and fast processing in order for digital humanities to really be effective, because they're very computing intensive activities," the participant said (Participant 3, Institution B). Participant 4 echoed these sentiments with additional details about how the digital humanities were already demanding more of the IT and instructional technology groups:

> [Digital humanities] are upsetting the apple cart because we are developing an institutional repository,… a collaborative network working space, and a digital publication platform. That's going to have a lot of impact on network services…. [I]t's also going to have a lot of impact on instructional technology because any faculty project that we support through this infrastructure we're developing will have to have a course and curriculum component that is associated with the research we are helping them do. So that's going to feed back into service and demands on instructional technology and IT in general. (Participant 4, Institution B)

The two participants from Institution F stated that changes in classroom technology were already having an impact on instructional technology. Participant 10 described the switch from analog to digital devices as a major change that was already underway, and one that will come at cost:

> We have a hundred classrooms with fixed installations in them and projectors that are aging…. [W]hat do you do when you swap them out and … [the new device is digital]? ... [Y]ou have to look at all of your hardware that controls the projector

> and everything.… [T]here are new technologies that can enhance classroom experience, but they are costly upgrades. (Participant 10, Institution F)

Participant 11 anticipated the emergence of new kinds of classroom technologies that will improve the interaction of students with faculty and each other. At the institution, they have tested

> a portable cart with 24 tablet [computers], and they use it primarily in some of the chemistry and physics courses where they have teams of students within a class putting together projects that are discussed in open class…. [T]he faculty member can take any group and put their [screen] up on a secondary screen and their primary instructors presentation materials are [highlighted] on the primary screen. (Participant 11, Institution F)

Participant 11 said they were also assessing an application for iPads that would allow the faculty member to control the room (the projector, the lighting, the audio) from their iPad.

The remaining three topics were only cited by individual participants. Participant 12 (Institution G) stated that GoogleApps for Education and its open information architecture had a profound effect on the institution. The participant also cited the positive effects of the Open Source Movement and Digital Media and the ease with which students can create content, having mentioned the participant had recently "published a [piece] on…multimedia projects in liberal arts colleges and how they are useful as student learning projects" (Participant 12, Institution G).

At Institution B, Participant 3 stated that eTextbooks and electronic supplements were “beginning to pick up speed in terms of faculty adoption and a little bit in terms of student adoption” (Participant 3, Institution B).

Lastly, Participant 11 (Institution F) praised the ability of virtual servers to host classroom management software. We put the room management software on a virtual server so that…I can [remotely manage] about 60% of our classrooms…. Occasionally static electricity upsets the programming on our control panels, and I can deal with that [remotely]” (Participant 11, Institution F).

Not all participants chose to provide answers to Section 9 specifically. When presented

Instructional Technology Developments

Like Section 9, an open-ended question was used to foster dialogue about specific instructional technology developments and trends that were affecting instructional technology at the participants’ institutions. Eight topics were discussed by the participants, beginning with the topics cited most frequently. Two participants described the emerging importance of Learning Management System customization (Participants 2 and 10). Two participants cited the emergence of e-portfolios as an important emerging trend within instructional technology and higher education (Participants 4 and 7). Two participants raised the increasing use of external cloud services as a potential location for hosting instructional technology tools (Participants 8 and 13). One participant believes that eTextbooks were an important instructional technology to monitor closely (Participant 1). One participant mentioned iPads as an emerging instructional technology trend (Participant 7). One participant stated that improved integration between the campus data system and campus websites will have an impact on instructional technology (Participant 7). One participant was confident that mobile devices will have a large impact on learning in the classroom, though there was resistance to the idea among the faculty (Participant 12). One participant believes that clicker services will continue to grow and take advantage of the ubiquity of mobile devices (Participant 12).

Two participants described the emerging importance of LMS customization. Participant 10 (Institution F) related that "what drives us here is how can we take…web 2.0 [tools] and integrate [them] into Moodle in an effective fashion," allowing it to actually be an interactive space rather than just a repository (Participant 10, Institution F). At Institution A, Participant 1 said that they had switched to the CLAMP version of Moodle. The participant did not give a specific reason for the switch, but it was very likely due to the responsiveness of the CLAMP community to the needs of its members (Participant 1, Institution A). These needs include finding and resolving bugs in the Moodle LMS, sharing in-depth documentation about how to use and adapt Moodle LMS features, and hosting events each year during which members can learn to customize the Moodle LMS. These needs were not necessarily unique to liberal arts institutions, but the member institutions of CLAMP decided that tackling them with colleagues from other liberal arts institutions would be more realistic and produce a better technological outcome than attempting to create a similar organization among instructional technology professionals from other types of institutions of higher education ("Collaborative liberal arts moodle project", 2009).

Two participants cited the emergence of e-portfolios as an important emerging trend within instructional technology and higher education.[9] At Institution B, Participant 4 stated that "that's something else we've heard some students need. We just don't have anything in place nor … [have we] developed that process yet, and we should. It's kind of a disservice that we haven't" (Participant 4, Institution B). Participant 7 (Institution D) echoed this in the description of how the faculty were increasingly interested in having students create e-portfolios, but the instructional technologists had not found a good platform for faculty and students to use. "We're looking at potential solutions for that [within] Google Sites [templates] using some app scripts," the participant said (Participant 7, Institution D).

Two participants raised the increasing use of external cloud services as a potential location for hosting instructional technology tools. The first was Participant 8 (Institution E), who said that they were beginning to "look at not outsourcing [functions to external services like Google Apps] but using [services like] Amazon's EC2 Cloud to put our test server infrastructure there as opposed to hosting stuff locally" (Participant 8, Institution E). As mentioned elsewhere in this study, hosting test environments outside of an

---

[9] An e-portfolio is an online portfolio of evidence (text, digital files, images, or multimedia) that is assembled and managed by a user. E-portfolios can be used as a demonstration of an individual's abilities or qualifications.

institution can allow instructional technologists to avoid organizational barriers that prevent them from freely experimenting with and innovating instructional technology. However, Participant 8 hopes to no longer host production servers locally for cost reasons. “Think about what it costs to build and maintain server rooms,” the participant said. “From an HVAC system [to cool the server room] and electricity standpoint, it’s pretty stunning.” The major impediment that was in the way of this was “discomfort [among stakeholders] with us not being in control of data” (Participant 8, Institution E).

Participant 13 (Institution G) raised the issue of support versus access, also raised earlier by Participant 5 (Institution C). “Are you going to provide and support specific tools,” the participant said, “or are you going to provide access to tools that are already out there in some form or another?” (Participant 13, Institution G) Simpler cloud-based tools “don't always do things as well [as proprietary software], but they do things that maybe more people can [quickly learn to] do” (Participant 13, Institution G). And these simple cloud-based tools get faculty access to a tool for free or for a lower cost than proprietary software.

Participant 1 (Institution A) believes that eTextbooks were an important instructional technology to monitor closely. At the moment, the participant stated, “eTextbooks are being developed for large schools with large student populations, and I think smaller colleges are getting lost in the shuffle because we don’t have the numbers [to propel adoption among faculty and students), so [we are] trying to think through …

who will end up being the survivors of it because, you don't want to invest in something that might disappear" (Participant 1, Institution A).

One participant mentioned iPads as an emerging instructional technology trend. Participant 7 (Institution D) mentioned that "[w]e have quite a few iPads on campus right now, and our [IT site web logs] indicate the iPad iOS is the largest operating system [among site visitors on campus]" (Participant 7, Institution D).

Participant 7 also stated that improved ERP integration with the campus portal will have an impact on instructional technology. That integration "is always [an] elusive [goal], and we're finally going to get off a very old data system and get onto [a modern system]. So now we stand a chance of being able to [implement] that portal idea, and that will be something that will be critical to a lot of pieces to the IT puzzle" (Participant 7, Institution D). The participant's comments indicate that future types of instructional technology tools will be enhanced by their ability to tap into the data in institutional ERP systems about students and the work they were undertaking in their courses.

Participant 12 (Institution G) was confident that mobile devices will have a large impact on learning in the classroom. However, "we do have a significant number of faculty who are so resistant to mobile devices in the classroom because they are [seen as] a disruptive factor…. Some [faculty] talk about banning [devices from the class] all together" (Participant 12, Institution G).

Lastly, Participant 12 also believes that clicker services will continue to grow and take advantage of the ubiquity of mobile devices. Faculty at Institution G experimented with clickers, “but the trouble with clickers is they’re tied to a room and hard [for faculty] to reserve, but [new mobile device-based tools] like Pollanywhere.com [(“Polleverywhere.com”, 2012)] [are] going be huge” (Participant 12, Institution G).

Higher Education Marketplace Developments

Finally, it was important that this study include participants’ thoughts on other trends and developments in and beyond higher education that were affecting the instructional technology landscape and the overall environment at their respective institutions. This section of the interview yielded eight categories of responses from the participants’ responses, beginning with the most frequently cited categories of responses. Three participants described how changing student demographics and dynamics were affecting instructional technology (Participants 3, 6, and 9). Three participants expressed concerns over the level of information literacy among students and the need to improve it (Participants 4, 11, and 13). Three participants raised the issue of eroding financial resources as a major headwind for their institutions (Participants 7, 9, and 11). Two participants cited admissions uncertainty and fluctuation as an overarching trend that was affecting their institutions (Participants 2 and 10). Two participants from different institutions indicated that finding qualified personnel for the instructional technology group had been a challenge (Participants 4 and 10). One participant mentioned the emerging tension between faculty and students over how the classroom interaction will be structured in the future (Participant 6). One participant mentioned Open Content as another emerging phenomenon that liberal arts faculty members have not anticipated (Participant 6). One participant suggested that the ways in which institutions connect to students before they arrive on campus will need to change in order to better serve students when they do (Participant 1).

Three participants described how changing student demographics and dynamics were affecting instructional technology. The participants at these institutions did not describe an erosion of the institutions' future prospects due to diminishing admissions. Instead, these participants foresaw challenges in creating an instructional technology environment to meet the needs of the different types of students they will be serving. Participant 3 (Institution B) sees instructional technology becoming all the more important as students come from more wide-ranging backgrounds:

> [Due to Institution B's decision to implement a need-blind admissions policy], we're going to have much greater diversity and many more students who approach learning and technology from a different socioeconomic background, a different cultural background, a different family background. We're gonna have to be able to meet their needs. Therefore, instructional technology is going to become more important. The ability for instructors to do things like [flipping the classroom], where students can access content and observe it at their own speed in their own way, that's going to be important. So will finding ways to use the digital media to reinforce lessons across multiple channels to enhance learning and reach more students effectively. (Participant 3, Institution B)

Participant 6 (Institution C) echoed these sentiments, saying that the diverse students that will increasingly attend the institution “have different ways of learning, they have different expectations of technology, and on us as an institution. I think [adapting to meet the needs of these students] is going to be one of the challenges of liberal arts institutions” (Participant 6, Institution C). Participant 9 (Institution E), the last participant to mention this topic, suggested that the technology students bring with them to campus, especially mobile devices such as smart phones and tablet computers, will put much more pressure on institutions to allow them to learn with those devices:

> [Recently] we did a survey because [campus stakeholders] had some misconceptions about what was going on on-campus with incoming students. [It found that] most of our incoming students have laptops, [and] most or all of them have cell phones. Now that we’ve done the survey, we realize we don’t necessarily need the amount of computer labs that we needed before. Students are expecting that we’ll have mobile computing available for them that will integrate with their handhelds. I think they’re expecting that (Participant 9, Institution E).

Three participants expressed concerns over the level of information literacy among students and the need to improve it. Participant 4 (Institution B) was concerned that the assumptions made about students’ understanding of technology resources available to them were far too generous. The general assumption was that students know how to use these tools and know how to properly use them in an academic setting. The assumption had proven to be incorrect, and “[we can] help them understand how to use them in their life at [the institution] and beyond” (Participant 4, Institution B).

Participant 11 (Institution F) and Participant 13 (Institution G) stated concurring perspectives. Participant 11 was concerned that students “bring more advanced hardware and software” that they were comfortable using but were not supported by the institution. “You get [video encoding standards] that are newer and are not part of our standard deployed infrastructure,” the participant stated (Participant 11, Institution F). As a result, “when [students] are doing presentations and they’re using video clips that they make on their own machines, the clips may or may not play on the [institutional] equipment” (Participant 11, Institution F).

Participant 13’s concern was that students were not scared to use the tools provided, but they were not necessarily using them well. “It's amazing how they struggle with [the tools that the institution provides, such as GoogleApps], and that means maybe when we try to get them to do video [in classes] in [their second year] year…it is more of a stretch,” the participant said.

Three participants raised the wassue of eroding financial resources as a major headwind for their institutions and higher education, in general. Participant 7 (Institution D) expressed concern about the impact of state and federal budget deficits on higher education. However, the lack of resources could be a spur to creative adaptation. “We have to deal with it…[and] the expectation that we will be under a budget crunch…. [Institutions will] start making decisions based on having less money. And that’s going to drive [institutions] from Microsoft Office to Google Apps. But that can be a good thing," the participant said, referring to the innovative practices that can develop during times of budget strain (Participant 7, Institution D). Participant 9 (Institution E) also had a positive perspective on the outcomes of tighter financial resources. From the participant's perspective, the recession of 2007 through 2009 allowed Institution E to more fully implement open source tools such as Moodle LMS and Drupal, which the instructional technology group considered more favorable technology environments than the commercial products they had been using. "Everybody had to make concessions to deal with the recession. In a way, it did drive portions of some of our technology we purchased. But I wouldn't say it drove it necessarily in a bad way. I think we are hoping to stay open source, so I think that really worked to our advantage…," the participant stated (Participant 9, Institution E).

Participant 11 (Institution F) did not portray anything positive coming from the recession. The shrinking financial resources available to instructional technology shifted the instructional technology group to constantly anticipate a resource poor budget environment. However, like Participant 7 at Institution D, Participant 11 stated that the instructional technology group had adopted a "conservative approach from the systems and networking sides, and just because Microsoft Office comes out with a new version we don't deploy it across campus until it's been studied" (Participant 11, Institution F).

Two participants cited admissions uncertainty and fluctuation as an overarching trend that was affecting their institutions. At Institution A, Participant 2 described how an abnormally large freshman class created challenges for the student experience in the classroom and with technology because “it happened at a time when we really couldn’t hire any faculty members and a lot of them were on sabbatical. That was interesting and it was a good problem to have really. To have a lot of students is a good thing, but it did dictate what we [technologically] did that year” (Participant 2, Institution A).

While Participant 2 portrayed the potential for larger than expected classes as a relatively positive aspect of admissions fluctuation, Participant 10 (Institution F) voiced a contrasting concern. Institution F is located in the rural area of an economically struggling state in the upper-Midwest region of the United States, which is a factor in the students who attend the institution.

> The fact that 80% of our students come from [the state] is certainly an impact on us. I am sure that we are not going to make the rather ambitious enrollment goals for this semester and, that being the case, cuts will happen somewhere. We’ve cut and cut and cut, and I don’t know how much more you can cut and still stay innovative unless you stick with just the free stuff and that’s not always effective (Participant 10, Institution F).

For this participant, the diminishing student classes were directly affecting the ability of the instructional technology group to implement innovative instructional technology.

Two participants from different institutions indicated that finding qualified personnel for the instructional technology group had been a challenge. Participant 4 (Institution B) stated that it had been hard to find individuals with the right fit.

"Whenever we do a search it typically takes us a long time to find somebody, and it wasn't pretty, which is … interesting given that the [current soft job] market should have people out there." At Institution F, Participant 10 attributed their personnel recruiting challenges to their rural location and the bleak economic prospects for the state in which the institution is situated.

Participant 6 (Institution C) mentioned the emerging tension between faculty and students over how the classroom interaction will be structured in the future. Many faculty, the participant said, still have a "chalk and talk [mentality] and 'you need to attend my lecture to get anything out of my class.' I think that the student population is going…to push them. I don't think our students are going to pay the money that we expect them to pay if we're not meeting their needs" and expectations of flexible, on-demand learning outside of the classroom (Participant 6, Institution C).

Participant 6 (Institution C) also mentioned Open Content[10] as another emerging phenomenon that liberal arts faculty members have not anticipated ("Open educational resources", 2012). "I'm not sure they've really wrapped their head around the open content movement, whether it is open eTextbooks or open lectures of content," the participant said (Participant 6, Institution C).

Lastly, Participant 1 (Institution A) suggested that the ways in which institutions connect to students before they arrive on campus will need to change in order to better serve them when they do arrive. "We've been thinking this year about how to connect

[10] Open Content is also referred to as Open Educational Resources.

with the students even before they start and should we be doing even more before they even get here to get them connected and leverage that [time before they physically arrive on campus]," the participant stated (Participant 1, Institution A).

Chapter 5: Discussion, Conclusions, and Implications

Summary

This study focused on the decision-making processes regarding instructional technology at small, residential liberal arts institutions of higher education. Thirteen participants – one chief information officer, six directors of instructional technology, and six instructional technology staff members – from seven colleges and universities in six states that met the study criteria were interviewed. These participants were asked questions about the instructional technology environment at their institution using an interview protocol based on the RIPPLES Model (Surry, 2002) and additional questions about technological and higher education marketplace factors.

The purpose of this study was to better understand the factors that influence decisions at small, residential liberal arts colleges and universities to develop instructional technology tools in-house, utilize open source or free web-based tools, or purchase commercial tools. The participants provided rich insights into these decision-making processes, with the participants at five institutions indicating that open source instructional technology tools that need little to no customization, such as Moodle ("Moodle.org: Open-source community-based tools for learning", 2009), and free web-based tools, such as Google Apps for Education ("Google apps for education", 2011), were the preferred instructional technology platforms. The participants at one institution indicated their preference for creating home-grown instructional technology tools using open source programming and development platforms. Another institution was the one where the participants stated a preference for commercial instructional technology tools.

The preferences of the participating institutions for open source and free web-based instructional technology are consistent with the reasons in which the institutions were nominated. Five of the seven selected institutions were nominated by members of the IT or instructional technology staff at the nominated institution. In particular, three institutions were only nominated once by a member of their respective staff, so it was not surprising that the instructional technology preferences cited by participants of those institutions matched the reasons they were nominated. Another two institutions were both nominated by two individuals: a member of the IT and instructional technology staff, respectively, and individuals outside of the institutions. The IT staff member at one institution nominated it for its exemplary use of open source instructional technology tools, while the second individual nominated the institution for its use of home-grown, open source, and free web-based instructional technology tools. Interestingly, the IT staff member who nominated the institution did not include free web-based instructional tools in the nomination despite the extensive use of free web-based instructional technology tools there. For another institution, the instructional technology staff member nominated the institution for its exemplary use of open source instructional technology tools, while the second individual nominated the institution for its use of open source and free web-based instructional technology tools.

The remaining two institutions were nominated by external individuals. One institution was nominated for its use of home-grown and open source, which accurately matched the preference at the institutions for home-grown instructional technology tools based in open source platforms. Only one institution was nominated for the exemplar use of a type of instructional technology tool that did not match actual preferred type of instructional technology tool cited by participants. In the case of that institution, it was nominated by an external individual for its use of home-grown instructional technology tools, but two study participants stated that open source and free web-based tools were the preferred types of tools.

Preferred Types of Instructional Technology

- Open source instructional technology tools with little to no customization
- Free web-based instructional technology tools
- Customization and outright development are not preferred; they require staff members or take current staff members away from interacting with faculty and students.

Participant Background

- Instructional technology directors: doctoral degrees in traditional academic disciplines were common, as was experience as faculty members in these disciplines before transitioning into instructional technology.
- Instructional technology staff members: master's degrees were common.

Organizational Models for Instructional Technology

- Two instructional technology organizational models among participating institutions.
  - Expertise model: each staff member has primary expertise in one type of instructional technology that faculty members and students in any department can utilize.
  - Liaison model: each staff member is charged with supporting the faculty members within defined disciplinary spheres or within a particular grouping of departments.
- Staff office location: centrally, either in a Library or IT building.

Resources

- Resources available for buying hardware or software, but not for adding staff.

Infrastructure

- Good or excellent infrastructure and relationship between the instructional technology staff members and the infrastructure staff members.

People

- Some faculty technology advisory committees.
- Administrators: some readily offer financial and policy support, while others do not.
- Decision-making patterns
  - Instructional technology staff members doing basic research about a tool and then making recommendations to directors and chief information officers.
  - CIOs deciding what kinds of instructional technologies to focus on

- Group consensus among instructional technology staff
- Staffers exploring the technical feasibility of a tool while the director made sure it was pedagogically sound.

Policy

- Open, informal policy environment that does not encumber innovation of or experimentation with instructional technology.
- Hope for better policies for directing faculty to utilize instructional technology in their teaching.

Learning

- Learning assessment is a challenging activity to capture and measure.
- Faculty do not welcome instructional technology staff members into conversation about the impact of instructional technology on student learning.

Evaluation

- Limited role in the evaluation of the impact of instructional technology on student learning.
- Lack of knowledge about evaluation methods required to successfully evaluate the instructional technology being utilized.
- Concern that an evaluation agenda could snuff out the very creativity among the instructional technology staff members that made the group effective in the first place.

Support

- Cuts in training budgets and the lack of time to devote to training limited their ability to broaden their professional development.
- Faculty members do not include instructional technology staff members in their curricular planning.
- Faculty do not have enough venues to share instructional technology experiences with each other or with instructional technology staff members.
    - Conversely, some praised faculty members' willingness to give ample feedback about instructional technology and to forge strong, collaborative relationships with instructional technology staff members.
- Split on the level of support institutional administrators are giving to instructional technology innovation and implementation. Some characterized administrators' lack of support as a barrier to instructional technology. Others characterized administrators at their institutions as enabling instructional technology through various support mechanisms.

Information Technology Developments, Instructional Technology Developments, and Higher Education Marketplace Developments

- Mobile devices, tablet computers, cloud computing services, enhanced "Web 2.0" services, video conferencing, online learning, and eTextbooks were cited multiple times as promising to have, or already having, a profound impact on how students learn at their institutions.
- Awareness of changing financial, academic preparedness, and technological fluency characteristics of incoming students, eroding financial resources at their institutions, admissions uncertainty and fluctuation at their institutions, and challenges to finding qualified personnel for instructional technology positions, among others.

Figure 7. Overview of Findings

Figure 7, shown above, provides a concise overview of the findings of the study, beginning with the finding that many of the institutions that utilized open source technology did not customize it. They implemented it without customization, just as they might implement a commercially-purchased instructional technology tool, with the important difference being that open source tools have no licensing or purchasing costs. Customization and outright development would have required having instructional technology staff members who have the appropriate time in their role to carry out that customization or development and who possess the requisite knowledge to do so. Two participants voiced a reticence to reduce the time instructional technology staff members spend interacting with and working with faculty and students. These two participants, plus two other participants, also stated that there was an ongoing lack of resources available to add additional staff who can undertake instructional technology customization and development.

The seven-dimension RIPPLES Model (Surry, 2002) was shown to be an effective framework for exploring instructional technology innovation and implementation at small, residential liberal arts institutions, partly because it allowed the study participants to provide insight into many other aspects of instructional technology beyond the decision-making and selection process of instructional technology. For example, the participants revealed that it was common for the instructional technology directors to have doctoral degrees in traditional academic disciplines and have spent time as faculty members in these disciplines before transitioning into instructional technology. Four of the directors interviewed for the study had doctoral degrees. Similarly, four of the six instructional technology staff members among the participants had master's degrees, mostly in applied fields such as journalism or instructional systems, but also in disciplines like English and Biology, without faculty experience. These two findings regarding the educational attainment of instructional technology directors and staff members were raised by participants in the first section of the interview (see Appendix B. Open-ended Interview Protocol) and then in the People and Support dimensions.

The interview process also provided details about how instructional technology staff groups are organized at small, residential liberal arts institutions. Participants described two instructional technology organizational models – the expertise model and the liaison model – of which five participating institutions utilize the former, and two utilize the latter. As discussed in Chapter 4, instructional technology staff members at institutions that utilize the expertise model have a primary expertise in one type of instructional technology, such as multi-media or website programming, that faculty members and students in any department can utilize. One participant summed up the expertise model in saying that

> [w]e tend to specialize on a technology and then it doesn't matter what discipline has need for that. We would support them. So I may actually have two instructional technologists working with one faculty member for one class…. So instead of it being just one instructional technologist who needs to be a specialist in [multiple]…technologies, we would just tap the technologist who has that specialty.

Conversely, in the liaison model, each instructional technologist is charged with supporting the faculty members within certain disciplinary spheres, or within a particular grouping of departments that may not have a disciplinary similarity, rather than supporting particular types of instructional technology. Unlike advocates of the expertise model, one participant found that expertise was not as important as creating relationships with faculty and students “because [the technologies]…are getting a little bit easier to deal with. [S]o…[we are] putting our people where they’ll do the most good…, out of the hardware/software support and into the hands-on application support”.

These two staffing models have repercussions on how instructional technology staff members work with and relate to faculty members. The expertise model can make it difficult for an instructional technology staff member to develop a professional relationship with faculty members because that instructional technology staff member is not assigned to a particular group of faculty members. “I think it’s harder to maintain that intimate connection with what’s going on in the different departments. It’s something we’re working to correct now,” one participant said. It requires the instructional technology staff member to create other ways to engage faculty members, such as partnering with centers for scholarship and teaching on campus, which was mentioned by participants at two institutions.

Like the staffing models encountered, there was little variance in where instructional technology staff groups were housed on their respective campuses. All of the institutions house their instructional technology staff centrally, either in a Library or IT building. Instructional technology staff members were housed in the Library at the three institutions where the IT and Library units were one organizational entity. At one institution, the instructional technology staff members were housed in the Library, but the IT unit was not part of the Library organizational structure. At the remaining three institutions, the instructional technology staff members were part of the overall IT organization of the institution and were housed centrally in an IT building.

In the Resources dimension of the RIPPLES model, participants indicated that the economic recession from 2007 to 2009 had a deep impact on financial resources for instructional technology implementation and innovation. As such, only three participants, one at each of three institutions, stated that there were few to no limitations on resources for acquiring and experimenting with instructional technology tools. These participants, however, acknowledged a definite resource limit when the subject of adding instructional technology staff was raised with administrators. These three institutions had some important differences, indicating that there was no simple explanation for the phenomenon of adequate technology resources but inadequate personnel resources. One institution utilized the expertise model for its five instructional technology staff and one director of instructional technology, and the institution preferred commercial instructional technology tools over other types. The instructional technology staff group at that institution was part of the IT department, yet their offices were in the Library. Another institution had merged IT and Library units and utilized the expertise model for its five instructional technology staff and one director of instructional technology, who also had offices in the Library. Open source and free web-based instructional technology tools were preferred over other types. Lastly, IT and the Library were separate organizational units at one institution. The liaison model was used for the 11 instructional technology staff members and one director of instructional technology, who had offices in an IT building. Open source and free web-based instructional technology tools were preferred over types.

One of the more interesting set of comments about the instructional technology profession came from two participants at one institution during questioning about resources for instructional technology. In their defense of building instructional technology tools in-house, they stated that a central part of the profession of instructional technology is the drive to innovate and create new tools. While it can be costly to retain the staff who can do that, it was worth that expense, because “[i]t’s...our job...to take what’s on the shelf and show people how to use it, which is great but [that implies that]...what we can do is restrained by what other people have thought of and created. And I think part of education is about exploration and...innovation,” according to one of those participants.

There were very few subjects on which nearly every participant offered a similar perspective, but the Infrastructure dimension of the RIPPLES model was one of those subjects. All but one of the 13 participants characterized the technological infrastructure at their institution, and the relationship between the instructional technology staff members and the infrastructure staff members, as good or excellent. One participant’s perspective was representative of these 12 participants:

> [W]hat’s really important is that people, regardless of team, here care about their job – they take pride in what they’re doing and that shows. So if you go to somebody with a problem, you’re first response is going to be, “Okay, let’s look

at that." [Overall], our infrastructure's focus is standardization and reliability, but there's flexibility whenever some sort of change needs to happen.

Within the People dimension of the RIPPLES model, participants offered an important perspective on how instructional technology tools were decided upon by them, faculty, and administrators. At three of the seven institutions, there was some form of a faculty technology advisory committee that makes recommendations about instructional technology decisions. Institutional administrators gave financial and policy support but were not usually vocal advocates at three institutions. This lack of vocal advocacy was not portrayed as problematic by the three participants. They were happy to have solid, if discreet, support from administrators. One participant stated, "now with a new president, [instructional technology] has become a big priority for [the CIO] and [the CIO] is jumping right at it. [Now] we are putting out a lot of resources and taking some risks and trying some different things."

Among instructional technology staff members, three participants stated that the instructional technology staff members at their institutions do the basic research about instructional technology tools and then make recommendations to their respective directors and then chief information officers. A CIO at one institution decided what the instructional technology staff members will focus on, while at another, the instructional technology staff members used group consensus to make decisions, though occasionally the CIO will prescribe a direction for the group. Finally, one participant stated that the instructional technology staff members focus their efforts on the technical feasibility of a tool rather than the pedagogical application of it, while the instructional technology director takes on the responsibility of assuring its applicability to the latter.

In the Policy dimension of the RIPPLES model, the participants did not describe having a complex policy environment for instructional technology at their liberal arts institutions. Nine participants indicated that they experience an open, informal policy environment that did not encumber innovation of or experimentation with instructional technology. One participant described how an open policy environment supports instructional technology experimentation as: “It makes us very nimble and we don’t get held back by having to go through a more formalized process. I think if that wasn’t the case, if we didn’t have good people making good smart decisions at the top, I think it may be detrimental to the institution.” Five participants described the policy environment as appropriate but needing adjustments. Two participants wanted policies to compel more faculty members to utilize instructional technology. One participant went so far as to suggest that having a tenure and promotion policy that favorably considers the use of instructional technology would trigger a wave of creative uses of and experimentation with instructional technology. Another participant stated a hope for policy changes that would increase the involvement of faculty in decisions about instructional technology as a way to more efficiently use instructional technology staff members and resources. Overall, the participants were satisfied with the policies (or lack thereof) in use that governed instructional technology staff, but they hoped to have better policies for directing faculty to utilize instructional technology in their teaching.

From the Learning RIPPLES dimension, student learning is a subject of focus when new instructional technology tools were being developed, selected, or implemented among most of the instructional technology staff members interviewed, though some participants readily admitted that learning assessment was a challenging activity to capture and measure. The participants indicated varying support by administrators on this subject, with some participants stating that administrators were an important ally in instructional technology staff members' efforts to facilitate learning, while others hold the position that institutional administrators were not engaged in discussions about the relationship between learning and instructional technology. Still other participants indicated that they would like to assess the impact of instructional technology on student learning, but the faculty culture at their institutions did not welcome instructional technology staff members into that conversation.

From the Evaluation RIPPLES dimension, the participants indicated that they have a limited role in the evaluation of the impact of instructional technology on student learning. At the two institutions where the instructional technology staff tried to evaluate it, basic descriptive statistics about instructional technology were collected, such as how many students used a particular tool in a given semester. Beyond that, participants indicated that they lack the knowledge about evaluation methods that were needed in order to successfully evaluate the instructional technology being utilized at their institution, or that the evaluation efforts they were undertaking were inadequate. The final few participants indicated that evaluation initiatives at their institutions were the sole domain of faculty, who may not welcome instructional technology staff members into that process. The uncertain expectations, yet apparent inevitable arrival of evaluation had some participants nervous. One participant candidly admitted that "we can't tell when [a learning outcome pattern] is due to a personality match [or an instructional technology tool]. We don't even know if one professor grades harder than another professor," so how will instructional technology staff members meet an assessment requirement? One participant at another institution was concerned that an evaluation agenda could snuff out the very creativity among the instructional technology staff members that made the group effective in the first place: "[P]utting us under an evaluation puts us under a microscope, so it takes away some of our freedom to be able to do these…creative and innovative things more under radar. You know doing things under the radar is the way you really get attention".

From the Support RIPPLES dimension, the participants made statements about the support that they receive for various aspects of their roles that one would expect, such as when they stated that cuts in training budgets and the lack of time to devote to training limited their ability to broaden their professional development. Other observation were less obvious, but very insightful. Two participants stated that the expectation for staff members to develop a professional development plan was a barrier, while another participant stated that the remote location of their institution limited access to professional development opportunities because of the increased cost of travel from the institution's more remote location.

Categories of responses from other RIPPLES dimensions were re-iterated as participants described the support they receive in the Support dimension. Six participants were very clear in their position that the technical support teams at their institution support the mission of the institution, understand the value of instructional technology in carrying out that mission, and were strong enablers of instructional technology. One participant concisely summed it up, stating that “the technical support team is always doing a balancing act, but the fact that instructional technology is a priority is clear, and they respect that, and they do their [best] to be very, very prompt. A smaller subset of three participants made similar statements about the support of the open source community and even commercial vendors of instructional technology tools as making a critical difference in the quality and stability of instructional technology at their institutions.

The four sub-components of the Support dimension in the RIPPLES model (Training, Technical, Pedagogical, and Administrative) also revealed more information about relationships between instructional technology staff members and faculty members. Three participants believe that a pedagogical support barrier exists because faculty members do not include instructional technology staff members in their curricular planning. Three other participants suggested that faculty do not have enough venues to share instructional technology experiences with each other or with instructional technology staff members. Conversely, some participants praised faculty members’ willingness to give ample feedback about instructional technology and to forge strong, collaborative relationships with instructional technology staff members.

Lastly on the subject of support, the participants were split on the level of support institutional administrators were giving to instructional technology innovation and implementation. Five participants characterized administrators' lack of support as a barrier to instructional technology. One participant summed up this position very well:

> I really feel that the administration as a whole really does value what we are doing. We have just taken a back seat to all the other changes that are going on [due to the new president's initiatives]…. I really do believe that [instructional technology is] a priority [for the new president and new administrators], but I think the philosophy is that [the current instructional technology approach] is working right now and [they want to] focus on things that are at a higher level that maybe do need to be changed.

Conversely, six participants characterized administrators at their institutions as enabling instructional technology through various support mechanisms, such as pushing for a cultural change to make digital scholarship and the use of instructional technology in pedagogy accepted parts of the scholarship and teaching components in the tenure process, or acknowledging that the instructional technology staff support the core academic programs at the institution. Another participant succinctly described how "if [the president and administration] see you're putting your resources towards the fundamental [mission] of the institution, which is improving student learning, then [your initiatives are] supported really, really well."

The participants also provided useful insight in the three final sections of the interview protocol: Information Technology Developments, Instructional Technology Developments, and Higher Education Marketplace Developments. There was an obvious overlap between the first of the two final sections (Information Technology Developments, Instructional Technology Developments). This overlap was intentional for two reasons. First, certain topics straddle both the information technology and instructional technology categories. Tablet devices, such as Apple's iPad, are a recent information technology development that had broad application potential as an instructional technology tool, as shown in the fact that different participants cited them as an important information technology and instructional technology development. The researcher wanted to give ample opportunities for a participant who, for example, considers tablet devices to be an important information technology development, to voice that perspective whether they categorized it as an important information technology or instructional technology development. Second, the researcher wanted to give participants a broad category (Information Technology Developments) and a more focused category (Instructional Technology Developments) to let them voice their perspectives on broad technological trends and specific trends, respectively, if that they chose to do so.

The results within the interviews were that five participants offered their perspective on both information technology developments and instructional technology developments when they responded to the Information Technology Developments section. They subsequently declined to offer their perspective in the Instructional Technology Developments section. They, in effect, considered them to be the same topic. Six participants offered perspectives on both Information Technology Developments and Instructional Technology Developments. One participant declined to offer a perspective on Information Technology Developments but offered a perspective about Instructional Technology Developments. One participant declined to respond individually to either the Information Technology Developments or Instructional Technology Developments sections. Instead, that participant offered their perspective on all three of the Developments sections within the Higher Education Marketplace Developments section.

In the first two of these final sections, the participants gave a comprehensive portrayal of the technological landscape that is shaping many levels of higher education today, particularly instructional technology. Mobile devices, tablet computers, cloud computing services, enhanced “Web 2.0” services, video conferencing, online learning, and eTextbooks were cited multiple times as promising to have, or already having, a profound impact on how students learn at their institutions.

Finally, regarding Higher Education Marketplace Developments, the participants showed that they were quite aware of the larger factors affecting their institutions and higher education, in general. These factors included: the changing financial, academic preparedness, and technological fluency characteristics of incoming students; eroding financial resources at their institutions; admissions uncertainty and fluctuation at their institutions; and challenges to finding qualified personnel for instructional technology positions, among others.

Discussion

This study builds on the important work of Surry (Ensminger et al., 2004; Surry & Farquhar, 1997; Surry & Land, 2000; Surry & Ensminger, 2002; Surry, 2002; Surry et al., 2005; Surry et al., 2005; Surry & Jasinski, 2006; Surry & Ely, 2007). The RIPPLES Model that Surry developed provided a flexible foundation that allowed this study to begin to make sense of the complex organization "soup" that is the world of instructional technology at small, residential liberal arts institutions.

This study also affirms and builds upon the theories of Ely (1990, 1999) as well as the findings of Davis et al. (1982) and Hannan (2005), Hannan et al. (1999), and Hannan and Silver (2000). The RIPPLES Model openly utilizes Ely's Eight Conditions that Facilitate Implementation (Surry, 2002, p. 5; Ely 1990, 1999). Therefore, the usefulness of the RIPPLES Model in the context of this study further emphasizes the wide applicability of Ely's Eight Conditions that Facilitate Implementation. The rich discussion by the participants in this study about how the nature of professional relationships with faculty members facilitated or hindered instructional technology initiatives at the participating institutions echoed the observations by Davis et al. (1982) that "innovation…is shaped by the interaction of the individual and the organization" (p. 585) and that "the existence of formal agencies and mechanisms for the support of instructional improvement is important to the innovation process in higher education" (p. 586). Davis et al. emphasized that the kinds of innovations that faculty members utilize are partly contingent on the institutional staff. This study confirms that.

Finally, Hannan (2005) and Hannan et al. (1999) established important landmarks for faculty and staff members involved in teaching innovations. The need to respond to changing student demographics, having support from within the institution, staff development, and the desire to make their work more interesting (Hannan et al., 1999, p. 283-286) are all concepts that were very important to the participants in this study, as were factors that supported and obstructed innovation in teaching and learning (Hannan, 2005, p. 976).

While the RIPPLES model provided a flexible framework for conducting this study, the seven dimensions of model did not generate equal volumes of responses from the participants, nor is the order of the dimensions an ordinal listing of the importance of the dimensions. Based on the volume of responses, and overall concern, from the participants, the Resources, People, Policies, and Evaluation dimensions emerged as the most pressing dimensions of instructional technology among the participants, followed by the Support, Learning, and Infrastructure dimensions.

The need for clear insight into how and why small, residential liberal arts institutions are making decisions about instructional technology is critically important. Institutional resources available for instructional and information technology are increasingly limited, while the students arriving at such institutions anticipate and expect the effective and efficient use of technology in their courses (Salaway et al., 2007). As this study has shown, institutions in this study were more than willing to experiment with new forms of instructional technology, such as open source and free web-based instructional technology tools like Moodle ("Moodle.org: open-source community-based tools for learning", 2009) and Google Apps for Education ("Google Apps for Education", 2011), but they will need information about how to structure their instructional technology staff in order to best implement these kinds of tools. They will need to be able to answers questions such as "What is the best background for instructional technology directors and staff members to have: technology developers or as technology facilitators?" or "How shall instructional technology staff members interact with faculty members?"

Implications

Two key implications emerged from the study findings. First, the profession of instructional technology at small liberal arts institutions is transitioning from building instructional technology tools and more on utilizing tools that have already been created. Given this, the knowledge that directors of instructional technology and instructional technology staff members need is changing. Being a programmer has less utility than knowing how to effectively implement an existing instructional technology tool that is readily available in an open source or free web-based form. If anything, being able to create deeper professional relationships with faculty members is emerging as more important than the ability to design and build tools.

The second implication is that given the importance of interaction and collaborative relationships between instructional technology staff members (including directors) and faculty members, the location of instructional technology staff members is critical to the success of these relationships. Instructional technology staff members struggle to build professional relationships with faculty members when their offices are far away from the spaces where faculty members teach, do research, and interact. As much as possible, institutions should consider having policies that place the offices of instructional technology staff members as close to these centers of faculty activity as possible. Furthermore, the professional practice of instructional technology staff members should, when possible and appropriate, include interaction with faculty members in order to foster the development of professional relationships.

As stated at the beginning, this study was not undertaken in order to arrive at generalizable findings or to put forth a predictive model about types of instructional technology tools chosen by institutions. This study set out to provide a more complete portrayal of the organizational dynamics that inform decision-making about instructional technology profession at small, residential liberal arts institutions. Simply put, this study set out to understand why small, residential liberal arts institutions build, buy, “bend” (open source tools), or “borrow” (free web-based) instructional technology, and it has contributed to understanding these phenomena. Moreover, the study also provides details about the background of instructional technology directors and staff members, the organizational structure of instructional technology staff groups, the professional relationships and interactions between instructional technology staff members and faculty members that are not explored in the aggregate-level publications that are the primary literature consulted institutional and IT administrators, such as the Educause Core Data Service Report (Grajek & Arroway, 2012).

This study focused on unearthing and understanding the myriad factors that influence what types of instructional technology tools are given preference by instructional technology staff members. The RIPPLES Model examines a broad set of financial and organizational factors, which made it the most appropriate framework to utilize.

This study makes two important contributions. First, it provides instructional technology directors and staff members at small, residential liberal arts institutions with very useful comparison cases as they are considering the types of instructional technologies to explore and implement. For example, the reasons cited by study participants for not building home-grown instructional technology tools – the need for additional personnel who have the requisite technology skills, the inability to hire additional staff, the need to devote staff time to maintaining and improving a home-grown tool rather than interacting with faculty and students – will be very helpful for instructional technology directors and staff members who are considering whether or not to embark upon building an instructional technology tool as opposed to utilizing an open source or commercial tool. Second, the study also provides important information about how instructional technology staff groups are structured. For example, the participants' responses about why they utilized the expertise or liaison staff model for the instructional technology group will provide a useful comparative context for institutions that are planning to make changes to their instructional technology staffing structure.

Limitations

Using a multi-institution case-study analysis of decision making about instructional technology at a limited number of liberal arts institutions makes any broad generalization of findings problematic. However, this is an initial study of the subject. An exhaustive search of the literature did not return any studies on this particular subject. Therefore, unearthing patterns and categories of responses that will guide and support later research is the primary goal, not generalization.

Peer-nomination technique, the participant selection method utilized in this study, also has limitations. First, this technique is subject to any biases and assumptions among the community members who elected to nominate an institution. For example, community members were asked to nominate institutions that were, from their professional perspective, exemplar users or creators of four types of instructional technology (home-grown, commercial, open source, and free web-based). As described at the beginning of this chapter, most of the qualifying nominated institutions were nominated by staff members at the institution. Five of the seven selected institutions were nominated in this manner. Another two were nominated by a member of the community outside of the institution.

A second example of the oversight among the nominators is the fact that all of the institutions nominated for the study utilized a central staffing model in which their instructional technology staff members have offices in library or IT buildings. However, there are instances of small, residential liberal arts institutions that staff their instructional technology staff members, and even directors, in the academic departments near the faculty members they serve. No institutions that utilize this staffing model were nominated, therefore the perspective of instructional technology directors and staff members in this type of staffing model were not part of the findings.

An additional limitation is the fact that the study is based on the self-reported observations and recollections of the participants, making study dependent upon their honest reflections. There is no way to absolutely determine the validity of the participants' observations, though the length of time each participant had spent in the profession of instructional technology and the length of time at their respective institution was included as a way to establish their credibility as a member of the profession and a member of their institutional community.

Lastly, the study also did not include interviews with faculty members or students at the participating institutions to ascertain their perceptions of how different types of instructional technology tools are implemented, nor does the study investigate how these two groups perceive the instructional technology tools supported by the instructional technology staff. It was decided that including interviews with faculty and students was outside the scope of this study.

Directions for Future Research

Other theoretical frameworks, particularly Rogers's Theory of Diffusion of Innovations (Rogers, 2003), do not have the appropriate perspective for this study. In the case of Diffusion of Innovations Theory, Rogers's approach accounts for the adoption of a specific innovation by individuals across an organization. In the context of this study, Diffusion of Innovations Theory would be a useful framework for understanding why faculty members decided to adopt a specific instructional technology tool or not. However, adoption of instructional technology tools by faculty members is not a focus of this study (though it is a very important research subject), so utilizing a theoretical framework that is focused on adoption would not have been appropriate.

The findings of this study point to many potential topics for future research. First, there is a ripe opportunity for research about why commercial LMS are utilized more frequently at most types of colleges and universities given that private institutions that solely grant bachelor's degrees are the only type of institution that utilize open source LMS more frequently than commercial LMS (Grajek & Arroway, 2012, p. 31). This study could be a model for exploring the factors that influence decisions regarding LMS and other types of instructional technology at other types of institutions.

It has been frequently established throughout this study that the participating institutions utilized one of two organizational models for their instructional technology staff: expertise and liaison. Given the need for more research on liberal arts institutions, I recommend a survey of instructional technology directors and staff members at these types of institutions and also a survey of faculty members to examine which model they prefer and whether they like or prefer the model their institution had or was planning to transition to. One could also envision a broad survey of institutions – small, liberal arts institutions or spanning into other types of institutions (larger master's- and doctoral-granting institutions, for example) – that explores whether these two organizational models are widespread and uniform across institutional types. The effect of office arrangement for instructional technology staff members – centralized in a non-academic building or out among faculty in academic buildings – on collaborative relationships with faculty members would also be a strong candidate for future research.

As this study showed, directors of instructional technology at the participating institutions tended to have professional backgrounds and doctoral degrees in traditional academic disciplines, while the instructional technology staff members tended to have a background of information technology and master's degrees in applied information technology fields. A second potential area for research that could yield useful information for IT leaders would be to explore whether doctoral degrees in academic disciplines and master's degrees in applied information technology fields are common trends among instructional technology directors and staff members, respectively, at other institutions and what the effect is on their interactions and collaborative relationships with faculty members. I am particularly interested in whether there is a positive relationship and outcome when instructional technology staff members and the faculty with whom they work have similar professional and academic backgrounds. For example, is a history professor more likely to accept and work more closely and meaningfully with an instructional technology staff member who has a graduate degree in history?

Lastly, participants from some rural institutions in the study group described the negative impact of low bandwidth on instructional technology, while other participants at other rural institutions in the study group were happy to report that their institution had access to higher bandwidth Internet connections. This indicates that there is an opportunity for further research on bandwidth at rural institutions and its effects on the type of instructional technology tools that an institution is able to offers to its faculty members and students and whether there is an effect on learning outcomes.

The pace of innovation in the realm of instructional technology will continue to accelerate, as will the pressure – both from political figures and the ever-growing number of students seeking postsecondary degrees and certificates – on institutions of higher education to adopt new types of technologies and models for utilizing them. Institutions of higher education will be repeatedly put into the position of deciding which instructional technology tools to evaluate and implement, and they will need to consider how their instructional technology staff should be structured to support these tools and the faculty members and students who utilize them. This study can help inform this process by better revealing how instructional technology staff members are currently selecting and implementing instructional technology tools.

References

2012 horizon report. (2012). The New Media Consortium, EDUCAUSE Learning Initiative. Retrieved October 1, 2012, from http://www.educause.edu/library/resources/2012-horizon-report

About gmail. (2012). Retrieved September 18, 2012, from https://mail.google.com/mail/help/intl/en/about.html

Albright, M. (1999). Teaching in the information age: A new look. *New Directions for Teaching and Learning, 80*, 91-98.

Alger, J. R. (2002). Legal issues in on-line education. Paper presented at the *EDUCAUSE Conference*, April 17, 2002, Retrieved from http://net.educause.edu/ir/library/pdf/NTW0204.pdf

Allen, D. W. (1975). Teacher improvement: We know enough to start. In D. W. Allen, M. A. Melnik & C. C. Peele (Eds.), *Improving university teaching: Reform, renewal, reward*. Amherst, MA: Clinic to Improve University Teaching, University of Massachusetts.

Amazon web services. (2012). Retrieved August 24, 2012, from http://aws.amazon.com/

Arabasz, P., Pirani, J. A., & Fawcett, D. (2003). *Supporting E-learning in higher education.* Boulder, CO: EDUCAUSE Center for Applied Research.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G. Patterson, D., Rabkin, A., Stoica, I., Zaharia, M. (2009). *Above the clouds: A Berkeley view of cloud computing.* (No. UCB/EECS-2009-28). EECS Department, University of California, Berkeley.

Audio hijack pro. (2011). Retrieved August 3, 2011, from http://www.rogueamoeba.com/audiohijackpro

Ayers, E. L. (2004). Doing scholarship on the web: 10 years of triumphs and a disappointment. *The Chronicle of Higher Education: The Chronicle Review,* (21), March 11, 2008.

Baccalaureate origins of s&e doctorate recipients. (2008). Retrieved April 2, 2013, from http://www.nsf.gov/statistics/infbrief/nsf08311/

Benson, R., & Palaskas, T. (2006). Introducing a new learning management system: An institutional case study. *Australasian Journal of Educational Technology, 22*(4), 548-567. Retrieved from http://www.ascilite.org.au/ajet/ajet22/benson.html.

Bess, J. L. (1977). The motivation to teach. *Journal of Higher Education, 43*, 243-257.

Bialo, E. R., & Sivin-Kachala, J. (1996). *The effectiveness of technology in schools: A summary of recent research*. Washington, D.C.: Software Publishers Association.

Birman, B. (1997). *The effectiveness of using technology in K-12 education: A preliminary framework and review*. Washington, D.C.: American Institutes for Research.

Blackboard. (2009). Retrieved April 24, 2008, from http://www.blackboard.com/

Blustain, H., Goldstein, P., & Lozier, G. (2001). Assessing the new competitive landscape. In R. A. Katz (Ed.), *Dancing with the devil: Information technology and the new competition in higher education*. (pp. 51-72). San Francisco: Jossey-Bass.

Brainard, J. (2007). Report urges improvements in teaching of science. *Chronicle of Higher Education, 53*(22), A1.

Brown, M. M. (1989). What are the qualities of good research? In F. H. Hultgren, & D. L. Coomer (Eds.), *Alternate modes of inquiry in home economics research* (Yearbook 9, American Home Economics Association ed., pp. 257-297). Peoria, IL: Glencoe Publishing Company.

Burkman, E. (1987). Factors affecting utilization. In R. M. Gagne (Ed.), *Instructional technology: Foundations* (pp. 429-455). Hillsdale, NJ: L. Erlbaum Associates.

Campbell, K. (2004). Instructional technology innovation as transformational learning: Female faculty's narratives of experience. In K. Morgan, J. Sanchez, C. A. Brebbia

& A. Voiskounsky (Eds.), *Human perspectives in the Internet society: Culture, psychology and gender* (pp. 255-264). Boston: WIT Press.

Carnegie foundation for the advancement of teaching: Classification description. (2010). Retrieved March 22, 2010, 2010, from http://classifications.carnegiefoundation.org/descriptions/basic.php

Carnegie foundation for the advancement of teaching: Summary tables: Basic classification. (2011). Retrieved April 2, 2013, from http://classifications.carnegiefoundation.org/summary/basic.php

Celsi, R. L., & Wolfinbarger, M. (2002). Discontinuous classroom innovation: Waves of changes for marketing education. *Journal of Marketing Education, 24*(1), 64-72.

Chickering, A. W., & Reisser, L. (1993). *Education and identity*. San Francisco: Jossey-Bass.

Chickering, A. W., & Ehrmann, S. C. (1996). Implementing the seven principles: Technology as lever. *AAHE Bulletin, 49*(2), 3-6.

Chickering, A. W., & Gamnson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin, 39*(7), 3-7.

Clegg, S., & Trayhurn, D. (2000). Gender and computing: Not the same old problem. *British Educational Research Journal, 26*(1), 75-89.

COACHE: The collaborative on academic careers in higher education. (2012). Retrieved November 18, 2012, from http://isites.harvard.edu/icb/icb.do?keyword=coache

Cohen, M., March, J., & Olsen, J. (1972). A garbage can model of organizational choice. *Administrative Science Quarterly, 17*, 1-25.

Collaborative liberal arts moodle project. (2009). Retrieved September 22, 2009, from http://www.clamp-it.org/

The common application. (2011). Retrieved January 24, 2011, from https://www.commonapp.org/CommonApp/default.aspx

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, Calif.: Sage Publications.

Cuban, L. (1986). *Teacher and machines: The classroom use of technology since 1920*. New York: Teachers College Press.

Daft, R. L., & Becker, S. W. (1978). *The innovative organization*. New York: Elsevier North-Holland, Inc.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal*, *34*(3), 555-590.

Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results.* Unpublished manuscript.

Davis, R. H., Alexander, L. T., & Hussain, M. N. (1982). The impact of organizational and innovator variables on instructional innovation in higher education. *The Journal of Higher Education*, *53*(5), 568-586.

Desire2Learn: Innovative learning technology. (2009). Retrieved April 24, 2008, from http://www.desire2learn.com/

Driscoll, M. P. (2006). Psychological foundations of instructional design. In R. A. Reiser, & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (pp. 36-44). Upper Saddle River, New Jersey: Pearson Education.

Drupal. (2013). Retrieved January 1, 2013, from http://drupal.org/

Ely, D. P. (1990). Conditions that facilitate the implementation of educational technology innovations. *Journal of Research on Computing in Education*, *23*(2), 298-305.

Ely, D. P. (1999). Conditions that facilitate the implementation of educational technology innovations. *Educational Technology*, *39*, 23-27.

Ensminger, D. C., Surry, D. W., Porter, B. E., & Wright, D. (2004). Factors contributing to the successful implementation of technology innovations. *Educational Technology & Society*, *7*(3), 61-72.

Evernote. (2012). Retrieved September 18, 2012, from http://evernote.com/evernote/index.php

Facebook. (2012). Retrieved August 24, 2012, from http://www.facebook.com

Farquhar, J. D., & Surry, D. W. (1994). Adoption analysis: An additional tool for instructional developers. *Education and Training Technology International*, *31*(1), 19-25.

Flowers, L., Pascarella, E. T., & Pierson, C. T. (2000). Information technology use and cognitive outcomes in the first year of college. *The Journal of Higher Education, 71*(6), 637-667.

Georgina, D. A., & Olson, M. R. (2008). Integration of technology in higher education: A review of faculty self-perceptions. *Internet and Higher Education*, *11*(1), 1-8.

Gerring, J. (2007). *Case study research : Principles and practices*. New York: Cambridge University Press.

Glaser, B., & Strauss, A. (1967). *The discovery of grounded theory*. New York: Aldine.

Goldstein, P. J. (2004). *Information technology funding in higher education.* Boulder, CO: EDUCAUSE Center for Applied Research.

Goldstein, P. J. (2007). *IT collaboration: Multi-institutional partnerships to develop, manage, and operate IT resources.* Boulder, CO: EDUCAUSE Center for Applied Research.

Goldstein, P. J., & Katz, R. N. (2005). *Academic analytics: The uses of management information and technology in higher education.* Boulder, CO: EDUCAUSE Center for Applied Research.

Google apps for education. (2011). Retrieved December 27, 2011, from http://www.google.com/apps/intl/en/edu/index.html

Google voice. (2011). Retrieved August 3, 2011, from http://www.google.com/voice

Grajek, S., & Arroway, P. (2012). *The EDUCAUSE 2011 core data service report: Highlights and insights into higher education information technology.* (). Boulder, CO: EDUCAUSE.

Green, K. C. (2010). The 2010 campus computing survey. Retrieved August 24, 2012, from http://www.campuscomputing.net/sites/www.campuscomputing.net/files/Green-CampusComputing2010.pdf

Griffin, B. (2005). Why don't good ideas fly? what youth ministry can learn from innovation research. Retrieved September 24, 2009, from http://fulleryouthinstitute.org/2005/12/why-don%E2%80%99t-good-ideas-fly/

Grunwald, H. E. (2004). *Institutional contexts and faculty traits that predict use of the web by college faculty teaching in traditional classrooms.* (Unpublished doctoral dissertation). University of Michigan, Ann Arbor, MI.

Hall, G., & Hord, S. (1987). *Change in schools: Facilitating the process*. Albany, NY: SUNY Press.

Hanley, G. L. (2001). Designing and delivering instructional technology: A team approach. In C. A. Barone, & P. R. Hagner (Eds.), *Technology-enhanced teaching and learning: Leading and supporting the transformation on your campus* (pp. 57-64). San Francisco: Jossey-Bass.

Hannan, A. (2005). Innovating in higher education: Contexts for change in learning technology. *British Journal of Educational Technology, 36*(6), 975-985.

Hannan, A., English, S., & Silver, H. (1999). Why innovate? some preliminary findings from a research project on 'innovations in teaching and learning in higher education'. *Studies in Higher Education, 24*(3), 279-289.

Hannan, A., & Silver, H. (2000). *Innovating in higher education: Teaching, learning and institutional cultures*. Buckingham: Society for Research into Higher Education and Open University Press.

Havelock, R. G. (1971). *Planning for innovation through dissemination and utilization of knowledge*. Ann Arbor, MI: Institute for Social Research, University of Michigan.

Havelock, R. G., & Zlotolow, S. (1995). *The change agents guide* (2nd ed.). Englewood Cliffs, NJ: Educational Technology Publications.

Higher education in the high-tech age. (2005), *Chronicle of Higher Education, 52*(16), B1-B4.

Horrigan, J. B. (2008). *Use of cloud computing applications and services.* Washington, D.C.: Pew Research Center.

Introducing the chromebook. (2012). Retrieved August 24, 2012, from http://www.google.com/intl/en/chrome/devices/

Jasinski, M. (2007). *Innovate and integrate: Embedding innovative practices.* Australian Government: Department of Education, Science and Training. Retrieved from http://www.flexiblelearning.net.au/flx/webdav/site/flxsite/shared/New%20Practices/Innovate_and_Integrate_Final_26Jun07.pdf

Join a community. (2010). Retrieved March 22, 2010, 2010, from http://www.nitle.org/involved/community.php

Keller, G. (1998). Does higher education research need revisions? *The Review of Higher Education, 21*(3), 267-278.

Kiernan, V. (2006). Spending on technology rebounds at colleges and may set record this year. *Chronicle of Higher Education, 52*(27), A30.

King, J. L., Gurbaxani, V., Kraemer, K. L., McFarlan, F. W., Raman, K. S., & Yap, C. S. (1994). Institutional factors in information technology innovation. *Information Systems Research, 5*(2), 139-169.

Kingdon, J. W. (1994). *Agendas, alternatives, and public policies* (2nd ed.). New York: Harper.

Klein, K. J., & Sorra, J. (1996). The challenge of innovation implementation. *Academy of Management Review, 21*(4), 1055-1080.

Kotter, J. (1996). *Leading change*. Cambridge, MA: Harvard Business School Press.

Kozma, R. B. (1978). Faculty development and the adoption and diffusion of classroom innovations. *The Journal of Higher Education, 49*(5), 438-449.

Kozma, R. B. (1979). Communication, rewards, and the use of classroom innovations. *The Journal of Higher Education, 50*(6), 761-771.

Kozma, R. B. (1985). A grounded theory of instructional innovation in higher education. *The Journal of Higher Education, 56*(3), 300-319.

Kvavik, R. B., & Katz, R. N. (2002). *The promise and performance of enterprise systems for higher education.* Boulder, CO: EDUCAUSE Center for Applied Research.

Lane, L. M. (2008). Toolbox or trap? course management systems and pedagogy. *EDUCAUSE Quarterly, 31*(2), 4-6.

Lane, L. M. (2009). Insidious pedagogy: How course management systems affect teaching. *First Monday, 10*(5). Retrieved from http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2530/2303

Lenhart, A., Madden, M., Macgill, A. R., & Smith, A. (2007). *The use of social media gains a greater foothold in teen life as they embrace the conversational nature of interactive online media*. Washington, D.C.: Pew Internet Project.

Levine, A. (1980). *Why innovation fails*. Albany: State University of New York Press.

List archives at LISTSERV.EDUCAUSE.EDU. (2010). Retrieved March 22, 2010, 2010, from http://listserv.educause.edu/

Macgill, A. R. (2007). *Parent and teen Internet use*. Washington, D.C.: Pew Internet Project.

McLendon, M. K. (2003). Setting the governmental agenda for state decentralization of higher education. *The Journal of Higher Education, 74*(5), 479-515.

About educause. (2012). Retrieved August 24, 2012, from http://www.educause.edu/members

Merriam, S. B. (1988). *Case study research in education: A qualitative approach*. San Francisco: Jossey-Bass.

Miller, W. D. (2010). *A descriptive study of the process post-secondary military institutions use to adopt, implement and train for use of new instructional technologies.* (Unpublished Ph.D.). Virginia Polytechnic Institute and State University, Blacksburg, VA.

MiNiT. (2009). Retrieved November 8, 2010, from http://lists.gustavus.edu/mailman/listinfo/minit

MISO: Measuring information service outcomes. (2012). Retrieved July 27, 2012, from http://www.misosurvey.org/

Monash University. (2009). Retrieved June 16, 2008, from http://www.monash.edu.au/

Moodle.org: Open-source community-based tools for learning. (2009). Retrieved September 25, 2009, from http://moodle.org/

Morgan, G. (2003). *Faculty use of course management systems.* Boulder, CO: EDUCAUSE Center for Applied Research.

Muldoon, K. M. (2004). Student's guide to the pelvis and perineum. Retrieved June 25, 2008, from http://artsci.wustl.edu/~gol/kathleen_muldoon/introduction.html

Nicolle, P. S. (2005). *Technology adoption into teaching and learning by mainstream university faculty: A mixed methodology study revealing the 'how, when, why, and why not'.* (Unpublished doctoral dissertation). Louisiana State University and Agricultural and Mechanical College, Baton Rouge, LA.

NITLE - advancing liberal education in the digital age. (2009). Retrieved September 22, 2009, from http://www.nitle.org/

Nord, W. R., & Tucker, S. (1987). *Implementing routine and radical innovations*. Lexington, MA: Lexington Books.

Oblinger, D. B., & Hawkins, B. L. (2005). IT myths: The myth about E-learning. *EDUCAUSE Review, 40*(4), 14-15.

Open educational resources. (2012). Retrieved November 18, 2012, from http://www.hewlett.org/programs/education-program/open-educational-resources

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students. vol.2, A third decade of research*. San Francisco: Jossey-Bass.

Patton, M. Q. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications, Inc.

PLATO learning: Browse our products. (2010). Retrieved April 16, 2010, from http://www.plato.com/Browse-Products.aspx

Polleverywhere.com. (2012). Retrieved August 25, 2012, from http://www.polleverywhere.com/

Reiser, R. A. (1987). Instructional technology: A history. In R. M. Gagne (Ed.), *Instructional technology: Foundations* (pp. 11-48). Hillsdale, NJ; London: Lawrence Erlbaum Associates.

Responses to the downturn: A survey of colleges. (2009). Retrieved October 21, 2009, from http://chronicle.com/article/Responses-to-the-Downturn-A/47421/

Robertson, I. (2007). Factors influencing vocational teacher's use of online functionalities in australia. *Australasian Journal of Educational Technology, 23*(3), 371-389.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: The Free Press.

Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations*. New York: Free Press.

Ryan, B., & Gross, N. C. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology, 8*, 15-24.

Saettler, P. L. (1968). *A history of instructional technology*. U.S.A: McGraw Hill, Inc.

Saettler, P. L. (1990). *The evolution of american educational technology*. Englewood, CO: Libraries Unlimited.

Salaway, G., Caruso, J. B., Nelson, M. R., & Dede, C. (2007). *The ECAR study of undergraduate students and information technology, 2007.* Boulder, CO: EDUCAUSE Center for Applied Research.

Sannier, A. (2008). From context to core. Retrieved January 3, 2012, from http://campustechnology.com/Articles/2008/12/From-Context-to-Core.aspx?Page=1

Schwarzwald, J., Koslowsky, M., & Mager-Bibi, T. (1999). Peer ratings versus peer nominations during training as predictors of actual performance criteria. *The Journal of Applied Behavioral Science, 35*(3), 360-372.

SMART: Products. (2010). Retrieved April 16, 2010, from http://www2.smarttech.com/st/en-us/products/

Spotts, T. H. (1999). Discriminating factors in faculty use of instructional technology in higher education. *Educational Technology & Society*, *2*(4), 92-99.

Stansberry, S. L., & Harris, E. L. (2005). Understanding the interrelationship of instructional technology use and organizational culture: A case study of a veterinary medical college. *Journal of Veterinary Medical Education, 32*(1), 31-37.

Stockdill, S. H., & Morehouse, D. L. (1992). Critical factors in successful adoption of technology: A checklist of TDC findings. *Educational Technology*, *1*, 57-58.

Stoeker, J., & Pascarella, E. T. (1991). Women's colleges and women's career attainments revisited. *Journal of Higher Education, 62*, 394-406.

Strategic technology plan: For washington state community and technical colleges. (2008). Olympia, WA: State Board for Community and Technical Colleges. Retrieved from http://www.sbctc.edu/docs/strategicplan/strategic_technology_plan.pdf

Student response solutions. (2010). Retrieved April 16, 2010, from http://www.turningtechnologies.com/studentresponsesystems/studentresponsesolutions/

Subramanian, A., & Nilakanta, S. (1996). Organizational innovativeness: Exploring the relationship between organizational determinants of innovation, types of innovations, and measures of organizational performance. *Omega, 24*(6), 631-647.

Surry, D. W. (2002, April). A model for integrating instructional technology into higher education. Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Surry, D. W., & Ely, D. P. (2006). Adoption, diffusion, implementation, and institutionalization of instructional innovations. In R. A. Reiser, & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (pp. 104-111). Upper Saddle River, New Jersey: Pearson Education.

Surry, D. W., & Ensminger, D. C. (2002, April). *Perceived importance of conditions that facilitate implementation.* Paper presented at the Annual Meeting of the American Educational Research Association, New Orleans, LA.

Surry, D. W., Ensminger, D. C., & Haab, M. (2005). A model for integrating instructional technology into higher education. *British Journal of Educational Technology, 36*(2), 327-329.

Surry, D. W., & Farquhar, J. D. (1997). Diffusion theory and instructional technology. *Journal of Instructional Science and Technology, 2*(1). Retrieved from http://www.ascilite.org.au/ajet/e-jist/docs/vol2no1/article2.htm

Surry, D. W., Jackson, M. K., Porter, B. E., & Ensminger, D. C. (2005). A comparison of the relative importance of implementation conditions for various adopter and demographic groups. *Annual Meeting of the American Educational Research Association,* Montreal, Quebec, Canada, April, 2005.

Surry, D. W., & Jasinski, M. (2006). *Innovative practices in e-learning.* Unpublished manuscript. Retrieved April 27, 2008, from http://www.surveymonkey.com/s.aspx?sm=H_2blBE_2fkXyaykD_2fFDQK5k_2bw_3d_3d

Surry, D. W., & Land, S. M. (2000). Strategies for motivating higher education faculty to use technology. *Innovations in Education and Training International, 37*(2), 1-9.

Tarde, G. (1903). *The laws of imitation* (E. C. Parsons, Trans.). New York: Henry, Holt and Co. (Original work published 1890).

Tornatzky, L. G. (1990). *The processes of technological innovation*. Lexington, Mass.: Lexington Books.

Tornatzky, L. G., & Klein, K. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management, 29*(1), 28-44.

Twigg, C. A. (2005). *Increasing success for underserved students: Redesigning introductory courses.* Saratoga Springs, NY: The National Center for Academic Transformation.

U.S. News and World Report: Education: Colleges. (2011). Retrieved August 28, 2011, from http://colleges.usnews.rankingsandreviews.com/best-colleges/search.result

Ulius, S. (2003). Intellectual property ownership in distributed learning. *EDUCAUSE Review, 38*(4), 62-63.

Van de Ven, A. H. (1986). Central problems in the management of innovation. *Management Science, 32*(5), 590-607.

Vandover, W.F. (2007). *The graduate online lecture project: A graduate student-based instructional technology project.* Poster presented at the teaching and learning conference 2007. Minneapolis, Minnesota, April 23, 2007.

Weick, K. E. (1976). Educational organizations as loosely coupled systems. *Administrative Science Quarterly, 21*(1), 1-19.

Welcome to the national center for academic transformation. (2009). Retrieved July 10, 2008, from http://thencat.org/

Welcome to the social archive of teacher's college. (2009). Retrieved June 2, 2008, from http://pocketknowledge.tc.columbia.edu/

Welcome to VideoANT. (2009). Retrieved June 2, 2008, from http://ant.umn.edu/

Zaltman, G., Duncan, R., & Holbek, J. (1973). *Innovations and organizations*. New York: John Wiley and Sons.

Zemsky, R., & Massy, W. F. (2004). Thwarted innovation: What happened to e-learning and why. Retrieved July 18, 2009, from http://www.irhe.upenn.edu/Docs/Jun2004/ThwartedInnovation.pdf

Appendix A. Listserv Participation Inquiry and Response Form

Instructional Technology Innovation in Liberal Arts Institutions

Please complete the form below if you would like to nominate 1 to 2 liberal arts colleges or universities that exemplify innovation and implementation of custom-built, purchased, open source, and/or free web-based instructional technology tools.

Thank you for your help in selecting institutions for this research study and your potential interest in taking part in it. You will be contacted about a future interview time if you volunteer to participate in the study and your institution is selected for the research sample.

Fritz Vandover, doctoral student at University of Minnesota, Twin Cities
Academic Information Associate, Humanities
Macalester College
1600 Grand Avenue St. Paul, MN 55105
phone: 651-696-6761
wvandove@macalester.edu

---

* Required

Your Name *

Your Institution *

Your E-Mail Address or Phone Number *

Are you willing to be interviewed about instructional technology at your institution for this research study? * (yes) (no)

Nominated Institutions

Please nominate at least four liberal arts institutions in the United States that, based on your knowledge, effectively utilize custom-built, purchased, open source, or free instructional technology tools. Please include the name of a colleague or contact at that institution, if you have one.

Institution 1 *
Reason for Nominating Institution 1 *

_Their development and implementation of home-grown instructional technology tools.
_Their implementation of commercial instructional technology tools.
_Their customization and implementation of open source instructional technology tools.

_Their customization and implementation of free, web-based instructional technology tools.

Institution 1 Contact Name

Institution 1 Contact e-mail address or phone number

Institution 2 *

Reason for Nominating Institution 2 *

_Their development and implementation of home-grown instructional technology tools.

_Their implementation of commercial instructional technology tools.

_Their customization and implementation of open source instructional technology tools.

_Their customization and implementation of free, web-based instructional technology tools.

Institution 2 Contact Name

Institution 2 Contact e-mail address or phone number

Appendix B. Open-ended Interview Protocol

Section 1: Instructional Technology Delivery and Support Model

These first questions relate to overall structure and delivery of instructional technology at your institution.

-Please describe your institution's approach to delivering and supporting instructional technology.

-How is your IT organization generally structured for delivery and support? What does the instructional technology staff "look like"?

-How long has this structure been in place?

-Has your structure for delivery and support of instructional technology changed along with the over-arching IT organization?

-Does your institution and/or instructional technology team tend to rely on any one type of instructional technology (commercial, home-grown, open source, or free web-based)?

-How long have you been doing instructional technology work at your current institution? And how long have you been in the field of instructional technology in higher ed.?

Section 2: Resources

The following questions relate to "Resources". By Resources, I mean the financial resources (money) needed to develop and utilize instructional technology at your institution.

-Describe the availability of financial resources for instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-In what ways are financial resources used for instructional technology tools (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-In what ways are financial resources a barrier to new instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-And in what ways are they an enabler?

Section 3: Infrastructure

The next few questions relate to “Infrastructure”. By Infrastructure, I mean the technological capabilities of your institution, including the communication system, data network, hardware, and software. Infrastructure can also include the relationships between the instructional technology staff and networking or IT staff.

-Describe the infrastructure for instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-In what ways is infrastructure a barrier to new instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-And in what is it they an enabler?

Section 4: People

The next few questions relate to the concept of “People”. By this, I mean the social and human aspects of your institution. This includes the goals, skills, talents, backgrounds, beliefs, opinions and feelings of the people who make up your institution (staff, faculty, administrators, and students).

-Please comment on the role of people in instructional technology innovation and implementation (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based).

-Describe the importance of shared decision-making in instructional technology decisions (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based).

-In what ways do the leaders of your institution consider your opinions, ideas, experiences, and beliefs when making decisions about instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-In what ways is the culture at your institution a barrier to new instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-And in what ways is it an enabler?

Section 5: Policies

The next few questions relate to the concept of “Policies”. By Policies, I mean the written and unwritten rules, practices, traditions, and regulations that govern your institution's day-to-day operations as well as IT operations.

-How would you describe the policies at your institution with regard to instructional technology tools?

(Examples)
- Extremely Fluid and Easy to Change
-Rigid and Hard to Change
-Appropriate
-Inappropriate

-How would you change the policies at your institution with regard to instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-In what ways are the policies at your institution a barrier to new instructional technology (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-And in what ways are they an enabler?

Section 6: Learning

The next few questions relate to the concept of “Learning”. By this, I mean the student learning outcomes that instructional technology is intended to positively facilitate. This also refers to the institution’s focus on the learner's experience within the curriculum.

-How is the improvement of learning taken into consideration when new instructional technologies are being explored (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-How do the leaders of your institution discuss the relationship between instructional technology tools and student learning (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

Section 7: Evaluation

The next few questions relate to "Evaluation". In this context, "evaluation" means the assessment of student learning goals, the effectiveness of technology plans and innovative practices, and the costs and benefits associated with an instructional technology tool.

-How would you describe the use of evaluation at your institution with regard to new instructional technology tools?

(Examples)

-Adequate
-Inadequate

-In what ways is evaluation at your institution a barrier to new instructional technology tools (innovating new, purchasing commercial, implementing/customizing open source, implementing/customizing web-based)?

-And in what ways is it an enabler?

Section 8: Support

The next few questions relate to "Support". Support has four components: Training Support, Technical Support, Pedagogical Support, and Administrative Support and Leadership.

Training Support refers to all the formal and informal instruction you or your staff receive or have received related to innovating new instructional technology tools, purchasing commercial instructional technology tools, and procuring and customizing free and/or open source instructional technology tools.

-How is the Training at your institution a barrier to the innovation of new instructional technology, the purchase of commercial instructional technology, and the procurement customization of free and/or open source instructional technology?

-And how is it an enabler?

Technical Support refers to the ongoing support you (and your learners) have when hardware, software, or network problems arise related to an instructional technology tool that was innovated at your institution, purchased from a vendor for your institution, or a free and/or open source instructional technology tool that was procured and customized by your institution.

-How is the Technical Support at your institution a barrier to the innovation of new instructional technology, the purchase of commercial instructional technology, and the procurement customization of free and/or open source instructional technology?

-And how is it an enabler?

Pedagogical Support refers to the collaboration with and feedback from faculty at your institution related to the innovation of new, purchasing (of a commercial product), or procuring and customizing (of a free and/or open source) instructional technology tool.

-How is the Pedagogical Support at your institution a barrier to the innovation of new instructional technology, the purchase of commercial instructional technology, and the procurement customization of free and/or open source instructional technology?

-And how is it an enabler?

Administrative Support and Leadership refers to the commitment your managers/supervisors have made to innovating new instructional technology tools, purchasing commercial instructional technology tools, and procuring and customizing free and/or open source instructional technology tools.

-How is Administrative Leadership at your institution a barrier to the innovation of new instructional technology, the purchase of commercial instructional technology, and the procurement customization of free and/or open source instructional technology?

-And how is it an enabler?

Section 9: Information Technology Developments

The next few questions relate to the emergence of new kinds of information technologies and their effect instructional technology at your institution. By this, I mean new any new software, programming languages or techniques, hardware, server components, or *any other trends in the IT field* that facilitate the development of instructional technology tools.

-How has the emergence of new information technologies been a barrier to the innovation and procurement of instructional technology at your institution?

-How has it been an enabler?

-Please describe any information technology developments that have already had or you anticipate having an impact on your institution's innovation and procurement of instructional technology.

Section 10: Instructional Technology Developments

The next few questions relate to the emergence of new kinds of instructional technologies and their effect on your innovation and procurement of instructional technology tools. By this, I mean new any new software, free or fee-based instructional technologies, devices, or *any other emergent trends in instructional technology* that facilitate the development of instructional technology tools.

-How has the emergence of new instructional technologies been a barrier to the innovation and procurement of instructional technology at your institution?

-And how has it been an enabler?

-Please describe any instructional technology developments that have already had or you anticipate having an impact on your institution's innovation and procurement of instructional technology.

Section 11: Higher Education Marketplace Developments

The next few questions relate to the impact of trends in or beyond the higher education marketplace on your development and procurement of instructional technology tools. By this, I mean admission trends at your institution or broader trends such as the recent recession and its impacts on higher education nationally and locally.

-What kinds of trends in or beyond the higher education marketplace are constraining or enabling your institution's ability to innovate and procure instructional technology?

> -admissions trends at your institution or regionally
> -incoming student expectations of technology in and outside of the classroom
> -higher education associations/consortia

-the market for qualified staff members
-the effect of the recession on your institutions funds

Appendix C. Correspondence with Dr. Surry

Subject: **Re: Educational technology innovation in higher education**

From: vando015@umn.edu

Date: 14 Apr 2008 10:51:53 -0500

To: Daniel Surry <DSurry@usouthal.edu>

```
Hello Dan,

Thank you very, very much for the papers and for permission to use your
survey and framework in my research. And congratulations getting your paper
proposal out the door.

I will definitely be in touch soon.

Thank you again,
Fritz

On Apr 14 2008, Daniel Surry wrote:

>Hi Fritz,
>
> Thanks again for the email Friday. I submitted my paper and it feels like
> an 800 pound gorilla has jumped off my back!
>
> Attached are some articles related to the RIPPLES model which I hope you
> will find helpful.
>
> One of the attached papers is the report of a national study we helped
> with in Australia. The survey we used for that is online
>
>http://www.surveymonkey.com/s.aspx?sm=H_2blBE_2fkXyaykD_2fFDQK5k_2bw_3d_3d
>
> If you wanted to modify the survey and use it for your research, that
> would be fine with me, I have 2-3 PhD students who are doing that or plan
> to do it for their dissertations. I think the framework of the survey is
> very useful in getting at the barriers and enablers that are important.
>
>Anyway, keep in touch and let me know if I can be of assistance in any way
>
>Good luck with your research
>
>Dan
>
>
>
>****************************************
>Dan Surry
>Associate Professor
>University of South Alabama
>College of Education
>UCOM 3700
>Mobile, AL 36688
>(phone) 251-380-2861 (fax) 251-380-2713
>Yahoo IM: dsurry
```

Appendix D. RIPPLES Variables and Extra-Institutional Factors

Jasinski (2007) clearly described the specific aspects of each component of the RIPPLES model (Resources, Infrastructure, People, Policies, Learning, Evaluation, and Support) that will be utilized in this dissertation. These definitions have been adapted to this study, as necessary, below:

1. **Resources**: the monetary resources required to develop a home-grown instructional technology tool, purchase a commercial instructional technology tool, or implement an open source instructional technology tool and make it ready for implementation and full use.

   Resources include:

   - **source of funding** (**soft money** from extra-institutional sources, and **hard money** that an institution commits to an instructional technology development, selection, and implementation)
   - **costs** associated with implementing a new instructional technology tool (**direct costs** [hardware, software, license fees, staff salaries]**, indirect costs** [increased demand for services, increased demand for network storage and bandwidth, additional salaries for additional staff]**, initial costs** [one-time costs upon adoption such as hardware or software purchases]**, on-going costs** [training, software upgrades, annual licensing fees]) (Jasinski, 2007, pp. 45-46).

2. **Infrastructure:** the technological framework and capacity of an institution, such as servers (Jasinski, 2007, p. 46).

3. **People:** the human element of an institution. It includes the goals, skills, talents, backgrounds, beliefs, opinions and feelings of the people who constitute the institution (Jasinski, 2007, p. 47).
4. **Policies:** the written and unwritten rules, practices, traditions, and regulations that govern the institution and affect its capacity to support the types of instructional technology tools utilized (Jasinski, 2007, p. 47).
5. **Learning:** the instructional outcome of an institution's curriculum and the activity that instructional technology tools are intended to improve through improved **pedagogical benefits** and **access benefits** to the institution's learning opportunities (Jasinski, 2007, pp. 47-48).
6. **Evaluation:** an assessment of the context into which an instructional technology tool is introduced as well as its effect on that context (Jasinski, 2007, p. 48).
7. **Support**: the support that those developing, implementing, and maintaining instructional technology tools receive. It includes **training**, **technical support, pedagogical integration**, and **administrative leadership** (Jasinski, 2007, p. 48).

Extra-Institutional Factors

In addition to the RIPPLES variables stated above, several additional factors were probed due to their relevance to the subject of this research. With the developments in computer technology that are constantly taking place, the role of general **information technology developments** and specific **instructional technology developments** will be probed to see if they had any impact on decisions related to instructional technology at the participating institutions.

Similarly, the effects of the recent economic downturn on higher education endowments, appropriations, and operating budgets have been noted widely in many media and research venues (“Responses to the Downturn: A Survey of Colleges”, 2009). This study will explore whether **higher education market developments** has been a factor in decisions related to instructional technology development.

In addition to these extra-institutional variables, other factors that are cited by participants as critical to decisions about instructional technology at their institution were explored as they emerged during interviews.

Appendix E. Participant Consent Information Sheet

I am conducting research to learn more about how liberal arts institutions make decisions related to instructional technology tools. As part of this study, I am interviewing staff and faculty members to learn more about these decision processes. This oral consent agreement is to obtain your permission to include you in the study.

Do you give your consent to be interviewed for this study?

I am also asking permission to make audio recordings of the interviews in order to aide my analysis. You can decline to answer any question or withdraw from the study at any point.

Do you give your consent to have this interview recorded?

I will prepare transcripts of the recordings, but names will not be associated with any participants in my final analysis. I may contact you again after the interview in order to clarify parts of our discussion.

The data from this research will be used for a doctoral dissertation. There are no risks or benefits for the participants in this study. Any concerns about the study can be voiced to my advisor, Dr. Darwin Hendel, University of Minnesota-Twin Cities, 612-625-0129, or Fritz Vandover, Macalester College, 651-696-6761.

Appendix F. Institutional Review Board Approval

1009E89373 - PI Vandover - IRB - Exempt Study Notification

1 message

irb@umn.edu <irb@umn.edu> **Wed, Sep 15, 2010 at 11:36 AM**
To: wvandove@macalester.edu

TO : hende001@umn.edu, wvandove@macalester.edu,

The IRB: Human Subjects Committee determined that the referenced study is exempt from review under federal guidelines 45 CFR Part 46.101(b) category #2 SURVEYS/INTERVIEWS; STANDARDIZED EDUCATIONAL TESTS; OBSERVATION OF PUBLIC BEHAVIOR.

Study Number: 1009E89373

Principal Investigator: Fritz Vandover

Title(s):
Organizational Decision-making During Instructional Technology Innovation in Higher Education

---

This e-mail confirmation is your official University of Minnesota RSPP notification of exemption from full committee review. You will not receive a hard copy or letter.
This secure electronic notification between password protected authentications has been deemed by the University of Minnesota to constitute a legal signature.

The study number above is assigned to your research. That number and the title of your study must be used in all communication with the IRB office.

Research that involves observation can be approved under this category without obtaining consent.

SURVEY OR INTERVIEW RESEARCH APPROVED AS EXEMPT UNDER THIS CATEGORY IS LIMITED TO ADULT SUBJECTS.

This exemption is valid for five years from the date of this correspondence and will be filed inactive at that time. You will receive a notification prior to inactivation. If this research will extend beyond five years, you must submit a new application to the IRB before the study's expiration date.

Upon receipt of this email, you may begin your research. If you have questions, please call the IRB office at (612) 626-5654.

You may go to the View Completed section of eResearch Central at http://eresearch.umn.edu/ to view further details on your study.

The IRB wishes you success with this research.

Appendix G. About the Researcher

I began working in the field of instructional technology in 2000 at Washington University in St. Louis as a graduate student in the History Department. My previous professional experience as a web programmer at a graphic design firm gave me the opportunity to jump right into the discussions and explorations that were taking place in the Graduate School of Arts and Sciences about how to best utilize the Internet and multimedia-based content in teaching, research, and learning at the University. After finishing my M.A. in History in 2002, I joined the instructional technology staff in the College of Arts and Sciences as a Teaching and Technology Developer, staying in that role until 2005. At that time, I moved with my wife to Minneapolis, Minnesota, to begin my doctoral coursework at the University of Minnesota-Twin Cities. After completing my coursework in the 2008, I joined the Academic Technology Services staff at Macalester College, a small, liberal arts institution in Saint Paul, Minnesota. I support the use of information and instructional technology in teaching and research among faculty members in six humanities departments.