# **Examining Transformative Faculty Development Factors to Advance Technology Adoption and Diffusion at a Campus-Based Institution**

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**EXAMINING TRANSFORMATIVE FACULTY DEVELOPMENT FACTORS TO**

**ADVANCE TECHNOLOGY ADOPTION AND DIFFUSION**

**AT A CAMPUS-BASED INSTITUTION**

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# Dedication

This dissertation is dedicated to all faculty, teachers, and educators who experience resistance to integrated technologies and the product developers and training facilitators who serve them.

**Acknowledgement**

I want to thank my husband, Timothy, and my children, JeTaime and Malachi, for their loving encouragement and endearing support. I am so very appreciative of my family’s unselfish sacrifices of vacations and “mommy time” while I studied and worked towards my goal of a doctoral degree. I also want to thank “the tribe” whose love and support kept me motivated and inspired.

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Abstract

**EXAMINING TRANSFORMATIVE FACULTY DEVELOPMENT FACTORS TO ADVANCE TECHNOLOGY ADOPTION AND DIFFUSION AT A CAMPUS-BASED INSTITUTION**

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The purpose of this mixed-method research, in the context of a case study was to examine faculty concerns with integrating technologies and the influences and motivations that lead to technology adoption and diffusion in the classroom. Specifically, the study examined the conceptual frameworks of Rogers' Innovation Diffusion Theory (IDT) and Concerns-based Adoption Model (CBAM) to identify factors that would support the creation of a professional development program. This study examines factors that are significant for motivating and influencing faculty to accept, adopt and diffuse technology into classroom instruction. The population for this study consisted of 1,472 tenured and tenure-track faculty at a Carnegie Research university in the northeastern United States. Four hundred thirty five faculty members responded to the survey. However, the number of responders to each survey question varies as reported. The quantitative data was collected from members of the faculty population using a Likert-style survey on SurveyMonkey.com. Descriptive statistics, including frequencies, means, and standard deviations were computed for all factors using SPSS. Hypothesized relationships

were evaluated using Pearson-product moment correlation coefficients, t-tests, analysis of variance procedures, and bivariate linear regression. The qualitative results were compiled from case-study interviews and identified patterns of language and speech regarding technology integration and adoption using NVivo software and hand-coding.

The ethnographic explorations of individual and institutional culture and grounded theory exploration of individual experiences were used to identify common themes and codes. The narrative research exploration of individual stories was used to describe the lives of the faculty members who were represented in this study. Non-intervention, quantitative methods were correlational. A Likert-style survey was used to collect data and demographic information for random sampling.

The results revealed that the faculty members' integration of technology into the classroom was related to the content taught in the context of this University's culture. Faculty who taught content in the sciences were most likely to integrate technology into classroom instruction. The arts and humanities disciplines reported a lower extent of integrating innovative technology into their teaching strategies. This data indicates a statistically significant relevance to the departmental influence on the faculty member's level of technology usage and a likely conclusion that there is a linkage between the integration of technology into classroom instruction and the content taught. The quantitative data reported that individual motivators for faculty, as a collective community, were related to perceptions within the department. However, case studies of individual faculty members suggests otherwise. The qualitative results conclude that the strongest influence on faculty members' personal beliefs about effective teaching and levels of technology use are the individual's disposition rather than department perceptions and expectations.

Faculty's motivation to integrate technology into classroom instruction was influenced by the usefulness of the technology and the obvious benefits to their work habits and activities. The results also revealed that faculty members, as a collective group, were concerned with how integrating technology into the classroom would distract from their principle work responsibilities and add more work to their busy schedule. Faculty were also concerned with how their job responsibilities would change if they integrated technology into classroom instruction. The results of the case study revealed that leadership and organizational support from University administration was not a significant factor for motivating faculty to integrate technology into the classroom. The factors of influence for the case study group included the rate of efficiency and the experience of learning how to use the technology. Faculty from the case study group also communicated overall resistance without explanation.

By understanding the fundamental principles that influenced faculty's technology adoption practices and behaviors, education administrators, instructional designers, and technology engineers can develop support initiatives for faculty from holistic and experiential perspectives. With the implementation of the McKissic Transformative Professional Development Model, which is based on the framework of Rogers Innovation Diffusion Theory and the Concerns-based Adoption Model collectively, organizational and individual adoption perspectives of emerging technology will facilitate engaging and stimulating experiences for students and teachers alike.

# Chapter 1: Introduction

## Introduction

Since the emergence of integrated technologies in higher education to the present, scholars, government, and non-government organization officials have addressed the need for technology training. These key stake-holders have a vested interest in the professional development that, not only provides skill and information about new technology, but also implements a transformative approach to the knowledge, skills, and dispositions of faculty to accept, adopt, and diffuse technology in classroom learning environments. In 1997, the U.S. Department of Education published a report, *Technology and Its Ramifications for Data Systems: Report of the Policy Panel on Technology* suggesting that the adoption and integration of emerging technologies into higher education instruction would change the roles and work habits of faculty. The report concluded that, as faculty became more involved in technology-based instruction, their responsibilities, activities and workloads would radically change, making a reexamination of data definitions and analytical conventions necessary (p. 15). A decade later, Dede (2006) also contrasted the dynamic, coherent evolution of technology with the types of professional development programs available for those with an interest in and awareness of innovative technology. Dede (2006) concludes that 'fragmented, intellectually superficial' integrated technology professional development program designs failed to adequately improve faculty's capabilities or address their concerns with technology adoption and diffusion. He claimed that "this problem of just-in-time support is exacerbated when [faculty] attempt to implement new strategies in environments made hostile by reluctant peers or administrators who see those innovations as undercutting the current school culture" (p.1). In 2010, Helinek &

Kircher published a research brief in the University Leadership Council of The Advisory Board Company citing a primary concern for faculty with technology adoption as the “lack [of] both the technical and the pedagogical experience necessary to create a quality online course” (p. 8). While the Helinek & Kircher (2010) report cites online courses, this apprehension to engage in teaching practices using innovative technology and technology adoption and diffusion applies to the eLearning phenomenon and justified the need for the proposed study.

This chronological review of faculty training programs identified government agencies, educational organizations, and academic scholars’ concerns with the lack of training and professional development programs that identified factors contributing to faculty members’ unprepared response to 21$^{st}$ Century learners who expect the use of technology as a teaching strategy for classroom instruction. These concerns determined the need for an adjustment in faculty professional development with long-term, transformative impact as a critical component for addressing and alleviating those concerns.

In the last 15 years five major changes in technology training, resulting from widespread adoption of technology, are driving evolutionary changes in faculty roles and work patterns, such as:

1. Unbundling of the instructional functions of curricular development, instructional delivery, student diversity support, and student evaluation requiring greater faculty specialization.
2. Decreasing the emphasis on “professing” and increasing the emphasis on facilitating in virtual environments resulting from asynchronous, self-paced modes of instructional delivery.

3. Blurring of institutional boundaries that currently define where faculty carry out their activities, influencing and redefining the terms and conditions of faculty work to accommodate virtual, hybrid and situated learning environments.
4. Changing faculty activities associated with the adoption of new technologies, affecting institutional policies, staffing patterns, faculty scholarly reward systems, and the reallocation of resources to support faculty development.
5. Adopting computer- and telecommunications-based technologies is causing faculty to change how and where they perform their work, resulting in a need to realign pedagogical and technological skills; along with office, classroom, online and laboratory learning spaces (U.S. Department of Education, 1998; Dede, 2006).

Such dramatic changes in faculty teaching strategies and institutional culture can result from the wide-scale adoption of new technologies and will continue to be factors for ongoing implications for both operational and policy contexts (Helinek & Kircher, 2010).

This study explored three transformative factors that influence and motivate the dramatic changes identified for faculty engagement in innovative technology for classroom instruction – knowledge, skill, and disposition. An exploration of initial levels of faculty concerns with technology adoption provided a conceptual framework that supported the integration of technologies into current teaching practices. These frameworks were used to what extent the factors for influence and motivation are based on individual beliefs, content taught, and the perceptions of organizational support. Overall, the exploration identified which theories of adoption worked best for tenured and tenure-track faculty members. Dede (2006) explained "awareness of 'best practices' is not the same as having the will and skill to adapt such practices to one's own priorities, requirements, constraints, and resources" (p. 50). The results of these explorations identified faculty concerns with emerging technology and the factors of influence and motivation that would advance technology adoption and diffusion for classroom instruction.

**Problem Statement**

Nationally, current faculty development opportunities are primarily technical skill training with instructional design support for course conversion (Dede, 2006; Sahin and Thompson, 2007; Straub, 2009). "Most professional development consists of transmitting information to [faculty], a strategy that does not work significant changes in their practice" (Dede, 2006, p. 49). The researcher's observation and experience at the University of Maryland, a Carnegie Research I University, provided opportunities for exploring an institution-wide technology training program that was similar to the national models. However, there were no appointed academic units to address faculty experiencing resistance to these emerging technologies. This lack of institutional support perpetuated a disconnect between individual concerns and the goals and objectives of the academic unit. This problem caused a need to address factors of influence and motivation strategies for implementing skills as taught in the technology training program.

The faculty training services at the University of Maryland included "guidance for best practices in teaching, learning, and course management using the tools it supported to guide participants in the thought processes and skills needed to undertake a technological modification or transformation of the instructional materials and learning environments they created for their students" (www.umd.edu/oit/training-services). This means that the Learning Technologies Institute (LTI) provided customized workshops and services for training faculty to use various tools such as Wikis, Blogs, Wimba Live Classroom, and Camtasia using Blackboard's Educational Learning Management System (www.umd.edu/oit/training-services). These services were available during scheduled face-to-face “brown bag” discussions, formal training sessions, and in Sloan-C online workshops and Webinars. By offering these training sessions throughout the year, the University of Maryland’s faculty had an opportunity to develop the knowledge and skills necessary for integrating technology into classroom instruction. However, while many faculty members were provided technological skills they failed to make cognitive connections of the skill training with the method of instruction which would support a transformative change in disposition.

Should the University of Maryland fail to incorporate a new approach into their faculty training program that does not influence and motivate faculty to innovation adoption and diffusion necessary for advancing campus-based teaching and learning practices into the 21$^{st}$ Century, faculty resistance will continue to hinder the University’s entrepreneurial explorations of eLearning for engaging in effective teaching in the classroom. Such resistance will also prohibit the University from successfully achieving the goals outlined in the University of Maryland Strategic Plan 2007 – 2008, which is still in effect. The primary goals include “embrac[ing] the power of technology” by “responding quickly to changing student demand for courses, pioneering the application of technology in the creation and study of literature, extending wireless Internet service to the surrounding community… “ and to “act with entrepreneurial spirit” by “developing online educational programs” (p.3).  Should faculty continue to resist the integration of technology into classroom instruction they will, not only thwart a primary goal of the Strategic Plan, but also hinder external research funding opportunities that support innovative technology for advances in engineering, mathematics, science and the social sciences. Ultimately, the University’s enrollment will decrease and cause a loss of the Carnegie Research RU/VH status.

**Purpose and Significance of the Study**

**Purpose.** This action-oriented research had two purposes. First, to explore the components of Innovation Diffusion Theory, (Redmond, 2003; Rogers, 2003; Schrum, Skeele, & Grant, 2003) and Concerns-based Adoption Model, (Hall, 1979; Sahin and Tompson, 2007; Straub, 2009; West, Waddoups, & Graham, 2007) as the conceptual frameworks for identifying factors that influenced and motivated University of Maryland faculty of different academic units to engage in technology acceptance and adoption as a classroom teaching strategy. Second, the identification of these factors was used to develop recommendations for ongoing, transformational support and technology training programs at a campus-based institution.

**Significance**. The significance of the study was to address the need for the development of a technology training program for University of Maryland's tenured and tenure track faculty. The current professional development program fails to identify factors of influence and motivation and thwarts a progression toward technology adoption and diffusion into classroom learning environments. This study examines new approaches for transforming faculty's professional development models and identifies factors for understanding the adoption of emerging technologies for sustainable innovation diffusion.

The study used areas of technology acceptance, adoption and diffusion found in Rogers' Innovation Diffusion and the Concerns-based adoption model. These conceptual frameworks were instrumental for explaining how to identify faculty's levels of technology awareness and technology use while addressing concerns, influences and motivations during transformative stages of development. Although these two frameworks provided diverse approaches in transformative professional development, it was important to consider research that contributed to the theoretical knowledge of faculty development using this approach.

**Research Questions Focused on Solution-Finding**

The primary question was, "how can the University of Maryland develop a transformative professional development program, based on components of the concerns-based adoption model and innovation diffusion theory, to engage faculty in emerging technologies?"

Sub-questions

1. To what extent are technology diffusion factors of individualized, and to what extent are they organizational?
    a. To what extent is integration of technology into classroom instruction linked to the content taught?
    b. To what extent is integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?
2. Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, are used to influences and motivations of faculty from differing academic units?

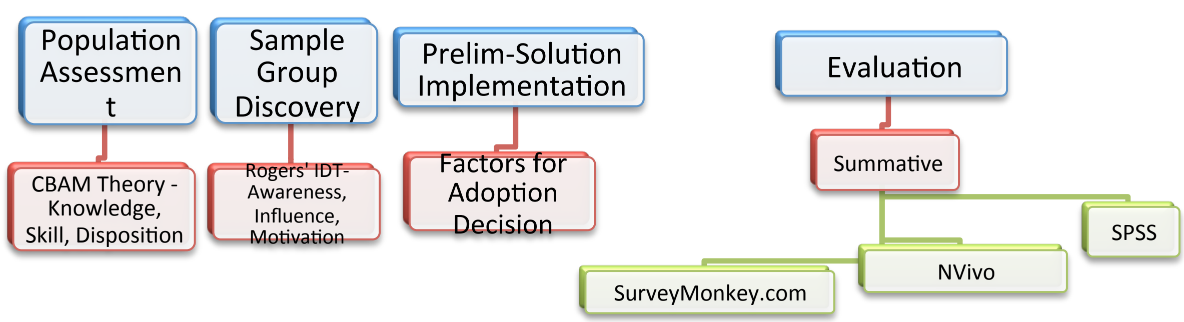
**Conceptual Framework**

For the purposes of this study, the Concerns-based adoption model, CBAM, was used to identify faculty concerns with integrated technologies for classroom instruction and to measure levels of technology awareness and actual usage. The Innovation Diffusion Theory, IDT, was used to explore predictive influences on faculty's technology adoption decision-making process. This transformative process depended on communication between the users, but it was perceived that if users adopt and integrate technology at the same time, it is more likely to be followed by other users of the same academic unit (Rogers, 2003).

Rogers' IDT and CBAM's conceptual frameworks were the guiding principles of this research and the case study. For the purposes of this research, a case study was defined as an examination of detailed information about specific participants or small group with an emphasis on the exploration and description of the event or situation. This use of heuristic inquiry will explore factors of influence and motivation from the "constructivist view point because it taps into the deepest essences of individual meaning" (Thorne, p. 15). Because of this research, the professional development program recommended will examine factors that motivate faculty in a campus-based community to participate in technology adoption and innovation diffusion (Figure 1).

Figure 1

Four Stages of Faculty Development




There were three levels of exploration n in this study. Each revolved or recycled as an ongoing, nonlinear process that began at any stage but always ends with Stage 4. The case study research also progressed through these stages of exploration.

## Stage I

### Population Assessment

- ❑ CBAM Survey

**Stage II**

**Sample Group Discovery**

- Rogers' Innovation Diffusion Theory case study interviews

**Stage III**

**Solution Prelim and Implementation**

- Factors for adoption decision

**Stage IV**

**Evaluation – Summative**

- SurveyMonkey.com
- NVivo

**Definition of Terms**

The definitions of terms distinguished between the various key terms, theories, and concepts of the study. These terms were related by way of research, but a clear distinction between them is important for purposes of assessing the content. These definitions were used to ensure that key words, terms, theories and concepts were interpreted the same way throughout the proposal and research phases.

**Campus-based institution** – Using the L4/HR: Large four-year, highly residential classification from Carnegie Foundation for the Advancement of Teaching, "campus-based institution" in this study referred to the enrollment data showing at least 10,000 degree-seeking students at these bachelor's degree granting institutions. According to Carnegie ranking, at least half of degree-seeking undergraduates lived on campus and at least 80 percent attend full time (http://classifications.carnegiefoundation.org/descriptions/size_setting.php ).

**Concerns-based Adoption Model (CBAM)** – G.E. Hall (1979) first introduced the concerns-based approach as a conceptual framework that examines the salient points in the progression of concerns from non-concern, through self-concern, to the mature concern of the impact of teaching upon students. It is during these stages that concerns are not necessarily sequential for each individual and many enter with varying degrees of maturity. The gap in CBAM research implied that future research is needed on the terms of the dynamics of concerns as they related to the change process.

**Innovation Diffusion Theory** – E.M. Rogers originally published the Innovation Diffusion Theory in 1962. His theory, revised in 2003, describes the patterns of adoption to predict how a new invention will be successful for the user. This theory had potential application to information technology ideas and techniques that were used as a theoretical basis for a number of Information System research projects.

**eLearning** – eLearning is the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance. It is based on three fundamental criteria: 1. eLearning is networked, which makes it capable of instant updating, storage/retrieval, distribution and sharing of instruction or information; 2. it is delivered to the end-user via a computer using standard Internet technology; and 3. it focuses on the broadest view of learning solutions that go beyond the traditional paradigms of training (Rosenberg, 2001).

**Emerging technologies** – The Institute for Ethics and Emerging Technologies defines *emerging technologies* as new knowledge, or the innovative publication of existing knowledge; leading to the rapid development of new capabilities; have long-lasting economic, social and political impacts; a new opportunities for and challenges to addressing global issues; and the potential to disrupt or create entire industries" http://ieet.org/index.php/IEET/more/treder20101206 .

**Faculty resistance** – Weimer (2002) defines faculty resistance to accept and adopt technology as objections based on two sources. First, faculty resist because they find new approaches to technology teaching practices in classroom-based learning environments enormously threatening, and second, the emotional reaction of issues related to power and authority with regards to moving away from an exclusive reliance on content expertise and into the new and unfamiliar domain of learning skills (p.162).

**Information system –** The U.S. Department of Interior best defines Information System for the purposes of this proposal as "a discrete set of information technology (IT), data, and related resources, such as personnel, hardware, software, and associated IT services organized for the collection, processing, maintenance, use, sharing, dissemination, or disposition of information" (http://www.doi.gov/ocio/architecture/documents/DEARPolicyDefinitions.htm) .

**Research University** – The Carnegie Foundation for the Advancement of Teaching (http://www.carnegiefoundation.org/) classifications have been the leading framework for recognizing and describing institutional diversity to support its program of research and policy analysis starting in 1970. Classifications are based on empirical data from colleges and Universities and have been updated in 1976, 1987, 1994, 2000, 2005, and 2010 to reflect changes and to ensure adequate representation of sampled institutions, students, or faculty. Research University classification is granted to higher education institutions that meet the following criteria:

- Offer a full range of baccalaureate program;
- Are committed to graduate education through the doctorate;
- Give high priority to research;
- Award 50 or more doctoral degrees each year;
- Receive annually $40 million or more in federal support.

**Situated learning environment** – Behaviorist theories and cognitive theories look at knowledge external to world, in either behaviors or internal processes or structures. On the contrary, situated learning looks at the learning phenomenon in a broader and holistic perspective incorporating behaviors (actions) and cognition by recognizing the interaction between people and environment and the role of situation. Wilson and Myers (2000) commented that situated learning "is positioned to bring the individual and the social together in a coherent theoretical perspective" (http://www.personal.psu.edu/wxh139/Situated.htm).

**Technology adoption and diffusion** – E. Rogers (1995) recently presented adoption/diffusion theories relate to the scale of innovation efforts by distinguishing between macro-level and micro-level theories. Macro-level theories focus on the institution and systemic change initiatives while micro-level theories focus on individual adopters and a specific innovation or product rather than on large-scale change.

**Transformative development –** For the purposes of this research, transformative development is described as the process by which one evolves beyond a linear model of development to a more organic model, which reflects the complex realities of the individual.

**Web-technologies** – Described by Bonk (2009) as "emerging educational technologies and resources allowing for a more learner-centered focus in education where the learners are active instead of the more passive mode of instruction that has existed for centuries," Web-based technologies are resources with tools are based on production or participation, not consumption and absorption (p.42).

**Assumptions, Limitations & Delimitations**

The assumptions for this study were based on the researcher's previous experiences with eLearning as a student, instructor, and instructional designer at private and land grant higher education institutions in the northeastern United States. These afforded the researcher to form biases and assumptions that created limitations to the study from multiple perspectives.

However, faculty resistance to innovation and decision-making processes for technology acceptance and adoption was the primary research interest throughout the study.

The researcher was able to acknowledge perceptions about University instruction that did not thoroughly integrate technology into teaching strategies because of participation in training programs and observations of faculty dialogue regarding integrated technologies. These experiences with the institutional culture were perpetuated with the University as the flagship campus and delineated it from the for-profit entity of the state university system. While faculty biases against integrated technologies were determined by informal conversations and formal observation at the University, they were not the expressed values of the institution as a whole.

The limitations to the study were caused by the deliberate exploration of tenured and tenure-track faculty's stages of concern, level of technology use, and communication processes. The implications of not considering other members of the campus community established a need for additional research from the perspective of visiting faculty and adjunct instructors. The researcher's accessibility to the site and access to the research sample group, which fits the demographic conditions for the study, is also a limitation to this study. These limitations did not allow generalizable consensus of data interpretation and any further research based on the results must be modified according to the needs and conditions thereof.

The delimitations of the study were the deliberate use of only IDT and CBAM as the conceptual frameworks for this analysis. There are other theoretical models, theories, and frameworks that could be used to discuss technology adoption and faculty development. However, the information related to cognitive levels of perception and attitudes regarding technology acceptance, and innovation adoption concepts were, purposefully, not included in the research and further research can contribute additional theoretical frameworks to the results of this study.

**Summary**

The goal of this research was to identify factors of influence and motivation that could advance faculty's decision-making process for acceptance, adoption, and diffusion of technology into classroom instruction. The exploration of these factors allowed the researcher to create a dual approach for transformative faculty professional development programs based on the frameworks of CBAM and IDT. By relating these two theories, the research explored the relationship between experiences, expectations, and concerns to explain concepts that affect faculty decisions about technology adoption and diffusion.  This pragmatic approach aligned influences and motivators for technology adoption and diffusion with concerns about integrated technologies in classroom instruction and used the results to recommend a framework for transformative professional development. The mixed-methods approach, in the context of a case study, included qualitative ethnographic, grounded theory, and narrative research strategies. The research results were also explored using quantitative experimental, correlational, and Likert-style non-intervention methods as a model for decreasing threats to the validity of the study. The findings of this study were used to recommend a framework of transformative impact on understanding how campus-based institutions could enhance training policies and practices related to faculty development design and services from a holistic perspective.

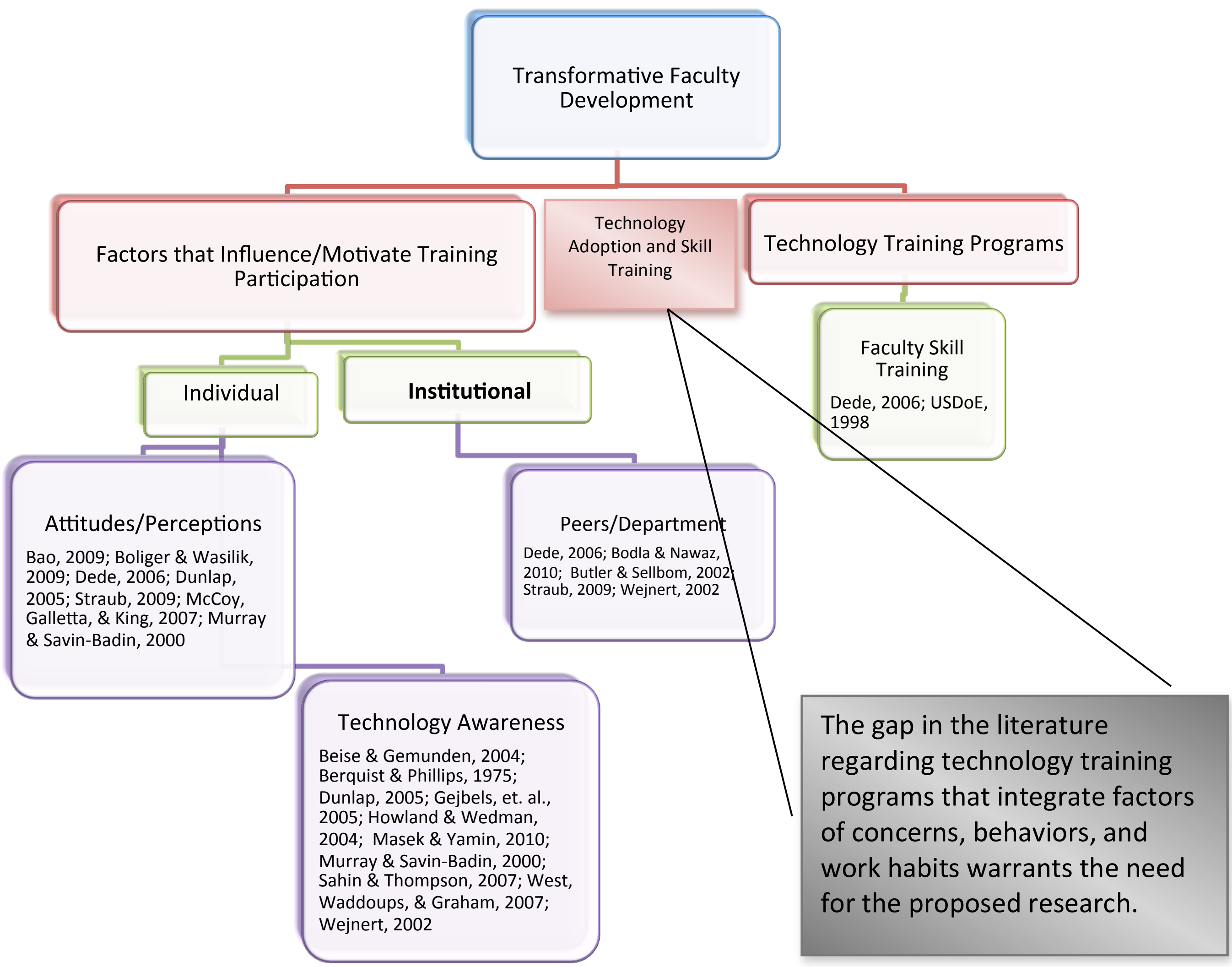
# Chapter 2: Literature Review

## Introduction

As emerging technologies become critical components for reinforcing the core of teaching and learning in higher education, the faculty development programs' design and implementation become a challenge for campus-based institutions nationwide. Scholars in the field have discussed this challenge in transformative faculty development. These discussions have identified factors of faculty disposition that support research for the development of a new approach in technology training programs. The literature discussed in this review assessed articles and books related to the various factors that influence and motivate faculty acceptance, adoption, and innovation diffusion of emerging technologies in classroom instruction at a campus-based institution. The literature review map (Figure 2) illustrates two main threads of study; 1. factors that influence faculty attitudes, beliefs, and works habits and motivate participation in technology training; and 2. technology training programs. The first thread includes a sub-set of individual and institutional factors to examine specific influences and motivations. The strategies for integrating IDT and CBAM were based on the discussions in the literature of this review although CBAM was identified as a multi-faceted approach in the first thread of support for the research. The literature "contains a plethora of references that conclude that technology-mediated learning compares favorably with on-campus classroom instruction. However, an analysis of the literature reveal(ed) that many of the documents [were] how-to articles, advocacy pieces, and second-hand reports" (National Postsecondary Education Cooperative, 2004).

Figure 2

Literature Map




The absence of scholarly articles about influences and motivations for technology adoption and diffusion left obvious gaps in the literature. Although many articles discussed incentives, peer-mentoring, and technical skill training as strategies that transformed faculty attitudes and perceptions about integrated technologies, few actually included the factors of cognitive stimuli and conceptual frameworks in the literature. However, there were multiple articles within the literature review categories which argued that ontological change is a result of psychological nature. Among these scholarly publications, the concepts of innovation diffusion and concerns-based adoption were argued as the foundational frameworks for the current shift within higher education to understand faculty innovation adoption and diffusion into teaching and learning (Savery & Duffy, 2001).

This review of literature identified components of theoretical and conceptual frameworks which discussed strategies for adoption and diffusion of emerging technologies that were incorporated into guidelines for developing faculty training programs from multiple perspectives; 1. factors that influence and motivate technology adoption; 2. technology adoption and skill training; and 3. technology training programs. These three components informed the guidelines as an approach for implementation practices generated through institutional policies for faculty development.

**Conceptual Frameworks**

The impact of transformative training and development programs for faculty of campus-based institutions were examined through more studies of transferability, including studies that measured the application of emerging technologies to solve learning and instructional objectives in campus-based learning environments.

The Concerns-based adoption model is a conceptual framework that described, explained, and predicted probable concerns and behaviors throughout a transformative change process. McCoy, Galletta, and King (2007) provided an assessment of CBAM as “one of the most widely used behavioral models in the field of information systems (p.81). This technology acceptance model, along with Hofstede’s 1980 empirical study on classification systems and cultural dimensions, is based on a scale of value differences and was used by the authors to predict technology adoption. Both concepts focused on the "perceived ease of use" and "perceived usefulness" to formulate the level of change and adoption of an individual while the authors use the technology adoption model to study the "nature of national culture" (p.81) across multiple cultures. This research was instrumental in assisting the researcher with exploring and explaining the case study analysis of meaningful clusters of interview discussions.

In a quantitative study on the Learning/Adoption Trajectory mode, Sahin & Thompson (2007) used CBAM to study faculty at a College of Education to determine predictive factors for technology adoption levels. The authors predicted four technology adoption areas: "(a) participant demographics, (b) computer experience, (c) instructional hardware used in teaching, and (d) methods of learning about technology" (p.190). Along with technology use and experience, demographics such as gender, race/ethnicity, and teaching experience were included in the study as variables that affected faculty levels. The authors' use of the multiple linear regression was a strategy for comparing CBAM with the Learning/Adoption Trajectory model. This strategy was used to determine the ability of a new variable to predict faculty technology use and was important for "providing a means for addressing the individual needs of faculty with respect to technology use" (p.190) and was a significant contribution to the study for exploring faculty decision-making processes. Sahin & Thomspon's (2007) study provided the guidance and support for the researcher to use bivariate linear regression for the quantitative and qualitative data analysis.

As the supporting theory for that decision-making process, Everett Rogers' (1995) Diffusion of Innovations theory explained the process by which an innovation is communicated through certain channels over time among members of a particular social system. This five-step decision-making process was imperative to the research because the theory suggested that transformative change could be promoted through communication of a social system such as the faculty members of a campus community.

As illustrated in the literature map and discussed in this preliminary review of literature on the conceptual frameworks, interaction between Rogers' Diffusion Theory and CBAM required more exploration. In addition, evaluative work to gauge the effectiveness of various methods and models of professional development was an obvious gap in the literature yet was important for exploring and assessing transformative change.

**Influences and Motivations for Participation in Technology Training Programs**

Many faculty lack the necessary technical and pedagogical competencies to successfully integrate technologies into classroom-based learning environments (Wejnert, 2002). The University technology training programs offer modes of skill training and support for troubleshooting information technology issues, but the programs required more than simply stringing together services. There was a need for support that encompassed factors that influenced and motivated participation in technology training program while acknowledging users' concerns and levels of use that, ultimately, advance technology adoption.

In a comparative study of attitudes and disposition, the CBAM was used to examine faculty culture. Researchers used this strategy to identify factors leading to technology acceptance (Bodla & Nawaz, 2010; McCoy, Galetta, & King, 2007; Redmond, 2003; Sahin & Thompson, 2007). By exploring articles of earlier chronological reviews of transformational leadership, scholars determined that CBAM was "one of the most widely used behavioral models in the field of information systems (McCoy, Galetta, & King, 2007, p.81). The CBAM supports technology acceptance models developed to predict technology adoption related to the Theory of

Reasoned Action. The Theory of Reasoned Action examined specific information systems (Redmond, 2003) yet both concepts' focus on "perceived ease of use" and "perceived usefulness" were relevant to the research's assessment of factors for gauging level of change and adoption of an individual. However, it was Redmond's (2003) review of institutional change and culture that supported research for this study. He examined institutional change as a concept for personal transformational change, specifically, when the institutional culture *demands* change. By discussing the different types of institutional change related individual change, the research narrows the focus to "mid level…informal institutions use of new technologies and techniques" (p.665). This exhaustive analysis of the diffusion theory also examined the "delay in adoption explains a lack of awareness of the innovation … on which to base the decision to adopt" (p.667). This analysis indicated that the process of diffusion is based on communication and the delay in the adoption process was caused by a lack of or no communication. Redmond (2003) also argued that, from an institutional perspective, resistance was based on individual values. This cognitive approach to the diffusion theory was useful for the study of CBAM.

In relation to Rogers' Innovation Diffusion Theory, Vishwanath (2005) created an empirical model of technology adoption based on personality characteristics that is pertinent support for this study's exploration of factors contributing to innovation diffusion. The author concluded that technology adoption was based on a research "measurement model" of factors that contributed to global innovativeness, especially "tolerance for ambiguity, complexity, and insolubility," and will ultimately result in other contributors such as integrated social networks and media use (Vishwanath, 2005, p. 805). This "measurement model" was a guiding principle in this study to predict the likelihood of adoption. Vishwanath's (2005) study assessed tolerance as a conditional factor that would expound on other contributors such as cognitive behaviors, which are relevant to the research. The conclusion of this particular study benefited technology innovation invention rather than integration. The researcher took advantage of the opportunity to expound on other factors of influence and motivation as cognitive behaviors. The conclusion of this particular study had a significant impact on the development of the data collection tools used in this study because of the discussion of technology innovation invention rather than integration. This future implication was used as a guideline for assessing quantitative data results as factors among faculty from various academic units within the University. The study was also used to determine the relevance of content as an institutional influence for technology adoption in the case study analysis.

There were few explorations that contributed to technology acceptance, adoption and diffusion as a significant component of technology skill training programs. There is an abundance of literature that addressed individual and institutional influences and motivations for technology adoption such as attitudes and perceptions, awareness, and peer and departmental culture. There were also scholarly interpretations of faculty resistance that identified mental models, such as satisfaction, and perceptions. Butler and Sellbom (2002) discussed economic, sociological, organization, and psychological influence as contributing factors that influenced and motivated individual faculty members to accept and adopt emerging technologies. This is an analysis by which the research built upon and introduced new concepts and practices for metaphysical approaches to faculty “readiness” for change based on the transformational change models that were introduced in the literature. The findings of the study discussed areas of proficiency, barriers to technology acceptance as the primary factors that inhibited faculty adoption while addressing more generalizable models for institutional adaptation. The barriers to technology acceptance discussed in Butler and Selbom's (2002) literature was a supportive contributor to the researcher's analysis of case study barriers as outlined in Figure 15.

The exhaustive list of sources supported the epistemic, performance, and presentational views presented as "simple actions of design and instruction." These important aspects were used in the study because of the chronological review of a distance education's processes based on experience and conceptual frameworks. Tabata and Johnsrud's (2008) research also focused on faculty attitudes and "innovation theory" to assess the underlying factors of participation and non-participation in online education. They concluded that, along with the core issues, implications for policy and practice relevant to technology use and skills, training and development and instructional design, technical support, quality issues, and workload compensation. This study supported Sahin and Thompson's (2007) study of faculty at a College of Education which determined predictive factors for technology adoption levels in four areas: "(a) participant demographics, (b) computer experience, (c) instructional hardware used in teaching, and (d) methods of learning about technology" (p. 190). These factors were used to determine faculty use of technology and examined influences on attitudes and demographics such as gender, race/ethnicity, and teaching experience were also included as variables that would affect faculty levels from an individual perspective. The CBAM was the conceptual framework for the study; however, Sahin and Thompson (2007) used the multiple linear regression as the qualitative research method to compare other variable to predict faculty technology use. This mixed methods approach was used to guide the methodology of the study and suggested that data analysis tools, self-directed informational sources, and collegial communication were contributing factors that encouraged faculty member's adoption of technology. This analysis was important for “providing a means for addressing the individual needs of faculty with respect to technology use” (Sahin & Thompson, 2007, p.190).

Another assessment of professional development strategies that addressed the challenges of technology adoption as discussed was presented in the literature of West, Waddoups, and Graham’s (2007) exploration of methods was used to “understand the experiences of instructors as they are persuaded to adopt a course management system and integrate it into their teaching (p.1).” The research used in the study explained why instructors embrace, reduced their use, or sought replacement options of the course management system tool and how the implications of training and institutional support affected any of those three areas. The results of the study discovered that there were more institutional influences on faculty adoption of the course management system rather than the impact of successful implementation.

**Technology Training Program Guidelines**

This section of the research identified literature that examined the concept of technology training guidelines and practices for faculty professional development. At the University, faculty relied on the technology training programs to provide the knowledge and skills necessary for integrating technology into classroom learning environments. This section provides an overview of ideas and practices about the way technology training was done at campus-based higher education institutions. The review examines how institutions used coherent models to establish faculty development and training programs. The literature explored policies and procedures that influenced these ideas and practices as a basis for summarizing the significance of the study.

In the model of comprehensive methods developed by Berquist and Phillips (1975), was identified as important for understanding the evolution of faculty development. The limitations of the authors’ case studies, referred to as case “histories,” included dated references to technological advances and integrated technologies pedagogy. However, those dated references were supported by Dede's (2006) compilation of online training and development programs for teachers. Dede's (2006) research compliments Berquist & Phillips by exploring the chronology of emerging models and methods with the supporting theory that "[the] problem of just-in-time support is exacerbated when teachers attempt to implement new strategies in environments made hostile by reluctant peers or administrators who see those innovations as undercutting the current school culture" (p.1). The limitations of the Berquist & Phillips (1975) case study was beyond a respectable time limit for inclusion into this study as a supporting theory, but the revolutionary ideas of introducing new technology and the discussions about organizational development causes provisional acceptance and a relevant impact on current research.

As discussed in the Introduction, there was an abundance of literature that traced the evolution of technology training programs, which proved the evolutionary approach of Berquist & Phillips' study as pertinent and relevant. The regional accrediting commission for higher education institutions, the Middle States Commission on Higher Education, MSCHE, (2002) generated a report of educational assessment measures that consider distance and online education forms of delivery as "technologically-spawned innovations in educational practice" yet emphasized the regional accreditation process as the "dependable indicator of institutional quality." From this report, the researcher considers the MSCHE's definition of the accreditation process as a critical factor in perpetuating a certain culture among campus-based institutions. This concept was explored because of the regional familiarity of those on the accreditation board with those of the institution's administration. The resolve to sustain certain values in the evaluation process, such as the balance between innovation and accountability, addressed specific elements essential to rating the quality of distance education courses and effective teaching strategies.

Along with MSCHE, The Office of Post Secondary Education in the U.S. Department of Education (2006) evaluated regional accrediting agencies' guidelines to identify best practices in the review process of online and distance education courses and programs. The purpose of the report was to: 1) to provide a mutually beneficial practice of more consistent and thorough assessment and accountability measures for distance education programs; and 2) to develop a framework for Congressional legislation that required accreditation agencies to include these practices and guidelines in the accreditation process. The purpose of both, the MSCHE and the Office of Post-Secondary Education, was to provide higher education institutions with models that ensured credibility and accountability criteria for distance education programs. The USDE (2006) report examined the "shift" and movement to online education as a strategy for improving educational services. The discussion of economic considerations, accessibility, and increased global perspective were favorable factors of the paradigm shift. Although classroom and traditional resources were not barriers to online instruction in the USDE report, multimedia, technical, and faculty support resources were strategies relevant to the research and important to consider.

Comparable to the Sloan Consortium's rubric of quality standards, Phipps and Merisotic (2000) conducted a case-study of twenty-four benchmarks for quality of online learning strategies. The authors examined The Institute for Higher Education Policy, which is sponsored by Blackboard (an electronic learning management system) and the National Education Association. By dividing the benchmarks into seven categories, quality measures were collected from campus-based, higher education institutions around the nation. Phipps and Merisotic's

(2000) study was important because it identified the important of online learning practices and described them as “drastically different from the traditional classroom-based education.” Because faculty technology adoption was an important component of the proposed research, this review of literature explored the complexities of integrating technology into teaching and was used to support the research theory that faculty required support mechanisms for successful technology adoption and transformational teaching strategies.

**Summary.** The researcher examined the impact of transformative training and development programs for faculty of campus-based institutions. This exploration was a study of transferability between factors that influenced and motivated technology adoption and diffusion with actual technology usage. Furthermore, an evaluative body of literature that gauged the effectiveness of various models of professional development was an obvious gap in the literature. Also, the absence of literature that provided an understanding of this mode of faculty training was a significant support for the need of the research.

**Conclusion.** Integrated technologies and professional development emphasis shifted from a focus on technology skill to assimilation and adaption of new knowledge and skills, yet this shift failed to evolve into existing teaching habits and practices at the University. Detailed comparisons between components of Rogers’ IDT and CBAM were needed to ascertain if faculty relationships between their current teaching practices and level of technology adoption would correlate with organizational culture and institutional support. These theoretical frameworks contributed to recommendation of an effective professional development framework that would advance faculty’s adoption and diffusion of emerging technologies into classroom instruction. Rogers’ IDT and CBAM were used as the interpretive frameworks for guiding many professional development programs in higher education. The researcher used an evaluative approach of those programs to determine how each component of IDT and CBAM worked together, yet functioned separately within a transformative professional development model. A result was a new approach for technology training that could be designed to affect and transform faculty's ability to use emerging technologies in classroom-based learning environments.

**Research questions.** It is important to understand faculty's concerns with integrated technology as a means for designing and implementing a faculty development program. However, it is equally important to understand the factors of influence and motivation that would advance a technology adoption and diffusion. The research questions were designed to understand those factors as well as to provide a basis for a transformative approach to professional development that includes the knowledge, skills, and dispositions. There were specific strands that contributed to this exploration. These strands were identified as factors of influence and motivation based on attitudes/perceptions, technology awareness, peers, individual and institutional. The professional development strategies discussed in this section had significant indications for understanding faculty acceptance or resistance to using and integrating emerging technologies in professional practice, specifically the University faculty. By understanding faculty knowledge and skills, the researcher sought to have an accurate measure of faculty's dispositions about professional development for meeting their demands for primary activities such as teaching and research.

The primary question in this study was, "how can the University develop a transformative professional development program, based on components of concerns-based adoption model and innovation diffusion theory to engage faculty in emerging technologies?"

Sub-questions

1. To what extent were technology diffusion factors of individualized, and to what extent were they organizational?

a. To what extent was integration of technology into classroom instruction linked to the content taught?

b. To what extent was integration of technology into classroom instruction influenced by the faculty member’s beliefs about effective teaching?

2. Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, were used to influence and motivate faculty from differing academic units?

# Chapter 3: Action Research Methodology

## Introduction

This study faculty decision-making processes regarding the acceptance of technology, adoption of emerging technologies, and diffusion among classroom learning environments. Specifically, this study examined faculty's knowledge, skills, and disposition about integrated technologies and the factors of influence and motivation for them to adopt and diffuse technology into classroom instruction. A mixed-methods approach, in the context of a case study, examined a population of 1,472 faculty members at the University. A Likert-style survey on SurveyMonkey.com was used to collect quantitative data while the qualitative results were compiled from case-study interviews that identified patterns of language and speech regarding technology integration and adoption. Qualitative data analysis supported the reliability and applicability of descriptive quantitative results and served as the research method for identifying faculty beliefs and perceptions about emerging technologies related to practical skill and technology usage in classroom instruction. The study was conducted with tenured and tenure-track faculty of differing academic units and was approved by the Institutional Review Board's, IRB, of the researcher's institution of matriculation and the University.

This chapter describes the procedures and methods that were used to gather and analyze data required for this study.  It has been divided into five major sections: Site and Population; Research Design and Rationale; Quantitative Data Collection and Analysis; Qualitative Data Collection and Analysis; and Ethical Considerations. The first section, Site and Population describes the population, site description and site access. The second section, Research Design and Rationale describes the research methods, list of methods that were used, stages of data collection and the mixed methods design of the study. The third section, Quantitative Data Collection and Analysis discusses the instrument description, participant selection, identification and invitation for University faculty, and concludes with the data collection and data analysis. The fourth section, Qualitative Data Collection and Analysis, mirrors the quantitative section. The fifth section, Ethical Considerations, describes Drexel University's IRB authorization process (Appendix A) and documented University agreement for access to University faculty (Appendix B). This section also discusses protection of the human subjects' rights and welfare and how the confidentiality or anonymity of participants was assured throughout the study. The Human Subjects IRB form is found in the appendix.

## Site and Population

**Population description.** There were 1,472 tenured and tenure track faculty members at the University during the time of this study. This population of campus-based instructors was chosen as the sample group because they demonstrate a different styles and methods of instruction than those of their for-profit private-school counterparts (Bodla and Nawaz, 2010). Tenured and tenure track faculty's academic units and "nature of culture" were examined to assess the various stages of technology acceptance and adoption. The sample group was validated as "double-blind" because the list-serv was compiled by the University's Office of Human Resources and the researcher had no means of identifying those on the list.

The case-study method evaluated the factors of influence and motivation of from faculty members selected by the researcher. This sample group was defined by the researcher's access and familiarity with the differing academic units to ensure that there was a representation of various disciplines.

**Site description.** Situated on 1,250 acres in the northeastern corridor of the United States, the University is a Carnegie Research University (RU/VH: very high research activity). The University was established in 1856 as a flagship institution of a state university system. The institution reported 1,472 tenured and tenure track faculty members at the time of the study. In 2010, the University secured $545 million in new, externally sponsored research grants and placed 36th among 500 top universities worldwide in the 2010 Academic Ranking of World Universities (Maryland in the News, 2011).

According to the 2010 annual report, the University had 38 faculty members appointed to the National Academies, 4 current Nobel laureates among the 3,996 total body of faculty members. Academically, the University ranked No. 36 among the world's research universities according to the Academic Ranking of World Universities (it was ranked No. 12 among U.S. Public Universities, and No. 28 among all U.S. universities), No. 15 on *Newsweek's* list of "The 25 most Desirable Large Schools", No. 16 in the QS World Rankings among U.S. Public Universities for Technology and Engineering, and the College of Education is 23rd in the *U.S. News & World Report*'s Graduate Rankings.

**Site access.** The researcher was a program manager in the Office of Extended Studies (OES) at the University. The OES provides program development and administrative support to academic units and is managed as a self-support unit on campus. The OES also manages non-traditional undergraduate programs such as winter and summer term, online and campus-based professional and post-baccalaureate programs.

The Office of Human Resources was instrumental in providing an email list-serv and initiating contact with the sample group based on the authorization of the Vice President for

Extended Studies (Appendix C). Data was collected in the web-based program, SurveyMonkey.com.

**Research Design and Rationale**

The mixed-method design chosen for this study included a nonintervention quantitative designs (Figure 3) and used qualitative ethnographic research, grounded theory, and narrative research (Figure 4) to validate the results. This research design was based on the frameworks of CBAM and Rogers' IDT. These conceptual models provided various dimensions of functional knowledge, cognitive flexibility, and self-directed learning using a mixed-methods approach within the context of a case study.

Figure 3

Quantitative Designs and Uses for the Proposed Study

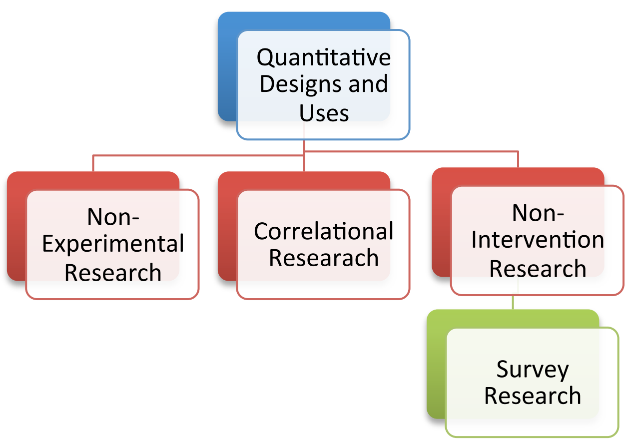
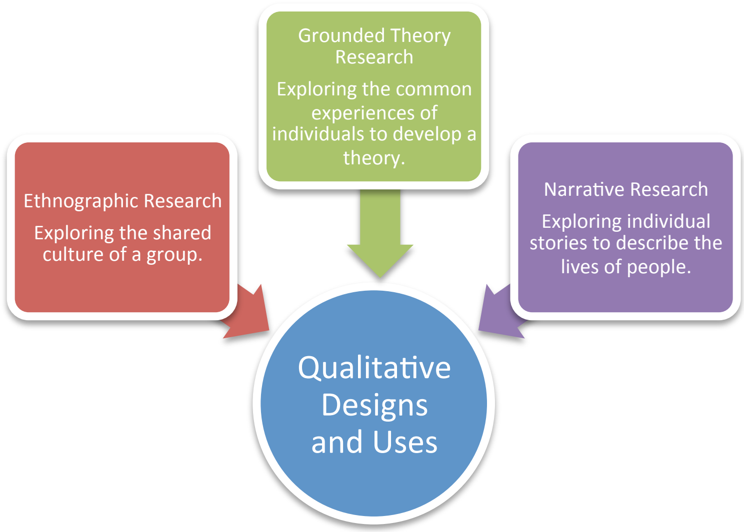


Figure 4

Qualitative Designs and Uses for the Proposed Study




The rationale for using the case-study approach was based on Yin's (2009) description that "case-studies are the preferred method when (a) 'how' or 'why' questions are being posed, (b) the investigator has little or no control over events, and (c) the focus is on the contemporary phenomenon with a real-life context" (p.2). The primary research question of, "how can the University develop a transformative professional development program, based on components of the concerns-based adoption model and innovation diffusion theory, to engage faculty in emerging technologies?" satisfied Yin's criteria (a). The lack of control over faculty's decision to adopt and integrate technology satisfies criteria (b) and the development of a model faculty development program that can be implemented at campus-based institutions met the criteria for (c). The sub-questions of the study examined the "what" components of the research, which contributed depth and breadth of the overall primary question.

**Research methods.** The research instruments were based on the CBAM stages of concern and level of technology use, which allowed data collection to focus on a complete and comprehensive approach. The use of the case-study approach allowed a norm-referred measure, which assessed the individual member among the faculty sample group. These methods support an educational research design that can use the results to replace the traditional, didactic, teacher-centered approach and incorporate a learner-centered theory for faculty development. This methodology was instrumental for comparing faculty as peers to determine the individual versus the organizational influence on beliefs about integrating technology as an effective teaching strategy.

**List of methods used.** The methods in this study included a quantitative survey and a qualitative case study interview. The components of Concerns-based adoption model and Rogers' Innovation Diffusion Theory were the frameworks for developing the survey and interview questions. The seven stages of the CBAM were used to examine the major factors of influence and motivation for transformative professional development. CBAM was first introduced to identify and continuously monitor technology concerns and use reported by K-12 teachers (Hall, 1979; Hall & Hord, 1987; Hord, Rutherfor, Huling-Austin, & Hall, 1987; Loucks-Horsley & Steigelbauer, 1991). This conceptual framework, illustrated in Figure 5 and Figure 6, was used to develop the Likert-style survey completed by the sample group and to construct the interview questions for the case study group. The theories of IDT, illustrated in Figure 7, were also used in the development of the case study interview questions to examine the correlation between the survey responses and the case study discussions. These expressions and behaviors are relevant to a broad spectrum of educators, policymakers, and practitioners as a model for change in individuals in various fields of study and professions (Straub, 2009).

Figure 5

The Concern-based Adoption Model Stages of Concerns

| Stage of Concern | **Examples of Expression of Concern** |
|---|---|
| 6. Refocusing | I have some ideas about something that would work even better. |
| 5. Collaboration | How can I relate what I am doing to what others are doing? |
| 4. Consequence | How is my use of technology affecting my students? How can I refine my use of technology to have more impact and meet learning objectives? |
| 2. Personal | How will using technology in the classroom affect my teaching strategies? |
| 1. Informational | I would like to know more about technology for the classroom. |
| 0. Awareness | I am not concerned about using technology in the classroom. |

Figure 6

The Concern-based Adoption Model Indicators of Level of Use

| Levels of Use | Behavioral Indicators of Level of Use |
|---|---|
| VI. Renewal | The user is seeking more effective alternatives to the established use of technology in the classroom. |
| V. Integration | The user is making deliberate efforts to coordinate with others in using technology for classroom learning environments. |
| IVB. Refinement | The user is making changes to the integrated technology to increase learner engagement. |
| IVA. Routine | The user is making few or no changes and has established a pattern of use of the technology integrated in current teaching strategies. |
| III. Mechanical | The user is making changes to better organize use of integrated technologies in the classroom. |
| II. Preparation | The user has definite plans to begin integrated technology into classroom learning environments. |
| I. Orientation | The user is taking the initiative to learn more about innovative technology and how to integrate technology into classroom learning environments. |
| 0. Non-Use | The user has no interest in integrating technology into classroom-based instruction and is taking no action. |

**Stages of data collection.** The Four Stages of Faculty Development illustrated in Figure 1 were based on the constructs of IDT and CBAM and allows the recommended framework to revolve and recycle as needed based on the impact of the influence and motivation on faculty's decision-making process. These frameworks were also used as the conceptual and theoretical models for determining a stage of progression or regression through the various stages.

*Stage I: Population Assessment*

The research began with a Stages of Concern Instrument (Appendix A). This Likert-type survey assessed faculty's initial stage of technology adoption based on CBAM stages of technology adoption. This approach explored the faculty members' dispositions and concerns and knowledge of innovation and actual skill of technology usage.

*Stage II: Sample Group Discovery*

This phase of the research explored faculty's response to the idea of integrating emerging technologies into classroom instruction (Figures 5 and Figure 6). This phase was implemented for the faculty sample group and the case-study group. The case-study group provided an opportunity to observe behaviors during the interview sessions while collecting data on responsive comments, related inquiry, and interviewer/interviewee discussions based on Rogers' IDT (Figure 7).

Figure 7

Rogers' Innovation Diffusion Theory Taxonomy

| Innovation Diffusion Theory | |
|---|---|
| **Knowledge** | User becomes aware of innovation and has some idea about how it functions for use in the classroom. |
| **Persuasion** | User forms an favorable or unfavorable attitude toward the innovation for classroom use. |
| **Decision** | User engages in activities that lead to a choice to accept or reject the innovation. |
| **Implementation** | User puts an innovation into use and integrates it into classroom teaching strategies. |
| **Confirmation** | User evaluates the results of an innovation. |

*Stage III: Solution Prelim and Implementation*

Faculty of the case study group were interviewed about influences and motivators for gaining knowledge about innovation, factors that motivate adoption decisions, and what influences and motivations were related to the department and institution. These factors were then used to compare and contrast those with the faculty survey group responses on the web-based survey.

*Stage IV: Evaluation – Summative*

The validity of the data was increased using a multi-faceted method of addressing potential issues in data collection and data analysis. The interpretations that compromised the merging or connecting of the quantitative and qualitative strands of the study were also validated using a multi-faceted approach of various data collection methods (Creswell & Plano Clark, 2011). Qualitative research methods included coding, ethnographic observations, and case-study interviews to collect data on faculty knowledge, skills, and dispositions from an ethnographic approach of understanding the culture of the individual. The quantitative analysis included descriptive statistics of the faculty population, paired differences and paired correlation assessments.

**Mixed Method Design**

The mixed methods approach was used to explore quantitative and qualitative data. The action research method used quantitative and qualitative data analysis strategies to examine the faculty and case study sample group's study of stages of concern and levels of technology use in a comparative analysis of the results. The combination of these methods caused an evolving and revolving study of the data.

Two different methods of data collection were used during this study – a web-based survey completed by the faculty sample group based on CBAM and case study interviews based on CBAM and IDT. This approach allowed data analysis to occur during various stages of the study and determined how the research recycled or revolved during data collection. Creswell and

Clark (2011) cited Teddlie and Tashakkori's 2009 conclusion of using mixed method interpretation to examine quantitative results and qualitative findings to assess how the information addressed the primary question of the study. The combination of mixed methods research with action oriented research caused the reliability to the qualitative research to increase as the percentage of codes that are similar to survey results also increased. Once the interpretations were computed, the systematic comparison with quantitative data analysis created an overall increase in reliability statistics (p.212).

**Quantitative Data**

During Stage I and II, a Likert-style survey was used to administer the questions for completion via SurveyMonkey.com to the faculty sample group. Quantitative data was used to understand the correlation among variables to determine if one group, i.e. social scientists, performs better on an outcome than another group, i.e. mathematicians. A mixed method of quantitative and qualitative data analysis was used to understand the correlation between content taught and level of technology usage.

**Instrument description.** The faculty sample group was initially assessed using the CBAM analysis reconfigured into a Likert-style survey to determine the stages of concern and levels of technology use. This framework had implications for the approach of professional development and acknowledged a change in teaching and learning in technology development programs as a critical approach for [facultuy] learning (Loucks-Horsley & Steigelbauer, 1991).

The CBAM Expressions of Concern and Levels of Use 6 has seven levels with 6-point stages of 0. Awareness, 1. Informational, 2. Personal, 3. Management, 4. Consequence, 5. Collaboration, and 6. Refocusing to identify technology use and addresses faculty's self-concerns before the hands-on training session. Each stage has an expression assigned to it for defining faculty concerns, such as 0 = no concern; 2 = wanting more information; 3. time management; 4. learner impact and affecting teachers; 5. community and peer-relations; and 6. exploration of alternatives. As each stage progresses numerically, the greater the levels of concern with technology use (Figure 5). The CBAM Level of Use and Behavioral Indicators of Level, displayed in Table 2, determined implementation concerns. This analysis has a chronological list to indicate behavioral levels of technology use. They are 0 = non-use with no interest; I. = orientation with user learning more about the innovation; II. Preparation with plans to begin using the innovation; III. Mechanical with behavioral modifications for better use; IV. A. Routine use with few or no changes in behavioral patterns; IV.B. Refined use with changes made to increase learner impact; V. integration of technology with deliberate efforts to coordinate with others; and VI. Renewal level where the user seeks effective alternatives to the established use (Hall, 1979; Hall & Hord, 1987; Hord, Rutherford, Huling-Austin, & Hall, 1987; Loucks-Horsley & Steigelbauer, 1991) (Figure 6).

Rogers' IDT exploration was conducted using case study interview conversations. The validated interview instrument consisted of eight questions that asked this sample group to discuss concerns with integrating technology into classroom instruction and their self-perceived levels of technology use. The qualitative interview questions also examined faculty responses to collaborations within the department to explore the outcome, sources, and required resources. These case study questions, validated by IDT, are listed in Appendix E.

**Participant selection.** Participants in the case study were self-selected from an invitation from the researcher. This self-selection process is from the sample population, inclusive of 1,472 faculty members.

**Identification and invitation.** The sample population of 1,472 faculty members was accessed via email by a list-serv compiled by the University's Office of Human Resources. An introduction to the study and invitation was presented in the body of the email and included researcher and supervising professor contact information.

**Data collection.** Quantitative data was collected using the Likert-style survey with questions based on CBAM. The survey was administered to the faculty sample group of 1,472 faculty members and received responses from 435 participants. This represents a 29% response rate.

**Data analysis.**. SPSS: An IBM Company software was used to analyze bivariate and linear regression tests of the empirical data. The data analysis was vetted by a professional statistician.

**Qualitative Data**

During Stage III, an ethnographic case-study approach was used for data collection. The researcher conducted interviews with a case study group to determine a correlation between content areas taught, perception and beliefs about integrating emerging technologies for effective teaching strategies, and current technology usage.

**Instrument description.** Face-to-face interviews with open-ended questions were conducted with the case study group. These interview questions were based on Rogers' Diffusion Theory. The responses were used to explore in-depth information about faculty perception and beliefs about personal motivators and departmental influences for advancing technology adoption and diffusion into classroom instruction.

**Participant selection.** The case study group was comprised of five faculty members. This small sample size is not intended to generalize, but will provide an understanding from the perspective of these five participants. Creswell and Clark (2011) confirm that case study approaches require smaller sample sizes because "the larger the number of people, the less detail that typically can emerge from any one individual" (p.174).

**Identification and invitation**. The case study group was identified from the researcher's previous interactions and professional association. The researcher extended phone and email invitations to faculty members to participate in the study.

**Data collection**. One-on-one interviews were conducted via face-to-face sessions and audio taped to ensure accuracy of the discussion. Specific ethnographic interview protocol was used for note taking purposes (Creswell and Clark, 2011).

**Data analysis.** The transcription notes from the data results were hand coded. The software, NVivo, was used for module coding of data in order to identify specific and recurring themes among the participant responses.

**Ethical Considerations**

The role of the researcher is a limitation of the proposed research methodology and design strategy. The researcher was a University administrator of the University and provided support for academic units that expressed interest in engaging in online, hybrid, and entrepreneurial instruction. It is researcher's former position at the University, which allowed the Assistant Vice President for Extended Studies to provide access to the site for the research (Appendix A). However, the Office of Human Resources disseminated the email invitation with a link to the quantitative survey n SurveyMonkey.com to maintain participant anonymity. The email recipient information was not revealed to the researcher or dissertation chairperson even though the text of the email contained the contact information for both. Some participants may have remembered a sense of familiarity with the researcher from previous work related experiences. The researcher submitted the necessary documents to the Drexel University and University of Maryland ethics review committees obtained IRB approval from the Drexel University IRB (see Appendix A) with a University IRB Authorization Agreement (see Appendix B) as part of the research approval process.

# Chapter 4: Findings and Results

## Review of Purpose and Significance of the Study

The purpose of this study was to explore the factors of motivation and influence to advance faculty's technology adoption and diffusion into classroom instruction. The study also explored faculty's transformation from reluctance to emerging technologies into awareness for sustainable innovation diffusion. Faculty's awareness was related to knowledge, adoption and diffusion was related to skill, and reluctance was related to disposition. The study used CBAM for developing the quantitative data collection tool and Rogers' IDT to create the qualitative tool for exploring and comparing results that can be used to develop recommendations for sustainable, transformational support and technology training programs. The significance of this study is to identify transformational approaches that can be implemented on campus-based institutions' faculty development models.

The research questions posed in this study were: How can the University of Maryland develop a transformative professional development program, based on components of concerns-based adoption model and innovation diffusion theory, to engage faculty in emerging technologies?"

1. To what extent are technology diffusion factors individualized, and to what extent are they organizational?

    a. *To what extent is integration of technology into classroom instruction linked to the content taught?*

    b. *To what extent is integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?*

2. Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, are used as influences and motivations of faculty from different academic units experiencing different administrative cultures?

**Summary of Data Collection**

The University's Office of Information Technology, OIT, notified the Office of Extended Studies that the institution was changing the platform for web-based instruction from Blackboard/ELMS to Canvas, a new, open-source learning management system developed by Instructure™. This confidential information was not shared campus-wide, especially to primary end-users such as faculty and administrators until Spring 2012. This change in distance learning management systems required a request for change approval for the original IRB protocol.

The change requests had an impact on the originally proposed stages of assessment. There were four change requests. First, *Stage I: Professional Development & Pre-Assessment*, no longer served as the pre-intervention assessment method because the observation of faculty attending training sessions in the OIT training center was no longer appropriate. The scheduled face-to-face training sessions were cancelled due to the change in electronic learning management systems. The IRB accepted the change from the OIT training center to informal, private, and non-private meeting spaces as educational settings to interview case study subjects.

Second, the *Stage II: Emerging Technologies* phase of the research described the OIT staff/faculty training official as the administrator of the survey. With the change in face-to-face training opportunities to online, self-guided presentations, the IRB approved the use of a University list-serv of faculty members administered by the Office of Human Resources. This list-serve use HR position/assignment codes to maintain faculty confidentiality and anonymity. A staff member in HR distributed the list-serve email on behalf of the researcher as an additional measure to maintain confidentiality of the recipients and ensuring a double- blind study.

Third, the *Stage II: Emerging Technologies* phase did not allow the researcher to recruit self-selected case study subjects. The IRB change approved the use of an exploratory interview with the case study subjects rather than with the faculty sample group.

Finally, the OIT staff/faculty training official did not approach the potential subjects as first approved by the IRB. The HR list-serve administrator approached the sample group via email communication. The researcher and primary investigator's contact information was included in the email invitation along with the description, purpose, and significance of the survey. The revision to the IRB protocol was approved prior to the administration to the sample population.

**Participant Demographics**

The demographic information shows that the participants represented a broad cross-section of university instructors with faculty status. The population for this study consisted of 1,472 tenured and tenure-track faculty members, a total of 435 members responded to the survey, producing a response rate of 29%. However, the number of responders to each survey question varies as reported.

Figure 8

Illustration of Tenured and On-Track Faculty Status


Figure 8 illustrates 228 responders to the question of status, 9% were non-tenured, on track ($n$ = 21) and 91% were tenured ($n$ = 207). The arts, agriculture, humanities, the natural and mathematical sciences, business, and education departments were represented in this status analysis.

Figure 9

Faculty Department Of Principle Activities

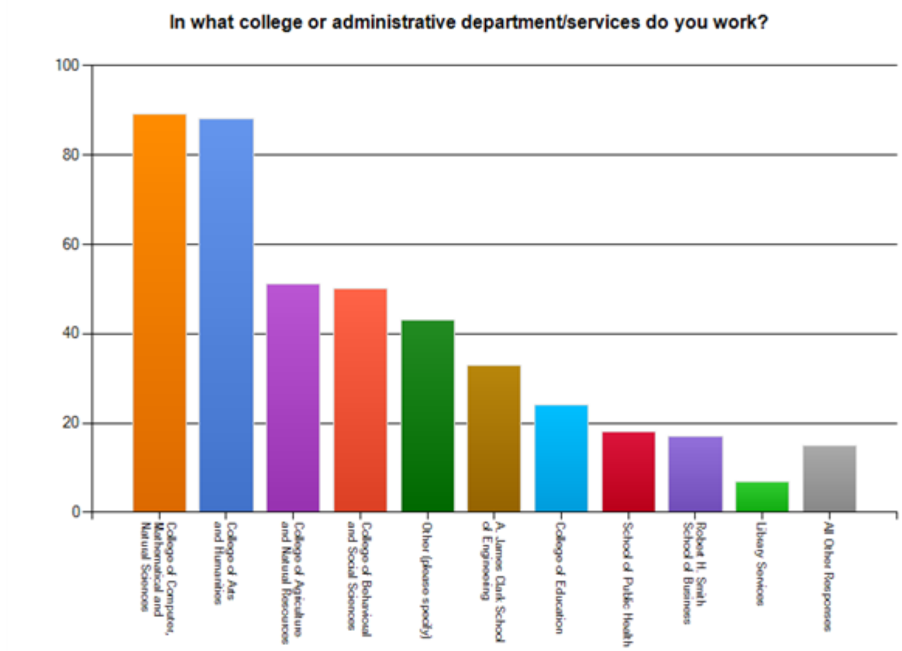
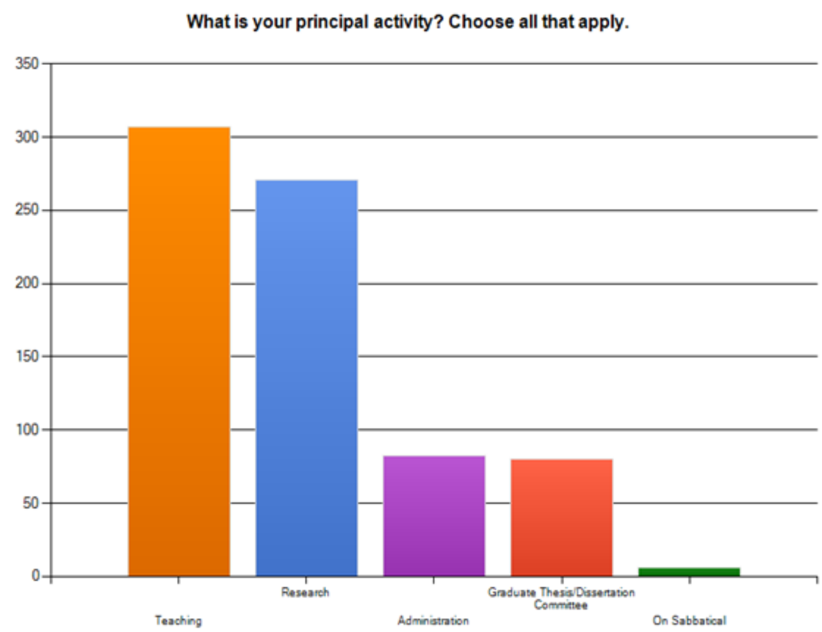



Figure 9 illustrates the faculty member's place of work. Of the 435 responders to the question of in which department does the member work, the largest numbers of the population were from the College of Arts and Humanities and the College of Computer, Mathematical and Natural Sciences. The most represented departments were as follows: 20% worked in the College of Arts and Humanities (*n* = 88) and 21% worked in the College of Computer, Mathematical and Natural Sciences (*n* = 89). Of the other colleges, 11% from the College of Behavioral and Social Sciences (*n* = 50), 12% from the College of Agricultural and Natural Resources (*n* = 51), and 4% represented the Robert H. Smith School of Business (*n* = 17), 8% were from the School of

Engineer, (*n* = 33), 4% from the School of Public Health (*n* = 18), and 6% from the College of Education (*n* = 24). In the category of “Other”, was a 10% response rate (*n* = 43) and the responses included departments such as Public Health, Business, and the Graduate School.

Figure 10

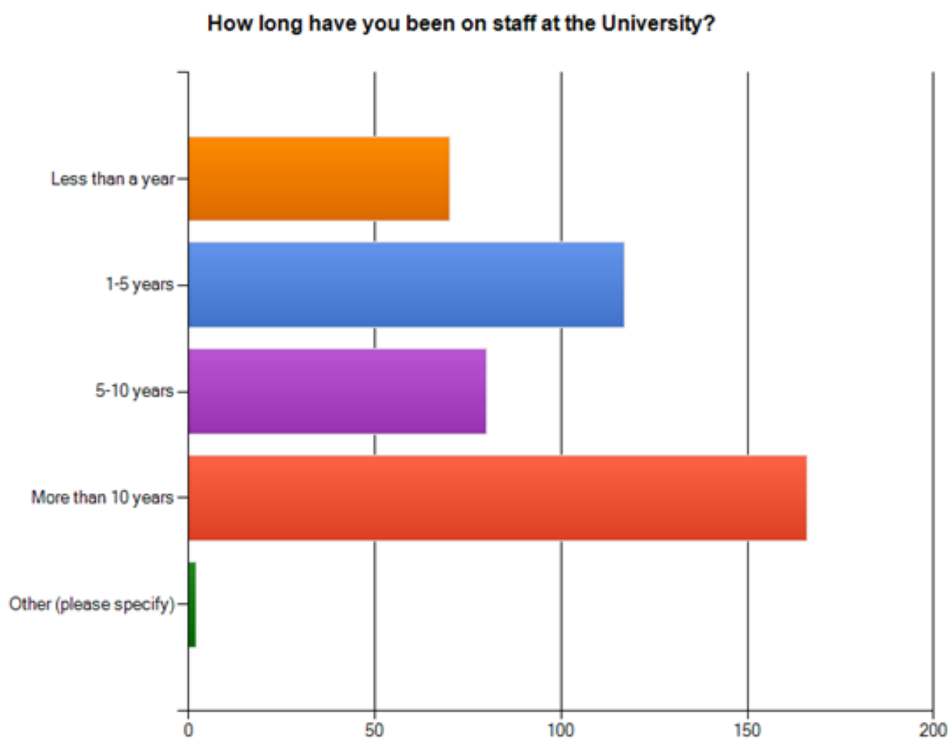
Faculty’s Principle Activities




Faculty were asked the principle activity on which they spent the most time in their current position. Of the 435 responders illustrated in Figure 10, 307 or 71% were teaching, 271 or 62% were conducting research, 82 or 19% were performing administrative duties, and 80 or 18% were participating on graduate thesis and/or dissertation committees, while 6 or 1% were on sabbatical.

Figure 11

Faculty Time On Staff




The number of years on staff varied for the tenured and on-tenure track faculty (Figure 11). Of the 435 responders, 16% were on staff for less than a year (*n* = 70), 27% were on staff for 1-5 years (*n* = 117), 18% were on staff for 5-10 years (*n* = 20), and 38% were on staff for more than 10 years (*n* = 166). There was a category of "other" to which 5% responded (*n* = 2). The first response was 21 years and the second was ">30".

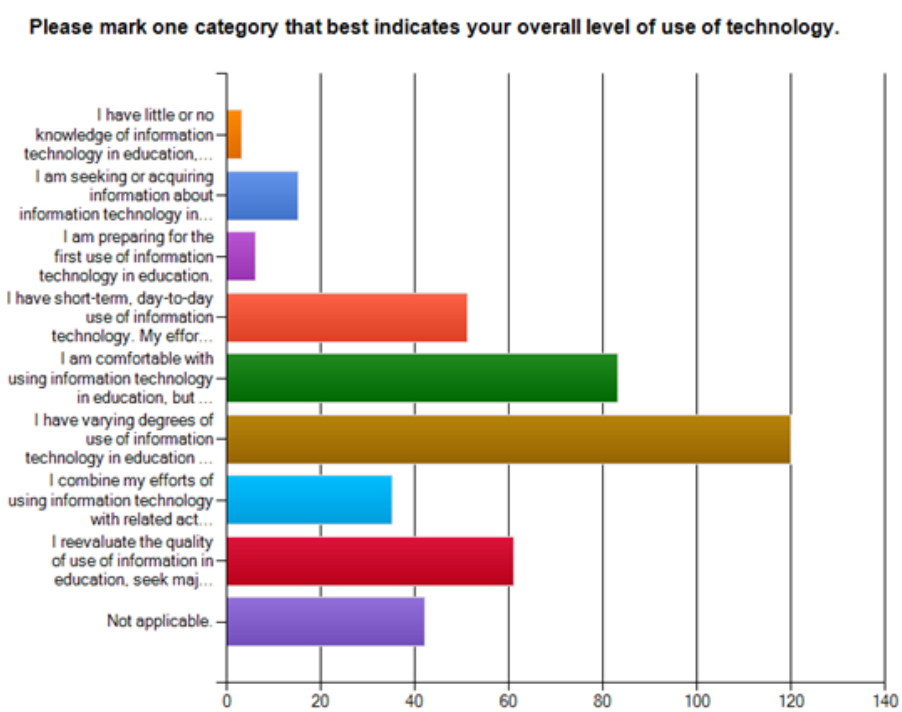
**Review of Survey Questions**

The researcher categorized questions into three distinct areas of concern: 1. knowledge of innovative technology for classroom instruction; 2. level of skill for integrating innovative technology into classroom instruction as an effective teaching practice; and 3. overall disposition. Each area of concern is used to determine the correlation between the adoption of an innovation based on the five basic principles of adoption and diffusion theory (Adams, 2011) which states that " the positive or negative perception of an individual or group and the degree of acceptance about an innovation influences the speed of adoption" (p. 36).

Figures 12 and 13 represent CBAM's stages of concern, SoC, and levels of technology use, LoU. These questions were asked of participants to indicate their overall level of technology use and at what level they rated themselves as concerned about using innovation of technology in the classroom. When considering the principles of knowledge, skill, and disposition, there were 416 responses for LoU and 370 responders to the questions regarding SoC.

Figure 12

Faculty's Reported Level of Technology Use Based On Concern-based Adoption Model



There were 416 responders to LoU as illustrated in Figure 12. The LoU rankings were analyzed using a Likert-scale response sequence from one to eight with one as the least level of technology use and eight as the highest. Of the 416 responders, there were three faculty members who reported, “I have little or no knowledge of information technology in education, no involvement with it, and no interest of becoming involved.” There were 15 faculty members who reported, “I am seeking or acquiring information about information technology in education.” There were six faculty members that reported, “I am preparing for the first use of information technology in education.” Fifty-one reported, “I have short-term, day-to-day use of information technology. My efforts are primarily directed toward mastering tasks with little time for reflection.” There were 83 who reported, “I am comfortable with using information technology in education, but I have little time for reflection on improvement.” There were 120 who reported, “I have varying degrees of use of information technology in education to increase the expected benefits within the classroom.” Thirty-five reported, “ I combine my efforts of using information technology with related activities of other teachers and colleagues to achieve impact in the classroom.” There were 61 who reported, “I reevaluate the quality of use of information in education, seek major modifications or alterations to increase impact, examine new developments in the field, and explore new goals for myself,” and there were 42 who reported, “not applicable.”

Figure 13

Faculty's Reported Stages of Concern Based On Concern-based Adoption Model

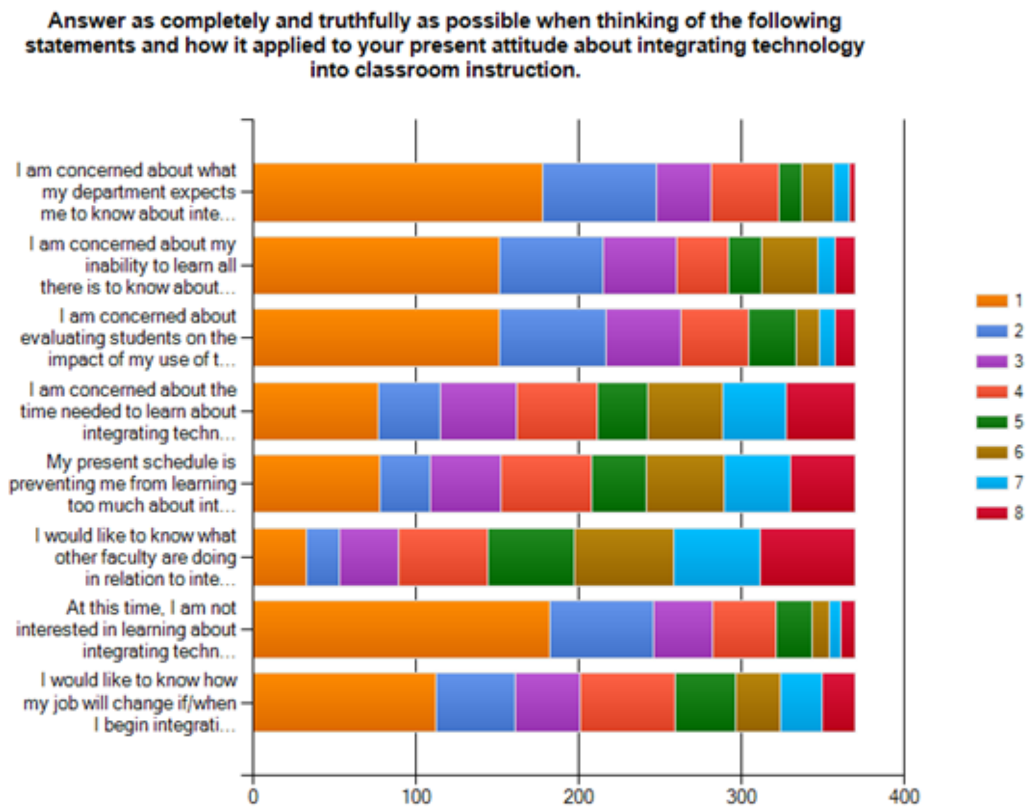



Figure 13 illustrates responses to the CBAM SoC.. Again, the rankings were based on a Likert-style criteria. One represents the lowest stages of concern and eight represents the highest or strongest stage of concern. For the statement, "I am concerned about what my department expects me to know about integrating technology into my classroom instruction and how those expectations might be in conflicts with how I prefer to teach." There were a total of 370 respondents. Of the 370, 178 reported level one, 70 reported level two, 33 reported level three, 42 reported level four, 14 reported level five, 19 reported level six, 10 reported level seven, and four responders had the highest level of concern, which was level eight.

For the statement, “I am concerned about my inability to learn all there is to know about integrating technology-based instruction effectively” there were 370 responders. Of the 370, 151 reported level one stage of concern, 64 for level two, 45 for level three, 32 for level four, 20 for level five, 35 for level six, 10 for level seven, and 13 reported the highest stage of concern which is level eight.

For the statement, “I am concerned about student evaluations on the impact of my use of technology for classroom instruction,” there were 370 responders. Of the 370, 151 reported level one, 66 reported level two, 46 reported level three, 41 reported level four, 29 reported level five, 15 reported level six, nine reported level seven, and 13 reported level eight.

For the statement, “I am concerned about the time needed to learn about integrating technology into instruction that will keep me away from doing what I am supposed to be doing” there were 370 responders. Of the 370, 77 reported level one, 38 reported level two, 47 reported level three, 49 reported level four, 31 reported level five, 46 reported level six, 39 reported level seven, and 43 reported level eight.

For the statement, “my present schedule is preventing me from learning too much about integrating technology-enhanced instruction”, there were 370 responders. Of the 370, 78 reported level one, 31 for level two, 43 for level three, 56 for level four, 33 for level five, 48 for level six, 41 for level seven, and 40 for level eight.

For the statement, “I would like to know what other faculty are doing in relation to integrating technology-enhanced instruction,” there were 370 responders. Of the 370 respondents, there were 33 reporting level one, 20 reported level two, 36 reported level three, 55 reported level four, 53 reported level five, 61 reported level six, 53 reported level seven, and 59 reported level eight.

For the statement, “at this time, I am not interested in learning about integrating technology-enhanced instruction,” there were 370 responders. Of the 370, 182 reported level one, 64 reported level two, 36 reported level three, 39 reported level four 22 reported level five, 11 reported level six, seven reported level seven, and nine reported level eight.

For the statement, “I would like to know how my job will change if/when I begin integrating technology-enhanced instruction into the classroom,” there were 370 responders. Of the 370, 112 reported level one, 49 reported level two, 40 reported level three, 58 reported level four, 37 reported level five, 28 reported level five, 25 reported level seven, and 21 reported level eight.

**Research Questions**

The researcher analyzed the participants SoC data through multiple descriptive approaches, as well as inferentially through appropriate statistical procedures. The CBAM Stages of Concern (SoC) and Levels of Usage (LoU) survey was operative from October 18 – November 4, 2011. The administration of the survey was web-based, delivered via SurveyMonkey.com (see: http://surveymonkey.com). This electronic format was a convenient tool for downloading responses into a spreadsheet form for further analysis. Research Question 1, “How can the University of Maryland develop a transformative professional development program, based on components of the concerns-based adoption model and innovation diffusion theory, to engage faculty in emerging technologies?”

1: To what extent are technology diffusion factors individualized, and to what extent are they organizational?

a. *To what extent is integration of technology into classroom instruction linked to the content taught?*

b. *b. To what extent is integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?*

Research Question 2, "Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, are used as influences and motivations of faculty from different academic units experiencing different administrative cultures?"

The hypothesis for sub-question 1(*a*) is *the integration of technology into classroom instruction is linked to the content taught.* A possible choice for the null hypothesis is *the integration of technology into classroom instruction is not linked to the content taught.*

The survey asked responders to define in which department were they faculty instructors to determine the culture and teaching practice of an academic unit. The sub-question 1(*b*) is *the integration of technology into classroom instruction is influenced by the faculty members' beliefs about effective teaching.* A possible choice for null hypothesis is *the integration of technology into classroom instruction is not influenced by the faculty members' beliefs about effective teaching.*

Sub-Question 2 is explored using a case study methodology. The hypothesis for sub-question 2 is, *technology awareness, levels of technology use, and concerns with integrated technologies are used as influences and motivations of faculty from different academic units experiencing different administrative cultures.* A possible choice for null hypothesis is *technology awareness, levels of technology use, and concerns with integrated technologies are not used as influences and motivations of faculty from different academic units experiencing different administrative cultures.*

Figure 14

Department's Reported Level of Technology Use Based on Concern-based Adoption Model

| Please mark one category that best indicates your overall level of use of technology. | In what college or administrative department/ services do you work? | | | | | | |
|---|---|---|---|---|---|---|---|
| Answer Options | Robert H. Smith School of Business | College of Computer, Mathematical and Natural Sciences | College of Education | A. James Clark School of Engineering | Philip Merrill College of Journalism | Response Percent | Response Count |
| I have little or no knowledge of information technology in education, | 1 | 1 | 0 | 0 | 0 | 1.2% | 2 |
| I am seeking or acquiring information about information technology in | 0 | 4 | 2 | 0 | 0 | 3.7% | 6 |
| I am preparing for the first use of information technology in education | 0 | 0 | 0 | 0 | 0 | 0.0% | 0 |
| I have short-term, day-to-day use of information technology. My effort | 0 | 7 | 2 | 3 | 0 | 7.4% | 12 |
| I am comfortable with using information technology in education, but | 3 | 20 | 2 | 10 | 1 | 22.2% | 36 |
| I have varying degrees of use of information technology in education | 6 | 25 | 10 | 6 | 1 | 29.6% | 48 |
| I combine my efforts of using information technology with related acti | 1 | 6 | 3 | 3 | 1 | 8.6% | 14 |
| I reevaluate the quality of use of information in education, seek major | 4 | 12 | 3 | 4 | 0 | 14.2% | 23 |
| Not applicable. | 0 | 13 | 1 | 7 | 0 | 13.0% | 21 |
| | | | | | | *answered question* | 162 |
| | | | | | | *skipped question* | 4 |

Figure 14 compiles the data results from the academic departments. This data analyzes the correlation between content taught and level of technology use. The Robert H. Smith School of Business, had one respondent with little or no interest of information technologies and also one who was at a level of combing efforts with related activities of their peers. Three respondents reported a level of comfort with using technology in education but no time for reflection on improvement. There were six respondents who reported varying degrees of use of information technology, and four responders reported that they were at a level of reevaluating the quality of their use of information technology for educational purposes, seeking major modifications, and examining new developments in the field of integrated technologies.

To identify specific influences on faculty members' beliefs about integrating technology into classroom instruction, a case study analysis was explored using Rogers' IDT. The theory of communication between faculty as a social system for advancing technology adoption is supported by Rogers' IDT. According to Butler and Sellbom (2002), there are barriers that affect the rate of adoption, and/or prevent individuals, groups, and institutions from adopting a technology.

Tables 1 through 8 illustrate quantitative analysis of paired differences of the variables, stages of concern and level of technology use. The Mean is an interval/ratio measure of central tendency that identifies the average of the values for the cases on the variable. The Standard Deviation is an interval/ratio measure of dispersion that indicates the approximate average distance of cases from the Mean. The 95% Confidence Interval is a value used by the researcher as a measure of validity for the results fall within this range. The value of the *t* statistic is used to determine the value of degrees of freedom and probability (Szafran, 2011). The abbreviation *sig* is used as the heading for the significance level instead of *p* (probability).

Table 9 illustrates the results of the quantitative results from the sample group population. The T-test method was used to test the hypothesis of the difference between the faculty member's level of technology use and statement of concern. This two-tailed hypothesis test is appropriate because the rejection area in the sampling distribution is divided between the two tails, 1. level of use; and 2. stages of concern (Szafran, 2011). The extreme results in either tail of the sampling distribution would determine if the researcher could reject the null hypothesis. The probability rule for this study is .05 or less. If the *sig* is greater than .05, the researcher cannot reject the null hypothesis. Tables 10 through 16 are the test results for the hypothesis that the integration of technology into classroom instruction is influenced by the faculty members' beliefs about effective teaching and the correlations between level of use and faculty concerns.

Table 1

Paired Difference Test Between Stage of Concern: Expectations and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Change in job responsibilities and little or no knowledge about information technology | 58.800 | 30.294 | 21.186 | 96.414 | 4.340 | .012 |
| Change in job responsibilities and seeking information about information technology | 58.000 | 31.329 | 19.1 | 96.900 | 4.140 | .014 |
| Change in job responsibilities and first use of information technology | 59.200 | 30.638 | 21.158 | 97.242 | 4.321 | .012 |
| Change in job responsibilities and short-term, daily use of information technology | 56.800 | 31.681 | 17.463 | 96.137 | 4.009 | .016 |
| Change in job responsibilities and level of comfort with using information technology | 52.000 | 32.581 | 11.546 | 92.454 | 3.569 | 0.023 |
| Change in job responsibilities and varying degree of using information technology | 49.600 | 33.208 | 8.366 | 90.834 | 3.34 | .029 |
| Change in job responsibilities and combining efforts with peer-related activities | 56.400 | 31.445 | 17.356 | 95.444 | 4.011 | .016 |
| Change in job responsibilities and reevaluating the quality of using information technology | 54.600 | 30.746 | 16.424 | 92.776 | 3.971 | .017 |

In Table 1, the *t* statistic is two. This calculates to two standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis. The significance between the faculty member's concerns about what the department will expect from their use of innovative technology in the classroom and the actual level of technology usage is greater than .05 for each paired sample. Therefore, null hypothesis is not rejected.

Table 2

Paired Difference Test Between Stage of Concern: Learning Curve and Levels of Use

| Paired Differences | | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|---|
| Stage of Concern with | Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| My learning curve and little or no knowledge about information technology | | 62.000 | 51.716 | -2.213 | 126.213 | 2.681 | .055 |
| My learning curve and seeking information about information technology | | 61.200 | 52.313 | -3.756 | 126.156 | 2.616 | .059 |
| My learning curve and preparing to first use information technology | | 62.400 | 52.147 | -2.349 | 127.149 | 2.676 | .055 |
| My learning curve and short-term, daily use of information technology | | 60.000 | 52.773 | -5.526 | 125.526 | 2.542 | .064 |
| My learning curve and level of comfort with using information technology | | 55.200 | 53.148 | -10.792 | 121.192 | 2.322 | .081 |
| My learning curve and varying degree of using information technology | | 52.800 | 52.127 | -11.924 | 117.524 | 2.265 | .086 |
| My learning curve and combining efforts with peer-related activities using information technology | | 59.600 | 52.605 | -5.718 | 124.918 | 2.533 | .064 |
| My learning curve and reevaluating the quality of using information technology | | 57.800 | 51.373 | -5.988 | 121.588 | 2.516 | .066 |

In Table 2, the *t* statistic is almost three when testing assumptions about the faculty's concern with the learning curve for adopting and diffusing technology into classroom instruction. This calculates to almost three standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis. The significance between the faculty member's concerns about what their learning curve and the actual level of technology usage are greater than .05. Therefore, null hypothesis is not rejected.

Table 3

Paired Difference Test - Stage of Concern: Student Evaluations and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Student evaluations and little or no knowledge about information technology | 66.200 | 48.608 | 5.846 | 126.554 | 3.045 | .038 |
| Student evaluations and seeking information about information technology | 65.400 | 49.288 | 4.201 | 126.599 | 2.967 | .041 |
| Student evaluations and preparing to first use information technology | 66.600 | 49.034 | 5.717 | 127.483 | 3.307 | .039 |
| Student evaluations and short-term, daily use of information technology | 64.200 | 49.736 | 2.444 | 125.956 | 2.886 | .045 |
| Student evaluations and level of comfort with using information technology | 59.400 | 50.148 | -2.867 | 121.667 | 2.649 | .057 |
| Student evaluations and varying degree of using information technology | 57.000 | 50.148 | -2.867 | 121.667 | 2.649 | .057 |
| Student evaluations and combining efforts with peer-related activities using information technology | 63.800 | 49.56 | 2.263 | 125.337 | 2.879 | .045 |
| Student evaluations and reevaluating the quality of using information technology | 62.000 | 48.384 | 1.923 | 122.077 | 2.865 | .046 |

In Table 3, the *t* statistic is three when testing assumptions about the faculty's concern with how students will evaluate their use of technology into classroom instruction. This calculates to three standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis. The significance of faculty concern about how students will rate their use of technology in the classroom and the actual level of technology usage is less than .05 for paired sample of concern with student evaluations and the "little," "seeking," "preparing," "short-term," "efforts," and "reevaluation" levels of technology use in the classroom. The null hypothesis is rejected. The probability for "comfortable" and "degrees" is greater than .05, therefore, null hypothesis is not rejected.

Table 4

Paired Difference Test - Stage of Concern: Work Distraction and Levels of Use

| Paired Differences | | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|---|
| Stage of Concern with | Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Distraction from work activities and little or no knowledge about information technology | | 48.000 | 17.292 | 26.530 | 69.47 | 6.207 | .003 |
| Distraction from work activities and seeking information about information technology | | 47.200 | 18.254 | 24.535 | 59.865 | 5.782 | .004 |
| Distraction from work activities and preparing to first use information technology | | 48.400 | 17.544 | 26.616 | 70.184 | 6.169 | .004 |
| Distraction from work activities and short-term, daily use of information technology | | 46.000 | 18.788 | 22.671 | 69.329 | 5.475 | .005 |
| Distraction from work activities and level of comfort with using information technology | | 41.200 | 20.969 | 15.164 | 67.236 | 4.393 | .012 |
| Distraction from work activities and varying degree of using information technology | | 38.800 | 21.218 | 12.454 | 65.146 | 4.089 | .015 |
| Distraction from work activities and combining efforts with peer-related activities | | 45.600 | 18.407 | 22.745 | 68.455 | 5.54 | .005 |
| Distraction from work activities and reevaluating the quality of using information technology | | 43.800 | 18.267 | 21.118 | 66.482 | 5.361 | .006 |

In Table 4, the *t* statistic ranges from four to six when testing assumptions about the faculty's concern with the distraction from principles work responsibilities and the adoption and diffusion of technology into classroom instruction. This calculates to four to six standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis.   The significance between the faculty member's concern with distractions from principle responsibilities and the actual level of technology usage is less than .05. Therefore, the null hypothesis is rejected.

Table 5

Paired Difference Test Between Stage of Concern: Busy Schedule and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Schedule too busy and little or no knowledge about information technology | 47.800 | 19.228 | 23.926 | 71.674 | 5.559 | .005 |
| Schedule too busy and seeking information about information technology | 47.000 | 20.457 | 21.599 | 72.401 | 5.137 | .007 |
| Schedule too busy and preparing to first use information technology | 48.200 | 19.383 | 24.133 | 72.267 | 5.560 | .005 |
| Schedule too busy and short-term, daily use of information technology | 45.800 | 20.921 | 19.823 | 71.777 | 4.895 | .008 |
| Schedule too busy and level of comfort with using information technology | 41.000 | 23.249 | 12.133 | 69.867 | 3.934 | .017 |
| Schedule too busy and varying degree of using information technology | 38.600 | 24.409 | 8.292 | 68.908 | 3.536 | .024 |
| Schedule too busy and combining efforts with peer-related activities | 45.400 | 20.501 | 19.94 | 70.856 | 4.952 | .008 |
| Schedule too busy and reevaluating the quality of using information technology | 43.600 | 20.768 | 17.813 | 69.387 | 4.694 | .009 |

In Table 5, the *t* statistic is between four and six when testing assumptions about the faculty's concern with the learning curve for adopting and diffusing technology into classroom instruction. This calculates to four to six standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis. The significance between the faculty member's concern about their schedule is too busy to consider adopting and diffusing technology into classroom instruction and the actual level of technology usage is less than .05. Therefore, null hypothesis is rejected.

Table 6

Paired Difference Test Between Stage of Concern: Peer Interest and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Interest in peer activities and little or no knowledge about information technology | 39.000 | 15.083 | 20.272 | 57.728 | 5.782 | .004 |
| Interest in peer activities and seeking information about information technology | 38.200 | 16.115 | 18.19 | 58.21 | 5.300 | .006 |
| Interest in peer activities and preparing to first use information technology | 39.400 | 14.639 | 6.547 | 21.223 | 6.018 | .004 |
| Interest in peer activities and short-term, daily use of information technology | 37.000 | 16.447 | 16.578 | 57.422 | 5.03 | .007 |
| Interest in peer activities and level of comfort with using information technology | 32.200 | 20.005 | 7.361 | 57.039 | 3.599 | .023 |
| Interest in peer activities and varying degree of using information technology | 29.800 | 22.884 | 1.385 | 58.215 | 2.912 | .044 |
| Interest in peer activities and combining efforts with peer-related activities | 36.600 | 15.962 | 16.78 | 56.42 | 5.127 | .007 |
| Interest in peer activities and reevaluating the quality of using information technology | 34.800 | 18.363 | 11.999 | 57.601 | 4.238 | .013 |

In Table 6, the *t* statistic is between four and six when testing assumptions about the faculty's concern with their peer's use of technology in the classroom and their actual technology usage. This calculates to four to six standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis.  The significance between the faculty member's concern about their peers' activities and the actual level of technology usage is less than .05. Therefore, the null hypothesis is rejected.

Table 7

Paired Difference Test Between Stage of Concern: No Interest and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| No interest and little or no knowledge about information technology | 68.200 | 64.759 | -12.209 | 148.609 | 2.355 | .078 |
| No interest and seeking information about information technology | 67.400 | 65.519 | -13.953 | 148.753 | 2.300 | .083 |
| No interest and first use of information technology | 68.600 | 65.175 | -12.326 | 149.526 | 2.354 | .078 |
| No interest and short-term, daily use of information technology | 66.200 | 65.948 | -15.686 | 148.086 | 2.245 | .088 |
| No interest and level of comfort with using information technology | 61.400 | 66.267 | -20.881 | 143.681 | 2.072 | .107 |
| No interest and varying degree of using information technology | 59.000 | 65.761 | -22.653 | 140.653 | 2.006 | .115 |
| No interest and combining efforts with peer-related activities | 65.800 | 65.77 | -15.864 | 147.646 | 2.237 | .089 |
| No interest and reevaluating the quality of using information technology | 64.000 | 64.626 | -16.244 | 144.244 | 2.214 | .091 |

In Table 7, the *t* statistic is two when testing assumptions about the faculty's lack of concern with adopting and diffusing technology into classroom instruction. This calculates to two standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis. The significance between the faculty member's lack of interest and the actual level of technology usage is greater than .05. Therefore, the null hypothesis is not rejected.

Table 8

Paired Difference Test Between Stage of Concern: Job Change and Levels of Use

| Paired Differences | | | 95% Confidence Interval of the Difference | | | |
|---|---|---|---|---|---|---|
| Stage of Concern with Level of Use | Mean | Standard Deviation | Lower | Upper | t | Sig. (2-tailed) |
| Change in job responsibilities and little or no knowledge about information technology | 58.800 | 30.294 | 21.186 | 96.414 | 4.340 | .012 |
| Change in job responsibilities and seeking information about information technology | 58.000 | 31.329 | 19.1 | 96.900 | 4.140 | .014 |
| Change in job responsibilities and first use of information technology | 59.200 | 30.638 | 21.158 | 97.242 | 4.321 | .012 |
| Change in job responsibilities and short-term, daily use of information technology | 56.800 | 31.681 | 17.463 | 96.137 | 4.009 | .016 |
| Change in job responsibilities and level of comfort with using information technology | 52.000 | 32.581 | 11.546 | 92.454 | 3.569 | 0.023 |
| Change in job responsibilities and varying degree of using information technology | 49.600 | 33.208 | 8.366 | 90.834 | 3.34 | .029 |
| Change in job responsibilities and combining efforts with peer-related activities | 56.400 | 31.445 | 17.356 | 95.444 | 4.011 | .016 |
| Change in job responsibilities and reevaluating the quality of using information technology | 54.600 | 30.746 | 16.424 | 92.776 | 3.971 | .017 |

In Table 8, the *t* statistic is almost between three and four when testing assumptions about the faculty's concern with the change in job responsibilities if they adopt and diffuse technology into classroom instruction. This calculates to three to four standard errors to the right of where the null hypothesis says the center of the sampling distribution is in this analysis.   The significance between the faculty member's concern a change in job responsibilities and the actual level of technology usage is less than .05. Therefore, the null hypothesis is rejected.

The SoC data can be presented in several descriptive analytic procedures, as well a through inferential analysis of the correlations between faculty concerns and beliefs. This association is measured by Pearson's *r* to determine if there is a perfect, positive correlation (*r* = 1.00) of the SoC variables and if the null hypothesis can be rejected based on the level of statistical significance. The probability rule, *sig*, is .05 or less.

Association and regression tests were used to see whether the two variables were associated, without necessarily inferring a cause-and-effect relationship. Linear regression describes how much change in the dependent variable typically results from a change in the independent variable, the strength and direction of the independent variable's effect on the dependent variable, and the proportion of the variation among the cases on the dependent variable. These associations are used to explain differences among the cases on the independent variable (Szafran, 2011). To test the hypotheses for this study, the researcher analyzed the association between the variables in the SoC to see the values of the association for many different pairs of variables.

Table 9 illustrates the bivariate linear regression for the intervals of association for the responses on questions related to Stages of Concern. The researcher used Pearson's correlation of coefficients, *r*, to measure the association of the SoC variables.

Table 9

Pearson Correlation Test Between Stages of Concern and Levels of Use

| Pearson Correlation | | Expect's | Learning Curve | Student Evals | Work Distraction | Busy Schedule | Peer Interests | Not Interested | Job Change |
|---|---|---|---|---|---|---|---|---|---|
| Expecations | Pearson Correlation | 1 | .987** | .989** | .860** | .770* | .-.622* | .995** | .969** |
| | Sig. (2-tailed) | | .000 | .000 | .006 | .026 | .100 | .000 | .000 |
| Learning Curve | Pearson Correlation | .987** | 1 | .981** | .865** | .753* | .-.630* | .983** | .939** |
| | Sig. (2-tailed) | .000 | | .000 | .006 | .031 | .094 | .000 | .001 |
| Student Evaluations | Pearson Correlation | .989** | .981** | 1 | .826* | .723* | .-.668* | .994** | .968** |
| | Sig. (2-tailed) | .000 | .000 | | .011 | .043 | .070 | .000 | .001 |
| Work Distration | Pearson Correlation | .860** | .865** | .826* | 1 | .958** | .-.263* | 857** | .856** |
| | Sig. (2-tailed) | .006 | .006 | .011 | | .000 | .530 | .007 | .007 |
| Busy Schedule | Pearson Correlation | .770* | .753* | .723* | .958** | 1 | .-.052* | .766* | .821* |
| | Sig. (2-tailed) | .026 | .031 | .043 | .000 | | .903 | .027 | .012 |
| Peer Interests | Pearson Correlation | .-.622* | .-.630* | .-.668* | .-.263* | .-.520* | 1 | .-.609* | .-.521 |
| | Sig. (2-tailed) | .100 | .094 | .070 | .530 | .903 | | .109 | .186 |
| Not Interested | Pearson Correlation | .995** | .983** | .994** | .857** | .766* | .-.609* | 1 | .972** |
| | Sig. (2-tailed) | .000 | .000 | .000 | .007 | .027 | .109 | | .000 |
| Job Change | Pearson Correlation | .969** | .939** | .968** | .856** | .821* | .-.521* | .972** | 1 |
| | Sig. (2-tailed) | .000 | .001 | .000 | .007 | .012 | .186 | .000 | |

*Note. *. By default, the Bivariate Correlations proecedure uses pairwise deletion of missing data. **. Correlation is significant at the 0.01 level*

In Table 9, the Pearson Correlation coefficient rule is a symmetric measure of association with a possible range of values from -1.00 to 1.00. A 1.00 indicates a perfect positive correlation. The two-tailed level of probability, *sig*, is a validation for *r*.

The *r* for "Peer Interest" reports a negative association of the SoC values. However, all other SoC values are statistically significant for a correlation of the coefficients. The sig reports values greater than .05. Therefore, the null hypothesis, with regard to peer interest, is not rejected but the null hypothesis for all other values is rejected.

**Case Study Demographics**

The case study population consisted of five faculty members. Of the population, 60% were non-tenured, on track ($n = 3$) with one male and two females. Of the 40% tenured faculty members ($n = 2$) there was one male and one female.

Interviewee 1 is an Asian American male faculty member on tenure track in the School of Public Health in the Department of Public Health Administration. He has been on staff for more than five years and his primary activity is research. The Department of Public Health Administration has worked with the researcher's Office to introduce integrated technologies for classroom instruction to the faculty of that unit.

Interviewee 2 is a Caucasian male faculty member on-tenure track in the Philip Merrill College of Journalism. He has been on staff for almost two years and has worked with the researcher's Office to market and implement a new journalism course. Teaching is his primary activity.

Interviewee 3 identifies as "other" and is a female on-tenure track faculty member representing the Psychology Department. She worked with the researcher to develop the administrative logistics for a new certificate program and has been on staff for almost 7 years.

Interviewee 4 is an African American, tenured, female faculty member in the African American Studies Department. She has been on staff for more than 20 years and has worked with the researcher's Office to identify the pros and cons of using the Office of Extended Studies as the administrator of a workforce development program.

Interviewee 5 is a tenured, Caucasian male. He represented the Sociology Department. Interviewer 5 has worked with the researcher to learn Blackboard before it was eliminated as the campus's eLearning system. Interviewer 5 has been on staff approximately 20 years.

**Case Study Components**

Grounded theory was used to explore the case studies' multiple comparisons and patterns of technology awareness (knowledge), levels of technology use (skill), and attitudes about integrated technologies (dispositions). These areas were explored as factors of influence and motivation for faculty from differing academic units. The research question for the case study relates to "*how does a faculty member's department influence technology awareness, levels of technology use, and concerns with integrated technologies?"*

Faculty concerns about integrating technology into classroom instruction was examined using the case study method. There case study purpose was to 1. explore the motivators for the faculty member's knowledge about integrated technologies; and 2. explore the influences for faculty concerns and dispositions about integrated technologies.

The unit of analysis was the small case study group of faculty members. The "case" of how faculty discuss the influences and motivations was explored with variations in the definition of "concerns with technology for classroom instruction" based on the perspective of different faculty members.

The thematic coding method was used to develop a cluster map for linking data to the purpose of the case study (Figure 15). There were eight interview questions based on the SoC. Each open-ended question aligned with the eight quantitative survey questions in the Likert-style survey (Appendix E). The cluster-rating map was used to report the resistance issues into meaningful clusters and enabled the researcher to prioritize issues that affected the use of innovative technology in classroom instruction. The case study interviews provided the descriptive research data for comparative analysis with the survey results.

Figure 15

Cluster Map of Resistance Issues

| Cluster # | Cluster Name | Barriers and Influences | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| **Issues** | | Change | Perception | Tech Support | Knowledge/ Information | Institutional Culture | Department Culture | |
| 1 | Faculty Concerns | 7 | 12 | 4 | 10 | | 12 | 45 |
| 2 | Leadership/Support | | 9 | 11 | | | 9 | 29 |
| 3 | Benefits/Usefulness | | 13 | | 8 | 14 | 6 | 41 |
| 4 | Resistance | 18 | 4 | | 3 | 6 | 8 | 39 |
| 5 | Learning Curve | 9 | 12 | 15 | 7 | | | 43 |
| **Total** | | 34 | 50 | 30 | 28 | 20 | 35 | |

The results of these groupings, categorized into meaningful clusters, do not provide results about what the barriers were within any specific cluster. However, the clusters were used to identify the barriers within each cluster of the specific issue. For example, the number of faculty concerns with change, perception, technical support, level of knowledge and information, and department culture are data calculations for Cluster 1 and a representation of the number of times a subject remarked with on these issues. However, the data do not specify if the faculty member considered the reported issue as a positive influence or a negative barrier to effective teaching.

For the case study, the T-test methods of Paired Sample Correlations were used to test the hypothesis about the *correlation* between two variables. The Pearson's correlation "*r*" was used as the criteria for interpreting the statistically significant correlations of the data in the case study analysis. Of the five case study participants, responses to the survey questions on SoC and LoU were analyzed to test assumptions between the relationship of the actual level of technology usage with the member's concern with adopting and diffusing technology into classroom instruction. The paired-sample correlation analysis was used to test these hypotheses in Pearson's Correlations (*r*). Correlations closest to the number one had the strongest correlation with numbers at zero having no correlation at all. Numbers with negative correlations have a negative impact on the relationship of the variables while 1.00 is Pearson's value to determine the perfect positive correlation of *r*.

Table 10

Paired Correlation Test Between Stage of Concern: Expectations and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2 tailed) |
|---|---|---|---|
| Department expectations and little or no knowledge about information technology | 5 | .794 | .108 |
| Department expectations and seeking information about information technology | 5 | -.125 | .841 |
| Department expectations and short-term, daily use of information technology | 5 | .004 | .995 |
| Department expectations and level of comfort with using information technology | 5 | -.169 | .786 |
| Department expectations and varying degree of using information technology | 5 | .075 | .905 |
| Department expectations and combining efforts with peer-related activities using information technology | 5 | -.200 | .747 |
| Department expections and reevaluating the quality of using information technology | 5 | .232 | .707 |

Table 10 reports the significance between the faculty member's concern with department expectations of their use of technology in the classroom and the actual level of technology usage. In this analysis, *r* for each variable is a statistically significant correlation for expectations and little technology use. There is a negative correlation for learning curve and faculty seeking information for technology use, short-term technology use, comfortable with technology use, and combining peer efforts towards technology use.

Table 11

Paired Correlation Test Between Stage of Concern: Learning Curve and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2-tailed) |
|---|---|---|---|
| My learning curve and little or no knowledge about information technology | 5 | .790 | .112 |
| My learning curve and seeking information about information technology | 5 | -.076 | .903 |
| My learning curve and short-term, daily use of information technology | 5 | -.191 | .758 |
| My learning curve and level of comfort with using information technology | 5 | -.050 | .936 |
| My learning curve and varying degree of using information technology | 5 | .090 | .885 |
| My learning curve and combining efforts with peer-related activities using information technology | 5 | -.205 | .741 |
| My learning curve and reevaluating the quality of using information technology | 5 | .215 | .728 |

In Table 11, the significance between the faculty member's concern with their ability to learn how innovative technology in the classroom and the actual level of technology usage is greater when the member reported little to no use of actual technology usage. In this analysis, *r* for each variable is a statistically significant correlation for learning curve and little technology use and varying degrees of technology use, and faculty's stage of reevaluating the quality of their use of information technology in the classroom. There is a negative correlation for learning curve and faculty seeking information for technology use, short-term technology use, comfortable with technology use, and efforts put towards technology use.

Table 12

Paired Correlation Test Between Stage of Concern: Work Distraction and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2-tailed) |
|---|---|---|---|
| Distraction from work activities and little or no knowledge about information technology | 5 | .473 | .420 |
| Distraction from work activities and seeking information about information technology | 5 | -.354 | .559 |
| Distraction from work activities and preparing to first use information technology | 5 | -.365 | .546 |
| Distraction from work activities and short-term, daily use of information technology | 5 | -.244 | .693 |
| Distraction from work activities and level of comfort with using information technology | 5 | -.180 | .772 |
| Distraction from work activities and varying degree of using information technology | 5 | -.373 | .537 |
| Distraction from work activities and combining efforts with peer-related activities | 5 | .554 | .950 |
| Distraction from work activities and reevaluating the quality of using information technology | 5 | .536 | .006 |

In Table 12, the significance between the faculty member's concern with the distraction of innovative technology in the classroom and the actual level of technology usage are tested. In this analysis, *r* for each variable is a statistically significant correlation for faculty who perceive that the integration of technology into classroom instruction would cause a distraction from principle work activities and little technology use, varying degrees of technology use, combining efforts with peer activities, and the stage of reevaluating the quality of their use of information technology. There is a negative correlation for distraction and faculty seeking information for technology use, short-term technology use, comfortable with technology use, varying degrees of technology use.

Table 13

Paired Correlation Test Between Stage of Concern: Busy Schedule and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2-tailed) |
|---|---|---|---|
| Schedule too busy and little or no knowledge about information technology | 5 | .297 | .628 |
| Schedule too busy and seeking information about information technology | 5 | -.571 | .315 |
| Schedule too busy and short-term, daily use of information technology | 5 | -.481 | .412 |
| Schedule too busy and level of comfort with using information technology | 5 | -.327 | .591 |
| Schedule too busy and varying degree of using information technology | 5 | -.382 | .526 |
| Schedule too busy and combining efforts with peer-related activities | 5 | -.509 | .382 |
| Schedule too busy and reevaluating the quality of using information technology | 5 | .496 | .738 |

Table 13 illustrates the significance between the faculty member's concern with a busy schedule and the actual level of technology usage. In this analysis, *r* for each variable is a statistically significant correlation for faculty who reported that their schedule is too busy to take the necessary steps for integrating technology into their classroom instruction and little technology use and the stage of reevaluating the quality of their technology use in the classroom. There is a negative correlation for distraction and faculty seeking information for technology use, short-term technology use, comfortable with technology use, varying degrees of technology use, varying degrees of technology use, and the stage of combining efforts with their peers' activities of technology use.

Table 14

Paired Correlation Test Between Stage of Concern: Peer Interest and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig.(2 tailed) |
|---|---|---|---|
| Interest in peer activities and little or no knowledge about information technology | 5 | -.804 | .101 |
| Interest in peer activities and seeking information about information technology | 5 | -.806 | .100 |
| Interest in peer activities and short-term, daily use of information technology | 5 | -.568 | .318 |
| Interest in peer activities and level of comfort with using information technology | 5 | -.523 | .366 |
| Interest in peer activities and varying degree of using information technology | 5 | -.837 | .077 |
| Interest in peer activities and combining efforts with peer-related activities | 5 | -.605 | .280 |
| Interest in peer activities and reevaluating the quality of using information technology | 5 | -.836 | .111 |

In Table 14, there is no statistical significance in the correlation between a faculty member's interest in combining related peer activities and the CBAM levels of technology use.

Table 15

Paired Correlation Test Between Stage of Concern: Peer Interest and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2-tailed) |
|---|---|---|---|
| No interest and little or no knowledge about information technology | 5 | .762 | .134 |
| No interest and seeking information about information technology | 5 | -.179 | .773 |
| No interest and short-term, daily use of information technology | 5 | -.248 | .688 |
| No interest and level of comfort with using information technology | 5 | -.077 | .902 |
| No interest and varying degree of using information technology | 5 | .006 | .992 |
| No interest and combining efforts with peer-related activities | 5 | -.276 | .653 |
| No interest and reevaluating the quality of using information technology | 5 | .157 | .801 |

In Table 15, there is varying statistical significance between the faculty member's lack of interest of innovative technology in the classroom and the actual level of technology usage. In this analysis, *r* for each variable is a statistically significant correlation for not interested and little technology use, varying degrees of technology use, and the stage of reevaluating technology use. There is a negative correlation for distraction and faculty seeking information for technology use, short-term technology use, comfortable with technology use, and efforts put towards technology use.

Table 16

Paired Correlation Test Between Stage of Concern: Job Change and Levels of Use

| Stage of Concern with Level of Use | N | Correlation | Sig. (2-tailed) |
|---|---|---|---|
| Change in job responsibilities and little or no knowledge about information technology | 5 | .635 | .250 |
| Change in job responsibilities and seeking information about information technology | 5 | -.361 | .550 |
| Change in job responsibilities and short-term, daily use of information technology | 5 | -.321 | .598 |
| Change in job responsibilities and level of comfort with using information technology | 5 | -.121 | .847 |
| Change in job responsibilities and varying degree of using information technology | 5 | -.142 | .820 |
| Change in job responsibilities and combining efforts with peer-related activities | 5 | -.366 | .545 |
| Change in job responsibilities and reevaluating the quality of using information technology | 5 | .048 | .938 |

The significance between the faculty member's concern with a change in job responsibilities and the actual level of technology usage is illustrated in Table 16. In this analysis, *r* for each variable is a statistically significant correlation for job change and reevaluation of technology use. There is a negative correlation for job change and faculty seeking information for technology use, short-term technology use, comfortable with technology use, varying degrees of technology use, and efforts put towards technology use.

**Results**

In this study, the web-based, Likert-style survey was used to collect data to analyze faculty's stages of concern and levels of technology use. These variables were based on the CBAM stages in Figure 5 and Figure 6. The data from each question of the survey was used to explore factors of influence and motivation from the perspective of the faculty member as an individual and as a representative of an academic unit. Multiple linear regression analysis was used to test the strength of this prediction model. Factor analysis was used to reduce the number of variables to knowledge, skills, and disposition so that relationships between participants' technology usage and level of concern could be examined with a bivariate analysis test.

The primary question in this study was, "how can the University of Maryland develop a transformative professional development program, based on components of concerns-based adoption model and innovation diffusion theory to engage faculty in emerging technologies?"

Sub-questions

1. To what extent were technology diffusion factors of individualized, and to what extent were they organizational?
    a. To what extent was integration of technology into classroom instruction linked to the content taught?

Quantitative data was used to understand the correlation among the LoU ad SoC variables to determine if one group, i.e. psychologists, journalists, historians, performs better on an outcome than another group, i.e. computer and mechanical engineers and mathematicians. A mixed method of quantitative and qualitative data analysis was used to understand the correlation between content taught and technology acceptance and usage. The analysis of Figure 14 identifies the highest number of responses from the College of Computer, Mathematical and Natural Sciences and the A. James Clark School of Engineering while the lowest number of responses from the College of Education and the Philip Merrill College of Journalism.

The qualitative case study interview data was collected from various departments on campus. The results indicated that the integration of technology into classroom instruction was most significant for faculty from the College of Arts and Humanities, ARHU. These faculty members had a higher response rate of investigating methods and practices of how to integrate technology into the classroom and the number of previous training sessions attended. This data provided a generalized concept of their knowledge about integrated technologies. Interviewee 5 stated that, "there are many departments on campus that have turned to Blackboard discussions to assess students' understanding of the lesson. To me, there's no need for them to be in class, but I guess that's what the boss wants." Faculty responses from the College of Behavioral and Social Sciences, BSOS, revealed less significant indicators. The researcher notes that BSOS was in the process of investigating training opportunities specifically for BSOS faculty. This "in-house" investigation for methods and practices for integrating technology into classroom instruction was at the administrative/leadership level.

b. To what extent was integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?

The case study interviews provided rich descriptive research results about faculty concerns with expectations and change, department perception and culture, technical support, and level of knowledge and information about technology. Figure 15 is an illustration of the cluster map of resistance issues that address faculty's barriers and influences to their beliefs about integrated technologies and effective teaching. As these responses were prioritized, based on the number of responses to each issue, the faculty member's concern was identified as the most prominent factor of the meaningful cluster. The department perception and department culture were the highest scoring of those concerns, followed by knowledge and information, along with expected change in job responsibilities. The least of their concern was technical support. The researcher experienced resistance from Interviewee 1 when conducting an initial technology training session for assessing level of use. He stated that he was most concerned with completing his article for publication rather than participating in technology training. He stated that, "we have OIT for [building courses and technical support]."

The next issue in the Barrier and Influence cluster was the faculty member's perceived learning curve for integrating technology into classroom instruction. Technical support and perceptions from peers were the highest scoring results in this area followed by expected change and level of knowledge and information. The median result was the faculty member's belief about the benefits and usefulness of the technology. Institutional culture and peer perception were the highest scoring clusters for barriers and influences.  Each of the case study interviewees stated that they did not want to be perceived as an extension of the University of Maryland University College campus. The University of Maryland University College is a for-profit, higher education institution that is not affiliated with the University System of Maryland. From the researcher's experience, the case study group perpetuated the culture of the flagship University as a whole. Previous conversations with faculty, staff, and administrators were similar to the case study group and confirmed that there is a deliberate and consistent attempt to disassociate the University of Maryland's flagship campus from the for-profit entity – even though they are less than five miles apart in distance and have adjoining parking facilities.

Leadership support was the lowest scoring issue in the cluster of Barriers and Influences listed in Figure 15. Interviewee 3 explained that she is happy with the attempts the department chair has taken to provide training outside of OIT. She stated that "OIT lessons are taught by "techies" that don't explain why the technology is so important. At least an outside person would make me feel like I should care, because they care."  The researcher noted that ARHU faculty members independently sought information about innovative technology for classroom instruction.

Tables 10 through 16 provide data from the quantitative survey tests for the case study group. These tests were conducted to determine the correlation between faculty's SoC and LoU. During the cas -study, Interviewee 2 stated that, "faculty members of the twenty-first century university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments."

When faculty reported little to no use of technology there was a positive correlation with their concern about the department's expectations of their use of technology in the classroom (Table 10). There was a positive correlation between the faculty member's concern with the learning curve they would experience and the "little" and "varying degrees" of technology use. The remaining SoC variables reported negative correlations with the faculty's concern with the learning curve for understanding how to integrate technology into classroom instruction (Table 11).

In the area of faculty's concern with the integration of technology being a distraction to their primary activities, Table 12 shows the positive correlation when faculty reported "little" use of technology, however, there was a negative correlation for the other levels of use. The data reports the same correlations when evaluating concerns about their schedule being too busy to consider integrating technology for classroom instruction (Table 13).

When faculty reported that they were not interested in integrated technologies, there was a correlation with the lowest level of technology use, varying degrees of technology use, and the highest level of reevaluating integrated technology use in the classroom. The lowest level of technology use and the lack of interest had the strongest correlation (Table 15) while faculty's reported concern with combining related peer activities all generated negative correlations (Table

14). Faculty’s concern with change in their job responsibilities had a positive correlation with the lowest level of technology use (Table 16).

Table 9 was used to report the quantitative results of the sample group’s survey responses to determine the correlation of the SoC. There was a positive correlation between the seven of the eight variables. The value peer interest was the only variable with the negative correlation in the table of coefficients.

The data collected in SurveyMonkey.com provided the results for the quantitative data analysis for Q2, “which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, were used to influence and motivate faculty from differing academic units?” Tables 1 through 8 illustrate the paired differences of SoC and LoU to report the results of these findings.

The null hypothesis was not rejected when comparing the differences between faculty’s SoC’s such as “I am concerned about what my department expects me to know about integrating technology into my classroom instruction and how those expectations might be in conflicts with how I prefer to teach”, “I am concerned about my inability to learn all there is to know about integrating technology-based instruction effectively”, and “at this time, I am not interested in learning about integrating technology-enhanced instruction”. In addition, when comparing the differences between the comfortable and varying degrees of technology use with the concern with how students will rate the faculty member’s use of technology in the classroom, the null hypothesis was not rejected.

The null hypothesis was rejected when comparing the differences between faculty’s SoC’s such as “I am concerned about the time needed to learn about integrating technology into instruction that will keep me away from doing what I am supposed to be doing”, “my present schedule is preventing me from learning too much about integrating technology-enhanced instruction", "I would like to know what other faculty are doing in relation to integrating technology-enhanced instruction," and "I would like to know how my job will change if/when I begin integrating technology-enhanced instruction into the classroom." When considering faculty's concern with student evaluations of their use of technology in the classroom, the null hypothesis was also rejected when faculty reported "I have little or no knowledge of information technology in education, no involvement with it, and no interest of becoming involved," "I am seeking or acquiring information about information technology in education," "I am preparing for the first use of information technology in education," "I have short-term, day-to-day use of information technology. My efforts are primarily directed toward mastering tasks with little time for reflection," " I combine my efforts of using information technology with related activities of other teachers and colleagues to achieve impact in the classroom," and "I reevaluate the quality of use of information in education, seek major modifications or alterations to increase impact, examine new developments in the field, and explore new goals for myself."

**Reliability and Validity of the Instruments.**

Selected theories for specific behaviors and target populations can be a complex task since constructs are often present in several theories under different names (Bartholomew et. al., 2011). In fact, several theoretical and conceptual frameworks may need to be combined in order to understand adoption and non-adoption phenomena (Langlois & Hallam, 2010). The two conceptual frameworks of this study are proven as reliable and validated tools for examining the extent to which an innovation implement conforms to the intent of the change facilitators. The CBAM model has been proven to be most useful as a guideline for understanding faculty concerns with technology adoption and diffusion into classroom instruction. Rogers Diffusion

Theory is the taxonomy used to develop the tool to assess the decision-making process of whether an individual will adopt a particular technology and the time frame involved with that decision. These constructs have been used as a long-standing resource for research across multiple disciplines, and the results have influenced campus-based and online teaching practices throughout many higher education institutions.

Historically, adoption is understood in terms of some kind of behavior change (Straub, 2009). The results of adoption theory are measured in terms of behavioral change; however, the predictors of these behavioral changes can be understood through contextual, cognitive, and affective factors of motivation and influence. There are two adoption and diffusion theories selected as the research tools for this study.

First, Rogers' Diffusion Theory has been used broadly across disciplines to comprehend and predict change. Rogers (2003) defined diffusion as a "special form of communication" (p. 5). Straub (2009) concludes that the "strength of Rogers' theory is in the broad foundation it provides to understand the factors that influence choices an individual makes about an innovation. It is the basis for understanding adoption. Because of the magnitude of this theory, it provides the basic understanding of innovation diffusion theory" (p. 628). Rogers' taxonomy is the validated research tool for this study because it is the process which describes how an individual makes a choice to adopt or reject technology. The four primary components of diffusion theory are: (a) the innovation itself, (b) communication channels, (c) social system, and (d) time. The four elements interact to describe how an individual's adoptions combine to represent diffusion and is still used in research either directly or implicitly through its influence and integration into other theories (Boyne et. al., 2005; Deffuant et. al., 2005; Kientzel and Kok, 2011; Pennington, 2004).

Second, the original Concerns-based Adoption Model recommended that factor analysis not be performed on samples solely composed of innovation users. To be meaningful, factor analysis must be performed on a large stratified sample of users and nonusers (Zemsky and Massey, 2004). The CBAM is a model used to predict, measure, describe, and explain the change process faculty members experience when considering the implementation of innovation into classroom instruction. There are five key components of CBAM. They are: (a) change is a process, not an event; (b) change is accomplished by individuals; (c) change is a highly personal experience; (d) change involves developmental growth in feelings and skills; and (e) change can be facilitated by interventions directed toward individuals, innovations, and contexts (Hord, Stiegelbauer, Hall, & George, 2006). Hord et al. (2006) note that "[CBAM] emphasize the concrete and more tangible operational forms of the innovation, thereby increasing the possibility of having reliable and valid information about use of the innovation" (p.4). The CBAM was useful as a resource for constructing and using the Stages of Concern and the Levels of Use to provide rigor to the study and to increase the likelihood that the research evaluations accurately reflect the extent of the data analysis.

# Chapter 5 : Interpretation, Conclusions, and Recommended Actionable Solution

## Introduction

The national trend for faculty development programs focused on technical skill and prioritized instructional design for course conversion over cognitive development (Dede, 2006; Sahin and Thompson, 2007; Straub, 2009). Researchers have determined that these strategies did not encourage transformative change for technology adoption and diffusion among faculty members of campus-based institutions.

The literature review outlined obvious gaps in scholarly articles about technology training programs that exclude factors of concern, behaviors, and work habits as useful determinants for advancing faculty’s adoption and diffusion of integrated technologies. The literature identified criteria for institutions to establish technology training programs, but paid little attention to the factors of influence and motivation with which to develop meaningful training and facilitated guidance for faculty.

This chapter will interpret the findings of the study, discuss conclusions of the findings as they relate to the theoretical and conceptual frameworks of IDT and CBAM, and summarize recommended actionable solutions for future research. Implications of the findings and the limitations of the research are also examined in this section of the dissertation.

## Interpretation of Findings

**Introduction.** The interpretation of the findings for this study will be presented in the same sequence as the research questions posed. The sub-questions of the primary research question one will be discussed followed by the interpretation of the findings for question two.

This sequence will allow the primary research question to be answered in full context based on the descriptive narrative of the interpretations from a statistical analysis of the data as presented.

The research questions for this study were: How can the University of Maryland develop a transformative professional development program, based on components of concerns-based adoption model and innovation diffusion theory, to engage faculty in emerging technologies?"

1. To what extent are technology diffusion factors individualized, and to what extent are they organizational?

    *a. To what extent is integration of technology into classroom instruction linked to the content taught?*

    *b. To what extent is integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?*

2. Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, are used as influences and motivations of faculty from different academic units experiencing different administrative cultures?

**Interpretation for Q1(*a*).** To answer the question, "*To what extent is integration of technology into classroom instruction linked to the content taught?"* the quantitative survey results were used to interpret these findings. The results of the survey were illustrated in the department demographics in Figure 14. This data reports that faculty members from departments in the Computer, Mathematics, and Natural Sciences and Engineering had the highest levels of technology usage. Faculty members in Education and Journalism had the lowest levels of technology usage.

Therefore, those faculty members in the natural sciences, mathematics, and engineering departments were most likely to integrate technology into classroom instruction. This means that content taught and the faculty member's level of technology usage are likely correlations to examine the integration of technology into classroom instruction.

**Conclusion for Q1(*a*).** The results for the sub-question (*a*) conclude that the integration of technology into classroom instruction is linked to the content taught. Rogers' IDT supports the conclusion of this report because the theory explains faculty's concern with other "community" members as an important factor for influencing adoption and diffusion of technology for campus-based institutions. This influence is perpetuated by "an effort to maintain the status quo whereas non-adoption is not necessarily driven by such an incentive" (Boa, 2009, p.120).

**Interpretation for Q1(*b*).** The results of the question, "*To what extent is integration of technology into classroom instruction influenced by the faculty member's beliefs about effective teaching?"* are interpreted from the case study quantitative analysis. The data reported that the department's culture was a statistically significant factor for influencing faculty members' decision to integrate technology into the classroom.

These results were also interpreted from case study findings generated in the Cluster Map of Resistance Issues (Figure 15). The case study interview discussed a higher number of faculty concerns in the category of perception issues. Interviewee 2's statement about becoming "a designer of learning experiences, processes, and environments" speaks to disposition and supports implications that a major shift in both mindset and practice requires thoughtful and strategic intervention by campus-based institutions.

The meaningful cluster of "benefits/usefulness" was the third highest barrier and influence issue and represents a significant extent to which faculty determines the benefits and usefulness of technology as an influence for classroom instruction as an effective teaching strategy in classroom instruction.

**Conclusion for Q1(*b*).** The case study results conclude that the strongest indicator for motivating faculty members' personal beliefs about effective teaching and levels of technology use was the individual's disposition as a result of the department's cultural influence. This means that the faculty member's disposition was a direct response to the culture within the department rather than the individual faculty member's perceptions about oneself. Interviewee 3, a tenured-track faculty member states, "advocates of this instructional approach recognize that the preparatory path to a faculty appointment rarely attends to how people learn." This disposition speaks to the concern about the department's cultural history of awarding tenure track based on other requirements rather than teaching and learning. This faculty member's statement supports the conclusion that there is no influence and motivation to integrate technology into the classroom the practice will not positively affect her ability to achieve tenure status.

There were no statistically significant indicators to suggest that the faculty sample groups' technology diffusion is influenced by a specific individual belief in effective teaching practices. The individual motivators of faculty as a collective community were related to perceptions within the department. However, case studies of individual faculty members suggests otherwise. The motivation to integrate technology into classroom instruction was influenced by how the technology use would benefit them for personal and professional achievement and the usefulness in their work habits and activities. Gayton's (2009) exploration of college's institutional contexts on eLearning supports the conclusion that the integration of technology into classroom instruction is not influenced by the faculty member's beliefs about effective teaching. He states, "[t]he conflict between academic administrators' rhetoric and actual faculty practices is derived from the institutional contexts that guide education practices believed to increase enrollment and reduce costs. While colleges have embraced [technology-based] education to respond to the pressures from the external environment, the adoption of [this] instruction has been guided by a vision that is based upon unsubstantiated beliefs and assumptions and has taken the status of myth" (p.67). Therefore, the conclusion to Q1(*b*) is that there is a greater extent to the faculty member's integration of technology into classroom instruction if there is a direct benefit to the faculty member's personal or professional goals – such as achieving tenure status. There is a lesser extent when the faculty member considers his or her personal beliefs about effective teaching as a general practice.

**Interpretation for Q2.** The mixed-methods approach was also used to answer the second primary question, *"Which components of the conceptual frameworks, such as technology awareness, levels of technology use, and concerns with integrated technologies, are used as influences and motivations of faculty from different academic units experiencing different administrative cultures?"* The results of the T-tests reported that the levels of technology awareness and technology usage and the stages of concern were indeed factors of influence and motivation for faculty members.

The quantitative analysis detailed faculty's level of use at polar extremes. The data accounted for faculty at level = 0, no technology use, or at level = 7, where they were re-evaluating the impact of their usage of technology in the classroom (Figure 6). Those faculty members with an average awareness of innovative technology and comfortable degrees of technology use, primarily word-processing, were not influenced or motivated by those concepts. Faculty member's concern with being distracted from work responsibilities, a busy schedule, peer interest, and concern with how their job responsibilities would change if they integrated technology into classroom instruction were the factors that proved to be statistically significant influences and motivations for faculty from different academic units.

The qualitative case study sample group results explained how the learning curve to increase level of awareness and overall resistance were the primary issues in the meaningful clusters of barriers and influence related to stages of concern with integrated technologies. The less meaningful cluster was leadership/support (Figure 15).

**Conclusion for Q2.** Leadership and organizational support from the administration of differing academic units is not a significant factor for influencing faculty's concern with integrated technologies. Even though the University of Maryland's Strategic Plan (2008) lists "embrace the power of technology" as a primary goal with the objective of "increasing on a global level with online educational programs and services to translate laboratory research into a commercial domain" (p.3), faculty do not fully share in the administrative leaders' values and principles for the future of the University from this perspective. Bao's (2009) exploration of organizational resistance to technological innovations supports this conclusion. He states, "[f]aculty's resistance to innovation is an attempt to counteract the force to change and an effort to maintain the status quo of an organization, even if an innovation carries performance-enhancing attributes" (p.128).

## Conclusion

As learner-centered epistemologies have become increasingly well understood in the last 15 years, and with the publication of the seminal *How People Learn* (Bransford, Brown, & Cocking, 2000), there is a growing recognition that faculty development practices are far from an ideal situation. The University's OIT has the opportunity to develop a transformative professional development program, based on components of the concerns-based adoption model and innovation diffusion theory. These frameworks will provide the necessary guidelines by which professional development programs can engage faculty in emerging technologies yet address their concerns before attempting to increase their level of awareness and technology usage.  This conclusion is based on the researcher's discovery of certain faculty concerns correlating with various levels of technology use. There were also strong indicators that key influences and motivations were based on individualized perceptions and interest in peer activities, yet these issues were perpetuated by the culture of the department.

This conclusion is supported by Bransford, Brown, & Cocking's (2000) report that a fundamental principle of modern learning theory is that different kinds of learning goals require different approaches to instruction while new goals for education require changes in opportunities to learn (p.131). The results support the conclusion that leadership, organizational infrastructure, and the culture of the academic unit or department were more likely to affect perceptions about effective teaching practices and that peer interactions is likely to increase levels of technology awareness and levels of technology usage. However, leadership, organizational infrastructure, and the culture of the academic unit were less likely to actually motivate and influence technology adoption and diffusion into classroom-based learning environments.

**Discussion**

In the last 20 years, there have been major changes in technology training; however, these changes have only resulted in altered faculty roles and works patterns (Dede, 2006). But faculty knowledge, skills, and dispositions about integrated technologies continues to be major cause of resistance and results in a void or is limited during face-to-face instruction. The researcher has identified factors in faculty training programs which contribute to faculty members' unprepared response to accept technology as a teaching strategy for classroom instruction.

This study details how factors of concern caused a need for an adjustment in faculty professional development -- specifically, professional develop programs designed with long-term, transformative impact as a critical component for addressing and alleviating those concerns. This study was conceptually framed by the Concerns-based Adoption Model, CBAM, (Hall & Hord, 2006) to assess faculty response to innovation based on their Stages of Concern (SoC) and Levels of Use (LoU) which described, explained, and predicted faculty's concerns and behaviors as influences to the change process. McCoy, Galletta, and King (2007) assessed that CBAM is "one of the most widely used behavioral models in the field of information systems (p.81).

Everett Rogers' (1995) Diffusion of Innovations theory was the theoretical framework used to explain the process by which an innovation is communicated through certain channels over time among members of a particular social system. The researcher used this theory to explore faculty members' knowledge about integrated technologies and the adoption or rejection decision-making processes. Rogers' Diffusion theory was also used to examine communications in the faculty members' social system of peers and colleagues as motivation for transformative change.

Both frameworks focused on faculty's knowledge, skill, and disposition about innovative technology and contributed to an understanding of predictors to the way faculty would respond to professional development interventions focused on "perceived ease of use" and "perceived usefulness" of integrated technologies. Thus, the recommended actionable solution is organized around the primary aspects of CBAM and Rogers' Diffusion theory to create a model for transformative change and technology adoption of an individual faculty member.

**Recommended Actionable Solution**

A transformative training and development program for faculty of campus-based institutions was examined through conceptual and theoretical frameworks of probable concerns and behaviors that lead to technology adoption and diffusion. Hence, the CBAM Stages of Concern and Levels of Use were very prominent factors in this study. The researcher argues that, in addition to contributing to an understanding of the way faculty respond to professional development interventions focused on innovative uses of technologies, these factors ought to play a greater role as the primary mechanism in the design of any technology training program. Those factors can be used to explore faculty resistance to integrated technologies and provide a thorough understanding of the faculty member's knowledge, skill, and disposition as an important indicator for the success of both, the faculty's development and the actual technology training program.

The researcher recommends that campus-based institutions examine the impact of transformative training and development programs through a lens of transferability, including a measure that works to incorporate innovation into campus-based learning environments.

According to Hord et al. (2006),

> In concerns research, the generic name given to the object or situation that is the focus on the concerns in *innovation*. The innovation and its use provide a frame of reference from which concerns can be viewed and described. The innovation is not necessarily new. It may be a new strategy, program, or practice, or it may be something that has been in use for some time (p. 7).

This definition of innovation provides a focus for assessing concerns, levels of use, and implementation strategies. For this study, the innovation was defined as emerging technologies that lead to the development of new capabilities; have long lasting economic, social and political impacts; and new opportunity for and challenges to addressing global issues. However, the results of the study also support questions regarding technology-enhanced education as, not only, those that focus on technology, although those are important, but includes an analysis of the technology as a criteria about what constitutes good teaching and learning (Amiel & Reeves, 2008). The researcher developed this definition based on the U.S. Department of Education (1997) report, *Technology and Its Ramifications for Data Systems: Report of the Policy Panel on Technology.* The report suggested that the adoption and integration of emerging technologies into higher education instruction would change the roles and work habits of faculty and supports the researcher's exploration of how innovation impacts the change process of faculty members. Hence, the researcher focused on application – actual classroom use and its impact – to make the recommendation of a faculty development model that focuses on the innovation beyond the traditional "workshop" or training session and integrates an opportunity to explore perceived usefulness and benefits to explain *why* faculty should integrate technology into the classroom. The recommended model incorporates these concepts as best communicated through peer teaching and learning groups (Vishwanath, 2005).

The researcher expects that there are challenges for technology-oriented faculty development programs. For example, "fragmented, intellectually superficial" integrated technology professional development program designs fail to adequately improve faculty's capabilities or address their concerns with technology adoption and diffusion (Dede, 2006). The researcher recommends an actionable solution to this challenge by maintaining a balance between the emphasis on technological skills and pedagogical approaches. There should also be a consideration for faculty expectations aligned with faculty professional development activities.

**Faculty development initiative.** Wejnert (2002) believes that there are factors that influence the spread of innovations across groups, communities, society, and countries (p. 297). The researcher expounded on this belief and used Rogers' IDT to examine how the diffusion of innovations can spread to abstract ideas and concepts, technical information, and actual practices within a social system. This spread denotes flow or movement from a source to an adopter, typically via communication and influence (Rogers, 2003). The research has determined that such communication could influence faculty's probability of adoption of an innovation if the motivation stems from any societal entity, including individuals and groups. The researcher develops this communication for technology training programs from the perspective of a "socio-technological" model within the technology training's instructional design. This "socio-technological" approach integrates social and technical competencies within a training program that acknowledges the user's concerns of the benefits and usefulness of the innovation with the ability and time required to learn about the innovation and to advance levels of technology awareness and usage. Zemsky & Massey (2004) discuss the introduction of technologies for teaching and learning as an important "catalyst of innovation" (p.60). This "catalyst" of introducing innovative technologies must be superseded with an environment that causes faculty to closely consider the process of teaching and learning using integrated technologies. The redesigning of the traditional teaching and learning environment to include the socio-technological status of a faculty member is the researcher's parameter for defining a new solution-oriented outcome for transformative professional development.

Numerous models, including the CBAM and Rogers' IDT, have focused on describing educator change processes in response to understanding the adoption and diffusion of innovative technologies. However, the model of "change in professional development practice" has not been implemented in faculty training programs. The researcher's recommended actionable solution of a new faculty development model uses the descriptors from the CBAM and the decision-making stages of Rogers' IDT. These descriptors make it possible to develop strategies for identifying faculty's knowledge, skill, and disposition and, in turn, using those identifications as the influence and motivation for engaging in the transformative change process (Table 16).

Figure 16

McKissic Model of Transformative Professional Development

| **McKissic Transformative Professional Development Model** | |
|---|---|
| **1. Knowledge** | Faculty takes initiative to learn more about innovative technology. |
| **2. Skill** | Faculty's level of technology usage is assessed and the benefits of the use are discussed using practical applications. |
| **3. Disposition** | Faculty engages in situated peer communications to motivate "teaching and learning" about innovation. |

Table 16 is an illustrative visual of the McKissic Transformative Professional Development Model. This model, based on the results of the study, interprets the conceptual framework for the recommended professional development program from the socio-technological perspective as described. It incorporates and correlates faculty concerns with level of technology usage. The stages of the McKissic Model are based on concepts of knowledge, skill, and disposition as described.

Stage 1: Knowledge -- the faculty member takes an initiative to learn about innovative technology. At this stage, the faculty members' Stage of Concern and Level of Use is determined by the facilitator. This knowledge would allow faculty to feel as though their concerns and beliefs about effective teaching strategies are addressed as a precursor to participating in training modules and face-to-face sessions (Sahin & Thompson, 2007).

Stage 2: Skill – the faculty members' level of technology use is confirmed and the training facilitator proceeds with recording the level of use for each confirmed faculty participant and notes the stages of concern. The integration of this process as a "participant pre-technology training assessment" also ensures attention to faculty's individual needs and concerns for future use and encourages continued communication with the facilitator or training office (West, Waddoups, and Graham, 2007).

Stage 3: Disposition – during the training session, the facilitator uses the introductory agenda of the training session to engage faculty participants in peer communications about their knowledge and/or use of the technology. This opportunity to discuss perceived usefulness and perceived ease of use allows peer-to-peer motivation and influence to promote technology adoption. Faculty would consider the individualized technology training assessment as a social "system" for transformative change rather than an administrative task or institutional force to change.  This focus on the behavior patterns describes the typical experience as faculty "learn about, begin to use, and gain increasing experience in the use of new instructional practices. It is a theory of 'change in practice'"(Anderson 1997, p. 346-347).

**Model faculty development program.** There are four stages of implementation for the McKissic Transformative Professional Development Model. These stages incorporate variables focused on the characteristics of a socio-technological concept and the idea that the nature of adoption and diffusion processes depends on the social community of the faculty member and considers how these different communities will affect the influence and motivation factors for that member:

### Stage I

**Professional Development & Pre-Assessment**

- ❑ Assess faculty member's technological knowledge, technological skill, and disposition about effective teaching and learning prior to introducing innovation.

**Stage II**

**Exploration of Emerging Technologies**

- ❑ Explain the usefulness of the innovation and relate the practical applications to the faculty member's knowledge, skill, and disposition

**Stage III**

**Solution Prelim and Implementation**

- ❑ Discuss alternative innovations that meet the factors in Stage II
- ❑ Explore faculty's perceptions about integrating the innovation into classroom instruction.

**Stage IV**

**Evaluation**

- ❑ Determine if faculty's perceptions and ideas about integrating the technology are practical uses of the innovation and, if not, suggest alternate innovations and return to Stage III.
- ❑ Follow up with faculty to assess technology knowledge, technology skill, and disposition about effective teaching

This McKissic Model is cyclical. Each stage revolves or is recycled as an ongoing, nonlinear process that began at any stage but always ends with Stage 4 as defined in Figure 1.

The CBAM stages of concern and levels of use were used in the study to explore faculty's level of technology awareness compared with actual usage. Rogers' IDT was aligned with CBAM as the premise for the McKissic Model to explain how these factors align with concerns, influences, and motivations while positively influencing transformative stages of development. The McKissic Model incorporates several key assumptions supported by CBAM and Rogers' IDT: (a) change is a process, not an event; (b) change is accomplished by individuals; (c) change is a highly personal experience; (d) change involves developmental growth and feelings and skills; and (e) change can be facilitated by interventions directed towards individuals, innovations, and contexts (Hord, Stiegelbauer, Hall, & George, 2006).

## Summary

The results of this study support the conclusion that the University requires a modified technology program that facilitates meaningful and engaging communications among the campus' social system of faculty networks. The limitations of the study were the deliberate analysis of tenured and tenure-track faculty at the University and the use of the researcher's former employer as an accessible site. Additional limitations suggest that the stages and levels of CBAM and the descriptors of Rogers' IDT do not assume a strict step-wise conformity for every faculty member. "The sequence of [the stages of concern, level of use, and decision-making process] is logical, but there is no guarantee that a faculty member will move through all levels in a lock-step developmental fashion" (Hall et al., 2006, p. 11).

Further implications for this study could address concerns and levels of technology use for other institutions such as for-profit higher education institutions and government agencies to identify factors that contribute to the learner's unprepared response to accept technology as a practical resource with benefits and usefulness for appropriate work related responsibilities. Future research could also include an exploration of primary and secondary teachers and adjunct faculty and instructors.

This study focused on individual faculty member's feelings and concerns in response to an innovation. The notion of concern can be misunderstood as a negative term. Van den Berg and Ros (1999) describe concerns as "questions, uncertainties, and possible resistance that teachers may have in response to new situations and/or changing demands" (p. 880). In this study, the CBAM organized concerns into several stages and used Rogers' IDT to describe the communication and decision-making process from awareness to self-guided evaluation. Although these frameworks provide diverse approaches for transformative professional development, it is important to consider future research that will contribute to the theoretical approach of faculty development using conceptual models that test the *causes* for concern.

**Future Research**

The original proposal for this study included the use of the Problem's Based Learning Theory, PBL, as a conceptual framework for exploring faculty's perceived challenges with integrated technology into the classroom, their disposition about innovation in the classroom, and their stated reasons for participating in a face-to-face training session. The unexpected change in the University's electronic learning management system no longer warranted the use of PBL as an appropriate theoretical approach. There were no strategies for observing and recording faculty reasons for participating in the face-to-face training session.

The incorporation of a three-pronged study, such as the Problem Based Learning Theory, PBL, will allow a triangular approach for exploring multiple transformative factors that influence and motivate dramatic changes agents for faculty to engage innovative and emerging technologies into their classroom instruction. The PBL theory will allow additional exploration of key factors that determine the effectiveness of the McKissic Model's strategies for transforming technical and personal knowledge, skills, and dispositions amongst faculty communities at campus-based institutions. Additional research is also needed to evaluate ongoing engagement strategies to ensure that these experiences evolve to facilitate higher order thinking to keep up with the increase in faculty's socio-technological status. This research could explore several variables such as the size of the campus and faculty communities and the demand and change in the facilitator's role. Such research will provide new information for the national policy issue of faculty preparedness as it implements an instructional approach redesigned to address emerging pedagogues.

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**Appendices**

## Appendix A: Drexel University IRB Human Subject Research Approval

DREXEL UNIVERSITY
COLLEGE OF MEDICINE

Office of Regulatory Research Compliance

APPROVAL NOTICE (EXEMPT)

TO: Joyce Pittman, Ph.D.
School of Education
Mailstop: Drexel

FROM:

Danyelle S. Gibson, Alternate Member
Institutional Review Board (IRB #3)
Drexel University College of Medicine
1601 Cherry Street, Suite 10444, 3-Parkway, Philadelphia, Pa 19102
Tel: 215-255-7864 Fax: 215-255-7874

SUBJECT: EXEMPT APPROVAL
TITLE: Transformative Faculty Development Programs for Technology Adoption and Diffusion at Campus-Based Institutions
SPONSOR: Internal
PROTOCOL No: 1108000132A002

RE: 10/13/11 - Approved University Amendment #1- Request to replace face-to-face interaction with on-line.

Date: 10/14/11

On behalf of the Committee, I am pleased to inform you that the subject protocol has been reviewed and approved as **EXEMPT research** (45 CFR 46, 101(b) (1)) for the period indicated above. We operate under many Government requirements. As a result, this approval is granted with the following understandings:

1. If this is a sponsored project, then the study may not be activated until the Clinical Research Group has received BOTH a fully executed sponsored agreement AND appropriate letter(s) of indemnification by the sponsor. If this is not a sponsored study (designated "internal"), the costs of the project must be identified and a cost center designated. Please call 215-255-7857 if you have any questions regarding these procedures.
2. You must advise the IRB of the activation date. Use the attached form for this purpose.
3. Protected Health Information (PHI) cannot be collected without a Waiver of Authorization per HIPAA regulations.

4. Any change to the protocol must be submitted in writing and approved by the IRB in advance.
5. Any adverse reaction must be reported to the IRB as soon as it occurs.
6. Should the IRB decide to monitor your project directly, please cooperate fully. Failure to do so may result in withdrawal of this approval and notification to the sponsor and/or Federal agencies. Specific information regarding monitoring appears in the book: "Guidelines for Biomedical and Behavioral Research Involving Human Subjects", obtainable through this office or via the website http://research.drexel.edu.
7. Whether or not this protocol is activated, the IRB will conduct a Continuing Review at least annually. Should you fail to respond to this Federally-required progress report, the project may become ineligible for re-approval and the IRB may choose not to consider other projects for approval.
8. A final progress report must be submitted to the IRB in format similar to that of a periodic report.

The IRB welcomes your research project into the list of approved protocols. Your compliance with the above conditions will help to protect the continuation of all research activity at the University. With your project and others like it, we look forward to additions to knowledge of human health and benefits to science, our patients, and society.

cc: Dept Chair, Tenet, and Drexel

# Appendix B: University of Maryland IRB Authorization Agreement

Drexel UNIVERSITY

IRB AUTHORIZATION AGREEMENT BETWEEN DREXEL UNIVERSITY AND UNIVERSITY OF MARYLAND COLLEGE PARK FOR THE PROTECTION OF HUMAN SUBJECTS

**Name and Address of Institution or Organization Providing IRB Review (Institution A):**
Drexel University College of Medicine
Office of Regulatory Research Compliance
3 Parkway Building - 1601 Cherry Street
10th Floor Suite 10444
Philadelphia, PA 19102-1192
Federal Wide Assurance Number: 0001852
IRB Number: 000002796

**Name of Institution Relying on the Designated IRB (Institution B):**
University of Maryland College Park
1204 Marie Mount Hall
College of Park, MD 20742
Federal Wide Assurance Number: 00005856
IRB Number: 00000474

The Officials signing below agree that University Of Maryland College Park will rely on the designated IRB of Institution A for review and continuing oversight of its human subjects research described below.

This agreement is limited to the following specific protocol(s):

**Name of Research Protocol:** *Transformative Faculty Development Programs for Technology Adoption and Diffusion at Campus-Based Institutions*

**Sponsor or Funding Agency:** __N/A________ **Award Number, if any:** ___________

**Name of Principal Investigator (Institution A):** Joyce A Pittman, Ph.D. (1108000132)
**Name of Principal Investigator (Institution B):** Stephanie McKissic

The protocol reviewed and approved by the IRB of Institution A will include a description of the research to be conducted at Institution B. Principal Investigators at both Institutions will maintain current copies the IRB approved protocol. Institution A will conduct this research in accord with the terms and conditions of its OHRP-approved Assurance and will provide relevant minutes of its IRB meetings to Institution B upon request. Institution B will conduct this research in accord with the terms and conditions of its OHRP-approved Assurance. Institution B remains responsible for ensuring compliance with the IRB's determinations and with the terms of its OHRP-approved Assurance. This agreement will be kept on file at both Institutions and will be available to OHRP upon request. *No subject recruitment is to occur at Drexel University*

Authorizing Officials
University of Maryland College Park

X Sadared Bodison MD
Name Sadared Bodison
Title Co-chair of IRB
Address 1204 Marie Mount Hall
College Park, MD
Telephone and Fax 301 405 4212
(e-mail) irb@umd.edu

08/25/2011
Date

Drexel University

X Sreekant Murthy
Sreekant Murthy, Ph.D.
Vice Provost for Research Compliance
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10th floor Suite 10444
Philadelphia, PA 19102
215-255-7858 (phone)
215-255-7874 (fax)
sm53@drexel.edu

8/23/11
Date

# Appendix C: University of Maryland Letter of Access

UNIVERSITY OF
MARYLAND
Office of Extended Studies

0132 Main Administration Building
College Park, Maryland 20742
301.405.7762 TEL 301.314.4071 FAX

June 1, 2011

Stephanie C. McKissic
2856 Brunston Castle Lane
Waldorf, MD 20601

Dear Ms. McKissic:

This letter is to inform you that the Office of Extended Studies, University of Maryland, supports your research study titled, ***A Case Study: Developing A Sustainable Transformative Professional Development Program Model To Engage Faculty Acceptance And Adoption Of Emerging Technologies At A University In The Northeastern United States***. It is our understanding the project will begin on June 20, 2011 and ends approximately January 31, 2012.

We are very interested in your efforts which may help improve our understanding of faculty professional development at the University of Maryland. We hope to use your research to improve the effectiveness of training and development for our online learning initiatives.

We hereby grant you, the researcher, Stephanie C. McKissic, access to the population and sample described in your research protocol upon approval of Drexel University's IRB research contract for your proposal as well as University of Maryland's IRB authorization agreement.

If you have any questions or need further assistance, please contact me at 301-405-6551.

Sincerely,

Chuck Wilson
Assistant Vice President for Extended Studies

# Appendix D: Quantitative Survey based on the Concerns-based Adoption Model



mckissic Sign Out Help

Home My Surveys Resources Plans & Pricing + Create Survey

**Technology Use Survey**
Education Edit

Design Survey Collect Responses Analyze Results

Edit Survey

Preview Survey Send Survey »

To change the **look** of your survey, select a theme below.

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PAGE 1 Edit Page Options ▼ Add Page Logic Move Copy Delete Show this page only

Technology Use and Stages of Concern Survey

Thank you for participating in this study on transformative faculty development programs for technology adoption and diffusion at campus-based institutions. The following survey explores your current levels of technology usage and identifies factors that would motivate you to incorporate or enhance the emerging technologies for your face-to-face teaching and learning work habits.

There is no compensation for participating in this study. The benefits are considered contributions to the field of faculty development and technology training. Taking part in this project is entirely up to you and you may stop at any time without penalty. This survey can be completed in approximately 5-10 minutes.

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Demographics

There are five questions about your position at the University. These questions will help determine the level of technology used related to position, rank, and academic or administrative status.

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+ Add Question ▼

Q1 Edit Question ▼ Add Question Logic Move Copy Delete

**1. What is your principal activity? Choose all that apply.**

- Teaching
- Research
- Administration
- Graduate Thesis/Dissertation Committee
- On Sabbatical

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Q2 Edit Question ▼ Add Question Logic Move Copy Delete

**2. What is your administrative or academic rank? Choose all that apply.**

- Clerical
- Director
- Administrator
- Chair
- Faculty - Professor
- Faculty - Associate Professor
- Other (please specify)
- Faculty - Assistant Professor
- Faculty - Clinical Professor
- Faculty - Tenured
- Faculty - Non Tenured, On Track
- Faculty - Non Tenured, Term Contract
- Faculty - non Tenured, Continuing Contract

+ Add Question ▼ Split Page Here

Q3 Edit Question ▼ Add Question Logic Move Copy Delete

**3. How long have you been on staff at the University?**

- Less than a year
- 1-5 years
- 5-10 years
- More than 10 years
- Other (please specify)

+ Add Question ▼ Split Page Here

Q4 Edit Question ▼ Move Copy Delete

**4. What is your field/discipline of teaching or administration? Use N/A if this question is not applicable to your current position.**

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Q5 Edit Question ▼ Add Question Logic Move Copy Delete

**5. In what college or administrative department/services do you work?**

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Levels of Technology Use

The categories below refer to your use of innovative technology in the classroom. One of the six levels best indicates your self-described knowledge of technology use for educational instruction.

NOTE: For the purposes of this survey, innovative technology is defined as the process of disseminating classroom instructional content and information using electronic, computer software and/or hardware, and web-based applications. These processes include PowerPoint, Moodle, Blackboard, Wimba, Camtasia, etc.

+ Add Question ▼

Q6 Edit Question ▼ Add Question Logic Move Copy Delete

**6. Please mark one category that best indicates your overall level of use of technology.**

- ☐ I have varying degrees of use of information technology in education to increase the expected benefits within the classroom.
- ☐ I reevaluate the quality of use of information in education, seek major modifications or alterations to increase impact, examine new developments in the field, and explore new goals for myself.
- ☐ I combine my efforts of using information technology with related activities of other teachers and colleagues to achieve impact in the classroom.
- ☐ I have little or no knowledge of information technology in education, no involvement with it, and no interest of becoming involved.
- ☐ I have short-term, day-to-day use of information technology. My efforts are primarily directed toward mastering tasks with little time for reflection.
- ☐ I am comfortable with using information technology in education, but I have little time for reflection on improvement.
- ☐ I am seeking or acquiring information about information technology in education.
- ☐ I am preparing for the first use of information technology in education.
- ☐ Not applicable.

+ Add Question ▼

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Integrating Technology With Classroom Instruction

There are eight statements that reflect attitudes toward integrating technology into classroom instruction. Select one number per question that best reflects your PRESENT attitude. The higher the number, the better the statement reflects your present attitude.

+ Add Question ▼

Q7 Edit Question ▼ Move Copy Delete

**7. Answer as completely and truthfully as possible when thinking of the following statements and how it applied to your present attitude about integrating technology into classroom instruction.**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| I am concerned about what my department expects me to know about integrating technology into my classroom instruction and how those expectations might be in conflict with how I prefer to teach. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am concerned about my inability to learn all there is to know about integrating technology-based instruction effectively. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am concerned about evaluating students on the impact of my use of technology for classroom instruction. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I am concerned about the time needed to learn about integrating technology into instruction that will keep me away from doing what I am supposed to be doing. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| My present schedule is preventing me from learning too much about integrating technology-enhanced instruction. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I would like to know what other faculty are doing in relation to integrating technology-enhanced instruction. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| At this time, I am not interested in learning about integrating technology enhanced instruction. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| I would like to know how my job will change if/when I begin integrating technology -enhanced instruction into the classroom. | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Additional Comments

## Appendix E: Qualitative Interview Questions based on Rogers' Innovation Diffusion Theory

1. How does your department refer to the use of technology for classroom instruction?
2. What are your thoughts about your level of skill and use of technology for classroom instruction?
3. How do you think students would rate the impact of technology on your classroom instruction?
4. What type of training seminar or workshop would you attend for technology training?
5. What is the maximum amount of time you would prefer to spend in a technology training seminar or workshop?
6. Describe a time when faculty shared ideas about integrated technologies?
7. Describe the types of integrated technologies in which you are most interested?
8. Explain how your department would refer to your use of technology in the classroom?