University of Louisville
ThinkIR: The University of Louisville's Institutional Repository

Electronic Theses and Dissertations

5-2009

Concerns and perceptions of faculty using Web-based instructional technology.

Elizabeth Romero Fuerte
University of Louisville

Follow this and additional works at: https://ir.library.louisville.edu/etd

Recommended Citation

Fuerte, Elizabeth Romero, "Concerns and perceptions of faculty using Web-based instructional technology." (2009). *Electronic Theses and Dissertations.* Paper 467.
https://doi.org/10.18297/etd/467

This Doctoral Dissertation is brought to you for free and open access by ThinkIR: The University of Louisville's Institutional Repository. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of ThinkIR: The University of Louisville's Institutional Repository. This title appears here courtesy of the author, who has retained all other copyrights. For more information, please contact thinkir@louisville.edu.

CONCERNS AND PERCEPTIONS OF FACULTY USING WEB-BASED INSTRUCTIONAL TECHNOLOGY

By

Elizabeth Romero Fuerte
B.S., Universidad Nacional Autónoma de México, 1993
M. S., Tecnológico de Monterrey, Campus Ciudad de México, 1998
M. A., Western Kentucky University, 2003

A Dissertation
Submitted to the Faculty of the
Graduate School of the University of Louisville
and
Graduate Studies and Research at Western Kentucky University
in Partial Fulfillment of the Requirements
for the Degree of

Doctor of Philosophy

Department of Education and Human Development
University of Louisville
and
College of Education and Behavioral Sciences
Western Kentucky University

May 2009

Copyright 2009
by
Elizabeth Romero-Fuerte

All rights reserved

CONCERNS AND PERCEPTIONS OF FACULTY USING

WEB-BASED INSTRUCTIONAL TECHNOLOGY

By

Elizabeth Romero Fuerte
B.S., Universidad Nacional Autonoma de Mexico, 1993
M.S., Tecnologico de Monterrey, Campus Ciudad de Mexico, 1998
M.A.E., Western Kentucky University, 2003

A Dissertation Approved on

March 30, 2009

By the following Dissertation Committee:

Dissertation Director

DEDICATION

To my daughters Sofia and Anna, with love

ACKNOWLEDGEMENTS

No dissertation is ever possible without the assistance, support, guidance, and efforts of several people. This work is not the exception. Several names are not written in this page but in my heart, and they know it.

I would like to thank my advisor Dr. Christopher Wagner for his guidance, understanding, and most importantly, his friendship during my graduate studies. I would like to thank the members of my dissertation committee for their input, valuable discussions, and accessibility. In particular, I would like to thank Dr. Marge Maxwell for her assistance and guidance in getting my work focused and providing me with the foundation for becoming a researcher. In addition, I would like to thank Dr. Joe Petrosko for his statistical advice and Dr. Ric Keaster for his editing assistance.

I would like to thank Dr. Robert Wyatt, director of the Office of Distance Learning at Western Kentucky University, whose support during my graduate studies was invaluable. A very special thank you to my colleagues and friends for their inspiration and support in difficult moments.

I would like to thank my husband Miguel for venturing with me in this enterprise, for his tolerance, and for his understanding. Finally I thank my parents, Mercedes and Augusto, for nurturing in me the love of learning.

ABSTRACT

CONCERNS AND PERCEPTIONS OF FACULTY USING

WEB-BASED INSTRUCTIONAL TECHNOLOGY

Elizabeth Romero-Fuerte

March 30, 2009

This study examined faculty levels of implementation of Web-based instructional technology (WBIT) and computer self-efficacy beliefs (CSE) as factors associated to faculty perception of institutional mechanisms and its relative importance as conditions supporting the implementation of WBIT in higher education. Using a sample of 334 faculty teaching at selected universities in the Commonwealth of Kentucky, faculty perceptions of support mechanisms for the implementation of WBIT were examined. Results revealed that it is possible to develop faculty profiles that include psychological and behavioral variables and that adding such variables improve the prediction of faculty levels of technology implementation. Furthermore, findings from this study suggested there are perception differences regarding the conditions that support implementation at different stages. Factors such as levels of use of WBIT and faculty concerns about implementation provided an explanation of the perception differences. In the first phases of implementation (i.e., nonuse/preparation and self/task concerns) participation and the accessibility to resources, including incentives and rewards, were clearly more important. In later stages (i.e., focus on improvement and impact concerns) the administrative

support in the form of leadership interventions – providing encouragement and serving as a role models – and the visible support by the upper level leaders became key factors.

Further research is needed in the area of personalization in order for universities to develop not only a cost-effective but also an efficient way of offering professional development opportunities that consider specific users' profiles. Findings from this study are promising in the sense that it sets the basis for a theory-grounded definition of faculty profiles. This study establishes the foundation to reconsider the need for customized administrative practices and a more diverse spectrum of interventions which, in a constantly evolving field, are necessary for large scale technology implementations to expand in higher education institutions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Considerable research has been conducted during the last decade regarding the implementation of information technology (IT) in higher education. Research on IT innovation in higher education has especially focused on identifying key factors associated with failed or successful implementation experiences. Although important research in implementation of IT has been conducted in distance education settings, the fact that more and more traditional universities are diversifying their market and complementing their face-to-face offerings with distance education components (e.g., online courses) expands the distance education phenomenon to include traditional universities.

Faculty concerns associated with the implementation of Web-based Instructional technology (WBIT) are generally found in the areas of administrative and technical support (Maguire, 2005). Most of the literature looking at the implementation of WBIT focuses on faculty technology usage, faculty attitudes and concerns regarding the use of technology, and faculty perceptions toward the incorporation of technology into instruction (Aust, Newberry, O'Brien, & Thomas, 2005; Crooks, Yang, & Duemer, 2002; Inman & Mayes, 1998; Vodanovich & Piotrowski, 2005). Conversely, empirical research that examines institutional support concerning technology implementation in higher education has received significantly less attention. Few studies have addressed the needs and perceptions of faculty in terms of institutional mechanisms that support the acquisition of technical skills and the subsequent implementation of WBIT (Gammill & Newman, 2005). Moreover, even though psychological theories postulate mediating mechanisms through which external factors affect behavior (Bandura, 1997), practices that reflect educational and psychological theories are rarely found in distance education studies (Lee, Driscoll, & Nelson, 2004). Therefore, a study designed to identify possible relationships among psychological constructs and the development of concerns and perceptions of faculty implementing WBIT fulfills a current need.

Background of the Study

For the last two decades, post-secondary institutions have been challenged to undergo radical transformation and renewal. Various forces, both social and technological, have accelerated the rate at which change is needed in higher education (Duderstadt, 2000). Presently, organizations must interact not only with their primary environment but also with many technological, legal, social, economic, and institutional structures that constrain the activities of the organization and over which they have very little direct control (Bennis & Nanus, 1997). In this context, "universities may see substantial organizational changes imposed on them over the next decades by external forces" (Annand, 2007, p. 1).

The literature addresses many different factors that necessitate change in higher education institutions. Green and Hayward (1997) point out a variety of factors that make change essential. They include (a) the effects expansion has on higher education and the push for greater access, (b) the problems of declining resources and the challenge of diversifying funding sources, (c) the expectation that higher education will make a greater contribution to economic and social development, (d) the pressures to be accountable to an increasingly skeptical and demanding public, (e) the conflicts surrounding institutional autonomy, (f) the growth of technology, and (g) the desire for internationalization. "Factors contributing to that transition are economic pressures from mounting costs, demands by the business world for graduates who are able to function in a knowledge society,... greater diversity among students who go on for higher education" (Palloff & Pratt, 1999, p. 3) and a growing market evincing demands on education anytime and at anyplace.

Akin to society at large, a factor that has played an imperative role in transforming higher education is the advance of information technology (IT). The potential for use of IT in education has been increasingly recognized and higher education faculty members have begun to use this technology in different ways in their teaching (West, 1999). Instructors today frequently incorporate electronic technologies that extend instructional resources to their students: threaded discussion boards, websites, chat rooms, e-mail, listservs, newsgroups, etc. Findings of a survey conducted by the National Education Association (NEA, 2000) indicated that almost half of faculty teaching courses that are not Web-based nonetheless use e-mail to communicate with their students once a week or more.

Additionally, the fact that more and more traditional universities are diversifying their market and complementing their face-to-face offerings with distance education components (e.g., online courses,) is expanding the use of technologies that support distance education into traditional universities. Derived from this expansion is the emerging concept of *dual-mode* institutions of higher education. According to the

National Center for Education Statistics (NCES, 2003) during the 2000-2001 academic year, 56 percent of all 2- and 4-year institutions offered distance education courses, which represents an increase of approximately 34% over a 3-year period. According to the report, there were an estimated 2,876,000 enrollments in college-level, credit-granting distance education courses, with 82 % of these at the undergraduate level.

Also, because the use of IT in the traditional classroom is becoming a more common practice, the lines distinguishing Web-based delivery and face-to-face classroom teaching are becoming less discernable. In 2000, 90% of all institutions that offered distance education courses used asynchronous Internet courses as their primary technology for instructional delivery (NCES, 2003) while, according to the Institute for Higher Education Policy (IHEP, 1999), approximately 54% of higher education face-to-face classes used e-mail, 39% used Internet resources, and 28% had a website. Additionally, approximately one-fifth of all college courses now use electronic course management tools (e.g., Blackboard); and conversely, some distance education courses incorporate one or more on-campus, face-to-face class meetings (Green, 2001).

Certainly, "distance education has become a concrete manifestation of the changes in higher education" (Flokers, 2005, p. 2) and, as such, represents an important instructional method for institutions of higher education that is no longer considered a "new" delivery method. This phenomenon sometimes makes it difficult for researchers to distinguish the differences between online courses and Web-enhanced courses, especially in terms of analysis and overall implications. For instance, facilitative teaching is as essential a component of online teaching as it is of face-to-face instruction. Also, the literature recognizes that the lines distinguishing the role of the traditional classroom instructor from the online instructor are blurry and largely untested. Palloff and Pratt (1999) note the similarities between teaching in the classroom and teaching online; yet, they caution those who oversimplify the differences that exist. Some of those differences relate to how teachers may confirm engagement, comprehension, participation, and conflict resolution (Easton, 2003).

Because the use of IT permeates both online and face-to-face teaching and learning processes, research on implementation of IT in dual-mode universities cannot evade either one. Therefore, this study examined issues related to the implementation of IT in the educational process for both face-to-face and online instruction. Accordingly, selected dual-mode universities in the Commonwealth of Kentucky were chosen for this study. These universities have experienced a natural, non-systemic incorporation of WBIT and as such provided the study with a natural profile of faculty concerns and efficacy beliefs across different levels of implementation.

In this study the scope of IT was limited to instructional technology and more specifically to Web-based instructional technology (WBIT). In this context, the term WBIT refers to any technology that allows electronic educational content to be delivered via the Internet (e.g., Content Management Systems, such as Blackboard; Internet open resources, such as Wikis and Blogs). Notwithstanding that a broad group of stakeholders are involved in this transformation, for the purpose of this study, we considered as crucial the participation of faculty, academic administrators, and technology-related staff, as they attempt to implement and provide support for the implementation of technology in higher education.

Statement of the Problem

During the last decades, higher education administrators and policymakers have made important decisions regarding investments in technology and programs offered to support the use of technology at various levels. A variety of national organizations (the National Education Association [NEA] and the Institute for Higher Education Policy [IHEP] among others) have developed specific indicators and standards for assessing the implementation of instructional technology. While these indicators and standards provided an outline for successful practices, research shows that institutions of higher education face a slow rate of technology implementation at the classroom level (Vodanovich & Piotrowski, 1999, 2001, 2005). Despite the fact that technology is increasingly being used by higher education institutions, the teaching and learning transformation across the curriculum has not yet occurred. Annand (2007) depicted the technological change dilemma as follows:

> The generally silent struggle underway within the academy to determine the appropriate means to employ technology – using it to either fundamentally change the way education is delivered to students, or using it to augment the traditional way that higher education has been conducted by replicating the classroom in an electronic environment – is far from being resolved. If creatively implemented, significant transformative change may be realized within current academic structures. (¶ 31)

Technologies are considered within most universities, without regard for how technology coupled with organizational change might transform the educative process. The extent and nature of WBIT application in higher education is still varied and in many cases is limited to a few isolated instances (e.g., e-mail communication and posting assignments) (Groves & Zemel, 2000; Vodanovich & Piotrowski, 2005). "It is still unclear whether resistance to change within the academy constitutes anything other than rearguard action" (Annand, 2007, p. 31); however, Vodanovich and Piotrowski (2005) suggest that the lack of more advanced applications of Internet in the courses might be due to the lack of competence and proper training in such advanced applications.

In 2002, the IHEP published a report containing 24 benchmarks that according to the study are essential to ensure quality in Internet-based distance education. The report supported their findings based on the degree to which various measures of quality were actually being incorporated into the policies, procedures, and practices of institutions that were identified as distance education leaders. Their recommendations regarding institutional support, course development, and faculty support are relevant for the present study. In the recommendation section the report suggested that providing faculty with professional incentives for developing distance learning courses and having institutional rewards for effective distance learning teaching were not essential institutional support benchmarks. The argument was that "despite their relative low presence at the institution, quality Internet-based distance education was occurring at every one of these institutions" (p. 23). Additionally, among the non-essential benchmarks in regard to course development, the report suggested that there was no need for a course design managed by specialized teams (i.e., content experts, instructional designers, technical experts, and evaluation personnel) because "Internet-based distance education is the responsibility of the instructor and the academic department" (p. 24). Finally, considering the faculty support benchmarks, the report suggested the need for technical assistance in course development, training and continuous mentoring, and resources to deal with issues related to content access.

As reported by the NEA (2000), notwithstanding more than half of distance learning faculty spend more hours on their distance learning course than traditional classes, 84% do not get a corresponding reduction in workload, and 63% are compensated for their distance learning course as if it were part of their normal course load. In the same line, and contrary to what the IHEP report suggests, the literature reveals that faculty members continue to perceive the need for faculty release time and agreed that the most important obstacles to teach online are the lack of institutional incentives for teaching Web-based courses, the lack of adequate support systems, and the lack of recognition from the administrators and peers in the form of credit towards tenure and promotion (Dooley & Murphrey, 2002; Gammill & Newman, 2005; Lee, 2001; O'Quinn & Corry, 2002; Rockwell, 1999; Schell, 2004; Schifter, 2000; Shea, Motiwalla, & Lewis, 2001).

Although scarce research has been conducted to investigate the views of administrators and support staff in regard to the institutional support mechanisms for the implementation of WBIT, there is evidence suggesting significant differences between faculty and administrators' perceptions (Lee, 2002; Schifter, 2002). In fact, the literature reveals that administrators' perceptions of instructional support are in general more optimistic than the corresponding faculty members' perceptions (Lee, 2002). Of all the barriers cited by faculty, perhaps the most frequently mentioned is the lack of technical and administrative support (Lee, 2002; Maguire, 2005; Schifter, 2000, 2002), while administrators emphasize the availability of the resources but are concerned with the limited use of them by faculty (Lee, 2002).

An examination of the results of the National Campus Computing Survey for the past several years makes it clear that higher education institutions are shifting concerns regarding IT implementation. With an evident declining trend, the most significant IT issue from the 2000-2002 survey was the "instructional integration of information technology" (40.4%, 31.5%, and 24.1% each year respectively) particularly "assisting faculty with the instructional integration of technology." Not surprisingly, the second most significant priority for those years was "IT user support". By fall 2006, "instructional integration ranked a distant second (17%), well-behind network and data security (30.5%, about the same as in 2005), and only slightly ahead of upgrading/replacing the campus Enterprise Resource Planning system (ERP) (16.3%)" (Green, 2006, p. 2). From the IT specialists' standpoint, the concerns for system security have diminished professional development and capacity building for the use of academic-related software. One reason for this shift may center on the wealth of sensitive organizational information stored in data banks of universities, while another reason could be the ease with which faculty and students can access and use the new software. Despite the fact that current concerns of institutions implementing WBIT might lean more toward security and connectivity, as shown by the literature, institutional support to promote the technological change is still needed at several levels.

In summary, a review of the literature regarding institutional support mechanisms for WBIT implementation reveals a gap between the views of successful online instructors, in terms of their needs, and what research says about the needs of faculty at different levels of expertise and technical skills. In this context, especially if resource allocations for professional development and faculty support have diminished, understanding what influences the perception of faculty members regarding the conditions that support the implementation of WBIT becomes of fundamental interest to administrators and policymakers. Further research is needed to investigate the nature of those differences and increase the opportunity for institutions to have a more accurate profile of their faculty views and needs. Factors such as levels of concern about using Web-based instructional technology, levels of technology use, and measures of computer self-efficacy may provide an explanation of the perception differences. After all, understanding concerns and perceptions of faculty and administrators in an ongoing implementation context is central to the improvement of professional development activities, leadership interventions, and administrative practices necessary for WBIT implementation to succeed in dual-mode higher education institutions.

Theoretical Framework

This study was influenced by Change Theory and draws upon Concerns Theory and Social Cognitive Theory to investigate the nature of faculty perceptions of conditions promoting the implementation of WBIT in higher education. This section provides an overview of the Concerns Theory and the Concerns Based Adoption Model (CBAM) (Hall & Hord, 1987, 2001, 2006) and addresses the concept of perceived self-efficacy – an aspect of Bandura (1986) Social-Cognitive Theory of personality – as those frameworks constitute the theoretical foundation for this research.

Change Theory

Change Theory is a broad field with no unified, universally accepted construct that provides a framework for analysis of empirical research. There are theorists in several fields (e.g. business, social sciences, and engineering) that have explored the concept of personal and organizational change and formulated theories. In general terms, change theories look at the way that people face changes. According to Evans (1996) as change requires the learning of something new that replaces something familiar, this unavoidably creates anxiety for many people. Evans believes that change creates hope because it offers growth and progress but it also stirs up fears because it challenges competence and power, creates confusion and conflict, and risks the loss of continuity and meaning. Change theories also look at groups' behaviors as they cope with organizational change. Individuals and groups create habits and tend to resist change in order to preserve stability and permanence. Indeed, notwithstanding it is precisely to maintain stability that organizations build culture, it could easily become a collective prison: members may become reliant on culture in a way that causes them to resist any innovation that threatens their dependency (Morgan, 1986).

In the educational field, one of the most widely accepted researchers and theorists of change is Everett Rogers. As shown in Figure 1, Rogers' (1995) theory of diffusion of innovations rests on three concepts: (1) the innovation–decision process, (2) the attributes of the innovation, and (3) the adopter categories.

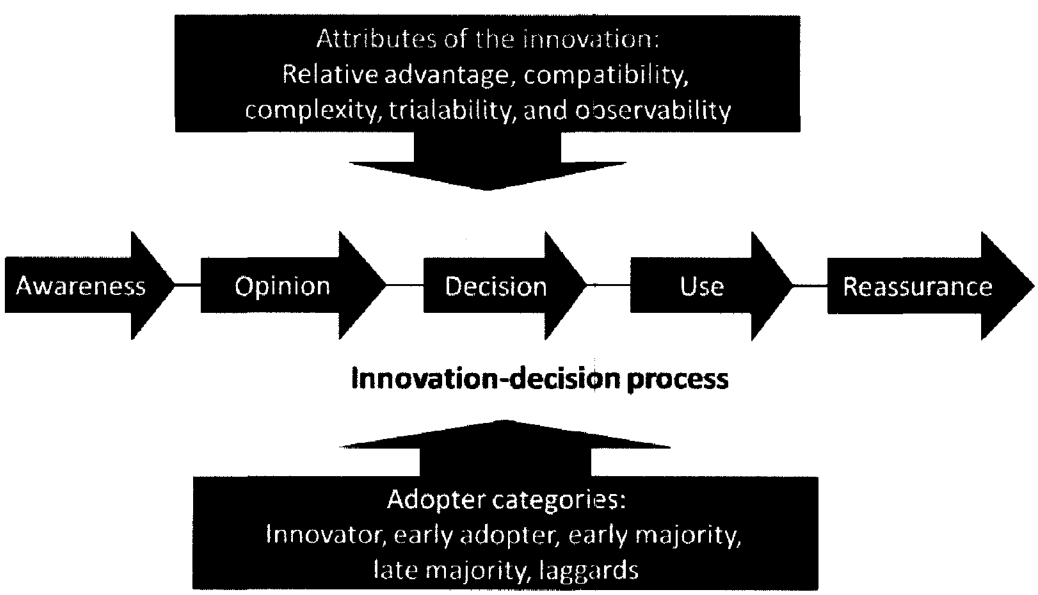


Figure 1. Roger's Diffusion of Innovations Theory

The innovation-decision process can be conceived as a basic model for change based upon a cost-benefit analysis, where the major obstacle is uncertainty. According to Rogers (1995) this process involves gaining awareness of the innovation, forming an opinion about the innovation, adopting or rejecting the innovation, continuous use of the innovation, and seeking evidence that supports the decision to implement the innovation. The second part of his theory explains how the attributes of a particular innovation (either a product or a process innovation) can influence the decision of adopting. The five attributes he identified are *relative advantage, compatibility, complexity, trialability,* and *observability.*

Along with the innovation-decision process and the attributes of the innovation, Rogers' theory identified five adopter categories. Rogers (1995) used the adopter categories to explain how the traits of an individual or group can also influence the rate of the adoption. These categories are *innovators, early adopter, early majority, late majority*, and *laggards*. According to his research, these five types of adopters have different social and psychological characteristics. Empirical research has indicated that the adopter categories approximate a bell-shaped curve within a social system (Rogers, 1995).

However, while Rogers' theory identifies the innovator's characteristics, at least in a generic manner, his theory does not provide any practical guide in assessing change at the operational level, nor does it situate adopters' characteristics into a developmental perspective. In contrast to Rogers' research, Ely (1999) considered the environment in which an innovation takes place and identified eight conditions that may influence the successful adoption of innovations (See Table 1).

Table 1
Ely's Conditions Fostering Implementation of Innovations (Adapted from Ely, 1999).

Condition	Description
1. Dissatisfaction with the status-quo	Refers to an emotional discomfort resulting from the use of current processes or technologies that are perceived as inefficient, ineffective or not competitive.
2. Knowledge and skills	Refers to users having or acquiring the needed skills and knowledge to use the technology.
3 Resources	Refers to availability and accessibility to resources needed to implement the technology. Resources include finances, hardware, software, materials, personnel, and technological support.
4. Time	Refers to the willingness for organizations to provide paid time for users to learn the new skills in order to use the technology, as well as the user's willingness to devote time to develop these new skills.
5. Incentives and rewards	Refers to either intrinsic or extrinsic rewards that result from using the innovation.
6. Participation	Refers to the stakeholders involvement in the decision-making process to adopt and implement the technology.
7. Leadership	Refers to the level of ownership and support given by the leaders, including providing encouragement and serving as role models.
8. Commitment	Refers to "visible" support by the upper level leaders or powerbrokers.

Ely's conditions of change (i.e., dissatisfaction with *status quo*, knowledge and skills, resources, time, incentives and rewards, participation, leadership, and commitment) have been the starting point of numerous empirical studies and have proven to be present in successful implementations of technology regardless of people characteristics and type of innovation. Ely's theory does not provide a mechanism to categorize adopters; however, Surry and Ensminger (2003) suggest that there is a difference in the relative importance of the eight conditions, as seen by the adopters, and that there are important intra-group variables that affect the perceptions of group members in regard to the conditions.

The present study looked at the innovation decision process, as described by Rogers and relied on Ely's conditions of change in order to operationalize the criterion variable of the study: the institutional support mechanisms for the successful implementation of Web-based instructional technology (WBIT).

The present study looked at the nature of concerns of faculty regarding the use of WBIT, levels of use of WBIT, and self-efficacy beliefs as the variables affecting the perception of support needed to implement WBIT. A description of the operationalization of these variables is provided in the following sections.

The Concerns-Based Adoption Model

Technology implementation is a highly complex and dynamic process. The concept of concerns is a useful way to understand the states of emotion and thought that people have when facing change (e.g. implementation of technology). Concerns theory is a framework that has been used to analyze technology implementation from a developmental perspective. In this framework, "concerns refer to those problems or questions that arise with more or less an emotional undertone in response to new situations" (van den Berg et al., 1999, p. 335). The idea of calling those feelings and questions *concerns* was originally proposed by Frances Fuller (1969). Fuller conceived the idea of teachers having concerns that would evolve with increasing experience and maturity in the implementation process.

In 1973, Hall, Wallace, and Dossett proposed a developmental pattern of how feelings and perceptions evolve as the change process unfolds. They identified a set of stages of concern about an innovation that educators experienced whenever they were introduced to a new educational product or process. Evans and Chauvin (1993) extended the work of Fuller and others to a variety of educational settings, and expanded Fuller's original model to seven developmental stages of concern (i.e., *awareness, informational, personal, management, consequence, collaboration*, and *refocusing*). They defined typical expressions of concern and stated that those expressions correlate with a particular stage of concern. For example, for the personal concern a typical expression would be "How will using the innovation affect me?" Grounded in the concerns theory, Hall and Hord (1987) developed the Concerns-Based Adoption Model (CBAM). The CBAM is a descriptive and predictive model which "outlines the developmental process that individuals experience as they implement an innovation and participate in staff development" (Hord, 1987, p. 12). The CBAM is based on the following assumptions about educational change:

1. Change is a process, not an event.
2. Change is accomplished by individuals.
3. Change is a highly personal experience.
4. Change involves developmental growth.
5. Change is best understood in operational terms.

6. Change can be facilitated by interventions directed toward the individuals, innovations, and contexts (Hall & Hord, 1998, p. 6).

Conceptually, the CBAM is a three-dimensional model that describes the developmental progression of attitudes (i.e., feelings and motivations) that an individual might have about an innovation at different points during the implementation process (Hall & Hord, 1987). Seven stages of concern are identified within this framework (See Table 1). The stages of concern "appear to progress from little or no concern, to personal or self concerns, to concerns about the task of adopting the innovation, and finally to concerns about the impact of the innovation." (George, Hall & Stiegelbauer, 2006, p. 8). The SoC suggests a possible developmental progression of people's concerns across all seven stages; however, the "resolution of early stage concerns does not necessarily lead to the arousal of later stage concerns" (Anderson, 1997, p. 334). According to this framework, "Merely acquiring more knowledge about or experience with an innovation does not guarantee that an individual will resolve earlier concerns and have later concerns emerge." (George et al., 2006, p. 9).

The second dimension of the CBAM is the Levels of Use (LoU) of the innovation. LoU focus on general patterns of individual's behavior as they prepare to use, begin to use, and gain experience implementing the innovation (Hall & Hord, 1987). This dimension incorporates eight levels of use that represent a possible developmental progression in the behavior of individuals as they move through a particular implementation process (i.e., *nonuse, orientation, preparation, mechanical, routine, refinement, integration*, and *renewal*) (see Table 2).

Table 1
Stages of Concern (CBAM) (Adapted from George, Hall & Stiegelbauer, 2006)

Stages of Concern	**Definition and Expressions of Concern**
	Impact Concerns
6. Refocusing	The individual focuses on exploring ways to improve the use of the innovation. Expression: *I have some ideas about something that would work even better.*
5. Collaboration	The individual focuses on coordinating with others. Expression: *I am concerned about relating what I am doing with what other instructors are doing.*
4. Consequence	The individual focuses on the innovation's impact. Expression: *How is my use of the innovation affecting students?*
	Task Concerns
3. Management	The individual focuses on the process, tasks, and the use of resources. Expression: *I seem to be spending all my time getting material ready.*
	Self Concerns
2. Personal	The individual is uncertain about the demands of the innovation. The individual is considering the reward structure of the organization, personal commitment, and potential conflicts. Expression: *How will using it affect me?*
1. Informational	The individual indicates a general awareness of the innovation. Expression: *I would like to know more about it.*
0. Awareness	The individual indicates little involvement with the innovation. Expression: *I am not concerned about it.*

The underlying assumption of the Stages of Concern and the Levels of Use is that change is accomplished by the individual first and then transferred to the organization; therefore, SoC and LoU are based on assessing the implementation of innovations from the behavior of people at the operational level. Together, the SoC and LoU "provide a powerful description of the dynamics of an individual involved in change, one dimension focusing on feelings, the other on performance" (George et al., 2006, p. 4).

These dimensions of the CBAM have been extensively used in educational research with practical implications for professional development. Although studies using the CBAM are commonly found in elementary and secondary settings, the model has also been used in higher education (e.g., Adams, 2002; Dobbs, 2004; Snider, 2003; Todd, 1993). This study considered the Stages of Concerns and Levels of Use from the CBAM in order to operationalize faculty levels of WBIT implementation.

Table 2
Levels of Use of the Innovation (CBAM) (Adapted from Hall, Dirksen & George, 2006).

Level of Use		**Behavior Expected**
0.	Nonuse	The individual is doing nothing to be involved in the innovation.
I.	Orientation	The individual is acquiring information about the innovation and exploring the value of using the innovation.
II.	Preparation	The individual is looking for opportunities to use the innovation.
III.	Mechanical Use	The individual is using the innovation in a superficial manner and working on mastering the tasks required.
IV A.	Routine	The individual uses the innovation in a more automatic and stable way.
IV B.	Refinement	The individual varies the use of the innovation.
V.	Integration	The individual combines his/her particular use of the innovation with the way others are using it.
VI.	Renewal	The individual reevaluates the quality of use of the innovation seeking to increase the innovation's impact.

Self-Efficacy Theory

The psychological construct of perceived self-efficacy was developed by Bandura (1977, 1986, 1997) within a broader framework on personality development and functioning grounded in Social Learning Theory (Bandura & Walters, 1963). "Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1995, p.2). While self-efficacy is rarely referenced directly in the Change Theory and particularly in the Concerns Theory literature, its presence pervades it; "efficacy beliefs influence how people feel, think, motivate themselves, and act" (Bandura, 1995, p. 2). Research about transfer of training in the last decade found that self-efficacy is positively related to motivation, is a powerful performance predictor, influences the effectiveness of training in transfer process, and is a moderator of other personal variables such as job satisfaction (Cheng & Ho, 2001). Among the independent variables studied, self-efficacy is considered one of the most important individual variables located in the phase of pre-training along with other cognitive abilities and locus of control (Beas & Salanova, 2006).

Bandura (1997) stated that "efficacy beliefs play a central role in the cognitive regulation of motivation" (p.122); accordingly, self-efficacy beliefs are of particular importance to intentional actions (Caprara & Cervone, 2000) and they constitute mediating mechanisms through which external factors affect behavior (Bandura, 1997). Bandura and Cervone (1983) stated that self-monitoring one's behavior is accompanied by feelings of satisfaction and dissatisfaction, which in turn contribute to self-regulatory efforts. The study of these self-regulatory functions is central to the field of adult development (Cervone, Artistico, & Berry, 2006) and, therefore, important to faculty new skills acquisition and professional development practices.

From a psychological perspective, cognitive components such as goals, evaluative standards, and beliefs underlie personal agency. As stated by Cervone et al. (2006) those cognitive components are linked to mental representations of strategies for goal achievement and are critical for behavior self-regulation, self-control, self-directed motivation, and lead to the realization of individual potentials.

> A firm sense of self-efficacy is an important motivational contributor to the attainment of further competencies and success. Those who enter adulthood poorly equipped with skills and plagued by self-doubts find many aspects of their adult life stressful and depressing. (Bandura, 1986, p. 417)

Research in this area has shown that perceived self-efficacy directly contributes to decisions, actions, and experiences (e.g., persistence); that self-efficacy may moderate the impact of other psychological mechanisms on developmental outcomes (e.g., confidence); and that self-efficacy beliefs influence other cognitive and emotional factors (e.g., goal setting) that can contribute to performance (Cervone et al., 2006).

Because people can have different beliefs about themselves in different domains, Bandura's Self-efficacy Theory suggests that specific measures of self-efficacy must be applied to specific psychological domains. In this sense Computer Self-efficacy (CSE) refers to individuals' judgment of their capabilities to use computers in diverse situations. Particularly, CSE was found to exert a significant influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers (such as affect and anxiety), as well as their actual computer use (Compeau & Higgins, 1995).

From a behavioral perspective, the CBAM suggests that Stages of Concern (SoC) and Levels of Use (LoU) can be used as indicators of individuals' level of implementation of specific innovations. The CBAM, while focused on individual's feelings and performance, fails to consider the influence of specific psychological indicators, such as self-efficacy beliefs. Because efforts to place self-efficacy into developmental contexts has been articulated and demonstrated previously (Cervone et al., 2006), the present study considered self-efficacy beliefs as a psychological mechanism that might influence the perceptions of individuals regarding conditions that should exist or be created in the environment where WBIT is implemented in order to facilitate its adoption.

Purpose of the Study

The purpose of this study was to explore the manner in which technology use and perceived self-efficacy beliefs influence faculty perceptions of institutional support across different levels of implementation. While introducing WBIT into instruction clearly depends on faculty members' skills and experiences, knowing what the appropriate mechanisms are to support faculty in skills development may depend more on the attitudes and perceptions of the faculty members involved in the implementation process than on other demographic variables. Informed by a review of the literature, this study considered selected individual characteristics (years of teaching experience, experience teaching Web-based courses, and technology-related professional development); level of implementation of WBIT; and self-efficacy beliefs as factors that may affect faculty perceptions of conditions that support the use of WBIT.

To bridge the gap between technology use and instruction and provide an empirical approach to technology implementation planning, this cross-sectional study sought to understand how personal, behavioral, and psychological indicators interact in the context of an ongoing implementation. In this context, the study was guided by the following research questions.

General Research Questions

Using Ely's (1990, 1999) conditions that facilitate the implementation of educational technology innovations, the Concerns-Based Adoption Model (CBAM) (Hall & Hord, 1987, 2001, 2006) and constructs of Self-Efficacy Theory (Bandura, 1986, 1997) this study addressed the following research questions (RQ):

RQ1. What are the Stages of Concern (SoC) and Levels of Use (LoU) with respect to faculty using Web-based Instructional technology (WBIT)?

RQ2. What, if any, is the relationship between Compeau & Higgins' (1995) measures of Computer Self-efficacy (CSE) and faculty levels of implementation of WBIT (SoC and LoU)?

RQ3. Do Stages of Concern (SoC), Levels of Use (LoU), and Computer Self-Efficacy (CSE) affect the perception of faculty in regard to the relative importance of Ely's conditions that facilitate the successful implementation of technology?

Relevance of the study

As previously stated, a review of the literature regarding institutional support mechanisms for WBIT implementation reveals a discrepancy between the needs of successful online instructors and the needs of faculty at different levels of expertise, technical skills, and levels of implementation. Knowing that resource allocations for professional development and faculty support have diminished, understanding what influences the perception of faculty members regarding the conditions that support the implementation of WBIT becomes fundamental for the development of tailored strategies that will have the most impact in the successful implementation of WBIT in higher education. The present study fulfilled this need by providing universities in the Commonwealth of Kentucky with a profile of faculty levels of WBIT and self-efficacy beliefs, coupled with their perceptions of importance of support mechanisms to improve the chance of a continuous WBIT implementation process. Factors such as levels of concern about using Web-based instructional technology, levels of technology use, and measures of computer self-efficacy provided a possible explanation of the perception differences. From a pragmatic perspective, understanding concerns and perceptions of faculty and administrators in an ongoing implementation context is central to the improvement of professional development activities, leadership interventions, and administrative practices necessary for WBIT implementation to succeed in dual-mode higher education institutions.

A review of the literature revealed no empirical studies that incorporate both the Stages of concern (SoC) dimension and the Levels of Use (LoU) dimension of the CBAM in order to measure levels of implementation of WBIT in higher education. Neither are there studies that integrate the concerns of higher education administrative personnel (e.g., deans and department heads) while exploring institutional support for the implementation of WBIT. Furthermore, the inclusion of psychological constructs as factors associated with faculty technology use and perceptions of support are notable deficiencies in the literature on technology implementation. By including such constructs in the context of an ongoing innovation, this study contributed to the predictability of faculty support needed for the implementation of WBIT in a more meaningful manner than reliance on demographic factors.

Definition of Terms

Adoption – Process of decision made by person in order to use an innovation (Rogers, 1995).

Concerns – Concerns refer to those problems or questions that arise in response to new situations (van den Berg et al., 1999).

Course Management System (CMS) – A CMS is software used to manage and archive information for interactive use. The content managed includes electronic text documents, image media files, audio files and Web content. Example of a CMS highly used in education is Blackboard.

Delivery Method – Term used to refer to the way in which information is presented to the learner. The delivery method is defined by the type of technology used (e.g., Internet, broadcast television, etc.)

Distance Education – System in which the learning process takes place at a distance, commonly through certain technology-mediated communication, instead of face-to-face communication.

Distance Learning – Process of learning in which the professor-student interaction occurs at distance. There are different ways of content delivery that are considered distance learning methods. Some of the most common forms of course delivery are Web-based, videoconferencing, broadcasting television, and blended approaches combining one or more distance modalities with face-to-face interactions.

Dual-Mode Institution – A dual-mode institution is an institution that offers both traditional face-to-face courses and distance education courses.

Electronic Course Management – Also called Course Management System (CMS) or Learning Management System (LMS).

E-mail – Abbreviation for *electronic mail*; a method of composing, sending, storing and receiving messages over electronic communication systems.

Enterprise Resource Planning System (ERP) – ERP systems integrate all data and processes of an organization into a unified system. In the context of a university an ERP integrate students' records from different sources such as finance, library, registrar, etc.

Implementation – In the context of this study, implementation is the planning, designing, and putting in practice of a software application.

Innovation – Innovation is the introduction of something new; in this study it refers to the introduction of Web-based applications into the teaching process.

Institutional Support – Institutional support refers to the resources that the university makes available for the incorporation of technology into teaching. Particularly, in this study institutional support was the dependent variable and was operationalized through the eight conditions that facilitate the implementation of innovation as described by Ely (1990) (i.e., dissatisfaction with *status quo*, knowledge and skills, resources, time, incentives and rewards, participation, leadership, and commitment).

Internet – The Internet is a worldwide interconnected computer networks publicly accessible using the standard Internet Protocol (IP).

Online – In the context of this study online means resources that are available on demand, via the Internet.

RSS – An abbreviation for Really Simple Syndication is a family of Web feeds formats used to publish frequently updated Web pages in a standardized format.

Self-Efficacy – "Perceived self-efficacy refers to beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1995, p. 2).

Technical Support – Also known as *tech support* encompasses a variety of services providing assistance with computer hardware and software.

Web-Based Information Technology (WBIT) – In this study, the scope of IT is limited to instructional technology and more specifically to Web-based instructional technology. The term *WBIT* refers to any technology that allows electronic educational content to be delivered via the Internet (e.g., Content Management Systems and other Internet open resources).

Website – Set of interlinked documents, images, videos and other digital resources accessible via the Internet.

CHAPTER II

LITERATURE REVIEW

Introduction

The purpose of this study was to analyze the nature of faculty concerns and perceptions of institutional support for the implementation of Web-based instructional technology (WBIT) in higher education. Faculty perceptions of institutional support (conditions for successful implementation) across levels of implementation (Stages of Concern and Levels of Use based upon the Concerns-Based Adoption Model) were expected to be mediated by the extent of professional development activities involving faculty members and by individual characteristics such as teaching experience and computer self-efficacy beliefs. As stated previously, understanding concerns and perceptions of faculty and administrators in an ongoing context, it is important to the improvement of professional development activities, leadership interventions, and administrative practices necessary for WBIT implementation to succeed in dual-mode higher education institutions.

The purpose of this chapter is to provide relevant background to the study from the literature. In this study, the term WBIT refers to any technology that allows electronic educational content to be delivered via the Internet (e.g., Content Management Systems, such as Blackboard; Internet open resources, such as Wikis). The first section recounts the empirical findings regarding WBIT usage, faculty concerns and perceptions of institutional support for the implementation of WBIT, and conditions for successful implementation. The second section provides an examination of the empirical research regarding the Concerns Based Adoption Model (CBAM) (Hall & Hord, 1997, 1998, 2001) and the Self-efficacy Theory – an aspect of Bandura's (1986) Social Cognitive Theory of personality – as applied to the implementation of technology in higher education settings.

Web-Based Instructional Technology Usage and Faculty Concerns

Most of the studies looking at the implementation of Web-based instructional technology focus on faculty technology usage, faculty attitudes and concerns about technology, and faculty perceptions toward the incorporation of technology into instruction. For instance, Crooks, Yang, and Duemer (2002) conducted a study to explore faculty perceptions about navigability and content of a particular Web-based resource and faculty attitudes towards Web-based resources in general. Crooks et al. (2002) categorized the use of the World Wide Web (www) in three categories as follows: (a) a searchable database, (b) a forum for interpersonal communication, and (c) a location to supplement regular curriculum; they focused their study in the third category. Participants in their study were 552 faculty members who belonged to at least one of eight major professional educational organizations with an interest in the history, philosophy, and social context of higher education; 127 responded to the survey (23%). Crooks et al. classified teaching experience in two levels: $\leq$ 12 years of teaching (n = 38) and > 13 years of teaching experience (n = 74); and classified institutions in two categories, research and doctoral institutions (n = 61) and masters, baccalaureate, and associate of arts colleges (n = 41). Theirs sample consisted of 83 males, 40 female, and 4 members that did not report gender information. Most of the participants held a Ph.D. degree (78%) and were employed by public institutions of higher education (64%).

Crooks et al. (2002) used a self-developed survey to collect the data. The first section of the survey consisted of demographic questions; the second section included 11 statements regarding a webpage specifically designed for the study; the third section included 8 statements about Web resources in general. Sections two and three of the instrument employed a 5-point Likert-type response formatted scale (1 = *strongly disagree* to 5 = *strongly agree*) with a reported Cronbach's coefficient alpha of 0.83. Section four of the instrument consisted of 17 factors related to the use of Web-based resources in education. Sections two and three were divided by the authors as measures of three key factors: (1) Content, (2) Facility, and (3) General. The questions of *Content*, attempted to measure the understandability, comprehensiveness, relevancy and the general appeal of the content of the specific website designed for the study. The statements of *Facility* intended to measure how competent the faculty members were with navigation in the Web resource. The *General* items focused on measuring the perception of effectiveness, reliability, and usability of Web resources in general. Crooks et al. used multivariate analysis of variance (MANOVA) for each of the six independent variables of the demographics' section of the survey (current position, gender, years in academia, institution type, Carnegie classification, and institution's student population). The researchers analyzed the data from section four in two phases. First, they used frequency distributions to determine the use factors selected most frequently; and second, they performed Chi-square tests between each of the six demographic variables (all tests performed using a .05 alpha level).

Crooks et al. (2002) found that faculty members of more than 13 years of experience agreed more with the facility statements of the survey than the faculty of less experience, $F(1,110) = 8.107, p < .01$. Their results also showed that the faculty members of research/doctorate institutions agreed more with the content statements of the survey ($M = 3.84$) than the faculty members of the masters, baccalaureate, or associate colleges ($M = 3.54$), $F(1,110) = 4.295, p < .05$. Regarding section four, the most important factors influencing the likelihood of faculty to use Web-based resources were research relevance (61%), access (59%), ease of navigation (59%), classroom relevance (48%), and site reputation (42%). Results of the separate Chi-square tests comparing these five factors with the demographic variables in the survey revealed a significant difference for gender only. Females (78%) were more likely than males (50%) to consider ease of navigation an important use factor, $\chi^2 = 8.09$, $p < 0.01$; females (63%) were more likely than males (41%) to consider classroom relevance an important use factor $\chi^2 = 5.02$, $p < 0.05$; and females (55%) were more likely than males (35%) to consider site reputation an important factor for the use of the resource $\chi^2 = 4.48, p < 0.05$. In this case, Crooks et al. confirmed previous results where female participants expressed more concern with the utility of the computer-related tools, its relevance in the classroom, and the site reputation than their male counterparts.

Vodanovich and Piotrowski (1999, 2001, 2005) have extensively studied faculty usage and attitudes toward Web-based instruction. Vodanovich and Piotrowski (1999) conducted a survey of a national sample of industrial-organizational psychologists to assess three aspects related to the use of Internet for instructional purposes: (a) faculty perceived attitudes about the Internet from their institution, their department, and their personal views; (b) faculty usage of the Internet for instruction and the extent of formal training; and (c) perceived benefits and shortcomings. A total of 82 out of 100 surveys were returned. Fifty one percent of the sample held the rank of assistant professor; 23 % were associate professors and 22% full professors. The majority of respondents were male (62%), held a doctoral degree (56%), and had taught at the university level for an average of 10 years. The instrument for data collection consisted of a three-page survey with a set of questions pertaining to each one of the three scopes of the study. Items in the perceived attitudes section were rated with a 5-point Likert-type response formatted scale (1 = *very negative* to 5 = *very positive*); items about faculty usage of the Internet consisted of a 9-item checklist; and items in the perceived benefits and shortcomings section were presented as a list of frequently discussed problems and benefits found in previous research and rated in a 5-point Likert-type scale (1 = *none* to 5 = *extensive*).

Vodanovich and Piotrowski (1999) found the extensive use of Web resources for assessing scholarly literature (60%), followed by posting assignments (35%) and exercises (29%), and posting syllabi (28%). In terms of attitudes, the researchers found that faculty perceived a more positive attitude by the administration ($M = 4.5$, $SD = .69$) and by the academic department ($M = 4.0$, $SD = .86$) than their self-perceived attitude (M = 3.9, $SD = .88$). Although the perceived Web instruction efficacy is somewhat positive ($M = 3.6$, $SD = 1.2$), faculty reported to have relatively little formal training ($M = 1.7$, $SD = .80$). The most important benefit of Web–based resources reported was access to information ($M = 3.9$, $SD = .88$), followed by convenience ($M = 3.8$, $SD = .92$) and remote access for students ($M = 3.6$, $SD = 1.2$). The obstacles reported included time to prepare ($M = 3.3$, $SD = .92$) followed by technical problems ($M = 2.7$, $SD = 1.0$). They reported no significant differences found by gender, rank, or years of university teaching experience.

In a further study, Vodanovich and Piotrowski (2001) extended their sample and sent a two-page questionnaire to assess faculty attitudes, patterns of use, and perceived drawbacks of Web-based instruction. A total of 150 usable answered surveys were obtained (30% response rate). Demographic information from the survey respondents was as follows: 86% males, 12% females, 19% assistant professors, and 60% full professors. The sample median for years of teaching was 20 years. They found that the psychology faculty extensively used the Internet in their courses (M = 3.6), considered the Internet tools effective ($M = 4.0$), and the perception toward the Internet tools was positive ($M = 4.3$). The main use of Internet was basically delivery of information by e-mail ($M = 4.2$), distribution of course syllabi ($M = 3.8$), and reading professional literature ($M = 3.5$). These results, although somewhat higher than the previous result obtained on the same survey provided evidence confirming that faculty lack formal training or a personal assistant to use and develop didactic Web-based tools and material. Once more, the drawbacks included the time required to develop material ($M = 3.7$, $SD = 0.95$) and technical difficulties ($M = 3.1$, $SD = 0.92$). The researchers suggested that the lack of more advanced applications of Internet in the courses might be due to the lack of competence and proper training in such advanced applications.

More recently, Vodanovich and Piotrowski (2005) conducted a study to identify issues that general faculty in a middle-sized southeastern university perceive as limitations for using Web-based resources in their teaching. The primary instrument for data collection consisted of a two-page survey on Internet usage, attitudes, and perceived benefits and shortcomings related to the implementation and effectiveness of Web-based pedagogical resources for instruction. The researchers mailed the survey to 250 faculty members and obtained a 34.8% response rate (N = 87). The sample for the study consisted of assistant professors (28.7%), associate professors (32.2%), and full professors (24.1%). The average length of time teaching at the university of the sample was 10.3 years (SD = 9.3). Their descriptive analysis showed that the main use of Internet resources is limited to providing information to the student in the form of e-mail (89.7%), posting of syllabi (70.1%), accessing literature (64.4%), and giving assignments (63.2%). More rich and interactive resources such as testing (21.8%), tutorials (33.3%), exercises (47.1%), and distance learning classes (28.7%) were seldom used in classes. The researchers found that the rank or years of teaching do not have an impact on their perception of Web-based instruction and reported that the amount of time necessary for developing a course using the Internet was the main issue expressed by faculty (M = 3.2; SD = 1.2), followed by technical problems (M = 2.8, SD = 1.1) and interpersonal interactions (M = 2.6, SD = 1.3). In terms of benefits, their findings included ease of access to information (M = 4.1, SD = .90), convenience (M = 4.0; SD = 1.0), and the ease/speed of communication (M = 3.8, SD = 1.2).

Vodanovich and Piotrowski (2005) found that although 73.6% of the faculty had a positive perception of the use of the Internet for teaching (M = 3.9, SD = 1.1) and that its use was effective (69.4%, M = 3.8, SD = 1.1), less than half of the sample (47%) currently used Web-based approaches in their courses. The researchers interpreted this finding as a reflection of the struggles faculty face in a constant evolving technology environment:

> Faculty may be confronted and struggling with their own lack of competence, confidence, and motivation to grasp and become proficient in online/computer-based skills. Such resistance to 'change' is in fact a part of the gradual developmental process toward full 'acceptance' of any emerging technology. (p. 313)

Vodanovich and Piotrowski (2005) stated that "58.1% of faculty respondents indicated that they had either 'no' or 'very little' formal didactic training in the use of the Internet as an instructional method" (p. 313). They suggested that the lack of training ($M = 2.4$, $SD = 1.0$), along with factors such as competency, confidence, and motivation might be associated with faculty positive views but sparse usage.

In order to assess faculty technology use and their perceived barriers and needs for new technology adoption, Groves and Zemel (2000) conducted a quantitative action research case study. The researchers developed a 65-question survey adapted from Spotts and Bowman (1995). The instrument was designed to determine respondents' self-reported knowledge and use of technology, as well as perceived barriers to the use of instructional technology (IT). The instrument was reviewed by the College's Technology Committee for content validity. All 67 full-time faculty and 68 graduate teaching assistants/associates (GTAs) in the College of Human Ecology at the University of Tennessee were invited to participate by receiving a cover letter and the survey. Forty-one surveys from faculty (61%) and 23 from GTAs (34%) were returned and useable (49% overall response rate). Respondents ranked their own knowledge about various technologies using a 5-point Likert-type response formatted scale (1 = *none* to 5 = *expert*). Descriptive analysis of the data showed that word processing, Internet, presentation software, e-mail, and spreadsheets were the most familiar technologies for faculty and GTAs; statistical computing, electronic discussion lists, multimedia use, computer-aided instruction, and distance learning were the most unfamiliar technologies. Groves and Zemel's findings confirm that personal computer and its use-related software (e.g., word processing) has become standard operating equipment for most higher education faculty, as opposed to the use of 'new technologies' (e.g., multimedia, distance learning, and computer instruction).

In order to determine what type of technologies were in use and which others were required in order to attain full potential of the IT, Inman and Mayes (1998) surveyed a sample of faculty members of the 14 colleges of the University of Kentucky Community College System (*N* = 1053) from which 861 (81.8%) members returned the survey. The study took four main technologies into consideration: multimedia, electronic communications, computer interactive software for computer-based instruction (CBI), and electronic information resources. Inman and Mayes' survey was a paper and pencil survey and asked about the use of the four technologies under investigation and about 11 categories of need. The areas of need included hardware, software, training on use of hardware, training on use of software, staff support, classrooms equipped with the necessary technology, faculty development in teaching/learning aspects, equipment for the development of materials, resources for the acquisition of material, rewards/recognition for the time committed and *other*. A limitation in Inman and Mayes' survey was the fact that the needs were equally weighted so the importance of a specific need related to the impact in the course was not taken into account. Demographics of the sample were as follows: 54% women, 46% men; 9.4 years of service (SD = 7.63); 11% Instructors, 24.5% Assistant Professors, 44.1% Associate Professors, and 20.5% Professors; the average number of courses taught by the respondents was 3.1 (SD = 2, Median = 3, Mode =5) and about one third (33.6%) were teaching more than 16 hours and other third (33.4%) between 13 to 15 hours.

Inman and Mayes (1998) explored the technology resources and relationships between faculty variables in three categories: (a) use of technology, (b) needs for the technology resources and relationships among faculty variables, and (c) use and need. Regarding the use of technology, the results of the survey showed that 61.7% used at least one of the four kinds of technology and between them, 49.3% used only one, 30.5% used two, 14.9% used three, and 5.3% used all of them. The most frequently used technology was CBI (41.0%), followed by electronic libraries (36.8%), multimedia (19%), and finally e-mail (11.7%). For need of technological resources, their findings showed that the most common recognized need was for general faculty education (58.8%), followed by infrastructure (rooms, hardware, software, money, and resources for development).

Inman and Mayes (1998) conducted further inferential analysis. The results provided evidence that, in general, a faculty that used at least one technology had at least one need χ^2 (1, N = 861) = 12.49, p = 0.0004. For those who used multimedia, CBI and electronic libraries their probability to have a need were χ^2 (1, N = 861) = 7.82, p = 0.005, χ^2 (1, N = 861) = 8.95, p = 0.0027, and χ^2 (1, N = 861) = 12.9, p = 0.0003, respectively. Their analysis of the different needs expressed for each individual technology showed no relationship, except the fact that those who were already using at least one of the technologies were more likely to want some reward for their time χ^2 (1, N =861) = 6.71, p = 0.01. Inman and Mayes (1998) reported that a faculty that gets involved in some of the technologies is more likely to express rewards as an important need, so they suggested that a support and reward/recognition system must be established. Finally they noted that demographics of the sample did not play a visible role in the analysis.

Gueldenzoph, Guidera, Whipple, and Mertler (1999) examined faculty use of specific Internet-related technologies (e-mail, www, newsgroups, file transfer protocol, and Gopher) for instructional use and identified significant factors associated with the adoption of these technologies. Their study incorporated faculty use of instructional technology as the criterion variable and gender, age, discipline, rank, years of teaching, teaching style, perceived effectiveness of instructional technology, perceived access to technology, and perceived administrative support as predictors. Gueldenzoph et al. (1999) developed a 60-item questionnaire based mainly on past surveys found in the literature. To produce a profile of teaching style, their survey included selected questions from the Teaching Style Inventory developed by Dunn and Dunn (1997) and classified all faculty among three teaching styles: traditional, transactional, and individualized. One hundred sixty eight out of 721 full-time faculty members responded to the survey (23.3% response rate). Both quantitative and qualitative data were collected. The researchers used symmetric lambda correlation coefficients to determine the strength of the relationships between use of technology and the nominal variables of gender and discipline; for the rest of the predictors, they used Pearson correlation coefficients. They conducted further analysis using one-way analysis of variance (ANOVA) to determine whether there was significant differences between groups based on the predictors ($\alpha = .05$).

Gueldenzoph et al. (1999) found no significant difference between gender and use of instructional technology, between rank and use of instructional technology, and between discipline and use of instructional technology. Their findings suggested that younger faculty appear to be more likely to use technology as an aid to their classroom instruction ($r = -.0176$ at $p < .05$); that less experienced faculty (which they showed to be correlated to age) are more likely to use instructional technologies ($r = -0.195$ at $p < .05$); and that there is a significant relationship between teaching style and use of instructional technology ($r = .266$, $p = .004$). Gueldenzoph et al. found significant relationships between faculty perceptions of effectiveness and technology use ($r = .387$, $p = .000$), between access and use ($r = .393$, $p = .000$), and between administrative support and use of instructional technology ($p = .01$). From the analysis of qualitative data, Gueldenzoph et al. (1999) suggested that "the support currently being provided, through institutionally-sponsored training workshops, may be of limited effectiveness in terms of technology implementation" (p. 131).

On the other hand, a significant amount of research in terms of Web-based technology implementation belongs to the field of distance education, particularly as it relates to the implementation of distance education in dual-mode universities. When faculty have been surveyed on the implementation of Web-based technologies in online distance learning (ODL) researchers have found similar concerns. A concern noted repeatedly in the ODL literature is the issue of faculty workload (Berge, 1998; Betts, 1998; Rockwell, Shaver, Fritz, & Marx, 1999; Schifter, 2000). For instance, Betts (1998) conducted a study to identify the factors that influence the participation of faculty in distance education. The initial sample was comprised of 993 full-time regular active faculty, and full-time visiting faculty, and the eight deans of the eight academic schools within George Washington University (GWU). The return rate was of 53.8% (532 faculty and 7 deans). The sample was divided between participants (who are currently participating or previously have participated in distance education) and non-participants (who have never participated in distance education). Betts' study instruments were three self-designed surveys to examine the following four relationships: (a) faculty participation and demographics; (b) faculty participation and intrinsic motivation; (c) faculty participation and extrinsic motivation; and (d) faculty participation and inhibiting factors. Betts (1998) conducted a pilot of the surveys at George Mason University prior to using them in the study at GWU.

Faculty respondents were primarily professors and associate professors who taught graduate courses at master's and doctoral levels on-campus in Washington, DC. The faculty participants were predominately male and at least 45 years old. Their average experience was 12.62 years and the average number of courses taught was 4.33. Eighty-six of the faculty respondents were identified as distance education participators and were primarily professors and assistant professors who taught courses at the master's and at the doctoral level. Non-participators were 446 faculty members, primarily professors and associate professors who taught masters and undergraduate courses. The five major inhibiting factors found in Betts' study were (a) lack of technical support; (b) concern about faculty workload; (c) lack of release time; (d) lack of grants for materials/expenses; and (e) concern about quality of courses. Deans were also included in her sample and reported factors (a), (b), and (c) as major inhibitors, but the deans also mentioned the lack of training and the lack of support of colleagues as significant inhibitors. Although consistent with the barriers found previously, the statistical analysis of Betts' data showed that division (School), age, and non-tenure-accruing status all had significant effects on faculty participation in distance education. Older faculty showed more participation than younger faculty and the researcher assumed that this was a result of their experience. For the non-tenured faculty, higher participation was assumed to be the result of the fact that they are not involved in the tenure and promotion process. However, gender did not indicate significant effects on faculty participation in distance education.

Another study that explored incentives and obstacles for the use of ODL was conducted by Rockwell, Shaver, Fritz, and Marx (1999). They conducted the study in two colleges of a mid-western land-grant university which have in the past encouraged the development of distance education opportunities, and their current strategic plans identified an expansion in their effort. A survey was prepared from the interviews conducted to 16 administrators from both colleges about what they perceived were the faculty's concerns about delivering education via distance. The tape-recorded interviews were later analyzed and subjectively grouped by the main researcher into eight categories: time, cost, instructional design, instructor-student relationship, reward structure, degree programs, policy, and training. With these comments and other concerns identified from the literature, the researchers generated and mailed a 19-item survey using a Likert-type scale. This instrument was evaluated by five faculty members to assure the appropriateness of each item and provide the instrument with content validity. Reliability for the instrument was not reported. Participants in the study were 207 faculty members and 30 administrators; 138 faculty members (67%) and 23 administrators (77%) answered the survey. In the group of faculty, 53% were senior faculty (full professors and administrators), 42% were associate and assistant professors, and 5% were instructors.

Rockwell et al. (1999) used the following scale to interpret the results obtained: (a) variables identified by 55% or more participants as incentive, obstacle, or neither an incentive nor an obstacle were classified as *incentive*, *obstacle*, or *neither an incentive nor an obstacle* respectively; (b) variables identified by 45-54 % participants as incentive, obstacle, or neither an incentive nor an obstacle were classified as *leaning toward* being an incentive, obstacle, or neither an incentive nor an obstacle respectively; (c) variables identified by 44% or fewer participants as incentive, obstacle, or neither an incentive nor an obstacle were classified as *not discernible* of being an incentive, obstacle, or neither an incentive nor an obstacle respectively. The researchers used the Cochran-Mantel-Haenszel Chi-square test to determine if there was a difference in the linear trend between faculty and administrators, the interest in distance learning courses, years of experience, tenured and non-tenured faculty, and faculty exclusively teaching undergraduate classes, and those exclusively teaching graduate classes. For the comparisons, the significance level was set at $p < .05$. Regarding the interest in distance learning courses, 26% of the responding faculty had taught via distance, 40% expect to teach via distance in the future, and 34% never expect to teach via distance. Almost half of the administrators (46%) expect to teach via distance in the future. Out of 61 faculty and administrators expecting to teach via distance, 34% expect to do so in 2 years, 46% within 3 to 5 years, and the remaining 19% expect to teach via distance sometime after the next 5 years.

According to Rockwell et al. (1999), four of the recognized obstacles were related to time demanded for the development of a distance learning course (time requirement, time taken from research, training requirements, and developing effective technology skills), and assistance or support needs is also viewed as an obstacle that suggests faculty require assistance for the instructional design and the technological delivery of material. The subgroup analysis found that faculty were more likely to see *developing effective skills* ($\chi^2 = 12.49$, $df = 1$, $0.05 < p < .10$) than administrators. Non-tenured faculty saw four items as being less of an obstacle than did tenured faculty. They were *time taken from research* ($\chi^2 = 4.14$, $df = 1$, $p < 0.05$), *training requirements* ($\chi^2 = 9.39$, $df = 2$, $p < 0.05$), *assistance or support needs* ($\chi^2 = 5.45$, $df = 1$, $p < 0.05$), and *developing effective skills* ($\chi^2 = 5.03$, $df = 1$, $p < 0.05$)

A study conducted by Aust, Newberry, O'Brien, and Thomas (2005) used interviews to identify uses, advantages, disadvantages, and barriers to integrating instructional technology. Congruent with most of the studies found, Aust et al.'s (2005) analysis of interviews revealed that the most frequently perceived advantages of technology was ease in the access to information (89%), variety of resources (35%), greater access to people outside of the classroom such as community members (23%), students' attention (19%), and the ability to individualize instruction (19%). Among the relevant disadvantages, Aust et al. mentioned time consumption (30%), lack of access (30%), reluctance to learn or anxiety of technology (30%), and support for troubleshooting (27%). To the question of whether technology should be integrated to teacher education programs, participants answered that instructors should model technology use in their courses (36%), technology should be integrated into existing courses rather than rely solely on a technology specific course (36%), and specifically mentioned that a technology course is needed (20%). Other comments included the need for more faculty training (36%) and increased access to technology in the classroom

(20%). Additionally, Aust et al. reported that e-mail with students (69%), assignments that required students to use technology (42%), videos or overhead projectors (27%), and PowerPoint (19%) were the technologies the faculty used most frequently. Only few participants (23%) had websites for their course where their syllabus and assignments were posted. As barriers, Aust et al. found lack of training and support (40%), lack of time for learning (52%), lack of access to equipment (72%), lack of funds (20%), and fear and anxiety towards technology (36%) as barriers. As resources, training (64%), funds (18%), and access to equipment (29%) were mentioned.

Practices that reflect educational and psychological theory have rarely been found in distance education studies (Lee, Driscoll, & Nelson, 2004). Pajo and Wallace (2001) conducted one of the few studies found that incorporated constructs such as computer experience, computer enjoyment, and computer self-efficacy as related to perceived ease of use, perceived usefulness, and future intentions to use Web-based technology. With the aim of clustering barriers to implement Web-based instruction, Pajo and Wallace assessed faculty current use of Web-based technology in distance learning, future intentions to use such technology, and major barriers to the uptake of the technology. Participants were all academic staff from the colleges of business, science, and education at the Palmerston North campus of Massey University ($N = 719$). Responses were received from 250 staff member (34.8%). Descriptive statistics showed the majority of respondents were men (65%), over 50% were from the college of science, over 30% of the respondents indicated no prior experience, and over 10% reported more than 15 years experience. After eliminating respondents who indicated not being engaged in any form of distance education, a total of 180 surveys were used for further analyses.

Pajo and Wallace (2001) developed a questionnaire incorporating demographic questions (i.e., gender, age, occupational position, and distance education experience); level of technology use in their teaching; value of technology; and the main barriers, advantages, and disadvantages associated with Web-based technology. They also incorporated constructs such as computer experience, computer enjoyment, computer self-efficacy, perceived ease of use, perceived usefulness, and future intentions to use Web-based technology. Their instrument employed a 5-point Likert-type response formatted scale (1 = *non used or not a barrier* to 5 = *very used or very strong barrier*).

Congruent with most of the previous research, Pajo and Wallace (2001) found overall little use of most of the technologies with the exception of e-mail communication (90%) and remote access to library's electronic databases (70%). Chat rooms (10.8%), video or audioconferencing (10%), and Web-based tests (6.5%) were much less used. They also reported that the three most prohibitive barriers identified by staff were related to issues of time, being the most important the time required to learn how to use the technology (70%), followed by time associated with developing and implementing Web-based courses, and time needed for ongoing monitoring of Web-based courses. Somewhat different from other studies, they reported issues related to organizational support as significant barriers also. These included lack of technical support, insufficient training, insufficient resources, inadequate teaching support, and the perception that the institutions did not recognize or reward efforts to integrate Web-based technologies into teaching.

Pajo and Wallace (2001) conducted an exploratory factor analysis of the barriers questions using principal components extraction with Varimax rotation. They found five factors that accounted for 67.3% of the variance; however, they reported difficulties with the interpretability of the factors' structure and decided to rerun the factor analysis using a more rigorous cut-off of 1.5 for the Eigen values. The final solution presented by the researchers resulted in three factors that accounted for 53% of the variance. They label the factors as *personal barriers*, *attitudinal barriers*, and *organizational barriers*. Alpha coefficients for the factor scales ranged from .76 to .84 indicating acceptable internal consistency.

According to Pajo and Wallace (2001), barriers accounted for 35% and 37% of the variance in perceptions of ease of use and current usage respectively. The personal barrier factor explained a significant portion of the variance in both current use ($\beta = -.52$, $p < .000$) and perceptions of the ease use of the technology ($\beta = -.63, p < .000$) and showed that participants scoring higher on the personal barrier factor were less likely to find the technology easy to use or to be currently using it in their teaching. None of the other barrier factors contributed significantly to current use or perceived ease of use. Another interesting finding was the attitudinal barrier factor that accounted for a significant portion of the variance in enjoyment ($\beta = -.46, p < .000$), perceived usefulness ($\beta = -.21, p < .05$), and future intentions to adopt Web-based technology ($\beta = -.37, p <$ .000). However, Pajo and Wallace's findings revealed that the organizational barrier factor did not contribute significantly to the prediction of any of the outcome measures.

To better understand and more systematically study the barriers of distance training and education, Berge, Muilenburg and Van Haneghan (2002) explored work place, job function, type of delivery system used, expertise of the individual regarding distance education, the stage of the respondent's organization with regard to capabilities in delivering distance education, and the area in which the respondent primarily works, as possible factors that affect the individual perception regarding barriers for distance education. Berge et al.'s (2002) survey consisted of 64 barriers items from their literature review of previous survey studies. Berge et al. conducted a beta testing using paper and pencil with a pilot group and, after revisions, the final version was released. Respondents were asked to rate each of the 64 barriers in a 5-point Likert-type scale (1 = *no barrier* to 5 = *very strong barrier*). After data cleaning, 2,504 valid surveys were analyzed with SPSS.

Berge et al.'s (2002) descriptive analysis showed that 1,276 participants worked in higher education, 448 in corporate or business organizations, 375 in community colleges, 129 in government, 126 in middle or secondary schools, 117 in nonprofit organizations, and 33 in elementary schools. Regarding job functions, 1,150 were teachers or trainers; 648 managers, directors, department chairs, or principals; 346 support staff; 167 higher administrators such as dean, provost, vice-president, or superintendent; 102 researchers; and 91 undergraduate or graduate students. Respondents worked in different areas: education (33.0%), business (16.8%), health sciences (10.2%), humanities (8.6%), engineering (4.8%), behavioral sciences (4.6%), physical sciences (26%), fine arts (1.0%), and other disciplines (18.5%). The delivery systems being used by respondents were Web-based computer conferencing (1,462); print-based systems (286); videoconferencing or desktop videoconferencing (269); CD-ROM or multimedia (1771); audiotape or videotape (123); ITV (118); audio conferencing or audio graphics (35); EPSS (electronic performance support system) (32); and radio (2).

Berge et al. (2002) conducted General Least Squares Regression analysis with

Oblimin rotation to find the factors that accounted for most of the variance in perceived barriers. Ten factors accounted for 52% of the variance in barriers perceived by the respondents (i.e., administrative structure, organizational change, technical expertise, social interaction and quality, faculty compensation and time, threatened by technology, legal issues, evaluation of the effectiveness, access, and student support services). The researchers found that faculty compensation and time were the highest in rank and the administrative structure the lowest. All the barriers were in the range of weak to moderate.

To analyze the influence of demographics, Berge et al. (2002) conducted a series of Analyses of Variance (ANOVAs) tests and found small effects that accounted for less than 10% of the variability in the barrier scores. Respondents in business and corporations tended to be below average in all barriers. Higher education and community college respondents were below average regarding organizational problems but above average with regard to faculty compensation and time. Those in elementary education were above in three barriers: administrative, organizational change, and student support. Those in middle school did not seem to vary in either direction. Regarding the expertise, the trend showed that as expertise increases, the rank in threats decreases. Those of lowest expertise scored well above the average in technical support and below average in faculty compensation. The ones who used technology for their personal use were above average in administrative barriers, faculty compensation and time, student access, and student support services. Those who were learning about distance education scored above the average in technical support, social quality and interaction, evaluation, and access as greater barriers. In contrast, the ones that used distance education in their classes rated those barriers as of less concern except for the technical support. Finally, the highest group of expertise reported lower scores for all the barriers.

Further, Berge et al. (2002) analyzed the influence of the institution's stage of adoption and found that respondents whose institutions were in the first two stages of implementation were above the average in 6 of the 10 barriers. In both stages, organizational change, technical support, social quality, evaluation, access, and student support systems were greater than the average. For the stage one, administrative barriers were also above average, while for respondents in stage two, relevant concerns were in the faculty compensation and time, feeling threatened by technology, and legal issues. As the organization advances to the third stage of implementation, the compensation and time concern maintains above average but the concern of technical support drops below average. When a stable process is in place, 6 of the 10 barriers were below average (i.e., administrative, organizational change, technical support, evaluation, student access, and student support system). When a distance education program was institutionalized, all the barriers were below the average.

Because even the most effective change effort usually encounters some resistance (Evans, 1993), as part of the research addressing barriers to technology implementation, a group of researchers have addressed the perceived motivators that promote the use of WBIT. For instance, along with barriers to teach online, Betts (1998) also examined the relationship between faculty participation in distance learning and motivators. Betts asked participants to rate from 1 to 5 (1 = *strongly disagree* to 5 = *strongly agree*) to what extent they believed 34 factors listed had motivated them to participate in distance education. The five most important motivators reported were (a) ability to reach new audiences that cannot attend classes on campus; (b) opportunity to develop new ideas; (c) personal motivation to use technology; (d) intellectual challenge; and (e) overall job satisfaction. As part of the follow-up survey, the participators were asked to rate from 1 to 5 (1 = *strongly disagree* to 5 = *strongly agree*) to what extent they believed the 34 factors would motivate them to participate in distance education. The five highest rated answers matched the previous question in terms of the factors that had motivated them to get involved. Comparing the responses of those who did not use technology, the five highest rated responses were: (a) increase in salary; (b) monetary support for participation (e.g., stipend, overload); (c) opportunity to develop new ideas; (d) working conditions (e.g., hours, location); and (e) intellectual challenge. The deans agreed on motivators (a) and (b) but they perceived personal motivation to use technology, credit toward tenure and promotion, and release time as the most significant motivators.

By the same token, out of 19 items considered as incentives by Rockwell et al. (1999), 6 were related to intrinsic or personal rewards (i.e., providing innovative instruction, applying new teaching techniques, self-gratification, fulfilling personal desire to teach, recognition of work, and peer recognition) and two were related to extending the reach of education (i.e., access to place-bound students and reduction of student travel time). *Release time* was seen as an incentive by faculty because they saw the time requirement as an obstacle. The analysis of the subgroups revealed that the faculty members that were not intending to teach via distance were less likely to see *fulfilling a personal desire to teach* ($\chi^2 = 12.49$, $df = 2$, $p < 0.05$) and *self-gratification* ($\chi^2 = 5.82$, $df = 2$, $0.05 < p < 0.10$) as incentives than the faculty with experience in distance teaching.

In addition, Wilson (1998) conducted a state-wide study to understand faculty attitudes about distance learning and found that intrinsic motivation – striving to improve student learning – was the most important factor in convincing faculty to participate in distance learning, and financial incentives received the lowest ranking as motivators among faculty. Other motivators reported by literature include personal motivation to use technology (Bonk, 2001; Lee, 2001; Rockwell, et al., 1999; Schifter, 2002), collegial support and recognition (Rockwell et al., 1999), and the opportunity to use technology more innovatively to enhance course quality and develop new ideas (Dooley & Murphrey, 2000; Schifter, 2000).

Summary

As described in the above mentioned studies, the use of Web-based resources in higher education is commonly limited to research, e-mail communication, and instructional materials' distribution. Research has suggested that the lack of more advanced applications of the Internet in the courses may be due to the lack of competence and proper training in such advanced applications (Vodanovich & Piotrowski, 2005). Faculty concerns most commonly identified with the use of WBIT were those related to time pressures and perceived lack of training and skills, with equivocal or no significant differences across the set of predictors (e.g., gender, rank, age, experience, etc.).

Likewise, the majority of factors that are concerns to teaching online are found in the areas of administrative and technical support (Maguire, 2005). Of all the barriers cited by faculty and administrators, the one more frequently mentioned is the lack of technical support (Lee, 2001; Schifter, 2000; Wilson, 1998; Betts, 1998). Research has found significant differences among faculty participation level responses with regard to motivators. Overall, distance education participants rated intrinsic motives higher, while non-participating faculty rated higher personal needs, inhibitors, and extrinsic motives (Schifter, 2002). Research has also found that faculty attitudes change becoming more favorable with experience in teaching distance education courses (O'Quinn & Corry, 2002; Schifter, 2002). Furthermore, researchers have also found that barriers are perceived greater in the early stages of organizational implementation and that they decrease when the organization gains experience and expertise in the use of the technologies (Berge et al., 2002). Therefore, organizations should provide institutional support targeting those barriers at each stage of development of the technology implementation.

Institutional Support

The course of any innovation process strongly depends on the experiences, concerns, skills, and knowledge of the individuals and groups involved in the innovation (Hall & Hord, 1987). As stated in the previous section, faculty concerns associated with the implementation of Web-based instructional technology (WBIT) are found in the areas of administrative and technical support (Maguire, 2005). Nevertheless, most institutions of higher education have not yet defined a clear institutional support system to diminish faculty concerns and promote the integrated use of WBIT. For instance, even though more than 80% of 4-year institutions were offering distance education courses by 2002 (Ashby, 2002), according to the National Center for Educational Statistics (NCES, 1998), only about 60% of the universities had training available (non-mandatory) for faculty to develop distance education courses and teach online.

Empirical research that examines institutional support in terms of technology implementation in higher education is scarce. Few studies have addressed the needs and perceptions of faculty in terms of institutional mechanisms that support implementation of WBIT. For instance, Gammill and Newman (2005) conducted a descriptive-correlational study to examine faculty members' perceptions of factors and issues that support or impede the implementation of Web-based instruction. Participants in Gammill and Newman's study consisted of a representative sample of faculty members from all academic disciplines at Mississippi State University (N=975). To address the problem, the authors used a 56-item questionnaire consisting of Likert-type questions, scaled items, checklist, and closed-ended and open-ended questions. The authors considered the instrument to have content validity as it had been reviewed and used in previous studies. Gammill and Newman (2005) reported a 44% response rate and provided information regarding control of non-response bias; however, they did not report reliability of the instrument.

Demographics reported in Gammill and Newman's study showed that the majority of respondents held tenure (72.4%), were either full professors (32%) or assistant professors (28%), and held a doctoral degree (80.4%). In terms of Web-based instruction usage, the majority of respondents indicated having no previous experience teaching online courses (81%), and the average of courses taught online by faculty was one for both undergraduate and graduate levels. The majority of faculty responded that they will (30%) or possible would (45.5%) teach online in future; however, almost half of the respondents (48%) indicated that it is "not important" to offer Web-based academic courses. The primary reasons for planning to teach online were the potential to reach more students, flexibility, and teaching effectiveness. Among the reasons cited for not teaching online are the lack of effective interaction as compared with face-to-face instruction, no incentives or rewards for the effort, and technology problems.

In terms of factors related to Web-based technology implementation, Gammill and Newman (2005) found that reliability of technology ($M = 4.29$, $SD = 1.06$), technical support ($M = 4.27$, $SD = 1.03$), and course development/revision time ($M = 4.26$, $SD = 1.05$) are the technical factors considered more important by faculty. Pedagogical aspects rated as most important were nature of course content ($M = 4.34$, $SD = .93$), course objectives ($M = 4.11$, $SD = 1$), and course discussion ($M = 4.08$, $SD = 1.05$). Related to faculty-centered factors, the most important were level of administrative support (M = 3.93, $SD = 1.13$) and faculty load or release time ($M = 3.93$, $SD = 1.2$). In terms of issues related to Web-based instruction, Gammill and Newman (2005) found that faculty agreed that the most important obstacles are the lack of incentives for teaching Web-based courses ($M = 3.10$, $SD = .82$), the lack of adequate support systems ($M = 2.97$, $SD = .83$), and the idea that Web-based delivery is not appropriate for all courses ($M = 3.52$, $SD = .57$).

As far as support mechanisms, a study conducted by Betts (1998) asked faculty, in an open-ended question part of her survey, to make recommendations for faculty development programs. In all, there were 154 faculty responses. From the responses, three general recommendations emerged: (a) faculty would like support for course development (e.g., financial, administrative, and technical support); (b) faculty are interested in seminars and workshops that focus on skill development, the use of new technologies, designing courses, teaching strategies, and on the educational merit of distance education techniques (e.g., hands-on training, coaching, access to technology, tutorials, guided practices, and pilot tests); and (c) faculty would like release time for training.

The lack of recognition from the administrators and peers in the form of credit towards tenure and promotion is a large institutional barrier to online faculty participation (Betts, 1998; Lee, 2001; Rockwell, 1999; Schell, 2004; Schifter, 2000; Wilson, 1998). A case that exposed the administrative skepticism and lack of recognition from peers in the form of credit towards tenure and promotion was illustrated by Kiernan (2000). Kiernan (2002) conducted a case study of a fictitious professor at Indiana University who was heavily involved in Web-research, online publications, and teaching, and was turned down for tenure after being evaluated by more than 150 Indiana University faculty and administrators.

On the other hand, while time devoted to teaching or developing online courses is perceived by faculty to be significantly more, it is not as highly regarded as is time spent on research or even on time spent on teaching traditional face-to-face courses. Schell (2004) conducted a study to measure the acceptance of online courses and learning materials as a valuable academic endeavor. The instrument for data collection was a survey intended to rate the importance of developing online course materials in relation to their promotion/tenure process (no information was available about the validity or the reliability of the instrument). Participants in this study were teaching faculty ($N = 232$) holding doctorates who are on tenure-track positions in a 4-year, U.S. school that had developed online courses and/or online materials to be used in class and had not been denied promotion. The sample was from varied disciplines from sciences and engineering to business, arts, nursing, and medicine.

The majority of respondents in Schell's study were male (62%); 67% were tenured; 31% were assistant professors; 31% were associate professors, and 38% were full professors. Nearly half of participants (48%) responded that their school offered a doctoral degree. Respondents were asked to rate their perception of the decision maker in each phase regarding the value of developing online material (0 = *no importance* to 10 = *critical importance to the decision-making*). Schell's findings showed that respondents expressed that teaching was slightly more important than research in their promotion process, although this relation was strongly affected by the existence of a doctoral program in the specific school. Other results from the survey show that 47% of respondents stated an increased effort in the use of information technology (IT) in a course, rating values above 8 in a scale from 0 to 10, although rating does not assure them a successful career in terms of promotion and tenure. Schell (2004) pointed out that the mixed message from the administration undermines the widespread implementation of online programs and courses and limits the consolidation of this technology in higher education.

Albeit the recognized importance of the role of the administration in terms of providing support for implementation of Web-based instruction, until now, few studies have included administrators – in addition to faculty – as participant in their studies (e.g., Betts, 1998; O'Quinn & Corry, 2002; Rockwell, et al. 1999; Schifter, 2002). For instance, in addition to the sample of faculty, Betts (1998) surveyed, a small group of deans (N = 7) to know what they thought could encourage faculty participation and three themes emerged from the responses: (a) faculty need financial incentives to encourage them to participate in distance education; (b) faculty need training (i.e., workshops) as well as technical assistance; and (c) faculty need more information about distance education (i.e., cost, benefits, and perhaps an oversight office). Rockwell et al. (2002) surveyed a sample of 23 administrators and found that administrators felt faculty concerns about teaching Web-based courses related to time needed for preparation and delivery of distance education (as a major concern), cost (including technical staff and graduate assistant support), instructional design (especially technological assistance and training for designing online courses), instructor-student relationships (decrease of personal contact), reward structure (acknowledge and recognition through promotion and tenure processes), degree programs (lack of an overall plan for the implementation of distance education), lack of institutional policy, and lack of training.

Similarly, O'Quinn and Corry (2002) surveyed 572 faculty and 15 division chairs at a community college. Eight division chairs and 188 faculty members responded to the survey. The survey was based on Betts' instrument. Additional questions focused upon faculty support, rewards, and the changing role of the faculty member in distance education and how faculty and division chairs perceived distance education as related to the institution's mission statement. Using both quantitative and qualitative analysis (short answer questions), O'Quinn and Corry (2002) found that faculty and division chairs perceive faculty workload ($M = 3.92$), lack of release time ($M = 3.58$ for faculty, and $M = 3.62$ for division chairs), and lack of monetary support ($M = 35$ for faculty, and $M = 3.54$ for division chairs) as obstacles for participating in ODL. In general, the means generated from responses in O'Quinn and Corry's study reported the greatest concern on the workload that faculty incur as a result of participating in distance education.

Another study based on Betts' survey compared the perception differences about faculty and administrators' participation in distance education (Schifter, 2002). Schifter surveyed all full-time faculty and 25 senior administrators, including deans ($N = 1,312$). A total of 236 (20%) responded to the survey. The majority of respondents in Schifter's study were male (64%); 48% were full professor; 28% were associate professor, and 18% were assistant professor. The researcher used factor analysis with all 46 factors (29 motivating and 17 inhibiting factors) to analyze how the different factors grouped. Schifter (2002) further conducted an Analysis of Variance (ANOVA) on mean scores to determine significant differences by predictor (i.e., level of participation, gender, age, range, faculty rank, and tenure status). She conducted four independent Chi-square analyses to test the null hypothesis that there was no relationship between level of participation and gender, age, range, faculty rank, and tenure status. Schifter (2002) found significant differences between faculty and administrators for 12 motivating factors, two inhibiting factors, and personal needs. She reported strong significant differences ($p < .001$) between faculty and administrators on *reduced teaching load* and *monetary support* for participation. The administrators rated these factors much higher than faculty. According to Schifter (2002), overall administrators in her study did not appear to truly understand what would motivate faculty but had a clear perception of what would inhibit them from participation in distance education.

Considering the perspective of program directors and coordinators of the programs, Shea, Motiwalla, and Lewis (2001) conducted an exploratory study to establish the status of problems and issues of Internet-based distance education programs in higher education institutions. They used a survey distributed to 250 program coordinators and received 68 usable responses (28%). Shea et al. (2001) indicated that 44.1% of the programs involved in the study were serving 500 or more students, 33.3% between 100 and 499 students, and about 20% had 100 students or less. Thirty-three percent of the programs offered 50 sections or more, and 29% offered 10 sections or less. The majority of these programs targeted non-traditional students (adult learners) with 88.3% of them with less than 45 years of age and 48.8% between 30 and 45 years of age. Regarding the media used, the four most popular media were asynchronous with the e-mail as the most popular (96%). The next two most popular media were synchronous, telephone and live chat; the use of live video feeds to homes was reported not technically feasible.

Shea et al. (2001) asked participants to rate in what way the administration had been particularly supportive in running their program (1 = *most supportive* to 7 = *less supportive*). Descriptive statistics showed that the biggest complaint from the administrators was the inadequate staffing of the programs ($M = 4.38$), followed by advertisement ($M = 4.19$), promotion ($M = 4.13$), and release time for faculty ($M = 4.13$). According to Shea et al., distance education coordinators agree to a certain extent that administrators have helped to establish the viability of online programs ($M = 3.35$) and have increased funding to meet program needs (3.97).

On the other hand, Shea et al. (2001) explored the perceptions of distance education coordinators in terms of what they think faculty like best about teaching online (1 = *most liked* to 5 = *less liked*) and what faculty would like to improve (from 1 = *most liked* to 5 = *less liked*). Shea et al. found that distance education coordinators perceive the convenience and flexibility of online classes ($M = 2.89$) as well as interest in technology and innovation ($M = 2.89$) were important motivators for faculty; they did not consider income to be an important motivator ($M = 4.29$). Additionally, their findings suggested that program coordinators perceived faculty would like more technical support ($M =$

3.05), more pay ($M = 3.08$), more training ($M = 3.18$), and more administrative support ($M = 3.66$). Shea et al. noted that faculty ranked second to last the interaction with students ($M = 4.63$) and pointed out the lack of interest in teaching centers by the faculty ($M = 5.42$). According to the researchers, this lack of interest indicates either that schools have adequate teaching centers or that these centers are inconsequential in the teaching-learning process. Finally, the researchers stated that program coordinators expect that, as course management technologies improve, faculty will require less technical support and more guidance in the application of these technologies effectively.

Lee (2002) conducted a study to investigate perceptions of faculty and administrators with regard to instructional support in distance learning. She surveyed a group of 237 faculty members and 38 administrators from 35 institutions, for a response rate of 72%. Demographics showed a slight majority of males (53%), a majority of tenured professors (46%), and almost equal members of 4-year research and non-research university (42 % and 49% respectively). The instrument was a 35-item survey using a 5-point Likert scale *(1 = Not supportive* to *5 = Very supportive*) with an open-ended comment section for participants to describe other support mechanisms that they perceived as useful or needed. Instructional support indices included measures of course redesign (3 items), course facilitation (5 items), use and application of distance education technologies (3 items), rewards (4 items), incentives (5 items), and personnel (7 items). Lee (2002) reported satisfactory reliability for the instrument (Cronbach's alpha of .93).

Lee (2002) conducted independent *t*-tests on each dependent variable and further measured effect size to investigate if there were differences between faculty and administrator perceptions of instructional support with regard to each one of the constructs (course redesign, course facilitation, etc.). The researcher found significant differences for all the dependent variables with smaller mean scores for faculty than administrators, meaning that administrators perceived variables to be more supportive. Cohen's *d* revealed that administrators' perception of instructional support is more optimistic, in general, than the correspondent faculty members' perception. As far as the qualitative analysis, Lee (2002) reported that most of the participants did not comment on instructional support services other than those listed in the survey questionnaire. According to Lee (2002), "the most clear distinction revealed from the comments was the issue of availability versus efficiency of the instructional support system" (p. 37) along with a clear perception by faculty of a poor instructional support management, lack of communication from the administration in terms of support available, and lack of consistency in the support.

Few studies have looked at the implementation of Web-based instruction considering the views of support staff along with faculty and administrators. Dooley and Murphrey (2000) conducted an investigation to examine the perceived adoption rate of distance education instruction from the perspective of administrators, faculty, and support units. They were particularly interested in determining if differences existed among the varying perspectives of the members of the three groups. The researchers' theoretical framework was the Rogers' Diffusion of Innovations model. Based on this model, they used a Strengths, Weaknesses, Opportunities, and Threats analysis (SWOT) that coupled strengths and opportunities as promoters of innovation, and weaknesses and threats as retardants of adoption. The participants in Dooley and Murphrey's study were a convenient sample of stakeholders ($N = 42$) from a major research university who were initially nominated because of being innovators in using distance education technologies and further selected using the snowball sampling technique. The majority of participants were veteran faculty (8 females and 34 males) from which 16 were administrators, 15 were faculty members, and 11 were support unit employees.

Dooley and Murphrey's study used a variety of qualitative methods. They reported a prolonged engagement with the participants and the development of an interview protocol grounded in theory as means to ensure truth value and applicability. The primary data collection of the study was a set of semi-structured interviews. The researchers reported the use of member checking during the interviews for verification and clarification purposes. They used additional sources of data collection (triangulation for data consistency) such as documents based upon the theoretical framework, interviewees' documents, observations, and data from a reflective journal in which insights/reflections and methodological decisions were kept. Dooley and Murphrey (2000) used the constant comparative method to establish categories across the data set. To test emerging categories, a peer debriefing was conducted with a non-interviewed distance education group. The researchers presented the integrated categories (categories were coded first and then integrated) for each component of the SWOT analysis using Venn diagrams.

Dooley and Murphrey's findings revealed that the majority of the integrated categories were shared among administrators, faculty, and support units. As strength, the researchers found that the prominent category was the use of technology to enhance teaching and learning; as opportunity, the prominent category was the expansion of audience base to reach nontraditional students; and as a weakness, they found limited incentives, development support, and funding. The only non-shared category was threats. They reported career and job security to be the prominent category for faculty; competition from private and public institutions as the prominent category for administrators; and dependency on outside developers/programmers and security concerns as the prominent category for support units. Based upon Rogers' attributes theory, the researchers concluded that respondents perceived technology usage to be extremely complex and the trialability of the technology to be limited due to the required time and effort to convert courses into a distance education format. Dooley and Murphrey (2000) pointed out administrative support, training, and incentives as institutional support mechanisms that would increase the likelihood of effectively implement distance education technologies.

Summary

Faculty members are concerned with the availability of institutional support (such as resources) to promote course redesign, training in the use and application of distance technologies, training in teaching methods, technical consulting, teaching assistants, graphic work, and editing. The literature reveals that higher education institutions provide limited instructional support to faculty and it is often perceived as inadequate by faculty (Betts, 1998; Granger et al., 2002; Lee, 2002). Specifically, the literature shows that faculty members perceive the need for administrative support and faculty load or release time and agreed that the most important obstacles are the lack of institutional incentives for teaching Web-based courses, the lack of adequate support systems, the idea that Web-based delivery is not appropriate for all courses, and the lack of recognition from the administrators and peers in the form of credit towards tenure and promotion (Gammill &

Newman, 2005; O'Quinn & Corry, 2002; Rockwell, 1999; Schell, 2004; Wilson, 1998). In this sense, the lack of administrative support and limited incentives are recounted by the literature as the most common environmental factors perceived by faculty, administrators, and staff as obstacles in the implementation of WBIT.

In spite of the fact that the administrator is the source of providing instructional support to faculty, the research in terms of institutional support has disregarded how administrators perceive instructional support in their own institutions (Lee, 2002). Literature has found significant differences between faculty and administrators perceptions of institutional support in terms of motivating factors, inhibiting factors, and personal concerns (Lee, 2002; Schifter, 2002). In general, administrators did not appear to truly understand what would motivate faculty but had a clear perception of what would inhibit them from participation in distance education (Schifter, 2002). Moreover, the literature revealed that administrators' perception of instructional support is in general more optimistic than the correspondent faculty members' perception (Lee, 2002).

Furthermore, administrators, faculty, and support units have similar perceptions in terms of weaknesses for the adoption of distance education instruction (i.e., limited incentives, development support, and funding) (Dooley & Murphrey, 2002); however, in terms of concerns, they differ. Career and job security are more a prominent category of concern for faculty, while competition from private and public institutions are more prominent for administrators, and dependency on outside developers/programmers and security concerns are the concern for support units. Other perceptions of institutional support reported by the literature are the issue of availability versus efficiency of the instructional support system, poor instructional support management, lack of communication from the administration in terms of support available, and lack of consistency in the support (Lee, 2002; Schifter, 2002; Shea et al., 2001).

Conditions for Successful Implementation of WBIT

Research has shown that administrative support, training, and incentives would increase the likelihood of effectively implement Web-based instructional technologies (WBIT) (Dooley & Murphrey, 2000). However, universities' administrators seem to undervalue the importance of setting the conditions for successful implementation of WBIT and the benefit of having a faculty prepared for teaching using Web-based instructional methods effectively (Schell, 2004). Conditions for successful implementation may arise from the environment in which change is implemented. In the *Conditions for Change*, a seminal study based on a survey of 25 structured interviews completed cross-country, Ely (1990) proposed a series of settings for successful technological change. Considering the academic environment, he noted that one of the first steps to initiate change is dissatisfaction with things as they are – dissatisfaction with *Status Quo*. He also stated that knowledge and skills, whichever way they are acquired, must be present for change to occur. Another requirement he pointed out is the need of resources easily accessible to make the innovation work, resources that can be expensive devices or simple tools. He identified the time as a valuable resource for implementers: time to learn, adapt, integrate, and reflect on what people are expected to change. Ely also emphasized the importance of incentives and rewards, whether intrinsic or extrinsic, and considered the need for faculty participation, commitment and a leadership easily identified, as conditions to facilitate change (for a detailed description of Ely's eight conditions, see Table 1 in Chapter 1, page 13).

The eight conditions found in Ely's study (i.e., *dissatisfaction with status quo, knowledge and skills, resources, time, incentives and rewards, participation, leadership, and commitment*) have been the starting point of numerous empirical studies and their presence has seemed to positively influence the implementation of ICT innovations (Ensminger, Surry, Porter, & Wright, 2004; Surry & Ensminger, 2003). Although the conditions have proved to be present in successful implementations, the role of the setting in which the innovation is implemented and a hierarchy among the conditions been established have not been clear (Ely, 1999). Surry and Ensminger (2003) conducted a study to determine if there were differences in the perceived importance of the conditions by those working in business and industrial organizations and those working in educational organizations. Participants in the study were people from an Internet mailing list that responded to the questionnaire ($N = 92$); 36 people responded to the business questionnaire and 56 responded to the education questionnaire. Each questionnaire presented two hypothetical innovation scenarios consisting of 16 implementation questions (two per condition). Each question required a response on a 5-point semantic differential scale ranging from *very easy to implement* to *very difficult to implement*. Both questionnaires were content validated by experts.

Surry and Ensminger (2003) used descriptive statistics (i.e., frequency counts, graphs, and mean plots) and found that time, leadership, resources, and skills and knowledge were the most important factors in facilitating implementation for the business group; faculty rated resources, participation, and skills and knowledge as the most important factors. The researchers used one-way Analysis of Variance (ANOVA) to compare the means for the three demographic variables on each of the eight conditions.

For the business group, they found that middle-age workers perceived that the condition *Rewards and incentives* is more important than younger or older workers. They also found that respondents who identified themselves as *staff* perceived that *Skills and Knowledge* is a more important condition than respondents who identified themselves as middle or lower management. Unexpectedly, Surry and Ensminger did not find any statistically significant results for the education group.

Despite the relatively small size of the sample and the hypothetical nature of the scenarios, Surry and Ensminger's study tended to validate Ely's theory of the eight conditions that facilitate innovations. Also, their findings revealed that there is a difference in the relative importance of the eight conditions between educational and business settings. Finally, the results suggested that there are important intra-group variables that affect the perceptions of group members in regard to the eight conditions.

Another study that further explored Ely's conditions was conducted by Ensminger, Surry, Porter, and Wright (2004). Ensminger et al. (2004) conducted a study into Ely's conditions to determine if there were underlying relationships among them. The researchers developed an instrument to measure individuals' perceived importance of each condition in relation to the others. The data collection instrument in Ensminger et al.'s study was a 56-item questionnaire. The statements in the questionnaire were developed by the authors and further tested for content validity. A group of seven experts agreed to rate the accuracy of the statement according to Ely's definition of each condition. Fifteen statements were reworded considering the comments of the experts and included in the final version of the instrument. The statements were tested/retested for reliability purposes (reliability ranged from .586 to .864 with the average of all eight scores being .730). Participants were contacted by sending electronic messages to several electronic mailing lists related to the field of instructional design. The sample consisted of 54 males and 86 females (N = 179). The majority of the participants worked in higher education (n = 89), with several in business or industry (n = 22) and in K-12 settings (n = 20). The educational level of the group was diverse ranging from high school education (n = 32) to doctorate (n = 26) with the majority having a master's degree (n = 71).

Ensminger et al. (2004) created implementation profiles of all participants using descriptive statistics methods. Their findings indicated that, for the total sample, leadership and commitment were the least important conditions, while resources and participation were the most important. Commitment and leadership were the least important conditions for both males and females. Females selected knowledge and skills and resources as the most important variables while males reported participation and resources as the most important. Participants employed in higher education perceived resources as most important and considered skills and rewards as important conditions as well.

Ensminger et al. (2004) conducted a factor analysis of the implementation profiles of all participants; they used the principle component method of extraction and varimax rotation. For a condition to load on a factor, the researchers decided that it must have a minimum absolute value of .45 and must not have loaded on another factor at an absolute value of .45 or greater. They found that several of the conditions were related and four factors, which accounted for 73.3% of the variance, were identified. Managed change (Factor 1) accounted for 25.3% of the explained variance; conditions that loaded on this factor were leadership (.858) and commitment (.800). Individuals who score high on this factor see upper level management and direct supervisors as having an active role in the change process. Performance efficacy (Factor 2) explained 19.8 % of the total variance; conditions that loaded on this factor were participation (-.782), time (.744), and knowledge and skills (.528). Individuals who score high on this factor believe that they will be successful in using the innovation because they either currently have the needed skills or will be able to learn the skills if provided time. External rewards (Factor 3) contributed 14.2 % to the total variance explained; only one condition loaded on this factor, rewards (-.945). Individuals with a low score on this factor are more likely to want some compensation or reward for implementing an innovation. Finally, resources (Factor 4) explained 14% of the total variance.

In order to identify conditions that faculty perceive as contributing to successful implementation of instructional technology, Granger, Morbey, Lotherington, Owston and Wideman (2002) conducted a qualitative analysis of four Canadian schools. The case study took a grounded theory approach, a framework that conceives data collection, analysis, and theory as reciprocally related with each other. A national panel of educational technology experts nominated 60 schools across Canada where Information and Communication Technologies (ICT) has been successfully implemented. Preliminary data were gathered from interviews conducted in 12 of the 60 schools nominated. A convenient sample of 4 schools out of the 12 schools pre-selected was chosen because of "the overall discursive and conceptual richness of their [interview] data" (Granger et al., 2002, p. 481). Data for analysis focused on the transcriptions of tape-recorded interviews that were codified using ATLAS.ti software and analyzed using the constant comparative method. Three overarching categories encompass the several factors that emerged: (a) ways of learning (i.e., formal and informal ICT teacher education); (b) individual characteristics (i.e., educational background, experience, skills, and resistance to technology); and (c) environmental factors (i.e., logistics and community). For reliability purposes, emerging patterns were examined for relevant consistencies both among interviews and across the four schools.

Granger et al.'s (2002) findings suggested that informal ICT education such as "just in time learning" and "couching" are considered by teachers as most influential. However, they pointed out that "the relationship between teachers' skills and successful implementation is complex and not obviously predictive: attitudes, philosophies, communication, and access to skills training are also contributing factors, which both inform and are implicated in the notion of commitment" (p. 487). Finally Granger et al. (2002) suggested that investment in ongoing individual development and in the school community might be the underlying reason that made these four schools successful.

A study conducted by Aust, Newberry, O'Brien, and Thomas (2005) identified conditions where innovations for using technology emerged in small groups. Aust et al. (2005) used a model for promoting the technology integration in teacher education as their framework (the Learning Generation model). The Aust et al.'s sample was consisted of 265 members of the school of education conformed in small groups or Cohorts. Key goals of the model were to assess the teacher education candidates' perceptions and abilities concerning technology, to improve the technology literacy competencies, and to use several strategies to spread the innovations in integrating technology in teacher education. The researchers hypothesized that Cohorts pass through seven implementation stages: genesis, consultation, planning, initiation, action, assessment, and celebration.

Aust et al. (2005) conducted a two-phase model evaluation. The first phase included a quantitative survey and qualitative interviews that provided insights into technology skills of faculty and students, current conditions, capabilities, and needs. The second phase used an analysis of products produced on the Cohort's websites and faculty interviews that assessed the attainment of project goals. Aust et al. used survey methodology to operationalize their variables. The technology skills survey consisted of 30 items divided in six subscales: (a) basic computer skills (7 items, $\alpha = 0.836$), (b) online activities (5 items, $\alpha = 0.770$), (c) presentation software (5 items, $\alpha = 0.865$), (d) software used for instruction (5 items, $\alpha = 0.795$), (e) spreadsheets and databases (4 items $\alpha = 0.871$), and (g) word processing (4 items, $\alpha = 0.783$). The alpha coefficient for the total scale was .957. The responses regarding the capacity in the specific technology were assessed using a 5-point Likert-type scale (1 = *no experience* to 5 = *I can teach others*).

Aust et al. (2005) conducted one-way repeated measures ANOVA in order to compare the scores on the six subscales. They found significant differences, $F\ (5, 244) = 173.11$, $p < .001$. Eta squared showed that the effect of the subscales accounted for 78% of the variance in scores. Post hoc analysis, after Bonferroni adjustment, showed that 14 of the pair-wise comparisons were significant. Only the spreadsheet/database and presentations comparison was not significant. Faculty and students had the most confidence in their ability to use word processing ($M = 3.84$) and the least in their ability to use spreadsheet and database programs ($M = 2.77$). As far as gender, Aust et al. found that men scored significantly higher than women in the presentation ($M = 3.14$ vs. $M = 2.70$) and computer basic skills ($M = 3.86$ vs. $M = 3.51$). In terms of their capacity, most of the participants scored 3 (*I can do this but not to its full capacity*) or higher on the word processing (87%), online activities (75%), and basic computer skills (82%) subscales. Forty-two percent of the participants scored 3 or higher on the spreadsheet and database, as well as for software use (49%) and presentations (44%) subscales. Sixty-four percent of the participants scored 3 or higher on the total scale.

In the second phase, two independent researchers evaluated the products posted in the Cohort associated websites and looked for evidence of increased technology competencies, instructional technology integration, engagement of cohorts, recruitment of technology literates, dissemination of new visions of teaching, and use of technology to improve communication and collaboration. These independent researchers found that at least 48% of the websites showed evidence of each criterion. Finally, Aust et al. (2005) found a positive perception of faculty with regard to their ability to perform new tasks, the knowledge and experience of several technologies, and the improvement of skills of the students. Likewise, they found positive views of faculty in terms of the effectiveness of the model and its processes. The evaluation of this model suggested not only its capacity to increase the knowledge and skills in technology, but its capacity to sustain interest, ownership, and collaboration in obtaining long-term reform in the teacher education program.

Based on another model for integration of technology (the Integrated Technology Adoption and Diffusion Model), Sherry, Billig, Tavalin, and Gibson (1997) conducted a qualitative research to study the process of adoption and diffusion of Internet usage in academic settings. Specific aspects considered by the authors were the effectiveness of the training component and the change in the participants' level of use of Internet-based activities in instruction. Data for analysis were gathered using a variety of instruments such as surveys, in-depth interviews, focus groups, and examination of system logs and artifacts. Additionally, the researchers used information from an embedded case study of a cutting-edge elementary school. Sherry et al.'s data supported and expanded previous models of technological barriers, individual user perceptions and technology adoption and diffusion.

The Integrated Technology Adoption and Diffusion model (ITAD) has four elements with multiple sets of variables that impact the effectiveness of the technology adoption/diffusion process (i.e., technological, individual, organizational, and teaching and learning factors). The ITAD describes the cyclic process in which teachers successively evolve from learners (teacher-trainees), to adopters of educational technology, to co-learners/co-explorers, to a reaffirmation/rejection decision phase. In this last stage, an evaluation of the technology, its suitability, value, and cost is made. It is also in this stage that teachers in its role of *reaffirmers* contribute with technical support, assistance, and experience to the process, and their skills are no more limited to the specific educational environment where they developed, adding a new dimension to their acquired abilities in the form of portability (Sherry et al., 1997).

According to Sherry et al.'s findings, factors influencing adoption can be divided into four factors: (a) technological factors such as access, availability, usability, effectiveness, and reliability; (b) individual's factors, or user characteristics, such as motivation, reasons for use, need for control, comfort level, expertise, patters of use, gender, and special needs; (c) organizational factors such as physical environment, classroom connectivity, network capacity, and availability of resources and support; and (d) teaching and learning issues such as change in content, curriculum enhancement, planning and preparation, coherence, use of lesson plans, and evaluation.

Sherry, Billig, Tavalin, and Gibson (2000) conducted a qualitative study to further validate the ITAD model by means of the evaluation of several educational initiatives, specially the Boulder Valley Internet Project. The evaluation was conducted during a 3-year period, by using interviews, focus groups, classroom observations, surveys, (students, teachers, and administrators), threaded discussions, student projects posted on a website, among others. Through those online resources, teachers shared relevant information (e.g., ideas, concerns, experiences, etc.) and allowed an extension of the classroom and the school to a larger community. As the technology continued to improve and evolve with a continuous presence in the schools, the original four-stage model was modified to include a fifth stage of teacher's development in the form of the teacher as a leader. In this advanced stage, the teacher starts creating and sharing standards and rubrics rather than simply following them.

Sherry et al.'s (2000) findings seemed to validate their model. Furthermore, they confirmed that factors that helped faculty in the implementation process vary on each stage. While in the first phases the technical support and accessibility to technology were important, in later stages the administrative support becomes a key factor. The researchers also recognized that during the advance stage of evaluation, new capacities emerged, leading to new needs and the requirement of new strategies. A key new technology strategy was to keep a central focus on online professional and learner-centered exchanges that examined student work and products. As the evolution of the system continued, professional networks of educators were formed, where professional development planning with technology professionals and the construction of skills, knowledge and in-depth understanding of the content and pedagogy required for effective teaching and learning were performed. Sherry et al.'s model suggested that these learning networks must have a coherent, consistent vision among technology training, curriculum integration, and student performance assessment. They also recognize that a support or incentive system must be in place and visible. This incentive system must make mandatory the professional development in instructional technology and it should be backed by resources, structures and strategies to provide enough time for the different tasks involved.

Using a grounded theory approach and from a teacher-level point of view, Geijsel, Sleegers, and van den Berg (2001) developed a model expressing the relationships among conditions fostering the implementation of large scale innovation programs. The model focused on the dimensions of transformational leadership and teachers' participation in decision-making along with teachers' feelings of uncertainty and teachers' professional development activities as indicators of implementation. To test the model, the authors conducted two simultaneous studies. One study assessed the implementation of basic education curriculum for faculty at the prevocational education department ($N = 1475$) with a response rate of 45% ($N = 662$). The other study assessed the implementation of the qualification structure program for faculty at the senior secondary vocational education ($N = 1110$) with a response rate of 53% ($N = 587$). By comparing demographics in both groups of faculty, the researchers found that there were no significant differences and determined that both groups were comparable.

The primary data collection instrument in this study was a 59-item questionnaire. All variables were operationalized as questionnaire items. The dependent variable (implementation of a large-scale innovation program) was operationalized as two items: (a) self-perception of teachers' change in practice according to the principles of the innovation and (b) agreement with the principles underlying the innovation. The rest of the items were developed to measure the conditions identified as important for the implementation of large-scale innovation programs: (a) professional development activities, (b) feelings of uncertainty, (c) participation in decision-making, (d) vision, (e) individualized consideration, and (f) intellectual stimulation. Geijsel et al. (2001) examined the unidimensionality of the variables using factor analysis. The reliability was satisfactory (Cronbach's alpha value ranged from .67 to .92).

Further correlational analysis looked at the interrelation between variables. To test the relations between the variables in the research model, the authors conducted path analysis on both groups.

From the results of structural equation modeling, Geijsel et al. (2001) drew several conclusions: (a) there is a small positive impact of professional development activities on implementation of large-scale innovations, (b) feelings of uncertainty negatively influence the implementation of innovations, (c) there is a small indirect impact of teachers' experiences of participation in decision-making on the implementation of innovations, and (d) transformational leadership positively affects the implementation of innovations. They also noted that the model explained more of the variance in the agreement with the principles underlying the innovation than in the degree to which teachers' actually teach according to the principles of the innovation. Geijsel et al. suggested that large-scale innovations may lead to only a limited degree of actual change in teaching practice. Even when resources and other conditions are present, implementation seems to remain as an elusive practice.

Leadership as a Condition

A condition for successful implementation often mentioned in change theory is the role of leadership in inspiring a shared vision about what change means, sharing decision-making, supporting change, and modeling the way (Albury, 2001; Fullan, 2001; Gmelch, 2002; Kouzes & Posner, 2002; Roepke et al., 2000; Romm & Pliskin, 1999). Fullan (2001) identified five crucial aspects that leaders must cultivate for lasting change to take place: (a) a deep sense of moral purpose, (b) knowledge of a change process, (c) capacity to develop relationships across diverse individuals and groups, (d) skill in fostering knowledge creation and sharing, and (e) the ability to engage with others in coherence making amidst multiple innovations.

According to Albury (2001) the assumption that the adoption of institutional policies that encourage the use of new technologies is all that is necessary for the successful implementation of the policy obscures the role of middle level leadership. Indeed, there is a broad recognition in the research literature that in times of great transition and perceived change, leadership becomes critically important; effective leaders recognize that the greatest impediments to success with technology are often related to people rather than to technology per se (Roepke et al., 2000), and that building commitment to innovation among people who must implement it is essential for change to be accomplished (Evans, 1993). From Evans' (1993) approach, implementation depends on five dimensions of change: the content of the reform, the faculty willingness and capacity for change, the strength of school as an organization, the support and training, and the leadership. He emphasized the exceptional burden that leadership has in guiding people through the uncertainties of change.

Empirical research has also stressed the importance that leadership plays in the implementation process, especially on implementing large-scale ICT innovations. According to Hord and Huling-Austin (1986) faculty need specific leadership interventions during different stages of technology implementation. They conducted a longitudinal study that focused specifically on identifying the actions or interventions of principals and other facilitators in teachers' implementation of educational change. Hord and Huling-Austin derived a six-component framework in which the most frequent interventions were classified (i.e., providing logistical and organizational arrangements, training, monitoring and evaluation, providing consultation/problem-solving and reinforcement, creating an atmosphere and culture for change, and communicating the vision). Later, Hall and Hord (2001) identified six types of interventions with similar categories: (a) developing, articulating, and communicating a shared vision of change; (b) planning and providing resources; (c) investing in professional learning; (d) checking on progress; (e) providing continuous assistance; and (f) creating a context supportive of change.

In higher education settings, Owen and Demb (2004) used a qualitative approach to investigate the dynamic interaction between technology, leadership, organizational change, and institutional environments. They used an instrumental case study of a community college "known nationally as an exemplar for its learner-centered approach to education and integration of technology into pedagogy" (p. 639) to look at the following aspects: (a) the elements of current leadership models most salient in guiding large-scale technology implementation efforts, (b) the participants' perception of the factors affecting the change process, and (c) the distinctive dynamics of change involving technology implementation. The researchers gathered data from individuals' perceptions and stories by interviewing people involved in the implementation process; from focus group discussions (36 participants); from observations; and from the analysis of institutional documents, value statements, and indications of institutional direction. The interviews served as the primary data collection instrument. They interviewed students, faculty, and administrators who were selected using a purposeful sampling procedure. All interviews were conducted using open-ended questions.

Owen and Demb (2004) employed two methods of data analysis. For the analysis of leadership issues related to implementation, they used the Carter and Alfred model of leadership as the theoretical framework, clustering the data collected according to the model dimensions. For the analysis of organizational change, they used "an analysis rooted in participant perception that allowed themes to emerge from the data." (p. 640); two broad categories emerged through coding the data: change themes and institutional themes. Owen and Demb's leadership findings revealed "a broad array of leadership strategies that was consistent with and broadened the scope of the key dimensions of the Carter and Alfred model" (p. 641). Relevant findings are the critical role of top leaders in the institution to establish incentives and help faculty to overcome their anxiety and skepticism; the presence of participative decision-making strategies; the explicit formal and informal statements regarding the importance of technology in the university's vision and mission (no mixed messages); the emerging of many leaders, especially from the faculty; the presence of development, training, and peer mentoring opportunities; and the presence of rewards and achievement recognition.

Owen and Demb's change dynamics analysis suggested six themes that describe the impact of technology-related change associated with faculty, funding, students, and support units. The themes were (a) turbulence, lack of control caused by the rapidity of change and unpredictable outcomes; (b) tension, originated by opposing forces such as current practices and new needs, allocation of resources (e.g., classroom vs. online) and distributed budgets, and intellectual property issues; (c) planning, especially of infrastructure, support, and its impact in future; (d) implementation, strongly focused on faculty workload and compensations; (e) barriers, fundamentally the change in the faculty role, pedagogical controversy, and intellectual property; and (f) cultural change.

The researchers noted that the greater number of intractable issues appeared in the column dealing with faculty in the row of tensions. Interestingly, they reported, within the support unit findings, an inexistent "focal point defining the purpose and interrelation of different technology initiatives or the organization of the infrastructure to support them" (p. 656). Their findings also suggested that the gap between integrating technology and the need for institutional adjustments "creates a constant state of disruption, tension, and stimulation for further organizational change. Organizational culture may evolve to cope with technology and appear to close the gap. However, the rapid nature of technology development will soon create yet another gap." (p. 660). According to Owen and Demb (2004), the stability that permitted a critical mass of faculty to get involved and change over time in the case study was largely enabled by the sustained commitment of leadership and substantial resources.

Research has also shown that agreement with the underlying principles of Web-based strategies and positive attitudes towards the implementation of Web-based technologies do not necessarily correspond to the degree in which faculty actually teach according to the principles of the innovation. According to van den Berg, Vandenberghe, and Sleegers (1999) what may be needed is a better approach to educational innovation. They stated the following:

> The implementation of innovations implies not so much a structural functional perspective, but more a perspective in which interactive and experimental learning is stimulated. Innovations can, for this reason, strongly vary in character. ... Various aspects of the innovative capacity of schools, for instance, transformation leadership, indicated the necessity of a cultural-individual perspective … And the strong feelings of ambiguity of teachers asked specific forms of intervention. (p. 342)

Summary

"At all levels – the individual, organizational, and system – change is highly complex, multivariate, and dynamic" (Hall et al., 2001, p. 4). The eight conditions found by Ely (1999) have proved to be present in successful technology implementations (i.e., dissatisfaction with *status quo*, knowledge and skills, resources, time, incentives and rewards, participation, leadership, and commitment). Although of limited generalizability, research has shown that there is a relative place of importance among the conditions. Knowledge and skills, resources, and participation seem to be the most important conditions; while leadership and commitment were reported as the least important conditions (Ensminger et al., 2004). Findings from the evaluation of technology implementation models have suggested that the relationship between faculty skills and level of implementation may be mediated by attitudes, philosophies, communication, and commitment, and that they are not clearly predictive (Granger et al., 2002). Additionally, research has confirmed that factors that are considered by people as important vary on each stage of implementation (Sherry et al., 2000). While in the first phases the technical support, training, and accessibility to technology was important, in later stages the administrative support becomes a key factor.

Despite that researchers broadly recognize staff development and resource allocation as critical conditions in implementing technological innovations, they are never seen as sufficient conditions. Moreover, research has shown that the impact of professional development on implementation of large-scale innovations is relatively small (Geijsel et al., 2001; Owen & Demb, 2004), that informal ICT education such as "just in time learning" and "coaching" may be considered by teachers as most influential (Granger et al., 2002), and that other factors such as uncertainty feelings may negatively influence the implementation process (Owen & Demb, 2004; van den Berg et al., 1999). Furthermore, research has suggested that conditions such as leadership and participation in decision-making may have an important impact on the implementation process. A frequent suggestion is that transformational leadership positively affects the implementation of large-scale innovations (Geijsel et al., 2001; Hord & Huling-Austin, 1986; Owen & Demb, 2004; van den Berg et al., 1999). Yet, scarce empirical research in higher education has considered leadership as a factor influencing technology implementation.

Assessing Levels of Implementation

The Concerns-Based Adoption Model (CBAM) has been used extensively in education, particularly in curriculum reforms in elementary and secondary settings. As previously defined, the CBAM is a three-dimensional model that describes the individuals' adoption process through measures of Stages of Concern, Level of Use, and Innovation Configurations. Out of the three dimensions that comprise the CBAM, the

Stages of Concern is by far the dimension more found in the literature on implementation of innovations. Empirically, measures of Stages of Concern have been operationalized through the Stages of Concern Questionnaire (SoCQ) which will be discussed in detail later in this chapter. Arguably, Hall and Hord's (1987) Stages of Concern Questionnaire (SoCQ) is "the most rigorous technique for measuring concerns [of faculty regarding implementation of innovations] which is a 35-item questionnaire that has strong reliability estimates (test/retest reliabilities range from .65 to .86) and internal consistency (alpha-coefficients range from .64 to .83)" (2001, p. 68). The instrument assesses concerns through a 7-point Likert-type scale. The items represent the different types of concerns people have as they are first introduced to an educational innovation, begin to use it, and then move on to more experienced and mature perspectives and increased confidence in the use of the specific innovation.

With the aim of facilitating change, empirical research has analyzed stages of concern experienced by individuals in relation to a particular innovation (Evans & Chauvin, 1993). Research in this area mainly focuses on practical applications such as professional development effectiveness. For instance, Kember and Mezger (1990) conducted a study to evaluate a strategy for developing technical skills in faculty who were teaching online. The researchers drew upon contingency theories of management and the Concerns-Based Adoption Model (Hall, 1979) to propose a model to enhance the instructional design skills of faculty and address their concerns at their current stage of development. Kember and Mezger used the SoCQ to assess the concerns of faculty during the process of designing a Web-based course. Three instructional designers worked with 38 faculty members and rated their initial stages of concern. To evaluate the reliability and consistency of the assessment, each instructional designer independently attributed a stage of concern to the faculty with whom they were familiar. They reported Kendall's tau rank correlation coefficients of .71, .82, and .78 indicating a satisfactory measure of agreement. According to Kember and Mezger, consensus regarding the faculty stage of concern was reached in 31 cases. In three cases the consensus was not possible due to "differing behavior of the faculty in different units or toward the individual designers" (p. 56). In the remaining four cases, "a divergence of interpretation between the three designers [was] concerning individuals who attempted to reject the innovation in whole or in part" (p. 57). The researchers used mean values in the cases where consensus was not reached. According to Kember and Mezger, even though the staff development approach is resource intensive compared to the typical group training approach, the concerns profile showed that it is a cost-effective model.

Transfer of training has also been addressed using the stages of concern framework. Adams (2003) conducted a study using CBAM stages of concern to measure the degree to which attendance at technology faculty development programs corresponded to use of technology in teaching practices. Adams used a convenience sample of 589 full- and part-time faculty members at a postsecondary institution and explored three specific factors: academic task, level of computer integration, and concern about the innovation process. A total of 143 faculty members responded to a 40-item survey (39% overall return rate). In order to address technology concerns specifically, Adams used the Computing Concerns Questionnaire (CCQ), a modified version of the Hall's Stages of Concern Questionnaire (SoCQ) by Martin (1989). Additionally, Adams included age, gender, primary teaching division, and years of teaching experience as demographic factors, and a question concerning levels of computer use in teaching practices derived from the LCU questionnaire. No coefficients of internal reliability for the CCQ were reported, although other studies reported coefficients for this instrument ranging from .65 to .83 (i.e., Atkins & Vasu, 2000).

Adams (2003) compared the relationships among level of computer integration (three levels using the LCU, 1 = *non use*, 2 = *utilization*, and 3 = *integration*) and teaching discipline (8 levels, using Biglan's clustering of academic task area), stage of concern (seven levels using the CCQ), participation in technology staff development programs (information from a data base was combined with self-reported information to create a participation scale), and demographic variables (i.e., age, gender, and years of teaching experience). She found that the mean scores of computer usage occur around the utilization level: 48 % of respondents identified themselves in utilization level (level 2 of the integration scale), 27% identified themselves in the integration level (level 3), and 25% reported nonuse of computers in teaching (level 1). She also reported that applied academic task areas have a slightly higher integration average than pure academic task areas do.

Adams (2003) analyzed data from the CCQ by using mean group raw scores converted to percentile ranks and then using peak stages of concern (identification of the highest stage score) for comparison with other variables. She compared stage of concern and level of participation in technology staff development programs and level of computer integration. Adams found that a correlation exists between attendance at professional development activities and an increase in usage level of technology. Adams reported significant correlations between gender and engagement in professional development activities (i.e., women were more engaged in professional development activities than men), between higher integration levels and higher-order concerns, and between engagement in professional development activities and higher-order concerns. Demographics in Adams' study show that those in the 18-34 age range display a significantly higher level of computer integration ($M = 2.2$), that females display a greater integration average level than males do ($M = 2.139$), and that those with 0 to 3 years of teaching experience have a significantly higher level of computer integration ($M = 2.286$) and those in their middle years of tenure (10 to 19 years of teaching experience) display the least demonstration of integration of technology into teaching practices ($M = 1.969$).

Adams (2003) further explored the characteristics (across levels of concern, teaching discipline, and demographic factors) describing the type of instructor who more thoroughly integrates technology into instruction and found that they are generally younger, female, and have less teaching experience. In addition, Adams explored the perception of faculty regarding six previously articulated factors that may have been bearing on the individual's willingness to engage in development and technology integration. According to Adams, most of respondents perceived the availability of computers and software both for faculty (48%) and students (42%) to be the major barrier to integration of technology along with limited computer training for faculty (47%). Yet, she found the lack of time to integrate technology, insensitivity of administration to educational needs, unaware of technology resources, and fear of computers as the most common open-response barriers. These findings correlate with previous studies in terms of barriers previously reported in this review.

Similarly, Dobbs (2004) measured the importance of formal classroom and lab training for faculty and administrators' successful implementation of distance education through interactive television (ITV). Dobbs utilized the Stages of Concern Questionnaire (SoCQ) to survey 27 full-time faculty and administrators at the Texas State Technical College-Marshall (TSTC-M). Dobbs divided the sample into three groups. The first group received 9 hours of formal classroom training in three sessions of 3 hours every second week. The sessions consisted of hands-on activities and discussions to familiarize faculty with the technology and skills required for teaching at a distance. The second group received classroom training and 18 hours of lab training in the ITV classroom that included knowing and practicing with the equipment and a 10-minute presentation at the end. The third group did not receive any training and was considered the control group.

Dobbs (2004) administrated the SoCQ to the three groups prior to any training as a pretest. After the groups received the treatment, the SoCQ was again administered as a post-test. Respondents indicated in a 7-point Likert type scale the degree to which each concern was true. Dobbs conducted an analysis of variance (ANOVA) of the pretest data to validate the use of ANCOVA. She reported a significant F ratio at the $p < 0.01$ level of confidence in five of the seven stages of concern, and an additional stage at $p < 0.05$ level of confidence, validating the use of ANCOVA. Dobbs also conducted a linearity analysis between pre-test and post-test to meet the assumption of a covariate. Further, Dobbs conducted analysis of covariance (ANCOVA) to determine if differences occurred among the three groups. This analysis demonstrated a strong correlation at the $p < 0.01$ level between the pre-test and post-test in all seven stages confirming the validity of the analysis of covariance. Finally, independent *t*-tests were conducted on the comparison results of the groups to determine which differences among the groups were significant.

Dobbs' results showed no significant differences for Stage 0 (*awareness*), Stage 1 (*informational*), and Stage 2 (*personal*). However, significant differences were reported for Stages 3 to 6. In Stage 3 (*management*, $F = 7.40, p < .001$), results of post hoc analysis indicated that significant differences occurred between the classroom and laboratory group ($M = 17.11$) and the control group ($M = 11.51$). For Stage 4 (consequence, $F = 7.70$, $p < .01$) results indicated significant differences between the classroom and laboratory group ($M = 21.99$) the classroom group ($M = 14.61$) and the control group ($M = 11.51$). In Stage 5 (collaboration, $F = 7.14, p < .01$) significant differences were reported between the classroom and laboratory group ($M = 21.53$), the classroom group ($M = 17.00$), and the control group ($M = 14.14$). Finally, in Stage 6 (refocusing, $F = 6.52, p < .01$) significant difference was reported between the classroom and laboratory group ($M = 16.51$) and the control group ($M = 6.55$).

Because the classroom with lab group scored higher in stages 4, 5 and 3, in this order, while the classroom only group scored higher in stage 5, and significant differences between this groups occurred in stages 4, and 5, Dobbs (2004) inferred that the inclusion of the lab helped faculty to feel more comfortable with distance education in order to start instruction in the distance learning classroom. Finally, the control group had their concerns centered in stages 0, 1, 2. According to Dobbs, the control group was more concerned with individual position and well being with respect to the innovation. Dobbs concluded that lab training in addition to classroom for administrators and faculty are key factors for the success of a distance learning programs and that helps to institutionalize the innovation. According to Dobbs, faculty concerns change over time in a developmental way and, therefore, their concerns should be addressed at the point where they score on the SoCQ, and then activities should address their concerns so faculty can move to the next stages.

Snider (2003) conducted a study to evaluate the effectiveness of a program designed to integrate established and emerging technologies into the teacher preparation curriculum at the Texas Woman's University (TWU). Snider used the Concerns-Based Adoption Model (CBAM) as a framework for her study. The training process of teachers in TWU consisted in groups of teachers called Cohorts. Depending on their skills, the teachers in the Cohorts start as intern I, then move forward as intern II and finally as residents. Each category lasts one semester; the Cohort one started in fall 1999; and the Cohorts two and three started one and two semesters later respectively. Snider's study focused on the evolution of Cohorts two and three. Cohort two included 62 intern II's in fall 2000, 41 of whom continued as residents in spring 2001. Cohort three consisted of 66 pre-service teachers as intern I's in fall 2000, and 62 progressed to intern II's in spring 2001.

Snider (2003) used the following instruments: (a) Self-Evaluation Rubrics to assess technology proficiency that covered Basic Computer use (BCU), Advanced Computer use (ACU) and Internet Use (IU); (b) Stages of Concern Questionnaire (SoCQ) to assess faculty technology concerns; and (c) Training evaluation questionnaires to assess quality and utility. The BCU and ACU measured 7 dimensions, while the IU assessment measured 10 dimensions. Each dimension was assessed with four performance levels, with level three considered mastery. The BCU included the basic computer operation and file management basic tools (word processors, spreadsheets, graphics use, database use, hypermedia use, and networking). The ACU included use of instructional software, information literacy skills modification of instructional delivery, assessment, individualization of the educational program, professional growth and communication, and research and evaluation of technology use. IU included the use of e-mail, electronic lists, WWW, and search tools, among others.

As reported by Snider (2003), the SoCQ measures the concerns of faculty around three main clusters (i.e., self, task, and impact concerns). Snider reported Cronbach's alpha coefficients of internal consistency ranging from .64 to .83, and the test-retest correlations from .65 to .86. Snider used the SoCQ as pre-test and post-test assessments. Further, Snider (2003) used the quality and utility forms in which participants rated three items on a 6-point Likert-type scale (1 = *strongly disagree* to 6 = *strongly agree*). The items regarded the effect of the training on building technology proficiencies, increased understanding in technology integration, and improved motivation to integrate technology. Participants in Snider's study also evaluated the technology resources and training sessions based on their perception of its usefulness.

Snider's results obtained from the BCU show that the 20 (Cohort 2) and 42 (Cohort 3) future teachers perceive a significant improvement in their proficiency in the use of computers in all basic dimensions ($p < 0.01$). The strongest improvements in Cohort 2 were for spreadsheet and graphics use and word processing. For Cohort 3 the most significant advance was in database and graphics use as well as in general computer and spread sheet use. All Cohort 2 averages and four of six dimensions of Cohort 3 exceeded the mastery level.

Regarding the use of the Internet, Snider (2003) reported increased proficiency in 7 of the 10 dimensions ($p < 0.01$) but pointed out that faculty were still far from the mark of mastery in most dimensions except for e-mail and electronic mail lists (*M* = 3.58 and *M* = 3.40 respectively), e-mail and searching tools (*M* = 3.32 and 3.29, respectively), and e-mail and the World Wide Web (*M* = 3.1 1 and 3.20, respectively). In addition, Cohort 3 exceeded mastery in Internet basics (*M* = 3.05) on the post-test. Snider reported similar results in terms of the ACU completed by residents in spring 2001 (*N* = 35). On the posttest, residents' self-ratings exceeded mastery criterion in instructional software use (*M* = 3.12), modification of instructional delivery (*M* = 3.03), and professional growth and communication (*M* = 3.11). However, in the SoCQ results, Snider reported no significant differences in pre- and post-tests for the Cohort 2 pre-service teachers. In contrast, Sinder found significant differences for Cohort 3 in each domain except management for five out of six domains with significant differences ($p < .01$).

Snider (2003) pointed out that participants in Cohort 3 initially had relatively high informational and personal concerns (*M* = 5.14 and *M* = 4.97, respectively) as well as rather intense consequence and collaboration concerns (*M* = 4.87 and *M* = 4.55, respectively). Snider explained that this may reflect both their early limitations in technology knowledge and their appreciation of future responsibilities as teachers. Snider concluded that the post-test showed that awareness and informational concerns decreased significantly, while consequence, collaboration, and refocusing concerns increased.

Snider (2003) found that the acquired skill most frequently expressed was the improvement in technology knowledge and using computer resources as well as their ability to integrate technology in several ways to engage students, affect learning, and encourage higher order thinking. Snider pointed out that future teachers expressed concerns about the technology integration to the classroom, proficiency in use, time restrictions, and the availability of these resources in their actual classrooms. According to Snider, the first two concerns tend to diminish as the teachers advanced in the program, while the other two prevailed during the program. Snider suggested the benefit of being aware of the possible shortages in resources and the limitations of each case. Finally, Snider commented that faculty suggestions offered by the pre-service teachers were centered in the content of the sessions, in the form of knowing a broader spectrum of needs, from more hands-on basic skill development to a provision for testing certain skills levels.

Despite the extended used of CBAM in education, few studies have provided information about the reliability and construct validity of the Stages of Concern Questionnaire (SoCQ). Some researchers have pointed out inconsistencies of certain stages and some construct validity issues; for example, Kember and Mezger (1990) pointed out the unclear definition of the zero stage (i.e., awareness) and the difficulty of assigning a stage of concern to a faculty member who is unwilling to accept the innovation; however, they did not provide any alternative. Cheung, Hattie and Ng (2001) conducted one of the few studies found that provided empirical information about the reliability, construct validity, and simplex structure of SoCQ data and offered an alternative to this instrument. Cheung et al. (2001) used structural equation modeling to evaluate the application of the Stages of Concern Questionnaire (SoCQ) in a large scale curriculum innovation reform called the Target Oriented Curriculum (TOC). A total of 1,622 teachers participated in the study. They used the 35 items of Hall's SoCQ and added an extra item at stage 1 and at stage 4. Before they surveyed the population, they conducted a pilot study with 20 teachers to address clarity and readability of the survey.

The majority of participants in Cheung et al. (2001) study were women (81%). An important percentage of respondents had either no experience using the innovation (27%) or had 2 years of experience (26%). Only 10% of the participants had more than 2 years of experience in using the innovation. Cheung et al. (2001) reported results of the reliability test of Hall's 35-item, seven stage-model as moderate reliability (coefficients alpha ranging from .67 to .77, stage 0 subscales was the less reliable) with six items having relatively low item-total correlations (i.e., concerned about the area, limited knowledge about the innovation, effect of professional status, students' attitude toward the innovation, help other teacher with the innovation, and other approaches that might work better).

Cheung et al. (2001) further tested the construct validity of SoCQ data by the mean of confirmatory factor analysis using LISREL. Each item was allowed to load only in the stage of concern (SoC) that the item was designed to measure. The researchers calculated Chi-square ($\chi^2 = 1150$, $df = 205$), Root Mean Square Error of Approximation (RMSEA = .082), Goodness-of-Fit Index (GFI = .81), and Comparative Fit Index (CFI = .79) to assess the model fit and found that Hall's seven-stage model did not fit the data; all indexes were not satisfactory and the correlation among some factors were too high. Further, the researchers tested the structure of Hall's 35-item SoCQ which they believe is conceptually "the most critical aspect of the SoC model because it assumes a particular ordering of the seven SoC in the developmental hierarchy" (p. 228). Using the LISREL program, Cheung et al. conceptualized each teacher's concern as a causal chain leading from the first SoC to the second, and so on along the seven stages. They modeled each latent SoC to exert a linear influence on the five measured variables and to directly influence the next latent SoC only. According to Cheung et al., "Hall's hypothesized simplex model is empirically supported if it fits the real SoCQ data and if the intercorrelations of SoC variables display a simplex pattern." (p. 230). Results of their analysis showed that the model did not provide a good fit with the data leading them to conclude that the stages of concerns did not form a developmental hierarchy.

In order to improve Hall's SoCQ reliability, Cheung et al. (2001) used half of their sample to conduct exploratory factor analysis. After the analysis, the researchers retained only 22 items and five subscales resulted: Stage 0 (*awareness*), Stage 1 (*informational/personal*), Stage 2 (*management*), Stage 3 (*consequence/collaboration*), and Stage 4 (*refocusing*). The major changes were that the original items on Stage 1 were combined with Stage 2, and Stage 4 and Stage 5 formed a single stage of concern. Cheung et al. reported a slightly improved reliability of the 5-stage questionnaire as compared with the original 7-stage questionnaire, showing alpha coefficients of the five scales ranging from .75 to .84 and the total item-correlation of the 22 items ranged from .46 to .70. Further, they used the other half of the sample and tested the construct validity of the questionnaire through confirmatory factor analysis. Factor loadings above .5 for each item in the questionnaire validated the stages and correlations among the five factors lower than Hall's model (mean $r = .36$) confirmed that the 22 items could measure five relatively independent SoC constructs.

Cheung et al. (2001) reported a marginal model fit for the data ($\chi^2 = 1150$, $df =$ 205, GFI = .86, AGFI = .83, RMSEA = .085, TLI = .83, CFI = .85, PGFI = .70, PNFI = .73), but they pointed out that the overall model fit was better than other alternatives, including the original Hall's SoCQ. Furthermore, they found that the correlations among the five latent SoC constructs were concentrated adjacent to the main diagonal and systematically declined to a smallest correlation (pattern of a perfect simplex index). They also noted that stage 0 (i.e., awareness) did not follow the correlation pattern and that there was a little influence between stage 0 and 1 ($\beta = .16$) implying that stage 0 needed to be further revised. All other correlations were significant (stage 1 to stage 2, $\beta = .73$; stage 2 to stage 3, $\beta = .60$; and stage 3 to stage 4, $\beta = .77$).

To further test their SoCQ adapted model, Cheung et al. (2001) used the other half of their sample and examined the relationship between teachers' instructional experience with TOC and their stage scores. They divided the sample into three groups: non users, novices (less than 2 years of experience), and experienced users (2 or more years of experience). The researchers used Multiple Analysis of Variance (MANOVA) and found that the stage score for the three groups of teachers were significantly different from each other. Cheung et al.'s results showed that non-users had more intense Stage 0 concerns and less intense Stages 1, 2, 3, and 4 concerns. For novice teachers, Stage 0 decreased in intensity and others became more intense. Similarly, experienced teachers expressed more intense Stage four than novice did. However, as pointed out by Cheung et al., all three groups showed peak concerns at Stage 2 (management).

In summary, the concerns theory is a useful framework for the analysis of concerns of faculty in regard to the implementation of technology. The Concerns-Based Adoption Model (CBAM) proposed by Hall and Hord (1987) has been extensively used in educational settings, especially in terms of evaluating the effectiveness of staff development activities throughout the corresponding use of technology in teaching practices (i.e., effectiveness of transfer of training) (Adams, 2003; Dobbs, 2004; Kember

& Mezger, 1990; Snider, 2003). Despite the extended use of CBAM, most of the studies have only incorporated one dimension of the model by assessing teachers' concerns using the Stages of Concern Questionnaire (SoCQ) in isolation. Moreover, only few studies have provided empirical information about the reliability, construct validity, and simplex structure of SoCQ data (Cheung et al., 2001).

Assessing Self-Efficacy

Much of the computer self-efficacy literature focuses on a training context (Beas & Salanova, 2006; Bolt et al., 2001; Chou & Wang, 2000; Chuang, Liao, & Tai, 2005; Johnson & Marakas, 2000; Torkzadeh, Pflughoeft, & Hall, 1999). In the context of continuous technology changes, training, as professional development activity, can appear as a useful strategy to deal with the implementation of new technologies (Salanova & Graw, 1999). Research regarding transfer of training in the last decade found that self-efficacy is positively related to motivation, is a powerful predictor of performance, influences the effectiveness of training in transfer process, and is a moderator of other personal variables such as job satisfaction (Cheng & Ho, 2001). Additionally, the literature also suggests that gender may impact the relationship between computers and user attitudes and their perceived self-efficacy; findings in this area suggest that males have a more positive attitude toward computers and a higher perceived self-efficacy.

Chuang, Liao, and Tai (2005) argued that self efficacy would be predictive of learning partially via the mediation of trainees' motivation. They surveyed 250 undergraduate business students in eight remedial training classes offered by a business college. Participants indicated their level of agreement for each item in the survey with a

Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). The average age of the participants was 19 years old (*SD*=1.9) and they were majority female (77% female, 23% male). Chaung et al. (2005) measured training motivation and self efficacy using items adapted from Noe and Wilk (1993) and reported Cronbach's α of 0.82 and 0.71 respectively. Regression analysis showed that self efficacy was a significant predictor of learning ($\beta = 0.36, p < 0.01$) and training motivation ($\beta = 0.51, p < 0.01$) and that training motivation was a strong predictor of learning ($\beta = 0.45, p < 0.01$). The researchers also found that even when motivation was included in the equation, self-efficacy was still significantly correlated ($\beta = 0.18, p < 0.05$).

Torkzadeh, Pflughoeft, and Hall (1999) conducted a study to examine the relationship between attitude toward computers and computer self-efficacy. Torkzadeh et al. (1999) surveyed 414 undergraduates using a 30-item version of Murphy's instrument as pre- and post-test measures of attitudes and self-efficacy. The attitude part was measured with two questions: "I feel I have a positive attitude toward computers" and "I feel computers are helpful and useful." The items were rated on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). Torkzadeh et al. examined the construct validity of the 30-item computer self efficacy scale using principal components factor analysis with varimax rotation. Post-training responses were used for the factor analysis to avoid reactivity effects. Correlations between total scores and item scores were also used for validity. Items were eliminated if their correlation was less than or equal to 0.5 and if the factor loadings were greater than 0.4 on additional (non-primary) factors than the one intended to measure (multifactor loading). These criteria eliminated the items "I feel confident explaining why a program (software) will or will not run on a given computer" and "I feel confident storing software correctly."

Torkzadeh et al. (1999) clustered the remaining 28 items in 4 factors that explained 63.9% of the systematic covariance among the items. Factor 1 accounted for most of the covariance (44.8%) and consisted of nine items with loadings ranging from 0.65 to 0.80. The items defining this factor represent beginning-level computer skills. Factor 2 was defined by 10 items with loadings ranging from 0.49 to 0.75 and reflects advanced-level computer skills. Factor 3 was defined by six items with loadings ranging from 0.56 to 0.78 and reflects file and software management. Factor 4 was defined by three items with loadings ranging from 0.86 to 0.90 and reflects mainframe computer skills. This 28-item instrument had satisfactory reliability (Cronbach's alpha of .95). The reliability of each factor was as follows: beginning skills = 0.93; advanced skills = 0.88; file and software skills = 0.90; and mainframe skills = 0.95. The items regarding attitude loaded on the same factor with loadings of 0.85 and 0.85, explained 72.1% of the covariance among the items and had a reliability of 0.62.

Torkzadeh et al. (1999) tracked the difference in the perceived self-efficacy using a paired *t*-test procedure ($p = 0.001$) and showed that students entered the course with moderate self-efficacy, but that was greatly improved by the course. There was no significant difference in the improvements on self-efficacy based on gender. The average pre-training self-efficacy was 70 and 68 percentiles for males and females, respectively; and 81 and 80 post-training percentiles for males and females, respectively. Torkzadeh et al. found that respondents with negative attitudes toward computers did not improve their computer self-efficacy (there was no variation in respect to gender). The post training data showed that the negative attitude of respondents did not improve after the course while the attitude of respondents of positive attitudes further improved. Their results showed significant change in the overall respondent attitudes towards computers as they went through the course (t = -2.44, p = .015). Mean scores for the two attitude items were 8.11 (*SD* = 1.88) and 8.36 (*SD* = 1.78) for pre- and post-training, respectively. Similar changes were observed in mean scores for attitudes for male respondents for pre- and post-training; however, there were no significant changes in mean scores for female respondents for pre- and post-training. They concluded that positive attitudes toward computers can be reinforced by continuous improvement in training programs and that self-efficacy is normally improved after training except for the persons with a negative attitude toward computers.

Drawing from self-efficacy theory, Beas and Salanova (2006) conducted a study to examine the structure of self-efficacy and to analyze the relationship among different levels of self-efficacy and computer training, considering the effect of participants' attitude toward computers among information and communication technology (ICT) workers. Beas and Salanova used a cross-sectional design and surveyed a sample of 496 workers (50.6% men) from different occupational fields with the common characteristic of using information technology (IT) for at least 10% of their work time. One-third of the sample worked in administration, and the mean age of the sample was 32 (*SD* = 8.07).

To examine the structure of self-efficacy, Beas and Salanova (2006) hypothesized that different levels of self-efficacy, from more general to more specific, can be measured (i.e., generalized, professional, and computer self-efficacy). To measure the hypothesized levels of self-efficacy, the researchers used three instruments with a total of 15 items (see Table 4).

Table 4
Summary of Variables, Instruments, and Alpha Coefficients (Beas & Salanova, 2006)

Construct	Instrument & Response Format	Alpha
Job-related anxiety (6 items)	Psychological well-being related to work (Warr, 1990)	.81
Job-related depression (5 items)	Psychological well-being related to work (Warr, 1990)	.73
Self-efficacy (15 items)		
Generalized	General Self-efficacy questionnaire (Schwarzer, 1993)	.83
Professional	MBI-GS (Schaufeli, 1996)	.71
Computer	Self-constructed scale	.67
Computer attitude (7 items)	Self-constructed scale	.80
Computer-aided technology training (self-reported)		
# of courses		
hours of training		
Socio-demographic variables (self reported)		
Age, Gender, Educational Level		

Based on previous factorial analysis, the researchers separated professional self-efficacy into two factors (professional self-confidence and achieving professional objectives) therefore, creating four factors of self-efficacy. Beas and Salanova (2006) used a self-developed scale to measure computer self-efficacy and reported that construct validity for this scale was assessed successfully in a previous study. They tested the 4-factor structure of self-efficacy beliefs by performing a confirmatory factor analysis using AMOS (a structural equation modeling software). According to their results, the 4-factor structure of the self-efficacy beliefs did fit the data of the sample ($\chi^2 = 156.71$; $df = 84$;

AGFI = .96; TLI = .95; NFI = .92; CFI = .96 and RMSEA = .04) which means that different levels of self-efficacy can be measured.

To address the second purpose of the study, Beas and Salanova (2006) developed two additional hypotheses. In order to analyze the relationship among different levels of self-efficacy and computer training, they hypothesized that attitude toward computers will moderate the relationship of computer training (dependent variable) and self-efficacy (independent variable) and that more specific levels of self-efficacy (i.e., computer self-efficacy) will lead to stronger interaction effects of computer training moderated by attitude toward computers. Computer training was used as the dependent variable and measured as self-reported number of courses and total number of training hours received. Attitude toward computers was also a self-constructed scale (construct validity was previously assessed). Socio-demographic variables (i.e., age, gender, and educational level) were also self-reported. The researchers conducted four hierarchical multiple regressions, with attitude toward computers as the moderator variable. The stepwise regressions were performed with every dependent variable and the four factors of self-efficacy (i.e., generalized self-efficacy, professional self-confidence, achieving professional objectives, and computer self efficacy). In the first step they entered age, gender, and educational level; in the second step, they entered the number of training courses, number of hours of training, and attitude toward computers; and in the third step, they entered the calculated variable of number of courses by attitude toward computers and number of hours by attitude toward computers (for testing interaction effects). The researchers reported the final β values for each variable and tested the significance of each model (models considering the particular type of self-efficacy belief, socio-demographic factors, the dependent variable, and the moderator variable). They found that all models were significant: generalized self-efficacy, $R^2 = .129$, F = 2.76, $p \leq .01$; professional self-confidence, $R^2 = .16$, $F = 3.54$, $p \leq .001$; achieving professional objectives, $R^2 = .162$, $F = 3.57$, $p \leq .001$; and computer self- efficacy, $R^2 = .30$, $F = 7.88$, $p \leq .001$.

Beas and Salanova (2006) reported main effects of attitude toward computers (the moderator variable) for every factor of self-efficacy; however, they did not find interaction effects between the moderator and computer training (number of courses and hours of training) as they had predicted. The only significant interaction effect reported was between hours of training and professional self-confidence ($\beta = .17$, $p \leq .05$). They suggested that for those with negative attitudes towards computers, increasing number of hours of training is associated to a decrease in professional self-confidence. The researchers suggested that high levels of self-efficacy can help workers to cope with stressors more effectively. However, they could not confirm that more specific self-efficacy measures can better predict the dependent variable used in this study (i.e., computer training). Conversely, they suggested that generalized and specific measures of self-efficacy can be used to assess self-efficacy in a complementary manner. Yet, they noted that the more specific the self-efficacy measure in their study (i.e., computer self-efficacy) the more variance was explained (30% for computer self-efficacy as compared to 12% for generalized self-efficacy).

According to Beas and Salanova, socio-demographic variables seem not to be associated to generalized self-efficacy nor to professional self-confidence. As far as achieving objectives, they found that the younger the employee, the higher the self-efficacy belief is. In terms of the mediating effect of attitude toward computers over computer training, the researchers found that only attitude moderated the relationship between training and professional self-efficacy, which according to the researchers, correlated with other research (i.e., Beas, Llorens, & Salanova, 2000). According to the researchers, computer training did not have a main effect on self-efficacy, but interacted with attitude toward computers. They stressed the importance of attitude toward computers in the training process, as main effects were found on every level of self-efficacy.

So far, scarce research has focused on how self-efficacy influences the way employees face stress in the workplace, particularly in jobs that demand from the employees the learning and use of new technologies (Beas & Salanova, 2006). Fewer studies have focused on the adoption context (Liaw, 2002) or the ongoing use context (Agarwal and Karahanna, 2000; Deng, Doll, & Truong, 2004). The role of self-efficacy in an ongoing use context is more appropriated for the purpose of investigating implementation of large scale innovations, among other factors, due to the required active and self-directed users' behavior, the knowledge domain (task and software), and the nature of the appropriate support (expertise provided collegially).

Liaw (2002) developed and tested a conceptual model of individual perceptions of Web technology as a use and training tool with an integrated approach of the Technology Acceptance Model (TAM) and the Social Cognitive Theory (SCT). TAM suggests that two specific behavioral beliefs, perceived ease of use (EOU) and perceived usefulness (U), determine an individual's behavioral intention to use technologies; while SCT considers individual attitudes, motivation, and self-efficacy as behavioral indicators.

Liaw's model predicts that the higher the individual computer experience, the higher her/his Web self-efficacy; the higher the individual Web self-efficacy, the higher her/his Web usefulness, her/his intention to use the Web, and her/his Web enjoyment.

Liaw (2002) administered a survey to college students. The survey had three major components: computer experience, Web attitude scale and demographics. The survey was formatted as a 7-point Likert-type scale. A pilot was administered to examine validity of the instrument. The pilot was applied to 33 doctoral students; 20 responses were obtained (61%), 16 female and 4 male. There were 16 items on the Web attitude scale (Cronbach's alpha of 0.94 and corrected item-total correlation ranged from 0.20 to 0.91). Liaw surveyed 809 students from the white pages of the university and 263 returned the survey (32.5% response rate). The mean of the Web attitude scale was 91.88 ($SD = 14.31$). For the split-half coefficient the first half included the first 8 items. For the first half the mean was 45.08 ($SD = 7.63$); the second half had a mean of 46.80 ($SD = 7.63$). Corrected item-total correlations of the first half were from 0.47 to 0.79, while for the second half ranged from 0.58 to 0.80. The alpha coefficients were 0.87 and 0.91 respectively. The Cronbach's alpha for the total instrument was 0.93 and corrected item-total correlation ranged from 0.47 to 0.80.

Liaw (2002) analyzed six variables (i.e., Web self efficacy, Web enjoyment, Web usefulness, behavioral intention to use the Web, experience using the Internet/WWW, and experience with word processing packages). The bivariate analysis indicated that most variables were strongly correlated with each other ($r < 0.80, p < 0.01$) except for the correlation between Web usefulness and behavioral intention to use the Web ($r = 0.81, p < 0.01$). Liaw conducted multiple regression analysis and the results provided support of all the hypotheses. Also, the Web efficacy, enjoyment, and usefulness have positive effects on behavioral intention to use the Web. The results showed that self-efficacy plays a key role in perceptions and behaviors and, consistent to social cognitive theory, the experience improved self-efficacy. Also, consistent to the technology adoption model (TAM), self-efficacy had positive effects in enjoyment and usefulness.

Deng, Doll, and Truong (2004) explored the influence of self-efficacy in an ongoing context rather than in a training context. They argued that user autonomy, collegial support, and IT learning capabilities were important determinants of computer self-efficacy in an ongoing context. Deng et al. (2004) also investigated the direct and/or indirect influence of computer self-efficacy in the effective use of information technology and its impact in the workplace. They hypothesized that the user's autonomy in computer-mediated work will have a positive impact on the perceived impact of the user's application and on the user's computer self-efficacy. Also, they suggested that user's learning capabilities will impact the user's computer self-efficacy and the application use; and that the user's computer self-efficacy will have an impact in the user's intrinsic motivation, which in turn will have an impact in the effective application use.

Deng et al. (2004) surveyed 743 workers in a highly analytical engineering design firm; 153 responses were obtained (20.6% response rate). Demographics showed that 20.9% have used the software for more than 5 years; 54.2% between 1 – 5 years; 18.3% for several months, but less than one year; and 6.5% for several weeks, but less than a month. Most of the users were moderate to heavy users (40.5% used the software 'a great deal'; 25.5% used it 'much'; and 19.0% used the software 'moderately') and were highly educated (13.7% having a Ph.D. degree, 35.9% having a master's degree, 34.0% having a bachelor's degree, 7.8% having an associate degree, and 8.5% having only a high school diploma).

Deng et al.'s (2004) 54-item survey consisted of seven factors: computer self-efficacy (3 items), user autonomy (3 items), collegial support (3 items), learning capabilities (15 items), intrinsic motivation (3 items), effective IT use (11 items), and perceived impact of IT on work (16 items). The reliability of the seven factors was considered as acceptable (Cronbach's alpha of .74) and the validity for all seven variables as good (all item factor loadings equal .72 or higher). The Chi-square test used to measure discriminated validity between pairs of factors for one degree of freedom showed values above 12.21 for $p < 0.01$ indicating valid discrimination of the variables. The standardized solution for the combined measurement and structural model of Deng et al.'s (2004) model indicated good model fit ($\chi^2 = 221.07$, $df = 178$, $p = 0.01556$, RMSEA = 0.040, NNFI = 0.98, and CFI = 0.98) and the standardized structural coefficient (Γ) for the paths of the different variables allowed to validate the six hypotheses formulated. Deng et al. concluded that computer self-efficacy is related to effectiveness in the use of IT technologies in an indirect intrinsic way. They identified new promoters of computer self-efficacy in an ongoing environment (i.e., user autonomy and learning capabilities) and developed a model of conceptualization based in which they concluded:

> IT impact on work is a function of effective IT utilization and user autonomy in computer-mediated work. Effective IT use is a function of intrinsic motivation and the user's learning capabilities. Intrinsic motivation is a function of individuals' self-reflective thought about their own computer-mediated task performance. Finally, computer self-efficacy is a function of user autonomy, collegial support, and learning capabilities. (Deng et al., 2004, p. 407)

In summary, Bandura's self-efficacy theory provides a useful framework to analyze domains that are critical to technology implementation such as transfer of training. Although much of the computer self-efficacy literature focuses on a training context (Beas & Salanova, 2006; Bolt et al., 2001; Chou & Wang, 2000; Chuang, Liao, & Tai, 2005; Johnson & Marakas, 2000; Torkzadeh, Pflughoeft, & Hall, 1999;), some researchers have pointed out the need for analyzing self-efficacy in adoption context (Liaw, 2002) and ongoing use contexts (Agarwal & Karahanna, 2000; Deng, Doll, & Truong, 2004). The role of self-efficacy in an ongoing use context is more appropriate for the purpose of investigating implementation of large scale innovations, among other factors, due to the required active and self-directed users' behavior, the knowledge domain (task and software), and the nature of the appropriate support (expertise provided collegially).

Chapter Summary

Research consistently finds that policy is not enough to move effectively from innovation to change; real change is always personal and organizational change always painstaking (Evans, 1996). In general terms, the literature reported implementation of technology in higher education from two perspectives. Some researchers reported barriers and motivators (attitudes, usage, and perceptions) for implementing specific technology innovations and described the key factors to pass up further obstacles; some others looked at the implementation process considering the conditions fostering successful completion. Both approaches, however, point out aspects that facilitate the success of technological implementations and improve the chances of effective, lasting change.

This literature review considers both perspectives and focuses on factors contributing to the successful implementation of Web-based instruction. The majority of studies reviewed in the literature used multiple inquiry method – both quantitative and qualitative methods – typically using surveys as the method of data collection, with an open-ended question portion which allows for a qualitative aspect. Given the fact that 30% of articles published in distance education journals have been classified into case studies (Lee, Driscoll, & Nelson, 2004), selected pure qualitative studies investigating a single technological implementation program or organization were also included in the review.

The number of studies using experimental research methodology with identifiable questions for inquiry, specified methodologies, and collection and analysis of original data is relatively small in the literature. Few studies use formal theory to focus research questions, guide inquiry, and interpret findings. The majority of the studies found are descriptive in nature, documenting aspects of faculty participation, barriers, and motivators. In terms of the statistical method of analysis, the most commonly used techniques were ANOVA, Chi-square analysis, Regression, and Factor Analysis. However, psychometrics concerning validity and reliability were not properly addressed in the majority of studies. As stated by Lee et al. (2004), "the validity and reliability issues [in distance education research] seem to be of minor concern among the researchers" (p. 239). Also, few studies reported the result of power analysis, which is needed statistically to generalize the results in other contexts. Most of the studies did not report how they obtained adequate sample size, nor did they report effect size.

Analysis of the literature shows that usage, concerns, motivators, and faculty perceptions are the criterion variables that have received more attention. For instance, most of the studies looking at obstacles focus on faculty technology usage, faculty attitudes about technology, and faculty perceptions toward the incorporation of technology into instruction (Crooks et al., 2002; Gammill & Newman, 2005; Gueldenzoph, et al., 1999; Inman & Mayes, 1998; Vodanovich & Piotrowski, 2001, 2005). The most common predictors studied were age, gender, discipline, rank, and years of teaching experience. Other predictors studied were teaching style, perceived effectiveness of instructional technology, perceived access to technology, level of participation, and perceived administrative support.

In terms of findings, the barriers most commonly identified were those related to time pressures and perceived lack of training and skills, with equivocal or no significant differences across the set of predictors (i.e., gender, rank, age, and teaching experience). In the field of distance education, particularly as related to the implementation of distance education in dual-mode universities, the majority of factors that are barriers to teaching online are found in the areas of administrative and technical support (Maguire, 2005). Of all the barriers cited by faculty and administrators, perhaps the two most frequently mentioned are the lack of technical support (Betts, 1998; Lee, 2002; Schifter, 2000; Wilson, 1998) and the lack of recognition from the administrators and peers in the form of credit towards tenure and promotion (Betts, 1998; Lee, 2001; Rockwell et al., 1999; Schell, 2004; Schifter, 2000; Wilson, 1998). Research has also found that faculty attitudes change, becoming more favorable with experience in teaching distance education courses (O'Quinn & Corry, 2002; Schifter, 2002). Furthermore, research has also suggested that barriers are perceived greater in the early stages of implementation and that barriers decrease when the organization gains experience and expertise in distance education skills and technologies (Berge et al., 2002).

As far as motivators, research suggests that intrinsic motivators – e.g., striving to improve student learning – plays a more important role as a factor in convincing faculty to incorporate ODL. Other motivators reported by literature include personal motivation to use technology (Betts, 1998; Bonk, 2001; Lee, 2001; Rockwell et al., 1999; Schifter, 2002), collegial support and recognition (Rockwell et al., 1999), and the opportunity to use technology more innovatively to enhance course quality and develop new ideas (Betts, 1998; Dooley & Murphrey, 2000; Rockwell et al., 1999; Schifter, 2000). However, research has also shown that agreement with the principles of Web-based strategies and positive attitudes toward the implementation of Web-based technologies do not necessarily correspond to the degree in which faculty actually teach according to the principles of the innovation (Geijsel et al., 2001). Further investigation is needed to address the issue of positive perception but scarce implementation. Additionally, research has identified differences between administrator and faculty perceptions of use of technology (e.g., Kambutu, 2002; Shea et al., 2001; Schifter, 2002) and perceptions with regard to instructional support (Lee, 2002; Schifter, 2002). Findings of these studies reveal that, in general, faculty and administrators do have different concerns, motivators, and perceptions of instructional support in terms of the implementation of Web-based instructional technology.

Considering the conditions required for implementing a technological innovation, researchers have mainly considered individual characteristics and environmental factors as the two main avenues to cluster their findings. Eight conditions found by Ely (1999) (i.e., dissatisfaction with *status quo*, knowledge and skills, resources, time, incentives and rewards, participation, and leadership) have been the starting point of numerous empirical studies. Although proved to be present in successful implementations, neither the role of the setting in which the innovation is implemented nor a hierarchy among the conditions has been clear (Ely, 1999). Moreover, the evaluation of a technology implementation model by Sherry et al. (2000) suggested that factors that support faculty in the implementation process vary on each stage of implementation. According to Sherry et al., while in the first phases the technical support and accessibility to technology is critical, in later stages of implementation leadership and administrative support become key factors. Sherry et al. also recognized that during the advanced stage of evaluation, new capacities emerged, leading to new needs and the requirement of new strategies.

Despite the fact that research recognizes staff development and resource allocation as critical factors in the implementation of technological innovations, they are never seen as sufficient conditions. Empirical research has found only a small positive impact of professional development activities on implementation of large-scale innovations (Geijsel et al., 2001) and has shown that informal activities such as "just in time learning" and "coaching" are considered by faculty as most influential (Granger et al., 2002). Moreover, recognizing that feelings of uncertainty negatively influence the implementation of innovations (Geijsel et al., 2001), the presence of leadership as a condition for managing successful implementation of technology has gained more attention during the last decade (Owen & Demb, 2004). Particularly, transformational leadership has shown positive effects on the implementation of innovations (Geijsel et al., 2001). A condition often mentioned is the role of leadership in inspiring a shared vision about what change means, sharing decision-making, supporting change, and modeling the way (Albury, 2001; Gmelch, 2002; Roepke et al., 2000; Romm & Pliskin, 1999).

As reviewed in the literature, technology implementation is a highly complex and dynamic process. The concept of concerns is a useful way to understand the complex and dynamic states of emotion and thought that people have when facing a change (e.g., implementation of technology). Hall and Hord's Concerns-Based Adoption Model (CBAM) addresses key aspects of the change process by considering affective issues embedded in the type of questions people ask as they progress in the implementation of educational innovations. According to Hall and Hord (1987), the particular type of questions falls into one of the 7 stages of concern (i.e., awareness, informational, personal, management, consequence, collaboration, and refocusing) that can be clustered in three levels: self-concerns, task-concerns, and impact-concerns. The CBAM has been extensively used in educational settings, especially in terms of evaluating the effectiveness of staff development activities throughout the corresponding use of technology in teaching practices (i.e., effectiveness of transfer of training). Even though, empirical research has not yet confirmed the hypothesized simplex structure of Hall's Stages of Concern Questionnaire (Cheung et al., 2001), this instrument has proved to be a useful way to measure concerns of people facing implementation of innovations (e.g., Adams, 2003; Dobbs, 2004; Kember & Mezger, 1990).

In addition to the stages of concern dimension, the CBAM proposes eight levels of use that focus on general patterns of individuals' behavior as they prepare to use, begin to use, and gain experience implementing the innovation (i.e., *nonuse, orientation, preparation, mechanical, routine, refinement, integration*, and *renewal*). In addition to levels of use and leadership interventions, the inclusion of psychological constructs as factors associated to faculty technology use and perceptions of support are notable deficiencies in the literature on technology implementation. Indeed, Lee et al. (2004) noted that "practices that reflect educational and psychological theory have rarely been found in distance education and educational technology journals" (p. 237). In this context, research outside the educational field (e.g. social theory and organizational psychology) can be beneficial for understanding implementation of technology. For instance, research has suggested reasons for the lack of transfer of training. Among the independent variables studied, self-efficacy is considered one of the most important individual variables located in the phase of pre-training or prior to the training in itself, together with other cognitive abilities and locus of control (Beas & Salanova, 2006). Research about transfer of training in the last decade found that self-efficacy is positively related to motivation, is a powerful predictor of performance, influences the effectiveness of training in transfer process, and is a moderator of other personal variables such as job satisfaction (Cheng & Ho, 2001).

Bandura's self-efficacy theory provides a useful framework to analyze domains that are critical to technology implementation such as participation in development programs, transfer of training, and the solving of everyday problems that can interfere with one's professional goals. Because large scale implementations involve both domains of knowledge task and software and require the active participation of implementers and self-directed users' behaviors (Deng et al., 2004), the role of self-efficacy in an ongoing use context, rather than in the training context, is a most appropriate framework for analyzing the nature of faculty concerns and perceptions of institutional support for the implementation of Web-based instructional technology (WBIT) in higher education.

Research is needed in terms of measuring the influence of psychological constructs in the development of concerns of faculty and administrators and how those feelings relate to their perceptions of support for the implementation of WBIT.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to analyze faculty levels of implementation of Web-based instructional technology (WBIT) and computer self-efficacy beliefs as factors associated to faculty perception of institutional mechanisms and their relative importance as conditions supporting the implementation of WBIT. Previous chapters have outlined the need for this investigation and have examined related literature associated with faculty concerns, faculty levels of technology use for instruction, and conditions for successful implementation of technology. As stated in the literature review, the development of a profile of WBIT implementation in higher education is anticipated to provide insight for the development of strategies, especially related to the improvement of professional development activities, leadership interventions, and administrative practices necessary for large scale implementations to succeed in dual-mode higher education institutions.

This chapter describes the study's research design, research objectives and questions, methods, and procedures. First, the study's specific objectives, research questions, and associated hypotheses are provided. Then, the selection of the methodology is detailed followed by a description of the population profile and sample size. Then the instrumentation, pilot testing, and data collection procedures are provided.

Finally, the data analysis section describes the statistical procedures that were used to assess each research question.

Research Design

Objectives of the Study

In designating the purpose of this study, the researcher sought to pursue the following objectives: (a) identify and analyze faculty levels of concern and levels of use of Web-based instruction, (b) identify faculty self-efficacy beliefs and analyze the relationship between faculty computer self-efficacy beliefs and levels of WBIT implementation, and (c) identify and analyze faculty perceptions of conditions supporting the implementation of WBIT.

Research Questions

Using Ely's (1990, 1999) conditions that facilitate the implementation of educational technology innovations, the Concerns-Based Adoption Model (CBAM) (Hall & Hord, 1987, 2001), and constructs of Self-Efficacy Theory (Bandura, 1986, 1997), the purpose and specific objectives of this study are guided by the following research question: Are the conditions considered by faculty as important for the implementation of WBIT perceived differently across levels of implementation?

The following are the associated research questions (RQs) of the study:

RQ1. What are the Stages of Concern and Levels of Use with respect to faculty using Web-based instructional technology?

RQ2. What, if any, is the relationship between Compeau & Higgins' (1995) measures of computer self-efficacy and faculty levels of implementation of Web-based instructional technology (Stages of Concerns and Levels of

Use)?

RQ3. Do Stages of Concern, Levels of Use, and computer self-efficacy beliefs affect the perception of faculty in regard to the relative importance of Ely's conditions in supporting the successful implementation of technology?

Null Hypotheses (NH's):

NH1. Present concerns of faculty using Web-based instructional technology (WBIT) will not be predicted by individual characteristics and levels of WBIT use.

NH2. Faculty Levels of Use of WBIT will not be predicted by individual characteristics and computer self-efficacy beliefs.

NH3. There will be no significant correlation between measures of computer self-efficacy and faculty Stages of Concern and Levels of Use.

NH4. There will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use of WBIT) when self-efficacy beliefs are taken into consideration.

Selection of Methodology

This cross-sectional study, exploratory in nature, relied largely on quantitative methods supported by survey methodology. In the social sciences, survey research is a well-established methodology for exploring attitudes by asking people specific questions. Survey methodology utilizes the field survey as the primary method of gathering information about selected groups. There are several methods of collecting survey data ranging from interviews conducted face-to-face or by phone to self-administered questionnaires. According to Dillman (2007) there is a societal trend toward self-administration of surveys in part because of the lower cost involved and in part due to the fact that organizations are able to conduct such surveys themselves without the need of a contracted professional organization. Additionally, researchers "have found considerable evidence that the method of data collection affects the answers obtained" (Tourangeau, Rips, & Rasinkiski, 2000, p. 312). According to Bradburn (1983), self-administered questionnaires generally obtain higher levels of reporting of sensitive behaviors than do face-to-face interviews. Dillman (2007) suggested that self-administered surveys that had achieved a high response rate, regardless of the way they are presented to participants, share in common the main features of the Tailored Design perspective:

> These surveys had much in common. Each was designed according to the principles of social exchange theory regarding why people do or do not respond to surveys. Each used multiple contacts and respondent-friendly questionnaires. Communications were carefully constructed so as to emphasize the survey's usefulness and the importance of a response from each person in the sample… It is the development of survey procedures that create respondent trust and perceptions of increase rewards and reduce costs for being a respondent, that take into account features of the survey situation, and that have as their goal the overall reduction of survey error. (Dillman, 2007, p. 4)

Self-administered questionnaires are also poised to benefit from information technologies. "While the principles of survey research have remained largely unchanged, general trends in survey research during the last half century undoubtedly contributed to the emergence and development of computer-based survey collection methods" (Couper & Nichols, 1998, p. 4) eliminating laborious procedures and reducing the loss of data quality. With the previous considerations in mind, the survey in this study took the form of a computerized self-administered questionnaire accessible via Internet.

Because the accuracy of surveys depends on the accuracy of respondent answer, content and construct validity in survey methodology depends on careful instrument construction and survey administration. The field survey used in this study was consisted of two previously validated questionnaires, two self-developed questionnaires, and a check list section (See Appendix B). The survey was implemented according to procedures recommended by Dillman (2007) as described in the data collection section of this chapter.

Population Profile and Sample

Population Profile

The universities selected for participation have experienced a natural, non-systemic incorporation of WBIT and as such provided the study with a natural profile of faculty concerns and efficacy beliefs across different levels of implementation.

The Council on Postsecondary Education (CPE) coordinates change and improvement in Kentucky's postsecondary education system. Each institution publishes its own reports and information. According to the most current published Fact Book in the CPE's Website, the total population of full time faculty actively teaching was 4,211, distributed by university as shown in Table 5.

Sample Size

Many of the principles of survey research are not fully met under real-life conditions. As noted by Couper and Nichols:

> Precise population definitions, exhaustive sampling frames, full probability sampling methods, thoroughly pretested questionnaires, and fully-successful field operations are not always attainable. A variety of survey errors result from applying these principles in practice. These include coverage errors, sampling errors, nonresponse errors, and measurement errors, some reflecting errors associated with the mode of administration. (1998, p. 3)

In particular, a factor affecting computerized survey response is the dependence on the reliability of automatic mailing lists available to reach the population of interest, in other words the making of contacts by e-mail only. Even if an e-mail is sent to the entire population comprising the mailing list, several issues ranging from users' accounts that have been removed from the list to users' e-mails being over quota, the number of recipients can be dramatically reduced after the server's first attempt to deliver the message.

Table 5.
Population of Full-Time Faculty by University (University's Fact Book, 2006-2007)

University		Full-time Faculty
Eastern Kentucky University	(EKU)	650
Morhead State University	(MSTU)	384
Northern Kentucky University	(NKU)	567
Murray State University	(MSU)	396
Western Kentucky University	(WKU)	729
University of Louisville	(UofL)	1485
Total population		**4211**

A proportional random sample of 2,000 faculty members actively teaching was drawn from the 4211 full-time faculty members teaching at six selected universities in the Commonwealth of Kentucky, who voluntarily agreed to participate in the study after receiving an e-mail invitation (See Appendix A). Considering Lauter study tables for α = .05, *power* = .70 and an anticipated moderate effect size, the sample size requirements for Hotelling-Lawley trace criterion for six-group, eight dependent variable MANOVA conducted in the present study was of 86 subjects per group. Therefore, to gain a significant sample of the faculty population, the researcher determined to achieve the participation of at least 516 subjects (approximately 11% of the population).

Instrumentation

Study data were collected through a computerized, 65-question, self-administered survey, distributed in five multiple choice/selection sections. Table 6 shows the order of the sections in the survey and a brief description of each questionnaire. A detailed description of those instruments, their origins, and psychometrics is provided in the following sections of this chapter.

Table 6.
Web-based Survey Sections

Survey section	Questionnaire Description
Section 1	Levels of use of Web-based technologies for teaching consisting of five to ten questions, depending on the decision tree programmed according to the Interview Protocol described by Hall and Hord's (1998) Levels of Use theoretical framework.
Section 2	Levels of concern about using Web-based technologies for teaching comprising 35 questions from the CBAM Stages of Concern questionnaire (Hall & Hord, 1998, 2001)
Section 3	Computer self-efficacy comprising 10 questions from the Compeau & Higgins (1995) inventory.
Section 4	Conditions supporting technology use consisting of eight conditions from Ely's (1990) framework.
Section 5	General demographic information consisting of 11 research-developed questions.

Levels of Use Questionnaire (copy in Appendix B).

The Levels of Use (LoU) questionnaire was developed based on the Basic Interview Protocol (Hall et al., 2006) from the CBAM theoretical framework (see copy in Appendix B). As reported by Hall et al. (2006), two large cross-sectional longitudinal studies by Hall and Loucks (1977) provided data about typical LoU distributions. In the interview protocol, the questions asked to participants unfold according to the participants' responses. This branching format is based on seven dimensions of use: (a) knowledge, (b) acquiring information, (c) assessing, (e) planning, (f) status reporting, and (g) performing.

Given the nature of the instrument used to collect data (i.e., a one-to-one interview process) the validity of the CBAM LoU instrument is based on qualitative methods of data analysis. Two major comparisons of the data were made as estimates of the validity of the LoU interview (ethnographer ratings and consensus ratings of the independent readers of the protocols compared with consensus LoU interview rating). Correlation coefficients from those comparisons ($r = .98$ and $r = .65$, respectively) confirmed consistency between findings of the interview and observations. Several studies have confirmed the utility of the Basic Interview Protocol as a valid measure; however, the procedure is rather costly and logistically problematic, making their use impractical for all applications. In addition to the cost involved in interview processes, qualitative data analysis involves hours of recorded interview revising and more than one person to interpret and cluster data to ensure reliability.

Because of the costs and logistics involved in interview processes, there have been several attempts to develop paper-based questionnaires to measure the LoU construct; however, they have failed to include rigorous psychometric analysis (i.e., measures of validity and reliability). For instance, using a program evaluation study, Roberts (1995) developed an interactive instrument to assess LoU in teaching with technology. The self-administered version of the instrument as constructed by Roberts reduced the threat to internal validity but relied solely on participants' descriptions of technology use. She collected data in two forms: Self-profile LoU (raw data) and data for qualitative analysis (descriptions of activities corresponding to each selected personal level of use). From Roberts' analysis, four dimensions of behavior emerged: (a) acquiring information, (b) taking action, (c) assessing, and (d) sharing. Similarly, three levels of use emerged from her data: (a) Non-use (LoU 0, I, II); (b) Focus on use (LoU III, IVA, IVB); and (c) Focus on improvement (LoU V, VI).

For the purpose of the present study, an adapted version of the Basic Interview Protocol was designed and programmed using PHP code to produce a dynamic Web questionnaire. This adapted version considered the branching chart suggested by Hall et al. (2006) and provided an automatic decision tree for participants' classification into one of seven levels of use. The flow diagram shown in Fig. 2 shows the decision tree that the participants went through as they answered the questions in this section of the survey. The wording of the anchor questions remained as in Hall et al.'s (2006) Basic Interview Protocol; however the possible answers were not kept open, instead they were categorized according to the guidelines for interpreting participants' responses provided in the manual for measuring Levels of Use (Hall et al., 2006) and considerations from the LoU instrument constructed by Roberts (1995).

Participants in the present study were asked to answer the LoU questionnaire considering their current use of WBIT in teaching. For the purpose of conducting further psychometrics of LoU data obtained using the dynamic Web questionnaire, a self-reported level of use of Web-based technologies for teaching was collected in the demographic section of the questionnaire by using four levels of use (i.e., non-user, inexperienced user, experienced user, advanced user). Data obtained from that question was assessed for correlation with LoU data.

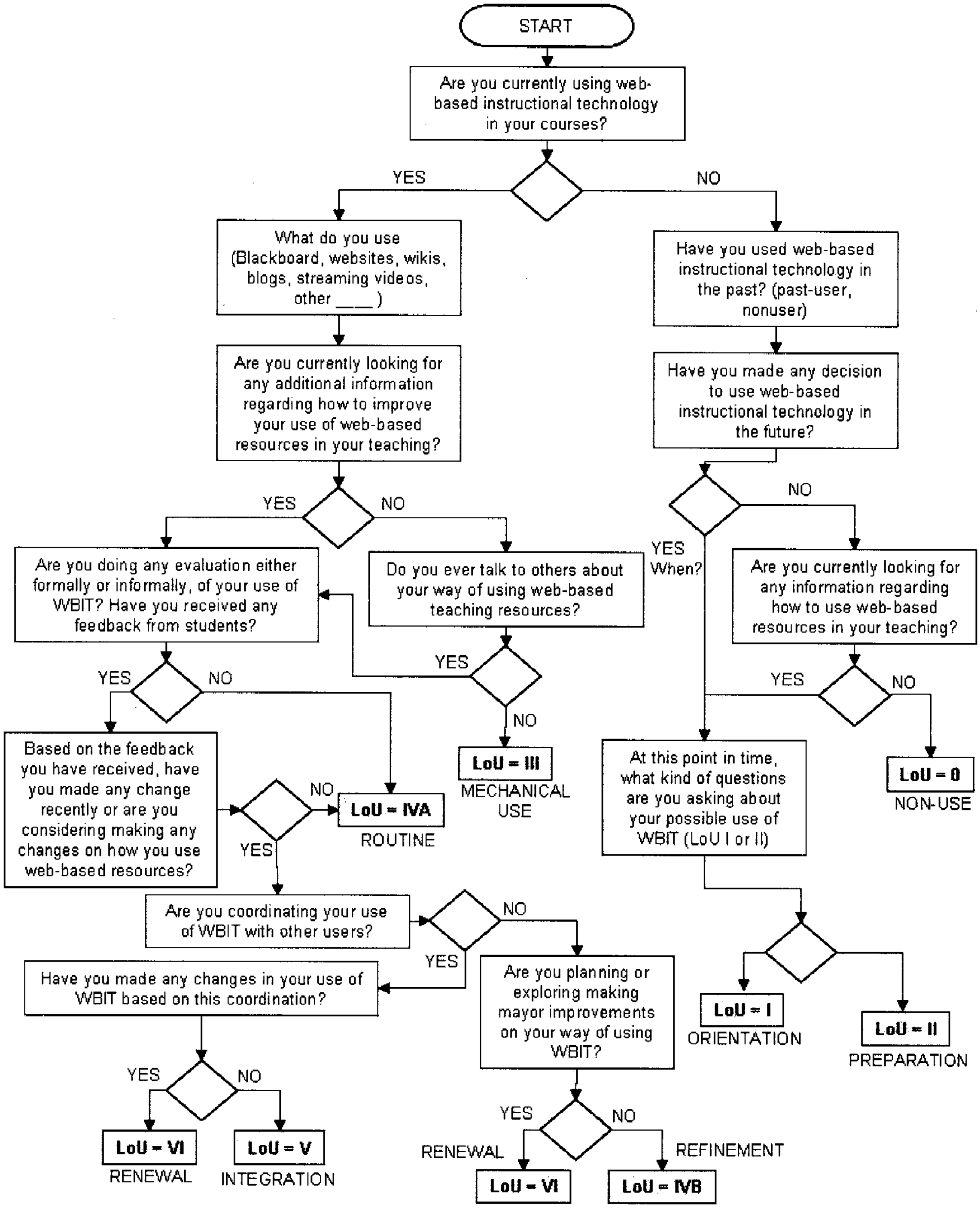


Figure 2. Flow diagram for measuring Levels of Use (Adapted from Hall et al., 2006)

Stages of Concern Questionnaire

The Stages of Concern Questionnaire (SoCQ) consisted of a multiple-choice, 35-item instrument based on a 7-point Likert type scale (1 = *Not true of me now* to 7 = *Very true of me now*) used to measure faculty concerns (see copy in Appendix B). As explained in previous chapters, the SoC suggests a possible developmental progression of people's concerns across seven stages as illustrated in Table 7. The questionnaire items were developed from typical responses of school and college teachers, who ranged from no knowledge at all about various programs to many years of experience in using them (George, Hall & Stiegelbauer, 2006).

Table 7.
Stages of Concern (Hall & Hord, 2001, p. 61)

Stages of Concern	**Expression of Concern**
	Impact Concerns
6. Refocusing	I have some ideas about something that would work even better.
5. Collaboration	I am concerned about relating what I am doing with what other instructors are doing.
4. Consequence	How is my use of the innovation affecting students?
	Task Concerns
3. Management	I seem to be spending all my time getting material ready.
	Self Concerns
2. Personal	How using it will affect me?
1. Informational	I would like to know more about it.
0. Awareness	I am not concerned about it.

Five statements were selected to represent each one of the seven fundamental SoC shown in Table 7. Validity of the SoCQ was assessed by examining how scores on the seven Stages of Concern scales related to one another and to other variables. As reported by George et al. (2006) there was evidence that items in the SoCQ will correlate more highly with the stage to which they have been assigned than with the total score. Correlations reported from a pilot study were .68, .78, .45, .82, .77 for stages of concern 1 through 6, respectively (May 1974, n = 363). "This correlational evidence indicated that the items on a particular scale tended to have similar responses, the inference being that the items in each scale measured a notion [category of concern] distinct from notions measured by other scales" (George et al., 2006, p. 13). As far as reliability, George et al. reported group reliabilities above .58 ($p < .01$) for six of the seven Stages of Concern and only one non-significant reliability ($r = .42$, $p = .06$) for Stage 3.

Arguably, Hall and Hord's Stages of Concern Questionnaire (SoCQ) is "the most rigorous technique for measuring concerns [of faculty regarding implementation of innovations] that has strong reliability estimates (test/retest reliabilities range from .65 to .86) and internal consistency (alpha-coefficients range from .64 to .83)" (2001, p. 68).

In the present study, participants were asked to respond to the 35 SoCQ items in terms of their present concerns about their use or potential use of Web-based instructional technology for teaching. For the completely irrelevant items, participants were asked to select *0* on the scale. For the items that represented concerns that participants had, they were asked to select the degree of intensity using a seven-point Likert type scale (1 = *Not true* to 7 = *Very true*).

Computer Self-efficacy Questionnaire (copy in Appendix B)

The particular domain of function analyzed in this study is the use of computers and specifically, the use of computers to use Web-based instructional technology in teaching. Self-efficacy measures utilize a micro-analytical research strategy. In this methodology, participants are presented with self-efficacy scales representing tasks varying in difficulty, complexity, or stressfulness. Participants are asked to judge what they can do and their degree of certainty that they can execute the tasks. "This methodology permits a microanalysis of the degree of congruence between self-percepts of efficacy and action at the level of individual tasks" (Bandura, 1986, p. 422).

Following Bandura's recommendations, Compeau and Higgins (1995) developed a computer self-efficacy (CSE) questionnaire that measures an "individual's perceptions of his or her ability to use a computer in the accomplishment of a job task" (p. 193). The CSE questionnaireconsisted of 10 items, using a 10-point Likert-type scale that incorporates task difficulty and self-efficacy magnitude differences. Self-efficacy strength is captured in the response scale (which measures levels of confidence in the judgments of ability). CSE has demonstrated high reliability, discriminate validity, and nomological validity (Compeau & Higgins, 1995).

For the purpose of this study, participants were asked to respond to the CSE questionnaire assuming that they were given new Web-based software for use in some aspect of their teaching. They were required to indicate whether they could use such unfamiliar software under a variety of conditions. For each question, they were asked to rate their degree of confidence using a 10-point Likert-type scale (1 = *Not confident at all* to 10 = *Totally confident*).

Conditions Supporting Technology Implementation Checklist

In order to operationally define the conditions for the analysis of the third research question, the present study considered Ely's (1999) conditions fostering successful implementation of technology (i.e., dissatisfaction with *status quo*, knowledge and skills, resources, time, incentives and rewards, participation, leadership, and commitment) as described in previous chapters. In this study, use of technology is limited to Web-based instructional technology (see copy in Appendix B). As stated previously, Ely's conditions have been the starting point of numerous empirical studies and their presence have proved to positively influence the implementation of technology and program innovations.

The purpose of this section of the survey was to learn about participants' perceived relative importance of the conditions described by Ely (1990). In the online survey, a brief description of the conditions was provided to participants. Participants were asked to rank the relative importance of each one of the eight conditions considering their current level of implementation (rank from 1 = *the most important for me at this time* to 8 = *the least important for me at this time*). Data collected from this section of the questionnaire were analyzed considering SoC, LoU, and CSE data as explained in the following chapter.

General Demographic Questionnaire

This section of the survey consisted of 11 multiple-choice/selection items (see copy in Appendix B). The items were designed for this study to collect basic demographic information from participants. In order to analyze further data, information from the selected demographic section was used to classify participants into categories.

Information in this section of the survey included the following for each participant:

- Age and gender,
- Position (Faculty/Administrator),
- Work status (Instructor/Professor Rank – Assistant, Associate, Tenured/Non-Tenured),
- Teaching area (Social Sciences, Natural Sciences, Health Professions, Education, Engineering, Business, Arts & Humanities, Agriculture),
- Teaching experience and online teaching experience (in years),
- Participation in professional development activities regarding the use of Web-based technologies, type of training (i.e., mandatory or voluntary),
- Self-reported level of training (basic level, intermediate level, advance level, teaching others), and
- Self-reported level of experience in the use of Web-based technologies for teaching.

Pilot Study

The purpose of a pilot study is to establish instrument content validity and to improve the questions, format, and scales (Creswell, 2003). In order to obtain feedback about the structure and individual questions within the instrument, the researcher identified a sample of 20 actively teaching faculty members, who were not included as part of the sampling for the main study. Participants for pilot testing were purposefully selected to represent a variety of levels of implementation of WBIT and a wide range of computer self-efficacy levels. The pilot study provided the researcher with a pre-test step that helped to catch grammatical and typographical errors; to ensure clarity regarding the procedure, instructions, and wording of questions; and to determine a reasonable procedural time estimate for inclusion in the invitation e-mail message for the main data collection.

Each pilot participant was personally approached by the researcher via e-mail and asked to complete the instrument and comment about the pertinence of questions, clarity of directions, and length of the survey. Faculty members who participated in the pilot testing received an e-mail message explaining the pilot study procedure and providing the Web link to access the survey. After completing and submitting the instrument, participants were taken to a screen that allowed them to submit anonymous feedback along with their estimated completion time.

Nineteen of the 20 participants completed the instrument. Completion of the instrument took between 18 to 24 minutes, with an average of 19.6 minutes. As a result, a time estimate of 20 minutes was determined for inclusion in the invitation e-mail and the informed consent form. Other areas of feedback, such as typographic, grammatical, and procedural, were registered as well. The most significant results of the pilot were that the procedures and the visual design of the survey were appropriate and functioned as expected. The majority of the feedback received from participants centered upon language they found unclear. Other comments included ambiguity; for instance, some of the participants were uncertain of the discipline area they had to choose. As a result, a more specific discipline breakdown was incorporated into the final version of the survey.

A strong concern raised by participants in the pilot study was the scale used in the Stages of Concern Questionnaire (SoCQ), as well as the ambiguity of some of the SoCQ questions. Participants believed that the seven scale provided in this section of the questionnaire was unnecessary and confusing. Additionally, the original SoCQ questions, which contained the first 35 questions of the instrument, were identified by pilot participants as sometimes unclear or problematic, especially because of the generic nature of the questions. Several pilot participants suggested changes in the questions in order to improve clarity; however, copyright permissions were given to the researcher to use the SoCQ "as is" (See Appendix A) and the researcher was concerned about maintaining the original validity and reliability measures of the instrument. Thus, this part of the survey remained the same after pilot testing. All other recommendations were incorporated into the final version of the instrument.

According to the principles for constructing Web surveys developed by Dillman (2007) a well-designed survey should include in the first section "questions that are likely to be interesting to most respondents, easily answered, and fully visible on the welcome screen of the questionnaire" (p. 378). Thus, the SoCQ section of the survey was identified as a threat to survey response rate after pilot testing. The strategy followed by the researcher was to move the SoCQ section to be the second section in the survey. Instead of answering the SoCQ first, participants were asked to answer the Levels of Use dynamic questionnaire first. The Levels of Use questionnaire contained a series of screens presenting two or three questions at a time, giving participants the idea of moving quickly throughout the survey. A copy of the final version of the survey questions and organization of sections is provided in Appendix B.

Data Collection

Study data were collected through a Web-based self-administered survey. Faculty members participating in the study were invited via e-mail to complete a multiple selection online survey with five sections as described in a previous section of this chapter. This Web-based survey was programmed in accordance to the University of Louisville's Institutional Review Board (IRB) standards to provide anonymity to participant responses. A dedicated Web site was developed and hosted at Western Kentucky University, Office of Distance Learning, for the purpose of data collection.

The survey was designed following recommendations for designing Web surveys made by Dillman (2007). The survey was programmed so that respondents were able to complete all sections in approximately 20 minutes. Participants were asked to answer all 65 questions of the survey at their own convenience, but advised that they would need to complete all questions at once. Participants gained access to the survey through a Web link distributed via e-mail after a first contact was established through a pre-notice e-mail invitation. The Web-based survey was hosted in the Western Kentucky University website at the following URL: http://www.wku.edu/reachu/survey/AccessCode.php

According to Dillman (2007) a four contact e-mail survey strategy will generate a response rate comparable to that obtained by postal mail. Following Dillman's advice, a pre-notice invitation was sent to the participants e-mails. After this first contact, over 350 e-mails were returned as "unable to locate the recipients" by the universities' servers, due to different technical reasons. After filtering the unreachable accounts, a second e-mail was sent 3 days after the pre-notice that provided participants with a highlighted Web address. When selected, this link transferred participants directly to the Web survey. 253 faculty members responded to this first invitation. After a week, a first reminder was sent following the same procedure and 96 faculty members submitted responses. After another week a final reminder/thank you note was sent in the same way, and another 64 faculty members responded. A total of four e-mail contacts were made to achieve a sample of 413 participants.

The participants' identities were held confidential by using two separate databases to collect survey responses and respondents' names and e-mails accounts for the purpose of participating in the drawing conducted as a token of appreciation for participation. By completing the online questionnaire, participants voluntary agreed to participate in the study. Participants' complete survey responses were compiled in an aggregate format and maintained on a secure computer that was password protected. Although completion of all questions in the survey was encouraged, the Web-based survey was programmed so that participants were able to decline to answer any questions or stop taking part of the study at any time without penalty of losing any benefits to which they were otherwise entitled. After data collection, descriptive statistics were used to present the relevant characteristics of the sample. Data from the survey was examined exclusively for research purposes by the primary researcher and her dissertation committee.

Data Analyses

This study was guided by three research questions pertaining to faculty concerns and perceptions of conditions facilitating the implementation of Web-based instructional technology in selected universities in the Commonwealth of Kentucky. These research questions were assessed through statistical analyses including descriptive statistics, Factor Analysis (FA) and multinomial logistic regression for RQ1, correlation analysis for RQ2, and multivariate analysis of variance (MANOVA) for RQ3. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, 2003) and a probability (p) value of 0.05 or less for significance testing. Due to the exploratory nature of the study, probability values between 0.05 and 0.1 were considered for marginally significant results as findings for potential further research.

The research questions and associated null hypotheses were analyzed using the following data analysis strategies:

Research Question 1 (RQ1)

Faculty members' categorical concern levels for RQ1 were determined through the CBAM Stages of Concern procedure (George, Hall & Stiegelbauer, 2006, p. 26 – 29). The step-by-step procedure has been summarized by the researcher as shown in Table 8.

Table 8.
Summary of CBAM Scoring Procedure (Hall, Dirksen, & George, 2006, pp. 26–29).

Step 1	Step 2	Step 3	Step 4
Gathering the Stages of Concern Questionnaire responses from participants	Scoring the questionnaire by calculating composite sum raw scores for each of the seven Stages of Concern (SoC): 0. Awareness 1. Informational 2. Personal 3. Management 4. Consequence 5. Collaboration 6. Refocusing	Interpreting concerns profile	Classifying participants into Concerns Level determined as: 1. Self (0-2) 2. Task (3) 3. Impact (4-6)

The SoCQ manual includes a CD that contains a SAS program that scores the SoCQ and computes the raw scale scores, percentile scores, and group averages. After running the software, participants were classified into one of the three concern levels: Self (SoC 0, 1, and 2); Task (SoC 3); or Impact (SoC 4, 5, and 6). As recommended by George et al. (2006) SoC raw scale scores from participants were used in SPSS for further statistical analyses (i.e., correlation of stages of concern with demographic data and other variables for RQ2). Table 9 presents a summary of variables for RQ1, NH1 while Table 10 presents a summary for RQ1, NH2.

Multinomial logistic regression was used to test hypothesis one. Multinomial logistic regression is a form of regression used when the dependent variable (criterion) is a variable with more than two categories, and the independent variables (predictors) are continuous variables, categorical variables, or both. In order to test hypothesis one, the Concerns Level (Criterion) will be predicted as: (a) Self, (b) Task, or (c) Impact. Predictors in the regression included: (1) Years of Online Teaching Experience, (2) Gender, (3) Level of Professional Development Participation, and (4) Levels of Use.

Table 9.
Summary of Variables for Research Question One (RQ1) for Null Hypothesis One (NH1)

Statistical Analysis: Multinomial Logistic Regression

Research Question One (RQ1)

What are the Stages of Concern and Levels of Use with respect to faculty using Web-based instructional technology?

Null Hypothesis One (NH1)

Present concerns of faculty using WBIT will not be predicted by individual characteristics and levels of WBIT use.

Stages of Concern (Outcome)

1. Self
2. Task
3. Impact

Predictors

1. Gender (Male, Female)
2. Level of Technology Professional Development (No training, Basic, Intermediate, Advanced)
3. Online Teaching Experience (0-1 year, 2-5 years, >10 years)
4. Level of Use (Preparation, Focus on use, Focus on improvement)

Levels of Use for RQ1 were assigned per participant automatically from the dynamic Web-based survey. In order to test hypothesis two, another multinomial logistic analysis was conducted. This time, the criterion variable Levels of Use was predicted using the same demographic variables and adding computer self-efficacy as a predictor.

Table 10.
Summary of Variables for Research Question One (RQ1) for Null Hypothesis Two (NH2)

Statistical Analysis: Multinomial Logistic Regression

Research Question One (RQ1)

What are the Stages of Concern and Levels of Use with respect to faculty using Web-based instructional technology?

Null Hypothesis Two (NH2)

Faculty Levels of Use of WBIT will not be predicted by individual characteristics and computer self-efficacy beliefs.

Levels of Use (Outcome)

1. Nonuse/Preparation
2. Focus on Use
3. Focus on Improvement

Predictor Categories

1. Gender
2. Level of Technology Professional Development (No training, Basic, Intermediate, Advanced)
3. Online Teaching Experience (0-1 year, 2-5 years, > 6 years)
4. Computer Self-efficacy level (Low, Medium, High)

Research Question 2 (RQ2)

To test null hypothesis three (NH3) a correlation analysis was used. Table 11 presents a summary for analysis for RQ2, NH3. Correlation analysis looks at the relationship between two variables. Pearson correlation measures the degree of linear relationship between two variables measured on interval scales. The magnitude of the correlation (from 0 to 1) indicates the degree to which the data points fit on a straight line; the sign (+ o -) indicates the direction of the relationship. Means, standard deviations, internal consistencies (Cronbach's α) and zero order correlations for all demographic variables (i.e., age, gender, position, work status, school, teaching experience, Web-teaching experience, computer experience, and professional development), SoC, LoU, and CSE were generated for the sample.

Table 11.
Summary of Variables for Research Question Two (RQ2) for Null Hypothesis Three (NH3)

Statistical Analysis: Correlation Analysis

Research Question Two (RQ2)

What, if any, is the relationship between Compeau & Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of Web-based instructional technology (Stages of Concerns and Levels of Use)?

Null Hypothesis Three (NH3)

There will be no significant correlation between faculty measures of levels of use of WBIT and faculty concerns and computer self-efficacy beliefs.

Dependent Variables (DVs)

1. Stages of Concern (self, task, impact)
2. Levels of Use (preparation, focus on use, focus on improvement)

Independent Variable (IV)

1. Computer Self-efficacy (low, medium, high)

Research Question 3 (RQ3)

Null hypothesis four was tested using Multivariate Analysis of Variance (MANOVA). MANOVA is an analysis method used to examine the main interaction effects of categorical variables on multiple dependent variables. The analysis was conducted through a three Levels of Implementation (Stages of Concern and Levels of Use), by three (Self-efficacy beliefs) MANOVAs, using eight Conditions scores as dependent variables (DVs). A summarized framework of the statistical analysis for RQ3 is provided in Table 12.

Table 12.
Summary of Variables for Research Question Three (RQ3) for Null Hypothesis Four (NH4)

Statistical Analysis: Factorial Multiple Analysis of Variance

Research Question Three (RQ3)

Do Stages of Concern, Levels of Use, and computer self-efficacy beliefs affect the perception of faculty in regard to the relative importance of Ely's conditions in supporting the successful implementation of technology?

Null Hypothesis Four (NH4)

There will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use of WBIT) when self-efficacy beliefs are taken into consideration.

Dependent Variables

1. Dissatisfaction with the status quo
2. Knowledge and skills
3. Resources
4. Time
5. Rewards
6. Participation
7. Leadership
8. Commitment

Independent Variables

1. Stages of Concern (Self, Task, Impact)
2. Levels of Use (Preparation, Use, Improvement)
3. Computer Self-Efficacy (Low, Medium, High)

Stages of Concern in the MANOVA analysis was defined by three categorical levels: (1) Self, (2) Task, and (3) Impact; similarly, Levels of Use was defined using three levels: (1) Non-user/Preparation, (2) Focus on Use, and (3) Focus on Improvement. Following the CBAM framework, participants were assigned to one of three groups of level of implementation. Self-efficacy was also represented using three levels: (1) Low, (2) Medium, and (3) High.

CHAPTER IV

RESULTS AND ANALYSIS

Introduction

Using a sample drawn from faculty teaching at six universities in the Commonwealth of Kentucky, this study explored levels of implementation of Web-based instructional technology (WBIT) and self-efficacy beliefs as factors associated with faculty perceptions of institutional mechanisms and its relative importance as conditions supporting the implementation of WBIT. Levels of implementation were assigned to each participant using measures of Stages of Concern and Levels of Use of technology from the Concerns-Based Adoption Model (CBAM). Framed in Bandura's self-efficacy theory, measures of Computer Self-Efficacy (Compeau & Higgins, 1995) were determined for each participant. Additionally, personal and professional demographic variables were identified for further analysis.

This chapter describes how the data were analyzed and the results. The first section provides a summarized description of the sample demographics. The three research questions guiding the study and related data analyses are then detailed. Lastly, a summary of findings is provided.

Sample Demographics

A sample was taken from 4,211 faculty members teaching at six selected universities in the Commonwealth of Kentucky. An e-mail was sent to 2,000 possible participants following the procedure described in Chapter 3. The survey instrument was available for data collection for 24 days. Of the possible respondents, 413 submitted survey responses resulting in a response rate of 21%. According to power analysis for MANOVA, a priori determination of sample size that considers an anticipated moderate effect size, requires a minimum of 516 responses to meet alpha level and power set by the researcher ($\alpha = .05$, $power = .70$). The sample size was not met therefore caution should be used in making any generalization while interpreting the results of this study.

All 413 submissions contained data; however, some respondents decided not to provide answers to some questions. The Stages of Concern Questionnaire (SoCQ) section of the survey accounted for most of the missing data. The scores for the SoCQ that were left empty were handled as suggested by George, Hall, and Stiegelbauer (2006):

> The original scoring procedure treated nonresponse to items the same as a 0 response. The procedure for calculating raw scale scores has been revised to estimate the response to any skipped item as the average of those that were marked for that scale. (p. 26)

Still, in 79 cases it was not possible to obtain an average value for the missing scores because of the amount of skipped questions per scale (26 participants skipped the section altogether).

From the demographic questions 15 participants did not report age (six males and nine females); only one participant did not report gender. No responses were missing in the other three sections of the survey (i.e., Computer Self-Efficacy levels, Levels of Use, and Conditions check list). After treating missing data in the SoCQ section, 334 submissions resulted in usable data. A detailed analysis of sample demographics follows.

Age and Gender

Responses to the question regarding the dichotomous variable gender revealed that men accounted for 51% of the responses while women comprised 49% of the responses. Only one value was missing. Age was gathered as an interval scale with a range of 59 years, mean and mode of 48 years, and standard deviation of 11 (minimum age of 20 and maximum of 79).

Position, Work Status, and Teaching Area

Position was operationalized as a dichotomous variable (instructor, administrator). Only 20 participants identified themselves as *administrators* (6%); the remaining 314 selected *instructor* as position (94.4%). *Work status* was set as a nominal variable with four levels (instructor and professor rank – tenured, tenure track, non-tenured). Sixteen out of the 20 participants that selected *administrator* as position did not provide work status information probably because at the time of the survey they had no teaching appointments. A total of 193 participants selected *professor* as work status; 25% selected *non tenured* and 35% *tenured.* The remaining 141 participants reported *instructor* in this variable (42%).

Teaching Area was operationalized as a nominal variable with eight levels (i.e., social sciences, natural sciences, health professions, education, engineering, business, arts and humanities, and agriculture). The nine values missing for this variable corresponded to participants who selected administrator as position instead of faculty. Table 13 shows the distribution of participants per teaching area.

Teaching Experience and Online Teaching Experience

Responses to the question regarding the nominal variable *Teaching Experience* revealed skewed data between 2 and 25 years of teaching experience from a range of 54 ($M = 14$, $SD = 10.4$, $Mode = 15$). Participants were also asked to report in an interval scale the number of years they have been teaching online. Overall, the sample presented skewed data around 0 and 7 years of online teaching experience from a range of 24 (M = 3.6, SD = 4, *Mode* = 0). Results revealed that 22% of participants have no experience teaching online, 50% have less than 5 years of online teaching experience, and 96% of participants have less than 12 years of experience teaching online.

Table 13.
Teaching Area Frequency Distribution

		Frequency	Percentage	Cumulative Percentage
Valid		5	1.5	1.5
	Agriculture	5	1.5	3.0
	Arts & Humanities	78	23.4	26.3
	Business	37	11.1	37.4
	Education	60	18.0	55.4
	Engineering	21	6.3	61.7
	Health Professions	39	11.7	73.4
	Natural Sciences	51	15.3	88.6
	Social Sciences	38	11.4	100.0
	Total	334	100.0	

Participation in Professional Development

The last part of the demographic section of the survey asked participants to indicate whether or not they have recently participated in professional development activities regarding the use of Web-based technologies (e.g., Blackboard, websites, etc.).

Responses to this question revealed that the majority of participants have been involved in professional development activities (80%); almost two thirds of them have participated in basic or intermediate level (62%). Nearly half of respondents (46%) have been involved in basic technology training or have not participated in technology-related development activities for the last 2 years. Table 14 illustrates the level of training activities in which participants reported they have more commonly participated during the last 2 years. In terms of type of training, most respondents reported participation in voluntary training (71%) as opposed to mandatory training (29%).

Table 14.
Distribution of Level of Professional Development

Level of Training	**Frequency**	**Percent**	**Cumulative Percent**
No training participation	65	20	20
Basic	87	26	46
Intermediate	121	36	82
Advanced	61	18	100
Total	334	100	

Sample Comparison to the Population

In order to secure the anonymous nature of this study, no information was gathered as far as the institution's name per participant, thus a Chi-square goodness of fit test was not conducted. An analysis of aggregated data was conducted as an alternative method for determining how respondents represented the larger population at the participant institutions. Information from the 2006-2007 Fact Book published by the

Kentucky Council on Postsecondary Education's website was used to compare faculty tenure status and gender with the sample information.

Tenure status of the total sample (i.e., non tenure-track faculty, tenure-track faculty, and tenured faculty) was compared to tenure status of the actual respondents. The total sample (*N* = 3677) was comprised of 55% tenured faculty members and 45% non-tenured faculty members (see Table 15). The respondents' percentage for these categories was comprised of 58% tenured faculty and 42% non-tenured faculty. Tenured faculty members were slightly more represented by the respondents (3%) as compared to their representation in the sample.

Table 15.
Population of Full-Time Faculty by University and Tenure Status (Source: Universities' Fact Books, 2006-2007)

University	Tenure	%	Non-Tenure	%	Total
Eastern Kentucky University	361	70	157	30	518
Morehead State University	187	49	197	51	384
Northern Kentucky University	211	60	139	40	350
Murray State University	215	54	181	46	396
Western Kentucky University	307	56	237	44	544
University of Louisville	741	50	744	50	1485
Total	2022	**55**	1655	**45**	3677

A second comparison was made considering gender information. The gender composition of the total sample was compared to the gender composition of the actual respondents (see Table 16). The total population (*N* = 4211) was comprised of 56% males and 44% females, whereas the respondents were comprised of 51% males and 49% female. While the difference in both comparisons is small (3% and 5%), caution must be exercised in interpreting the results considering that the responses may be more representative of tenured faculty members and of females.

Table 16.
Population of Full-Time Faculty by University and Gender
(Source: Universities' Fact Books, 2006-2007)

University	**Male**	**%**	**Female**	**%**	**Total**
Eastern Kentucky University	323	50	327	50	650
Morehead State University	207	54	177	46	384
Northern Kentucky University	211	37	356	63	567
Murray State University	243	61	153	39	396
Western Kentucky University	398	55	331	45	729
University of Louisville	965	65	520	35	1485
Total	2347	**56**	1864	**44**	**4211**

Study Objectives and Research Questions

The purpose of this study was to analyze faculty levels of implementation of WBIT and self-efficacy levels as factors associated to faculty perception of institutional mechanisms and their relative importance as conditions supporting the implementation of WBIT. In attaining this purpose the researcher sought to pursue the following objectives: (a) identify and analyze faculty levels of concern and levels of use of Web-based instruction, (b) identify faculty computer self-efficacy beliefs and analyze the relationship between faculty computer self-efficacy and levels of implementation of WBIT, and (c) identify and analyze faculty perceptions of conditions supporting the implementation of WBIT. Table 17 depicts the specific research questions and its associated null hypotheses.

Three research questions were developed for this study as illustrated in Table 17. These research questions were assessed through statistical analyses including Multinomial Logistic Regression for RQ1; Correlation Analysis for RQ2; and Factorial Multiple Analysis of Variance (MANOVA) for RQ3. Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS, 2003) and a probability (*p*) value of 0.05 or less for significance testing.

Data Analysis and Results

In addition to demographic variables the study's research questions involved three behavioral/psychological variables: Stages of Concern, Levels of Use, and Computer Self-Efficacy. A detailed explanation of the nature of these variables is provided in Chapter 3. In this section the sample distribution considering these variables is described followed by the research questions analyses and its results.

Implementation Level: Stages of Concern and Levels of Use

As detailed in Chapter 3, we operationalized implementation level as a function of two constructs grounded in the Concerns Based Adoption Model (CBAM): Stages of Concern and Levels of Use. Faculty members' categorical stages of concern (SoC) were determined through the CBAM Stages of Concern procedure (George, Hall & Stiegelbauer, 2006). Three categories were utilized to classify participants in terms of their concerns regarding the implementation of WBIT: (a) Self (SoC 0, 1, 2); (b) Task (SoC 3); and (c) Impact (SoC 4, 5, 6). A detailed description of the procedure followed to classify participants in one of three stages of concern is provided in Chapter 3 (Table 8, page 134). Table 18 presents participants' distribution of frequencies per level for the nominal variable SoC.

Table 17.
Research Questions and Associated Null Hypotheses

Research Question (RQ)	Null Hypothesis (NH)
RQ1. What are the Stages of Concern and Levels of Use with respect to faculty using Web-based instructional technology?	NH1. Present concerns of faculty using Web-based instructional technology (WBIT) will not be predicted by individual characteristics and levels of WBIT use.
	NH2. Faculty Levels of Use of WBIT will not be predicted by individual characteristics and computer self-efficacy beliefs.
RQ2. What, if any, is the relationship between Compeau & Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of Web-based instructional technology (Stages of Concerns and Levels of Use)?	NH3. There will be no significant correlation between measures of computer self-efficacy and faculty Stages of Concern and Levels of Use.
RQ3. Do Stages of Concern, Levels of Use, and computer self-efficacy beliefs affect the perception of faculty in regard to the relative importance of Ely's conditions in supporting the successful implementation of technology?	NH4. There will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use of WBIT) when self-efficacy beliefs are taken into consideration.

Participants' categorical Levels of Use (LoU) were assigned using an adapted version of the Basic Interview Protocol as described in Chapter 3. This adapted version considers the branching chart suggested by Hall et al. (2006) and provided an automatic decision tree for participants' classification into one of seven levels of use. For further analysis three levels of use were utilized to classify participants in terms of their level of use: (a) Nonuse/Preparation (LoU 0, I, II); (b) Focus on Use (LoU III, IVA, IVB); and (c) Focus on Improvement (LoU V, VI). Table 18 illustrates participants' frequencies per level for the nominal variable LoU.

Table 18.
Frequency Distribution for Stages of Concern (SoC) and Levels of Use (LoU)

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
SoC	Task	48	14.4	14.4	14.4
	Self	127	38.0	38.0	52.4
	Impact	159	47.6	47.6	100.0
	Total	334	100.0	100.0	
LoU	Preparation	46	13.8	13.8	13.8
	Focus on Improvement	130	38.9	38.9	52.7
	Focus on Use	158	47.3	47.3	100.0
	Total	334	100.0	100.0	

Computer Self-Efficacy (CSE)

The CSE questionnaire measured levels of confidence in judgments of ability to use WBIT. The average of responses per participant was used to determine a value representing the participant's degree of confidence in using WBIT. Participants were classified in one of three CSE levels: (a) Low ($CSE \leq 5$), (b) Medium ($6 \leq CSE \leq 8$), and (c) High ($9 \leq CSE \leq 10$). Table 19 presents participants' distribution of frequencies per level for the nominal variable CSE.

Table 19.
Distribution of Computer Self-Efficacy (CSE)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	70	21.0	21.0	21.0
	Low	111	33.2	33.2	54.2
	Medium	153	45.8	45.8	100.0
	Total	334	100.0	100.0	

Analysis of Research Question One (RQ1)

The first research question addressed the prediction of implementation level by considering Stages of Concern and Levels of Use of faculty using WBIT. In order to address RQ1 two null hypotheses were developed as summarized in Table 14. Data utilized to analyze RQ1 were collected from three sections of the survey. Quantitative data on Stages of Concern (SoC) were collected via a 35-item Stages of Concern Questionnaire (Section 2 of the survey). Data on Levels of Use (LoU) were collected via a dynamic questionnaire consisting of 5 to 10 questions developed as explained in Chapter 3. Data on Computer Self-efficacy were collected via a 10-item questionnaire (Section 4 of the survey). Additionally, selected individual characteristics (gender, online teaching experience, and participation in technology-related professional development) were collected via an 11-item demographic questionnaire (Section 5 of the survey).

Multinomial logistic regression was used to test both hypotheses developed for RQ1. Multinomial logistic regression was appropriate because it allows predicting a discrete outcome (i.e., categorical dependent variable) with more than two categories on a set of predictor variables (IVs) that can be continuous, discrete, dichotomous, or a mix (Tabachnick & Fidell, 2007).

Two sequential multinomial logistic regressions were performed through SPSS NOMREG to assess prediction of membership in one of three categories of Stages of Concern (i.e., *self, task, impact*) and in one of three categories of Levels of Use (i.e., *preparation, focus on use, focus on improvement*). In both regression analyses variables were entered in two sets: demographic variables first and then behavioral/psychological variables. In other words both regression analyses were performed first on the basis of three demographic predictors and then after the addition of a behavioral predictor (in predicting Stages of Concern) and the addition of a psychological predictor (in predicting Levels of Use).

NH1stated that concerns of faculty using Web-based instructional technology (WBIT) will not be predicted by selected individual characteristics and levels of use of WBIT. For the purpose of testing NH1 the outcome variables (DVs) were the three categories of concern level: (a) Self, (b) Task, and (c) Impact. The *self* category was used as the reference group in the logistic regression. Levels of the predictors more likely to be theoretically associated to self concerns were coded as zero. Gender, professional development, online teaching experience, and levels of use of WBIT were used as predictors of faculty's concerns level. Table 9 (page 134) provides a summary of analysis for testing NH1.

Similarly, NH2 stated that faculty levels of use of WBIT will not be predicted by selected individual characteristics and computer self-efficacy beliefs.

The outcome variable Levels of Use was represented by three discrete levels: (a)

Preparation, (b) Focus on Use, and (c) Focus on Improvement. The *focus on improvement* category was used as the reference group in the logistic regression. Gender, professional development, online teaching experience, and computer self-efficacy beliefs were used as predictors of faculty Levels of Use. Table 10 (page 135) provides a summary of analysis for testing NH2.

Of importance in these sequential regression analyses was whether behavioral and psychological variables significantly enhance prediction of the outcome after controlling by demographic variables. Demographic predictors considered in the model were gender, level of participation in technology-related professional development (no training, basic, intermediate, advanced), and online teaching experience (0-1 year, 2-5 years, >6 years). For NH1 the behavioral predictor tested was Levels of Use (nonuse/preparation, focus on use, focus on improvement), while for NH2 the psychological predictor included in the sequential analysis was Computer Self-Efficacy (low, medium, high).

Results of Analysis of Research Question One (RQ1) for Null Hypothesis One (NH1)

After deletion of cases with missing values, data from 334 participants were available for analysis: 127 participants were classified as having self concerns, 48 as having task concerns, and 158 as having impact concerns. Because goodness-of-fit is based on observed versus expected frequencies of cells formed by categorical variables, evaluation of expected cell frequencies for all pairs of discrete variables including the outcome variable was required (Tabachnick & Fidell, 2007). Evaluation of adequacy of expected frequencies for all predictors revealed no need to restrict model goodness-of-fit tests. No cells had frequencies fewer than five, nor were there any expected frequencies fewer than one. No serious violation of linearity in the logit was observed. However, combinations of discrete variables resulted in 54 cells with no cases (30.5% of cells with 0 frequencies). "Logistic regression may produce large parameter estimates and standard errors, and, possible, failure of convergence when combinations of discrete variables result in too many cells with no cases" (Tabachnick & Fidell, 2007, p. 442). Gender reported no significance as a predictor of outcome; therefore, in order to minimize the effect of the potential issue of ratio of cases to variables and following Tabachnick and Fidell's advice, gender was deleted from the analysis.

Goodness-of-fit analysis showed marginal model fit (discrimination among groups) on the basis of the two demographic predictors alone χ^2 (12, N = 334) = 11.79, p = .46, using the Pearson criterion. After addition of the behavioral predictor, model fit significantly increased χ^2 (50, N = 334) = 43.88, p = .72, Nagelkerke R^2 = .22 with 95% confidence interval. Table 20 summarizes the results of the sequential analysis and depicts the contribution of the individual predictors to the model by comparing models with and without each predictor. Both demographic predictors were significant for prediction of outcome, $p < .05$; additionally, Levels of Use significantly enhanced prediction, $p < .05$. In other words, comparison of log-likelihood ratios for models with and without the behavioral variable showed statistically significant improvement with the addition of Levels of Use, χ^2 (4, N = 334) = 70.32 – 52.56 = 17.76, $p < .05$.

Likelihood ratio tests showed all three predictors to significantly add to the prediction. Thus, faculty members' levels of technology-related professional development, online teaching experience, and Levels of Use significantly distinguish among the three categories of faculty Stages of Concern.

Table 20.
Logistic Regression Analysis of Stages of Concern as a Function of Demographic and Behavioral Variables.

Variables	χ^2 to Remove	*Df*	Model χ^2
Demographic			
Technology Professional Development	14.740*	6	
Online Teaching Experience	9.643*	4	
All demographic variables			52.56
Behavioral			
Levels of Use	17.75*	4	
All variables			70.32

* $p < .05$

Parameter Estimates, shown in Tables 21 and 22, present regression coefficients and Chi-square tests as well as odds ratios and the 95% intervals. Table 21 compares self-concerned faculty members with task-concerned faculty members, while Table 22 compares self-concerned faculty members with impact-concerned faculty members. Using a criterion $\alpha = .05$, the critical value for χ^2 with 1 *df* equals 3.841. As can be seen in Table 21 no predictor reliably separated self-concerned faculty members from task-concerned faculty members. However, as presented in Table 22, all predictors reliably separated self-concerned faculty members from impact-concerned faculty members.

As compared with impact-concerned faculty members, self-concerned faculty members were nearly three times less likely to participate in WBIT related professional development activities (*Odds Ratio* = .361) or to participate only in basic levels (Odds Ratio = .370). Self-concerned faculty members were twice as likely to have less than one year of experience teaching online (*Odds Ratio* = .472) and almost seven times as likely to be in preparation Level of Use (*Odds Ratio* = .143) than impact-concerned faculty members.

Table 21.
Logistic Regression Analysis of Stages of Concern as a Function of Demographic and Behavioral Variables: Self vs. Task Concerns

				95% Confidence Interval for Exp(B)	
Variables	B	Wald χ^2- *test*	Odds Ratio	Lower	Upper
No training vs. advanced	-.156	.070	.855	.27	2.71
Basic vs. advanced	-.093	.027	.912	.30	2.74
Intermediate vs. advanced	-.557	.920	.573	.18	1.79
0 – 1 year vs. > 10 years	.406	.466	1.500	.47	4.81
2 – 5 years vs. > 10 years	.784	1.803	2.190	.70	6.87
Preparation vs. improvement	-.448	.772	.639	.24	1.74
Use vs. Improvement	-.496	1.530	.609	.28	1.33

Table 23 illustrates the relationship between Stages of Concern (outcome) and the three categorical predictors. Impact-concerned faculty members are more likely to participate in intermediate and advanced levels of professional development activities (46% and 24.5% respectively), to have two to five years of online teaching experience (49%), and to be in *focus on improvement* Level of Use (50%). Self-concerned faculty members are more likely to participate in basic levels of professional development activities (33%), to have less than one year of online teaching experience (53%), and to be in *focus on use* Level of Use (51.2%).

Table 22.
Logistic Regression Analysis of Stages of Concern as a Function of Demographic and Behavioral Variables: Self vs. Impact Concerns

Variables	B	Wald χ^2- *test*	Odds Ratio	95% Confidence Interval for Exp(B) Lower	Upper
No training vs. advanced	-1.01	**5.31**	.36	.15	.86
Basic vs. advanced	-1.00	**5.52**	.37	.16	.85
Intermediate vs. advanced	-.23	.35	.80	.37	1.69
0 – 1 year vs. > 6 years	-.75	**4.05**	.47	.29	.98
2 – 5 years vs. > 6 years	.04	.01	1.04	.52	2.07
Preparation vs. improvement	-1.95	**13.97**	.14	.05	.40
Use vs. improvement	-.59	4.30	.56	.32	.97

* The statistic is significant at the .05 level.

Results of Analysis of Research Question One (RQ1) for Null Hypothesis Two (NH2)

Distribution of participants per Level of Use of WBIT was as follows: 46 faculty members were classified as being in *preparation*, 158 as being *focused on use*, and 130 as being *focused on improvement*. Again, Goodness-of-Fit criterion was used to evaluate the pertinence of the model. Only three cells had frequencies less than five, and there were no expected frequencies less than one. Thus, evaluation of adequacy of expected frequencies for all predictors revealed no need to restrict model Goodness-of-Fit tests. No serious violation of linearity in the logit was observed. However, combinations of discrete variables resulted in 13 cells with no cases (18% of cells with 0 frequencies).

Again, gender reported no significance as predictor of outcome (Levels of Use); therefore, following Tabachnick and Fidell's (2007) advice, gender was dropped from the analysis.

Table 23.
Predictors as a Function of Stage of Concern

	Stage of Concern			
Predictor	Self	Task	Impact	Total
Technology Professional Development				
No training	33	12	20	65
Basic	42	18	27	87
Intermediate	37	11	73	121
Advanced	15	7	39	61
Total	127	48	159	334
Online Teaching Experience				
< 1 year	67	23	35	125
2 – 5 years	39	20	78	137
> 6 years	21	5	46	72
Total	127	48	159	334
Levels of Use				
Preparation	30	10	6	46
Focus on Use	65	21	72	158
Focus on Improvement	32	17	81	130
Total	127	48	159	334

On the basis of the two demographic predictors alone, Goodness-of-Fit analysis depicted poor model fit (discrimination among groups) χ^2 (36, N = 334) = 62.12, p = .094, using the Pearson criterion.

Table 24.
Logistic Regression Analysis of Levels of Use as a Function of Demographic and Psychological Variables.

Variables	**χ^2 to Remove**	**Df**	**Model χ^2**
Demographic			
Gender+			
Technology Professional Development	9.99	6	
Online Teaching Experience	37.83*	4	
All demographic variables			62.12
Psychological			
Computer Self-efficacy	11.53*		
All variables			70.23

+ Variable not entered for analysis
* p < .05

After adding Computer Self-Efficacy, model fit improved significantly χ^2 (56, N = 334) = 50.54, p = .68, Nagelkerke R^2 = .23 with 95% confidence interval. Table 24 summarizes the results of the sequential analysis and presents the contribution of the individual predictors to the model by comparing models with and without each predictor. From both demographic predictors, only online teaching experience was significant for prediction of outcome, $p < .05$; additionally, Computer Self-Efficacy significantly enhanced prediction, $p < .05$. In other words, Levels of Use were best predictable from the addition of the psychological variable to the demographic variables χ^2 (4, N = 334) = 70.23 – 62.12 = 11.11, $p < .05$.

Likelihood ratio tests revealed two predictors to significantly add to the prediction. Online teaching experience and Computer Self-Efficacy significantly distinguish among the three categories of Levels of Use. Faculty members' level of technology-related professional development was not a significant predictor.

Table 25.
Logistic Regression Analysis of Levels of Use as a Function of Demographic and Behavioral Variables: Focus on Improvement vs. Preparation

Variables	B	Wald χ^2- *test*	Odds Ratio	95% Confidence Interval for Exp(B) Lower	Upper
Online Teaching Experience					
0 – 1 year vs. > 10 years	3.37	10.12*	29.21	3.65	233.7
2 – 5 years vs. > 10 years	1.26	1.33	3.53	.41	.11
Level of Professional Development					
No training vs. advanced	1.03	2.12	2.81	.70	11.30
Basic vs. advanced	.82	1.46	2.27	.60	8.61
Intermediate vs. advanced	.22	.10	1.24	.33	4.70
Computer Self-Efficacy					
Low vs. High	1.42	6.30*	4.13	1.36	12.51
Medium vs. High	.25	.19	1.28	.42	3.90

* The statistic is significant at the .05 level.

Parameter Estimates shown in Table 25 compares faculty members in *focus on improvement* Level of Use with faculty members in *preparation*. Using a criterion α = .05, the critical value for χ^2 with 1 *df* equals 3.841. Consequently, both predictors (i.e., online teaching experience and Computer Self-Efficacy) reliably separated faculty members in *focus on improvement* from faculty members in the *preparation* level. As compared with *focus on improvement*, faculty members in *preparation* Level of Use were remarkably more likely to have less than 1 year of online teaching experience (*Odds Ratio* = 29.21) and four times more likely to have *low* Computer Self-Efficacy (*Odds Ratio* = 4.13). No predictor reliably separated faculty members in *focus on improvement* from faculty members in *focus on use*.

Table 26.
Predictors as a Function of Levels of Use

	Level of Use			
Predictor	Preparation	Focus on Use	Focus on Improvement	Total
Online Teaching Experience				
< 1 year	37	58	30	125
2 – 5 years	8	62	67	137
> 6 years	1	38	33	72
Total	46	158	130	334
Computer Self-efficacy				
Low	25	55	31	111
Medium	15	68	70	153
High	6	35	29	70
Total	46	158	130	334

Table 26 shows the relationship between Levels of Use (outcome) and the two significant predictors. Faculty members in the *preparation* Level of Use were more likely to have less than 1 year of online teaching experience (80%). Also, faculty members in preparation reported lower levels of Computer Self-Efficacy (e.g., 54% were classified in *low* Computer Self-Efficacy). Faculty members in *focus on use* and in *focus on improvement* were more likely to have 2 to 5 years of online teaching experience (65% and 53%, respectively) and they were more likely to report medium levels of Computer Self-Efficacy (43% and 54%, respectively).

Analysis of Research Question Two (RQ2)

The second research question tested the correlation between Compeau & Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of WBIT. Levels of implementation were operationalized using faculty Stages of Concern and Levels of Use measures. In order to address RQ2, it was hypothesized that there will be no significant relationship between measures of Computer Self-Efficacy (*low, medium, high*) and faculty Stages of Concern (*self, task, impact*) and Levels of Use (*nonuse/preparation, focus on use, focus on improvement*).

Correlation analysis was performed through a SPSS CROSSTABS procedure. The Crosstabs procedure was conducted using Pearson's Chi-Square (χ^2) statistic. *Pearson* χ^2 is a nonparametric test that does not require assumptions about the shape of the sample distribution and it allows testing significance in a relationship. After testing for significance, the association's strength was measured using contingency coefficient (C) which is a widely used measure of strength based on χ^2. C has a value of zero when there is no association. Pearson's χ^2 test of significance was appropriate to test NH3 because it allows testing the significance of the association between two or more nominal variables.

Nominal variables included in the analysis were Stages of Concern (SoC), Levels of Use (LoU), and Computer Self-Efficacy (CSE). Data were collected from three sections of the survey. Quantitative data on the SoC were collected via a 35-item Stages of Concern Questionnaire (Section 2 of the survey). Data on LoU were collected via a dynamic questionnaire consisting of 5 to 10 questions developed as explaining in Chapter 3. Data on CSE were collected via a 10-item questionnaire (Section 3 of the survey).

According to the CBAM framework, concerns of faculty implementing new technology evolve from *self* concerns to *impact* concerns as faculty move from *preparation* to *focus on impact* LoU. Table 11 (page 136) provides a summary of variables used to test NH3. Of importance in this correlation analysis was whether faculty concerns and Levels of Use are associated to Computer Self-Efficacy levels. Therefore, a CROSSTABS procedure was performed using Stages of Concern (*self, task, impact*) and Levels of Use (*nonuse/preparation, focus on use, focus on improvement*) as dependent variables (rows) and Computer Self-Efficacy (*low, medium, high*) as independent variable (column).

Results of Analysis of Research Question Two (RQ2) for Null Hypothesis Three (NH3)

After deletion of cases with missing values for Stages of Concern, data from 334 participants were available for analysis. Evaluation of adequacy of expected frequencies for all variables revealed no need to restrict the model since assumptions for Chi-square had been met. No cells had frequencies fewer than five, nor were there any expected frequencies fewer than one. *Pearson* χ^2 test depicted a significant association between Stages of Concern and Computer Self-Efficacy: χ^2 (4, N = 334) = 11.316, p = .023, and a significant association between Levels of Use and Computer Self-Efficacy: χ^2 (4, N = 334) = 15.179, p = .004.

Table 27.
Crosstabs Results for Stages of Concern (SoC) by Computer Self-Efficacy (CSE)

			Computer Self-efficacy			
			Low	Medium	High	Total
SoC	Self	Count	50.0	52.0	25.0	127.0
		Expected Count	42.2	58.2	26.6	127.0
		% within CSE	45.0	34.0	35.7	38.0
		Std. Residual	1.2	-.8	-.3	
	Task	Count	21.0	22.0	5.0	48.0
		Expected Count	16.0	22.0	10.1	48.0
		% within CSE	18.9	14.4	7.1	14.4
		Std. Residual	1.3	.0	-1.6	
	Impact	Count	40.0	79.0	40.0	159.0
		Expected Count	52.8	72.8	33.3	159.0
		% within CSE	36.0	51.6	57.1	47.6
		Std. Residual	-1.8	.7	1.2	
	Total	Count	111.0	153.0	70.0	334.0
		Expected Count	111.0	153.0	70.0	334.0
		% within CSE	100.0	100.0	100.0	100.0

Table 28.
Crosstabs Results for Levels of Use (LoU) by Computer Self-Efficacy (CSE)

			Computer Self-efficacy			
			Low	Medium	High	Total
LoU	Preparation	Count	25.0	15.0	6.0	46.0
		Expected Count	15.3	21.1	9.6	46.0
		% within CSE	22.5	9.8	8.6	13.8
		Std. Residual	2.5	-1.3	-1.2	
	Focus on Use	Count	55.0	68.0	35.0	158.0
		Expected Count	52.5	72.4	33.1	158.0
		% within CSE	49.5	44.4	50.0	47.3
		Std. Residual	.3	-.5	.3	
	Focus on Improvement	Count	31.0	70.0	29.0	130.0
		Expected Count	43.2	59.6	27.2	130.0
		% within CSE	27.9	45.8	41.4	38.9
		Std. Residual	-1.9	1.4	.3	
	Total	Count	111.0	153.0	70.0	334.0
		Expected Count	111.0	153.0	70.0	334.0
		% within CSE	100.0	100.0	100.0	100.0

Tables 27 and 28 summarize the result of the correlation analysis for Stages of Concern and Levels of Use. Standardized residuals presented in both tables revealed which cells were major contributors to the statistical significance of the association. Crosstabs results illustrated in Table 27 show that the majority of faculty members with *low* Computer Self-Efficacy are in the *self* Stage of Concern (45%). Only 19% of faculty members with *low* Computer Self-Efficacy are in *task* Stage of Concern, and 36% of them are in *impact* Stage of Concern. From the groups of *medium* and *high* Computer Self-Efficacy, the majority of faculty members are in *impact* Stage of Concern (51.6% and 57.1%, respectively). These results provide evidence that there were Stages of Concern differences when Computer Self-Efficacy was taken in consideration.

Crosstabs results shown in Table 28 revealed that only a small percentage of faculty members with medium and high levels of CSE were classified in LoU preparation (9.8% and 8.6%, respectively). The majority of faculty members with medium levels of Computer Self-Efficacy (CSE) were classified in *focus on use* (44.4%) and *focus on improvement* (45.8%). The same pattern can be seen from faculty members with high CSE; the majority are classified in *focus on use* (50%) and *focus on improvement* (41.4%). Faculty members with higher levels of CSE tend to have higher levels of use. These results demonstrated that there were Levels of Use differences when Computer Self-Efficacy was taken in consideration.

Analysis of Research Question Three (RQ3)

The third research question examined the perception of faculty in regard to the relative importance of a group of conditions in supporting the successful implementation of technology. In order to evaluate RQ3, it was hypothesized that there will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use of WBIT) when self-efficacy beliefs are taken into consideration. As described in Chapter 3, data on conditions to support the implementation of WBIT were collected via an 8-item questionnaire (Section 4 of the survey). Table 29 shows a summary of variables for RQ3 for NH4.

Table 29.
Summary of Variables for Research Question Three (RQ3) for Null Hypothesis Four (NH4)

Statistical Analysis: Factorial Multiple Analysis of Variance

Research Question Three (RQ3)

Do Stages of Concern, Levels of Use, and computer self-efficacy beliefs affect the perception of faculty in regard to the relative importance of Ely's conditions in supporting the successful implementation of technology?

Null Hypothesis Four (NH4)

There will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use of WBIT) when self-efficacy beliefs are taken into consideration.

Dependent Variables

1. Dissatisfaction with the status quo
2. Knowledge and skills
3. Resources
4. Time
5. Rewards
6. Participation
7. Leadership
8. Commitment

Independent Variables

1. Stages of Concern (Self, Task, Impact)
2. Levels of Use (Preparation, Use, Improvement)
3. Computer Self-Efficacy (Low, Medium, High)

Factorial Multivariate Analysis of Variance (MANOVA) was used to test hypothesis four (NH4). MANOVA was an appropriate method to analyze NH4 because it allows testing the effect of two or more independent variables on a set of dependent variables (Stevens, 2002). A MANOVA with a Bonferroni-test adjusted α based on number of dependent variables and sample size was conducted in order to determine how faculty perceptions of conditions supporting the implementation of WBIT varied across levels of implementation.

As explained previously, conditions to support the implementation of WBIT were operationalized using the eight conditions from Ely's (1999) framework; implementation level was measured using stages of concern and levels of use of faculty as described in the Concerns Based Adoption Model (CBAM) (Hall & Hord, 1987, 2001, 2006); while Computer Self-Efficacy was measured using the Computer Self-Efficacy scale developed by Compeau & Higgins (1995). A comprehensive description of the procedure followed by the researcher to classify faculty members into one of the different categories for each one of the variables is provided in Chapter 3. A summary of variables for testing NH4 is presented in Table 12 (page 137).

Faculty members were assigned to one of three categories of Stages of Concern (*self, task, impact*), one of three categories of Levels of Use (*preparation, focus on use, focus on improvement*), and one of three levels of Computer Self-Efficacy (*low, medium, high*). A factorial MANOVA was performed with Stages of Concern, Levels of Use, and Computer Self-Efficacy as the independent variables, and eight conditions as dependent variables (i.e., *dissatisfaction with the status quo, knowledge and skills, resources, time, rewards, participation, leadership, and commitment*).

Results of Analysis of Research Question Three (RQ3) for Null Hypothesis Four (NH4)

After deletion of cases with missing values in the variable Stages of Concern, data from 334 participants were available for analysis. 3-Way Factorial MANOVA revealed statistically significant multivariate main effects for Levels of Use, *Wilk's* $\Lambda = .916$, $F(14, 602) = 1.928$, $p = .043$; and a significant multivariate interaction effect for Levels of Use by Stages of Concern, *Wilk's* $\Lambda = .864$, $F(28, 1086) = 1.611$, $p = .023$. Analysis of descriptive statistics, multivariate main effects, and multivariate interaction effects are provided in the following section.

Conditions Mean Responses

SPSS descriptive statistics provided the participants' perception mean responses and standard deviations for the eight dependent variables (i.e., Ely's eight conditions). Table 30 provides the faculty perception mean responses for each condition. Overall perception mean responses revealed the relative importance of each condition as perceived by faculty. Regardless of Stages of Concern, Levels of Use, and Computer Self-Efficacy levels, *Knowledge and Skills* ($M = 5.538 \pm 1.937$), *Resources* ($M = 6.130 \pm 1.644$), and *Time* ($M = 5.543 \pm 2.062$) were perceived by faculty as the most important conditions to implement WBIT. Similarly, *Dissatisfaction with the Status Quo* ($M = 3.6186 \pm 2.668$), *Participation* ($M = 3.765 \pm 1.703$), and *Leadership* ($M = 3.717 \pm 2.005$) were perceived by faculty as the least important conditions. In general, faculty perceived *Resources* as the most important condition to the successful implementation of WBIT and *Dissatisfaction with the Status Quo* as the least important condition (See Table 30).

Multivariate Main Effect Results

SPSS multivariate tests provided significant results of faculty perceptions of conditions for the successful implementation of WBIT when faculty Stages of Concerns and Levels of Use were taken into consideration. Specifically, a statistically significant multivariate main effect for Levels of Use was found: *Wilk's* Λ = .916, $F(14, 602)$ = 1.928, p = .043. Table 31 presents the results of univariate tests for the independent variable levels of use. Results of univariate test revealed significant differences among the mean values of Levels of Use for the following dependent variables: (a) *Participation*, F = 4.133, df = 2, p = .017; (b) *Leadership*, F = 5.230, df = 2, p = .006; and (c) *Commitment*, F = 7.985, df = 2, p = .000. Differences among the obtained mean values for the significant main effects results are examined next.

Table 30.
Faculty Perception Mean Responses for the Eight Dependent Variables

Condition		**Mean**	**Std. Deviation**
C1	Dissatisfaction with Status Quo	3.6186	2.6687
C2	Knowledge & Skills	5.5375	1.9378
C3	Resources	6.1291	1.6441
C4	Time	5.5435	2.0623
C5	Incentives & Rewards	3.8048	2.1706
C6	Participation	3.7658	1.7037
C7	Leadership	3.7177	2.0056
C8	Commitment	3.8829	2.2404

Participation

Differences between the obtained mean values for the dependent variable Participation (C6) of faculty in preparation ($M = 4.127 \pm .312$), focus on use ($M = 4.020 \pm .159$), and focus on improvement ($M = 3.389 \pm .182$) are displayed in Figure 3. These results illustrate the perception of faculty regarding the condition *Participation* which is understood as the level of stakeholders' involvement in the decision-making process to adopt and implement WBIT.

Table 31
Test of Between-Subjects Effects for Levels of Use (LoU)

Source	Dependent Variable	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.	Observed Power
LoU	Dissatisfaction	11.969	2	5.985	.843	.431	.194
	Knowledge & Skills	3.555	2	1.777	.494	.610	.131
	Resources	1.175	2	.587	.220	.803	.084
	Time	3.911	2	1.956	..474	.623	.127
	Rewards	16.335	2	8.168	2.011	.135	.414
	Participation	23.256	2	11.628	4.133*	.017	.728
	Leadership	38.553	2	19.276	5.230*	.006	.830
	Commitment	64.867	2	32.433	7.985*	.000	.955

* The mean difference is significant at the .05 level.
Bold conditions are significant at the .05 level.

Results suggested that once the Level of Use *focus on improvement* is met, the need for participation decreases in importance as a condition for the successful implementation of WBIT. Faculty members in lower levels of Levels of Use were significantly more associated with higher ranks of *Participation* as an important condition.

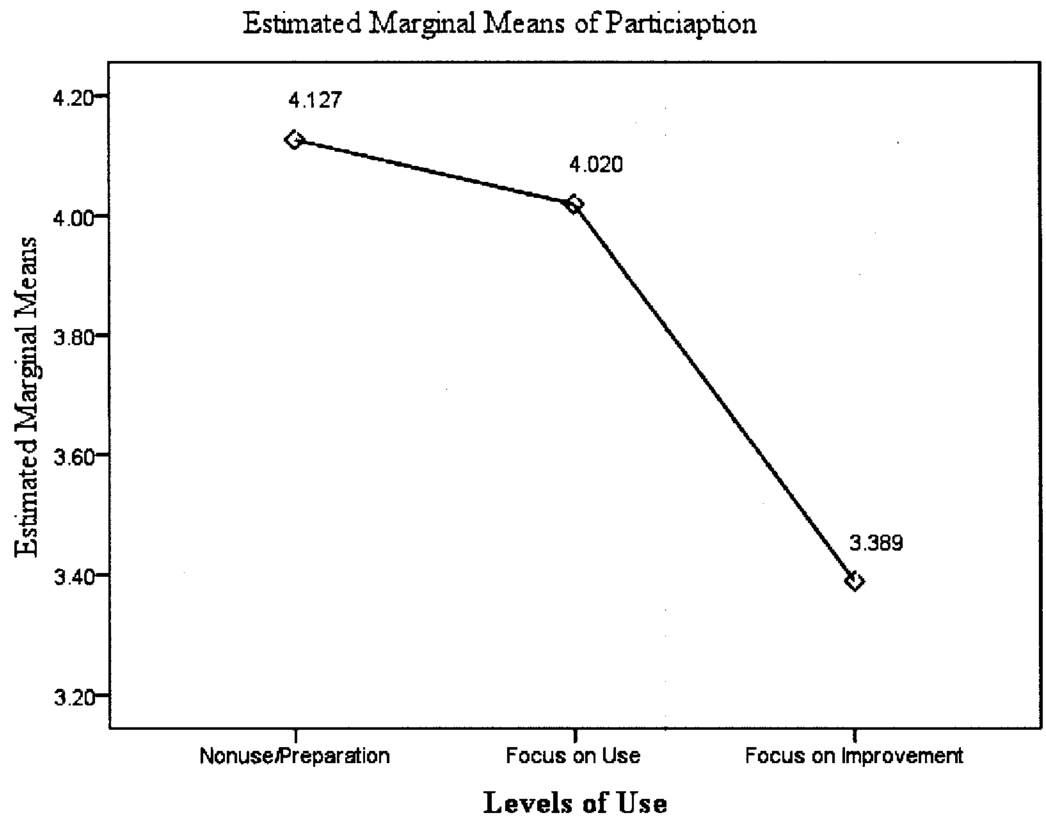


Figure 3. Estimated marginal means of *Rewards* (C5)

Multiple Comparisons Post Hoc tests were conducted for *Participation* to examine how the mean values for Levels of Use groups varied. Results presented in Table 32 revealed significant mean differences only for faculty members in *focus on improvement* as compared with faculty members in *focus on use*. Faculty members in *focus on use* perceived the need for participation significantly more important than those faculty members in *focus on improvement.*

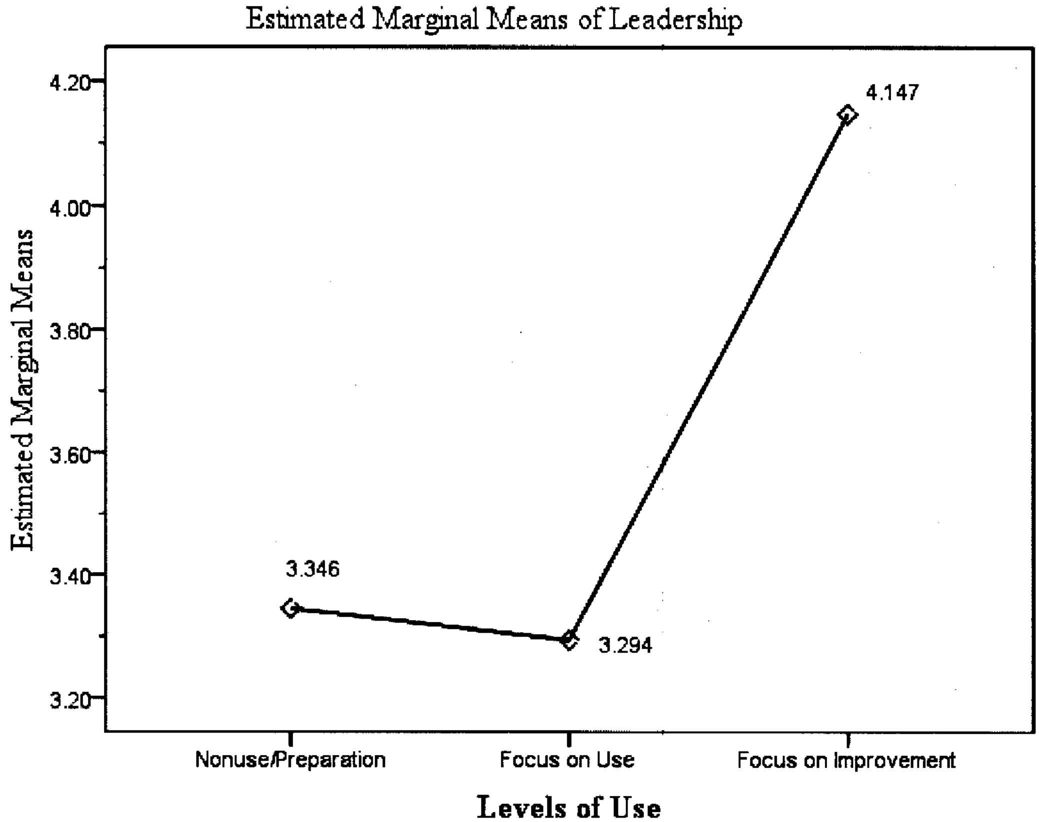


Figure 4. Estimated marginal means of *Leadership* (C7)

Table 33.
Leadership Multiple Comparisons for Levels of Use (LoU)

Dependent Variable	(I) LoU	(J) LoU	Mean Difference	Std. Error	Sig.
Leadership (C7)	Preparation	Focus on Use	.006	.393	.1.000
		Improvement	-.871	.406	.097
	Focus on Use	Preparation	-.006	.393	1.000
		Improvement	-.877*	.271	.004

Based on estimated marginal means
Adjustment for multiple comparisons: Bonferroni
* The mean difference is significant at the .05 level.

Commitment

Faculty members in the highest level of use (i.e., *improvement*) perceived the need for commitment significantly more important than those faculty members in *focus on use*. No significant differences were found between faculty members in *preparation* and those in *focus on use.* Differences between the obtained mean values of faculty in *preparation* ($M = 3.216 \pm .375$), focus *on use* ($M = 3.267 \pm .191$), and *focus on improvement* ($M = 4.351 \pm .219$) are displayed in Figure 5. These results illustrate the perception of faculty regarding the condition *Commitment* which is understood as the "visible" support by the upper level leaders or powerbrokers in the implementation of WBIT. Results depicted that the increase in importance of the condition *Commitment* was associated with faculty members in the upper level of use of WBIT (i.e., *impact*). In other words, these results provide evidence that as faculty advance in their use of WBIT, the need for commitment increases.

Multiple Comparisons Post Hoc tests were conducted for *Commitment* to examine how the estimated marginal mean values for Levels of Use groups varied. Results presented in Table 34 revealed significant mean differences in the perceptions of faculty in *preparation* as compared to those in *focus on improvement.* Significant differences were found also between faculty members in *focus on use* as compared to those in *focus on improvement*. Faculty members in *focus on improvement* Level of Use perceived the need for commitment significantly more important than faculty members in lower Levels of Use (i.e., *preparation* and *focus on use*).

Multivariate Interaction Effect Results

SPSS GLM test provided multivariate significant results of faculty perceptions of

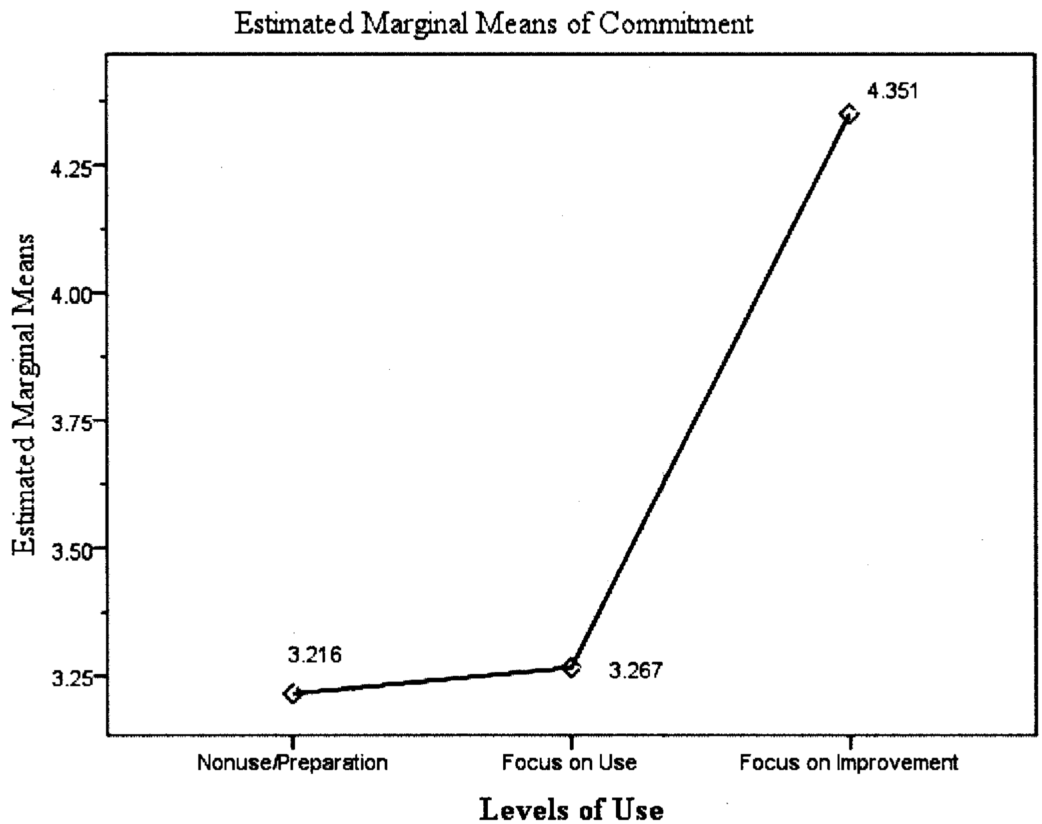


Figure 5. Estimated marginal means of *Commitment (C8)*

Table 34.
Commitment Multiple Comparisons for Levels of Use (LoU)

Dependent Variable	(I) LoU	(J) LoU	Mean Difference	Std. Error	Sig.
Commitment (C8)	Preparation	Focus on Use	-.051	.415	1.000
		Improvement	-1.135*	.432	.027
	Focus on Use	Preparation	.051	.415	1.000
		Improvement	-1.084*	.286	.001

Based on estimated marginal means
Adjustment for multiple comparisons: Bonferroni
* The mean difference is significant at the .05 level.

conditions for the successful implementation of WBIT when faculty Stages of Concerns and Levels of Use were taken into consideration, *Wilk's* $\Lambda = .829$, $F(28, 1140) = 2.174$, $p = .000$.

Table 35.
Test of Between-Subjects Effects: Levels of Use (LoU) by Stages of Concern (SoC)

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Observed Power
LoU*SoC	Dissatisfaction	41.999	4	10.500	1.479	.208	.458
	Knowledge	45.556	4	11.389	3.169*	.014	.820
	Resources	18.095	4	4.524	1.695	.151	.518
	Time	26.792	4	6.698	1.624	.168	.499
	Rewards	141.085	4	35.271	8.686*	.000	.999
	Participation	12.663	4	3.166	1.125	.344	.353
	Leadership	21.048	4	5.262	1.428	.224	.443
	Commitment	39.250	4	9.813	2.416*	.049	.692

* The mean difference is significant at the .05 level.

Table 35 presents univariate analyses results for the interaction effect of Levels of Use by Stages of Concern. Results revealed significant differences between the mean values for the following dependent variables: (a) *Knowledge & Skills*, $F = 3.169$, $df = 4$, $p = .014$; (b) *Incentives & Rewards*, $F = 8.686$, $df = 4$, $p = .000$; and (c) *Commitment*, $F = 2.416$, $df = 4$, $p = .049$. Differences among the obtained mean values for the significant interaction effects results are examined next.

Knowledge and Skills

Figure 6 displays a disordinal interaction of the obtained mean values of Levels of Use by Stages of Concern for the condition *knowledge and skills.* These results illustrate the perception of faculty regarding the condition *knowledge and skills* which is understood as the need of having or acquiring skills and knowledge to use the technology. Results suggested that the need for *knowledge and skills* at different Levels of Use is not consistent along Stages of Concern. As faculty members in the upper Stages of Concern continue to use WBIT their need for knowledge and skills decreases; however, self-concerned faculty members seem to have an increased need for *knowledge and skills* as they move towards upper Levels of Use.

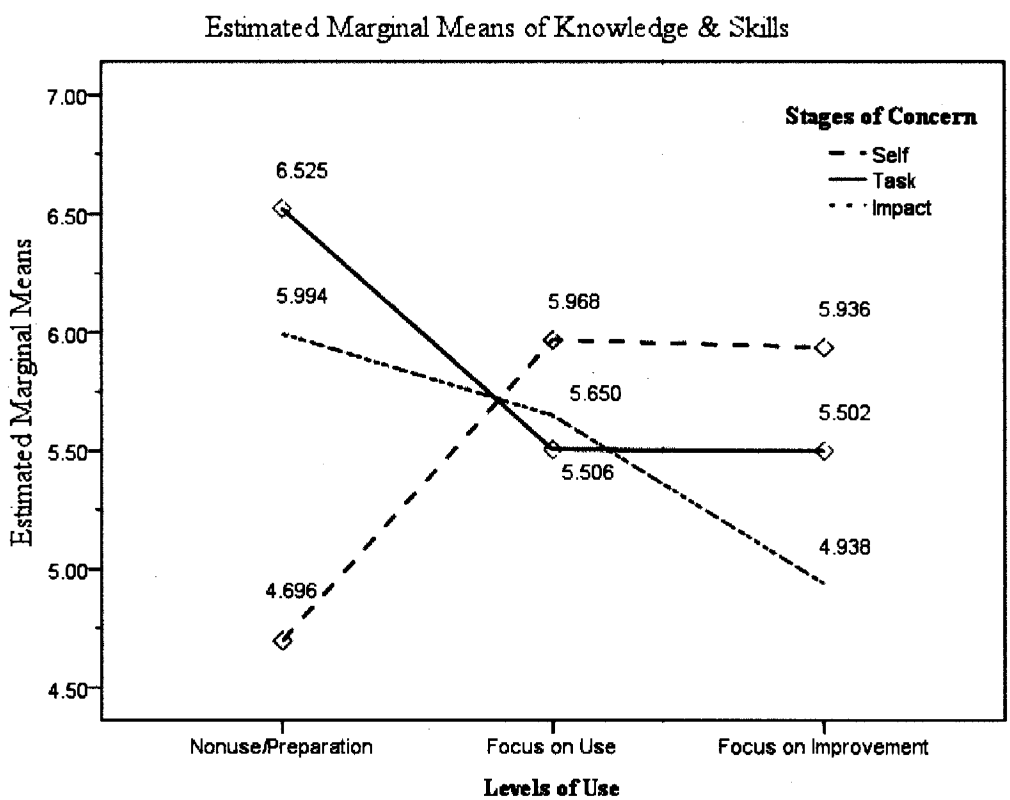


Figure 6. Estimated marginal means of *Knowledge & Skills* for the interaction effect

Post Hoc tests were conducted for the condition *knowledge and skills* to examine how the estimated mean values for Levels of Use by Stages of Concern groups varied. Table 36 displays the pairwise comparisons for the significant mean differences. The only significant difference was found for *preparation* Level of Use. Faculty members in *task* Stage of Concern ($M = 6.525 \pm .601$) perceived the need for *knowledge and skills* significantly more important than faculty members in *self* Stage of Concern ($M = 4.696 \pm .351$).

Table 36.
Knowledge & Skills Pairwise Comparisons

Levels of Use	(I) Stages of Concern	(J) Stages of Concern	Mean Difference (I-J)	Std. Error	Sig.
Nonuse/Preparation	Self	Task	-1.800*	.693	.030
		Impact	-1.367	.849	.325
	Task	Self	1.800*	.693	.030
		Impact	.433	.980	1.000
	Impact	Self	1.367	.849	.325
		Task	-.433	.980	1.000

Based on estimated marginal means
* The mean difference is significant at the .05 level
Adjustment for multiple comparisons: Bonferroni.

Incentives and Rewards

Figure 7 displays a disordinal interaction of the obtained mean values of Levels of Use by Stages of Concern for the condition *Incentives and Rewards*. These results illustrate the perception of faculty regarding the condition *incentives and rewards* which is understood as the need for intrinsic or extrinsic rewards that result from using WBIT.

Results suggested that the need for *incentives and rewards* at different Levels of Use is not consistent along Stages of Concern. Faculty members in the upper Stage of Concern (i.e., *impact*) perceived the need for *incentives and rewards* consistently less important across Levels of Use. For those faculty members with *task* concerns, the need for *incentives and rewards* increases in the upper Levels of Use. However, for faculty members with *self* concerns, the need for *incentives and rewards* decreases consistently as they move from lower Levels of Use to upper Levels of Use. Within *preparation* Level of Use, faculty members in *self* Stage of Concern expressed the largest need for *knowledge and skills;* conversely, within the *focus on improvement* Level of Use, the lowest rank was found also for self-concerned faculty members.

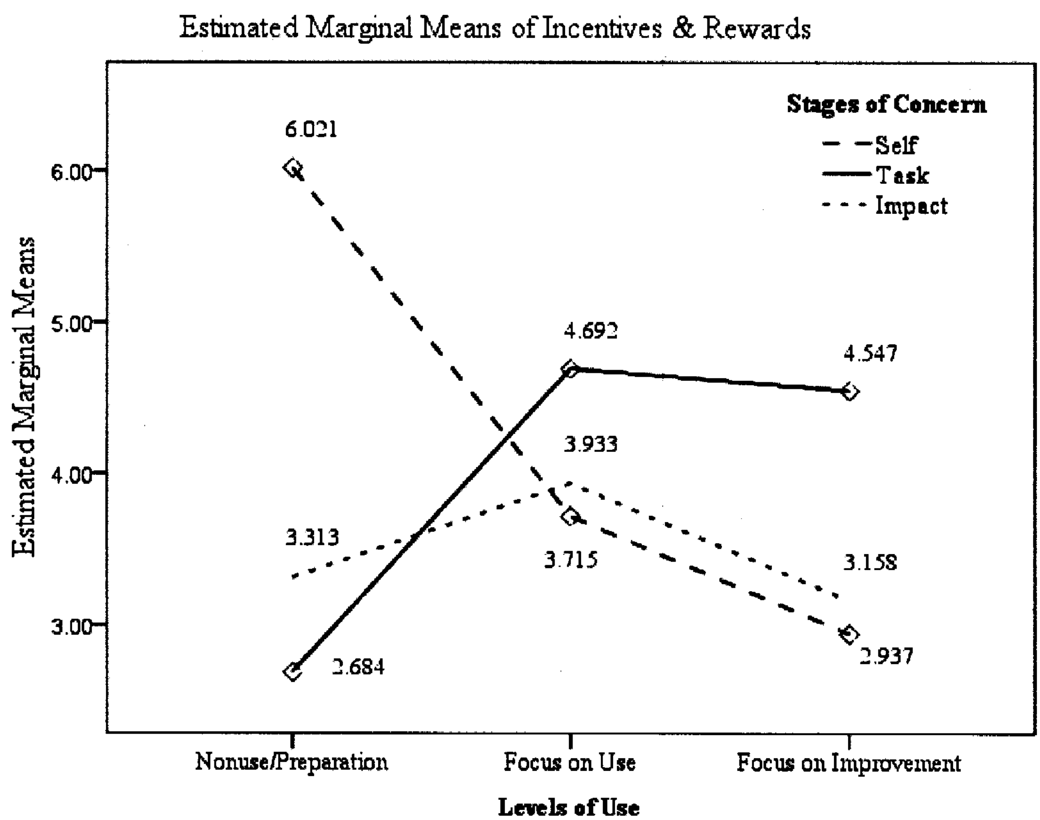


Figure 7. Estimated marginal means of *Incentives and Rewards* for the interaction effect

Post Hoc tests were conducted for the condition *incentives & rewards* to examine how the estimated mean values for Levels of Use by Stages of Concern groups varied. Table 37 displays the pairwise comparisons for the significant mean differences. Significant differences were found for *nonuse/preparation* Level of Use and for *focus on improvement* Level of Use. Within *preparation* Level of Use, faculty members with *self* concerns ($M = 6.525 \pm .601$) perceived the need for *incentives & rewards* significantly more important than faculty members with *task* concerns (M = 2.684 ± .639). The opposite is true for faculty within *focus on improvement* Level of Use. Faculty members with *task* concerns (M = 4.547 ± .492) perceived the need for *knowledge & skills* significantly more important than faculty members with *self* concerns (M = 2.937 ± .358).

Table 37.
Incentives & Rewards Pairwise Comparisons

Levels of Use	(I) Stages of Concern	(J) Stages of Concern	Mean Difference (I-J)	Std. Error	Sig.
Nonuse/Preparation	Self	Task	3.333*	.734	.000
		Impact	2.700*	.900	.009
Focus on Improvement	Self	Task	-1.623*	.604	.023
		Impact	-.205	.420	1.000

Based on estimated marginal means
* The mean difference is significant at the .05 level
a. Adjustment for multiple comparisons: Bonferroni.

Commitment

Figure 8 displays a disordinal interaction of the obtained mean values of Levels of Use by Stages of Concern for the condition *Commitment*. Results suggested that faculty members in the upper Stage of Concern (i.e., *impact*) perceived the need for *commitment* consistently more important across Levels of Use than faculty members in the lower Levels of Use.

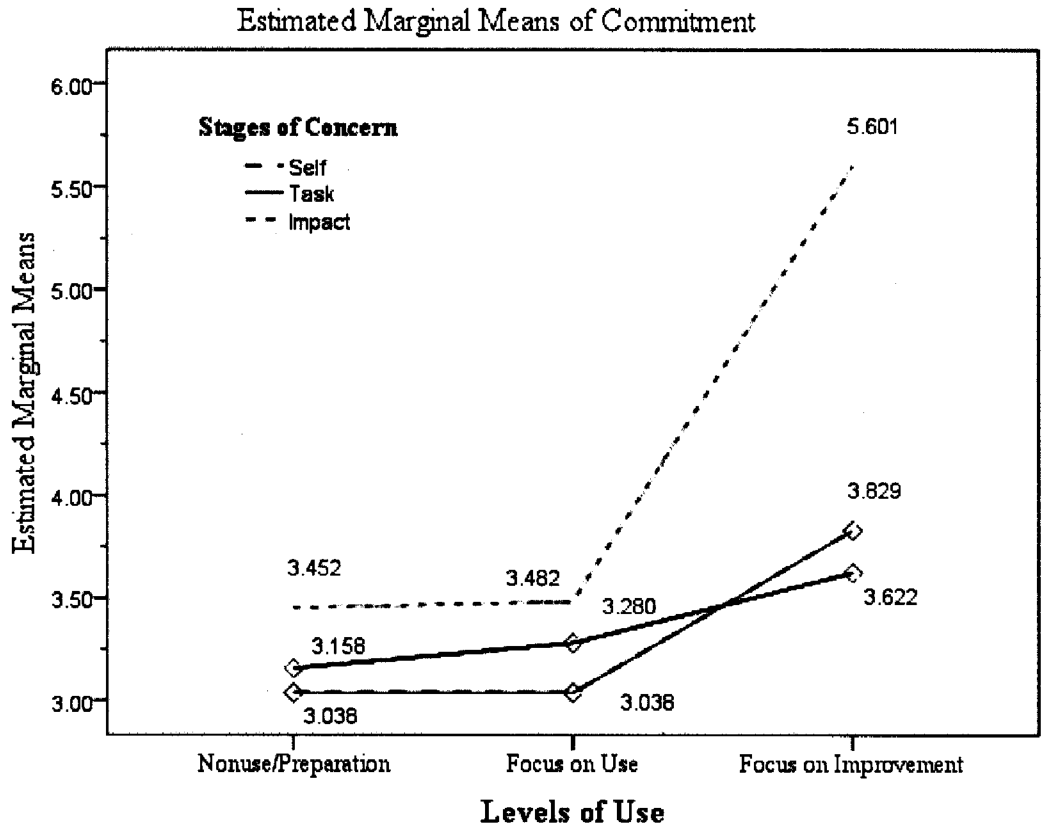


Figure 8. Estimated marginal means of *Commitment* for the interaction effect

Post Hoc tests were conducted for the condition *commitment* to examine how the estimated mean values for Levels of Use by Stages of Concern groups varied. Table 38 displays the pairwise comparisons for the significant mean differences. Significant differences were found for *focus on improvement* Level of Use only. Within *focus on improvement* Level of Use, impact-concerned faculty members ranked the need for commitment significantly more important than faculty members with *self* and *task* concerns. Within lower Levels of Use, the need for *commitment* was ranked consistently lower than for the upper Levels of Use.

Table 38.
Commitment Pairwise Comparisons

Levels of Use	(I) Stages of Concern	(J) Stages of Concern	Mean Difference (I-J)	Std. Error	Sig.
Focus on Improvement	Self	Task	.287	.605	1.000
		Impact	-1.755*	.421	.000
	Task	Self	-.287	.605	1.000
		Impact	-2.041*	.538	.001
	Impact	Self	1.755*	.421	.000
		Task	2.041*	.538	.001

Based on estimated marginal means
* The mean difference is significant at the .05 level
a. Adjustment for multiple comparisons: Bonferroni.

Non-significant Main Effects and Interaction Effects

SPSS multivariate tests provided non-significant results of faculty perceptions relating to the conditions *dissatisfaction with the Status Quo* (C1), *knowledge and skills* (C2), *resources* (C3), *time* (C4), and *participation* (C6) when faculty stages of concern, levels of use of WBIT, and computer self-efficacy beliefs were taken into consideration. The following independent variables (IV) and interactions did not achieve significant main effects in the MANOVA analysis: Stages of Concern, Computer Self-Efficacy, Computer Self-Efficacy by Levels of Use, Computer Self-Efficacy by Stages of Concern, and Computer Self-Efficacy by Levels of Use by Stages of Concern (see Appendix C).

Chapter Summary

The main purpose of the study was to analyze levels of implementation of Web-based instructional technology (WBIT) and self-efficacy beliefs as factors associated with faculty perceptions of institutional mechanisms and its relative importance as conditions supporting the implementation of WBIT. Conditions for the successful implementation of WBIT were evaluated using eight conditions found by Ely (1999). Levels of implementation were assigned to each participant considering measures of Stages of Concern and Levels of Use of technology from the Concerns-Based Adoption Model (CBAM). Framed in Bandura's self-efficacy theory, measures of Computer Self-Efficacy (Compeau & Higgins, 1995) were determined for each participant. Additionally, personal and professional demographic variables were identified for further analysis.

The study was guided by three research questions and four associated hypotheses. Research questions were assessed through statistical analyses including multinomial logistic regression, correlation analysis, and factorial multivariate analysis of variance (MANOVA). All statistics were analyzed using the Statistical Package for the Social Sciences (SPSS); probability (*p*) values of .05 or less were employed for significant results.

Data were collected from a sample of 334 faculty members currently teaching in selected universities in the Commonwealth of Kentucky who voluntarily responded to a Web-based survey. An analysis of aggregated data was conducted as an alternative method to determine how respondents compared to the larger population at the participant institutions. Tenured faculty were slightly more represented by the respondents (3%) compared to their representation in the population. Similarly, females were slightly more represented by respondents (5%) as compared to their representation in the population. While the difference in both comparisons is small, caution should be used in interpreting the results considering that the responses may be more representative of tenured faculty members and of females.

Data analysis and obtained results were addressed independently for each hypothesis. Research question one (RQ1) addressed the prediction of the implementation level by considering Stages of Concern and Levels of Use of faculty using Web-based instructional technology. Two null hypotheses were developed to address RQ1. Null hypothesis one (NH1) stated that Stages of Concerns of faculty using WBIT will not be predicted by selected individual characteristics and Levels of Use of WBIT. Null hypothesis two (NH2) stated that Levels of Use of WBIT will not be predicted by selected individual characteristics and Computer Self-Efficacy beliefs.

In order to test the two NHs two sequential multinomial logistic regressions were performed through SPSS NOMREG to assess prediction of membership in one of three categories of Stages of Concern (self, task, impact), and in one of three categories of Levels of Use (preparation, focus on use, focus on improvement). In both regression analyses variables were entered in two sets – demographic variables first and then behavioral/psychological variables (i.e., Levels of Use and Computer Self-Efficacy). Results of both regression analyses showed significance of contribution of the behavioral/psychological variables above significance of demographic predictors. In the analysis to predict Stages of Concern, model fit significantly increased, χ^2 $(50, N = 334) = 43.88, p = .72$, Nagelkerke $R^2 = .22$ with a 95% confidence interval, after addition of the behavioral predictor (Levels of Use). For the analysis to predict Levels of Use, goodness-of-fit depicted poor model fit on the basis of demographic predictors alone; however, model fit improved significantly after addition of the psychological variable (Computer Self-Efficacy) χ^2 $(56, N = 334) = 50.54, p = .68$, Nagelkerke $R^2 = .23$ with a

95% confidence interval.

The second research question (RQ2) hypothesized an association between Compeau & Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of Web-based instructional technology (WBIT). Levels of implementation were operationalized using faculty Stages of Concern and Levels of Use measures. Null hypothesis three (NH3) hypothesized that there will be no significant relationship between measures of Computer Self-Efficacy and faculty Stages of Concern and Levels of Use. Correlation analysis for the three categorical variables involved was performed using Pearson's Chi-Square (χ^2) statistic. Significance was found for Computer Self-Efficacy and Stages of Concern, χ^2 (4, N = 334) = 11.316, p = .023 and for Computer Self-Efficacy and Levels of Use, χ^2 (4, N = 334) = 15.179, p = .004. However, Contingency Coefficients for both analyses revealed weak associations (C = .181 and C = .208, respectively). The margin of error for both Crosstabs analyses, based on sample size, indicated that extreme caution should be used while interpreting these results. Overall, Crosstabs results suggested that low levels of Computer Self-Efficacy were slightly more associated with lower Stages of Concern (i.e., *self*) and lower Levels of Use (i.e., *nonuse/preparation*). Similarly, higher levels of Computer Self-Efficacy tended to be more associated with higher levels of Stages of Concern (i.e., *task and impact*) and higher levels of Levels of Use (i.e., *focus on use and focus on improvement*).

Finally, research question three (RQ3) examined the perception of faculty in regard to the relative importance of a group of conditions that were found to support the successful implementation of technology. In order to evaluate RQ3, null hypothesis four (NH4) hypothesized that there will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (Stages of Concern and Levels of Use) when Computer Self-Efficacy beliefs are taken into consideration. Descriptive analysis of overall results revealed that Knowledge and Skills ($M = 5.538 \pm 1.937$), Resources ($M = 6.130 \pm 1.644$), and Time ($M = 5.543 \pm 2.062$) were perceived by faculty as the most important conditions. The least important condition as perceived by the overall sample was Dissatisfaction with the Status Quo ($M = 3.6186 \pm 2.668$).

A 3-Way Factorial MANOVA was performed with Stages of Concern, Levels of Use, and Computer Self-Efficacy as the independent variables, and eight conditions as dependent variables (i.e., dissatisfaction with the status quo, knowledge and skills, resources, time, rewards, participation, leadership, commitment). Results of the MANOVA revealed statistically significant multivariate main effects for Levels of Use, *Wilk's* $\Lambda = .916$, $F(14, 602) = 1.928$, $p = .043$ and a significant multivariate interaction effect for Levels of Use by Stages of Concern, *Wilk's* $\Lambda = .864$, $F(28, 1086) = 1.611$, $p = .023$.

Univariate tests depicted significant main effects of Levels of Use for Participation ($F = 4.133$, $df = 2$, $p = .017$), Leadership ($F = 5.230$, $df = 2$, $p = .006$), and Commitment ($F = 7.985$, $df = 2$, $p = .000$); and significant interaction effects of Stages of Concern by Levels of Use for Knowledge & Skills ($F = 11.389$, $df = 4$, $p = .014$), Incentives & Rewards ($F = 8.686$, $df = 4$, $p = .000$), and Commitment ($F = 2/416$, $df = 4$, $p = .049$).

Post Hoc analysis of significant main effects for Levels of Use exposed that the need for *participation* was significantly less important for participants within *focus on* *improvement* than within *preparation* Level of Use. Conversely, the need for leadership was ranked significantly more important for faculty members within *focus on improvement* than within *preparation* Level of Use. Finally, the need for commitment was ranked significantly more important for participants within *focus on improvement* than within *focus on use* or *preparation* Level of Use.

Post Hoc analysis of significant interaction effects for Stages of Concern by Levels of Use exposed significant differences between the mean values of *self*-concerned faculty members and *task*-concerned faculty members within *preparation* Level of Use for the dependent variable *knowledge and skills*. For *incentives & rewards*, significant differences were found for the mean values of *self*-concerned faculty members as compared with *task*-concerned and *impact*-concerned faculty members within *preparation* Level of Use. Additionally, significant differences were also found for the mean values of *task*-concerned faculty members as compared with *self*-concerned and *impact*-concerned faculty members within *improvement* Level of Use. Finally, for the dependent variable *commitment*, significant differences were found among all three groups of Stages of Concern (i.e., *self*, *task*, and *impact*) but only for faculty members within *focus on improvement*.

Stages of Concern did not report significant main effects, and Computer Self-Efficacy has neither significant main effect nor interaction effect.

CHAPTER V

CONCLUSIONS

Introduction

This study explored faculty levels of implementation of Web-based instructional technology (WBIT) and self-efficacy levels as factors associated with faculty perception of institutional mechanisms and their relative importance as conditions for supporting the implementation of WBIT in higher education. Chapter 1 outlined current challenges faced by higher education institutions implementing Web-based instructional technology and established the need for this research. Chapter 2 provided literature associated with faculty concerns, faculty levels of use of instructional technology, and conditions for successful implementation of technology. In Chapter 3, the study's research design, research objectives and questions, methods, and procedures were addressed. Chapter 4 described the study's sample, data analyses, research questions, and obtained results. In this final chapter a summary of the research is initially provided. Then, findings from each research question are presented and discussed in the light of previous research. Theory, research, and practical implications of the study's results are also outlined. Finally, limitations and recommendations for future research are provided.

Summary of Research

A review of the literature regarding institutional support mechanisms for WBIT implementation reveals a gap between the views of successful faculty teaching online and what empirical studies have found about the needs of faculty at different levels of expertise and technical skills. The literature reveals that higher education institutions provide limited instructional support to faculty and it is often perceived by faculty as inadequate (Betts, 1998; Dooley & Murphrey, 2002; Granger et al., 2002; Lee, 2002). In this sense, the lack of administrative support and limited incentives are recounted by the literature as the most common environmental factors perceived by faculty as obstacles in the implementation of WBIT. Therefore, especially if resource allocations for professional development and faculty support have diminished, understanding what influences the perception of faculty members regarding the conditions that support the implementation of WBIT becomes of fundamental interest to administrators and policymakers.

Assessing levels of implementation of WBIT in higher education is a complex task. The CBAM has been used extensively in education. This study sought to develop a profile of faculty WBIT implementation considering the dimensions that comprise the CBAM (i.e., Stages of Concern, Levels of Use, and Innovation Configurations). The researchers' investigation of the participants' universities technology implementation plan, as found online, allowed the study to consider the Innovation Configuration variable as a constant. Therefore, this study measured Stages of Concern and Levels of Use of WBIT as variables to operationalize levels of implementation. Theoretically, the Stages of Concern while implementing technology evolve from personal self concerns to concerns about the impact of the innovation (George, Hall, & Stiegelbauer, 2006); while the Levels of Use progress from nonuse/preparation to focus on improvement Together, the SoC and LoU "provide a powerful description of the dynamics of an individual involved in change, one dimension focusing on feelings, the other on performance" (George et al., 2006, p. 4).

Framed in Bandura's self-efficacy theory, computer self-efficacy has shown to be an important construct to examine the ability of individuals to successfully perform computer-related tasks. As described by Bandura (1986), self-efficacy is an estimation of individualized self-percepts that result from dynamic interplay among self-referent thought, affect, and action. Bandura (1977) also observed that technological changes require self-appraisal capabilities through performance accomplishments. For the purpose of this analysis, we considered computer self-efficacy to play a critical role in self-motivating faculty to use WBIT, especially because a certain level of motivation is necessary to initiate coping with unfamiliar tasks (Bandura, 1982). This study considered the computer self-efficacy scale developed by Compeau and Higgins (1995).

The purpose of this study was to develop a profile of WBIT implementation and computer self-efficacy beliefs of faculty as well as to analyze how such a profile is associated with the perception of institutional mechanisms and its relative importance as conditions supporting the implementation of WBIT. Three objectives were developed in order to address the purpose of this study: (a) identify and analyze faculty levels of concern and levels of use of Web-based instruction, (b) identify faculty computer self-efficacy beliefs and analyze the relationship between faculty computer self-efficacy and levels of implementation of WBIT, and (c) identify and analyze faculty perceptions of conditions supporting the implementation of WBIT. Correspondingly, three research questions and four associated null hypotheses were developed (see Table 39). Results of hypotheses testing are discussed individually in the following section.

Table 39.
Objectives, Research Questions and Associated Null Hypotheses

Research Question (RQ)	Null Hypothesis (NH)	NH Testing
Objective 1. Identify and analyze faculty levels of concern and levels of use of Web-based instruction.		
RQ1. What are the Stages of Concern and Levels of Use with respect to faculty using Web-based instructional technology?	NH1. Present concerns of faculty using Web-based instructional technology (WBIT) will not be predicted by individual characteristics and levels of WBIT use.	NH1 Rejected
	NH2. Faculty Levels of Use of WBIT will not be predicted by individual characteristics and computer self-efficacy beliefs.	NH2 Rejected
Objective 2. Identify faculty computer self-efficacy beliefs and analyze the relationship between faculty computer self-efficacy and levels of implementation of WBIT.		
RQ2. What, if any, is the relationship between Compeau and Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of WBIT?	NH3. There will be no significant correlation between measures of computer self-efficacy and faculty Stages of Concern and Levels of Use.	NH3 Rejected
Objective 3. Identify and analyze faculty perceptions of conditions supporting the implementation of WBIT.		
RQ3. Do Stages of Concern, Levels of Use, and computer self-efficacy beliefs affect the perception of faculty in regard to the relative importance of Ely's conditions in supporting the successful implementation of technology?	NH4. There will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation of WBIT when self-efficacy beliefs are taken into consideration.	NH4 Upheld

Results of Analyses

A sample of 334 faculty members teaching at six universities in the Commonwealth of Kentucky was drawn to identify levels of implementation of Web-based instructional technology (WBIT) and computer self-efficacy beliefs. Levels of implementation were measured using the Stages of Concern Questionnaire and the Levels of Use of technology interview protocol, both instruments grounded in the Concerns-Based Adoption Model (CBAM). Self-efficacy beliefs of faculty regarding their confidence in working with computers were measured using the Computer Self-Efficacy questionnaire from Compeau and Higgins (1995) grounded in Bandura's Self-Efficacy Theory.

Usable data were collected from 334 faculty members who voluntarily responded to a Web-based survey. An analysis of aggregated data was conducted as an alternative method of determining how representative respondents were of the larger population at the participant institutions. Tenured faculty and females were slightly more represented by the respondents (3% and 5% respectively) compared to their representation in the population. Research questions were assessed through statistical analysis including multinomial logistic regression, correlation analysis, and factorial multivariate analysis of variance (Factorial MANOVA). All statistics were conducted using the Statistical Package for the Social Sciences (SPSS); probability (*p*) values of 0.05 or less were employed for significant results. Data were analyzed independently for each hypothesis. Results of analyses are presented independently per research question.

Research Question One (RQ1)

The first research question addressed the prediction of implementation level by considering Stages of Concern and Levels of Use of faculty using Web-based instructional technology. As shown in Table 39, RQ1 was developed as two-fold hypothesis. The purpose of the first hypothesis was not to test the CBAM's two dimensions used to define implementation profiles of faculty in this study (i.e., Stages of Concern and Levels of Use) but instead to analyze how the CBAM's behavioral dimension (i.e., Levels of Use) relates to its psychological dimension (i.e., Stages of Concern), assuming that those two dimensions conform implementation level (by declaring the Innovation Configuration dimension from the CBAM framework constant). Therefore, null hypothesis one (NH1) focused on analyzing concerns of faculty using WBIT, while null hypothesis two (NH2) focused on analyzing faculty's levels of use of WBIT.

The theoretical model tested in NH1 assumed that an individual presents different concerns at different points during the implementation process (Hall & Hord, 1987) and that those concerns change as individuals become more familiar with the use of the technology. Specifically, Levels of Use of WBIT were used as predictors of Stages of Concern along with selected demographic predictors (i.e., gender, online teaching experience, and level of technological professional development participation).

Results of a multinomial regression analysis for testing NH1 showed significance of contribution of the behavioral variable Levels of Use above significance of demographic predictors alone. These results suggested that Levels of Use of WBIT significantly increased the prediction of Stages of Concern of faculty implementing WBIT. Other variables found statistically significant included level of technology-related professional development participation and online teaching experience (See Figure 9). As a result, NH1 was rejected.

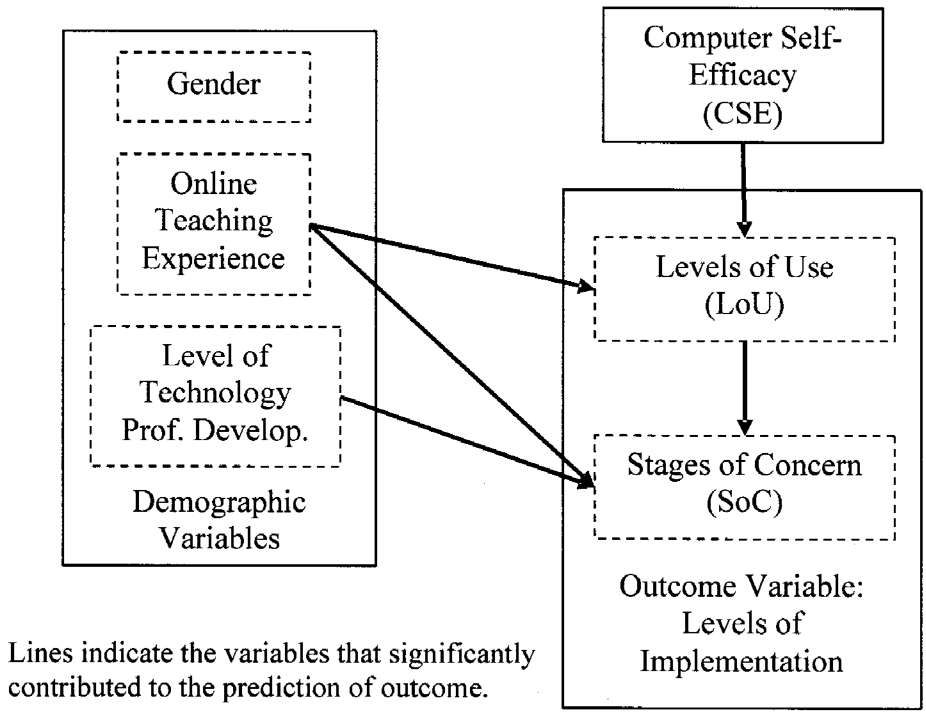
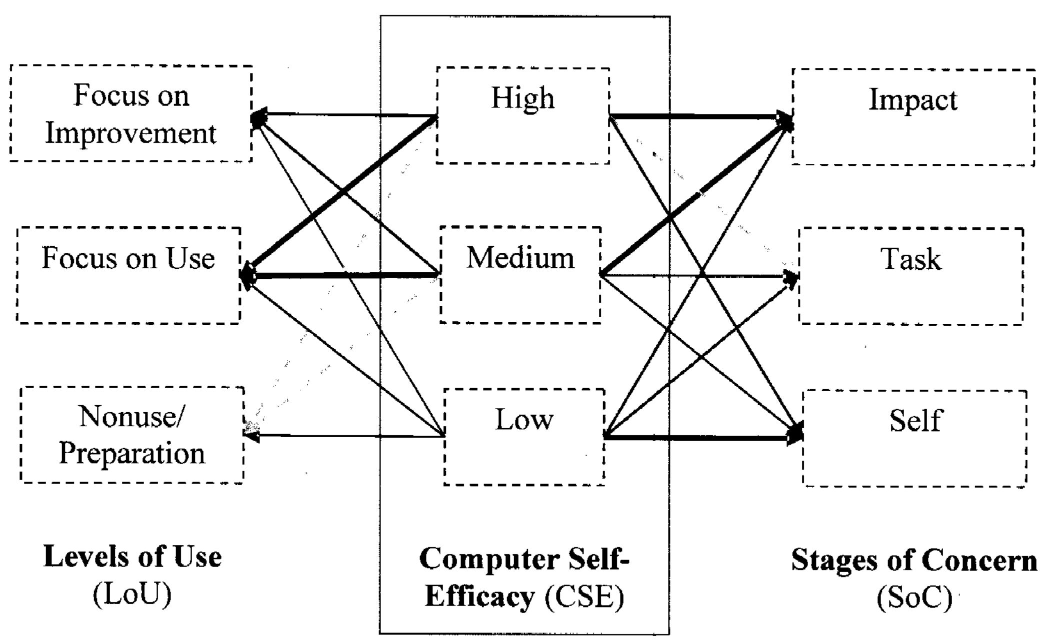


Figure 9. Summary of research findings for RQ1

The second part of RQ1 focused on analyzing WBIT usage. Based on social learning theory, the model tested in NH2 suggested that self-efficacy will increase prediction of WBIT usage. The theoretical model tested in NH2 assumed that individuals demonstrate different levels of use as reflection of their level of computer self-efficacy, online teaching experience, level of technology professional development participation, and gender. From the two demographic predictors entered in the model, online teaching experience was significant for the prediction of Stages of Concern (See Figure 9). Results of multinomial logistic regression analysis showed enhanced model prediction after adding the psychological construct Computer Self-Efficacy. These results suggested that, apart from use over time and experience, a firm sense of computer self-efficacy is an important factor to maintain advanced performance in technology use. Thus, based on the results obtained NH2 was rejected.

Research Question Two (RQ2)

The second research question (RQ2) hypothesized an association between Compeau & Higgins (1995) measures of computer self-efficacy and faculty levels of implementation of WBIT. As for RQ1, levels of implementation were operationalized using faculty Stages of Concern and Levels of Use measures. Null hypothesis three (NH3) hypothesized that there will be no significant correlation between measures of Computer Self-Efficacy and faculty Stages of Concern and Levels of Use. Results of a correlation analysis for the three categorical variables showed a significant, although weak association of Computer Self Efficacy and both implementation variables (i.e., Stages of Concern and Levels of Use) (See Figure 10).



Darker lines represent stronger correlations while lighter lines represent weaker correlations. The weakest correlations are represented using pale dashed lines.

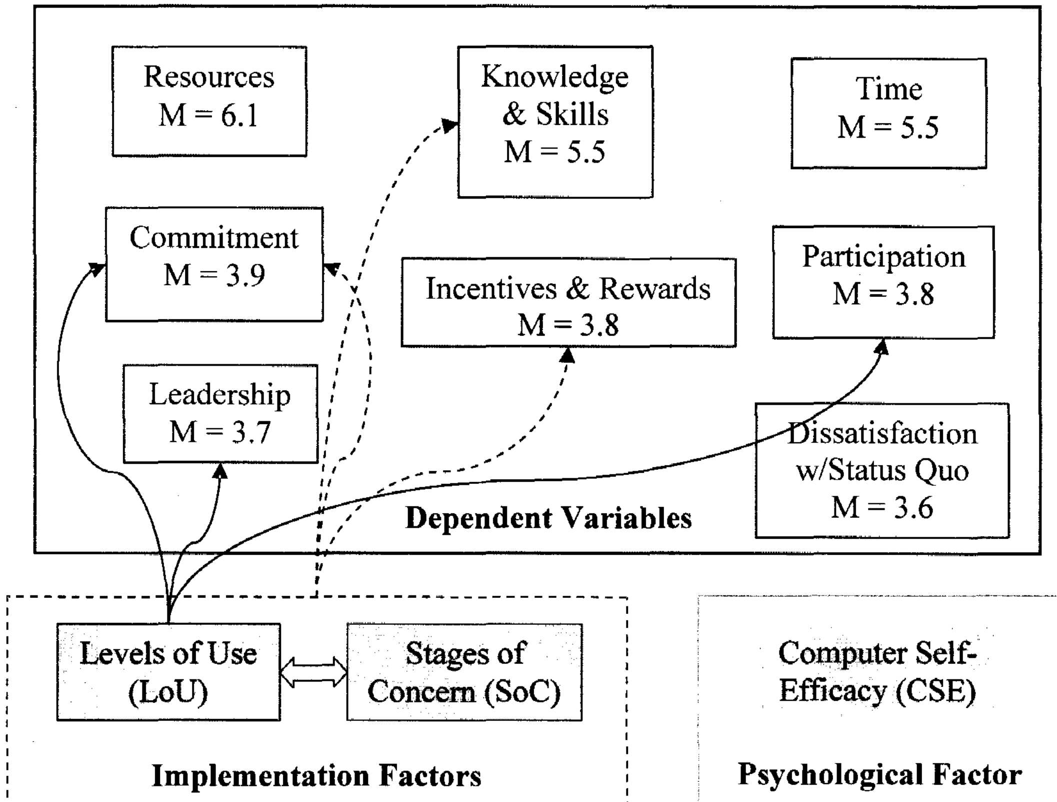
Figure 10. Summary of research findings for RQ2

Even though the correlation was weak, the trend of the correlation was in the expected direction. Overall, Crosstabs results suggested that low levels of Computer Self-Efficacy were slightly more associated to low Stages of Concern (i.e., *self concerns*) and Levels of Use (i.e., *nonuse/preparation*). Similarly, high levels of Computer Self-Efficacy tended to be more associated with medium and higher Stages of Concern and Levels of Use (i.e., *impact concerns* and *focus on improvement* respectively). Based on the results obtained, NH3 was rejected.

Research Question Three (RQ3)

The third research question (RQ3) examined the perception of faculty in regard to the relative importance of a group of conditions that were found to support the successful implementation of technology. In order to evaluate RQ3, null hypothesis four (NH4) hypothesized that there will be no significant differences in the perception of conditions that facilitate the implementation of WBIT across levels of implementation (stages of concern and levels of use of WBIT) when self-efficacy beliefs are taken into consideration. The theoretical model tested in NH4 suggested Levels of Use, Stages of Concern, and Computer Self-Efficacy as variables affecting faculty perception of Ely's (1990) eight conditions supporting the implementation of innovations.

A Factorial MANOVA was performed with Stages of Concern, Levels of Use, and Computer Self-Efficacy as the independent variables, and Ely's eight conditions as criterion variables (i.e., *dissatisfaction with the status quo, knowledge and skills, resources, time, rewards, participation, leadership, commitment*). Results revealed statistically significant multivariate main effects for Levels of Use (see continuous lines in Figure 11) and a significant multivariate interaction effect for the implementation factors, Levels of Use by Stages of Concern (see dashed lines in Figure 11).



Results of a Factorial MANOVA revealed statistically significant multivariate main effects for Levels of Use (represented with continuous lines) and a significant multivariate interaction effect for the implementation factors: Levels of Use by Stages of Concern (represented with dashed lines).

Figure 11. Summary of research findings for RQ3

Univariate tests showed significant main effects of Levels of Use for *Participation*, *Leadership*, and *Commitment.* The obtained mean values for the dependent variable *Participation* of faculty in *preparation*, *focus on use*, and *focus on improvement* illustrate the perception of faculty regarding the level of stakeholders' involvement in the decision-making process to adopt and implement WBIT. Results suggested that once the Levels of Use *focus on improvement* is met, the need for participation decreases in importance as a condition for implementation. Lower Levels of Use were significantly more associated with higher ranks of *Participation* as an important condition. Multiple

Comparisons Post Hoc tests revealed that faculty members in *focus on use* perceived the need for participation significantly more important than faculty members in *focus on improvement.*

The obtained mean values for the dependent variable *Leadership* of faculty at different levels of use of WBIT illustrate the perception differences of faculty regarding the importance of the level of ownership and support given by the leaders, including providing encouragement and serving as role models stakeholders in supporting the implementation of WBIT. Results of this analysis suggested that an increase in importance of *Leadership* as a condition was associated with faculty members in the upper level of use of WBIT. Multiple Comparisons Post Hoc tests revealed that faculty members in *focus on improvement* perceived the need for leadership as significantly more important than those faculty members in *focus on use.*

The obtained mean values for the dependent variable *Commitment* of faculty at different levels of WBIT use illustrate the perception of faculty regarding the importance of "visible" support by the upper level leaders or powerbrokers as a condition supporting the implementation of WBIT. Results depicted that the increase in importance of *Commitment* was associated with faculty members in the upper level of use. In other words, there was evidence that as faculty advance in their use of WBIT, the need for upper level leaders' commitment increases. Multiple Comparisons Post Hoc tests revealed that faculty members in *focus on improvement* perceived the need for commitment significantly more important as a condition for supporting the implementation of WBIT than faculty members in *non use/preparation* and *focus on use.*

Additionally to significant main effects results, significant interaction effects of

Stages of Concern by Levels of Use for *Knowledge & Skills*, *Incentives & Reward,* and *Commitment* were found. Results of this analysis suggested that the need for those three conditions at different Levels of Use was not consistent along different Stages of Concern. Specifically, as faculty members in the upper Stages of Concern (i.e., *task* and *impact*) continue to use WBIT, their perceived importance of knowledge and skills as a condition for implementation significantly decreases; however, for faculty members in lower Stages of Concern (i.e., *self* concerns) the perceived need for Knowledge and skills increases as they advance in their use of WBIT. An analysis of these results suggested that faculty with *self* concerns who are not using WBIT do not see as valuable the acquisition of *Knowledge & Skills* as a condition for implementation; rather, they perceive the need for *Incentives & Rewards* as a more important condition. However, as they start using and continue to use WBIT, their perception regarding those conditions change, placing more importance in the acquisition of *knowledge* and giving less importance to *incentives& rewards* as a condition for implementation. Conversely, faculty who are not advanced users (i.e., in *nonuse/preparation* level) but have higher level concerns (i.e., *task* and *impact*) from the beginning place less value to incentives and rewards and more value to the need for knowledge and skills as a condition supporting implementation.

In addition to main effects, the perceived importance of *Commitment* as a condition also presented an interaction effect. Results suggested that faculty members in the upper stage of concern perceived the need for commitment consistently more important across levels of use, while faculty members with lower level of concerns change their views about the importance of commitment as a condition as they progress in their use of WBIT.

While both implementation variables were significant in determining differences in the perception of conditions that facilitate WBIT implementation, Computer Self-efficacy was neither significant as main effect nor in its interaction with either implementation variable. The researcher concluded that Computer Self-Efficacy was not significant in determining perception differences of faculty regarding the relative importance of Ely's eight conditions supporting the implementation of innovations Therefore, NH4 was upheld.

Several conclusions were drawn from the above mentioned findings. The following section outlines the major findings of this study and describes implications of the study's results for both theory and practice.

Summary of Findings

Three objectives guided this research (see Table 39 on page 190 for a description of objectives and associated research questions). The first two objectives sought to develop a profile of faculty WBIT implementation (i.e., Stages and Concern and Levels of Use, and Computer Self-Efficacy beliefs). The third objective focused on exploring how such faculty profile was associated with the perception of institutional mechanisms and its relative importance as conditions supporting the implementation of WBIT. Therefore, findings will be described in terms of the two dimensions analyzed: (a) faculty WBIT implementation and (b) conditions supporting the implementation of WBIT.

Faculty WBIT Implementation Findings

As previously detailed, multinomial logistic regression analyses showed significance of contribution of implementation variables (e.g., Stages of Concern and

Levels of Use) above significance of demographic factors. Additionally, correlation analyses showed a significant association of Computer Self-Efficacy and both implementation variables. From these results, the researcher concluded the following regarding faculty WBIT implementation:

1. Experience using WBIT, level of professional development participation, and level of use of WBIT significantly predicted Stages of Concern, the psychological dimension of levels of implementation. These findings correlated with Adams (2003) findings in terms of professional development activities and levels of use as predictors of faculty stages of concern. However, Adams reported gender differences while in the present study gender did not report significance as predictor of either implementation variable. Nonetheless, results of this study correlated with other research studies that have found no gender differences (e.g., Gueldenzoph, Guidera, Whipple, & Merler, 1999).
2. Online teaching experience and computer self-efficacy significantly predicted Levels of Use, the behavioral dimension of levels of implementation. These findings suggested that the use of WBIT can be predicted from faculty online teaching experience, regardless the level of training they participate in; and that their WBIT usage is best predicted when computer self-efficacy is considered. Previous research has also suggested that the use of WBIT increases as faculty gain experience in online teaching (e.g., O'Quinn & Corry, 2002; Schifter, 2002). To this point, the literature has reported overall little use of WBIT with the exception of e-mail communication and remote access to digital libraries (e.g., Crooks, Yang, & Duemer, 2002; Pajo & Wallace, 2001; Vodanovich &

Piotrowski, 2001) and have suggested that this behavior may be a reflection of the struggles faculty face in a constantly evolving technology environment (Vodanovich & Piotrowski, 2005). Findings from the present study depicted that individuals' IT usage is, at least in part, shaped by their beliefs regarding their ability to use WBIT. Similarly, others have also found computer self-efficacy to exert a significant influence on individuals' expectations of the outcomes of using computers and their actual computer use (e.g., Compueau, 1995; Marakas, Yi, & Johnson, 1998).

3. Results of analysis for the level of implementation variables and Computer Self-Efficacy showed stronger correlations for the variable Stages of Concern than for Levels of Use. This result suggested that Computer Self-Efficacy may be, indeed, more related to the psychological aspect of WBIT implementation (i.e., Stages of Concern) than to the behavioral variable conventionally evaluated in IT training studies (i.e., Levels of Use). This may explain why others have found computer self-efficacy not being related to individuals' level of IT use (See for example, Gallivan, Spitler, and Koufaris, 2005). However, margin of error for both Crosstabs used in this study urged using extreme caution while interpreting these results. It is worth noting that, in view of past research that has shown the importance of the role of computer self-efficacy in an ongoing technology use context (e.g., Deng, Doll, & Truong, 2004; Liaw, 2002) the researcher anticipated stronger correlations than the ones found.

4. The correlation findings supported previous research regarding the notion that faculty presenting self concerns are usually more associated to scarce WBIT

usage (Ansah & Johnson, 2003) than faculty in higher stages of concern.

Conditions Supporting the Implementation of WBIT Findings

Research has identified eight conditions supporting the implementation of technology: *dissatisfaction with the status quo, knowledge & skills, resources, time, rewards, participation, leadership,* and *commitment* (Ely, 1990, 1999). Previous research investigating successful implementations has found differences in the perceived importance of the eight conditions among people working in different settings (e.g., Ensminger, Surry, Porter, & Wright, 2004; Surry & Ensminger, 2003). However, research has not yet determined the variables that affect the perception of intra-group members in regard to those conditions. The present study suggested a model to analyze intra-group differences that included Stages of Concern, Levels of Use, and Computer Self-Efficacy. A Factorial MANOVA analysis showed significant main effects for Levels of Use and interaction effects for Levels of Use by Stages of Concern. From these results, the researcher concluded the following regarding the conditions supporting successful implementation of WBIT:

1. *Knowledge & Skills, Resources*, and *Time* were perceived by faculty as the most important conditions. Ensminger et al. (2004) also reported *Knowledge & Skills* and *Resources* as the most important conditions.
2. Contrary to what others have found (see Geijsel et al., 2001; Owen & Demb, 2004) *Leadership* was found to be one of the least important conditions supporting implementation as perceived by the overall sample. Similarly, *Leadership* was reported as the least important condition by Ensminger's et al. (2004) study.

3. Results from multivariate main effects of Levels of Use provided support for research emphasizing that the lack of recognition and institutional incentives are an obstacle for the use of WBIT (e.g., Gammil & Newman, 2005; O'Quinn & Corry, 2002; Schell 2004); and may partially explain why faculty perceive limited institutional support (Lee, 2002; Schifter, 2002) while administrators perceive the availability of resources but a limited use of them by faculty (Lee, 2002).
4. Results from this study supported Sherry et al. (2003) notion that factors that help faculty in the implementation process vary on each stage of implementation and extended such notion by offering a deeper understanding of the variation's nature. Specifically, while in the first phases of implementation (i.e., nonuse/preparation and self/task concerns) *participation* and the accessibility to *resources*, including *incentives & rewards*, are clearly more important, in later stages (i.e., focus on improvement and impact concerns) the administrative support in the form of *leadership* interventions (i.e., providing encouragement and serving as a role models) and commitment (i.e., visible support by the upper level leaders) become key factors.
5. Disconfirming the alternative hypothesis regarding conditions supporting the implementation of WBIT from this study, Computer Self-Efficacy only provided marginal significant effects in their interaction with Levels of Use ($p = .10$) which was surprising given the considerable amount of research supporting the influence of this construct in computer use. Other studies have also failed to find significant contribution of computer self-efficacy to level of IT usage (e.g., Gallivan et al., 2005).

6. There is a need for further research in terms of perception differences due to intra-group variables.

Implications for Theory

Three major findings with implications for theory are identified in the light of this research results. The first one is concerned with the instrument used to operationalize Stages of Concern. The second is concerned with the instrument used to operationalize Computer Self-Efficacy. And the third one relates to the professional development field as it suggests a methodology of personalized delivery of multimedia-based professional development. A description of each one is provided in the next sections.

Stages of Concern Questionnaire (SoCQ)

As previously stated, the Concerns-Based Adoption Model (CBAM) has supported research in the technology implementation field during the last decade, mostly resulting in theory to correlate with practical findings. Because of its extended use, this instrument seems appropriate to the researcher who typically relies on the content validity and reliability of the developers and often neglect testing the psychometrics of their own data (Cheung, Hattie, & Ng, 2001). However, similar to other studies, results from the present study suggested the need for a revision of the questionnaire used to measure Stages of Concern (e.g., Cheung, et al., 2001; Shotsberger & Crawford, 1996).

The present study looked at the construct validity of the questionnaire and found several problems. First, only 30 out of the 35 items presented an item-total correlation greater than .5. Questions SoC7, SoCQ12, SoCQ13, SoCQ19, and SoCQ35 failed to load in any factor. Nevertheless, the researcher applied the 35-item SoCQ and carried out an exploratory factor analysis (FA) of the data. Using Principal Components and Varimax rotation, a five-factor solution with eigenvalues grater than 1 resulted rather than the seven-factor solution proposed originally in the CBAM. On the basis of the distribution of the high factor loading and the wording of items, results of FA proposed an alternative model to structure the SoC questionnaire. Cheung et al. (2001) provided a critical analysis of the questionnaire's psychometrics and simplex structure, comparison among other models, and proposed a revised five stages version of the SoC questionnaire. Findings from the present research are aligned with much of their findings and suggested that plausible alternative models should be investigated to determine if they fit the data better than the 35-items SoCQ.

Although Cheung et al. (2001) provided empirical evidence supporting the simplex structure of the SoC, several items in their study as well in this study failed to load in the stage that they were originally developed for. A possible explanation of this can be attributed to content validity threats. First, the scale used is not normalized because it has different levels within each subscale. This point was not statistically tested in the present study but it was mentioned as a potential validity threat by pilot participants. Comments such as "I'm thinking the classic strongly agree to strongly disagree may be your best option" were made by several pilot participants. Other comments were in the line of "I don't think your scale is working. Can one distinguish between a subscale 6 or 7 in 'very true of me now'? Even more questionable between a subscale 1 or 2 in a 'not true of me now' scale?"

Additionally, several pilot participants also commented that the wording of some questions was confusing and the scope seemed to be too broad to decide on a point in the scale. Specifically, items like SoCQ1: "I am concerned about students' attitudes toward the use of Web-based technologies" to which several pilot participants commented it should be clarified the type of attitudes we are looking at. Another participant commented: "It is that I am concerned they don't care or am I concerned in the sense that I try to teach them positive attitudes? Maybe add 'negative attitudes' if you mean the former and reword if the later." In an exploratory FA performed by the researcher, SoCQ1 loaded in factor *refocusing* instead of in factor *consequence* as was in the original model.

Another item pointed out as problematic was SoCQ14: I would like to discuss the possibility of using Web-based technologies in my teaching. In the original instrument, this item was designed to load factor *informational;* however, pilot participants commented that the item yielded to high agreement because "even as experienced person, they would like to discuss possibilities."

In summary, despite the popularity of the SoCQ a number of unresolved issues remain. Similar to other data tested using the SoCQ, the present study have also provided marginal fit for the data, urging extreme caution while interpreting findings. More research is needed to investigate the content validity, perhaps rewording some questions, as well as providing a deeper revision of the instrument and its psychometrics.

Computer Self-Efficacy

Research concerning self-efficacy is quite diverse. Research in this area has shown that perceived self-efficacy directly contributes in decision, actions, and experiences and may moderate the impact of other psychological mechanisms on developmental outcomes as well as influence other cognitive and emotional factors that can contribute to performance (Cervone, Artistico, & Berry, 2006). Self-efficacy has been used as a predictor, moderator, and outcome variable in different fields. Specifically self-efficacy has proved to be a more effective construct than generalized self-efficacy (Beas & Salanova, 2006). Nevertheless, very few researches to date have developed scales to measure computer self-efficacy (e.g., Compeau & Higgins, 1995; Kinzie, Delcourt, & Powers, 1994; Murphy, Coover, & Owens, 1989).

Past research on computer self-efficacy have used the available scales and have shown the importance of computer self-efficacy in decisions about using computers (Compeau & Higgins, 1995; Hill, Smith, & Mann, 1987) and a correlation of higher levels of computer self-efficacy with increased performance with computer related tasks (Harrison, Rainer, Hochwarter, & Thompson, 1997). However, recent research has shown ambiguous results while testing computer self-efficacy and its relationship with IT usage. Researchers have found computer self-efficacy not to be significantly related to people's level of IT usage (Gallivan, et al., 2005), others have found only weak associations between computer self-efficacy and level of technology use (Romero et al., 2009), and others have pointed to the need for re-examining the usability of items from current scales given the always changing nature of computer technology in its relation to society (Torkzadeh, Koufteros, & Pflughoeft, 2003). Findings of this study provide additional empirical evidence that scales developed a decade ago may not be pertinently measuring the computer self-efficacy construct as they were at the time they were originally developed and validated. Consequently, further research is needed to develop a more current instrument to be empirically evaluated.

In addition, findings from the present study suggested the influence of computer self-efficacy to be stronger on the psychological variable (Stages of Concern) than on the behavioral variable (Levels of Use) of WBIT implementation. A possible explanation for the weak correlation of computer self-efficacy and Levels of Use may be due to the mediator, rather than direct, role of such variable. Further research is needed to investigate perception differences using the psychological construct of computer self-efficacy in other predictive models.

Professional Development

Professional development continues to be an important factor promoting WBIT participation and in many cases the only strategy for WBIT training at the university level. However, research has found only a small positive impact of professional development activities on implementation of large-scale innovations (Geijsel et al., 2001); has also shown that informal ICT education such as "just in time learning" and "coaching" may be considered by teachers as most influential (Granger et al., 2002); and has proved that other factors such as uncertainty feelings negatively influence the implementation process (van den Berg et al., 1999; Gallivan et al., 2005; Geijsel et al., 2001; Owen & Demb, 2004).

The advance of Web-based applications and the ease of integration of multimedia have favored the expansion and proliferation of college courses taught over the Web. During the last decade, experiencing a shift to professional development opportunities to be delivered via the Internet has also been a trend in corporate companies with global reach. However, this shift is only starting to take place recently in higher education, especially regarding IT training. Higher education institutions are just now starting to offer an amount of online professional development opportunities for faculty. On-demand video tutorials are becoming more commonly available by software developers (e.g., Blackboard Academic Suite, Adobe Creative Suite, etc.) and, even more importantly, virtually any skill related to the performance of computer-based tasks can be found using search engines. This shift coupled with the need for universities to carefully select training investments has resulted in a need of making online resources available for faculty training a more common practice.

Despite the fact that the accumulating information on the Internet makes it difficult to locate adequate resources, resources for training are available and can be accessible. With the advent of Web 2.0, personalized delivery of multimedia resources in e-learning platforms is now possible. Really Simple Syndication (RSS) feeds and websites that deliver personalized recommendations provide an effective mean of information filtering opening a new research field at the conjunction of artificial intelligence and educational technology. Personalization has evolved as a key technology, bringing new insights and solutions to well documented problems for the expansion of e-learning. The theory of personalized recommendations tested in student-system interactions has provided evidence that implementing such recommendations resulted in an increased likelihood of systems' usage (e.g., Blom, 2002). Also, recent experimental results are showing that personalized delivery increases the usage of e-learning materials and the use of multimedia resources if these materials are delivered in ways that fit users' preferences (Zhuhadar, Romero, & Wyatt, 2009).

Further research is needed in the area of personalization in order for universities to develop broader and more cost-efficient professional development opportunities that consider specific users' profiles. Findings from the present study are promising in the sense that a basis is set for a theory-grounded definition of faculty profiles. From this study a profile of faculty WBIT usage, concerns about using WBIT, and computer self-efficacy beliefs has emerged. More research is needed to investigate additional behavioral and psychological variables likely to impact professional development outcomes both in generalized and personalized environments.

Implications for Practitioners

Substantial research has been conducted regarding factors, incentives, and obstacles affecting WBIT implementation. Most of that research has considered demographic factors as predictors and technology usage as outcome (e.g., Rockwell et al. 1999; Sherry et al., 1997, 2000; Surry & Ensminger, 2003); however, scarce research has considered psychological dimensions along with behavioral dimensions of technology implementation in higher education (e.g., Petherbridge, 2007; Watson, 2007). Therefore, several practical implications emerged from this study.

First, this study suggested an empirical model for institutions to develop a more inclusive profile of faculty which takes into consideration psychological constructs. Secondly, such a profile proved to improved prediction of WBIT implementation. And finally, this profile proved to better differentiate the views and needs of faculty regarding support mechanisms that facilitate the implementation of WBIT. With that in mind, the following list of implications for practitioners was developed:

1. Administrators may find it useful to consider a faculty profile that encompasses demographic, behavioral, and psychological variables. Recognizing the existence of a more inclusive profile should encourage future policy makers to advocate for the diverse needs of faculty in terms of technology implementation across performance level over time.

2. Faculty development continues to be a key factor in the implementation of Web-based instructional technology; however, the university investment on traditional training methods seems to fail to achieve the expected transfer of learning to use. Professional developers can now find a reason to expand the traditional notion of technology training in higher education and advocate for more personalized professional development initiatives. Especially in the light of current Web 2.0 applications, a more customized development solution should be made available.
3. Acknowledging a more comprehensive profile of the faculty's needs will potentially influence IT developers to take advantage of personalization in searching for solutions to faculty training. The use of video tutorials as a way of leveling technology skills among faculty is a well received solution already popular in several universities. Other possibilities reside in the field of artificial intelligence, particularly in the area of personalization and computer interaction.
4. There is now a guideline, although of limited scope, that coordinators and academic departments can utilize as a starting point in deciding investment for faculty technology adoption. Broadly, programs that are starting from early stages of WBIT implementation are more likely to have an increased demand for technical support and visible incentives for participation from the faculty who are less comfortable with technology. Conversely, coordinators may experience an increased demand for evident upper management support from middle and advanced technology users as an incentive to progress in using

WBIT. Paying attention to the middle level users will potentially stimulate and increase collegial participation.

5. And finally, upper level administration may be able to increase participation without the high cost of middle and advanced WBIT users' burnout through the use of specific leadership interventions and by encouraging the use of customized administrative and operational practices (practices rarely found in American universities such as the "one-stop-shop" for faculty technology concerns and needs approach or the creation of production cells – instructional designers, multimedia developers, graphic designers, etc. – within academic departments to support content development).

Limitations and Significance of the Study

This study examined faculty levels of implementation and self-efficacy beliefs as factors associated with faculty perceptions of institutional mechanisms and their relative importance as conditions supporting the implementation of WBIT. Focusing on selected public universities in the Commonwealth of Kentucky, the researcher was able to collect usable information from 334 full-time faculty members that voluntarily responded to a Web-based survey. Considering the sample size as related to the population and the self-selected nature of participation, results of this study may not be generalized as participants may not represent the entire spectrum of faculty implementing WBIT, even among the selected universities, much less in the higher education arena.

Although effort was made to design and carry out the research as free of threats as possible, as stated by Onwuegbuzie (2000) every single study has threats to internal and external validity. Furthermore, even though most empirical research does not contain a section discussing the threats to internal and external validity, providing information about sources of validity is beneficial because it "(a) allows readers to better conceptualize the underlying findings; (b) promotes external replications; (c) provides a direction for future research; and (d) advances conducting of validity meta analysis and thematic effect sizes" (Onwuegbuzie, 2000, p. 51).

There were several internal and external threats to the validity of this study. Nonresponse bias and selection biases resulting from both the differential self-selection of participants and the use of online self-administrated questionnaires to collect data were threats to the internal validity. Another internal validity threat was derived from the low reliability and content validity of the questionnaires used when tested with data collected from the study's sample. Because of the nature of the study is sensitive to strong personal bias in favor or against WBIT use, behavior bias was another threat to the internal validity of this study.

Although compensated by the researcher selection of statistical design described in Chapter 4, several internal validity threats related to data interpretation were present. First, the difference in the representation of the groups for testing purposes involves a statistical regression threat to internal validity. As explained in Chapter 3, power analysis revealed an effect size threat to internal validity. Lastly, causal effects resulted from the plausibility of unidentified variables to be mediating the relation between factors and outcomes, as opposed to a direct relationship between factors and outcomes that represent another possible internal threat.

Threats to the external validity of the study were also identified. The first one was derived from the lack of random sampling, which ultimately limits the study's generalization. The study's sample was selected from the accessible population representing only the group of participants who were available at the time of the study. The second threat to external validity is called reactive arrangement and it is defined as the effect of changes in individual responses that occur as a direct result of participants being aware that they are participating in a research study (Onwuegbuzie, 2000). Specifically, the computer self-efficacy results of the survey may have been affected by participant effects because of the tendency of people to judge their own capability of using computers higher or lower than it really is.

Notwithstanding the limitations indicated above, this study is significant for the technology implementation research field in several ways. First, as discussed in the theoretical implications, the psychometric analysis of collected data provides additional evidence supporting the need for constructing more reliable instruments to operationalize technology implementation variables such as concerns and self-efficacy. Secondly, including psychological constructs in analyzing behavioral variables is a paradigm hardly explored in the technology implementation literature, especially in educational settings. Furthermore, the correlation of results with recent research conducted in similar settings (e.g., Gallivan et al., 2003; Petherbridge, 2007; Watson, 2007) advocates credibility for this study.

Most importantly, this study suggested an empirical model for institutions to develop a more inclusive profile of faculty views and needs in terms of support mechanisms that facilitate the implementation of WBIT. In the light of Web 2.0 applications, showing that a faculty profile of WBIT implementation is more than demographic distinctions is critical. This concept will potentially expand the traditional notion of technology training in higher education and advocating for personalized professional development initiatives. In conclusion, this study establishes the foundation to reconsider the need for customized administrative practices and a more diverse spectrum of interventions which, in a constantly evolving field, are necessary for large scale implementations to expand in higher education institutions.

REFERENCES

Adams, N. B. (2003). Educational computing concerns of postsecondary faculty. *Journal of Research on Technology in Education, 34*, 285-303.

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, 665-694.

Albury, R. (2001, December). *On being "Head": Reflection on leading an educational innovation involving computer technology.* Retrieved February, 2004, from ERIC Document Reproduction Service (ED 467 916).

Ansah, A. O., & Johnson, J. T. (2003). Time will tell on issues concerning faculty and distance education. *Online Journal of Distance Learning Administration, 6*(4).

Anderson, S. (1997). Understanding teacher change: Revisiting the concerns based adoption model. *Curriculum Inquiry,* 331_367.

Annand, D. (2007, November). Re-organizing universities for the information age. The International Review of Research in Open and Distance Learning, 8(3). Retrieved December 7, 2007, from http://www.irrodl.org/index.php/irrodl/article/view/372/956.

Ashby, C. (n.d.). Growth in distance education programs and implications for federal education policy. Testimony before the committee on health, education and pensions, US. senate, september 26, 2002.

Atkins, N., & Vasu, E. (2000). Measuring knowledge of technology usage and stages of concern about computing: A study of middle school teachers. *Journal of Technology and Teacher Education, 8* (4).

Aust, R., Newberry, B., O'Brien, J., & Thomas, J. (2005). Learning generation: Fostering innovation with tomorrow's teachers and technology. *Journal of Technology and Teacher Education, 13* (2), 167-195.

Bandura, A. (1986). *Social foundations of though and action: a social cognitive theory.* Eglewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1995). *Self-efficacy in changing societies.* New York, NY: Freeman.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Freeman.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American psychologist, 37*(2), 122-147.

Bandura, A. (1999). Social cognitive theory of personality. In L. Pervin & O. John (Eds.), Handbook of personality (2nd. ed.). New York: Guilford.

Bandura, A. & Cervone, D. (1983). Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, 41, 586-598.

Beas, M., Llorens, S., & Salanova, M. (2000). Formación para el uso de ordenadores y niveles de autoe_cacia: el rol modulador de las actitudes hacia los ordenadores. *Psicología del Trabajo, de las Organizaciones y de los recursos humanos.* Madrid: Biblioteca Nueva.

Beas, M. I., & Salanova M. (2006). Self-efficacy beliefs, computer training and psychological well-being among information and communication technology workers. *Computers in human behavior, 22*, 1043-1058.

Benjamin, B., & Conger, J. A. (1999). *Building leaders: How successful companies develop the next generation.* California: Jossey-Bass Publishers.

Bennis, W., & Nanus, B. (1997). *Leaders: strategies for taking charge* (2nd ed.). New York: HarperBusiness.

Beggs, T.A. (2002). Influences and barriers to the adoption of instructional technology. Carrollton, GA: State University of West Georgia. Retrieved September 6, 2006, from www.mtsu.edu/~itconf/proceed00/beggs/beggs.htm.

Berge, Z.L. (1998). Barriers to online teaching in post-secondary institutions: Can policy changes fix it? *Online Journal of Distance Learning Administration, 1*(1). Retrieved October 19, 2003, from http://www.westga.edu/~distance/Berge12.html

Berge, Z. L., Muilenburg, L.Y., & Van Haneghan, J. (2002). Barriers to distance education and training: survey results. *The Quarterly Review of Distance Education, 3*, 409-418.

Betts, K. S. (1998). An institutional overview: factors influencing faculty participation in distance education in the United States. *Online Journal of Distance Learning Administration*, 1(3). Retrieved October 19, 2003, from http://www.westga.edu/~distance/betts13.html.

Blom, J. (2002). A theory of personalized recommendations. *CHI 2002: changing the world, changing ourselves,* 540-541.

Bolman, L., & Deal, T. E. (1999). 4 steps to keeping change efforts heading in the right direction. *Journal for Quality & Participation*, 22(3), 6-12.

Bolt, M., Killough, L., & Koh, H. (2001). Testing the interaction effects of task complexity in computer training using the social cognitive model. *Decision Sciences, 32* (1),1-20.

Bonk, C. (2001). *Online teaching in an online world.* Bloomington, IN: CourseShare.com.

Bradburn, N. M. (1993). Response Effects. In P. Rossi, J. Wright, & A. Anderson (Eds.), *Handbook of Survey Research.* New York: Academic Press.

Caprara, G. V., & Cervone, D. (2000). *Personality: Determinants, dynamics, and potentials.* New York: Cambridge University Press.

Cervone, D., Artistico, D., & Berry, J. M. (2006). Self-efficacy and adult development. In C. Hoare (Ed.), *Handbook of adult development and learning.* New York: Oxford University Press.

Cheng, E. W., & Ho, D. C. (2001). A review of transfer of training studies in the past decade. *Personnel review, 30,* 102-118.

Cheung, D., Hattie, J., & Ng, D. (2001). Reexamining the Stages of Concern Questionnaire: a test of alternative models. *Journal of Educational Research, 94,* 226-236. Retrieved Saturday, February 10, 2007, from the Academic Search Premier database.

Chou, H., & Wang, T. (2000). The influence of learning style and training method on self-efficacy and learning performance in www homepage design training. *International Journal of Information Management, 20* (6), 455-472.

Chuang, A., Liao, W., & Tai, W. (2005). An investigation of individual and contextual factors influencing training variables. *Social Behavior and Personality, 33,* 159-174.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: development of a measure and initial test. *MIS Quarterly, 19,* 189-211.

Compeau, D. R., & Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research, 6* (2), 118.

Couper, M. P. & Nichols, W. L. (1998). The History and Development of Computer Assisted Survey Information Collection Methods. In M. P. Couper, R. P. Baker, J. Bethlehem, C. Z. E. Clark, J. Martin, W. L. Nichols, & J. M. O'Reilly (Eds.), *Computer Assisted Survey Information Collection* (pp. 1-22). New York: John Wiley & Sons, Inc.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Crooks, S. M., Yang, Y., & Duemer, L.S. (2002). Faculty perceptions of Web-based resources in higher education. *Journal of Educational Technology Systems, 31*, 103-113.

Deng, X., Doll, W. J., & Truong, D. (2004). Computer self-efficacy in an ongoing use context. *Behavior & Information Technology, 23*, 395-412. Retrieved Saturday, February 10, 2007, from the Academic Search Premier database.

Dillman, D. A. (2007). Mail and Internet surveys: The tailored design method (2nd ed.). New Jersey: John Wiley & Sons, Inc.

Dobbs, R. L. (2004). Impact of Training on Faculty and Administrators in an Interactive Television Environment. *The Quarterly Review of Distance Education, 5*, 183-194. Retrieved Saturday, February 10, 2007, from the Academic Search Premier database.

Dooley, K., & Murphrey, T. P. (2000). How the perspectives of administrators, faculty, and support units impact the rate of distance education adoption. *Online Journal of Distance Learning Administration, 3*(4). Retrieved August 29, 2006, from http://www.westga.edu/%7Edistance/ojdla/winter2000/dooley34.html.

Duderstadt, J. J. (2000). *A university for the 21st century.* Ann Arbor: University of Michigan Press.

Easton, S. S. (2003). Clarifying the instructor's role in online distance learning. *Communication Education, 52*(2), 87-105.

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

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

Ellsworth, J. B. (2000, September). A survey of educational change models. ERIC Clearinghouse on Information and Technology (ERIC Document Reproduction Service No. ED 444597).

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

Evans, L., & Chauvin, S. (1993). Faculty Developers as Change Facilitators: The Concerns-Based Adoption Model. *To Improve the Academy-Resources for Faculty, Instructional, and Organizational Development, 12*, pp. 167-170.

Evans, R. (1993). The human face of reform. *Educational Leadership, 52*(1), 19-23. Retrieved January, 2004, from EBSCO Publishing.

Evans, R. (1996). *The human side of the school change: Reform, resistance, and the real-life problems of innovation.* California: The Jossey-Bass education series.

Farrera, R. (2000). *Administración Financiera en Instituciones Educativas*. México: Trillas.

Folkers, D. A. (2005, January/March). Competing in the marketspace: Incorporating online education into higher education - An organizational perspective [Electronic version]. *Information Resources Management Journal, 18*(1), 61-78.

Fullan, M. (2001). *Leading in a culture of change.* California: Jossey-Bass.

Fullan, M. (2003). Implementing change at the building level. In *Best practices, best thinking, and emerging issues in school leadership* (pp. 31-36). California: Corwin Press.

Fuller, F. F. (1969). Concerns of Teachers: A Developmental Conceptualization. *American Educational Research Journal, 6 (2)*, 207-226.

Gallivan, M., Spitler, V., & Koufaris, M. (2005). Does information technology training really matter? a social information processing analysis of coworkers' influence on it usage in the workplace. *Journal of Management Information Systems, 22*(1), 153-192.

Gammill, T., & Newman, M. (2005). Factors associated with faculty use of Web-based instruction in higher education [Electronic version]. *Journal of Agricultural Education, 46*(4), 60-71.

Granger, C.A., Morbey, M. L., Lotherington, H., Owston, R. D., & Wideman, H.H. (2002). Factors Contributing to Teachers' Successful Implementation of IT [Electronic version]. *Journal of Computer Assisted Learning, 18*, 480-488.

Geijsel, F., Kelchtermans, G., Sleegers, P., & van den Berg, R. (2001). Conditions fostering the implementation of large-scale innovation programs in schools: Teachers' perspective [Electronic version]. *Educational Administration Quarterly, 37*(1), 130-166.

George, A. A., Hall, G. E., & Stiegelbauer, S. M. (2006). Measuring implementation in schools: the stages of concern questionnaire. Austin, TX: Southwest Educational Development Laboratory.

Gmelch, W. H. (2002, February). *Where have all the leaders gone?* Paper presented at the Annual Meeting of the American Association of Colleges for Teacher Education. Retrieved February, 2004, from ERIC Document Reproduction Service (ED 462 381).

Gmelch, W. H., & Miskin, V. D. (1995). *Chairing an academic department.* California: Survival Skills for Scholars.

Green, K. C. (2001). Distance learning: Lessons from the early years. *Converge, 4* (10), 60-62.

Green, K. C. (2004). *The 2004 national survey of information technology in US higher education.* Retrieved September 8, 2006, from http://www.campuscomputing.net/summaries/2004/index.html.

Green, K. C. (2006). *The 2006 national survey of information technology in US higher education.* Retrieved May 14, 2006, from http://www.campuscomputing.net/summaries/2006/index.html.

Green, M. F. (Ed.). (1997). *Transforming higher education: views from leaders around the world.* American council on education, Oryx Press.

Green, M., & Hayward, F. (1997). Forces for change in transforming higher education. *Transforming Higher Education.*

Groves, M. M., & Zemel, P. C. (2000). Instructional Technology Adoption in Higher Education: An Action Research Case Study [Electronic version]. *International Journal of Instructional Media, 27*(1), 57-61.

Gueldenzoph, L. E., Guidera, S. Whipple, D., & Mertler, C. (1999). Faculty use of instructional technology in the university classroom [Electronic version]. *Journal of Educational Technology Systems, 28*(1), 121-135.

Hall, G.E., Dirksen, D. J., & George, A. A. (2006). Measuring implementation in schools: levels of use. Austin, TX: Southwest Educational Development Laboratory.

Hall, G. E., & Hord, S. M. (1987). *Change in Schools: Facilitating the Process.* Albany, NY: State University of New York Press.

Hall, G. E. & Hord, S. M. (2001). *Implementing Change: Patterns, Principles, and Potholes.* Arlington Heights, IL: Allyn & Bacon.

Harrison, A., Rainer, R., Hochwarter, W., & Thompson, K. (1997). Testing the self-efficacy-performance linkage of social-cognitive theory. *The Journal of social psychology, 137*(1), 79-87.

HEFCE (2001). *Rewarding and developing staff in higher education.* Retrieved February, 2004, from http://www.hefce.ac.uk/Pubs/hefce/2001/01_16htm.

Hill, T., Smith, N., & Mann, M. (1987). Role of efficacy expectations in predicting the decision to use advanced technologies: The case of computers. *Journal of Applied Psychology, 72*(2), 307-313.

Hord, S .M., Rutherford, W. L., Huling-Austin, L., & Hall, G. E. (1987). *Taking Charge of Change.* Alexandria, VA: Association for Supervision & Curriculum

Development.

Inman, E., & Mayes, L. (1998). Educational technology: a survey of faculty use and need [Electronic version]. *Journal of Staff, Program, & Organization Development*, 16(1), 15-20.

Johnson, R., & Marakas, G. (2000). Research report: the role of behavioral modeling in computer skills acquisition: toward refinement of the model. *Information Systems Research, 11*(4), 402.

Kambutu, J. (2002). Administrators prefer technology-based distance learning. *Quarterly Review of Distance Education, 3*(3), 341-43.

Kember, D., & Mezger, R. (1990). The instructional designer as a staff developer: a course team approach consistent with the concerns-based adoption model. *Distance Education, 11*(1), 50-70. Retrieved Saturday, January 20, 2007, from the Academic Search Premier database.

Kiernan, V. (2000). Rewards remain dim for professors who pursue digital scholarship. *Chronicle of Higher Education.*

Kinzie, M., Delcourt, M., & Powers, S. (1994). Computer technologies: Attitudes and self-efficacy across undergraduate disciplines. *Research in Higher Education, 35* (6), 745-768.

Kouzes, J., & Posner, B. (2002). The leadership practices inventory: Theory and evidence behind the five practices of exemplary leaders. *Retrieved March, 5*, 2007.

Lee, J. (2001). Instructional support for distance education and faculty motivation, commitment, satisfaction. *British Journal of Educational Technology, 32*(2),153-160.

Lee, J. (2002). Faculty and administrator perceptions of instructional support for distance education. *International Journal of Instructional Media, 29*(1), 27-45. Retrieved Saturday, January 20, 2007, from the Academic Search Premier database.

Lee, Y., Driscoll, M. P., & Nelson, D. W. (2004). The past, present, and future of research in distance education: Results of a content analysis. The American Journal of Distance Education, *18*(4), 225-241. Retrieved Saturday, January 20, 2007, from the Academic Search Premier database.

Liaw, S. (2002). Understanding user perceptions of World Wide Web environments. *Journal of Computer Assisted Learning, 18*(2), 137-148.

Maguire, L. (2005). Literature review - faculty participation in online distance education: Barriers and motivators. *Online Journal of Distance Learning Administration, 8*(1). Retreived Saturday, January 20, 2007, from the Academic Search Premier database.

Marakas, G., Yi, M., & Johnson, R. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification of the construct and an integrative framework for research. *Information Systems Research, 9* (2), 126.

Martin, J. (1989). Measuring the stages of concern in the development of computing expertise.

Murphy, C., Coover, D., & Owen, S. (1989). Development and validation of the computer self-efficacy scale. *Educational and Psychological Measurement, 49* (4), 893.

Morgan, G. (1986). *Images of Organization.* London, Sage Publications.

National Center for Education Statistics. (1998). *Distance education in higher education institutions.* Retrieved November 4, 2006, from http://nces.ed.gov/pubs98/98062.pdf.

National Center for Education Statistics. (2003). *Distance education at degree-granted postsecondary institutions: 2000-2001.* Retrieved November 4, 2006, from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2003017.

National Education Association. (2000). *A survey of traditional and distance learning higher education members.* Washington, DC: Author. Retrieved November 4, 2006, from http://www2.nea.org/he/abouthe/images/dlstudy.pdf.

O'Quinn, L., & Corry, M. (2002). Factors that deter faculty from participating in distance education. *Online Journal of Distance Learning Administration,* 5(4). Retrieved on September 6, 2006, from http://www.westga.edu/~distance/ojdla/winter54/Quinn54.html.

Onwuegbuzie, A. (2000). Expanding the framework of internal and external validity in quantitative research. ERIC. *Retrieved March, 5*, 2007.

Owen, P. S., & Demb, A. (2004). Change dynamics and leadership in technology implementation. *The Journal of Higher Education*, *75*, 636-666.

Palloff, R., & Pratt, K. (1999). *Building Learning Communities in Cyberspace: Effective Strategies for the Online Classroom*, San Francisco, CA: Jossey-Bass.

Pajo, K., & Wallace, C. (2001). Barriers to the uptake of Web-based technology by university teachers. *Journal of Distance Education*, *16*(1). Retrieved August 26, 2006, from http://cade.athabascau.ca/vol16.1/pajoetal.html.

Petherbridge, D. (2007). A concerns-based approach to the adoption of Web-based learning management systems. Unpublished dissertation.

Purcell, S. & Perritt, D. (2008). Understanding and Promoting Best Practices in Technology Implementation in Higher Education Classrooms. In K. McFerrin et al. (Eds.), *Proceedings of Society for Information Technology and Teacher Education International Conference 2008* (pp. 2194-2197). Chesapeake, VA: AACE.

Rockwell, K., Shaver, J., Fritz, S., & Marx, D. (1999). Incentives and obstacles influencing higher education faculty and administrators to teach via distance. *Online Journal of Distance Learning Administration, 2*(3). Retrieved on September 6, 2006 from http://www.westga.edu/~distance/rockwell24.html.

Roepcke, R., Agarwal, R., & Ferratt, T. W. (2000). Aligning the IT human resources with business vision: the leadership initiative [Electronic version]. *MIS Quarterty, 24*, 327-353.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.

Romero, E., Wagner, C., Zhuhadar, L., & Wyatt, R. (2009). Web-based technology use and computer self-efficacy as predictors of faculty perceptions of support for the implementation of e-learning. In *Mobile, hybrid, and on-line learning, 2009. elml'09.international conference on* (pp. 28-34).

Room, C., & Pliskin, N. (1999). The role of charismatic leadership in diffusion and implementation of e-mail [Electronic version]. *The Journal of Management, 18*, 273-290.

Romero, E. , Zhuhadar, L., Wagner, C., & Wyatt, R. (2009). Web-based technology use and computer self-efficacy as predictors of faculty perceptions of support for the implementation of eLearning. Proceedings of the 2009 International Conference on Mobile Hybrid, and Online Learning. IEEE Computer Society. 28-34.

Salanova, M., & Grau, R. (1999). Análisis de necesidades formativas y evaluación en contextos de cambio tecnológico. *Revista de Psicología General y Aplicada, 52*, 329-350.

Schell, G. P. (2004). Universities marginalize on-line courses. Why should faculty members develop online courses if the effort may be detrimental to their promotion or tenure? [Electronic version]. *Communications of the ACM, 47*(7), 53-56.

Schifter, C.C. (2000). Faculty motivators and inhibitors for participation in distance education [Electronic version]. *Education Technology, 40*(2), 43-46.

Schifter, C.C. (2002). Perception differences about participation in distance education. *Online Journal of Distance Learning Administration, 5*(1). Retrieved on September 6, 2006, from http://www.westga.edu/~distance/ojdla/spring51/cshifter51.html

Shea, T., Motiwalla, L., & Lewis, D. (2001). Internet-based distance education: the administrator's perspective. *Journal of Education for Business, 77*, 112-117.

Sherry, A. C. 2003. Quality and its measurement in distance education. In Handbook of distance education, ed. M. G. Moore and W. G. Anderson, Mahwah, NJ: Lawrence Erlbaum Associates, Inc. 435–459.

Sherry, L., Billig, S., Tavalin, F., & Gibson, D. (1997). The Boulder Valley Internet Project: Lessons learned [Electronic version]. *T H E Journal*, *25*(2), 68-72.

Sherry, L., Billig, S., Tavalin, F., & Gibson, D. (2000). New insights on technology adoption in schools [Electronic version]. *T H E Journal*, *27*(7), 43-47.

Shotsberger, P., & Crawford, A. (1996). An analysis of the validity and reliability of the concerns based adoption model for teacher concerns in education reform. (ERIC Document Reproduction Service No. ED400278)

Snider, S.L. (2003). Exploring technology integration in a field-based teacher education program: implementation efforts and findings. *Journal of Research on Technology in Education, 34*, 230-249.

Spotts, T., & Bowman, M. (1995). Faculty use of instructional technologies in higher education. *Educational technology, 35*(2), 56-64.

Surry, D., & Ensminger, D. C. (2003). Perceived importance of conditions that facilitate implementation. *E-Journal of Instructional Science and Technology*, *6*(1). Retrieved on September 6, 2006, from http://www.usq.edu.au/electpub/e-jist/docs/Vol6_No1/perceived_importance_of_conditions.htm.

Tabachnick, B. G., and Fidell, L. S. (2007). *Using Multivariate Statistics. 5th Ed.* Boston: Allyn and Bacon.

Torkzadeh, R., Pflughoeft, K., & Hall, L. (1999). Computer self-efficacy, training effectiveness and user attitudes: an empirical study. *Behavior & Information Technology, 18*(4), 299-309.

Tourangeau, R., Rips, L. J. & Rasinkiski, K. (2000). *The Psychology of Survey Response.* Cambridge: Cambridge University Press.

van den Berg, R., Vandenberghe, R., & Sleegers, P. (1999). Management of innovations from a cultural-individual perspective. *School Effectiveness & School Improvement*, *10*, 321-351. Retrieved Saturday, January 20, 2007, from the Academic Search Premier database.

Vodanovich, S., & Piotrowski, C. (1999). Views of academic io psychologists toward Internet-based instruction. *The Industrial Organizational Psychologist, 37*(1), 52-55.

Vodanovich, S., & Piotrowski, C. (2001). Internet-Based Instruction: A National Survey of Psychology Faculty [Electronic version]. *Journal of Instructional Psychology, 28,* 253-255.

Vodanovich, S., & Piotrowski, C. (2005). Faculty attitudes toward Web-based instruction may not be enough: limited use and obstacles to implementation [Electronic version]. *Journal of Educational Technology Systems*, *33*, 309-318.

Watson, C. (2007). Self-efficacy, the innovation-decision process, and faculty in higher education: Implications for faculty development. Unpublished dissertation.

West, G. (1999). Teaching and technology in higher education: Changes and challenges. *Adult Learning, 10* (4).

Wilson, C. (1998). Concerns of instructors delivering distance learning via the www. *Online Journal of Distance Learning Administration*, *1*(3). Retrieved September 6, 2006 from http://www.westga.edu/~distance/wilson13.html

Zhuhadar, L., Romero, E., & Wyatt, R. (2009). The effectiveness of sonalization in delivering e-learning classes. *Advances in Computer-Human Interactions, 2009.* ACHI'09. Second International Conferences on, 130-135.

APPENDIX A

A1. SoCQ PERMISSION LETTER

ADVANCING RESEARCH
SEDL
IMPROVING EDUCATION

SEDL License Agreement

TO: Elizabeth Romero Fuerte (Licensee)
Instructional Designer
Western Kentucky University
Office of Distance Learning
104B Garret Conference Center
1906 College Heights Blvd. #61084
Bowling Green KY 42101-1084

FROM: Nancy Reynolds
Information Associate
SEDL
Information Resource Center
4700 Mueller Blvd.
Austin, TX 78723

SUBJECT: License Agreement to reprint and distribute SEDL materials

DATE: November 7, 2007 and (revised) January 14, 2008

Thank you for your interest in using the excerpts from the books 1) ***Measuring Implementation in Schools: The Stages of Concern Questionnaire*** written by Archie A. George, Gene E. Hall, and Suzanne M. Stiegelbauer and 2) ***Measuring Implementation in Schools: Levels of Use*** written by Gene E. Hall, Debcrah J. Dirksen, and Archie A. George, Both of these books were published by SEDL in 2006. You have asked to use excerpts as follows:

1. From *Measuring Implementation in Schools. The Stages of Concern Questionnaire*, **Stages of Concern Questionnaire** (SoCQ) published as Appendix A, pages 79-82 and also available as a PDF document on an accompanying CD-ROM.
2. From *Measuring Implementation in Schools. Levels of Use*, **The Basic Interview Protocol** published as Appendix A Pages 53-56

These excerpts will be referred to as the "works" in this permission agreement. SEDL is pleased to grant permission for use of the works cited above by the Licensee who is a doctoral student at the University of Louisville. The Licensee will use the works to collect data for her dissertation on concerns and perceptions of faculty using web-based instructional technology in higher education. The following are the terms, conditions, and limitations governing this limited permission to reproduce the works:

1. All reprinting and distribution activities shall be solely in the media in which the works have been made available for your use, *i.e., copy made from a print copy or a PDF document* or, can be converted to an online version that can be accessed only by participants in a password-protected environment and shall be solely for educational, non-profit use only. Precise compliance with the following terms and conditions shall be required for any permitted reproduction of the works described above.

SEDL License Agreement, p.2

2. No adaptations, deletions, or changes are allowed with the exception to substitute the words "the innovation" with a word or phrase that participants will recognize, such as the name of the innovation (i.e. "web-based instructional technology") or initiative, and questions can be added to identify demographic indicators of participants before or after the instrument, but otherwise, the wording and order of items cannot be changed. No derivative work based on or incorporating the works will be created without the prior written consent of SEDL.

3. This permission is non-exclusive, non-transferable, and limited to the one-time use specified herein. This permission is granted solely for the period November 7, 2007 through December 31, 2008, inclusive. SEDL expressly reserves all rights in this material.

4. You must give appropriate credit: "Reprinted with permission of SEDL," or attribute SEDL as appropriate to the professional style guidelines you are following. All reproductions of the materials used by you shall also bear the following copyright notice on each page of use: "Copyright © 2006, SEDL."

5. An exact copy of any reproduction of the work you produce shall be promptly provided to SEDL. All copies of the work produced by you which are not distributed or used shall be destroyed or sent to SEDL, save and except a maximum of three archival copies you are permitted to keep in permanent records of the activity you conducted.

6. This license agreement to reproduce the works is limited to the terms hereof and is personal to the person and entity to whom it has been granted; and it may not be assigned, given, or transferred to any other person or entity.

7. SEDL is not charging the Licensee a copyright fee to use the works.

I'm e-mailing you a PDF of this agreement. Please print and sign one copy below, indicating that you understand and agree to comply with the above terms, conditions and limitations, and send the original back to me. If you wish to keep a copy with original signatures, please also print, sign, and return a second copy and, after I receive and sign it, I'll return it with both of our signatures to you.

Thank you, again, for your interest in using excerpts from SEDL's publications ***Measuring Implementation in Schools: The Stages of Concern Questionnaire*** and ***Measuring Implementation in Schools: Levels of Use.*** If you have any questions, please contact me at 800-476-6861, ext. 6548 or 512-391-6548, or by e-mail at nancy.reynolds@sedl.org.

Sincerely,

Nancy Reynolds

Nancy Reynolds for SEDL

January 22, 2008

Date signed

Agreed and accepted:

Signature: Elizabeth Romero F.

01/15/2008

Date signed

Printed Name: Elizabeth Romero Fuerte

A2. PRE-NOTICE E-MAIL

Subject: Pre-notice: Invitation to Participate in Study

Message Body:

Dear Colleague:

In a couple of days you will receive an invitation to participate in a study regarding the concerns and perceptions of faculty using Web-based instructional technology. This study is being conducted by Elizabeth Romero (doctoral candidate) and Dr. Christopher Wagner (Advisor) and is sponsored by the Department of Leadership, Foundations, and Human Resource Education at the University of Louisville (UofL) and the Department of Educational Administration, Leadership, and Research at Western Kentucky University (WKU).

The goal of this study is to understand how to better meet you and your colleagues' needs in the successful use of Web-based technology as a teaching resource. Should you decide to accept this invitation, your opinions are likely to make a difference in the improvement of technology-related professional development activities in the Commonwealth of Kentucky. The study requires completing an online survey. Completion of this survey will enter you into a random drawing to get a token of appreciation for your participation.

We value your opinion and are hopeful that you will agree to participate in the study.

Best regards,

Christopher Wagner, Ph.D. (Advisor); E-mail: Christopher.Wagner@wku.edu
Ms. Elizabeth Romero (Doctoral Candidate); E-mail: Elizabeth.Romero@wku.edu

A3. FACULTY INVITATION LETTER

Subject: Invitation to participate in study

Message Body:

Dear Colleague:

Please accept this invitation to participate in a study about concerns and perceptions of faculty using Web-based instructional technology. The purpose of this survey is to learn about your perceptions of conditions that may support you either as you begin to use Web-based technologies or to assist you in improving your use of Web-based technologies in your teaching. This survey is comprised of 65 questions divided in 5 sections as follows:

Section 1: Levels of use of Web-based technologies for teaching (5-10 questions)
Section 2: Levels of concern about using Web-based technologies for teaching (35questions)
Section 3: Computer self-efficacy (10 questions)
Section 4: Conditions supporting technology use (8 conditions)
Section 5: General demographic information (11 questions)

Please be aware that this survey will take about 20 minutes of your time and that it is very important that you answer all 65 questions. At the end of the last section you will be given the opportunity to provide your name and e-mail address to enter in a drawing to get an 250 GB External HD or one of twenty-five webcams as a token of appreciation for your participation.

To access the survey, please click here:
http://www.wku.edu/reachu/survey/AccessCode.php

We value your opinion and are hopeful that you will agree to participate in the study.

Best regards,

Christopher Wagner, Ph.D. (Advisor); E-mail: Christopher.Wagner@wku.edu
Ms. Elizabeth Romero (Doctoral Candidate); E-mail: Elizabeth.Romero@wku.edu

A note of privacy

This survey is anonymous. This survey uses your e-mail address as the identifying code to indicate that you have (or have not) completed the survey and to enter your name in a drawing to get a small token of appreciation for your participation. There is no way of matching your e-mail address with your survey responses. Survey responses and e-mail addresses are managed in a separate database.

A4. FACULTY INVITATION REMINDER LETTER

Subject: Survey Reminder

Message Body:

Dear Colleague:
A week ago we invited you to participate in a survey regarding your concerns and perceptions of using Web-based instructional technology. On June 2nd we will announce the winner of the 250 GB Portable Hard Drive and the winners of the Logitech webcams. If you already took the survey, please disregard this message. If you have not still completed the survey, we want to encourage you to do so.

To access the survey, please click here:
http://www.wku.edu/reachu/survey/AccessCode.php

We value your opinion and are hopeful that you will agree to participate in the study.

Best regards,
Christopher Wagner, Ph.D. (Advisor)
Ms. Elizabeth Romero (Doctoral Candidate)

A note of privacy

This survey is anonymous. This survey uses your e-mail address as the identifying code to indicate that you have (or have not) completed the survey and to enter your name in a drawing to get a token of appreciation for your participation. There is no way of matching your e-mail address with your survey responses. Survey responses and e-mail addresses are managed in a separate database.

A5. INFORMED CONSENT FORM

Spring 2008

Dear Colleague:

Please accept this invitation to participate in a research study about concerns and perceptions of faculty using Web-based instructional technology. This study is being conducted by Elizabeth Romero (doctoral candidate) and Dr. Christopher Wagner (Advisor) and sponsored by the Department of Leadership, Foundations, and Human Resource Education at the University of Louisville (UofL).

This study involves completing an online questionnaire. Participation in this study is entirely voluntary and should take approximately 20 minutes of your time. There are no risks or benefits for your participation; however, the knowledge gained from your participation may help higher education institutions in the Commonwealth of Kentucky in the improvement of technology-related professional development activities, leadership interventions, and administrative practices necessary for the successful use of technology as a teaching resource.

By completing the questionnaire you are voluntary agreeing to participate and are acknowledging that all your present questions have been answered in language you can understand. Your complete survey will be compiled in aggregate format and maintained on a secure computer that is password protected. Presentations or publications of the study will be based on grouped data and will not reveal your identity. You may decline to answer any questions or stop taking part of this study at any time without penalty of losing any benefits to which you are otherwise entitled. Completion of this survey enters you into a random drawing to get a small token of appreciation for your participation.

If you have any questions or concerns please contact the principal investigator, Dr. Christopher Wagner, at (270) 745-4980. If you have any questions about your rights as a research subject, you may call the Human Subjects Protection Program Office at (502) 852-5188. You will be given the opportunity to discuss any questions about your rights as a research subject, in private, with a member of the Institutional Review Board (IRB). The IRB is an independent committee composed of people from the University community, staff of the institutions, as well as people from the community not connected with these institutions. The IRB has reviewed and approved this research study. If you have concerns or complaints about the research or research staff and you do not wish to give your name, you may call 1-877-852-1167. This is a 24 hour hot line answered by people who do not work at the University of Louisville. If you have concerns or complaints about the research or research staff and you do not wish to give your name, you may call 1-877-852-1167. This is a 24 hour hot line answered by people who do not work at the University of Louisville.

Click here to access the survey

APPENDIX B

B1. SURVEY INITIAL PAGE

Survey Overview

Concerns and Perceptions of Faculty
Using Web-based Instructional Technology

Dear Colleague:

The purpose of this survey is to learn about your perceptions of conditions that may support you either as you begin to use web-based technologies or to assist you in improving your use of web-based technologies in your teaching. This survey is comprised of 65 questions divided in 5 sections as follows:

Section 1: Levels of use of web-based technologies for teaching (5-10 questions)
Section 2: Levels of concern about using web-based technologies for teaching (35 questions)
Section 3: Computer self-efficacy (10 questions)
Section 4: Conditions supporting technology use (8 conditions)
Section 5: General Demographic Information (11 questions)

Please be aware that this survey will take about 20 minutes of your time and that it is very important that you answer all 65 questions. At the end of the last section you will be given the opportunity to provide your name and email address to enter in a drawing to get one of twenty $25.00 Barnes & Noble gift certificate or one of twenty webcams as a token of appreciation for your participation.

Thank you again for being part of this study.

Sincerely,

Christopher Wagner, Ph.D.
Elizabeth Romero-Fuerte, Doctoral candidate

[Click here to start the survey]

B2. LEVELS OF USE QUESTIONNAIRE

YES path

Section 1: Levels of Use of Web-based Technolog...

0 % Completed

Section 1: Levels of Use of Web-based Technologies

Instructions: The purpose of this section is to determine your present level of use of web-based technology in your teaching. The following questions refer to a variety of behaviors that you may have as you use web-based technology in your teaching.

1. Are you currently using web-based instructional technology in your courses?
(•) Yes ( ) No

[Next]

survey31

2. What are the three web-based technologies that you use more commonly in your teaching? (please use only text, do not use special characters such as apostrophes or quotations)

a.

b.

c.

3. Think of the technologies that are more important to your instruction, what do you use them primarily for? (Check all that apply)

- Collecting data ☐
- Presenting content ☐
- Demonstrating concepts ☐
- Drill-and-practice ☐
- Simulating behaviors/concepts ☐
- Communicating w/students ☐
- Facilitating cooperative learning ☐
- Facilitating problem solving ☐
- Other (please use only text, do not use special characters):

4. Are you currently looking for any additional information regarding how to improve your use of web-based resources in your teaching?
○ Yes ○ No

Next

survey33

5. Are you doing any evaluation, either formally or informally, of your use of web-based instructional technology?
○ Yes ○ No

6. Have you received any feedback from students?
○ Yes ○ No

Next

survey33

7. Based on your evaluation or the feedback you have received, have you made any change of your use of web-based instructional resources recently?
○ Yes ○ No

8. Are you considering making any changes in the near feature?
○ Yes ○ No

Next

survey34

9. Do you collaborate with other instructors, either formally or informally, in your use of web-based instructional technology?
○ Yes ○ No

Next

survey33

10. Have you made any changes in your use of web-based instructional technology based on that collaboration?

○ Yes ○ No

Next

NO path

Section 1: Levels of Use of Web-based Technolog...

0 % Completed

Section 1: Levels of Use of Web-based Technologies

Instructions: The purpose of this section is to determine your present level of use of web-based technology in your teaching. The following questions refer to a variety of behaviors that you may have as you use web-based technology in your teaching.

1. Are you currently using web-based instructional technology in your courses?
   - ○ Yes ● No

[Next]

survey38

2. Have you used web-based instructional technology in the past?
   - ○ Yes ○ No

[Next]

survey39b

4. Have you made any decision to use web-based instructional technologies in the future?
   - ○ Yes ● No

[Next]

survey33

6. Are you currently interested in getting any information regarding what web-based instructional technology is?
   - ○ Yes ○ No

[Next]

B3. STAGES OF CONCERN QUESTIONNAIRE

Section 2: Stages of Concern About Web-based I...

% Completed

Section 2: Stages of Concern About Web-based Instructional Technology Use

Instructions: We are interested in your concerns while using or thinking about using Web-based technologies in your teaching (i.e., technology that allows content to be delivered via the Internet). The following questions are meant to cover teachers of wide-ranging skill levels. If a particular question is not relevant to you, select "0" on the scale. On the remaining items, use 1 to 7 scale as follows:

Range is (0) *Irrelevant*, (1) *Not true of me now* to (7) *Very true of me now*.

Irrelevant	Not true of me now		Somewhat true of me now			Very true of me now	
0	1	2	3	4	5	6	7

		1	[redacted]	3		5	6	7
1. I am concerned about students' attitudes toward the use of web-based technologies.								
2. I know of some other approaches to teaching that might work better than using web-based technologies.								
3. I am more concerned about other innovations to teaching.								
4. I am concerned about not having enough time to organize myself each day.								
5. I would like to help other faculty use web-based technologies.								
6. I have a very limited knowledge about what web-based technology is.								
7. I would like to know the effect of teaching using web-based technology on my professional status.								
8. I am concerned about conflict between my interests and my responsibilities in using web-based technologies.								
9. I am concerned about revising my use of web-based technologies.								
10. I would like to develop working relationships with both our faculty and outside faculty using web-based technology.								
11. I am concerned about how the use of web-based technology affects students.								
12. I am not concerned about any aspect of using web-based technologies at this time.								
13. I would like to know who will make the decisions (e.g., university administration, IT, academic departments) in this technology-based teaching approach.								
14. I would like to discuss the possibility of using web-based technologies in my teaching.								
15. I would like to know what resources are available if I decide to adopt web-based technology.								
16. I am concerned about my inability to manage all that using web-based technology requires.								
17. I would like to know how my teaching/administration role is supposed to change.								
18. I would like to familiarize other departments or persons with the progress of the web-based technology approach.								
19. I am concerned about evaluating my impact on students while using web-based technologies.								
20. I would like to revise my university's web-based technology approach.								
21. I am completely occupied with other things (e.g., with teaching, research, university service, etc.) than implementing web-based instructional technology.								
22. I would like to modify my use of web-based technology based on the experiences of my students.								
23. I spend little time thinking about the use of web-based technologies.								
24. I would like to get my students excited about learning thorugh the use of web-based technologies.								
25. When working with web-based technologies, I am concerned about the amount of time I spend on non-academic issues.								
26. I would like to know what the use of web-based technologies may require of me in the immediate future (e.g., time, resources, etc.).								
27. I would like to coordinate my efforts with others to maximize the effects of using web-based technologies.								
28. I would like to have more information on time and energy commitments required by the use of web-based technologies.								
29. I would like to know what other faculty are doing in the use of web-based instructional technology.								
30. Currently, other priorities prevent me from focusing my attention on the use of web-based technologies.								

31. I would like to determine how to supplement or enhance the use of web-based technologies.
32. **I would like to use feedback from students to improve the current use of web-based instructional technology at my university.**
33. I would like to know how my role will change when I am using web-based technologies.
34. **When using web-based technologies in my teaching, coordinating tasks and people takes too much of my time.**
35. I would like to know how teaching using web-based technologies is better than not using web-based technologies.

What other concerns about web-based technology use, if any, do you have at this time? (Please describe those using complete sentences. Please use only text, do not use special characters such as apostrophes or quotations).

Please continue to next page

B4. COMPUTER SELF-EFFICACY QUESTIONNAIRE

60 % Completed

Section 3: Computer Self-efficacy

Instructions: For the questions in this section, imagine that you were given new web-based software for use in your teaching. Please indicate whether you think you would be able to complete the job using the software by selecting your confidence level for each of the conditions listed.

Range is: (1) *Not at all confident* to (10) *Extremely confident*.

I could use this new software if...

1. There was no one around to help me. Level
2. I had never used a package like it before. Level
3. I had only the software manuals for reference. Level
4. I had seen someone else using it before trying it myself. Level
5. I could call someone for help if I got stuck. Level
6. Someone else had helped me get started. Level
7. I had a lot of time to complete the job for which the software was provided. Level
8. I only had the help built into the software for assistance. Level
9. Someone showed me how to do it. Level
10. I had used similar packages before this one to do the same job. Level

Please continue to next page

B5. CONDITIONS SUPPORTING TECHNOLOGY USE CHECK LIST

80 % Completed

Section 4: Conditions Supporting Technology Use

Instructions: For the questions in this section, imagine that you have been instructed to use a new web-based resource (e.g., Blackboard) for some aspect of your teaching. Following is a list of conditions that may encourage the successful use of technology. I am asking you to put these conditions in rank order from 1 (most important) to 8 (least important) in supporting/encouraging your use of the new resource in your teaching at this time. You may use each number only once.

Please rank the conditions using each number only once.
1 = Most important; and 8 = Least important

Rank	Condition	Description
rank	Dissatisfaction with the status-quo	Refers to a discomfort resulting from the use of current processes or technologies that are perceived as inefficient, ineffective or not competitive.
rank	Knowledge and skills	Refers to users having or acquiring the needed skills and knowledge to use the technology.
rank	Resources	Refers to availability and accessibility to resources needed to implement the technology. Resources include finances, hardware, software, materials, personnel, and technological support.
rank	Time	Refers to the willingness for organizations to provide paid time for users to learn the new skills in order to use the technology, as well as the user's willingness to devote time to develop these new skills.
rank	Incentives and rewards	Refers to either intrinsic or extrinsic rewards that result from using the innovation.
rank	Participation	Refers to the level of involvement stakeholders have in the decision making process to adopt and implement the technology.
rank	Leadership	Refers to the level of ownership and support given by the leaders, including providing encouragement and serve as role models.
rank	Commitment	Refers to "visible" support by the upper level leaders or powerbrokers.

Please continue to next page

B6. DEMOGRAPHICS QUESTIONNAIRE

Section 5: General Demographic Information

90% completed

Section 5: General Demographic Information

Instructions: The purpose of this section is to gather demographic data and the extent of professional development activities associated with instructional technology. Please fill in, or check, the following items that apply to you best.

1. Age (in years):
2. Gender:
   - Male
   - Female
3. Position:
   - Faculty
   - Administrator
4. Work status (Check all that apply):
   - Instructor
   - Professor Rank (Assistant, Associate, or Full)
   - Tenured
   - Tenured Track
   - Non-Tenured
5. Teaching area:
   - Social Sciences
   - Natural Sciences
   - Health Professions
   - Education
   - Engineering
   - Business
   - Art & Humanities
   - Agriculture
6. Teaching experience in higher education (in years):
7. Online teaching experience in higher education (in years):
8. During the last two years, have you participated in professional development activities regarding the use of web-based technologies (e.g., Blackboard, websites, etc.)?
   - Yes
   - No
9. The type of training related to the use of technology that you participate in is usually:
   - Mandatory
   - Voluntary
10. Please select the level of training activities in which you more commonly participate in:
    - Basic level
    - Intermediate level
    - Advanced level
    - Teaching others
11. Please select your level of experience in the use of web-based technologies for teaching (e.g., Blackboard, Websites, etc.):
    - Non-user
    - Inexperienced user
    - Experienced user
    - Advanced user

You have completed all sections in this survey.
Please submit your answers and register for the drawing.

Submit Survey

Submit Survey

Thank you for participating in this study.

This survey is anonymous.
This survey uses your email address as the identifying code to indicate that you have (or have not) completed the survey and to enter your name in a drawing to get a token of appreciation for your participation.

There is no way of matching your email address with your survey responses. Survey responses and email addresses are managed in a separate database.

Please enter your name and email address to register.

Name:

Email Address:

Submit

APPENDIX C

FACTORIAL MANOVA DATA ANALYSIS

```
GLM C1 C2 C3 C4 C5 C6 C7 C8 BY CSE LoU SoC
 /CONTRAST(CSE)=Simple(1)
 /CONTRAST(LoU)=Simple(1)
 /CONTRAST(SoC)=Simple(1)
 /METHOD=SSTYPE(3)
 /INTERCEPT=INCLUDE
 /POSTHOC=LoU SoC(BONFERRONI T2)
 /PLOT=PROFILE(LoU*CSE LoU*SoC LoU)
 /EMMEANS=TABLES(LoU*SoC)
 /PRINT=DESCRIPTIVE HOMOGENEITY
 /CRITERIA=ALPHA(.05)
 /DESIGN= CSE LoU SoC CSE*LoU CSE*SoC LoU*SoC CSE*LoU*SoC.
```

General Linear Model

Warnings

Box's Test of Equality of Covariance Matrices is not computed because there are fewer than two nonsingular cell covariance matrices.

Between-Subjects Factors

		Value Label	N
Computer Self-efficacy	0	Low	111
	1	Medium	152
	2	High	70
Levels of Use	1	Nonuse/Preparation	46
	2	Focus on Use	157
	3	Focus on Improvement	130
Stages of Concern	0	Self	127
	1	Task	48
	2	Impact	158

Multivariate Tests

Effect		Value	F	Hypothesis df	Error df	Sig.
CSE	Pillai's Trace	.025	.535	14	604	.913
	Wilks' Lambda	.976	.535a	14	602	.913
	Hotelling's Trace	.025	.535	14	600	.913
	Roy's Largest Root	.020	.882b	7	302	.521
LoU	Pillai's Trace	.085	1.903	14	604	.023
	Wilks' Lambda	.916	1.928a	14	602	.021
	Hotelling's Trace	.091	1.952	14	600	.019
	Roy's Largest Root	.084	3.629b	7	302	.001
SoC	Pillai's Trace	.050	1.103	14	604	.351
	Wilks' Lambda	.951	1.103a	14	602	.352
	Hotelling's Trace	.051	1.102	14	600	.352
	Roy's Largest Root	.038	1.622b	7	302	.129
CSE * LoU	Pillai's Trace	.083	.923	28	1216	.582
	Wilks' Lambda	.919	.921	28	1086	.585
	Hotelling's Trace	.086	.919	28	1198	.587
	Roy's Largest Root	.043	1.860b	7	304	.076
CSE * SoC	Pillai's Trace	.118	1.315	28	1216	.127
	Wilks' Lambda	.886	1.320	28	1086	.124
	Hotelling's Trace	.124	1.323	28	1198	.122
	Roy's Largest Root	.068	2.947b	7	304	.005
LoU * SoC	Pillai's Trace	.141	1.591	28	1216	.027
	Wilks' Lambda	.864	1.611	28	1086	.023
	Hotelling's Trace	.152	1.630	28	1198	.021
	Roy's Largest Root	.105	4.567b	7	304	.000
CSE * LoU * SoC	Pillai's Trace	.173	1.112	49	2149	.277
	Wilks' Lambda	.837	1.116	49	1532	.272
	Hotelling's Trace	.183	1.118	49	2095	.267
	Roy's Largest Root	.092	4.048b	7	307	.000

c. Design: Intercept + CSE + LoU + SoC + CSE * LoU + CSE * SoC + LoU * SoC + CSE * LoU * SoC

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Dissatisfaction	200.95a	25	8.038	1.14	.295
	Knowledge & Skills	122.36b	25	4.894	1.33	.134
	Resources	91.91c	25	3.677	1.40	.100
	Time	132.90d	25	5.316	1.27	.174
	Incentives & Rewards	341.51e	25	13.660	3.43	.000
	Particiaption	100.25f	25	4.010	1.42	.089
	Leadership	222.27g	25	8.891	2.45	.000
	Commitment	460.51h	25	18.421	4.68	.000
Intercept	Dissatisfaction	1754.174	1	1754.17	248.90	.000
	Knowledge & Skills	4069.068	1	4069.06	1110.98	.000
	Resources	4835.790	1	4835.79	1842.98.	.000
	Time	4033.650	1	4033.65	967.66	.000
	Incentives & Rewards	2045.692	1	2045.69	513.59	.000
	Participation	1875.591	1	1875.59	666.84	.000
	Leadership	1553.982	1	1553.98	428.56	.000
	Commitment	1579.510	1	1579.51	402.11	.000
CSE	Dissatisfaction	13.230	2	6.615	.93	.392
	Knowledge & Skills	6.281	2	3.141	.85	.425
	Resources	1.494	2	.747	.28	.752
	Time	.650	2	.325	.07	.925
	Incentives & Rewards	4.912	2	2.456	.61	.540
	Participation	4.888	2	2.444	.86	.420
	Leadership	1.531	2	.765	.21	.810
	Commitment	.255	2	.128	.03	.968
LoU	Dissatisfaction	19.686	2	9.843	1.39	.249
	Knowledge & Skills	4.094	2	2.047	.55	.572
	Resources	.661	2	.330	.12	.882
	Time	.258	2	.129	.03	.970
	Incentives & Rewards	24.652	2	12.326	3.09	.047
	Participation	8.473	2	4.237	1.50	.223
	Leadership	32.416	2	16.208	4.47	.012
	Commitment	67.104	2	33.552	8.54	.000

SoC	Dissatisfaction	14.173	2	7.087	1.006	.367
	Knowledge & Skills	3.280	2	1.640	.448	.639
	Resources	2.251	2	1.126	.429	.652
	Time	14.323	2	7.161	1.718	.181
	Incentives & Rewards	5.220	2	2.610	.655	.520
	Participation	8.142	2	4.071	1.447	.237
	Leadership	10.165	2	5.083	1.402	.248
	Commitment	29.816	2	14.908	3.795	.024
CSE * LoU	Dissatisfaction	54.740	4	13.685	1.942	.103
	Knowledge & Skills	7.228	4	1.807	.493	.741
	Resources	6.445	4	1.611	.614	.653
	Time	3.028	4	.757	.182	.948
	Incentives & Rewards	26.304	4	6.576	1.651	.161
	Participation	3.426	4	.856	.304	.875
	Leadership	7.040	4	1.760	.485	.747
	Commitment	28.504	4	7.126	1.814	.126
CSE * SoC	Dissatisfaction	66.382	4	16.596	2.355	.054
	Knowledge & Skills	8.351	4	2.088	.570	.685
	Resources	28.981	4	7.245	2.761	.028
	Time	2.772	4	.693	.166	.955
	Incentives & Rewards	1.440	4	.360	.090	.985
	Participation	10.711	4	2.678	.952	.434
	Leadership	11.384	4	2.846	.785	.536
	Commitment	34.767	4	8.692	2.213	.068
LoU * SoC	Dissatisfaction	13.538	4	3.384	.480	.750
	Knowledge & Skills	26.297	4	6.574	1.795	.130
	Resources	23.523	4	5.881	2.241	.065
	Time	26.354	4	6.589	1.581	.179
	Incentives & Rewards	95.209	4	23.802	5.976	.000
	Participation	16.665	4	4.166	1.481	.208
	Leadership	18.260	4	4.565	1.259	.286
	Commitment	17.467	4	4.367	1.112	.351
CSE * LoU * SoC	Dissatisfaction	37.879	7	5.411	.768	.615
	Knowledge & Skills	5.212	7	.745	.203	.985
	Resources	39.586	7	5.655	2.155	.038
	Time	31.900	7	4.557	1.093	.367
	Incentives & Rewards	43.688	7	6.241	1.567	.145
	Participation	21.530	7	3.076	1.094	.367
	Leadership	30.477	7	4.354	1.201	.302
	Commitment	35.444	7	5.063	1.289	.255

Error	Dissatisfaction	2163.614	307	7.048
	Knowledge & Skills	1124.418	307	3.663
	Resources	805.535	307	2.624
	Time	1279.710	307	4.168
	Incentives & Rewards	1222.801	307	3.983
	Participation	863.479	307	2.813
	Leadership	1113.194	307	3.626
	Commitment	1205.920	307	3.928
Total	Dissatisfaction	6725.000	333	
	Knowledge & Skills	11458.000	333	
	Resources	13407.000	333	
	Time	11646.000	333	
	Incentives & Rewards	6385.000	333	
	Participation	5686.000	333	
	Leadership	5938.000	333	
	Commitment	6687.000	333	
Corrected Total	Dissatisfaction	2364.565	332	
	Knowledge & Skills	1246.781	332	
	Resources	897.447	332	
	Time	1412.619	332	
	Incentives & Rewards	1564.312	332	
	Participation	963.730	332	
	Leadership	1335.465	332	
	Commitment	1666.432	332	

a. R Squared = .085 (Adjusted R Squared = .010)
b. R Squared = .098 (Adjusted R Squared = .025)
c. R Squared = .102 (Adjusted R Squared = .029)
d. R Squared = .094 (Adjusted R Squared = .020)
e. R Squared = .218 (Adjusted R Squared = .155)
f. R Squared = .104 (Adjusted R Squared = .031)
g. R Squared = .166 (Adjusted R Squared = .099)
h. R Squared = .276 (Adjusted R Squared = .217)

Estimated Marginal Means

Levels of Use * Stages of Concern

Dependent Variable	Levels of Use	Stages of Concern	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Dissatisfaction	Nonuse/ Preparation	Self	2.787	.568	1.669	3.906
		Task	3.656	.900	1.886	5.426
		Impact	5.250a	1.150	2.988	7.512
	Focus on Use	Self	3.568	.368	2.844	4.292
		Task	5.064	.970	3.155	6.973
		Impact	3.964	.321	3.332	4.596
	Focus on Improvement	Self	3.536	.504	2.545	4.528
		Task	3.595	.775	2.069	5.121
		Impact	3.112	.330	2.462	3.762
Knowledge & Skills	Nonuse/ Preparation	Self	4.700	.410	3.894	5.506
		Task	6.533	.648	5.257	7.809
		Impact	6.250a	.829	4.619	7.881
	Focus on Use	Self	6.077	.265	5.555	6.599
		Task	5.724	.699	4.348	7.100
		Impact	5.660	.232	5.205	6.116
	Focus on Improvement	Self	5.900	.363	5.185	6.615
		Task	5.440	.559	4.341	6.540
		Impact	5.010	.238	4.542	5.479
Resources	Nonuse/Preparation	Self	5.646	.347	4.963	6.328
		Task	6.478	.549	5.398	7.558
		Impact	6.125a	.701	4.745	7.505
	Focus on Use	Self	6.401	.224	5.959	6.842
		Task	6.242	.592	5.078	7.407
		Impact	6.120	.196	5.734	6.505
	Focus on Improvement	Self	6.873	.307	6.268	7.478
		Task	5.226	.473	4.295	6.157
		Impact	6.230	.202	5.834	6.627
Time	Nonuse/Preparation	Self	6.300	.437	5.440	7.160
		Task	5.767	.692	4.405	7.128
		Impact	4.750a	.884	3.010	6.490
	Focus on Use	Self	5.568	.283	5.011	6.124
		Task	5.552	.746	4.084	7.020
		Impact	5.765	.247	5.279	6.251

	Focus on Improvement	Self	5.796	.388	5.033	6.559
		Task	6.077	.596	4.904	7.251
		Impact	4.836	.254	4.336	5.336
Incentives & Rewards	Nonuse/Preparation	Self	6.346	.427	5.505	7.187
		Task	3.144	.676	1.814	4.475
		Impact	3.500a	.864	1.800	5.200
	Focus on Use	Self	3.688	.277	3.144	4.232
		Task	4.498	.729	3.063	5.933
		Impact	3.964	.241	3.489	4.439
	Focus on Improvement	Self	2.710	.379	1.965	3.455
		Task	4.423	.583	3.276	5.570
		Impact	3.194	.248	2.706	3.683
Participation	Nonuse/Preparation	Self	4.642	.359	3.935	5.348
		Task	3.600	.568	2.482	4.718
		Impact	4.000a	.726	2.571	5.429
	Focus on Use	Self	4.463	.232	4.006	4.921
		Task	3.731	.613	2.525	4.937
		Impact	3.656	.203	3.256	4.055
	Focus on Improvement	Self	3.240	.318	2.614	3.867
		Task	3.976	.490	3.012	4.940
		Impact	3.273	.209	2.862	3.684
Leadership	Nonuse/Preparation	Self	2.613	.408	1.810	3.415
		Task	3.600	.645	2.330	4.870
		Impact	3.250a	.825	1.628	4.872
	Focus on Use	Self	3.385	.264	2.866	3.904
		Task	2.630	.696	1.260	3.999
		Impact	3.401	.230	2.947	3.854
	Focus on Improvement	Self	3.883	.361	3.172	4.594
		Task	3.738	.556	2.644	4.833
		Impact	4.730	.237	4.264	5.197
Commitment	Nonuse/Preparation	Self	2.967	.424	2.132	3.802
		Task	3.222	.672	1.901	4.544
		Impact	2.875a	.858	1.186	4.564
	Focus on Use	Self	2.851	.275	2.311	3.391
		Task	2.559	.724	1.134	3.984
		Impact	3.470	.240	2.999	3.942
	Focus on Improvement	Self	4.062	.376	3.321	4.802
		Task	3.524	.579	2.385	4.663
		Impact	5.614	.247	5.129	6.099

a. Based on modified population marginal mean.

Post Hoc Tests

Levels of Use

Multiple Comparisons

Dependent Variable	(I) Levels of Use	(J) Levels of Use	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Dissatisfaction	Nonuse/ Preparation	Focus on Use	-.1313	.44508	1.00	-1.2027	.9401
		Focus on Improvement	.2445	.45544	1.00	-.8518	1.3408
	Focus on Use	Nonuse/ Preparation	.1313	.44508	1.00	-.9401	1.2027
		Focus on Improvement	.3757	.31480	.701	-.3820	1.1335
	Focus on Improvement	Nonuse/ Preparation	-.2445	.45544	1.00	-1.3408	.8518
		Focus on Use	-.3757	.31480	.701	-1.1335	.3820
Knowledge & Skills	Nonuse/ Preparation	Focus on Use	-.4330	.32086	.535	-1.2053	.3394
		Focus on Improvement	.0926	.32832	1.00	-.6977	.8830
	Focus on Use	Nonuse/ Preparation	.4330	.32086	.535	-.3394	1.2053
		Focus on Improvement	.5256	.22694	.064	-.0207	1.0719
	Focus on Improvement	Nonuse/ Preparation	-.0926	.32832	1.00	-.8830	.6977
		Focus on Use	-.5256	.22694	.064	-1.0719	.0207
Resources	Nonuse/ Preparation	Focus on Use	-.3024	.27158	.799	-.9561	.3513
		Focus on Improvement	-.2997	.27789	.845	-.9686	.3693
	Focus on Use	Nonuse/ Preparation	.3024	.27158	.799	-.3513	.9561
		Focus on Improvement	.0027	.19208	1.00	-.4596	.4651
	Focus on Improvement	Nonuse/ Preparation	.2997	.27789	.845	-.3693	.9686
		Focus on Use	-.0027	.19208	1.00	-.4651	.4596
Time	Nonuse/ Preparation	Focus on Use	.1525	.34230	1.00	-.6715	.9764
		Focus on Improvement	.7067	.35026	.134	-.1365	1.5498
	Focus on Use	Nonuse/ Preparation	-.1525	.34230	1.00	-.9764	.6715

		Focus on Improvement	.5542	.24211	.068	-.0286	1.1370
	Focus on Improvement	Nonuse/ Preparation	-.7067	.35026	.134	-1.5498	.1365
		Focus on Use	-.5542	.24211	.068	-1.1370	.0286
Incentives & Rewards	Nonuse/ Preparation	Focus on Use	1.0266*	.33460	.007	.2211	1.8320
		Focus on Improvement	1.7104*	.34238	.000	.8862	2.5345
	Focus on Use	Nonuse/ Preparation	-1.0266*	.33460	.007	-1.8320	-.2211
		Focus on Improvement	.6838*	.23666	.012	.1141	1.2535
	Focus on Improvement	Nonuse/ Preparation	-1.7104*	.34238	.000	-2.5345	-.8862
		Focus on Use	-.6838*	.23666	.012	-1.253	-.1141
Participation	Nonuse/ Preparation	Focus on Use	.2747	.28117	.988	-.4021	.9516
		Focus on Improvement	.8251*	.28771	.013	.1325	1.5177
	Focus on Use	Nonuse/ Preparation	-.2747	.28117	.988	-.9516	.4021
		Focus on Improvement	.5504*	.19887	.018	.0716	1.0291
	Focus on Improvement	Nonuse/ Preparation	-.8251*	.28771	.013	-1.517	-.1325
		Focus on Use	-.5504*	.19887	.018	-1.029	-.0716
Leadership	Nonuse/ Preparation	Focus on Use	-.3694	.31925	.744	-1.138	.3991
		Focus on Improvement	-1.3923*	.32668	.000	-2.179	-.6059
	Focus on Use	Nonuse/ Preparation	.3694	.31925	.744	-.399	1.1379
		Focus on Improvement	-1.0229*	.22581	.000	-1.566	-.4793
	Focus on Improvement	Nonuse/ Preparation	1.3923*	.32668	.000	.6059	2.1787
		Focus on Use	1.0229*	.22581	.000	.4793	1.5664
Commitment	Nonuse/ Preparation	Focus on Use	-.2177	.33228	1.000	-1.017	.5822
		Focus on Improvement	-1.8873*	.34001	.000	-2.706	-1.0688
	Focus on Use	Nonuse/ Preparation	.2177	.33228	1.000	-.582	1.0175
		Focus on Improvement	-1.6696*	.23502	.000	-2.235	-1.1039

	Focus on Improvement	Nonuse/ Preparation	1.8873*	.34001	.000	1.0688	2.7058
		Focus on Use	1.6696*	.23502	.000	1.1039	2.2354

Bonferroni Adjusted. Based on observed means.
The error term is Mean Square(Error) = 3.928.
*. The mean difference is significant at the .05 level.

Homogeneous Subsets

Stages of Concern

Multiple Comparisons

Dependent Variable	(I) Stages of Concern	(J) Stages of Concern	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Dissatisfaction	Self	Task	-.2771	.44980	1.000	-1.3598	.8057
		Impact	-.0911	.31638	1.000	-.8527	.6704
	Task	Self	.2771	.44980	1.000	-.8057	1.3598
		Impact	.1859	.43753	1.000	-.8673	1.2391
	Impact	Self	.0911	.31638	1.000	-.6704	.8527
		Task	-.1859	.43753	1.000	-1.2391	.8673
Knowledge & Skills	Self	Task	-.0960	.32426	1.000	-.8765	.6846
		Impact	.4064	.22808	.227	-.1426	.9554
	Task	Self	.0960	.32426	1.000	-.6846	.8765
		Impact	.5024	.31541	.337	-.2569	1.2616
	Impact	Self	-.4064	.22808	.227	-.9554	.1426
		Task	-.5024	.31541	.337	-1.2616	.2569
Resources	Self	Task	.4006	.27445	.436	-.2601	1.0612
		Impact	.1870	.19305	1.000	-.2777	.6517
	Task	Self	-.4006	.27445	.436	-1.0612	.2601
		Impact	-.2136	.26697	1.000	-.8562	.4290
	Impact	Self	-.1870	.19305	1.000	-.6517	.2777
		Task	.2136	.26697	1.000	-.4290	.8562
Time	Self	Task	.1032	.34593	1.000	-.7295	.9359
		Impact	.6652*	.24332	.020	.0794	1.2509
	Task	Self	-.1032	.34593	1.000	-.9359	.7295
		Impact	.5620	.33649	.288	-.2480	1.3720
	Impact	Self	-.6652*	.24332	.020	-1.2509	-.0794
		Task	-.5620	.33649	.288	-1.3720	.2480

Incentives & Rewards	Self	Task	-.1532	.33815	1.000	-.9672	.6608
		Impact	.5741*	.23785	.049	.0016	1.1466
	Task	Self	.1532	.33815	1.000	-.6608	.9672
		Impact	.7273	.32892	.083	-.0645	1.5191
	Impact	Self	-.5741*	.23785	.049	-1.1466	-.0016
		Task	-.7273	.32892	.083	-1.5191	.0645
Participation	Self	Task	.2528	.28415	1.000	-.4312	.9368
		Impact	.4667	.19987	.061	-.0145	.9478
	Task	Self	-.2528	.28415	1.000	-.9368	.4312
		Impact	.2139	.27640	1.000	-.4515	.8792
	Impact	Self	-.4667	.19987	.061	-.9478	.0145
		Task	-.2139	.27640	1.000	-.8792	.4515
Leadership	Self	Task	-.1096	.32264	1.000	-.8862	.6671
		Impact	-.8322*	.22694	.001	-1.3784	-.2859
	Task	Self	.1096	.32264	1.000	-.6671	.8862
		Impact	-.7226	.31383	.066	-1.4780	.0329
	Impact	Self	.8322*	.22694	.001	.2859	1.3784
		Task	.7226	.31383	.066	-.0329	1.4780
Commitment	Self	Task	-.1207	.33580	1.000	-.9291	.6876
		Impact	-1.3760*	.23620	.000	-1.9446	-.8074
	Task	Self	.1207	.33580	1.000	-.6876	.9291
		Impact	-1.2553*	.32664	.000	-2.0416	-.4690
	Impact	Self	1.3760*	.23620	.000	.8074	1.9446
		Task	1.2553*	.32664	.000	.4690	2.0416

Bonferroni Adjusted. Based on observed means.
The error term is Mean Square(Error) = 3.928.
*. The mean difference is significant at the .05 level.

CURRICULUM VITAE

Elizabeth Romero-Fuerte

2242 Conestoga Dr.
Bowling Green, KY 42104
(270) 393.8359
(270) 535.8139
E-mail: Elizabeth.Romero@wku.edu

Western Kentucky University
Department of Distance Learning
1906 College Heights Blvd.
Bowling Green, KY 42101
(270) 745.2823

OBJECTIVE

Research and development leadership position in the implementation of technological innovations, professional development, and organizational development in higher education.

ACADEMIC PREPARATION

PhD in Educational Leadership and Organizational Development, candidate (2009)
Concentration area: Postsecondary Administration
Dissertation topic: Concerns and perceptions of faculty using Web-based instructional technology

M.A. Education. Western Kentucky University, USA, (2003)
Courses taken included:
Instructional Leadership
Special Topics in Educational Technology
Applied Organizational Communication
Advanced Organizational Theory
Advanced Educational Psychology

M.S. Computer Science. Tecnológico de Monterrey, México, (1998)

Thesis: "Design of an Algorithm for Image Recognition in Distributed Environments."

B. S. Engineering. Universidad Nacional Autónoma de México, México, (1993)

Major: **Electronics**
Minor: Telecommunications

Thesis: "Design of a Radiometer to Detect Atmospheric Humidity in

Selected Sites."

AREAS OF EXPERTISE

Distance learning; organizational change and technology innovations; Web-based technology implementation in higher education; professional development;

PROFESSIONAL EXPERIENCE

Instructional Designer. The Office of Distance Learning, Division of Extended Learning and Outreach. Western Kentucky University, Kentucky, USA (February 2005-Present).

Providing instructional consultation to faculty about teaching and learning with technology to create, redesign, and convert courses to fully online delivery format.
Responding to requests for support with the use of new technologies.
Exploring with faculty the use of technologies as they become available.
Developing and delivers workshops dealing with instructional and technical aspects of online teaching.

Multimedia Consultant. The Office of Distance Learning, Division of Extended Learning and Outreach. Western Kentucky University, Kentucky, USA (August 2003-January 2005).

Provided instructional and technical support for faculty using Tegrity.
Participated in workshops to promote the use of Tegrity in online classes.
Provided technical support for students using Tegrity.
Trained faculty in the use of diverse multimedia software on one-to-one basis.
Provided multimedia services for faculty teaching online classes.
Audio and video production and conversion formats
Development of multimedia course materials
Web design

Director. Distance Learning Department, Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico City Campus, México (January 1999- July 2003).

Established the organizational structure for the department.
Coordinated and supervised producers, instructional designers and graphic designers.
Coordinated distance learning faculty training.
Developed and implemented strategies to maintain and increase student enrollment.
Developed the department corporative image and public relationships.
Developed and documented procedures for a systematic course design and delivery.
Diffusion of distance education culture both in campus and outside.

PROFESSIONAL SERVICE

Western Kentucky University
Member of the Committee for International Outreach (2008)
Member of E-Train Express For Technology Advocates (2003-present)

Fairview Community Health Center
Member of the Board of Directors (2007-Present)

Instituto Tecnológico y de Estudios Superiores de Monterrey (1996–2003)
Chair of the Academic Committee for Admission of Online Students
Liaison person between Western Kentucky University and Tecnológico de Monterrey (2002)
Distance Learning Students Mentor
Member of the Admissions Committee
Member of the Entrance Examination Committee
Part-time faculty member
- Telecommunication Networks (Online, Masters Level)
- Information Technology (College Level)
- Information Systems (College Level)
- Physics (High School Level)

PUBLICATIONS

Romero, E., Zhuhadar, L., Wagner, C., & Wyatt, R. (2009). Web-based technology use and computer self-efficacy as predictors of faculty perceptions of support for the implementation of eLearning. *Proceedings of the 2009 International Conference on Mobile Hybrid, and Online Learning.* IEEE Computer Society. 28-34.

Zhuhadar, L., Romero, E., & Wyatt, R. (2009). The effectiveness of personalization in delivering e-learning classes. *Advances in Computer-Human Interactions, 2009. ACHI'09. Second International Conferences on*, 130-135.

Atwell, N., Maxwell, M., Romero, E. (2008). Implementing Technology: a Change Process. ERIC Clearinghouse on Information and Technology (ERIC Document Reproduction Service No. ED503023).

INDIVIDUAL CONFERENCE PRESENTATIONS

"Web-based technology use and computer self-efficacy as predictors of faculty perceptions of support for the implementation of eLearning".

2009 International Conference on Mobile, Hybrid, and Online Learning. Cancun, Mexico, February, 2009.

"The Instructional Designer as Faculty Developer: an Application of the Concerns Theory". *18th International Conference on College Teaching and Learning.* Jacksonville, Florida, April, 2007.

"A Constructivist Approach to Course Design". *E-Learn 2006*. Honolulu, Hawaii, October, 2006.

UNPUBLISHED RESEARCH

Design of an Algorithm for Image Recognition in Online Environments. MS Thesis. Instituto Tecnológico y de Estudios Superiores de Monterrey, 1998.

Design of Low Band Frequency Radiometer to Detect Atmospheric Humidity in Selected Sites. BS Thesis. Universidad Nacional Autónoma de Mexico, 1993.

GRANTS, HONORS, AND FELLOWSHIPS

Best Paper Award. International Conference on Mobile, Hybrid, and Online Learning. Cancun, Mexico. (February, 2009)
Graduate Studies Research Grant. (2008)
Minority Doctoral Grant. Western Kentucky University (2005).
Graduate Assistant Scholarship. Western Kentucky University (2003-2004).
Studying Abroad Scholarship. ITESM-CCM (2003-2004).
Academic Development Grant: attended the 20th World Conference on Open Learning and Distance Education. ICDE, Düsseldorf, Germany (2001).
Masters degree in Computer Science with honors (1998).
Scholarship for Academic Merit in High School (1986).