FACULTY PERCEPTIONS ABOUT ATTRIBUTES AND BARRIERS IMPACTING THE ADOPTION AND DIFFUSION OF WEB-BASED EDUCATIONAL TECHNOLOGIES (WBETS) AT THE UNIVERSITY OF CAPE COAST AND THE UNIVERSITY OF GHANA, LEGON

A Thesis

by

JEMIMA ABENA YAKAH

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2005

Major Subject: Agricultural Education

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	Kim E. Dooley
Committee Member,	Eluned Jones
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ABSTRACT

Faculty Perceptions about Attributes and Barriers Impacting the Adoption and Diffusion of Web-Based Educational Technologies (WBETs) at the University of Cape Coast and the University of Ghana, Legon. (August 2005)

Jemima Abena Yakah, B.A., Spelman College

Co-Chairs of the Advisory Committee: Dr. James R. Lindner
Dr. Kim E. Dooley

The purpose of this study was to determine faculty perceptions about factors impacting the adoption and diffusion of Web-Based Educational Technologies (WBETs) at the University of Cape Coast and the University of Ghana, Legon. This study, based on Rogers' theory of adoption and diffusion, is a modified replication of a study by Li (2004), in the context of Ghana. Data were collected with a modified instrument created by Li (2004), from 61 teaching faculty out of a target accessible population of 200. The instrument comprised of four sections: The first, was used to collect data about faculty stage in the innovation development process. The second was used to collect data describing five attributes (relative advantage, compatibility, complexity, trialability, and observability) impacting the adoption and diffusion of WBETs. The third was used to collect data about ten barriers (concerns about time, concerns about incentives, program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure) impacting the adoption and diffusion of WBETs. The fourth section was used to collect data on personal characteristics of the faculty. Descriptive, correlational and regression analyses

were used to examine relationships between faculty personal characteristics, stage in the innovation-decision process, and perceptions of attributes and barriers impacting the adoption and diffusion of WBETs.

From the descriptive results, respondents perceived 'relative advantage' and 'observability' as the two most important attributes that impact the adoption and diffusion of WBETs. Infrastructure, financial concerns, and technical expertise were perceived as posing moderate to strong barriers to the adoption and diffusion of WBETs. Only compatibility (attribute) and technical expertise (barrier) had statistically significant correlations with faculty stage in the innovation decision process. The attributes and barriers altogether explained only 10.6% and 17.3% respectively of faculty stage in the innovation-decision process. Of the eight personal characteristics examined, only 'experience with WBETs' had a statistically significant correlation with faculty stage in the innovation-decision process. Recommendations to administrators and policy makers include allocating investments and resources that promote attributes and eliminate barriers, and conduct further research into factors that affect the adoption and diffusion of WBETs.

DEDICATION

I would like to dedicate this thesis to my family and friends and to all who have wished me well through the years and offered me support of any kind. This study has not only expanded my appreciation of the rigors of the research process, but also increased my appreciation of the importance of family, friends and nurturing relationships.

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CHAPTER I

INTRODUCTION

According to Rogers (2003), agricultural productivity in America increased by about 85% during the 1950s because of the adoption and diffusion of farm management innovations such as weed sprays, chemical fertilizers, new crop varieties, and new farm machinery by American farmers. This launched an agricultural revolution that increased the amount of goods and services available to the public. For decades, in both developed and developing nations, researchers and individuals have used a variety of approaches to increase the adoption and diffusion of innovations. These innovations include innovative ideas, products, and processes that impact the production of goods and services for socio-economic growth and wellbeing.

Both the absolute adoption and rate of adoption and use of computers, multimedia devices, the Internet, the World Wide Web and other communications technologies has emerged, during the late 20th and early 21st century, as an important innovation. The impact of these innovative technologies may rival that of the agricultural innovations of the 1950s. A study conducted by the Organization for Economic Co-operation and Development (OECD), found that during the 1990s, none of the usual factors such as the use of labor, capital, or increase in the multifactor productivity index stood out as the most important factor to impact

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economic growth in the nine OECD countries used in the study (Colecchia & Schreyer, 2001). These countries were Canada, France, Germany, Italy, Japan, U.K., U.S., Australia, and Finland. Instead a new factor, the use of Information Communications Technologies (ICT) emerged (Colecchia & Schreyer, 2001). While economists are still debating the actual impact of ICTs on economic growth in the US and other developed economies, researchers (Schreyer, 2000, Roeger 2001) estimate that ICT alone may have directly and indirectly contributed significantly to economic growth and wellbeing of the developed world during the 1990s, and added an average of about 0.5% per annum to the economic growth in the United States (Schreyer, 2000).

Besides the term Information Communications Technology (ICT or ICTs), (Colecchia & Schreyer, 2001; World Bank, 2003a), computers and communications equipment are collectively identified by a variety of terms. In Agricultural Education, broadly defined, some of the specific terms used to describe these innovations include: Web-based Education Resources (Carr, 2000); Web-based Distance Education Technologies (Li, 2004) and Distance Education (DE) Technologies (Murphrey & Dooley, 2003). Schifter (2000) used the term, interactive Computer-Mediated Communication (CMC) systems. Berge (1998) used Computer-Mediated Communication Technologies. All of these terms describe the use of computers, multimedia technologies, interactive videoconferencing, and Internet connections collectively, in creating and facilitating environments for teaching and learning. These technological innovations have been especially employed in

enhancing and transforming traditional courier based correspondence courses and Distance Education (DE) programs into synchronous or asynchronous eLearning or Distance Learning (DL) courses (Lindner, 2002; Pardue, 2001; Schifter, 2000). As a result, these technologies have gained a fairly established level of association with traditional paper-based Distance Education and technology enhanced Distance Learning courses and programs.

The term Web-Based Educational Technologies (WBETs) encompasses all of the terms and innovative technologies listed above and specifically emphasizes their collective use in enhancing education. This new definition expands the use of theses technological innovations beyond their use in Distance Education to include their use in other teaching and learning environments that may not necessarily be related to Distance Education or technology supplemented correspondence courses. This study explores faculty perspectives about factors impacting the adoption and diffusion of WBETs in education in general and not just within the context of teaching or learning at a distance (or where there is a spatial separation between instructor and student).

For the purpose of this study, Web-Based Educational Technologies (WBETs) is specifically defined as the use of online courses and references, computers, audio/video materials (streaming video), the Internet, multimedia peripherals, electronic mail, content on compact disks (CD-ROMs), etc. as part of an educational method in which these innovations are the main tools that enable instructors and their students to come together to accomplish a certain teaching and

learning objective, within a certain period of time. This definition broadens the scope of the term by providing two distinct contexts for using the term WBETs as shown in the Figure on page 44.

The first context for the use of the term WBETs involved dependency on a live Internet connection at a point before, during or after the teaching and learning process. In this context, the term WBETs was used to describe a course, program, or lecture that by design includes audio video materials, streaming video, online references and libraries accessed synchronously by students or faculty online via a live Internet connection in real-time or asynchronously during a lecture session or on the student's own time before or after the lecture.

The second context for using the term WBETs involved the use of materials asynchronously, based on pre-recorded content on compact disks CD-ROMS and other electronic storage mediums that can be used to accomplish teaching and learning objectives, without a live Internet connection. Such WBETs may be courses, materials, references etc. that may have evolved from Web-based or Internet-dependent instructional designs, and may or may not have online components, but that by design can be used independently of an Internet connection. These innovations are often in the form of CD-ROMs, local area networks or Intranet supported educational materials, and multi-media equipment, like projectors, sound speakers, and microphones.

Research has revealed many factors affecting the adoption and diffusion of Web Based Educational Technologies (WBETs) in institutions of higher

education. The literature review highlights the works and findings of Berge (1998); Betts (1998); Carr (2000); Jones, Lindner, Murphy, and Dooley (2002); Lindner, J. R., Murphy, T.H., & Dooley K.E. (2001); Murphrey and Dooley (2000); Murphrey and Dooley (2003); Schifter (2000); Thompson (2004); and other researchers who have all identified factors that enhance or hinder the diffusion of WBETs. However, faculty perceptions and consequent acceptance of WBETs was a recurring factor that most researchers identified as one of the most important, if not the most important factor impacting the adoption and diffusion of WBETs.

A study by Lindner, Murphy, and Dooley (2002) provides an in-depth view of factors affecting faculty perceptions of technology-enhanced teaching. This research revealed factors such as faculty members' confidence level, academic ranking and perception of the value of technology in their teaching. Another study by Murphy and Terry (1998) found that even though faculty believed that the use of educational technologies could enhance their teaching, they were not confident in their ability to use educational technologies in their teaching. The study also found that the faculty did not feel that they had sufficient support for using educational technologies in their teaching.

Li (2004) identified and studied 15 factors, 5 attributes and 10 barriers impacting the diffusion of Web-Based Distance Education (WBDE) at the China Agricultural University. The attributes studied based on Rogers' (2003) Characteristics of Innovations framework within his theory of adoption and diffusion were: relative advantage, compatibility, complexity, trialability, and observability.

The barriers studied were: concerns about time, concerns about incentives, program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and inadequate infrastructure. Li (2004) adopted these barriers from Berge's (1999) survey on barriers to distance education.

In Berge's (1999) Barriers to Distance education survey, respondents were asked to select answers to 70 questions in an online survey to indicate their perceptions about barriers to distance education. On the survey respondents were asked to indicate if they were support staff, teaching faculty or trainer, manager or director or department chair or principal of an institution, or if they held a higher administrative post such as a VP, provost, dean or superintendent role within an institution of higher learning. The survey also asked respondents to indicate their perceptions about the most prevalent mediums of delivering training or education at a distance. The choices of mediums listed were: audiotape or Audio-Video, CD-ROM/multimedia (other than Internet - / intranet-based), computer conferencing (Internet / Intranet-based/Web-based), audio-conferencing / audio-graphics, radio, ITV, and print-based mediums of delivery. Of the 70 questions on the survey, 64 were specifically about the perceived barriers.

In another study, Berge (1998) found that while online education offers many advantages, it also poses many situational, epistemological, philosophical, socio-cultural, psychological, pedagogical, and technical problems for potential adopters. Specifically, Berge (1998) identifies several advantages such as increased flexibility,

access and convenience for students as well as cost and time savings for institutions, and time savings for instructors from an easier and faster process for updating and revising course materials. According to the theoretical framework, these findings by Berge (1998) suggest that WBETs are perceived as having relative advantage in comparison to traditional 'chalk-board-and-lecture' teaching methods.

Berge (1998) also found that faculty culture, fear of technology, lack of time to develop and implement online courses, lack of technological assistance, and resistance to change, were among the key barriers affecting the diffusion of computer-mediated communication in distance learning. These factors are consistent with those identified by Rogers (2003) in the context of the characteristics of innovations and adopter categories that impact the adoption and diffusion of innovations.

Rogers (2003) posits that innovations possess inherent characteristics that explain differences in their rates of adoption. In this study, the five main characteristics examined from Rogers theory of adoption and diffusion were relative advantage, compatibility, complexity, trialability, and observability are called attributes. Relative advantage refers to the degree to which an innovation is adopted based on economic or social scales. An innovation is perceived as having higher relative advantage if it offers more economic benefits such as an increase in money or wealth, if it saves times, or if it makes work easier than the innovation it seeks to replace. An innovation is also identified as having relative advantage on social scales if it makes adopters feel that they attain a higher social status by adopting that

innovation in comparison to using previous ideas or technologies the innovation seeks to replace. Compatibility is the degree to which an innovation is consistent with existing values, practices, and experiences of the adopters. An innovation that is compatible is adopted faster and easier than one which is not. This is because a compatible innovation fills a felt or unfelt need that is within the adopters' existing norms. Complexity refers to the degree to which an innovation is relatively difficult to understand or use. An innovation that is relatively simpler to understand and use will be adopted much faster and easier than a more complex innovation. Different aspects of an innovation such as the manner or format, in which it is presented to potential adopters, either worsen or eliminate complexity. Trialability is the degree to which an innovation may be experimented with on a limited scale prior to the decision to adopt or reject an innovation. Observability is the degree to which the results of adopting an innovation are visible to others. The higher the observability of an innovation, the more likely it is that the results of its adoption are obvious to the adopter and others in the social system. Each of these attributes is operationalized and measured with four items on the survey instrument.

Problem Statement

While enrollment at tertiary institutions have grown at a rate of about 12% per year between 1990 and 2000, and the number of students increased from 10,000 to 60,000, Ghana's tertiary enrollment ratio has remained low, at less than 2% (World Bank, 2004). Only one in four qualified candidates is accepted into a tertiary

institution and only about 0.3% of the population is enrolled at an institution of higher learning (World Bank, 2004). As a result of the low enrollment ratio, the Ghana Education Strategic Plan (ESP) has proposed many reforms to the education sector including the expansion of distance education programs to increase access to education, particularly for women and students in the northern regions of the country. The Plan further emphasizes that improving the quality and access to education may help alleviate poverty by increasing incomes which results in an increase in economic growth (World Bank 2004).

These findings suggest that access to adequate education is a problem in Africa and Ghana in particular and that there is a belief that computers, the Internet and other Web-based communications technologies used in concert as educational technologies can be used to reach a wide range of people and effectively deliver educational content. So why are Web Based Educational Technologies (WBETs) not widely used in education in Africa and Ghana in particular?

There are a thousand possible answers to this question. However, this research study was conducted to specifically identify faculty perspectives impacting the adoption and diffusion of WBETs in the context of Ghana. To accomplish this, the research collected data from faculty members at two universities in Ghana and used a research approach grounded in Rogers' (2003) theory of adoption and diffusion.

Purpose of the Study

The purpose of the study was to determine faculty perceptions about factors affecting the adoption and diffusion of Web-Based Educational Technologies (WBETs) across two institutions of higher education in Ghana: the University of Cape Coast and the University of Ghana, Legon.

Research Questions

The research questions that guided the research were as follows:

1. What were faculty perceptions about attributes and barriers influencing the adoption and diffusion of WBETs at the University of Cape Coast and the University of Ghana, Legon?
2. What were the relationships between faculty perceptions of attributes and barriers impacting the adoption and diffusion of WBETs and faculty stage in the innovation decision process, and level of awareness of the problem of limited access to institutions of higher education?
3. Did faculty personal characteristics impact faculty stage in the innovation decision process?

Objectives of the Study

The following seven objectives were developed to answer these three research questions and address the purpose of the study.

1. Describe faculty by selected personal characteristics.
2. Describe faculty by their current stage in the innovation-decision process related to WBET (no knowledge, knowledge, persuasion, decision, implementation, and confirmation).
3. Describe faculty according to their perceptions about attributes of WBET (relative advantage, compatibility, complexity, trialability, and observability).
4. Describe faculty according to their perceptions about barriers to diffusion of WBET (concerns about time, concerns about incentives, WBET program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure).
5. Examine the relationship between faculty members' stage in the innovation-decision process and their perceptions about attributes and barriers impacting the adoption and diffusion of WBETs.
6. Examine the relationship between faculty members' stage in the innovation-decision process and their level of agreement that limited access to education by students is a problem for Ghanaian institutions of higher education.
7. Examine the relationship between faculty members' personal characteristics and their stage in the innovation-decision process.

Objectives one to four were pursued to address research question one. Objectives five and six were performed to address research question two, and

objective seven was performed to address research question three. The results of the study were reported according to these objectives.

Significance of the Study

There is a need for increased access to tertiary education in Ghana. In 2003, only about 0.3% of the Ghanaian population had access to universities and other institutions of higher learning (World Bank, 2003a). According to the Ghana Education Strategic Plan (ESP), the enrollment ratio was about 2% in 2003 (World Bank, 2004). Previous research shows that faculty acceptance and adoption of WBETs is a critical factor in the adoption and diffusion of WBETs in institutions of higher education. Yet little is known about faculty perceptions of WBETs in Africa. This study explores faculty perspectives of two universities located in Ghana, West Africa where data were collected. These two universities are two of the oldest and most established universities in Ghana.

The study may hold many potentially far reaching implications and significance for the adoption and diffusion of WBETs at Ghanaian and African institutions of higher learning and beyond. This is because as Ghana and other countries in the developing would seek to use WBETs and specifically the use of technology enhanced distance education programs to extend access to education to the rural poor, in order to meet the MDGs by 2015, the literature shows that it is imperative that faculty perceptions are considered. Faculties in Ghanaian institutions of higher learning are very strong socio-political units that determine the existence

and relevance of the universities. For example, faculty grievances over wages led the universities to close down during a strike that lasted through the whole 1995 to 1996 academic year. During this period, all parties; faculty, administrators and students had no options than to leave the country to pursue their degrees and careers elsewhere, wait out the strike or abandon their dreams of completing their studies. Today, the faculties still have that leverage and power.

If faculty perceptions of attributes and barriers impacting the adoption and diffusion of WBETs at the subject institutions become widely known, administrators and policy makers at these two institutions could make better decisions regarding the quality and quantity of educational resources available to faculty and students. University administrators, policy-makers and government from other African Universities could draw on these findings as the basis for further research to improve access to educational resources.

If a better understanding of these attributes and barriers leads to institutional policy changes that enhance the adoption and diffusion of WBETs, many more students will gain access to higher education and become more productive members of society. Ultimately, this will impact economic growth and prosperity in Ghana and the sub-Saharan region. Finally, this study could illuminate opportunities for further research about faculty perceptions and factors impacting the diffusion of WBETs in Ghana and Africa.

Definition of Terms

Attributes: Characteristics of innovations that enhance their diffusion. In this study attributes discussed are Relative advantage, Compatibility, Complexity, Trialability, and Observability (Rogers, 2003).

Barriers: Factors that hinder the diffusion of WBETs. In this study, the ten main barriers discussed are: Concerns about time, concerns about incentives, program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and inadequate infrastructure (Li, 2004).

Compatibility: The degree to which an innovation is consistent with existing values, practices, and experiences of the adopters.

Complexity: The degree to which an innovation is relatively difficult to understand or use.

Diffusion: The process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2003, p. 11).

Distance Education: Planned learning that normally occurs in a different place and requires a well-defined system of delivery that includes modified teaching techniques, alternative modes for communication including, but not limited to technology, as well as alternative administrative and organizational components (Moore & Kearsley, 1996).

E-learning: It is instruction that is delivered electronically, in part or wholly — via a Web browser, such as Netscape Navigator, through the Internet or an intranet, or through multimedia platforms such CD-ROM or DVD.

Innovation: An idea, practice or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003).

Innovativeness: The degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of a system (Rogers, 2003).

Innovation-Decision Process: The process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of this decision (Rogers, 2003).

Observability: The degree to which the results of adopting an innovation are visible to others.

*Relative Advantage: T*he degree to which an innovation is adopted based on economic or social scales.

Trialability: The degree to which an innovation may be experimented with on a limited scale prior to adoption.

Web-based Distance Education: An educational method in which Web-based technologies (computer, Internet, electronic mail, multimedia technologies, etc.) are the main tools through which instructors and their students come together to

accomplish a certain teaching and learning process over a certain period of time (Lindner, Murphy, & Dooley, 2002).

Web-Based Educational Technologies: the use of online courses and references, computers, audio/video materials (streaming video), the Internet, multimedia peripherals, electronic mail, content on compact disks (CD-ROMs), etc. as part of an educational method in which these web or Internet-based educational tools are the main tools that enable instructors and their students to come together to accomplish a certain teaching and learning objective, within a certain period of time.

Limitations of the Study

The findings of this study are limited to the sample drawn at the University of Ghana, Legon, and the University of Cape Coast. Consequently, the results of the study may have limited external validity and not represent the perspectives of all faculty members because of the small sample size and the fact that only two universities were included in this study. Also, because of the low Internet penetration in Ghana and especially at the university of Ghana, it is possible that these perceptions may not hold true for a long time as faculty become more acquainted with computers and WBETs and move further along the innovation-decision process and the adoption of WBETs becomes common-place.

CHAPTER II

REVIEW OF LITERATURE

This research is grounded in Rogers' (2003) theory of adoption and diffusion. Rogers (2003) defines diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system (Rogers, 2003, p. 11). Rogers (2003) is emphatic that diffusion is a type of communication by which members of a social system or community share information about new ideas to gain an understanding and reach consensus in order to make decisions about whether to adopt or reject that idea. As information about a new innovation permeates a social system, its members form perceptions about adopting it based on various attributes and their knowledge of the innovation. This study explored faculty perceptions and degree of awareness or knowledge level of WBETs as an innovation that will impact students' access to higher education. This chapter discusses the theoretical underpinnings of the study and previous research on faculty perspectives about WBETs.

Theoretical Framework

Rogers' (2003) theory of adoption and diffusion proposes four main ideas that collectively seek to explain the diffusion process and the rate at which diffusion occurs across members of a social system. One aspect of the theory describes

diffusion as a communication process that is affected by the characteristics of an innovation.

Characteristics of Innovations

The five primary characteristics are: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage refers to the degree to which an innovation is adopted based on economic or social scales (Rogers, 2003). An innovation is perceived as having a higher relative advantage if it offers more economic benefits such as an increase in money or wealth, if it saves times, or if it makes work easier than the innovation it seeks to replace. In relation to this study, of if faculty perceive the use of WBETs as offering them an opportunity to receive higher monetary rewards in the form of increased wages, bonuses or other form of financial compensation, then WBETs would have high relative advantage compared to teaching without WBETs. Similarly, if WBETs were a means of saving time spent on preparing teaching materials or made performing other functions related to the teaching and learning process easier, then WBETs would again be perceived as having high economic relative advantage. An innovation is also identified as having relative advantage on social scales if it makes adopters feel that adopting the innovation confers a higher social status than using the innovation it seeks to replace. In other words, WBETs would be perceived as having higher social relative advantage if faculty believed that they would gain a higher social status among

members of the social system, (department, university or society at large) if they used WBETs in the teaching versus using existing teaching mediums.

Compatibility is the degree to which an innovation is consistent with existing values, practices, and experiences of the adopters (Rogers, 2003). An innovation that is compatible is adopted faster and easier than one which is not. This is because a compatible innovation fills a felt or unfelt need that is within the adopters' existing norms. In this study, compatibility was measured as the degree to which faculty felt that using WBETs was not foreign to them, but an acceptable activity that would fit with their normal teaching conditions.

Complexity refers to the degree to which an innovation is relatively difficult to understand or use. An innovation that is relatively simpler to understand and use will be adopted much faster and easier than a more complex innovation (Rogers, 2003). Different aspects of an innovation such as the manner or format, in which it is presented to potential adopters, either worsen or eliminate complexity. If the function and use of WBETs are perceived as similar to using a personal computer and personal computers are widely available and considered to be easy to use, then WBETs would be considered easy to use. As a result, they would have low complexity and faster adoption.

Trialability is the degree to which an innovation may be experimented with on a limited scale prior to adoption. An innovation that lends itself to trials is adopter much faster and easier than one which is not (Rogers, 2003). Trailability comes in the form of the ability to provide samples of the innovation for use, or the ability to

provide the innovation to potential adopted for trial over specific periods of time. In this study, WBETs would be considered to have high trialability if the faculty felt that they had access to WBETs so they could experiment with them at different teaching and learning activities.

Observability is the degree to which the results of adopting an innovation are visible to others. The higher the observability of an innovation, the more likely it is that the results of its adoption are obvious to the adopter and others in the social system (Rogers, 2003). In this study, faculty would perceive WBETs as having high observability if they know of others that use them in their teaching or learning activities. Observability may also be high if they know of the benefits or limitations of WBETs if they know of others or if they themselves have adopted these innovations.

Rogers' (2003) posits that these five characteristics of innovations are the most important characteristics that explain differences in the rates of adoption of innovations. Among these five characteristics, relative advantage and compatibility are perceived as having particularly significant impacts on the rate of adoption. The more readily members of a social system identify and appreciate the characteristics of an innovation, particularly with high relative advantage, high compatibility and low complexity, the quicker members of the social system will adopt it and the quicker an innovation will diffuse throughout a social system. In other words, as these characteristics impact the perspectives of members of the social system, the rate of adoption, and the rate of diffusion increase. As members of a social system

evolve through the adoption process they go through different stages of decision making about whether to adopt or reject the innovation. This aspect of Rogers' theory is called the Innovation-Decision Process.

Innovation-Decision Process

Rogers (2003) suggests that members of a social system follow a specific communication cycle as they confer with other members of their community, analyze available information and try to reach consensus and make the decision of whether to adopt or reject a new idea or innovation. Rogers (2003) describes this process, called the innovation-decision process, as having five distinct stages: Knowledge, persuasion, decision, implementation and confirmation. At the 'knowledge stage,' a member or members of the social system acquires or learns of the existence of the innovation and gains and understanding of its function. At the 'persuasion stage,' a member or members of the social system form a favorable or unfavorable opinions and attitudes about the innovation. At the 'decision stage,' a member or members of the social system engage in activities that lead to a determination to adopt or reject the innovation. This is followed by the 'implementation stage,' where a member or members of a social system put an innovation to use. Finally, a member or members of a social system undergo the 'confirmation stage,' where favorable or unfavorable opinions formed at the decision stage are reinforced or changed if other information becomes available for analysis.

Li (2004) proposed an additional stage to Rogers' (2003) innovation decision process. This study used an instrument created by Li (2004), which adds a new stage called 'no knowledge' to Rogers' (2003) five stages of the innovation decision process. According to Rogers (2003) members of a social system engage in the decision process to obtain and process information about the innovation in order to reduce their uncertainty about. Both Rogers (2003) and Li (2004) agree that those that have 'knowledge' or 'no knowledge' are on a lower stage in the innovation decision process. In this study, participants who have not used the innovation (WBETs) and have no intention to use them are lower in the innovation decision stage than others who a have higher level of awareness and experience in using the innovation. The stages of the innovation decision process (no knowledge, knowledge, persuasion, decision, implementation, and confirmation) are depicted in Figure 3 on page 44.

Adopter Categories

Finally, Rogers' theory of adoption and diffusion describes the innovativeness of members of the social system by five main adopter categorizes. Innovativeness is defined as "the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other member of a system" (Rogers, 2003, p. 22). This aspect of Rogers' theory suggests that differences in the personal characteristics and the innovativeness of members of the social system affect the rates of adoption of different innovations. Members of the social system

are characterized as: innovators, early adopters, early majority, late majority, and laggards. Members of the social system who actively seek new information and ideas, have high mass media exposure, and extended interpersonal communications networks that transcend their social system, are known as 'innovators.' Innovators are the first to adopt new ideas and innovations in their social system, and are comfortable doing so without prior subjective evaluations, information or assurances from others.

Rogers (2003) proposes that the members of the five adopter categories are normally distributed when plotted on a graph over time. This forms an 'S' shaped curve of the rate of adoption by the members of the social system over time. From left to right along the curve, are 'innovators' who form the first 2.5% of all members of the social system to adopt the innovation. They are followed by 'early adopters' who form the next 12.5% of adopters and then by the 'early majority' that forms the next 34%. The 'late majority' who form the next 34% are relatively late in adopting, and 'laggards' who form the last 13% of people in the social system who either adopt the innovation a very long period after the majority of people in the social system have adopted, or never adopt the innovation. Essentially, the 'S' shaped curve represents the learning curve for members of the social system. As illustrated in Figure 3, it is expected that at any point in time, the 2.5% of the population who are 'innovators' would have experienced all the stages of the innovation-decision process and acquired enough information to adopt an innovation. In contrast to the innovators, at that same time, 'laggards' would only be at the very early stages of the

decision process and would have some knowledge or 'no knowledge' of the innovation.

To summarize, this study was grounded in Rogers' (2003) theory of adoption and diffusion. The innovation under consideration in this study is the use of WBETs in education in two universities in Ghana. Access to tertiary education is limited in Ghana. The premise was that WBETs would solve the problem of limited access to education at the institutions of higher learning. Available literature has revealed that faculty acceptance and perceptions of an innovation are critical for its diffusion. Do faculty members perceive the WBETs as having a high relative advantage in comparison to their previous teaching methods? Do faculty members perceive WBETs as compatible with their current beliefs and norms? Are WBETs perceived as having the other attributes such as low complexity, high trialability and high observability that enhance the adoption and diffusion of innovations? What are faculty perceptions of barriers to the adoption and diffusion of innovations? Below are various schools of thought and previous research found on faculty perceptions about factors impacting the diffusion of WBETs at institutions of higher learning.

Previous Research

Traditional paper, television, and radio based correspondence courses are viewed as the foundation for Distance Education (DE) courses as we know them today (Li, 2004). Schifter (2000) posits that though Distance Education (DE) has been around for over a century, the introduction of interactive Computer-Mediated Communication

(CMC) systems have caused DE to evolve in a way that enables faculty and educators to create Asynchronous Learning Networks (ALN) and learning communities that offer students and faculty more opportunities for accomplishing specific teaching and learning objectives. Agunga (1997) identifies the use of computers, printed matter, multimedia or interactive television and audio-visual devices and techniques, supported by cable, microwave, satellite and fiber optic network infrastructure as examples of technologies used in technology-enhanced Distance Education. These technologies are collectively identified by many terms. For the purpose of this study, they will be referred to as Web-Based Educational Technologies, (WBETs).

Research has revealed many factors affecting the adoption and diffusion of Web Based Educational Technologies (WBETs) in institutions of higher education. Faculty perceptions and acceptance was the one recurring factor that almost all the researchers identify as one of the most important if not the most important factor impacting the diffusion of WBETs. Thompson (2004) found that the success of online higher education is highly dependent on strong faculty commitment to teaching with WBETs. Thompson identifies a number of positive factors or attributes offered by WBETs that help faculty find teaching and learning rewarding. These factors include increased access to or by students, flexibility and convenience of teaching and learning, increased knowledge of and experience with WBETs, opportunities for professional recognition, and increased opportunities for research (Thompson, 2004). NcNeil (1990) found that faculty perceptions and reactions to these new computer enhanced teaching technologies or WBETs are significantly more important to their adoption in higher education than

structural or technical challenges. Miller and Shih (1999) further emphasize this by concluding that since faculty are the key stakeholders in higher education who are ultimately responsible for delivering instruction to students, their concerns and perceptions must be addressed if effective and high quality improvements to the educational process are to be attained.

Dooley, Lindner, and Richards (2003) and Lindner and Murphy (2001) found in research studies that there was essentially no difference between the synchronous and asynchronous instructional methods. Participants engaged in the study conducted by Dooley, Lindner, and Richards (2003) achieved similar learning objectives of core distance education competencies regardless of delivery method, gender, major field of study, or previous academic degrees obtained. Lindner and Murphy (2001) conducted a similar study to investigate differences between students' learning over WebCT, a medium dependent on the use of WBETs over a traditional medium. This study found no significant differences in learning achievement. Russell (1999) also found that there was no significant difference between courses taught in the traditional face-to-face format in comparison to the effectiveness of courses taught through distance education mediums. These findings suggest that students have a fair chance of learning effectively irrespective of the medium of WBETs used. In spite of this, a study by Dooley and Lindner (2002) found that faculty competence in key areas of using WBETs can significantly affect the effective delivery of course materials and achieving teaching and learning objectives. Faculty competence is critical in course planning and organization, verbal and non-verbal presentation skills, teamwork, questioning strategies, coordination

skills, engendering student involvement, questioning skills, subject matter expertise, and the design of study guides graphically or visually or in modular units (Dooley & Lindner, 2002). Faculty must also be knowledgeable of basic learning theory and distance education. With some effort, teaching faculty can develop some of the key competency-based behavioral anchors such as adult learning theory, knowledge of WBETs, instructional design, communication skills, graphic design, and the ability to handle administrative issues, are critical for success in using WBETs effectively (Dooley & Lindner, 2002). Researchers (Lindner, Murphy & Dooley, 2002, Murphy & Terry, 1998) have found that faculty members often have perceptions about their level of competence that affects their adoption and effective use of WBETs.

A study Lindner, Murphy and Dooley (2002) provides an in-depth view of factors affecting faculty perceptions of technology enhanced teaching. This research revealed factors such as faculty members' confidence level, academic ranking and perception of the value of technology in their teaching. Another study by Lindner, Murphy, and Dooley (2002) found that even though faculty believed that the use of educational technologies could enhance their teaching, they were not confident in their ability to use educational technologies in their teaching. The study also found that the faculty did not feel that they had sufficient institutional support for using educational technologies in their teaching. Murphrey and Dooley (2000, 2003),

Berge (1998), Betts (1998), Schifter (2000, 2004), Carr and Miller (2001), Jones, Lindner, Murphy, and Dooley (2002), Murphy and Terry (1998), Dooley and Lindner

(2002), Thompson (2004), and other researchers have all identified several factors that enhance or hinder the diffusion of WBETs.

Hanna (1999) found that, globally, improvements in WBETs in general are lowering barriers to accessing higher education. Some of the specific advantages that are enhancing their adoption are their flexibility, convenience, institutional cost and time savings, access to a broader range of materials, and quality of teaching and learning experience. Other researchers have described the perceived benefits and advantages impacting the adoption of WBETs in terms of adopters' intrinsic or extrinsic value system (Hopey & Ginsburg, 1996; Kilian, 1997; Oswston, 1997). Betts (1998) identified several intrinsic factors such as intellectual stimulation, personal motivation, desire to reach new audiences, faculty workload, and release time influenced faculty perceptions about adoption more strongly than extrinsic factors. The extrinsic factors considered included: compensation, recognition, promotion and tenure, and merit pay. This finding is also supported by Lindner, Murphy, and Dooley (2001).

In principle, since most university level faculty and students are essentially adult learners, these finding are consistent with some of principles of adult learning theory proposed by Knowles, Holton, and Swanson (1998) regarding factors that motivate adult learners. Knowles, Holton, and Swanson (1998) suggest that adult learners are motivated by intrinsic rather than extrinsic factors. Many researchers (Hopey & Ginsburg, 1996; Murphrey & Dooley; 2000; Schifter, 2000) have proposed applying Rogers' (2003) diffusion of innovations theory to the adoption and diffusion of WBETs.

Rogers' (2003) theory of adoption and diffusion emerged from a series of diffusion studies conducted during the 1920s, 30s, and 40s in the rural sociology research tradition. According to Rogers (2003), the methodology, theoretical framework of diffusion studies and the theory of adoption and diffusion were shaped by a research study conducted by rural sociologists Ryan and Gross in 1943 on the diffusion the diffusion of hybrid corn.

Rogers' (2003) theory on adopter categories, suggests that it is possible to infer that the personal and social characteristics of potential adopters (faculty in this case) would affect their innovation-decision process and adoption. However, Schifter (2000) found that personal characteristics faculty such as gender, age, academic rank, and tenure status had no statistically significant impact on their level of interest and participation in distance education programs. Similarly as cited by Li (2004), Born and Miller (1999) found that there was no correlation between faculty members' academic rank and their perceptions of WBETs. However, faculty level of experience with distance education courses or programs had a significant impact on faculty perceptions of WBETs.

Besides McNeil (1990), Berge (1999) compiled a list of the most cited barriers to the adoption of DE technologies. These were the barriers from which he selected the most prominent barriers on which his study about barriers to distance education was based. Li (2004) adopted the list of barriers for constructing part III of the survey instrument from this list. These barriers were those examine in this study. They were: concerns about time, concerns about incentives, program credibility, financial concerns,

planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure. However, developing countries such as Ghana with very limited infrastructure face other infrastructure related barriers that are not explicitly measured or examined in this study. These other factors though exogenous to this study are systemic factors that affect most developing countries and are therefore highly relevant to exploring and finding solutions to the problem of limited access to higher education in the developing world. Potter (2003) found that in China, factors such as: cost of education, inadequate bandwidth, inadequate access to computers and software, lack of locally produced software, inefficient management of existing WBETs facilities, and lack of training for personnel involved with WBETs were the major barriers to the adoption of distance education. These are all factors that can be said to be relevant to Ghana as well.

Quaynor, Tevie, and Bulley (1997), and Foster, Goodman, Osiakwan, and Bernstein (2004) concur that perhaps one of the most serious barriers to the adoption and diffusion of WBETs is the lack of communications infrastructure and the low penetration of personal computers in Ghana. While Radio broadcasts reach about 75 percent of the population in sub-Saharan Africa, and television reaches about 40 percent of the population, only about 0.1 percent have access to the Internet (Kenny, 2000). Other barriers identified, particularly for the rural poor include, high cost of telephone connection fees to the Internet service provider. High connection costs associated with the actual connection to the World Wide Web. In 2000, individuals surfing the web spent about 33 cents a minute or about $7.50 per hour on connectivity. The poor

telecommunications network slows connection speeds and results in frequent dropping of connections. On average, it takes about five attempts to connect successfully (Kenny, 2000). Another systemic infrastructure problem is limited availability of electricity. In 1998, electrical power was rationed in Ghana due to levels of rainfall, which dried up the Akosombo dam, the Ghana's main source of hydro-electric power. The shortage of locals trained in computer technicians coupled with the terribly underdeveloped road networks particularly in the rural areas pose another level of cost difficulty to physically in obtaining access to community Internet Cafes or facilities to repair malfunctioning equipment. On average it takes about seven hours on a bus to reach the capital Accra, the nearest source of repair and maintenance services from the northern part of Ghana. Costs of repairs can run as much as $6,000 per year (Kenny, 2000).

Ploghoft (2003) also describes other factors and concerns of faculty members that may be unique to developing countries because of the nature of the technology transfer process where WBETs are concerned.

According to Ploghoft (2003), at a conference in Mauritius about the introduction of the AVU across several university campuses, most faculty members expressed that they felt that the design phase of the AVU, an example of an educational system based on WBETs did not reflect or incorporate consultations and the analysis of the needs of developing nations. Ploghoft (2003) asserts that the concept was developed "in house" by the European, American, and other developed country partners with little or no external input from the actual users of the resource. According to Ploghoft (2003), some faculty from the developing nations at the conference expressed concerns that the

North American models would dominate [to the detriment of “home grown” or “home inspired”] content resulting in loss of control over curricula , a loss that they perceive will be difficult to overcome. Ploghoft (2003) further asserts that others were concerned about an absence of a partnership approach during the design phase, possible loss of faculty jobs, the weakening of the traditional university systems, a decrease in educational quality, and a lowering of standards. These perceptions indicate uncertainty and possible barriers in the adoption of the innovation.

Context of the Research

Ghana, a former British colony located on the west coast of Africa between Cote D’Ivoire, Togo, Burkina Faso, and the Atlantic Ocean has a population of about twenty million, with an estimated population growth rate of 1.36% a year. About 38% of the population is between age 0 and 14, 58% between ages 15 and 64, and 3.7% over 65 years. About 31% of the total population is considered to be below the world poverty line. Only 74% of the population is literate. This consists of people over age fifteen that can read and write. Ghana’s GDP was estimated at $7.6 billion in 2003, growing at a real GDP growth rate of 4.7% and an economy built around agriculture, industry and service. About 60% of its GDP is from Agriculture, 25.4% from industry, and 39.2% from services. In 2003, the labor force was estimated at ten million with unemployment estimated at about 20% (Central Intelligence Agency, 2004).

Ghana is divided into ten administrative regions. Accra, the capital city of Ghana, is located in the Greater Accra region, which is in the southern part Ghana and on the

Atlantic coast. The map of Ghana below (Figure 1) shows all the nine of the ten regional capitals including Accra. Tema, which is also shown on the map is not a regional capital but is included because of its economic importance to the economy of Ghana. It holds Ghana's largest harbor and many manufacturing industries. The tenth regional capital, located in the northern most part of Ghana is missing from the map, as it is a fairly new regional capital.

*Figure 1.*Map of Ghana (Source: Central Intelligence Agency, 2004)

Since the late 1990s the adoption and diffusion of WBET has been very rapid in the United States. Pardue (2001), found that in 1998, about 80% of all public four-year institutions of higher learning offered some courses at a distance via a technology or

Internet enhanced medium. This would suggest that these technologies are viewed as having a significant impact on the effective delivery of information, training and other educational content to people engaged in teaching and learning processes (Pardue, 2001). While there is debate about the cost versus benefit of using WBETs in the educational process, it is widely believed that WBETs provide a relatively inexpensive means of delivering information and educational content to a broader range of people and students (Berge, 1998; Pardue, 2001).

It is estimated that over two billion people in the developing world live in poverty, many of whom have no access to education and are illiterate (World Bank, 2003a). During the 1990s, slow economic growth increased both the poverty rate and absolute number of the poor people in Sub-Saharan Africa. As a result, the region has the largest proportion of people supporting themselves on less than $1 a day (per capita GNP). The number of poor people in sub-Saharan Africa increased from 271 million in 1996 to 313 million in 2001. This number is expected to soar to 340 million people by 2015 (World Bank, 2005a). According to the World Bank, less than 5% of the student population in the region has access to tertiary education, far below the world average of 16%. In 1996, the average cost of educating one student at the university level in Africa per annum was about 400% of per capita income compared to 26% of per capita income per year in the United States (World Bank, 2003a). [*In Ghana only about 0.3% of the population had access to universities and other institutions of higher learning in 2003]*.

To address the issues of poverty and development, the international community and leading development agencies such as the World Bank have developed the

Millennium Development Goals (MDGs), a framework for measuring development progress and attaining significant development goals across the developing world by 2015. One of the goals is in the area of education. By 2015, the MDGs strive to ensure that all children complete their primary education (World Bank, 2005b). As more children get educated properly at the primary and secondary levels, it is expected that a larger percentage of the population will have access to higher education and to obtain adequate training needed to enter the workforce and improve economic growth and development. The second MDG emphasizes that:

> Education is development. It creates choices and opportunities for people, reduces the twin burdens of poverty and diseases, and gives a stronger voice in society. For nations it creates a dynamic workforce and well-informed citizens able to compete and cooperate globally – opening doors to economic and social prosperity. The 1990 Conference on Education for All pledged to achieve universal primary education by 2000. But in 2000, 104 million school-age children were still not in school, 57 percent of them girls and 94 percent were in developing countries – mostly in South Asia and Sub-Saharan Africa. The Millennium Development Goals set a more realistic, but still difficult, deadline of 2015 when all children everywhere should be able to complete a full course of primary schooling (The Millennium Development Goals, 2005).

The World Bank has been a leader in promoting the use of technology to improve access and the quality of education in Africa. A World Bank report identified Information Communications Technologies (ICTs) as potential agents of socio-

economic change, for affordably increasing access to knowledge through education for the millions of rural poor in Africa (World Bank, 2003a). In 1996, the World Bank helped six African universities launch the Africa Virtual University (AVU) project, an interactive distance education network. The network was designed to provide instructional and educational content through satellite broadcasting and the Internet, and to prepare students for accredited degrees and diplomas in science and engineering. In 2004, the AVU had 34 learning centers across 17 Africa countries including Ghana (World Bank, 2003c). In Ghana, the AVU centers are located at the Kwame Nkrumah University of Science and Technology, The University of Cape Coast and the University of Ghana, Legon. Over 3,000 hours of instructional programs from leading North American, European, Australian, and African universities have been delivered to more than 23,000 students and 2,500 professionals since the inception of the project in 1996 (World Bank 2003c, 2004).

The World Bank has also been working with the governments of developing countries to improve access to education for all school-aged children in accordance with the MDGs. Specifically, developing countries such as Ghana have launched education sector reforms as a critical part of their strategies to reduce poverty and achieve the MDGs (International Monetary Fund, 2004). Ghana's plans for educational reform are contained in its Education Strategic Plan (ESP). Ghana's ESP identified many problems with access and quality of education at both the pre-tertiary and tertiary levels. Average access and retention figures indicate significant disparities based on gender, location, income, and poverty. In particular, the remote and poorest regions of the country located

in the north had much lower gross enrollment rates at all levels of education than other regions. The ESP also revealed that the quality and relevance of tertiary education are viewed as inadequate by employers (World Bank, 2004). Employers complain that curricula and some subjects taught do not meet their needs and as such are irrelevant in the employment process. The National Council for Tertiary Education (NCTE) attributes this to many factors including: stagnant curricula, inexperienced teaching staff, and inadequate in-service training opportunities for students. Besides these factors, the tertiary institutions face a severe shortage for qualified teaching personnel due to excessive migration. In 2000, about 40% of university teaching positions were vacant. It is expected that this serious shortage may even worsen as the percentage of faculty and aspiring faculty (from student population) with HIV/AIDS intensifies across university campuses (World Bank, 2004). Perhaps information technology and WBETs specifically can be used to alleviate these problems in Ghana.

However, with regards to information communications technology and infrastructure, Ghana is still very underdeveloped. In 2003, there were an estimated 302,300 telephone lines and about 799,900 mobile cellular telephones in use. In 2001, there were an estimated 49 FM stations and 12.5 million radios, 10 television broadcast stations and 1.9 million television sets in Ghana (Central Intelligence Agency, 2004). The adoption and diffusion of the Internet has been rising since its introduction to Ghana in 1989. In 1989, Ghana became one of the first countries in sub-Saharan Africa to obtain access to the Internet. It obtained access through a Fiodonet connection between Greennet in London and the Ghana National Scientific and Technological Information

Network (GHASTINET), the Association of African Universities (AAU), and the Technology Transfer Center (TTC). For years, this network was managed by the National Science and Technology Library and Information Center (NASTLIC) until responsibility was turned over to the Balme Library at the University of Ghana, Legon. This network was enhanced by the AAU to a 'store and forward' email network that provided Internet connectivity to over 50,000 users, and 23 organizations including the three major Universities in Ghana: The Kwame Nkrumah University of Science and Technology, The University of Cape Coast, and the University of Ghana, Legon (Foster, Goodman, Osiakwan, & Bernstein, 2004). Network Computer Systems (NCS), established by Dr. Nii Quaynor, was the first company to offer Internet connectivity as a service to the Ghanaian public in 1992. NCS, one of the three most established Internet Service Providers in Ghana started operations in 1992 as a user and reseller of MCI mail services. In 1995, NCS obtained the domain name '.gh' from the Internet Assigned Number Authority (IANA) and also purchased a leased line from the Ghana Telecom Corporation to offer dial-up email and around the clock access to the World Wide Web. In 1996, NCS obtained direct access to the Internet backbone in the United States through its own satellite dish (Foster, Goodman, Osiakwan, & Bernstein, 2004).

A second ISP, Internet Ghana was established in June 1996 to target corporate clients. Internet Ghana established by Leslie Tamakloe also obtained connectivity by purchasing a leased line from Ghana Telecom and using MCI's Internet backbone in the United States. It also offered dial-up email and access to the Internet. Internet Ghana grew from serving 20 clients in 1996 to 84 in 2003. As its client base increased, Internet

Ghana upgraded its connection speed to the 256Kbps and by 2000, 2Mbps through its own satellite dish to the global Internet backbone. It became the first ISP to offer DSL services in Ghana and enabled customers to access both data and voice simultaneously over the same telephone line. In 2003, Internet Ghana had about 150 subscribers to its DSL service. In 2002, Internet Ghana upgraded its service again by purchasing an additional access through the SAT-3 submarine cable that runs from Portugal around South Africa to the Middle East. This added an additional 2 Mbps of access to its bandwidth.

The third major ISP in Ghana is Africa Online, established in November 1996 by Mawuli Tse of Ghana and two Kenyan partners. Africa Online which started out offering service at 64Kbps through a Ghana Telecom leased line through its hub in Boston, Massachusetts, upgraded its service to a 512Kbps via an earth station in Ghana to connect to the global backbone. Africa Online was the first to connect many of the regional capitals across the country with its 2Mbps VSAT infrastructure (Foster, Goodman, Osiakwan, & Bernstein, 2004).

Since 1999, the National Communications Authority (NCA) has registered about 52 ISPs all of whom have been granted permission to run their own satellite gateways to the global Internet backbone. The 16 ISPs currently in operation supply connectivity to more than 1000 Internet cafes around the country, most of which are located around the greater Accra region (Foster, Goodman, Osiakwan, & Bernstein, 2004). There is a disparity between the infrastructure ISP build in and around the southern half of the country and the rest of the country. While ISPs depend on an almost complete fiber optic

ring in the greater Accra region and other southern regional capitals, they extend their networks from the greater Accra region to the other regional capitals (northern) through a combination of VSAT, microwave and fiber optic connections (Foster, Goodman, Osiakwan, & Bernstein, 2004).

Statistics of Internet users in Ghana are varied since there is no central agency charged with tracking Internet adoption or usage in the country. Public access to the Internet through Internet Cafes, and not by household subscriptions, makes it difficult to estimate the actual number of users who may visit an Internet Café. It is especially difficult to estimate those who visit them sporadically, or at least once a month, or those who may be sharing an account with others. The most credible estimates were provided by Foster, Goodman, Osiakwan, and Bernstein (2004) who reported that in 2003, about 300,000 people, or 1 in 100 Ghanaians, were estimated to have access to the Internet at least once a month. They obtained their estimates through interviews with a panel of experts from the Ghana ISP Association, the International Computer Science Institute, MOSAIC group, Ecoband, and the Ghana National ICT policy committee. About 40,000 users were estimated to be from the universities even though the study results were not clear what percentage of those are faculty, students, staff or others. Figure 2 on page 41 provides a breakdown of estimated Internet users in Ghana in 2003 (Figure 2).

Type of Access	Number	Users per Account	Total Number of Users (1,000's)
Dial-up accounts	18,000	5 users per account	90
Leased lines	1000	20 per LAN	20
Busy Internet	1	Largest Cafe	20
Large & medium Cafes	50	1000 users per Café	50
Small Internet Cafes	750	100 users per Café	75
Universities	N/A	N/A	40
Total			~ 300

Figure 2. Number of Internet Users in Ghana in 2003 (Source: Adapted from Foster, Goodman, Osiakwan, & Bernstein, 2004).

During the 2000 to 2001 academic year, out of Ghana's population of 20 million, there were an estimated 4.5 million people enrolled at Ghanaian educational institutions. There were 702 thousand in pre-school; 2.6 million in Primary school; 865 thousand in Junior Secondary School; 220 thousand in Secondary School; 55 thousand in Technical and Teacher training institutions; and 59 thousand in universities and polytechnics across the country (International Monetary Fund, 2004). Until the late 1990s, Ghana had only five universities. The three oldest universities in Ghana are the University of Ghana, Legon, the Kwame Nkrumah University of Science and Technology and the University of Cape Coast. There are currently 15 universities across the ten regions of Ghana, five public and ten private. All the private universities are affiliated with religious institutions except one. Also, almost all the universities are located relatively close to the capital city, Accra, which is along the southern coast of Ghana. This means that the universities are not readily accessible to students who live in regions that are further away from the Greater Accra, Ashanti and Central regions where most of the universities are located.

Unlike the U.S., the diffusion of the Internet as an innovation was not lead by academia but by private sector companies and non-governmental agencies (Foster, Goodman, Osiakwan, & Bernstein, 2004; Quaynor, Tevie, & Bulley, 1997). Internet diffusion in Ghana, while spreading rapidly is low compared to the developed world. Diffusion is affected by inadequate infrastructure, low personal computer penetration (ownership and access), high telecommunication fees and access rates (Quaynor, Tevie, & Bulley, 1997). Not all the universities have wide spread connectivity at this time. Faculty members at the University of Ghana, Legon gained access to the Internet through the university in 2004. University students were expected to obtain free but limited access through the university starting from January 2005. By the end of 2004, the University had set-up two main central computer labs on campus, each with about 400 personal computers. Until that time, students gained access to the Internet through several Internet Cafés found on university grounds and around town.

Dr. Mumuni Dakubu, full professor at the department of Chemistry at the University of Ghana, Legon and head of Internet deployment at the university emphasized that the most serious problems facing adoption and diffusion at the University of Ghana was the limited bandwidth, cost of connectivity, and helping the faculty understand that they would have to adapt their teaching materials and delivery techniques to optimize the use of WBETs in their teaching. At the University of Cape Coast, many departments were wired for Internet connectivity in 2004 yet the actual usage was low because in some cases, no computers were available, or there were no trained personnel to set-up the necessary hardware components to establish connectivity.

In some cases, the university has provided computer hardware and other support to help departments get wired to the university backbone. The University of Cape Coast also has a central computer center with about 300 personal computers and a few more at its library. It also has an Africa Virtual University (AVU) learning center equipped with computers and Internet connectivity. By most measures, the diffusion of the Internet is in the very early stages across universities in Ghana. As a result, it is unclear to what extent the faculty have adopted WBETs or what perceptions they hold about the use of WBETs in achieving their teaching and learning objectives.

Conceptual Framework

The conceptual framework of the study is grounded in Rogers' (2003) theory of adoption and diffusion. The study proposes that as members of a social system acquire knowledge about an innovation and progress through the different stages of the innovation-decision process, the closer they will be to adopting and diffusing that innovation. Their stage in the innovation-decision process is affected by their perception of attributes and barriers that impact their decision making. At any specific point in time within the social system, it is expected that based on Rogers' theory of adoption and diffusion, about 2.5% of all members will be at the point of actually adopting an the innovation. This group of people (innovators) would have gone through all the prior stages of the innovation-decision process and would be at the final stage (confirmation). On the other hand, about 16% of the population (laggards) would still be at the 'knowledge' or 'no knowledge stage' and may adopt the innovation a long time after all

the other members of the social system have adopted the innovation. This framework is depicted below in Figure 3 on page 44.

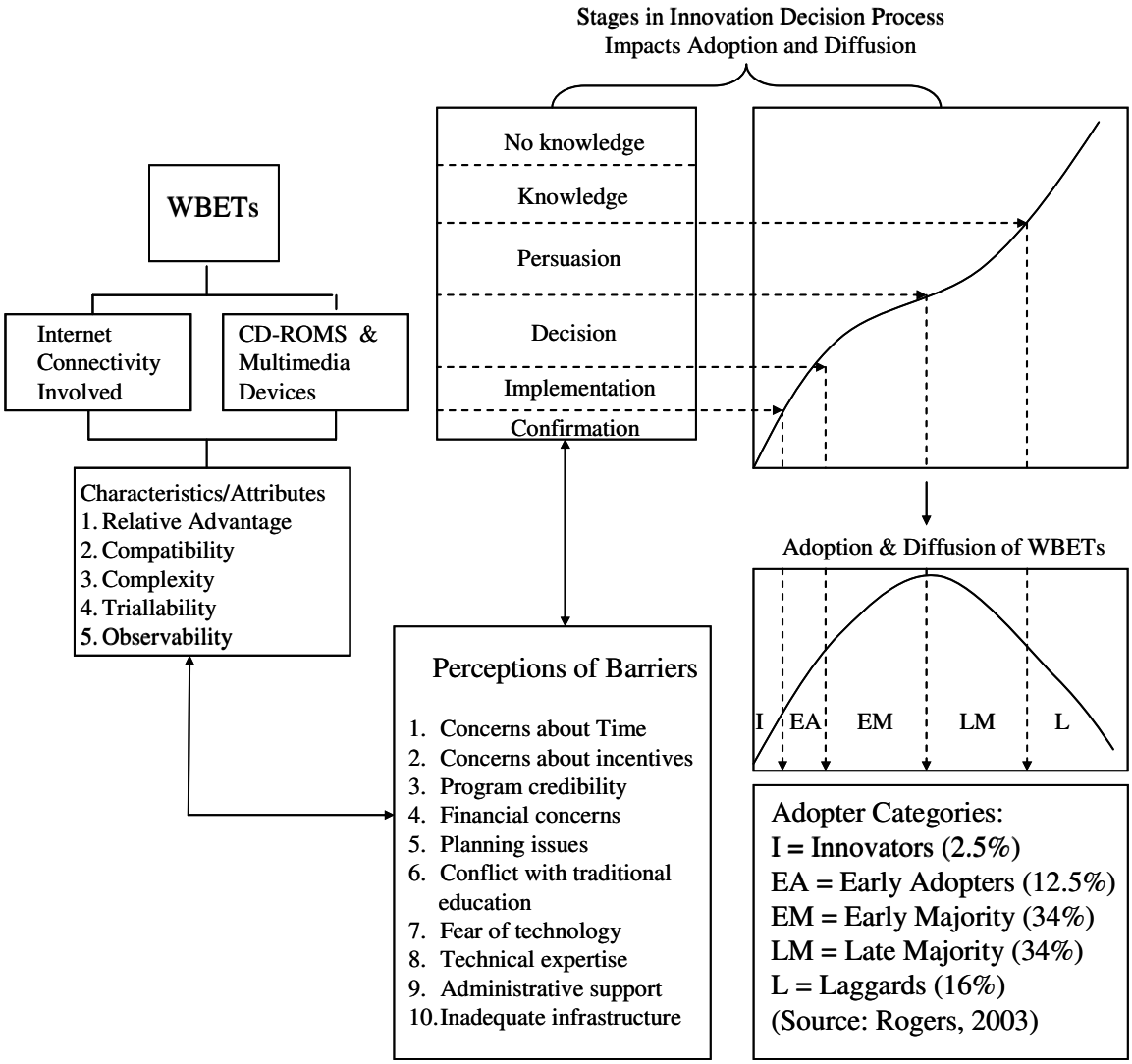

Figure 3. Conceptual Framework.

Based on this framework, it was expected that attributes and barriers would have a correlational relationship with stage in the innovation-decision process. A simple linear

regression was performed to determine the significance of this relationship and to investigate if causal relationship could be established. It was also expected that perceptions of attributes and barriers would be inversely related. Consequently, a favorable perception of attributes was expected to be closely correlated with stage in the innovation decision process, while a less favorable perception of attributes but a higher perception of barriers was expected to be highly correlated with a lower stage in the innovation-decision process.

CHAPTER III

METHODOLOGY

This chapter provides details about the type of research and research process; population sampling techniques used to select participants; the survey instrument used to collect data; the reliability and validity of the instrument; a description of the data analysis process and statistical procedures used in analyzing data collected; and the treatment of non-response.

Research Type

This descriptive and correlational study was designed to determine faculty perceptions about attributes and barriers impacting the adoption and diffusion of WBETs at the University of Cape Coast, and the University of Ghana at Legon. The research was grounded in Rogers' (2003) theory of adoption and diffusion. Specifically, Rogers' innovation-decision process, characteristics of innovation theory; and characteristics of adopter categories models, which are explained in the literature review section of the thesis. Random sampling was used to select faculty targeted from the two universities. The total population of faculty members at both universities was 659. Based on Gall, Gall and Borg (2003) suggested sampling techniques; a target population of 200 faculty members was chosen for the study. The study used an instrument developed by Li (2004) which incorporated components of Moore and Benbasat's (1991) measurements of the attributes of innovation and Berge's (1999) items study about barriers to distance education. Data

collected from the study was analyzed using descriptive, correlational and regression analysis techniques.

Population and Setting

University of Ghana, Legon

The University of Ghana located at Legon, Ghana was established in 1948 as the University College of Gold Coast and renamed the University of Ghana in 1961. The University is focused on research, teaching and delivering extension services and has two semi-autonomous schools for business administration and medicine as well as 53 departments across five faculties: Agriculture, Arts, Law, Science and Social Studies. In addition to this, the University of Ghana has five research institutes: Adult Education, African Studies, Statistical and Social Sciences, Medicine and Population Studies as well as three agricultural research stations located at Nungua, Kpong, and Kade. There are a total of about 430 teaching faculty members serving a student population that is estimated to have grown from about 7,400 in 1997 to 20,000 in 2004. For the purpose of this study, a total of about 100 faculty members out of 152 in the School of Agriculture and College of Sciences were targeted (University of Ghana, 2004).

The University of Cape Coast

The University of Cape Coast established in 1962 to train graduate professional teachers for Ghana's secondary schools, teacher training colleges, technical institutions as well as the Ghana ministry of education. Even though the focus of the university has

evolved over time, it still maintains a very deep link with its roots as an institution for training older, professionals and currently has one of the most developed distance education programs in the country that offers degrees and certificate programs to mid-career professionals.

In 1992, the Faculty of Education established a special unit with the Faculty of Education to design and manage Distance Education Programs offered by the Faculty. This unit was upgraded to the Centre for Distance Education, in 1997, and to its current name, the Center for Continuing Education, in November 2000. The University launched its first distance education program in October 2001 with a focus on teacher education programs that offer students an opportunity to earn a Diploma in Basic Education [DBE], in addition to their traditional offering of a Post-Graduate Diploma in Education [PGDE].

The Centre for Continuing Education, which currently relies on a print-based mode of delivery and intends to incorporate radio and television instruction by 2005 in order to accommodate dramatic increases in student enrollment, projected to be over fifteen thousand by 2005. The university states that its distance education programs have been hindered by of lack of adequate funding and low remuneration for program or curse development especially in relation to module writing. Besides its reputation for distance education and the training of professionals, the university has nine main academic colleges and institutes. In 2003, the university had 229 teaching faculty listed in their online faculty directory and 11,637 students enrolled, 30% of whom were female (University of Cape Coast, 2004).

Sampling Techniques and Participant Selection

Random stratified sampling was used for this study. Because of the nature of our program, initial interest was in investigating faculty perspectives from the colleges of agriculture at both universities but because of the small size of the entire faculty populations, the study included faculty from the colleges of agriculture and sciences. Participants were randomly selected from the university's phone directory for the mail survey but this was later changed based on advice from the local ad-hoc advisor who recommended that a face-to-face distribution of the survey instruments would improve face validity and response. Therefore, almost all of the questionnaires were given out to participants face-to-face and then collected at a later date. In all a total of 200 faculty members were targeted from the two universities.

Survey Instrument and Data Collection

The instrument comprised four sections: The first section which consisted of two questions was used to collect data about faculty stage in the innovation decision process. The first question was used to operationalize and assess faculty level of awareness about the limited access to higher education as a problem for Ghanaian institutions of higher education. Participants had three answer choices to indicate their level of awareness. These choices were: I agree, I disagree, and I am not sure. The second question consisted of a statement asking participants to indicate their attitude towards educational technologies. There were six possible choices which were coded to reflect their stage in the innovation decision process regarding web-

based educational technologies. The options for answering this question ranged from no knowledge or experience with WBETs to having at least one semester of experience with WBETs and planning to use them again in the future. Both questions were used to operationalize faculty perceptions about their stage in the innovation decision process. A copy of the survey instrument used for collecting the data is attached (Appendix E).

The second section of the instrument was used to collect data describing attributes impacting the diffusion of web-based educational technologies. This section consisted of a summated scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. Each of the attributes: relative advantage, compatibility, complexity, trialability, and observability were operationalized through four sub-questions or items. The third section also consisting of a summated scale ranging from 1 = No Barrier, 2 = Weak Barrier, 3 = Moderate Barrier, 4 = Strong Barrier, to 5 = Very Strong Barrier was used to collect data about barriers to diffusion of web-based educational technologies. The barriers examined were concerns about time, concerns about incentives, program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure. The fourth section was used to collect data on faculty personal characteristics. The characteristics examined were: 1) University affiliation, 2) College affiliation, 3) Gender, 4) Age, 5) Highest level of education, 6) Academic rank, 7) Teaching experience, and 8) Experience with WBETs.

Official approval was obtained from Texas A & M University Institutional Review Board (IRB) to ensure that the survey instrument met all university guidelines and standards regarding the protection of human subjects in research. Data were collected from 61 (*N*=61) randomly selected faculty members from December 16, 2004 through January 8, 2005. Each participant was given a questionnaire in-person. Each questionnaire was accompanied with a cover letter explaining the purpose of the study and the rights of the participants according to IRB guidelines. Data collected from the study was analyzed using descriptive, correlational, and regression analysis techniques and the Statistical Package for Social Sciences (SPSS, 11.0). The Alpha for all the statistical procedures was set a priori at a 0.05 or 95% significance level.

Reliability and Validity

The original instrument adopted from Li (2004) was tested through a pilot and a panel of experts consisting of faculty members from Texas A&M University and The China Agricultural University. The instrument was found to be clear and valid for conducting that study. The instrument was only modified slightly to reflect the change of Web-Based Distance Education which had been the innovation studied by Li to WBETs. This change was done to expand the scope of the innovation and also eliminate any unintended connotations DE may have raised since it is traditionally associated with paper-based correspondence courses. The focus of this research was on determining faculty perspectives in relation to how WBETs impact

education in general and not just distance education programs. To ensure clarity and that all respondents had a consistent view, a definition of WBETs as well as examples of their use were placed at the beginning of the questionnaire. Content and face validity were established by a panel of experts consisting of faculty members with experience in adoption and diffusion research (Li, 2004).

Data Analysis and Statistical Procedures

The data would be analyzed using descriptive, correlational and regression analysis. A standard version of the SPSS software package was used in analyzing the data. A mean score was found for the each of the attributes and each of the barriers by first summing each respondents' responses (number on a scale of 1 to 5 on the Likert-type scale) to the four items used to operationalize the attributes. The sum was then divided by four, the number of items, to find the average score for each attribute and barrier. The stage in the innovation-decision process was obtained as a number on a scale of 0 = 'no knowledge' to 6='confirmation'. These are nominal levels. These levels are assumed to represent the different adopter categories and are normally distributed along an 'S' curve as shown in Figure 3. The level of awareness that lack of access by students is a problem for Ghanaian institutions of higher education was obtained on a scale of 1 = I agree, 2 = I disagree, to 3 = I am not sure. Agreement was used as a proxy for having an awareness of the problem.

Descriptive analysis was obtained for objectives one through four. The findings of this analysis are presented in Chapter IV. The remaining objectives were

addressed using correlational and regression analysis. To determine the relationships between the attributes, barriers and other variables two bivariate correlation analyses were performed. A simple multivariate linear regression was also performed to determine the extent to which each of the five attributes, and the ten barriers had a causal impact on the stage in the innovation-decision process. To achieve this, the stage in the innovation-decision process was regressed on the five attributes in one model, and on the ten barriers in another model. These analyses provided a correlation coefficient (R Square) for attributes and barriers that was used to determine what percentage of the faculty stage in the innovation-decision process was due to the impact of the attributes and barriers. Faculty stage in the innovation-decision process was also regressed on those personal characteristics that were of significance.

Treatment of Non-Response

Due to time constraints and the advice of the Ad-hoc advisor at the University of Ghana, Legon, and the University of Cape Coast, the mail survey approach was modified so that most questionnaires were distributed face-to-face to improve the face-validity and response rate. There was no analysis of early versus late respondents due to the short period over which data were collected.

Items left unanswered on the questionnaire were not left out of the calculations, in which case the number of actual respondents, *N*, was provided. In sections two and three of the questionnaire, were all four items were needed in order

to calculate the mean, a lack of response for any of the individual items would have skewed the mean score. Count or frequencies (*f)*, of responses for the variables were found where applicable and percentages (%) adjusted accordingly.

CHAPTER IV

FINDINGS

This chapter presents the results and analysis of data obtained from respondents. The data is presented in tables with findings categorized according to the specific research questions and objectives.

Population Response

Responses were obtained from 61 (*N*=61) faculty members out of an accessible population of 200. About the same amount of time was spent collecting data from the two institutions. Only 110 out of the 200 target population were actually reached at both universities. From these, 62 completed questionnaires were obtained, 61 of which were useable. The resulting response rate for the study was 56.4% of the accessible population.

Findings Related to Objective One

Objective one of the study was to describe faculty by their personal characteristics. Those collected by the study were: university affiliation of faculty, gender, age, highest degree earned, rank of faculty, number of years of teaching experience at the university level, and experience using WBETs. Results obtained from the two universities are below in Table 1 on page 56.

Table 1
University Affiliation of Respondents

University	*f*	*%*
University of Ghana, Legon	26	42.6
University of Cape Coast	35	57.4
Total	61	100.0

Slightly a few more responses were obtained from the University of Cape Coast (*N*=35) than the University of Ghana (*N*=26). There were significantly more male respondents (*N*=55) than female respondents (*N*=6), as shown below (Table 2). There were equal numbers of female respondents from both institutions (*N*=3 from each institution).

Table 2

Distribution of Respondents by Gender (N=61)

Gender	*f*	*%*
Male	55	91.6
Female	6	9.8
Total	61	100.0

The ages of faculty respondents ranged from 26 to 68 years, with a mean age of 46.3 years (*N*=58), with a standard deviation of 9 years. Three respondents did not reveal their ages. The mean age was 45.9 at University of Ghana, Legon and 42.6 at the University of Cape Coast. On average, the faculty had taught at the university level for 9.8 years (*N*=61), with a standard deviation of 9 years. While the majority of faculty

respondents held doctoral degrees (Table 3), almost half of the faculty held either a masters or bachelors degree.

Table 3
Highest Degree Earned by Respondents

Degrees	*f*	%
Bachelors	6	9.8
Masters	22	36.1
Doctoral	33	54.1
Total	61	100.0

The distribution of academic rankings of the respondents is shown below (Table 4). Very few faculty members were full professors.

Table 4
Academic Rank of Respondents

Rank	*f*	%
Lecturers	47	79.7
Associate Professors	7	11.9
Professors	5	8.5
Total	61	100.0

Of the 61 respondents, about a third indicated that they had some experience using WBETs (Table 5).

Table 5
Experience of Respondents with WBETs

Faculty Experience	*f*	%
Experienced	18	29.5
No Experience	43	70.5
Total	61	100.0

The 18 faculty respondents who had experience using WBETs indicated the nature of their experience with WBETs (Table 6). About 94% of them had used on-line references, publications and libraries in their teaching and learning activities. The years of experience ranged from a few months to about 6 years. One of the faculty respondents had used content on CD-ROMS for about 5 years and used on-line references, publications and libraries for about 15 years. In the comments sections, many faculty respondents indicated their interest in learning more about WBETs and enthusiasm in using them to reach students. The faculty members who had experience in web-based distance education programs had generally obtained their experience while studying or working in the United States.

Table 6
Nature of Respondents' Experience with WBETs

Experience	*f*	%
Web-based Distance Education	4	22,2
CD-ROMS	10	55.6
Web-based references	17	94.4
Other	3	16.7

Findings Related to Objective Two

The second objective was to describe faculty respondents by their current stage in the innovation-decision process related to WBET. The stages of the innovation decision process were: no knowledge, knowledge, persuasion, decision, implementation, and confirmation. Faculty stage was determined by 1) If they had knowledge of the fact that limited access to higher education by students in Ghana was a problem, and 2) An indication of their attitude towards WBETs according to their stage in the innovation development process. Fifty-eight of the respondents responded to this question. The results obtained are shown below (Table 7).

Table 7
Respondents Agreement That Limited Access to Education is a Problem for Ghanaian Institutions of Higher Learning (N=58)

Levels of Agreement	*f*	*%*
Agree	52	89.7
Disagree	4	6.9
Not Sure	2	3.4
Total	58	100.0

Faculty stage in the innovation decision process was used as a proxy for operationalizing their likelihood to be in a certain adopter category and was also used to infer their speed of adoption (Figure 3). The distribution of respondents according

to their stage in the innovation-decision process is shown below (Table 8). It is interesting to note that none of the participants had absolutely no knowledge of the innovation (*f*=0). All of the respondents were at least aware of the existence of the innovation and believed that WBETs may be used to increase access to higher education. This is contrary to what Li (2004) proposed and used as justification for including the additional level of 'no knowledge' to Rogers' (2003) stages of the innovation decision process. Perhaps a different sample, in a rural setting may have had no knowledge.

Table 8
Distribution of Respondents by Their Current Stage in the Innovation-Decision Process (N=61)

Stage	Descriptions	*f*	%
No knowledge	I have not used Web-based Educational Technologies and have no plans for using them.	0	0.0
Knowledge	Web-based Educational Technologies may be a way to reach more students in Ghanaian higher education.	26	43.3
Persuasion	Web-based distance education is a way to reach more students in Ghanaian higher education.	12	20.0
Decision	I know the benefits of Web-based Educational Technologies. In the near future, I will try it in my own teaching.	13	21.7
Implementation	I am currently using Web-based Educational Technologies and they help me reach students that otherwise do not have access to higher education programs.	2	3.3
Confirmation	I have used Web-based Educational Technologies for more than one semester and plan on continuing to do so.	7	11.7
Total		60	100

Only 60 of the 61 respondents responded to this question. Mean response was (*M*=3.2), with a standard deviation of (*SD*=1.35) on the following scale: 1=No Knowledge, 2=Knowledge, 3=Persuasion, 4=Decision, 5=Implementation, 6=Confirmation. The cumulative view of respondents across the various stages of the innovation decision process is shown below in Figure 4 on page 61.

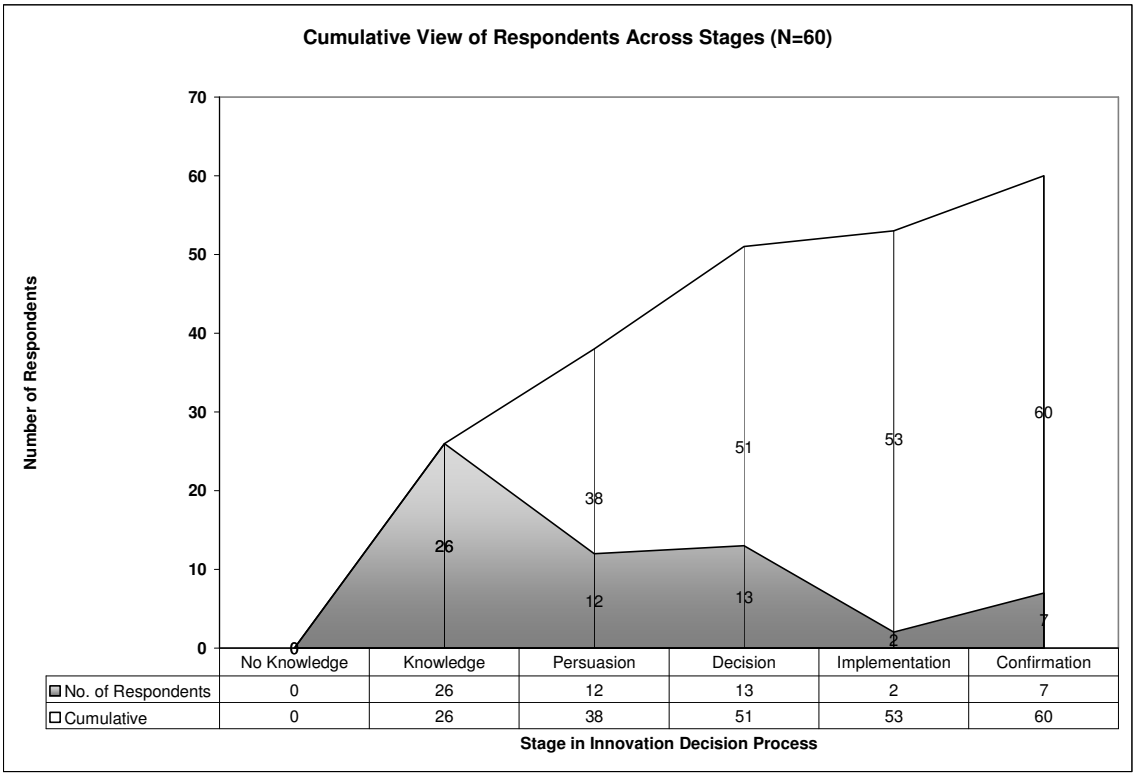

Figure 4. Respondents' Stages in the Innovation-Decision Process.

The shape of the cumulative stages of all the members in the population of respondents is consistent with the expectations of the conceptual framework. Also, the findings show that overall the population was fairly representative and consistent with the expectations of the conceptual framework, with fewer people at the final stages of

the innovation-decision process, representing the earlier adoption categories (innovators and early adopters).

Findings Related to Objective Three

The third objective was to describe faculty according to their perceptions about attributes impacting the adoption and diffusion of WBETs. The attributes discussed in this study were relative advantage, compatibility, complexity, trialability, and observability. The following tables show results obtained for each of the items that were used to operationalize attributes. Below are the results for respondents' perceptions of relative advantage as an attribute or enhancer or the adoption and diffusion of WBETs (Table 9).

Table 9
Faculty Perceptions about the Relative Advantage of WBETs (N=61)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Using Web-based educational technologies could reach more students.	0	0.0	0	0.0	3	4.9	36	59.0	22	36.1
Using Web-based educational technologies could give me access to more teaching resources.	0	0.0	2	3.3	6	10.0	25	41.0	27	44.3
Using Web-based educational technologies could provide more scheduling flexibility and save time	0	0.0	1	1.6	13	21.3	35	57.4	12	19.7
Web-based educational technologies could be provided economically.	1	1.6	11	18.0	27	44.3	18	29.5	4	6.6

Note: Scale, 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree; A mean relative advantage score was calculated by summing item responses: *M*=3.94, *SD*=.48

Compatibility was measured through the use of four items. Faculty perceptions of compatibility as an attribute or enhancer of the adoption and diffusion of WBETs is shown below (Table 10).

Table 10
Faculty Perceptions about the Compatibility of WBETs (N=61)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Using Web-based educational technologies are acceptable to me.	0	0.0	1	1.7	2	3.3	43	71.7	14	23.3
Procedures used in Web-based educational technologies would fit well with my teaching conditions.	0	0.0	7	11.5	13	21.3	33	54.1	8	13.1
Web-based educational technologies are available to me.	4	6.6	13	21.3	13	21.3	28	45.9	3	4.9
Web-based educational technologies are available to students.	7	11.5	24	39.3	13	21.3	15	24.6	2	3.3

Note: Scale, 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree; A mean compatibility score was calculated by summing item responses: *M*=3.43, *SD*=0.56

Complexity was measured through the use of four items. Faculty perceptions of complexity as an attribute or enhancer of the adoption and diffusion of WBETs is shown below (Table 11).

Table 11
Faculty Perceptions about the Complexity of WBETs (N=61)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Web-based educational technologies are easy to use.	1	1.7	12	20.7	19	32.8	23	39.7	3	5.2
The changes in teaching methodology necessary to use Web-based educational technologies will be easy for me to implement.	0	0.0	8	13.1	25	41.0	20	32.8	8	13.1
The changes in teaching methodology necessary to use Web-based educational technologies are easy to understand.	1	1.7	12	20.0	22	36.7	24	40.0	1	1.7
Web-based educational technologies are readily available to faculty.	10	16.4	23	37.7	18	29.5	10	16.4	0	0.0

Note: Scale, 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree; A mean complexity score was calculated by summing item responses: *M*=3.09, *SD*=0.67

Trialability was measured through the use of four items. Faculty perceptions of trialability as an attribute or enhancer of the adoption and diffusion of WBETs is shown below (Table 12).

Table 12
Faculty Perceptions about the Trialability of WBETs (N=61)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
It is possible for students to use Web-based educational technologies (e.g., Accessing the Internet, downloading and uploading materials, watching video lessons, chatting on-line, etc.).	0	0.0	5	8.3	7	11.7	37	61.7	11	18.3
It is possible for me to deliver selected portions of a course (a single lesson or unit) using Web-based educational technologies prior to developing an entire course.	1	1.6	12	19.7	14	23	29	47.5	5	8.2
It is currently possible for me to accomplish some teaching functions (e.g., reporting grades, communication with students, demonstrations, identify sources and references) on the Web.	7	11.5	13	21.3	11	18.0	26	42.6	4	6.6
It is currently possible for me to incorporate selected teaching materials (e.g., readings, assignments, references) on the Web in support of my classes.	4	6.6	18	29.5	15	24.6	21	34.4	3	4.9

Note: Scale, 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree; A mean 'trialability' score was calculated by summing item responses: *M*=3.36, *SD*=0.64

Observability was measured through the use of four items. Faculty perceptions of observability as an attribute or enhancer of the adoption and diffusion of WBETs is shown below (Table 13).

Table 13
Faculty Perceptions about the Observability of WBETs (N=61)

	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
I am aware of the limitations of Web-based educational programs for students.	2	3.3	4	6.6	7	11.5	34	55.7	14	23.0
I know of some faculty members who are using Web-based educational technologies.	2	3.3	10	16.4	14	23.0	27	44.3	8	13.1
I have observed some Web-based courses on my campus.	4	6.6	15	26.6	10	16.4	28	45.9	4	6.6
I am aware of the benefits of Web-based educational technologies for students.	0	0.0	1	1.6	39	63.9	0	0.0	21	34.4

Note: Scale, 1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=Strongly Agree; A mean 'observability' score was calculated by summing item responses: *M*=3.72, *SD*=0.64

Findings Related to Objective Four

The fourth objective was to describe faculty according to their perceptions about barriers to the diffusion of WBETs. The barriers discussed in this study were: concerns about time, concerns about incentives, WBET program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure. The results obtained are shown below (Table 14). These results show that the respondents perceived concerns about time as posing a moderate barrier to the adoption of WBETs.

Table 14
Faculty Perceptions about Concerns about Time (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Increased faculty time commitment for course development.	2	3.3	18	29.5	19	31.1	16	26.2	6	9.8
Increased faculty time for on-line communication with students.	3	4.9	10	16.4	23	37.7	20	32.8	5	8.2
Increased faculty time for getting feedback from students.	5	8.3	14	23.3	16	26.7	20	33.3	5	8.3
Increased faculty time to explore more research, information, and educational materials.	9	14.8	16	26.2	17	27.9	13	21.3	6	9.8

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'concerns about time' was calculated by summing item responses: *M*=3.07, *SD*=0.86

Respondents had slightly different perceptions about incentives. The results obtained for their perceptions of incentives are shown below (Table 15). These results indicate that on the whole, the respondents perceived concerns about incentives as posing a relatively weak to moderate barrier to the adoption and diffusion of WBETs.

Table 15
Faculty Perceptions about Concerns about Incentives (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Monetary compensation for adopting Web-based educational technologies.	12	19.7	13	21.3	14	23.0	18	23.0	4	6.6
Incentives for adopting Web-based educational technologies.	6	9.8	16	26.2	14	23.0	19	31.1	6	9.8
Recognition for adopting Web-based educational technologies.	13	21.3	16	26.2	15	24.6	13	21.3	4	6.6
Awards for adopting Web-based educational technologies.	17	27.9	11	18.0	21	34.4	11	18.0	1	1.6

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'concerns about incentives' was calculated by summing item responses: *M*=2.75, *SD*=0.96

The results obtained for faculty perceptions about the credibility of a program or course as a barrier to the adoption and diffusion of WBETs are shown below (Table 16). These results indicate that on the whole, the respondents perceived concerns about program credibility as posing a relatively weak to moderate barrier to the adoption and diffusion of WBETs.

Table 16
Faculty Perceptions of Program Credibility Concerns of WBETs (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Concerns about evaluation of students' work.	6	10.2	17	28.8	19	32.2	13	22.0	4	6.8
Concerns about testing of students' work.	6	10.0	15	25.0	21	35.0	16	26.7	2	3.3
Concern that programs using Web-based educational technologies lower the quality of students who are admitted.	10	16.4	22	36.1	21	34.4	7	11.5	1	1.6
Concern that programs using Web-based educational technologies lower the expectations for student learning.	12	20.3	21	34.4	20	33.9	5	8.5	1	1.7

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'program credibility' was calculated by summing item responses: *M*=2.63, *SD*=0.81

Faculty perceptions of financial concerns as a barrier to the adoption and diffusion of WBETs are shown below (Table 17). These results indicate that on the whole, the respondents perceived financial concerns as posing a moderate to strong barrier to the adoption and diffusion of WBETs. Most of the financial concerns were about the cost of the program to students and the affordability of WBETs.

Table 17
Faculty Perceptions about Financial Concerns (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Increased tuition and fee rates.	2	3.3	5	8.3	10	16.7	26	43.3	17	28.3
Increased payment for cost of technologies.	1	1.6	4	6.6	6	9.8	30	49.2	20	32.8
Sharing revenue with department or business units.	3	5.0	15	25.0	22	36.7	18	30.0	2	3.3
Lack of money to implement programs using Web-based educational technologies.	2	3.3	4	6.7	2	3.3	23	38.3	29	48.3

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'financial concerns' was calculated by summing item responses: *M*=3.77 *SD*=0.78

The results obtained for faculty perceptions about planning issues as a barrier to the adoption of WBETs for creating and implementing programs or courses are shown below (Table 18). These results indicate that on the whole, the respondents perceived concerns about planning issues as posing a moderate barrier to the adoption and diffusion of WBETs.

Table 18
Faculty Perceptions about Planning Issues (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of identified need (perceived or real) for Web-based educational technologies.	9	15.0	14	23.3	18	30.0	15	25.0	4	6.7
Lack of shared vision for the role of Web-based educational technologies in the organization.	5	8.2	11	18.0	22	36.1	19	31.1	4	6.6
Lack of strategic planning for Web-based educational technologies.	4	6.6	9	14.8	17	27.9	20	32.8	11	18
Lack of departmental 'champions' of Web-based educational technologies within the university.	4	6.6	9	14.8	15	24.6	24	39.3	9	14.8

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'planning issues' was calculated by summing item responses: *M*=3.19, *SD*=0.94

Faculty perceptions about the credibility the fear of technology as a barrier to the adoption and diffusion of WBETs are shown below (Table 19). The results indicate that on the whole, the respondents perceived the fear of technology as posing a relatively weak barrier to the adoption and diffusion of WBETs. This is slightly different from what the literature suggested.

Table 19
Faculty Perceptions about Fear of Technology (n=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Threat to instructors' sense of competence and authority.	16	26.2	15	24.6	14	23.0	15	24.6	1	1.6
Belief that job security is threatened.	23	37.7	18	29.5	11	18.0	7	11.5	2	3.3
Concern for legal issues (e.g., computer crime, hackers, software piracy, copyright).	13	21.3	12	19.7	23	37.7	9	14.8	4	6.6
Increased isolation of instructors.	12	20.3	14	23.7	18	30.5	11	18.6	4	6.8

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'fear of technology' was calculated by summing item responses: *M*=2.49, *SD*=0.93

The results obtained for faculty perceptions about conflict arising between courses or programs that use of WBETs versus traditional methods of teaching and learning as a barrier to the adoption and diffusion of WBETs are shown below (Table 20). The results indicate that on the whole, the respondents perceived concerns about conflicts as posing a relatively weak barrier to the adoption and diffusion of WBETs.

Table 20
Faculty Perceptions about Conflict with Traditional Education (*n*=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Competition with on-campus offerings or competition for existing students.	18	30.5	24	39,3	12	20.3	4	6.8	1	1.7
Disruption of the social organization of the traditional classroom.	16	26.2	20	32.8	15	24.6	8	13.1	2	3.3
Traditional academic calendar/schedule hinders use of Web-based educational technologies.	18	29.5	15	24.6	12	19.7	12	19.7	4	6.6
Lack of person-to-person contact (i.e., lack of face-to-face interaction with students; difficulty building rapport with participants at a distance).	5	8.3	8	13.3	23	38.3	17	28.3	7	11.7

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'conflicts with traditional education' was calculated by summing item responses: *M*=2.52, *SD*=0.90

The results obtained for faculty perceptions about technical expertise as a barrier to the adoption and diffusion of WBETs are shown below (Table 21). These results indicate that on the whole, the respondents perceived concerns about technical expertise as posing a relatively strong barrier to the adoption and diffusion of WBETs. This is consistent with what was suggested in the literature and previous research.

Table 21
Faculty Perceptions about Technical Expertise (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of technical support.	1	1.7	5	8.3	12	20.0	29	48.3	13	21.7
Lack of training programs for using Web-based educational technologies.	2	3.3	7	11.5	9	14.8	23	37.7	20	32.8
Lack of knowledge about Web-based educational technologies.	3	4.9	6	9.8	16	26.2	26	42.6	10	16.4
Lack of the "right" people to implement Web-based educational technologies.	4	6.7	7	11.7	12	20.0	25	41.7	12	20.0

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'technical expertise' was calculated by summing item responses: *M*=3.69, *SD*=0.90

Faculty perceptions about administrative support as a barrier to the adoption and diffusion of WBETs are shown below (Table 22). These results indicate that on the whole, the respondents perceived concerns about administrative support as posing a moderate barrier to the adoption and diffusion of WBETs.

Table 22
Faculty Perceptions about Administrative Support (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of support or encouragement from administrators.	5	8.2	13	21.3	15	24.6	16	26.2	12	19.7
Copyright issues in using materials in programs with Web-based educational technologies.	7	11.5	16	26.2	16	26.2	17	27.9	5	8.2
Difficulty in recruiting faculty.	4	6.8	11	18.6	18	30.5	16	27.1	10	16.9
Difficulty in recruiting students.	19	33.3	18	33.3	15	26.3	4	7	1	1.8

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'administrative support' was calculated by summing item responses: *M*=2.91, *SD*=0.76

Faculty perceptions about infrastructure as a barrier to the adoption and diffusion of WBETs are shown below (Table 23). The results indicate that on the whole, the respondents perceived concerns about infrastructure as posing a relatively a relatively strong barrier to the adoption and diffusion of WBETs.

Table 23
Faculty Perceptions about Infrastructure (N=61)

	No Barrier		Weak Barrier		Moderate Barrier		Strong Barrier		Very Strong Barrier	
Statement	*f*	%	*f*	%	*f*	%	*f*	%	*f*	%
Lack of adequate technology-enhanced classrooms/labs/infrastructure/technical services.	2	3.3	1	1.6	4	6.6	16	26.2	38	62.3
Lack of adequate student access to computers and the Internet.	1	1.6	5	8.2	10	16.4	17	27.9	28	45.9
Lack of adequate instructor access to computers and the Internet.	1	1.6	8	13.1	16	26.2	18	29.5	18	29.5
Lack of library access or delivery of materials.	4	6.6	4	6.6	18	29.5	18	29.5	17	27.9

Note: Scale, 1=No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, 5=Very Strong Barrier; A mean score for 'infrastructure' was calculated by summing item responses: *M*=3.97, *SD*=0.86

Findings Related to Objective Five

The purpose of objective five was to examine the relationships between faculty members' stage in the innovation decision process and their perceptions about the attributes and barriers impacting the adoption and diffusion of WBETs. The relationships of faculty perceptions of attributes and barriers on stage in the innovation-decision process were analyzed separately. Below are the results for the correlation between faculty stage in the innovation-decision process and their perception of attributes impacting the adoption and diffusion of WBETs (Table 24).

Table 24
Correlation between Faculty Stage in Innovation-Decision Process and Their Perceptions of Attributes

Attributes	Stage	Relative Advantage	Compatibility	Complexity	Trialability	Observability
Relative Advantage	.19	1	.28	.32*	.25	.21
Compatibility	.30*	.28	1	0.24	.27*	.24
Complexity	.06	.32*	0.24	1	.34*	.19
Trialability	.12	.25	.27*	.34*	1	.20
Observability	.09	.21	.24	.19	.20	1

Note: * p <.05

The variables faculty perceptions about attributes of WBDE and their perceptions about barriers to diffusion of WBDE were measured by correlational analysis and finally indicated by measures of association and statistical significance. Measures of association were indicated by Pearson's Product-Moment coefficient of correlation. This method is appropriate when the variables to be correlated are normally distributed and measured on an interval or ratio scale (Ary, Jacobs, & Razavieh, 1996). Table 5 shows the magnitudes of relationships (Davis, 1971).

Table 25
Magnitude of Correlation Coefficients

Coefficient	Description
0.70 or higher	Very Strong Association
0.50 to 0.69	Substantial Association
0.30 to 0.49	Moderate Association
0.10 to 0.29	Low Association
0.01 to 0.09	Negligible Association

The results for the correlation between faculty stage in the innovation-decision process and their perception of barriers impacting the adoption and diffusion of WBETs is presented below (Table 26).

Table 26
Correlation between Faculty Stage and Their Perceptions of Barriers

Barriers	Stage	Concerns about Time	Concerns about Incentives	Program credibility	Financial Concerns	Planning Issues	Conflict with Traditional Edu.	Fear of Technology	Technical Expertise	Administrative Support	Infrastructure
Concerns about Time	.17	1	.53**	.34**	.25	.16	.26*	.28*	.116	.35**	
Concerns about Incentives	-.08	.53**	1	.36**	.28*	.13	.40**	.19	.316*	.07	.08
Program Credibility	-.18	.34**	.36**	1	.21	.38**	.55**	.22	.26*	.53**	.08
Financial Concerns	-.18	.25	.28*	.21	1	.26*	.23	.30*	.53**	.40**	.20
Planning Issues	-.10	.16	.13	.38**	.26*	1	.53**	.27*	.58**	.58**	.32*
Conflict with Traditional Education	-.08	.26*	.40**	.55**	.23	.53**	1	.32*	.45**	.50**	.36**
Fear of Technology	-.02	.28*	.20	.22	.30*	.27*	.32*	1	.33*	.47**	.31*
Technical Expertise	-.27	.12	.32*	.26*	.53**	.58**	.45**	.33*	1	.60**	.71**
Administrative Support	-.10	.35**	.07	.53**	.40**	.58**	.50**	.47**	.60**	1	.60**
Infrastructure	-.12	.08	.08	.19	.31*	.52*	.36**	.31*	.71**	.60**	1

Note: * $p < .05$

Findings Related to Objective Six

The purpose of objective six was to examine the relationship between faculty members' stage in the innovation-decision process and their level of agreement with the statement that limited access to education by students is a problem for Ghanaian institutions of higher education. The analysis showed that there was no statistically significant correlation between faculty members' stage in the innovation-decision process and their level of agreement or awareness of the problem of limited access. The R Square obtained was 0.000 and the adjusted R Square was -0.018. This means that faculty stage in the innovation-decision process could not be explained at all by their level of awareness or agreement that access to education by students is a problem for Ghanaian institutions of higher learning. In other words, faculty level of awareness was completely independent of their stage in the innovation-decision process.

Findings Related to Objective Seven

Examine the relationship between faculty members' personal characteristics and their stage in the innovation-decision process. The eight personal characteristics of faculty examined in this study were: 1) University affiliation, 2) College affiliation, 3) Gender, 4) Age, 5) Highest level of education, 6) Academic rank, 7) Teaching experience, 8) Experience with WBETs. Also information was obtained about the nature of faculty experience with WBETs but these were just for background information purposes. About 30% or 18 out of 61 respondents had experience with WBETs. Four respondents had used or been involved with web-based distance education or programs.

Ten respondents had used content on CD-ROMs with online components. Seventeen out of the eighteen respondents or 94% reported with experience with WBETs had used web-based references, publications and libraries.

Of the eight personal characteristics examined in this study, only one of these personal characteristics was significantly correlated with faculty stage in the innovation-decision process. Faculty experience with WBETs was negatively correlated with the innovation-decision process (R= -3.91). This means that about 15.3% of the variation in faculty stage in the innovation-decision process can be explained by their experience with WBETs.

This finding is consistent with the finding of Li's (2004) finding that experience with the innovation had a major influence on faculty perspectives and subsequently their stage in the innovation decision process rather than factors such as gender or age.

Another aspect of this objective was that most of the personal characteristics were highly correlated at the 0.05 level. For example, highest level of education, academic rank, and teaching experience (measured in years) were highly correlated.

CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter provides a brief summary of the study, methodology, key findings, conclusions, implications and recommendations.

Summary of the Study

The purpose of the study was to determine faculty perceptions about factors affecting the adoption and diffusion of Web-Based Educational Technologies (WBETs) across two institutions of higher education in Ghana: the University of Cape Coast and the University of Ghana, Legon. The study was designed based on Rogers' theory of adoption and diffusion, and stages of the adoption-decision process. Data about faculty perceptions of attributes or factors that enhance diffusion, (relative advantage, compatibility, complexity, trialability, and observability) and barriers or factors hindering the diffusion of WBETs (concerns about time, concerns about incentives, program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure) were collected using a four part instrument created by Li (2004). The study was intended to provide insights about how faculty perceptions of WBETs, and their awareness that access to education by students is a problem for Ghanaian institutions of higher education, impact their stage in the innovation-decision process and consequently their adoption of WBETs. This is described in Figure 3, the conceptual framework on page 44.

Web-Based Educational Technologies (WBETs) was defined as the use of online courses and references, computers, audio/video materials (streaming video), the Internet, multimedia peripherals, electronic mail, content on compact disks (CD-ROMs), etc. as part of an educational method in which these web or Internet-based educational tools are the main tools that enable instructors and their students to come together to accomplish a certain teaching and learning objective, within a certain period of time.

Objectives of the Study

1. Describe faculty by selected personal characteristics.
2. Describe faculty by their current stage in the innovation-decision process related to WBET (no knowledge, knowledge, persuasion, decision, implementation, and confirmation).
3. Describe faculty according to their perceptions about attributes of WBET (relative advantage, compatibility, complexity, trialability, and observability).
4. Describe faculty according to their perceptions about barriers to diffusion of WBET (concerns about time, concerns about incentives, WBET program credibility, financial concerns, planning issues, conflict with traditional education, fear of technology, technical expertise, administrative support, and infrastructure).

5. Examine the relationship between faculty members' stage in the innovation-decision process and their perceptions about attributes and barriers impacting the adoption and diffusion of WBETs.
6. Examine the relationship between faculty members' stage in the innovation-decision process and their level of agreement that limited access to education by students is a problem for Ghanaian institutions of higher education.
7. Examine the relationship between faculty members' personal characteristics and their stage in the innovation-decision process.

Summary of Findings

The findings of the study were organized according to the seven objectives of the study. The results were based on responses obtained from 61 respondents out of the 200 target accessible population across the two universities involved in the study.

Objective one of the study was to describe faculty according to selected personal characteristics. The personal characteristics examined were: university affiliation, college or department affiliation, gender, age, highest level of education, academic rank, teaching experience, and experience with WBETs. There were 26 (23 male and 3 female) respondents from the University of Ghana, Legon, and 35 (32 male and 3 female) respondents from the University of Cape Coast. The ages of respondents from both universities raged from 26 to 68 years, with a mean 46.3 years and Standard deviation of 9 years. Three respondents did not reveal their ages. Based on the highest level of education received, 6 had bachelor's degrees, 22 had master's

degrees, and 33 had doctoral degrees. Based on academic rank, there were 47 lecturers, 7 associate professors, and 5 full professors. About 30% of the respondents (18/61) had experience with WBETs. Of these 17 out of 18 respondents or 94% of the respondents reported that they had experience with WBETs through the use of web-based references, publications and libraries. Four respondents had used or been involved with web-based distance education or programs and ten respondents had used content on CD-ROMs with online components. Results for faculty 'College' affiliation were not reported because there was some confusion about that question. Many of the respondents misunderstood that question. It was intended to capture what department of academic field within the university the respondent was from. However, most of the faculty misunderstood this. Many provided multiple responses indicating which universities they had obtained their education, left it blank or provided some other information. However, most of the faculty respondents were from the school of agriculture and sciences.

Objective two was to describe faculty according to their stage in the innovation-decision process. There were six stages in the innovation-decision process in this study. They were: no knowledge, knowledge, persuasion, decision, implementation, and confirmation. These stages were analyzed based on a scale of 0 = no knowledge, to 6 = confirmation. The results were obtained by calculating the frequencies and percentages of responses based on the scale. None (*f*=0, 0%) of the respondents were at the 'no knowledge stage'. There were 26 respondents (*f*=26, 43.3%) at the knowledge stage, 12 respondents (*f*=12, 20%) at the persuasion stage,

13 respondents (*f*=12, 21.7%) at the decision, 2 (*f*=2, 3.3%) respondents at the implementation stage, and 7 respondents (*f*=7, 11.7%) at the confirmation stage. It can be concluded that on the whole, the sample of faculty that participated in this study from the University of Ghana, Legon and the University of Cape Coast were on average at the decision stage. They knew or were aware of the benefits of WBETs and looked forward to trying them in their own teaching in the near future.

Objective three involved describing faculty according to their perceptions about the attributes of WBETs. The attributes examined in this study were: relative advantage, compatibility, complexity, trialability, and observability. The mean scores (M = mean) based on a summated scale 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree, and standard deviation (SD) for responses were as follows: relative advantage (M=3.94, SD = 0.48), observability (M=3.72, SD = 0.64), compatibility (M=3.43, SD = 0.56), complexity trialability (M=3.36, SD = 0.64), and (M=3.09, SD = 0.67). The results are shown in Table 27 below.

Table 27
Summary of Faculty Perspectives about Attributes

Attribute	M	SD	Level
Relative Advantage	3.94	0.48	Agree
Observability	3.72	0.64	Agree
Trailability	3.36	0.64	Neutral
Compatibility*	3.43*	0.56*	Neutral
Complexity	3.09	0.67	Neutral

Mean scores (M) based on a Likert-type scale 1 = Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, and 5 = Strongly Agree. Standard deviation (SD). * = Significant at .05 level.

Objective four involved describing faculty according to their perceptions about barriers impacting the adoption and diffusion of WBETs. A summary of the results based on the mean scores (M = mean) on a Likert-type scale of 1 = No Barrier to 5 = Strong Barrier, and standard deviation (SD) for responses are shown in Table 28 below. Faculty perceptions of barriers were as follows: concerns about time (M=3.07, SD = 0.86), concerns about incentives (M=2.75, SD = 0.96), program credibility (M=2.63, SD = 0.81), financial concerns (M=3.77, SD = 0.78), planning issues (M=3.19, SD = 0.94), conflict with traditional education (M=2.49, SD = 0.93), fear of technology (M=2.52, SD = 0.90), technical expertise (M=3.69, SD = 0.90),

administrative support (M=2.91, SD = 0.76), and infrastructure (M=3.97, SD = 0.86).

Table 28
Summary of Faculty Perspectives about Barriers

Barrier	M	SD	Level
Infrastructure	3.97	0.86	Strong Barrier
Financial concerns	3.77	0.78	Strong Barrier
Technical expertise*	3.69*	0.90*	Strong Barrier
Planning issues	3.19	0.94	Moderate Barrier
Concerns about time	3.07	0.86	Moderate Barrier
Administrative support	2.91	0.76	Moderate Barrier
Concerns about incentives	2.75	0.96	Moderate Barrier
Program credibility	2.63	0.81	Moderate Barrier
Fear of technology	2.52	0.90	Moderate Barrier
Conflicts with traditional education	2.49	0.93	Weak Barrier

Mean scores (M) based on a Likert-type scale 1 = No Barrier, 2=Weak Barrier, 3=Moderate Barrier, 4=Strong Barrier, and 5 = Very Strong Barrier. * = Significant at .05 level.

Objective five involved examining the relationship between faculty respondents' stage in the innovation-decision process and their perceptions about the attributes and barriers impacting the adoption and diffusion of WBETs. Only faculty

perceptions of compatibility had a statistically significant correlation with faculty respondents' stage in the innovation-decision process.

Objective six involved examining the relationship between faculty respondents' stage in the innovation-decision process and their level of agreement with the statement that limited access to education by students is a problem for Ghanaian institutions of higher education. There was no statistically significant correlation between faculty stage in the innovation-decision process and their level of agreement or awareness of the problem of limited access. Table 29 shows the summary of responses. Of the 58 respondents, 52 or 89.7% were in agreement that they perceived limited access to higher education by students as a problem for Ghanaian institutions of higher education. Four respondents or 6.9% disagreed, and two respondents or 3.4% were not sure if limited access to higher education was a problem or not for Ghanaian institutions of higher education.

Table 29
Summary of Faculty Agreement or Awareness of the Problem of Limited Access to Education (N=58*)*

Level of Agreement	*f*	%
Agree	52	89.7
Disagree	*4*	6.9
Not sure	*2*	3.4

No statistically significant correlation between faculty stage in the innovation-decision process and their level of agreement or awareness of the problem of limited access.

Objective seven involved examining the relationship between faculty members' personal characteristics and their stage in the innovation-decision process. Of the eight personal characteristics of faculty examined, only experience with

WBETs had a statistically significant impact on faculty stage in the innovation-decision process. The other characteristics: university affiliation, college affiliation, gender, age, level of education, and academic rank were not statistically significant, even though most were highly correlated to one another. Also, the Pearson Correlation Coefficient scale was used to determine the level of association between faculty personal characteristics and their stage in the innovation-decision process. This is shown in Table 30 below on page 85. Experience with WBETs showed a moderate association (-0.391) whereas the other characteristics only showed negligible associations with coefficients less than 0.1. This implies that faculty decisions about the use of WBETs may be irrespective of their university affiliation, gender, age, level of education or academic rank. Only prior experience with or exposure to WBETs is of any relevance to their decision making process.

Table 30
Summary of Faculty Respondents' Personal Characteristics and Their Stage in the Innovation-Decision Process

Personal Characteristic	Pearson Correlation Coefficient	Level
University affiliation	.075	Negligible Association
Gender	.060	Negligible Association
Age	.048	Negligible Association
Level of education	.031	Negligible Association
Academic rank	-.047	Negligible Association
Experience with WBETs	-.391**	Moderate Association
*** Correlation significant at the 0.01 Level.*		

Conclusions about Stages in Innovation-Decision Process

Based on the results, it can be concluded that faculty perceptions of attributes and barriers do impact their stage in the innovation-decision process. The majority of faculty (*f*=26, 43.3%) are in the knowledge stage as shown in Figure 4 on page 61.

Conclusions about Attributes

Based on the descriptive results of faculty perceptions of attributes impacting the adoption and diffusion of WBETs, it can be concluded that the majority of faculty perceived relative advantage (M=3.94, SD = 0.48), and observability (M=3.72, SD = 0.64) as having the highest impact on the adoption and diffusion to WBETs. The faculty in this study on average agreed that relative advantage and

observability had a strong impact on the adoption and diffusion of WBETs. Besides these, from a descriptive point of view, the faculty members were fairly neutral about their perceptions of compatibility, complexity, and trialability as attributes impacting the adoption and diffusion of WBETs.

Conclusions about Barriers

Based on the descriptive results of faculty perceptions of barriers impacting the adoption and diffusion of WBETs, it can be concluded that concluded that concerns about infrastructure (M=3.97, SD = 0.86), financial concerns (M=3.77, SD = 0.78) and technical expertise (M=3.69, SD = 0.90) were the three most important barriers perceived as impacting the adoption and diffusion of WBETs. All three were perceived as being almost strong barriers to the adoption and diffusion of WBETs. The other barriers in relative importance from most important to least important were as follows: planning issues (M=3.19, SD = 0.94), concerns about time (M=3.07, SD = 0.86), administrative support (M=2.91, SD = 0.76), concerns about incentives (M=2.75, SD = 0.96), program credibility (M=2.63, SD = 0.81), fear of technology (M=2.52, SD = 0.90), and conflict with traditional education (M=2.49, SD = 0.93). Planning issues, concerns about time, administrative support, and concerns about incentives were mostly perceived as posing moderate barriers while program credibility, fear of technology, and conflict with traditional education were perceived as posing weak barriers.

Final Conclusions and Implications of the Study

This research study has many implications for all who are interested in the growth and development of higher education and socio-economic development in Ghana. Specifically, the study offers beneficial insights to administrators and faculty members at the University of Ghana, Legon and the University of Cape Coast, development agencies and donor agencies that provide support the advancement of education in Ghana. There findings suggest that faculties perceived relative advantage and observability as having the most impact on the adoption of WBETs. From the questionnaire (Appendix E), items that measured relative advantage also imply that respondents had a certain expectation of WBETs. The findings imply that the respondents expect WBETs to offer either economic or social benefits that are superior to their current teaching methods. Similarly, they believe that the results of adopting WBETs influence their adoption and diffusion. They expect WBETs to enable them reach more students, provide more scheduling flexibility and save time, and provide them with more teaching resources. In addition, the respondents also believe that WBETs could be provided economically. In regards to the items that measured observability, faculty respondents indicated that they knew faculty members who were using WBETs in their teaching on campus. They also indicated that they were aware of the benefits of WBETs for students. If the perceptions of this random sample represent the total population of teaching faculty at these two universities, then administrators can assume that the faculty members have a favorable opinion of using WBETs. Also, the fact that all the respondents indicated

that they had some knowledge of WBETs also implies that the faculty members may welcome their formal introduction and requirement as teaching aids. It can be expected that faculty members would follow a relatively shorter learning curve as a result of their awareness and perceptions of the relative advantage and observability of WBETs.

Based on Rogers (2003) theory of adoption and diffusion, all innovations have certain characteristics that cause potential adopters to realize the benefits and costs or advantages and disadvantages of adopting or rejecting them. This research shows that statistically, 'compatibility,' is an important factor in promoting the adoption and diffusion of WBETs at the two universities. Compatibility is the degree to which an innovation is consistent with existing values, practices, and experiences of the adopters. An innovation that is compatible is perceived as filling a felt or unfelt need of the adopters. Descriptively, the faculty respondents in this study were in strong agreement that relative advantage and observability were significant impacts on the adoption and diffusion of WBETs. Limited resources would be well spent on improving faculty perceptions of the attributes of WBETs especially on 'compatibility', relative advantage and observability of the results of adopting WBETs.

From the barriers, administrators can expect that perceptions about infrastructure and technical expertise would pose the strongest barriers to the adoption and diffusion of WBETs. Given that Internet penetration in Ghana is still at its early stages, with high connection costs, and lack of computer maintenance and

repair facilities (Kenny, 2000), administrators can expect to spend more time explaining how they would address these issues. Concerns about the cost of adopting WBETs could also pose a significant a barrier if faculty members believe that their wages would be compromised due to the adoption and diffusion of WBETs. Since university teaching faculties are able to go on strikes if they are unhappy with wages, it may be important for administrators to explain how additional funding would be obtained outside of the limited university budget.

Perhaps the most fundamental finding of this research is that university faculty members do have perspectives that cannot be ignored. This finding is consistent with Miller and Shih's (1999) finding and asserts that since faculty are the key stakeholders in higher education who are ultimately responsible for delivering instruction to students their concerns and perceptions must be addressed if effective and high quality improvements to the educational process are to be attained. If their concerns and perspectives are considered in decision-making, faculty members would be more comfortable using WBETs in reaching more students (Ploghoft, 2003). They would feel more empowered as teaching professionals not only because they have more resources available to them but also because their views were considered in deploying these innovations. Carr (2000) asserts that the usefulness of WBETs and resources are determined by how the developer of the resource responds to the changing identified needs of the audience, purpose and content, funding conditions, and other variables that influence the development process. Furthermore, Carr (2000) proposes electing a "champion" committed to sustaining the vision,

purpose and functionality of the resources. Without such buy-in from faculty, the introduction of WBETs may not fully yield their benefits expected.

Using WBETs may also be a way to attract more professionals to the profession of teaching especially at the university level where shortages of teaching professionals causes a great strain on access and quality of education. Finally, soliciting faculty perceptions of WBETs would also help administrators and identify specific uses and technology needs peculiar to faculty at these universities and also make the investments in these WBETs worthwhile. Once all of these are addressed, the WBETs are sure to be used efficiently to attain desirable goals.

Recommendations

Many recommendations can be made about how to improve the adoption and diffusion of WBETs as a way of increasing students' access to institutions of higher education. In general, scarce university resources could be targeted at lowering faculty perceptions of barriers such as technical expertise, financial concerns and infrastructure, while simultaneously improving their perceptions of attributes of WBETs. Faculty member's perceptions may be improved through training classes that expose them to WBETs and enhance their competency in using them. In particular, a common training facility or laboratory could be provided where teaching professionals can practice the use of WBETs outside prior to their interactions with students.

In order for the educational courses or lectured offered through the use of or with WBETs to gain credibility among students and employers, courses and curricula would have to be developed effectively (Knowles, Holton, & Swanson, 1998, Boone, Safrit, & Jones, 2002). If the curricula do not meet the needs of students and employers, the physical investments in WBETs, infrastructure and other resources would be a waste. As such, another recommendation is that faculty members, departments and administration partner with established universities and programs that are experienced in effective curriculum design and the use of WBETs. In this regard, it is recommended that designed that are asynchronous in nature such as content on CD-ROMS, residing on local area networks be favored over synchronous designs that require live Internet connectivity. Limited bandwidth, infrastructure and cost constraints (Kenny, 2000) may make synchronous designs unreliable and ineffective in Ghana. It is also recommended that administrators and especially the government agencies responsible for education utilize WBETs at all sectors of the educational process so that students are familiar with the use of WBETs by the time they reach university. This way, faculty members can be comfortable of student readiness and ability to use and receive instruction delivered with WBETs.

Since funding is usually a major obstacle and significant barrier, it is recommended that departments write proposals to secure funding from sources associated with the World Bank's millennium development project which is promoting universal education for all (World Bank, 2004).

While research is widely available on faculty perceptions about the use of technology in education in the United States and the developed world, very little is available on faculty members at African institutions of higher learning. Since there are many cultural, socio-economic, and infrastructural, it is recommended that further research be conducted that includes a larger number of faculty members and more Ghanaian and African institutions of higher learning. Research including a larger sample size that explores a broader and deeper range of questions could yield more conclusive results. Such research would not only reinforce the findings of this study, but also extend the knowledge base available for decision-making and development. Further research could be conducted to explore other factors impacting the adoption and diffusion of WBETs as educational tools in Ghana.

Recommendations for further research include the following:

1. What are faculty perceptions of factors impacting the adoption and diffusion of WBETs at other institutions of higher learning in Ghana, Africa, and other developing countries?
2. What are faculty perceptions of other exogenous factors (socio-economic characteristics, socio-political factors, communications networks, foreign partners, etc.) impacting the adoption and diffusion of WBETs?
3. What are faculty perceptions of how WBETs can be effectively deployed and utilized as educational technologies in Ghana?
4. What are students' perceptions of factors impacting the adoption and diffusion of WBETs?

5. What is the level of students' readiness to receive instruction through WBETs.
6. What are other stakeholders' perceptions of factors impacting the adoption and diffusion of WBETs?
7. What are the linkages between faculty use of WBETs and students' educational achievement?
8. What are the linkages between faculty use of WBETs and access to education at the Ghanaian institutions of higher learning?
9. What are the linkages between the adoption and diffusion of WBETs and economic growth and development?

REFERENCES

Agunga, R. (1997). *The politics of distance education in the development of Africa.* Retrieved October 15, 2004, from http://www2.ncsu.edu/ncsu/aern/OSURAA.HTML

Ary, D., Jacobs, C. J., & Razavieh, A. (1996). *Introduction to research in education* (5th ed.). Fort Worth: Holt, Rinehart, and Winston, Inc.

Berge, Z. L. (1998). Barriers to online teaching in post-secondary institutions: Can policy changes fix it? *The Online Journal of Distance Learning Administration, 1*(2). Retrieved February 15, 2005 from http://www.emoderators.com/barriers/barrier1.html

Berge, Z. L. (1999). *Barriers to distance education survey*. Retrieved February 14, 2005, from http://cgi.umbc.edu/cgi-bin/dharley/misc/barrier_survey.pl

Betts, K. S. (1998). An institutional overview: Factors influencing faculty participation in distance education in postsecondary education in the United States: An institutional study. *The Online Journal of Distance Learning Administration, 1*(3). Retrieved February 14, 2005, from http://www.westga.edu/~distance /betts13.html

Boone, E. J., Safrit, R. D., & Jones, J. (2002). *Developing programs in adult education: A conceptual programming model* (2nd ed.). Prospect Heights, IL: Waveland Press, Inc.

Born, K. A., & Miller, G. (1999). Faculty perceptions of web-based distance education in agriculture. *Journal of Agricultural Education, 40*(3), 30-39.

Carr, J. A. (2000). Developing Web-based education resources: Lessons learned from three experiences. *Education Libraries, 25*(2), 13-21.

Carr, A., & Miller. G. (2001). Predictors of the adoption of educational technologies by faculty in the University of Guadalajara Center for Biology, Agronomic and Animal Sciences. *Journal of International Agricultural and Extension Education, 8*(1), 5-12.

Central Intelligence Agency. (2004). *The world factbook: Ghana*. Retrieved October 16, 2004, from http://www.cia.gov/cia/publications/factbook/print/gh.html

Colecchia, A. & Schreyer, P. (2001) ICT Investment and economic growth in the 1990s: Is the United States a unique case? A comparative study of nine OECD countries. Draft October 7th, 20001. Retrieved February 10, 2005 from http://www.ny.frb.org/newsevents/events/research/2001/schreyer.pdf

Davis, J. A. (1971). *Elementary survey analysis*. Englewood Cliffs, NJ: Prentice-Hall.

Dillman, D. A. (1978). *Mail and telephone surveys: The total design method*. New York: John Wiley and Sons.

Dooley, K. E., & Lindner, J. R. (2002). Competency-based behavioral anchors as authentication tools to document distance education competencies. *Journal of Agricultural Education, 43*(1), 24-35.

Dooley, K. E., Lindner, J. R., & Richards, L. J. (2003). A comparison of distance education competencies delivered synchronously and asynchronously. *Journal of Agricultural Education*, 44(1), 84-94.

Foster, W., Goodman, S., Osiakwan, E., & Bernstein, A. (2004). Global diffusion of the Internet IV: The Internet in Ghana. *Communications of Association of Information Systems, 13*(38), 1-47.

Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational research: An introduction* (6th Edition.). White Plains, NY: Longman.

Hanna, D. E. (1999). Higher education in an era of digital competition: *Choices and Challenges*. Madison, WI: Atwood Publishing.

Hopey, C.E., & Ginsburg, L. (1996). Distance learning and new technologies: You can't predict the future but you can plan for it. *Adult Learning*, *8*(1), 212-23.

International Monetary Fund (2004). *Ghana: Poverty reduction strategy paper annual progress report.* IMF Country Report 04/207, July 2004. Retrieved February 14, 2005 from http://www.imf.org/external/pubs/ft/scr/2004/cr04207.pdf

http://www.imf.org/external/pubs/ft/scr/2004/cr04207.pdf

Jones, E., Lindner, J. R., Murphy, T. H., & Dooley, K. E. (2002). Faculty philosophical position towards distance education: Competency, value, and educational technology support. *Online Journal of Distance Learning Administration, 5*(1). Retrieved February 15, 2005 from http://www.westga.edu/~distance/ojdla/spring51/jones51.html

Kenny, C. J. (2000). Expanding Internet access to the rural poor in Africa. Retrieved February 10, 2005 from http://www.itu.int/africainternet2000/Documents/doc7_e.htm

Kilian, C. (1997, July/August). Why teach online. *Educom Review*, *32*(4), 31-34.

Knowles, S. M., Holton, E. F., & Swanson, R. A., (1998). *The adult learner: The definitive classic in adult education and human resource development.* Gulf Publishing Company: Houston, TX.

Li, Y. (2004). *Faculty perceptions about attributes and barriers impacting diffusion of WBDE at the China Agricultural University.* Unpublished doctoral dissertation, Texas A&M University, College Station, TX.

Lindner, J. R., & Murthy, T. H. (2001). Student perceptions of WebCT in a web supported instructional environment: Distance education technologies for the classroom. *Journal of Applied Communications, 85*(4), 36-47.

Lindner, J. R., Murphy, T.H., & Dooley K.E. (2001). Factors affecting faculty adoption of distance education: competency, value, and educational technology support. *Proceedings of the 20th Annual Western Region Agricultural Education Research Meeting, Carmel, California.*

Lindner, J. R., Murphy, T. H., & Dooley, K. E. (2002). Factors affecting faculty perceptions of technology-mediated instruction: Competency, value, and educational technology support. *NACTA Journal, 46*(4), 2-7.

McNeil, D. R. (1990). *Wiring the ivory tower: A round table on technology in higher education*. Washington, DC: Academy for Educational Development.

Millennium Development Goals (2005). Retrieved June 23, 2005 from http://web.worldbank.org/WBSITE/EXTERNAL/WBI/WBIPROGRAMS/CGCS

RLP/0,,contentMDK:20459496~pagePK:64156158~piPK:64152884~theSitePK:460861,00.html

Miller, G., & Shih, C. (1999). Comparing quality in on-campus and off-campus courses: Perceptions of college of agricultural faculty. *Journal of Agricultural Education, 40*(1), 49-56.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.

Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view.* Belmont, CA: Wadsworth Publishing Company.

Murphrey, T. P., & Dooley, K. E. (2000). Perceived strengths, weaknesses, opportunities, and threats impacting the diffusion of distance education technologies in a college of agricultural and life sciences. *Journal of Agricultural Education, 41*(4), 39-50.

Murphrey, P., & Dooley, K. E. (2003). *Perceived strengths, weaknesses, opportunities and threats that impact the diffusion of distance education technologies for college of agriculture and life sciences in land grant institutions.* Proceedings 27th Annual National Agricultural Education Research Conference. Retrieved February 15, 2005 from http://aaaeonline.ifas.ufl.edu/NAERC/2000/web/i3.PDF

Murphy, T. & Terry, R. (1998). Faculty needs associated with agricultural distance education. *Journal of Agricultural Education, 39*(1), 17-27.

Owston, R. (1997). The world wide web: A technology to enhance teaching and learning? *Educational Researcher, 26*(2), 27-33.

Pardue, S. L. (2001). *Education and production. The virtual revolution: Implications for Academe*. Poultry Science Association. Retrieved February 15, 2005 from http://www.poultryscience.org/psa/toc/papers/01/ps01553.pdf

Ploghoft, M. E. (2003). The World Bank in cyberspace. *The African Symposium, 3*(3). Retrieved July 27, 2005 from http://www2.ncsu.edu/ncsu/aern/plowbank.html

Potter, G. (2003). *A comparison of Chinese and western distance education initiatives: Educational goals and instructional practices.* Paper presented on Distance Learning and the Internet Conference 2003. Singapore. Retrieved June 12, 2005, from http://www.cit.nus.edu.sg/dli2003/Presentation/Geoff_Potter.pdf

Quaynor, N., Tevie, W., & Bulley, A. (1997). *Expansion of the Internet backbone in Ghana*. Accra, Ghana: Network Computer Systems. Retrieved October 29, 2004 from http://www.isoc.org/inet97/proceedings/E5/E5_2.HTM

Roeger, W. (2001). *The contribution of information and communication technologies to growth in Europe and the US: A macroeconomic analysis.* Commission of the EC, Directorate-General for Economic and Financial Affairs (DG ECFIN) B-1049 Brussels, Belgium, in its series European Economy - Economic Papers with number 147 Retrieved February 14, 2005 from http://ideas.repec.org/p/fth/eeccco/147.html

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

Russell, T. L. (1999). *The no significant difference phenomenon*. Raleigh: North Carolina State University.

Schifter, C. (2000). Faculty participation in asynchronous learning networks: A case study of motivating and inhibiting factors. *Journal of Asynchronous Learning Network, 4*(1). Retrieved February 15, 2005 from http://sloan-c.org/publications/jaln/v4n1/pdf/v4n1_schifter.pdf

Schifter, C. (2004). (Abstract Only) Faculty participation in distance education programs: Practices and plans. *The distance education evolution: Issues and case studies.* Hershey, PA: Idea Group Publishing, 22 - 39 Retrieved February 15, 2005 from http://portal.acm.org/citation.cfm?id=973547

Schreyer, P. (2000). The contribution of ICTs to output growth: A study of the G7 countries. OECD March 2000. Retrieved February 25, 2005 from http://www.oecd.org/dataoecd/25/38/1826375.pdf

Thompson, M. (2004). Faculty self-study research project: Examining the online workload. *Journal of Asynchronous Learning Network, 8*(3). Retrieved February 15, 2005 from http://www.sloan-c.org/publications/jaln/v8n3/pdf/v8n3_thompson.pdf

University of Cape Coast (2004). University of Cape Coast home page. Retrieved October 31, 2004 from http://www.uccghana.net/Schools/Faculties.htm

University of Ghana (2004). University of Ghana home page. Retrieved October 31, 2004 from http://www.ug.edu.gh/content.asp?ID=130&db=3

World Bank (2003a). The African virtual university and growth in Africa: A knowledge and learning challenge. The Human Development Findings 223. Retrieved September 19, 2004 from http://www.worldbank.org/afr/findings/english/find223.pdf

World Bank (2003b). *Ghana country data profile*. Retrieved March 28, 2004 from http://devdata.worldbank.org/external/CPProfile.asp?CCODE=gha&PTYPE=CP

World Bank (2003c). *The Africa Virtual University*. Retrieved March 28, 2004 from http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:20135709~menuPK:64256345~pagePK:34370~piPK:34424~theSitePK:4607,00.html

World Bank (2004). *Ghana education sector project: Project appraisal document.* Report No. 26090 GH. Retrieved from http://www

World Bank (2005a) The millennium development goals. Retrieved June 23, 2005 from http://ddp-ext.worldbank.org/ext/MDG/homePages.do

World Bank (2005b). The millennium development goals report 2005. Retrieved June 23, 2005 from http://siteresources.worldbank.org/NEWS/PressRelease/20534432/un-mdg-release-060905.pdf

APENDIX A

INSTRUCTIONAL REVIEW BOARD –

HUMAN SUBJECTS IN RESEARCH

APPROVAL LETTER

VPR
Office of the Vice President for Research
Texas A&M University

Academy for Advanced Telecommunication and Learning Technologies
Center for Information Assurance and Security
Comparative Medicine Program
Institute for Scientific Computation
Institute for Telecommunications and Information Technology
Integrative Center for Homeland Security
Microscopy Imaging Center
Office of Business Administration
Office of Distance Education
Office of Graduate Studies
Office of Organizational Development and Diversity
Office of Proposal Development
Office of Research Compliance
Office of Sponsored Projects
Professional Development Group
Technology Commercialization Center
Technology Licensing Office
Texas A&M University Research Park

Texas A&M University

1112 TAMU
312 Administration Building
College Station, Texas
77843-1112

979.845.8585
FAX 979.845.1835

Date 12/08/2004

MEMORANDUM

TO: Jemima Yakah
Dept. of Agricultural Education
MS 2116

FROM: Dr. E. Murl Bailey, CIP, Advisor
Institutional Review Board
MS 1112

SUBJECT: IRB Protocol Review

Title: Faculty Perceptions about Attributes and Barriers Impaction Diffusion of Web-based Educational Technologies a the University of Cape Coast and the University of Ghana, Legon

Protocol Number: 2004-0616
Review Category: Exempt from Full Review
Approval Date: December 8, 2004 **to** December 7, 2005

The approval determination was based on the following Code of Federal Regulations
http://ohrp.osophs.dhhs.gov/humansubjects/guidance/45cfr46.htm

_____ **46.101(b)(1)**	_____ **46.101(b)(4)**
_/_____ **46.101(b)(2)**	_____ **46.101(b)(5)**
_____ **46.101(b)(3)**	_____ **46.101(b)(6)**

Remarks: Request of waived signed consent has been approved.

After specific review, it has been determined that approval for waiver of the requirement to obtain signed informed consent may be granted under 45 CFR 46.117(c). However, a study information sheet with all elements of consent must be provided to study participants.

The Institutional Review Board – Human Subjects in Research, Texas A&M University has reviewed and approved the above referenced protocol. Your study has been approved for one year. As the principal investigator of this study, you assume the following responsibilities:

***Renewal*:** Your protocol must be re-approved each year in order to continue the research. You must also complete the proper renewal forms in order to continue the study after the initial approval period.

***Adverse events*:** Any adverse events or reactions must be reported to the IRB immediately.

***Amendments*:** Any changes to the protocol, such as procedures, consent/assent forms, addition of subjects, or study design must be reported to and approved by the IRB.

***Informed Consent/Assent*:** All subjects should be given a copy of the consent document approved by the IRB for use in your study.

***Completion*:** When the study is complete, you must notify the IRB office and complete the required forms.

PART 46.101 PROTECTION OF HUMAN SUBJECTS

46.101

(a) Except as provided in paragraph (b) of this section, this policy applies to all research involving human subjects conducted, supported or otherwise subject to regulation by any Federal Department or Agency which takes appropriate administrative action to make the policy applicable to such research. This includes research conducted by Federal civilian employees or military personnel, except that each Department or Agency head may adopt such procedural modifications as may be appropriate from an administrative standpoint. It also includes research conducted, supported, or otherwise subject to regulation by the Federal Government outside the United States.

(1) Research that is conducted or supported by a Federal Department or Agency, whether or not it is regulated as defined in 46.102(e), must comply with all sections of this policy.

(2) Research that is neither conducted nor supported by a Federal Department or Agency but is subject to regulation as defined in 46.102(e) must be reviewed and approved, in compliance with 46.101, 46.102, and 46.107 through 46.117 of this policy, by an Institutional Review Board (IRB) thatoperates in accordance with the pertinent requirements of this policy.

(b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:[1]

(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section, if:
(i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) Federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.

(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.

(5) Research and demonstration projects which are conducted by or subject to the approval of Department or Agency heads, and which are designed to study, evaluate, or otherwise examine:
(i) Public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs.

(6) Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food isconsumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture.

APPENDIX B

PANEL OF EXPERTS

Panel of Experts

Dr. James Lindner, Associate Professor, Department of Agricultural Education, Texas A&M University

Dr. Kim Dooley, Associate Professor, Department of Agricultural Education, Texas A&M University

Dr. James Christiansen, Professor, Department of Agricultural Education, Texas A&M University

Dr. Anna Barnes, Academic Dean, School of Agriculture, University of Ghana, Legon

Dr. Mumuni Dakubu, Professor, Chemistry Department, University of Ghana, Legon

APPENDIX C

INVITATION LETTER TO AD HOC ADVISOR

Prof. Anna R. Barnes
Ag. Provost
College of Agriculture
University of Ghana, Legon
Ghana

November 15, 2004

Dear Barnes:

Per our conversation enclosed are about a hundred and twenty questionnaires for faculty at the university. I am interested in getting as many instructors (Professors and Lecturers) as possible from the school of agriculture and any other departments that use computers or other web-based technologies in their classes. I have learned that there are some instructors that work with the African Virtual University project on campus that use these technologies in their classes. I hope that we can somehow reach them as well.

My goal is to get at least 200 faculty members to participate in this study from the University of Cape Coast and the University of Ghana, Legon. All individual responses about respondents will be kept confidential and will not be published or disclosed. All information obtained will be discussed in group form only. For now, I hope that all completed the survey, can be returned to your office. But in the future they may be returned by January 7, 2005 through a prepaid envelope that I hope to arrange to provide once I arrive on December 16th.

Dr. Barnes, thank you for help. There is no way I could carryout this study without your support. I really appreciate your time and effort.

Sincerely,

Jemima A. Yakah
Masters Student
Department of Agricultural Education
Texas A&M University
2116 TAMU
College Station, Texas 77843-2116

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Cell: 404-550-2562
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APPENDIX D

INVITATION LETTER TO PARTICIPANTS

November 8, 2004

Dear faculty member:

The use of Web-based Educational Technologies such as online courses and references, audio/video materials (streaming video), the Internet, multimedia peripherals, electronic mail, compact disks (CD-ROMs), and other web or Internet-based educational tools, as the main tools for enabling instructors and students accomplish a certain teaching and learning objective within a certain period of time, is on the rise worldwide and in Ghana. For example the University of Cape Coast and the University of Ghana now have Africa Virtual University Centers, several Internet cafes and other facilities have introduced the use of web-based educational technologies to these campuses.

It is expected that the use of Web-based Educational Technologies will become more common over time. However, limited research has been conducted to assess the diffusion of web-based educational technologies in higher education. The attached survey on faculty perceptions about the attributes and barriers impacting the development and use of Web-based educational technologies in institutions of higher education in Ghana is to enhance our understanding of this phenomenon. It is our hope that this study will lead to further research, identifying solutions to enhance the effective diffusion and use of technology in education.

Approximately 200 faculty members are being asked to participate in this study from the University of Cape Coast and the University of Ghana, Legon. All individual responses about you the respondent are confidential and will not be published or disclosed. All information obtained will be discussed as part of a group. The questionnaires have been coded to track those who do not respond. If you are uncomfortable with any statement or question, you do not have to answer it. Once you have completed the survey, please return it by January 7, 2005 in the prepaid envelope provided.

This research study has been reviewed and approved by the Institutional Review Board - Human Subjects in Research, Texas A&M University. For research-related problems or questions regarding subject's rights, contact the institutional Review Board through Dr. Michael W. Buckley, Director of Compliance and Administration, Office of Vice President for Research at (979) 458-4067. Please contact Jemima Yakah by telephone at 1(979) 845-2972 or by email at jyakah@tamu.edu with any other problems or questions.

Again, thank you for participating in this study. Your time and effort is greatly appreciated!

Sincerely,

Jemima A. Yakah
Masters Student
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Enclosure: One double-sided survey and return envelope.

APPENDIX E

QUESTIONNAIRE

FACULTY PERCEPTIONS OF ATTRIBUTES AND BARRIERS IMPACTING THE DIFFUSION OF WEB-BASED EDUCATIONAL TECHNOLOGIES AT THE UNIVERSITY OF CAPE COAST, AND THE UNIVERSITY OF GHANA, LEGON

QUESTIONNAIRE

The following questionnaire is designed to gather data on faculty perceptions about attributes and barriers impacting the diffusion of Web-based educational technologies at the University of Cape Coast and the University of Ghana at Legon. For the purpose of this study, '**Web-based Educational Technologies'** are defined as the use of online courses and references, computers, audio/video materials (streaming video), the Internet, multimedia peripherals, electronic mail, content on compact disks (CD-ROMs), etc. as part of an educational method in which these Web or Internet-based educational tools are the main tools that enable instructors and their students to accomplish a certain teaching and learning objective, within a certain period of time.

For example, a course, program, or lecture that by design includes audio/video materials (streaming video), online courses or references accessed by students online, or accessed by a professor online during the course of a lecture session or by students asynchronously will be considered to be using Web-based educational technologies.

For the purpose of this study, attributes are those factors that enhance the use of web-based educational technologies as educational tools. Barriers refer to those factors that hinder the use of web-based educational technologies as educational tools. The questionnaire is divided into four parts. Please read the directions for each part before responding. All individual responses are confidential. No individual information about the respondent will be published or disclosed. Your responses will be combined with that of others and reported as grouped data. The questionnaires have been coded to help track those who do not respond.

This information is being gathered and analyzed as part of the requirements for completing my master's degree. It will take approximately ten minutes to fill out the questionnaire. Please return the completed survey in the envelope provided by January 7, 2005.

If you have any questions about this survey, please contact me at jyakah@tamu.edu or 1-979-845-2972. Thank you for taking time to fill out this questionnaire to enhance our understanding of factors that affect the diffusion of Web-based educational technologies.

Sincerely,

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PART I: STAGES OF THE INNOVATION-DECISION PROCESS

1. Please indicate your attitude toward the statement described below.

Limited access to higher education by students is a big problem for Ghanaian institutions of higher education.

_____ I agree.

_____ I disagree.

_____ I am not sure.

2. Select the ONE statement that best reflects your current attitude toward Web-based educational technologies.

√ **Check One**	**Statement**
_____	I have not used Web-based educational technologies and have no plans for using them.
_____	Web-based educational technologies <u>may be</u> a way to reach more students in Ghanaian higher education.
_____	Web-based educational technologies <u>are</u> a way to reach more students in Ghanaian higher education.
_____	I know the benefits of Web-based educational technologies. In the near future, I will try them in my own teaching.
_____	I am currently using Web-based educational technologies and they help me reach students that otherwise do not have access to higher education programs.
_____	I have used Web-based educational technologies for more than one semester and plan on continuing to do so.

PART II: ATTRIBUTES IMPACTING DIFFUSION OF WEB-BASED EDUCATIONAL TECHNOLOGIES

Below is a list of attributes that may impact the diffusion of Web-based educational technologies. Please read each item carefully and indicate your perception about the influence of each item about the use of Web-based educational technologies.

Use the following scales to indicate your response. Circle the best response.

1=Strongly Disagree (**SD**)
2=Disagree (**D**)
3=Neutral (**N**)
4=Agree (**A**)
5=Strongly Agree (**SA**)

Items	**SD**	**D**	**N**	**A**	**SA**
1. Relative Advantage					
Using Web-based educational technologies could reach more students.	1	2	3	4	5
Using Web-based educational technologies could provide more scheduling flexibility and save time	1	2	3	4	5
Using Web-based educational technologies could give me access to more teaching resources.	1	2	3	4	5
Web-based educational technologies could be provided economically.	1	2	3	4	5
2. Compatibility					
Web-based educational technologies are available to me.	1	2	3	4	5
Using Web-based educational technologies are acceptable to me.	1	2	3	4	5
Procedures used in Web-based educational technologies would fit well with my teaching conditions.	1	2	3	4	5
Web-based educational technologies are available to students.	1	2	3	4	5

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Items (cont')	SD	D	N	A	SA
3. Complexity					
Web-based educational technologies are readily available to faculty.	1	2	3	4	5
Web-based educational technologies are easy to use.	1	2	3	4	5
The changes in teaching methodology necessary to use Web-based educational technologies are easy to understand.	1	2	3	4	5
The changes in teaching methodology necessary to use Web-based educational technologies will be easy for me to implement.	1	2	3	4	5
4. Trialability					
It is possible for me to deliver selected portions of a course (a single lesson or unit) using Web-based educational technologies prior to developing an entire course.	1	2	3	4	5
It is currently possible for me to incorporate selected teaching materials (e.g., readings, assignments, references) on the Web in support of my classes.	1	2	3	4	5
It is currently possible for me to accomplish some teaching functions (e.g., reporting grades, communication with students, demonstrations, identify sources and references) on the Web.	1	2	3	4	5
It is possible for students to use Web-based educational technologies (e.g., Accessing the Internet, downloading and uploading materials, watching video lessons, chatting on-line, etc.).	1	2	3	4	5
5. Observability					
I know of some faculty members who are using Web-based educational technologies.	1	2	3	4	5
I have observed some Web-based courses on my campus.	1	2	3	4	5
I am aware of the benefits of Web-based educational technologies for students.	1	2	3	4	5
I am aware of the limitations of Web-based educational programs for students.	1	2	3	4	5

PART III: BARRIERS TO DIFFUSION OF WEB-BASED EDUCATIONAL TECHNOLOGIES

Below is a list of possible barriers to using Web-based educational technologies. Please read each item under each group carefully and indicate your perception about the influence of
the item on developing educational programs and using Web-based educational technologies.

Use the following scales to indicate your response. Circle the best response.

1=No Barrier (**NB**)
2=Weak Barrier (**WB**)
3=Moderate Barrier (**MB**)
4=Strong Barrier (**SB**)
5=Very Strong Barrier (**VSB**)

Items	**NB**	**WB**	**MB**	**SB**	**VSB**
1. Concerns about time					
Increased faculty time commitment for course development.	1	2	3	4	5
Increased faculty time for on-line communication with students.	1	2	3	4	5
Increased faculty time for getting feedback from students.	1	2	3	4	5
Increased faculty time to explore more research, information, and educational materials.	1	2	3	4	5
2. Concerns about Incentives					
Monetary compensation for adopting Web-based educational technologies.	1	2	3	4	5
Incentives for adopting Web-based educational technologies.	1	2	3	4	5
Recognition for adopting Web-based educational technologies.	1	2	3	4	5
Awards for adopting Web-based educational technologies.	1	2	3	4	5
Continues on Next Page →→→					

Items (Cont')	NB	WB	MB	SB	VSB
3. Credibility of programs using Web-based educational technologies					
Concerns about evaluation of students' work.	1	2	3	4	5
Concerns about testing of students' work.	1	2	3	4	5
Concern that programs using Web-based educational technologies lower the quality of students who are admitted.	1	2	3	4	5
Concern that programs using Web-based educational technologies lower the expectations for student learning.	1	2	3	4	5
4. Financial concerns					
Increased tuition and fee rates.	1	2	3	4	5
Increased payment for cost of technologies.	1	2	3	4	5
Sharing revenue with department or business units.	1	2	3	4	5
Lack of money to implement programs using Web-based educational technologies.	1	2	3	4	5
5. Planning issues					
Lack of identified need (perceived or real) for Web-based educational technologies.	1	2	3	4	5
Lack of shared vision for the role of Web-based educational technologies in the organization.	1	2	3	4	5
Lack of strategic planning for Web-based educational technologies.	1	2	3	4	5
Lack of departmental 'champions' of Web-based educational technologies within the university.	1	2	3	4	5
6. Fear of technology					
Threat to instructors' sense of competence and authority.	1	2	3	4	5
Belief that job security is threatened.	1	2	3	4	5
Concern for legal issues (e.g., computer crime, hackers, software piracy, copyright).	1	2	3	4	5
Increased isolation of instructors.	1	2	3	4	5
Continues on Next Page →→→					

Items (Cont')	NB	WB	MB	SB	VSB
7. Conflict with traditional education					
Competition with on-campus offerings or competition for existing students.	1	2	3	4	5
Disruption of the social organization of the traditional classroom.	1	2	3	4	5
Traditional academic calendar/schedule hinders use of Web-based educational technologies.	1	2	3	4	5
Lack of person-to-person contact (i.e., lack of face-to-face interaction with students; difficulty building rapport with participants at a distance).	1	2	3	4	5
8. Technical expertise					
Lack of technical support.	1	2	3	4	5
Lack of training programs for using Web-based educational technologies.	1	2	3	4	5
Lack of knowledge about Web-based educational technologies.	1	2	3	4	5
Lack of the "right" people to implement Web-based educational technologies.	1	2	3	4	5
9. Administrative support					
Lack of support or encouragement from administrators.	1	2	3	4	5
Copyright issues in using materials in programs with Web-based educational technologies.	1	2	3	4	5
Difficulty in recruiting faculty.	1	2	3	4	5
Difficulty in recruiting students.	1	2	3	4	5
10. Infrastructure					
Lack of adequate technology-enhanced classrooms/labs/infrastructure/technical services.	1	2	3	4	5
Lack of adequate student access to computers and the Internet.	1	2	3	4	5
Lack of adequate instructor access to computers and the Internet.	1	2	3	4	5
Lack of library access or delivery of materials.	1	2	3	4	5

PART IV: PERSONAL CHARACTERISITICS

Please indicate your responses to the following questions:

1. Which University are you from? _____

2. Which College are you from? _____

2. What is your gender? _____Male _____Female

3. What is your age? _____Years

4. What is your highest degree earned? __Bachelors __Master's __Doctoral

5. What is your rank as faculty? _____ Lecturer
_____ Associate Professor
_____ Professor

6. How many years have you taught at the university level? _____

7. Have you taught courses using Web-based educational technologies? _____Yes
_____No

If yes, please indicate the type and duration of Web-based educational technologies you have used (select all appropriate).

_____Web-based distance education program _____Years

_____Content on CD-ROMS with online component _____Years

_____Web-based references, publications, & libraries _____Years

_____Other (please list) _____ _____Years

In the space below, provide any additional comments you wish to share:

Please return the completed questionnaire in the return envelope provided.

THANK YOU FOR YOUR TIME AND HELP!

VITA

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