Assessing Adoption Theory in Relation to the Electronic Application for Government-Sponsored Health Insurance

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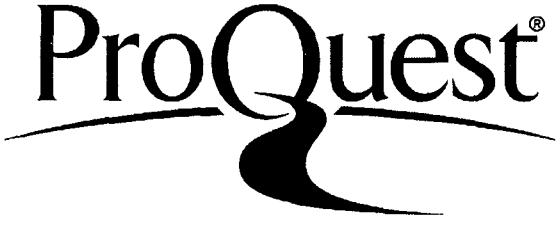

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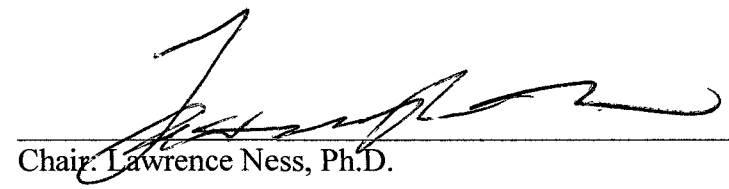

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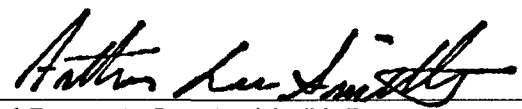

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Abstract

The problem investigated in this study was the low adoption rate of an electronic government system known as COMPASS and used by Pennsylvania residents to apply for a health insurance program supported by state and federal funds and managed by state government employees. Low utilization of electronic government systems has been a problem in the United States and various parts of the world. Review of the literature on diffusion and adoption theory indicated that demographic variables such as the age, ethnicity, gender, income, and race of citizens could be associated with adopting electronic government systems. This type of demographic information and the method of applying for coverage, either online or through other means were available from a database of applications to the health insurance program. These secondary data were used as a basis for a quantitative research design, involving correlational and comparative analyses, to investigate the possible connection of the age, income, race, gender, and ethnicity of applicants with adoption of COMPASS to apply for the health insurance program. Analyses were performed on 603 applications selected at random from the database. Logistic regression was used to assess the hypotheses concerning the income and age of applicants. The analyses indicated that income was significantly related to the probability of adoption of COMPASS, $z = 3.29$, $p = .001$, and that age was not significantly related to COMPASS adoption, $z = -1.63$, $p = .052$. Based on the proportion adopting COMPASS, statistically significant differences were observed between groups formed by applicant gender, $z = 3.14$, $p = .001$, and ethnicity, $z = 2.39$, $p = .008$. No significant difference was detected in the proportion of applicants using COMPASS among three racial groups, $\chi^2(2, N = 603) = 0.04$, $p = .979$. The study results indicated

disparities in COMPASS adoption based on the income, gender, and ethnicity of citizens and the possible need for continued offering of traditional, nonelectronic methods to apply for government-sponsored health care coverage. Research concerning the determinants of COMPASS adoption was recommended to help identify factors that could reduce disparities in adoption of electronic government systems.

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Chapter 1: Introduction

An innovation is a concept, behavior, procedure, product, or service perceived to be new by an individual (Mothe & Thi, 2010). A recent discovery or new invention could be thought of as an innovation. Moreover, an idea or product could be classified as an innovation if it is perceived to be new by an individual, regardless of the lapse of time since the first use or discovery of the idea or product (Bao, 2009; Rogers, 2003). Examples of an innovation could be a consumer product introduced to the market such as an iPod, a new method to sanitize water, or the capability to conduct business transactions through the Internet in addition to traditional modes.

Conducting business transactions through the Internet, or electronic commerce (e-commerce), has transformed the method consumers interact with retailers (Grewal & Levy, 2009). Similarly, personnel working for local, state, and national governments in a number of countries are conducting electronic government (e-government) transactions through use of the Internet (Carter & Weerakkody, 2008; Mirchandani, Johnson, & Joshi, 2009; Olphert & Damodoran, 2007; Rose, 2005). A study was conducted to investigate the adoption of a particular e-government application used by citizens to apply for government-sponsored health insurance. A number of diffusion and adoption theories have been developed and have been discovered to be useful in studying the dissemination of e-government systems (Carter & Weerakkody, 2008; Mirchandani et al., 2009; Olphert & Damodoran, 2007; Rose, 2005). The intent of the current study was to evaluate some of the concepts presented in the literature on diffusion theory and adoption of e-government systems as well as to supplement the literature with additional findings. The focus of this chapter is to introduce the adoption problem studied, the purpose of the

research, the research questions posed, and to define the special terms associated with diffusion theory and the health insurance program studied.

Background

The issue of paying for health care is a concern to many people. For instance, in a recent study, researchers discovered that 55% of Americans "say that they or another member of their household have put off some sort of needed medical care because of the cost over the past 12 months" (Henry J. Kaiser Family Foundation, 2009, p. 1). The researchers from this Foundation also stated that 43% of Americans lacking health insurance were experiencing difficulties paying for health care they had received. In addition, 45.7 million Americans were without health insurance in 2007 (DeNavas-Walt, Proctor, & Smith, 2008). To help provide health insurance to people lacking coverage, officials from the federal government have collaborated with state government administrators to institute a number of programs. For example, federal officials established a national program, called Medicaid, in 1965 (Milio, 2000). As another example, public officials in Pennsylvania created the Children's Health Insurance Program (CHIP) in 1992 (Pennsylvania Insurance Department [PID], 2008b). Although initially funded with only state appropriations, the CHIP program is supported through a combination of state and federal funds. Uninsured children up to age 19 and residing in families with household incomes greater than the limits for Medicaid may be enrolled in health care coverage through CHIP (PID, 2008a).

Similar to personnel working in private industry, public officials are interested in employing the Internet to provide services, including the ability to apply for CHIP. For instance, administrators in Pennsylvania launched an Internet-based program called the

Commonwealth of Pennsylvania Application for Social Services (COMPASS) in 2001 (PID, 2008b). Through employment of this program, individuals may apply for CHIP and a number of other social services (Commonwealth of Pennsylvania, n.d.).

As with other innovations, public administrators may be interested in the diffusion and adoption of e-government applications such as COMPASS. One reason is that public officials in Pennsylvania are concerned with the effect of electronic application methods on increasing enrollment in CHIP (PID, 2008b). To examine the adoption of COMPASS, research concerning diffusion and adoption theories was warranted.

The dissemination of a wide variety of innovations has been studied in the development of the diffusion and adoption theories in existence. For example, Rogers (2003) reported on studies of the diffusion of agricultural practices, education methods, pharmaceutical products, techniques to prevent diseases, and family planning practices among a plethora of other innovations. Based on his research, Rogers developed a number of theories and generalizations regarding the diffusion and adoption of innovations. Other researchers, such as Davis (1989) and Venkatesh and Davis (2000), were more focused in their work and studied the acceptance and adoption of computer-based technologies. The primary model resulting from the work of Davis (1989) was the technology acceptance model (TAM). More recently, a number of investigators combined elements of the theories developed by Rogers, variables from the TAM, and other constructs, such as trustworthiness or service quality, to study the intention to use e-government services (Carter, 2008; Carter & Belanger, 2005; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). Because diffusion and adoption theories have been helpful in studying the dissemination of a diverse set of innovations, including e-

government services, the theories may also be useful to investigate the diffusion and adoption of COMPASS as a means to apply for CHIP.

Problem Statement

The problem addressed in the current study was the low adoption rate of COMPASS among CHIP applicants (PID, 2010a). Only 17% of CHIP applicants used COMPASS as the method for making an application during the period of July through November 2010 (PID, 2010a). The issue of low utilization of e-government systems has been a problem in various parts of the United States and in other countries (Abu-Shanab, Al-Rub, & Not, 2010; Carter & Weerakkody, 2008; Henriksen & Damsgaard, 2007; Kolsaker & Lee-Kelly, 2008; Lee, Tan, & Trimi, 2005).

One potential reason for low utilization of e-government services is the existence of a digital divide in the United States (U.S. Government Accountability Office [GAO], 2005). The existence of a digital divide could mean members of some demographic groups will benefit from Internet-based services more than members of other demographic groups. For example, when Rogers (2003) developed the diffusion of innovations theory, he revealed a person's wealth could influence the adoption of an innovation such as the Internet. Further, developers of the unified theory of acceptance and use of technology (UTAUT) discovered differences between members of various age and gender groups in relation to adoption of information technologies (Venkatesh, Morris, Davis, & Davis, 2003). Other researchers have asserted that racial and ethnic differences could be associated with e-government adoption (Carter & Weerakkody, 2008; Rose, 2005). Although a small number of researchers have studied some demographic variables in relation to acceptance of e-government, these studies have

measured the intention to use e-government rather than usage behavior (Carter & Belanger, 2005; Lopez-Sisniega, 2009). Because use intentions may underestimate or overestimate usage behavior, the connection of demographic variables to e-government use may be imprecise (Van Ittersum & Feinberg, 2010). The research conducted in the current study helped clarify the relationship of demographic variables to e-government usage behavior.

Purpose

The purpose of this quantitative study was to examine the extent of a possible association of the age, income, gender, race, and ethnicity of applicants for CHIP in Pennsylvania with the choice of adopting or not adopting COMPASS to apply for health care coverage. The demographic information and the method of applying for coverage, either online or through other means, were available in a database of applications to CHIP. The database contains approximately 22,000 applications made during the 5-month period of July through November 2010. A power analysis indicated that a random sample of 603 applications, containing complete demographic information, was required to complete the study. Correlational and comparative analyses were performed with the application data to investigate the research questions.

Theoretical Framework

Numerous researchers have conducted studies related to the diffusion and adoption of an innovation. One of the most prolific researchers is Everett M. Rogers (Dayton, 2006). By analyzing his own research and the research of others, Rogers (2003) constructed a number of theories and generalizations concerning the diffusion and adoption of an innovation. The theories of Rogers are relevant to the current study

because the theories form the basis for much of the research on e-government adoption. Rogers' theories cover four broad topics that may affect the diffusion and adoption of an innovation. The four areas are (a) attributes of the innovation, (b) techniques used to communicate information about the innovation, (c) the time taken to diffuse the innovation, and (d) characteristics of potential adopters. The current study involved the fourth area: characteristics of potential adopters.

Although Rogers (2003) researched the diffusion and adoption of innovations in a general sense, Davis (1989) developed the TAM to study the adoption of computer-based technologies, especially in a work environment. With the TAM, two principal variables are used to predict the adoption of a new technology: perceived ease of use and perceived usefulness of the technology. The TAM has been employed by a number of researchers of e-government adoption (Carter & Belanger, 2005; Lopez-Sisniega, 2009; Schaupp & Carter, 2005; Orgeron, 2008).

Venkatesh and Davis (2000) extended the TAM by introducing a new construct called *subjective norm*. Venkatesh and Davis defined subjective norm as, "a person's perception that most people who are important to him think he should or should not perform the behavior in question" (p. 187). Venkatesh and Davis maintained that social normative factors might influence a person by promoting a favorable image within a social group. Venkatesh and Davis called the extended model TAM2. In addition, the developers of TAM2 worked with other researchers to combine elements of the TAM with attributes of seven other diffusion models to create the UTAUT (Venkatesh et al., 2003).

While developing the UTAUT, Venkatesh et al. (2003) revealed differences between age and gender groups in relation to the adoption of information technology. One of the objectives of the current study was to determine if age and gender variables were also connected to the adoption of an e-government system. Although the research of Venkatesh et al. (2003) indicated the UTAUT could be useful in studying technology adoption, other researchers asserted the UTAUT has not been thoroughly proven to predict adoptive behavior (Straub, 2009; Zhang, Guo, Chen, & Chau, 2009).

Whereas the work of Rogers (2003), Davis (1989), Venkatesh and Davis (2000), and Venkatesh et al. (2003) formed significant theoretical foundations, other researchers combined elements of the theoretical models to study the intention of individuals to adopt e-government services (Carter, 2008; Carter & Belanger, 2005; Carter & Weerakkody, 2008; Das, DiRienzo, & Burbridge, 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). Although some of the investigators revealed that age and gender did not affect the intention to use e-government services (Carter & Belanger, 2005; Lopez-Sisniega, 2009), the focus of many of the studies was on attributes of a particular e-government system, trust of the Internet, trust of government personnel, and other constructs rather than demographic characteristics of potential adopters of e-government. The research in this study concentrated on the possible connection of demographic variables of potential adopters with e-government use. Moreover, much of the prior research concerning e-government adoption measured the intention to use e-government systems (Carter, 2008; Carter & Belanger, 2005; Carter & Weerakkody, 2008; Das et al., 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005).

In contrast, usage behavior was evaluated in the current research study. Thus, the results of the current study supplement the work of other researchers.

Research Questions

Rogers (2003) developed a number of generalizations concerning the characteristics of individuals likely to be early adopters of an innovation. Although Rogers made various generalizations regarding the diffusion and adoption of an innovation, the availability of data limited those that could be assessed in this study. One generalization that could be evaluated was that higher personal income increases the likelihood of adoption of an innovation. Although Akers (2006) concurred with this observation, Lopez-Sisniega (2009) discovered that income was not related to the intention to use e-government services.

Another of Rogers' (2003) generalizations is the probability of adoption of an innovation is not related to the age of potential adopters. Although some researchers agreed with this assertion (Carter & Belanger, 2005; Lopez-Sisniega, 2009), other investigators argued that age could be associated with adoption of technology or e-government systems (Srivastava & Teo, 2009; Venkatesh et al., 2003). Therefore, the first two research questions concerned the generalizations from Rogers as they pertained to the adoption of COMPASS by CHIP applicants.

Q1. To what extent, if any, is income level related to the probability of COMPASS adoption?

Q2. To what extent, if any, is age related to the probability of COMPASS adoption?

In addition to assessing the questions connected to the generalizations made by Rogers (2003), another intention of the study was to determine to what extent the rate of adoption of COMPASS differed based on other demographic variables. For example, gender has been associated with technology adoption and satisfaction with e-government services (Chan et al., 2010; Venkatesh et al., 2003). In contrast, Carter and Belanger (2005) along with Lopez-Sisniega (2009) discovered that gender was not linked to the intention to use e-government services. The third research question was posed to prompt investigation of the role of gender in adoption of COMPASS.

Q3. To what extent, if any, do male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS?

Carter and Belanger (2005) asserted that race was not associated with the intention to use e-government systems. Nonetheless, Carter and Weerakkody (2008) maintained that race and ethnicity could be connected to the digital divide in the United States. Carter and Weerakkody were not clear; however, regarding the types of race or ethnic members who could be advantaged by using the Internet. The work of Carter and Belanger along with Carter and Weerakkody suggested that investigation of race and ethnicity in connection to the use of COMPASS was warranted. Therefore, the fourth and fifth research questions were posed.

Q4. To what extent, if any, do CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS?

Q5. To what extent, if any, do Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS?

Hypotheses

The research hypotheses associated with each of the research questions are stated below.

$H1_0$. Income level is not significantly correlated to the probability of COMPASS adoption.

$H1_a$. Income level is significantly correlated to the probability of COMPASS adoption.

$H2_0$. Age is not significantly correlated to the probability of COMPASS adoption.

$H2_a$. Age is significantly correlated to the probability of COMPASS adoption.

$H3_0$. Male CHIP applicants do not differ from female CHIP applicants, based on the proportion adopting COMPASS.

$H3_a$. Male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS.

$H4_0$. CHIP applicants from various racial groups do not differ, based on the proportion adopting COMPASS.

$H4_a$. CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS.

$H5_0$. Hispanic CHIP applicants do not differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

$H5_a$. Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

Nature of the Study

The response variable in this study was the dichotomous decision to adopt or not adopt COMPASS to apply for CHIP. The independent variables for the five research questions were the household income, age, gender, race, and ethnicity of the applicants, respectively. The data necessary for testing the hypotheses came from a centralized database containing the demographic information on each applicant and the method used to apply for CHIP. Binary logistic regression was performed to test the first two sets of hypotheses concerning the possible relationship of the income or age of applicants with the probability of adopting COMPASS to apply for CHIP. Furthermore, comparative analyses were completed to determine if COMPASS adoption differed significantly among groups formed by the race, gender, and ethnicity of applicants.

Significance of the Study

An intention of this study was to examine the diffusion of innovations theories and generalizations espoused by Rogers (2003), as they relate to the adoption of online techniques for applying for government-sponsored health care coverage. The results of the current study supported Rogers' generalizations that a person's wealth is positively related to adoption of an innovation and that a person's age is not related to adoption of an innovation. Furthermore, the outcomes of the current research strengthened the conclusion revealed by Venkatesh et al. (2003) that gender is associated with technology adoption. The study results also supported the conclusions drawn by Carter and Belanger (2005) and Lopez-Sisniega (2009) that age of an individual is not a significant predictor in determining the intention to use e-government services. In addition, the results of the current research helped to clarify the extent of a digital divide existing between members

of different ethnic groups concerning the use of e-government services, as maintained by Carter and Weerakkody (2008). Because many of the prior studies of e-government adoption concerned use intention, the results of this study, focusing on usage behavior, augment the current literature on e-government acceptance by individual citizens.

In addition to supplementing the work of other investigators, the results of the research in this study helped elucidate the demographic characteristics of CHIP applicants connected to the adoption of online application methods. Furthermore, the outcomes of the study point to disparities in COMPASS adoption among different demographic groups. This type of analysis should assist administrators of CHIP in understanding the clientele of the program. In addition, the results of the current study may be of assistance to personnel in other state agencies considering the employment of Internet-based tools to provide services to citizens. For instance, more than seven million children in the United States were enrolled in programs similar to CHIP in the 2007 federal fiscal year (Centers for Medicare and Medicaid Services, 2008). The conclusions from the current research could prove useful to administrators in other states developing online modes for applying for health care benefits.

Definitions

The research study involved the assessment of diffusion and adoption theory in relation to the electronic application for government-sponsored health insurance. To ensure proper understanding of the research, critical terms connected to theories of diffusion and adoption of innovations or the health insurance program under study should be defined.

Adoption. Adoption is defined as a decision to make use of an innovation (Rogers, 2003).

Applicant. Because the government program under study is for children aged 0 through 18 years, an applicant is an adult applying for CHIP on behalf of a child (PID, 2008a). The demographic information and actions taken by adult applicants were studied in the research.

Digital divide. The digital divide is the gap that exists between individuals receiving benefits from using the Internet and individuals not receiving benefits from use of the Internet (Rogers, 2003).

Diffusion. Diffusion is a communication process, occurring over time, to inform members of a social system about an innovation (Rogers, 2003).

Innovation. An innovation is a concept, behavior, procedure, product, or service perceived to be new by an individual (Mothe & Thi, 2010).

Social system. A social system is a set of individuals involved in solving a common problem or obtaining a common goal (Rogers, 2003).

Summary

Just as business leaders are using the Internet to conduct business transactions, government personnel in many countries have invested heavily in developing e-government systems to enhance services to citizens (Olphert & Damodoran, 2007). One e-government application, known as COMPASS, may be used by residents of Pennsylvania to apply for government-sponsored health insurance and other social services (PID, 2008b). The utilization of COMPASS has been low indicating that adoption of it is not widespread. Use of e-government systems has been low in segments

of the United States and in other countries (Abu-Shanab, Al-Rub, & Not, 2010; Carter & Weerakkody, 2008; Henriksen & Damsgaard, 2007; Kolsaker & Lee-Kelly, 2008; Lee, Tan, & Trimi, 2005). A digital divide in the United States could be related to the low utilization rate of e-government systems such as COMPASS (GAO, 2005).

A number of investigators have developed theories regarding the diffusion and adoption of innovations such as information technology and the Internet. Noteworthy among the studies are the work by Rogers (2003), Davis (1989), Venkatesh and Davis (2000), and Venkatesh et al. (2003). Other researchers have combined elements of various theoretical models to investigate the intention to use e-government service (Carter, 2008; Carter & Belanger, 2005; Carter & Weerakkody, 2008; Das et al., 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005).

A research study was conducted to investigate the attributes of adopters of COMPASS and determine if use of the tool has been more widespread among members of certain demographic groups compared to other demographic groups. By focusing on the adoption of an e-government application by members of various demographic groups, the results of this study supplement the diffusion and adoption studies performed by other researchers. Furthermore, the conclusions made in this study could be helpful to public administrators in Pennsylvania and other states.

Chapter 2: Literature Review

The purpose of the research study was to investigate the link of the age, income, gender, race, and ethnicity of CHIP applicants with adoption of an online method to apply for health care coverage. Because of this purpose, the research involved searching for literature regarding the diffusion of innovations and adoption of e-government services. Furthermore, because COMPASS is an Internet-based program, the research strategy included searching for literature pertaining to the adoption of technology. Many of the reviewed articles were discovered in academic databases, such as ProQuest and EBSCOHost. A book regarding diffusion theory, Rogers (2003), was also located.

The literature review begins by discussing various theories related to the diffusion and adoption of general innovations. This section is followed by a presentation of the major theories concerning adoption of technology. Articles relating to the application of diffusion and adoption theories are presented in a third segment. The literature review continues by describing literature related to cultural attributes that can affect the diffusion of an innovation. This section is followed by a discussion of a number of studies aimed at determining the factors associated with the intention to use e-government services. Another segment of the review covers the literature regarding the status of e-government adoption in the United States and other countries. The final section of the literature review contains a summary of the literature along with gaps discovered in the literature.

Innovation Diffusion Theories

One of the most cited authors in the field of diffusion and adoption research is Everett M. Rogers. A discussion of some of Rogers' theories is appropriate because the

work of Rogers formed a basis for much of the research on e-government adoption. In 1962, Rogers published the initial edition of a series of books in which he presented a number of theories and applications related to the diffusion and adoption of an innovation (Dayton, 2006). Rogers (2003) is the most recent edition in the series and was the version used in this study. After studying the diffusion of a wide variety of innovations, Rogers reported that four factors have a bearing on the adoption of an innovation. These factors are the innovation itself, the approaches used to communicate information concerning the innovation, the time taken to diffuse an innovation, and characteristics of the society to whom the innovation is presented. Of these four areas, much of the research regarding adoption of e-government services focused on attributes of an innovation.

Innovation characteristics. Rogers (2003) theorized that five characteristics of an innovation would determine the rate at which members of a social system adopt the innovation. One of the characteristics is the relative advantage of the innovation compared to other technologies. The relative advantage of an innovation might not be apparent when the innovation is introduced (Schmidt & Druehl, 2005). A product might fail to meet customer expectations at one point; however, succeed in meeting expectations at a later point through improvements in the product (Schmidt & Druehl, 2005). For instance, changes in a product's attributes and cost may improve the relative advantage of the product. Moreover, viewing the relative advantage of online transactions at specific stages rather than a single event may also be important (Choudhury & Karahanna, 2008). For example, Choudhury and Karahanna (2008) reported that 75% of online consumers would start the process by placing items into their

shopping cart and then exit the process before completing the purchase process. This observation indicates that a consumer seeking health insurance may view a government website as a suitable option to obtain information and decide to use another method to apply for coverage.

Another important feature affecting the diffusion and adoption of an innovation is the compatibility of the innovation with the values and needs of potential adopters (Rogers, 2003). A third element is the innovation cannot be so complex as to escape understanding by potential adopters. The fourth characteristic, espoused by Rogers (2003), is that potential adopters should have the opportunity to try the innovation on an experimental basis before full adoption. Rogers used the term trialability to describe this condition. Finally, the results or benefits of the innovation should be observable.

Other innovation diffusion theories. Another useful framework for studying the diffusion of an innovation is threshold theory (Kunst & Krantzer, 2007; Larsen & Ballal, 2005; Rogers, 2003). According to this theory, the number of people who have already adopted an innovation could influence another person to adopt the innovation. An additional aspect of diffusion is the spread of the process over time with different categories of people adopting an innovation at different points according to their innovativeness. Through the individual innovativeness theory, members of a social system can be separated into five categories: innovators, early adopter, early majority, late majority, and laggards (Rogers, 2003). With this type of categorization, a bell-shaped curve is used to describe the percentage of people adopting a particular innovation over time. Although this statistical distribution of potential adopters may apply in many situations, the suitability of the distribution could be inconsistent. For example, a bell-

shaped curve did not match the distribution of university faculty members in a study of instructional computer use (Sahin & Thompson, 2006).

The innovation-decision process is one more facet of diffusion theory (Rogers, 2003). Through this process, an individual or members of organization move from first acquiring knowledge of a new idea to forming an opinion about the innovation and seeking confirmation of the decision to accept or reject the innovation. This progression entails five phases (Rogers, 2003). The first stage is termed knowledge. At this stage, an individual or group first learns of the existence of an innovation. During the next phase, termed persuasion, a person develops a positive or negative opinion of the innovation. The third stage is called decision and involves the process of making a choice to accept or reject an innovation. The fourth phase is implementation, during which a person makes use of the innovation. Finally, the fifth stage is confirmation. During this stage, the decision to accept or reject an innovation is reinforced. Rogers (2003) also reported that individuals who know about an innovation before others in a society generally possess (a) higher social status, (b) more education that is formal, (c) greater contact with mass media and interpersonal channels of communication, and (d) higher levels of social interaction.

Another theory espoused by Rogers (2003) is the rate of adoption theory. This theory holds that dissemination of an innovation will be slow at first and then have a period of rapid growth, followed by a period of stability or even decline. A graph of the cumulative adoption rate would resemble an S-shaped curve. Rogers maintained that the diffusion of a large number of innovations fit the S-curve. Despite this assertion, Mukhopadhyay, Samaddar, and Nargundkar (2008) stated that models using an S-curve

do not adequately account for external factors. Mukhopadhyay et al. (2008) maintained that if the growth in diffusion were to stop for a period because of an external factor, the S-curve would start to flatten without a chance to regenerate growth back into the curve.

Based on his research and the research of others, Rogers (2003) developed a plethora of generalizations regarding the rate of diffusion and adoption of an innovation among members of a social system. Rogers also made generalizations concerning the characteristics of potential adopters of innovations. Generalizations regarding the age and income of prospective adopters were investigated in the current study.

Criticisms of diffusion research. Although Rogers (2003) was a proponent of diffusion theory, he also presented some of the criticisms of research in this area. Rogers termed one of the criticisms as pro-innovation bias. For instance, a researcher may be biased in that he or she is convinced that a particular innovation should be diffused and adopted rapidly without reinvention or rejection. Another concern of diffusion theory is individual-blame bias (Rogers, 2003). This bias is the notion that individuals are solely to blame for their problems, rather than their social environment. A third issue, according to Rogers, is the recall problem. This problem arises when research participants have difficulty remembering the time when they adopted a new concept.

The final criticism of the diffusion of innovations, according to Rogers (2003), is the utilization of innovations may increase the gaps in socioeconomic status among members of a society. Therefore, the adoption of an innovation may have undesirable or unanticipated consequences as well the desirable and anticipated ones (Rogers, 2003). Larsen and Ballal (2005) agreed with this assertion by stating that some diffusion researchers fail to assess the value of an innovation and determine if the innovation

should be implemented. Because of this oversight, the reasons for not adopting certain innovations are not discovered (Larsen & Ballal, 2005).

Technology Adoption Theories

Because the study for this dissertation concerns the adoption of computer-based technology, the literature related to technology adoption is relevant. As an example, Straub (2009) reported on an adoption model called the concerns-based adoption model (CBAM). The CBAM was originally developed to study innovation adoption in the education field (Straub, 2009). This model is helpful in assessing how the concerns of an individual affect the adoption of an innovation by that individual (Straub, 2009).

Six assumptions form the base for the CBAM (Straub, 2009). One of the assumptions is that change is a process, not an event. The second assumption is individuals, not organizations, accomplish change. Third, change is a personal experience. The fourth assumption is change involves developmental growth. The fifth principle of the CBAM is change is best understood in operational terms. Finally, the facilitation of change should concentrate on innovations, individuals, and context.

The focus of the CBAM is on facilitation of innovation adoption by understanding concerns of potential adopters, rather than reasons for adoption of an innovation (Straub, 2009). Straub (2009) maintained this focus on facilitation contrasted to Rogers' (2003) innovation diffusion theory that concentrated on why adoption occurs. This conclusion; however, appears contradictory to the discussion of Rogers concerning the use of opinion leaders and change agents to promote the adoption of an innovation.

The CBAM is composed of three primary components: innovation configuration, stages of concern, and levels of use (Straub, 2009). The stages of concern involve the

anxieties of teachers regarding the effects of the innovation on themselves and their students. In the levels-of-use stage, a researcher would describe how extensively teachers employ an innovation. The levels of use for a teacher could be in any one of eight categories ranging from nonuse to full use and extension of an innovation (Straub, 2009). Because of the various levels, the levels-of-use construct is more detailed than a simple decision to adopt or not adopt an innovation.

Straub (2009) reported that one criticism of the CBAM is that researchers using the model have focused on use of an innovation by teachers and have shown less concern for acceptance of an innovation by students. Further, Straub contended that personnel implementing the CBAM generally assume that teachers will be resistant to change. Nonetheless, Straub opined the CBAM might challenge educational leaders to think beyond their own views of an innovation and consider the effects of the innovation on the teachers who must implement the innovation. Straub also cautioned that use of theories in an environment in which adoption of an innovation is mandated would not measure true technology acceptance because individuals in such an environment would ultimately have to use the technology. By evaluating various diffusion models, Straub concluded that, "successfully facilitating a technology adoption needs to address cognitive, emotional, and contextual concerns" (p. 645).

The CBAM may be useful to researchers investigating adoption of technology by members of the education field and other areas. Nevertheless, the CBAM does not focus on the demographic variables of potential adopters. Further, the research performed using the CBAM has concentrated on innovations in the education field. The characteristics of members of the education domain and the social interactions occurring

in that field may not be reflective of the circumstances surrounding the introduction of an innovation to the public.

Another model used in studying technology adoption is the TAM, developed by Davis (1989). The TAM has received considerable attention and influenced a number of researchers. As examples, the TAM was used as a basis for the work by Carter (2008), Carter and Belanger (2005), Carter and Weerakkody (2008), Mirchandani et al. (2008), and Zhang et al. (2009).

While developing the TAM, Davis (1989) hypothesized that two variables, perceived usefulness and perceived ease of use, influenced the adoption pattern of computer technology. Davis defined perceived usefulness as, "the degree to which a person believes that using a particular system would enhance his or her job performance" (p. 320). Further, Davis defined perceived ease of use as, "the degree to which a person believes that using a particular system would be free of effort" (p. 320). Davis reported that perceived ease of use was similar to the concept of self-efficacy promoted by other researchers. Straub (2009); however, stated the two constructs differed in that perceived ease of use was a judgment concerning the attributes of the innovation and self-efficacy involves an assessment of the abilities of a potential adopter.

Davis (1989) contended that improved measures were required to assess the nature of perceived usefulness and perceived ease of use and the association of these variables to computer use. To develop the improved measures, Davis conducted two studies, with the results of the first study used to guide the design of the second study. The intent of both studies was to develop scale items that would be reliable and have a high degree of construct validity.

In the first study, Davis (1989) evaluated the usefulness and ease of use of an electronic mail system, called PROFS, and a file editor, named XEDIT. The participants in the study were experienced users of the two systems. Davis discovered usage of the two systems was significantly correlated with perceived usefulness and ease of use reported by the participants in the survey.

Using the results of the first study, Davis (1989) refined the measures of perceived usefulness and ease of use for the second survey. The second study involved evaluation of two programs not assessed in the first study. One program was Chart-Master and the other was Pendraw. Participants in the second study did not have significant experience with either of the two programs, according to Davis. In the second study, Davis revealed a significant correlation between perceived usefulness and ease of use and the self-predicted future use of Pendraw. For Chart-Master, usefulness was significantly correlated with use intention; ease of use was not significantly related.

After analyzing the results of both studies, Davis (1989) concluded that perceived usefulness was more strongly connected to usage than ease of use. Davis rationalized this result by asserting that users may be willing to endure difficulties of using a program if the program offers functionality that will improve job performance. Conversely, if a program does not perform a useful function, the program may not be employed although it is easy to use (Davis, 1989). Davis also noted that perceived usefulness and ease of use are subjective constructs and might not reflect objective reality.

Although the initial work by Davis (1989) concentrated on a few computer programs used in the workplace, the TAM has been tested on a variety of information systems including expert systems, digital libraries, spreadsheets, and electronic health

systems (Venkatesh, Davis, & Morris, 2007). Venkatesh and Davis (2000) reported the TAM consistently accounts for a substantial portion of the variance in usage intentions and behavior for information technology used in the workplace. Further, Venkatesh and Davis maintained the TAM compares well with other models such as the theory of reasoned action and the theory of planned behavior. Nevertheless, Straub (2009) asserted the TAM might not capture the complexity and unique characteristics of different environments. Moreover, Zhang et al. (2009) criticized the TAM by stating that it did not consider cultural differences in the intentions to use an innovation.

Although not fully evaluating cultural differences, Venkatesh and Davis (2000) acknowledged that social factors could influence the adoption of technology. Venkatesh and Davis expressed concern that information technologies were underutilized in workplaces. Venkatesh and Davis theorized that gaining a thorough understanding of the determinants of perceived usefulness could help to design interventions to promote the acceptance and use of new computer systems. Because of this belief, Venkatesh and Davis conducted research to extend the TAM with other independent variables. Venkatesh and Davis called the extended model TAM2.

In developing the TAM2, Venkatesh and Davis (2000) introduced a new construct called subjective norm. This construct appears similar to the opinion leader and threshold concepts espoused by Rogers (2003). Venkatesh and Davis reported that, in prior research, subjective norm was discovered to have a significant effect on use intention in settings in which the use of a technology was mandatory. In contrast, subjective norm did not have a significant effect on use intention in voluntary settings (Venkatesh & Davis, 2000).

Venkatesh and Davis (2000) also maintained that social normative factors might influence a person by promoting a favorable image within a social group. Venkatesh and Davis stated that a supporter of image theory would contend that, in making an adoption decision, an individual would transit through two stages. In the first stage, a person will determine if an innovation is compatible with the person's standards. Rogers (2003) concurred with this assertion. In the second phase, a person will perform a profitability test by comparing acceptable alternatives to find the optimal selection. Making this comparison is analogous to determining the relative advantage of an innovation, as proposed by Rogers. In addition to image and subjective norm, Venkatesh and Davis hypothesized that voluntariness may affect perceived usefulness and perceived ease of use. Furthermore, Venkatesh and Davis argued that cognitive processes, such as job relevance, output quality, perceived ease of use, and demonstrable results would be determinants of perceived usefulness and usage intention.

Venkatesh and Davis (2000) conducted four longitudinal studies to test their hypotheses. Each of the studies involved administering a questionnaire at three points in time at different private firms representing a range of industries and organizational contexts. The types of technologies being introduced at each company also varied. Further, the questionnaire was given immediately following training, about one month after implementation, and three months after implementation of a new system at each firm. The results of the studies led Venkatesh and Davis to conclude that all of the hypothesized social factors and cognitive processes influenced perceived usefulness. Moreover, Venkatesh and Davis asserted that subjective norm applied a significant direct

effect on usage intentions of mandatory systems in addition to perceived usefulness and perceived ease of use. This conclusion did not hold for voluntary systems.

Because of their research, Venkatesh and Davis (2000) maintained that use of social influence might be more effective than compliance-based approaches to acceptance of new technology systems in the workplace. Venkatesh and Davis suggested that communication campaigns should be designed to raise the prestige of system usage. Additionally, Venkatesh and Davis recommended the development of interventions to demonstrate the effectiveness of a new system to increase user acceptance of the new system.

In an attempt to refine models of the adoption of technology, the developers of TAM2 worked with other colleagues to combine attributes of the TAM with characteristics of other diffusion models to create the UTAUT. As the name implies, researchers constructed the UTAUT to study the adoption of computer technologies rather than innovations in general. Venkatesh et al. (2003) evaluated the TAM along with the theory of reasoned action, the motivational model, the theory of planned behavior, the model of personal computer utilization, the innovation diffusion model, and the social cognitive theory.

According to Venkatesh et al. (2003), the researchers constructing these models evaluated the relationship between various independent variables and the intention to use or usage of computer technologies. Some of the independent variables were included in more than one of the models. Further, some of the independent variables used in the models pertained to characteristics of a particular innovation, such as relative advantage

and ease of use. Other independent variables concerned attributes of a potential adopter, such as anxiety, self-image, and self-efficacy.

To evaluate the eight models, Venkatesh et al. (2003) conducted longitudinal studies in four organizations. In conducting the studies, Venkatesh et al. administered questionnaires measuring constructs from all eight models using 7-point scales. The questionnaires were administered at three points in time. The first point was immediately after participants received training on a new technology. Another set of data was collected approximately one month after implementation of the new technology and the third set of data was collected about three months after implementation.

Based on evaluation of the results from the longitudinal studies, Venkatesh et al. (2003) theorized that four determinants would influence the intention to use a technology. The four constructs were performance expectancy, effort expectancy, social influence, and facilitating conditions. Venkatesh et al. defined performance expectancy as, "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). Venkatesh et al. defined effort expectancy as, "the degree of ease associated with the use of the system" (p. 450). Venkatesh et al. also stated that effort expectancy would be most salient for older women, especially those with little experience with the system in question. Social influence was defined as, "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). Finally, Venkatesh et al. described facilitating conditions as, "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453).

In addition to describing these constructs, Venkatesh et al. (2003) theorized that four moderating variables would interact with the determinants. The four moderating variables were gender, age, voluntariness, and experience. To validate the UTAUT, Venkatesh et al. administered a survey in two additional organizations. Based on their research, Venkatesh et al. concluded that performance expectancy, effort expectancy, and social influence were determinants of intention to use a new technology. Furthermore, intention and facilitating conditions were determinants of usage behavior, according to Venkatesh et al.

The research also confirmed that experience, voluntariness, gender, and age were each moderating variables for at least one of the determinants of intention (Venkatesh et al., 2003). Nonetheless, the moderating effects were not consistent for every determinant. For instance, the influence of performance expectancy on behavioral intention was stronger for younger men and the social influence on behavioral intention was more salient for older women.

Despite this inconsistency in moderating effects, Venkatesh et al. (2003) reported the UTAUT was an improvement over any of the original eight models by accounting for 70% of the variance in usage intention. Furthermore, Chan et al. (2010) discovered that facilitating conditions, performance expectancy, and effort expectancy constructs from the UTAUT were significant determinants of user satisfaction with e-government services in mandatory settings. Nevertheless, Chan et al. concluded that social influence did not have a significant effect on user satisfaction in a mandatory adoption setting.

The work of Venkatesh et al. (2003) is helpful in understanding the adoption of computer technology. Nonetheless, Venkatesh et al. performed the longitudinal studies

over a period of a few months. This amount of time may not be reflective of the diffusion of innovations introduced to the public. Furthermore, Venkatesh et al. completed the studies in work settings with participants receiving training on the new systems. This environment is not the same as conditions for potential adopters of other innovations introduced to the public. For instance, potential users of COMPASS do not have training provided and usage is likely to occur in homes or other settings outside of a workplace. Indeed, Straub (2009) reported the UTAUT has not been tested extensively outside of a corporate environment. Zhang et al. (2009) reported mixed results from the tests of the UTAUT that have been completed. These observations indicate the UTAUT may not suffice in explaining all types of technology adoption.

Applications of Theories

Although a number of authors have developed theoretical frameworks to investigate the diffusion and adoption of innovations, other researchers have employed the theories to study the dissemination of new products or concepts. As an example, Harting, Rutten, Rutten, and Kremers (2009) took a qualitative approach to explore the utilization of treatment guidelines by physical therapists. Other researchers have used diffusion theory to investigate how social or electronic networks may be employed to promote a consumer product (Choudhury & Karahanna, 2008; Kunst & Krantzer, 2007). A third set of researchers wrote about the use of diffusion theory to analyze the adoption of technology in the field of education or private industry (Bajwa, Lewis, Pervan, & Lai, 2005; Chen, 2009; Demir, 2006; Park & Chen, 2007; Sahin & Thompson, 2006; Yang, Lee, & Lee, 2007).

Given this evidence, a review of literature concerning the applications of diffusion and adoption theories may elucidate the factors contributing to the diffusion and adoption of online techniques to apply for government-sponsored health insurance. Because this dissertation study evaluated a form of e-government, a review of the literature concerning adoption of e-government is appropriate. An important concept to remember in surveying the literature is that different authors may have different conceptions of e-government. According to Carter and Belanger (2005), up to six categories of e-government exist. The types of e-government, defined by Carter and Belanger, are (a) government personnel delivering services to individuals, (b) government employees providing services to individuals as part of the political process, (c) government personnel performing services for businesses as citizens, (d) government employees servicing businesses in the marketplace, (e) government employees delivering services to other employees of the same government, and (f) personnel working for one government providing services to employees of another government.

The study conducted as part of this dissertation focused on government personnel delivering services to individuals. In addition to reviewing the literature regarding e-government adoption, examination of some of the literature concerning diffusion and adoption of other innovations may be helpful in understanding the diffusion and adoption of e-government services. One area of consideration is the involvement of consumers in the design of an innovation.

Hassan (2008) stated that involvement of consumers in the innovation process is one technique to reduce the risk associated with traditional approaches to product development. Nevertheless, Hassan indicated that attempting to involve consumers in the

innovation process could have limitations. For instance, a consumer may express needs based on personal experiences without considering future trends such a technology development and global competition. To alleviate this concern, Hassan suggested that utilization of lead users might be helpful. This type of consumer may develop a new product because of dissatisfaction with current offerings in the marketplace (Hassan, 2008). Thus, a lead user may be ahead of the masses in terms of identifying needs and developing ideas to satisfy those needs. Hassan argued that lead users could have a significant impact on the successful diffusion of an innovation. Hassan reported that personnel at Apple used this strategy to launch the iPhone and iPod products. Hassan also stated that leaders from other companies such as Adidas, Lego, and Minnesota Mining and Manufacturing have utilized lead users in the design of their products.

One method to implement the lead user concepts of Hassan (2008) in encouraging the use of e-government services would be to involve citizens in the design of the service (Anthopoulos, Siozos, Nanopoulos, & Tsoukalas, 2006; Carter, 2008; Olphert & Damodoran, 2007; Srivastava & Teo, 2009). Anthopoulos et al. (2006) described a bottom-up procedure to design e-government services. Using this procedure, end-users and public officials participate in the design of a system. Anthopoulos et al. stated that one form of participation is for citizens and public administrators to specify expectations of e-government services and the transition from traditional delivery methods to electronic ones.

Anthopoulos et al. (2006) asserted that citizens prefer some involvement of public employees in the delivery of public services rather than a completely automated process. Furthermore, the complexity of some public services inhibits the automation of them.

For those services that can be automated, Anthopoulos et al. suggested the system be designed with one-stop e-government portals. To build such a system, Anthopoulos et al. promoted a program, called e-Government Groupware System, which can be used in a manner to support the collaboration of public officials. According to Anthopoulos et al., this collaboration will help government employees take ownership and be less apprehensive of the new system.

Olphert and Damodoran (2007) completed another study supporting the input of citizens in the design of e-government systems. Olphert and Damodoran reported that public administrators in many countries have invested heavily in the development of e-government systems. Despite these investments, adoption of e-government by citizens in the United Kingdom has been slow (Carter & Weerakkody, 2008; Kolsaker & Lee-Kelly, 2008; Olphert & Damodoran, 2007). In a 2006 study, 36% of British citizens were discovered to use online government services compared to 50% of the population in a number of other European countries (Olphert & Damodoran, 2007). In addition, Olphert and Damodoran reported that a significant portion of British citizens perceived that personnel in the private sector were designing online systems that were superior to systems developed by public administrators. This perception gap was even more pronounced in the United States (Morgeson & Mithas, 2009; Olphert & Damodoran, 2007). In contrast, many citizens in Singapore preferred government websites to sites operated by personnel in the private sector (Srivastava & Teo, 2009).

Olphert and Damodoran (2007) argued that part of the reason for the slow adoption of e-government is that some personnel developing e-government systems have concentrated on technical aspects of information and communication technology and

have paid relatively little attention to the human and social aspects. Designers of information and communication technology systems could benefit from more interaction by potential users (Anthopoulos et al., 2006; Carter, 2008; Olphert & Damodoran, 2007). Some of the reasons provided by Olphert and Damodoran are that citizens have an understanding of their own needs, problems, priorities, and local environment. Olphert and Damodoran defined citizen engagement as, "the active participation of citizens, in partnership with government, in decision and policy making processes" (p. 494). Olphert and Damodoran asserted that input from citizens is most effective when engagement starts at the earliest stages of system development and continues throughout the development cycle.

In addition to acquiring citizen input to e-government systems, Olphert and Damodoran (2007) stated that understanding the needs and characteristics of the citizens is important. Lack of attention to human aspects of system development could contribute to the digital divide in a society (Olphert & Damodoran, 2007). These assertions lend credence to the importance of understanding the attributes of users and potential users of programs like COMPASS.

Cultural Aspects of Diffusion

Although involvement of consumers in the design of an innovation may help in its diffusion, cultural dimensions are also important (Rogers, 2003; Yalcinkaya, 2008; Zhang et al., 2009). Therefore, a review of relevant literature concerning the effects of cultural differences in diffusion may be helpful. For instance, Yalcinkaya (2008) maintained that communication tactics vary between people living in different parts of the world. Yalcinkaya theorized this condition would affect the diffusion and adoption of

an innovation in different countries. Yalcinkaya reviewed the work of numerous researchers concerning cultural differences and the effects on innovation adoption. Based on his research, Yalcinkaya made a number of propositions regarding the speed of new product adoption in different cultures.

One distinction made by Yalcinkaya (2008) is that an innovation may diffuse more swiftly in societies where individuals are independent and empowered to make decisions compared to societies where status and authority are priorities. Nevertheless, Richardson (2009) maintained that adoption rates could be more rapid in authoritarian cultures if adoption of an innovation is perceived to be mandatory. Another contrast made by Yalcinkaya was individualism versus collectivism. Yalcinkaya stated that independence is valued in individualistic cultures. In such societies, individuals are expected to stand up and look out for themselves. Conversely, individuals in collectivistic cultures tend to value the welfare of the societal members and strong relationships among themselves, according to Yalcinkaya. Because of these differences, Yalcinkaya propositioned that new product adoption is slower in individualistic cultures than in collectivistic cultures.

Yalcinkaya (2008) argued that persons in high-uncertainty avoidance cultures would adopt new products at a slower pace compared to individuals in low-uncertainty avoidance societies. Furthermore, Yalcinkaya stated that people in a long-term oriented culture would adopt a new product at a slower rate than adoption by individuals in a culture with a short-term orientation. Yalcinkaya reported that persons in a long-term oriented culture would value perseverance toward slow results and adaptation of traditions to new circumstances. In contrast, individuals with a short-term orientation

expect to achieve quick results (Yalcinkaya, 2008). Because of this expectation, Yalcinkaya argued that individuals in a culture with a short-term orientation are likely to acquire new products that may improve their status within society.

While studying the adoption of information and communication technologies of teacher trainers in Cambodia, Richardson (2009) used only one of the two major constructs in the TAM. Richardson hypothesized that ease of use along with voluntariness and the image of the adopters would influence the adoption of information and communication technologies. Moreover, Richardson hypothesized that relative advantage, compatibility, complexity, trialability, and observability variables from the diffusion of innovations theory of Rogers (2003) would affect the adoption of information and communication technologies. Further, Richardson tested the possible association of age, gender, and number of years of work experience with the adoption of information and communication technologies.

To conduct his study, Richardson (2009) administered a survey to 379 teacher trainers in Cambodia. Richardson discovered that none of the demographic variables had an impact on the rate of adoption of information and communication technologies. Richardson also revealed that image was the only innovation characteristic that did not significantly affect adoption. Furthermore, Richardson noted that an authoritarian culture exists in Cambodia. Because of this fact, Richardson commented that if adoption of an innovation were perceived to be mandatory, adoption rates would increase. Additionally, the participants in the study conducted by Richardson involved the trainers of teachers. This type of individual may not reflect characteristics of members of the public.

As another example of cultural paradigms affecting the diffusion of an innovation, Garcia, Bardhi, and Friedrich (2007) blended a discussion of diffusion theory with approaches to overcome resistance to innovations by potential adopters. Garcia et al. (2007) defined a *resistant innovation* as one that requires potential adopters to accept significant changes to their normal routines, traditions, or beliefs. Conversely, Garcia et al. defined a *receptive innovation* as one that does not require major alterations to existing behavior patterns of potential adopters. Thus, potential adopters may be more amenable to a receptive innovation. Garcia et al. advised that marketing a resistant innovation is likely to require the leaders of an organization to address the attitudes and paradigms of prospective consumers in addition to touting the attributes of the innovation.

To illustrate their points, Garcia et al. (2007) utilized the example of the diffusion of screw cap closures for wine bottles. Although screw caps could solve some of the problems associated with use of a cork, Garcia et al. maintained that some consumers associated screw caps with low-quality wine. Garcia et al. went on to assert the perception of screw-cap wines being inferior is not universal. For instance, many of the top-selling wines in Australia and New Zealand have screw-cap closures, according to Garcia et al. One of the reasons for this difference in consumer perceptions is the utilization of a marketing tactic known as *coopetition* (Garcia et al., 2007).

Leaders of a company employing this strategy will involve competitors in designing a marketing campaign to overcome consumer resistance and benefit the industry. Garcia et al. (2007) reported that wine makers Australia and New Zealand employed the concept of coopetition to educate others in the industry as well as

consumers on the quality improvement associated with screw caps. Garcia et al. also stated that competing wineries borrowed or shared bottling equipment while transitioning from cork bottling to screw caps. Although personnel in state agencies do not compete for business, a collaborative effort among employees of the agencies to educate citizens on the benefits of online services may be possible. Carter (2008) did not mention collaborative efforts, although he espoused the notion of marketing and educational campaigns to promote the use of e-government services.

In addition to research on marketing of new consumer products, investigators have noticed cultural issues in the diffusion of e-government services. Zhang et al. (2009) provided one example. Zhang et al. argued that cultural differences in the diffusion and adoption of information technology have not been thoroughly studied. Zhang et al. also opined that adoption of e-government has not been thoroughly evaluated in various cultures.

Zhang et al. (2009) reported that a value called Hexie is one of the predominant elements in the Chinese culture. This value places importance on the balance between positive and negative forces. Because of the importance of Hexie in the Chinese culture, Zhang et al. theorized that characteristics of an innovation could produce different levels of fit with members of the Chinese society. Although Zhang et al. acknowledged the TAM has received considerable attention in studies of technology adoption, they proposed to extend the TAM by introducing a new independent variable called *perceived fit*. Zhang et al. hypothesized that perceived fit might help explain adoption of technology by members of a society. Zhang et al. stated that perceived fit was similar to the compatibility construct espoused by Rogers (2003).

To test their hypothesis, Zhang et al. (2009) conducted a study involving public employees who were users of a workflow management program. After training on the software, Zhang et al. surveyed the users to determine the extent that perceived fit was associated with the evaluation and perceived usefulness of the workflow software. Zhang et al. concluded that perceived fit had a significant positive relationship with both evaluation and perceived usefulness. Zhang et al. also concluded that end users in China were more concerned for the perceived fit than ease of use in evaluating the information system.

Two other researchers investigating cultural differences in the adoption of e-government were Carter and Weerakkody (2008). Carter and Weerakkody reported the infrastructure in United States and the United Kingdom placed citizens in both countries in a position to employ e-government services successfully. Nevertheless, use of e-government in the United Kingdom has been limited (Carter & Weerakkody, 2008; Kolsaker & Lee-Kelly, 2008; Olphert & Damodoran, 2007). In addition, use of e-government services in the United Kingdom has been lower than use of commercial websites and lower than use of e-government sites in other European countries (Carter & Weerakkody, 2008; Olphert & Damodoran, 2007).

After studying various diffusion models, including the TAM and the diffusion of innovations theories developed by Rogers (2003), Carter and Weerakkody (2008) hypothesized that relative advantage, trust, Internet accessibility, and Internet skill influenced the intention of an individual to use e-government services. In this context, trust could have more than one dimension. One aspect of trust is the confidence citizens place in the abilities of the personnel working in government agencies (Carter &

Weerakkody, 2008; Srivastava & Teo, 2009). Another facet of the trust construct is the perception that government personnel care about citizens and act in the interest of citizens (Srivastava & Teo, 2009). A third dimension of trust involves the perceived level of honesty of government personnel (Srivastava & Teo, 2009). Carter and Weerakkody cited prior studies indicating that trust was an influencing factor in the adoption of e-government services.

Carter and Weerakkody (2008) conducted a survey of 260 residents of Northwest London in the United Kingdom to test their hypotheses. Based on the results of their study, Carter and Weerakkody concluded that relative advantage and trust had a significant effect on the intention of participants to use e-government services. Carter and Weerakkody also asserted that relative advantage and trust were consistently associated with e-government adoption in the United States. A number of other researchers confirmed the significance of trust in government personnel in relation to using e-government services (Carter & Belanger, 2005; Chan et al., 2010; Das et al., 2008; Kolsaker & Lee-Kelly, 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005; Srivastava & Teo, 2010).

Although citizens may trust in government personnel, a lack of trust in technology could inhibit the realization of the full potential of e-government services. Citizens may want to cooperate with e-government initiates, but the lack of trust of the technology could inhibit utilization of e-government systems (Srivastava & Teo, 2010). In contrast, a high level of trust in technology by citizens combined with a low level of trust in government personnel could lead to a competitive environment. In such a case, a citizen may use the information transparency, made possible through the Internet, to

emphasize deficiencies in government policies and procedures (Srivastava & Teo, 2010). Interestingly, Carter (2008) discovered that trust in government personnel was not significant in predicting the intention to use e-government services.

Carter and Weerakkody (2008) concluded that Internet accessibility and Internet skill were not significantly related to the intention to use e-government websites in the United Kingdom. This result is in contrast to conclusions from studies conducted in the United States where Internet accessibility and Internet skills were significant contributors to the intention to use e-government services, according to Carter and Weerakkody. Nonetheless, the lack of association of Internet skill with the intention to use e-government is congruent with the findings of Lopez-Sisniega (2009) who studied e-government use in Mexico.

Carter and Weerakkody (2008) also maintained that race and ethnicity contributed to the digital divide in the United States. Carter and Weerakkody; however, did not specify the racial or ethnic members more likely to use the Internet and e-government services. Nevertheless, the association of race and ethnicity with a digital divide in the United States was supported by the research of Horrigan (2010) who discovered that 49% of Hispanic Americans had broadband Internet access at home compared to the national average of 65% who had broadband access. Further, Horrigan reported the adoption rate of broadband by Hispanic Americans who preferred to speak Spanish was only 20%. Horrigan also discovered that 59% of African Americans had broadband Internet access compared to 69% of Caucasians in the United States.

Adoption of E-government Services

In addition to the research by Carter and Weerakkody (2008), a number of other studies have been completed to investigate the variables that may influence the intention to use e-government. A common tactic was to combine elements from more than one model to study the intent to use e-government services, similar to the strategy employed by Carter and Weerakkody. For instance, some of the researchers combined constructs from the TAM, Rogers' (2003) diffusion theories, and trust models (Carter & Belanger, 2005; Lopez-Sisniega, 2009; Schaupp & Carter, 2005). Another set of investigators combined constructs from the TAM and trust models (Carter, 2008; Orgeron, 2008). In addition to using trustworthiness constructs and elements from the TAM, Orgeron (2008) employed service quality variables in his study. A number of other researchers also used quality constructs to evaluate the intention to use e-government (Mirchandani et al., 2008; Wangpipatwong et al., 2009). Each of the studies is briefly described next.

Schaupp and Carter (2005) expressed concern over the low turnout among young voters. According to Schaupp and Carter, only 16% of eligible voters, aged 18 to 24 years, voted in the 2002 presidential election. One possible solution to this problem is to increase the availability of electronic voting (e-voting) systems.

To investigate the problem of adoption of e-voting, Schaupp and Carter (2005) proposed employing a combination of variables from the TAM, the diffusion of innovation theory developed by Rogers (2003), and a web trust model. From the TAM, Schaupp and Carter hypothesized that higher levels of perceived usefulness and perceived ease of use would be associated with higher levels of intention to use an e-voting service. Drawing from the diffusion of innovation theory, Schaupp and Carter hypothesized that compatibility, relative advantage, and user image would be positively

associated with intention to use e-voting. Furthermore, Schaupp and Carter proposed that compatibility would affect perceived ease of use. Finally, Schaupp and Carter theorized that higher levels of trust in the Internet and trust in government personnel would each be positively associated with the intention to use e-voting services.

The Internet trust construct can be comprised of two dimensions. One aspect of this construct is the belief that use of the Internet to interact with government personnel will be just as effective in delivery of services as through traditional means (Srivastava & Teo, 2009). Another facet of the Internet trust construct is belief that information transmitted over the Internet will be safe and secure (Srivastava & Teo, 2009).

To test their hypotheses, Schaupp and Carter (2005) conducted a survey of 208 undergraduate students. The results of the survey indicated that perceived usefulness, compatibility, trust in the Internet, and trust in the government personnel were significant in predicting the intention to use e-voting services. Perceived ease of use was not significant in predicting the intention to use e-voting. Nonetheless, Schaupp and Carter pointed out that subjects in the study were already experienced users of computers and the Internet. In addition, Schaupp and Carter revealed that participants in the study did not view the use of e-voting as a status symbol. Thus, image was not a significant factor. Moreover, a higher level of relative advantage was not associated with increased intention to use e-voting services. Schaupp and Carter opined that voting carried more weight than the means it was accomplished.

To raise the level of trust of citizens, Schaupp and Carter (2005) suggested that public officials emphasize the success and accuracy of e-voting systems that have been used in the past. In addition, some citizens may be more likely to trust employees of a

private sector business than employees of a government agency (Morgeson & Mithas, 2009; Schaupp & Carter, 2005). Therefore, Schaupp and Carter recommended that public administrators work in partnership with personnel from private firms to develop e-voting systems.

Carter and Belanger (2005) conducted another evaluation of the use of e-government services. To investigate the utilization of e-government systems, Carter and Belanger also proposed combining variables from the TAM with elements from the diffusion of innovation theory developed by Rogers (2003), and trust constructs. From the TAM, Carter and Belanger hypothesized that perceived ease of use and perceived usefulness would be related to the intention to use e-government services. From the diffusion of innovation theory developed by Rogers, Carter and Belanger theorized that an innovation's relative advantage, complexity, compatibility, and observability would be related to the intention to use e-government capabilities. Carter and Belanger omitted the trialability construct, which is part of the diffusion of innovations theory, from their study. Carter and Belanger opined that trialability would not explain a significant amount of variation in the intent to use e-government services. In addition, Carter and Belanger discussed the construct of trustworthiness and hypothesized that it would be related to the intention to use e-government services. Carter and Belanger stated that trustworthiness involved trust in the Internet and trust in government employees.

To test their hypotheses, Carter and Belanger (2005) administered a survey to 105 attendees at a community concert in Virginia. The survey measured citizens' attitudes toward using online systems maintained by personnel from the Virginia Department of Motor Vehicles and the Virginia Department of Taxation. The participants in the survey

came from a wide range of ages, with slightly more than one-third being male. Although the majority of participants were Caucasian, 26% were minorities, according to Carter and Belanger.

By analyzing their results, Carter and Belanger (2005) concluded that perceived ease of use, compatibility, and trustworthiness had a significant positive relationship to intention to use e-government services. Carter and Belanger also concluded that a significant difference did not exist between demographic groups formed by age, race, and gender in relation to the intention to use e-government programs. The research study for this dissertation also involved age, race, and gender variables; however, the dependent variable reflected usage behavior rather than the intention to use e-government systems.

In a similar study conducted in Virginia, Carter (2008) again hypothesized that perceived ease of use, perceived usefulness, trust in the Internet, and trust in the government officials offering a service would influence a person's intention to use e-government services. Carter continued by stating that computer self-efficacy is another variable that may influence adoption of e-government systems. Carter reported that computer self-efficacy is the confidence a person has in performing various tasks with a computer. Further, Carter argued that adoption of one e-government service would increase the likelihood of using other e-government services. Therefore, Carter included computer self-efficacy and prior e-government experience as independent variables that may be associated with the intention to employ e-government systems.

Carter (2008) reported the results of his study suggested that perceived usefulness, perceived ease of use, trust of the Internet, and previous experience with e-government were significant predictors of the intention to employ e-government services in the future.

Of these variables, Carter stated that perceived usefulness was the most salient, accounting for nearly 75% of the variance in intention to use e-government systems. Interestingly, the work of Carter indicated that trust of government and computer self-efficacy were not significant predictors of the intention to use e-government in the future.

After presenting his results, Carter (2008) made a number of suggestions to encourage e-government adoption. One suggestion was to permit real-time interaction with government employees during an Internet session. Furthermore, Carter suggested the posting of the number of successful transactions completed during a period.

Lopez-Sisniega (2009) also used independent variables from the TAM, the diffusion of innovation theory of Rogers (2003), and web trust models to investigate the barriers perceived by citizens to use of e-government services in Mexico. In addition to the variables from the models, Lopez-Sisniega included citizen income, age, family structure, literacy, computer literacy, and access to the Internet as six other independent variables.

Lopez-Sisniega (2009) conducted interviews of taxpayers in a treasury office to test his hypotheses. Based on the results of the interviews, Lopez-Sisniega concluded that trust in the Internet, trust in government, perceptions of usefulness, perceptions of compatibility, access to the Internet, perceived ease of use, and perceived relative advantage were positively associated with the intention to use e-government services. Lopez-Sisniega also concluded that citizens' income, family structure, age, gender, literacy, and computer literacy were not significant indicators of the intention to use e-government services. In contrast, Abu-Shanab et al. (2010) revealed that computer literacy was an obstacle to e-government adoption in Jordan.

One more researcher to use constructs from the TAM and trustworthiness of the web was Orgeron (2008). In addition to these models, Orgeron employed service quality variables to construct a model for adoption and satisfaction of e-government services by citizens. A unique feature of the study by Orgeron was the sample frame consisted of people who had already used e-government services. The purpose of the study by Orgeron was to assess the intention to reuse a state government website to make transactions. Orgeron hypothesized that Internet trust, government trust, ease of use, usefulness, service quality reliability, service quality responsiveness, service quality empathy, and service quality assurance would be positively related to the intention to reuse the website.

Orgeron (2008) employed an online survey to test his hypotheses. From the results of the survey, Orgeron concluded that each of the independent variables was related to the intention to reuse the state government website for transactions. One of the potential drawbacks of using an online survey may be that respondents are already familiar with using the Internet and might not be representative of members of the public with little or no experience conducting online transactions.

Along with Orgeron (2008), Wangpipatwong, Chutimaskul, and Papasratorn (2009) were concerned with the affects of quality issues on the reuse of e-government services. Wangpipatwong et al. (2009) asserted that continual use by citizens would help achieve long-term gains from investing in e-government technologies. Wangpipatwong et al. hypothesized the quality of a particular e-government website would induce citizens to employ the website on a continual basis.

Wangpipatwong et al. (2009) categorized quality as information quality, system quality, and service quality. Wangpipatwong et al. referred to information quality as the reliability and accuracy of the information presented on a website. System quality, according to Wangpipatwong et al., concerned the attributes and performance characteristics of a website. Finally, Wangpipatwong et al. used service quality to refer to the quality of support services provided to citizens using e-government services.

To test their hypotheses, Wangpipatwong et al. (2009) administered a web-based survey to 614 citizens of Thailand who had already used e-government services. By analyzing the results of the survey, Wangpipatwong et al. concluded the three types of quality were positively related to the intention of citizens to continue using e-government websites. In addition to Orgeron (2008) and Wangpipatwong et al., Mirchandani et al. (2008) discovered the quality of government websites and support affected the attitude of citizens in Thailand and Indonesia toward using e-government services.

Status of E-government Diffusion

Although many of the studies reviewed so far have concentrated on attributes of innovations or potential adopters of innovations, another set of literature helps to understand the status of e-government adoption in the United States and other countries. Review of this group of literature should help place the problem of the low usage rate of COMPASS in perspective. Therefore, the review of this group of literature is next.

Rose (2005) asserted that successful deployment of e-government is dependent on the infrastructure enabling access to the Internet as well as the percentage of residents employing the Internet. Rose evaluated the adoption of e-government by comparing characteristics of the populations and economic circumstances in different countries.

Rose pointed out that use of the Internet, by residents of a particular country, is dependent on collective national capital as well as local capital. According to Rose, collective national capital consists of national income per capita, level of telecommunications, and the openness of leaders of the national government. One of the factors in evaluating the level of local capital is if a community is classified as urban or rural. Rural communities are less likely to have the infrastructure to support Internet services (Crenshaw & Robison, 2006; Rose, 2005). Another dimension of local capital is the availability of public facilities such as schools, libraries, and Internet cafes.

Rose (2005) also maintained that informal social capital, such as a computer in the household or friends using e-mail, may influence an individual to employ the Internet. Larsen and Ballal (2005) and Rogers (2003) supported this proposition. Furthermore, Rose included attributes of individuals such as education, age, employment, income, and openness to new technology in a category called human capital. These characteristics are also related to the decision of a person to use the Internet, according to Rose.

In addition to a digital divide that could occur within a country, a digital divide exists between categories of countries (Crenshaw & Robison, 2006; Rose, 2005). Further, Rose (2005) reported that members of the International Telecommunications Union (IUT) discovered that, in 2002, infrastructure existed for widespread use of the Internet in 51 lower middle-income countries, yet less than 5% of the population in these countries was using the Internet. Conversely, the IUT study revealed the Internet was used by an average of 45% of the population in 42 high-income countries.

Rose (2005) also reported that growth of Internet use across the globe fits the S-shaped curve espoused by Rogers (2003). Nonetheless, Rose stated that some of the

population in a society would not use the Internet. For instance, some young children or individuals with severe disabilities may not possess the skills for employment of the Internet. Because of this observation, Rose argued that a practical upper limit for Internet use within a society is between 80% and 85% of the population.

In addition to making these observations, Rose (2005) described different levels of government websites and the presence on the Internet. For instance, Rose reported that government websites in Angola and Yemen offer minimal capabilities to access government information online. Information may not be available for every department and the information may be dated or vague in these countries (Rose, 2005). In contrast, the websites maintained by government personnel in other countries allow transactional e-government. In this situation, a citizen may make a request through a website and receive a decision concerning the request online. For instance, Rose gave the example of a citizen completing a tax form, having the taxes determined, and making payment of the tax online. Rose reported that transactional e-government existed in 17 countries, including the United States.

Rose (2005) stated that, in 2001, 54% of American adults were users of the Internet. Rose maintained that most Internet users employ the technology to e-mail friends or family or to conduct their work rather than accessing government websites. A similar disparity was revealed during a study of e-government adoption in Jordan (Abu-Shanab et al., 2010). Rose opined that government officials should not force Internet usage by terminating non-electronic methods to provide communication with citizens. Rose argued that government personnel have an obligation to serve persons regardless of Internet use.

Despite these observations and concerns by Rose (2005), public officials in many countries have made large investments in the development of e-government systems (Olphert & Damodoran, 2007). For instance, Henriksen and Damsgaard (2007) analyzed seven initiatives supported by public officials in Denmark to encourage the use of the Internet and other electronic technologies in conducting business between personnel in government entities and the public. Henriksen and Damsgaard discovered that some of the initiatives were essentially promotional campaigns with nominal concrete action plans. A small number of the initiatives; however, included specific measures that led to higher utilization of digital transactions between administrators in different government organizations. Nonetheless, Henriksen and Damsgaard reported the initiatives had minimal effect on the use of the Internet by the Danish public when interacting with officials in government organizations.

In addition to the low utilization of e-government systems in Denmark, revealed by Henriksen and Damsgaard (2007), other researchers discovered low use of e-government services in the United Kingdom (Carter & Weerakkody, 2008; Kolsaker & Lee-Kelly, 2008; Olphert & Damodoran, 2007). Nonetheless, Olphert and Damodoran (2007) reported that over 50% of the population in numerous other European countries had made online government transactions. Olphert and Damodoran; however, did not specify the countries having the higher utilization rates.

In the United States, federal officials have devoted significant funds and effort to promote e-government operations (GAO, 2005). In 2002, President Bush recommended establishing a fund of $100 million for an e-government initiative to be managed by the General Services Administration (Shafritz & Russell, 2003). In fact, a federal law called

the E-Government Act of 2002 was passed to promote the use of e-government services (GAO, 2005). One of the provisions of this act established the Office of E-Government and the E-Government Fund.

According to personnel from the GAO, a number of other provisions of the E-Government Act (2002) have been implemented (GAO, 2005). One of the implemented sections was to establish an integrated Internet portal for making transactions with personnel from the federal government. The Internet portal was called FirstGov (GAO, 2005). Nevertheless, the GAO personnel also stated that other provisions of the E-Government Act have not been implemented. As an example, a section of the act called for a study of the effects of the digital divide on access to e-government services. That study was not completed by the time the GAO report was produced.

Despite some provisions of the E-Government Act (2002) not being fulfilled, a United Nations report listed the United States as a leader among countries in e-government implementation (Lee et al., 2005). Nonetheless, e-government implementation at the state level, in the United States, is quite varied. Implementation of e-government is extensive in some states and sparse in other states (Lee et al., 2005).

Akers (2006) completed another study of the adoption of e-government services throughout the states in the United States. In his study, Akers used classic diffusion theory in combination with policy innovation diffusion theory to evaluate the utilization of e-government services by citizens, members of private organizations, and personnel within agencies in different states. Although Akers discovered significant determinants of the adoption of e-government services, he researched e-government in a broad sense rather than specific applications such as applying for government-sponsored health care.

During an investigation of e-government implementation at the municipal and county level in the United States, Norris and Moon (2005) discovered that nearly 88% of local governments had websites in 2002. Norris and Moon reported; however, that only a small number of the local government websites offered capabilities to make two-way transactions such as making payments or recording complaints. Nevertheless, Norris and Moon stated that many of the local government officials were planning to increase the amount of online services offered.

Policy Diffusion

Offering of online services by the leaders of one municipality or government could influence the leaders in another location to adopt an innovation or policy. For instance, King and Mori (2007) suggested that diffusion theory might be useful in analyzing the adoption of various governmental policies by leaders of different countries. King and Mori asserted that political ideologies and economic interests could inhibit the diffusion of public policies. Nonetheless, one method to diffuse public policies is through policy transfer. According to King and Mori, policy transfer involves the borrowing of policies developed in one country by officials in another country. King and Mori maintained that commercial globalization and advances in technology have increased the likelihood of policy transfer between countries. Indeed, policies concerning carbon taxes, free access to environmental information, and strategies for sustainable development are examples of policies that have been transferred from one country to another (King & Mori, 2007).

Similar to policy diffusion among countries, governmental policies and procedures can diffuse between states in the United States (Ingle, Cohen-Vogel, &

Hughes, 2007). Ingle et al. (2007) asserted that policy diffusion is especially evident in states in the same region or sharing a common border. According to Ingle et al., such diffusion has occurred in tax reforms, tort laws, and educational programs. Given the observations presented by Ingle et al. and King and Mori (2007), the policies used to enhance COMPASS and advance its use could diffuse into other states where similar programs have been built. Thus, the results of the current study could have implications for public administrators in multiple states.

Use Intention and Behavior

Public administrators expending resources to promote e-government services may be concerned with the use of the services rather than the intention to use e-government. A number of the studies discussed so far in the literature review concerned the measurement of the intention to use e-government services (Abu-Shanab et al., 2010; Carter, 2008; Carter & Belanger, 2005; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). Although Venkatesh et al. (2003) maintained that use intention was significant in predicting usage behavior in the work setting, Van Ittersum and Feinberg (2010) asserted that use intention is not always an accurate predictor of usage behavior.

Van Ittersum and Feinberg (2010) reported the probability of people following through on the intention to purchase a new technology product is .32. To improve the performance of intention measures, Van Ittersum and Feinberg developed a measurement called *cumulative timed intent*. A researcher using this measurement would ask participants about the likelihood of adopting a technology at multiple points in the future, rather than at a single point. Van Ittersum and Feinberg conducted three longitudinal studies to test the accuracy of cumulative timed intent. After reviewing the results of the

studies, Van Ittersum and Feinberg concluded that cumulative timed intent was more accurate than a number of other intention models. The work and assertions of Van Ittersum and Feinberg support the need for research on usage behavior in relation to adoption of technology and e-government services.

Summary

Implementation of COMPASS is one example of an initiative by government personnel to improve service to citizens through e-government systems. A substantial amount of literature has been written regarding the diffusion and adoption of innovations including e-government services. One of the most cited authors in the field of diffusion research is Everett M. Rogers. After studying the diffusion of a wide variety of innovations, Rogers (2003) developed a number of generalizations and theories concerning the diffusion and adoption of innovations.

Despite the number of theories developed by Rogers (2003), numerous researchers have focused on one area: the attributes of an innovation contributing to its diffusion and adoption (Carter & Belanger, 2005; Carter & Weerakkody, 2008; Chen, 2009; Choudhury & Karahanna, 2008; Demir, 2006; Harting et al., 2009; Lopez-Sisniega, 2009; Richardson, 2009; Sahin & Thompson, 2006; Schaupp & Carter, 2005; Yang et al., 2007). Although Rogers asserted that five innovation characteristics affect the diffusion of an innovation, a number of researchers revealed that two characteristics have been especially prominent in their association with the intention to use e-government services. The two attributes are the relative advantage of the innovation compared to alternatives and the compatibility of the innovation with the values of potential adopters (Carter &

Belanger, 2005; Carter & Weerakkody, 2008; Lopez-Sisniega, 2009; Schaupp & Carter, 2005).

Another important model used to study the adoption of e-government services is the TAM. The two independent variables in the TAM are perceived ease of use and perceived usefulness of an innovation (Davis, 1989). Both variables had a significant impact on the intention to use e-government systems in a number of studies (Carter, 2008; Carter & Belanger, 2005; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). In addition to characteristics of an innovation, trust in the Internet and trust in government personnel were discovered to be key predictors of the intention to use e-government (Abu-Shanab et al., 2010; Carter, 2008; Carter & Belanger, 2005; Das et al., 2008; Kolsaker & Lee-Kelly, 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005).

A number of the authors of the reviewed literature assessed the effects of some of the demographic variables used as independent variables in the current research. For instance, Carter and Belanger (2005) along with Lopez-Sisniega (2009) discovered that age and gender were not associated with the intention to use e-government systems. Nevertheless, Venkatesh et al. (2003) concluded that both age and gender produced moderating effects on the determinants of the intention to use new technology.

None of authors of the reviewed literature simultaneously investigated the association of income, age, gender, race, and ethnicity variables in relation to the diffusion and adoption of an e-government service. Further, none of the researchers evaluated the diffusion and adoption of a program similar to COMPASS for applying for health care coverage. Moreover, much of the research on e-government adoption by the

public focused on intention to use e-government services rather than usage behavior (Carter, 2008; Carter & Belanger, 2005; Carter & Weerakkody, 2008; Das et al., 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). Because usage intention is not a reliable predictor of usage behavior (Van Ittersum & Feinberg, 2010), the current study adds to the understanding of variables associated with e-government usage behavior. In addition, the policy diffusion research of Ingle et al. (2007) and King and Mori (2007) suggested that policies adopted by leaders of one local, state, or federal government could influence the policies and practices of leaders of other government entities. Thus, the results of this study of COMPASS utilization could be helpful to public administrators promoting the use of similar programs in states outside of Pennsylvania.

Chapter 3: Research Method

The concern investigated in this study was the low usage rate of an e-government application, known as COMPASS, to apply for CHIP. The purpose of the quantitative study was to examine the extent the age, income, gender, race, and ethnicity of applicants are connected to adoption of the online mode of applying for health care coverage. Investigation of these variables helped to identify the types of CHIP applicants who have adopted COMPASS and those applicants who appeared to prefer other methods of applying for coverage. Aligned with the purpose of this study are the following research questions and hypotheses.

Q1. To what extent, if any, is income level related to the probability of COMPASS adoption?

$H1_0$. Income level is not significantly correlated to the probability of COMPASS adoption.

$H1_a$. Income level is significantly correlated to the probability of COMPASS adoption.

Q2. To what extent, if any, is age related to the probability of COMPASS adoption?

$H2_0$. Age is not significantly correlated to the probability of COMPASS adoption.

$H2_a$. Age is significantly correlated to the probability of COMPASS adoption.

Q3. To what extent, if any, do male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS?

$H3_0$. Male CHIP applicants do not differ from female CHIP applicants, based on the proportion adopting COMPASS.

$H3_a$. Male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS.

Q4. To what extent, if any, do CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS?

$H4_0$. CHIP applicants from various racial groups do not differ, based on the proportion adopting COMPASS.

$H4_a$. CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS.

Q5. To what extent, if any, do Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS?

$H5_0$. Hispanic CHIP applicants do not differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

$H5_a$. Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

The research approach employed to investigate these questions will be described in this chapter. Included in the chapter are descriptions of the methods used to collect and analyze appropriate data and operational definitions of the independent and dependent variables. Moreover, the limitations of interpreting the results along with threats to external validity are presented. Finally, ethical assurances are discussed followed by a summary of the chapter.

Research Methods and Design

The research study involved a quantitative approach to analyze the applicant data collected at the time of applying for CHIP and stored in a centralized database. Permission to use the information in the database has been obtained from appropriate personnel in the PID. This permission is discussed in the Ethical Assurances section. The applicant data extracted from the database for conducting the research are (a) the date the CHIP application was completed, (b) date of birth, (c) gender, (d) race, (e) ethnicity, (f) household income, and (g) the method of making an application. Although investigation of some of the research questions required associative analyses, other questions were examined through comparative analyses.

The intention of investigating the first two research questions was to assess the relationship of applicant income and age to using COMPASS to apply for CHIP. Furthermore, the independent variables of income and age were ratio and the dependent variable, COMPASS adoption, was a dichotomous, categorical variable. Given these definitions of the independent and dependent variables, a correlational design using binary logistic regression was used. Binary logistic regression may be used to evaluate the direction and magnitude of the relationship of the income and age variables with the probability of using COMPASS to apply for CHIP (Moutinho & Hutcheson, 2008).

Logistic regression has been used in a variety of studies involving a categorical response variable. For example, logistic regression has been used to study adoption of preventative health practices (Dhalla & Poole, 2009), predicting the success of shopping online (Naseri & Elliot, 2010), and calculating the odds of adopting of e-government services (Carter & Weerakkody, 2008). Moreover, use of logistic regression for research

involving a single independent variable measured on a ratio scale and a categorical dependent variable has been recommended by researchers at the University of California at Los Angeles (UCLA Academic Technology Service, n.d.).

The purpose of examining the third through fifth research questions was to determine if significant differences existed in the adoption rate of COMPASS based on the gender, race, and ethnicity of CHIP applicants. Comparative analyses may be employed for these types of questions (Zikmund, 2003). For example, an analysis was completed to test for statistically significant differences between the proportion of men applying for CHIP online and the proportion of women applying online.

One advantage of taking the approach of analyzing secondary data is the information contained in the database reflects actions taken by applicants, rather than intentions or recollections of applicants, as would be the case in conducting a survey (Zikmund, 2003). Further, Zikmund (2003) reported that survey research is subject to potential errors from nonresponses and self-selection bias. Analysis of the applicant data in the database avoids these types of errors.

In addition to a quantitative approach, some researchers may consider a qualitative or exploratory method. The research questions; however, were not exploratory. For example, the research questions were not meant to determine the reasons for using or not using COMPASS. Therefore, a qualitative approach, such as conducting a focus group interview would not be appropriate.

Participants

Human participants were not involved in this study. The data analyzed came from applications for CHIP in Pennsylvania. To qualify for health care coverage through

CHIP, a child must be a resident of Pennsylvania, must not be covered by another health insurance plan, and must not be eligible for the state Medicaid program (PID, 2008a). Because no upper income limit exists for CHIP, an adult applying on behalf of a child could be from any income range (PID, 2008a).

To study the problem of the low adoption rate of COMPASS, a simple random sample of CHIP applications completed during the period of July through November 2010 was selected. The selection of this period was made because a new version of COMPASS was released to the public in June 2010 (Pennsylvania Department of Public Welfare, 2010). The first full month of availability of the new version of COMPASS was July 2010. Furthermore, the most recent data are from applications made in November 2010. Approximately 22,000 applications for CHIP were made during the July through November 2010 period (PID, 2010a). The use of a simple random sample ensured applications made in the sample period had an equal chance of selection. Use of this technique also ensured the sample was representative of the population of CHIP applicants, assuming a sufficient sample size (Ritchey, 2008).

Binary logistic regression was used to test the hypotheses concerning the income and age of CHIP applicants. A formula developed by Hsieh, Bloch, and Larsen (1998) may be used to calculate the required sample size for binary logistic regression with a single independent predictor variable that is continuous. The formula is:

$$n = (Z_{1-\alpha/2} + Z_{1-\beta})^2/[P1(1-P1)\beta^{*2}].$$

In this equation, n is the required sample size, β^* is the effect size, P1 is the assumed event rate at the mean of the independent variable, and Z_u is the upper uth percentile of the standard normal distribution. The probability of adopting COMPASS was stated in

the problem statement as .17. This value was used for P1 in the sample size equation. Further, α is the probability of a Type I error, assumed to be .05. The desired power, $1 - \beta$, is .95. Using a medium effect size, β^*, of .5 yielded a required sample size of 370 applications to test the hypotheses regarding the income and age of applicants in relation to adoption of COMPASS.

The G*Power 3 program, developed by Faul, Erdfelder, Lang, and Buchner (2007), was used to determine the sample size required to test each of the comparative hypotheses involving the proportion of applicants adopting COMPASS grouped by gender, race, and ethnicity. One of the input parameters of G*Power is the type of statistical testing to be performed. Faul et al. (2007) recommended a *z*-test to compare proportions from two independent samples. In addition to having independent samples, Zikmund (2003) stated the sample size must be greater than 30 to use a *z*-test for comparing two proportions. If the sample size is 30 or less, Zikmund recommended the use of a *t*-test.

The gender and ethnicity independent variables in the current study each had two levels. Further, the CHIP applications from male applicants were independent of the applications from female applicants. Similarly, CHIP applications completed by Hispanic applicants were independent of the applications completed by non-Hispanic applicants. Therefore, a *z*-test was employed to investigate the hypotheses regarding the differences in the proportion of CHIP applicants adopting COMPASS by gender and ethnicity. Again, using an effect size of .5, with the previous α and power assumptions, a sample size of 210 applications was initially calculated for the hypotheses concerning the gender and ethnicity of applicants.

The race independent variable in the study had three levels. Although analysis of variance (ANOVA) is a common technique for comparative analyses of three or more groups, it was not appropriate for this study. One reason is that use of ANOVA requires the dependent variable to be measured on a ratio or interval scale and come from a normal distribution (Zikmund, 2003). The underlying data for the current research did not meet either of these conditions. Further, the Kruskal-Wallis test, which is a nonparametric version of ANOVA, was not appropriate because the underlying data must be ordered to use the Kruskal-Wallis test (Zikmund, 2003). Ordering was not possible with the nominal data analyzed in this study. In situations where the underlying data are nominal and three or more groups are to be compared, Zikmund (2003) recommended a chi-square test. Thus, a chi-square test was used to evaluate the hypotheses concerning differences in the proportion of applicants adopting COMPASS in various racial groups.

To use the chi-square test, observed proportions were converted to observed and expected frequencies. Because the race variable had three levels, the chi-square test had 2 degrees of freedom. Using these degrees of freedom along with a medium effect size of .3 produced a required sample size of 172 applications for the hypotheses regarding race.

As the 370 samples required for logistic regression was the maximum sample size calculated, a simple random sample of 370 CHIP applications was initially gathered to test the hypotheses. Nevertheless, preliminary analysis of the data revealed the ratio of non-Hispanic applicants to Hispanic applicants was approximately 10:1. Because the power of the *z*-test is dependent on the ratio of the sizes of the two populations (Faul et al., 2007), an additional 233 applications were randomly selected to ensure a power of at

least .8 for testing all hypotheses. The extra sampling yielded a total of 603 CHIP applications being selected for the study.

Materials/Instruments

The data analyzed in this study were collected in a centralized database containing the information from applications for CHIP. An extract of the database was employed to obtain the necessary data elements from a random sample of 603 applications. No data were collected through surveys, interviews, experiments, or other methods. Therefore, no published instrument, survey, or apparatus was employed to conduct the study.

Operational Definition of Variables

The purpose of the statistical analyses was to investigate the possible connection between certain demographic variables and the adoption of COMPASS as the means to apply for health care coverage. In conducting the investigation, the distinction between adoption and diffusion should be made. Whereas Rogers (2003) referred to diffusion as the process of communicating about an innovation, he employed the term adoption to refer to making use of an innovation. Other researchers, such as Bajwa et al. (2005), employed the term adoption if an innovation was made available to end users. Bajwa et al. employed the term use to refer to utilization of an innovation. In the current study, adoption meant use of an innovation rather than its availability to a potential user.

Another key variable used in the current research is income. Rogers (2003) made use of the expression social status to refer to a broad concept that may include such measures as possession of wealth, occupational prestige, and self-perceived identification with a social class as well as personal income. Akers (2006) employed the notion of wealth in describing the general dissemination of e-government throughout a particular

state. In his study; however, Akers defined wealth as per capita income because he focused on features of the general population in a given state. Akers asserted that wealth of the population in a particular state would be associated with higher rates of e-government adoption in that state. In this study, the term income referred to the household income of an applicant for health care coverage instead of the per capita income of a population.

One more variable discussed in the literature and utilized in the current research is age. Rogers (2003) used the age variable to refer to the age of a potential adopter. The same definition was employed in this study. The remaining variables used in the research questions and hypotheses were not defined in the literature. Thus, the section below provides the operational definitions of the independent and dependent variables employed in this study. The numbering of each independent variable corresponds to the associated research question number.

Age: Independent variable (X_2). Age was operationally defined as the chronological age, in years, of an applicant for benefits through CHIP. Age was a ratio variable.

COMPASS adoption: Dependent variable (Y). COMPASS adoption was operationally defined as having possible values of 1 indicating adoption of COMPASS and 0 indicating use of another method to apply for CHIP. COMPASS adoption was a nominal variable.

Ethnicity: Independent variable (X_5). Ethnicity was operationally defined as having possible values of Hispanic or non-Hispanic. Ethnicity was a nominal variable.

Gender: Independent variable (X_3). Gender was operationally defined as having possible values of male or female. Gender was a nominal variable.

Income: Independent variable (X_1). Income was operationally defined as the annual household income as reported on the application for coverage through CHIP. Income was measured as a ratio variable in units of $1,000.

Race: Independent variable (X_4). Race was operationally defined as having possible values of African American, Caucasian, and other race. An applicant specifying more than one race or providing a race other than African American or Caucasian on the CHIP application was classified as other race. Race was a nominal variable.

Data Collection, Processing, and Analysis

While applying for CHIP coverage, demographic and financial information is requested for members of an applicant's household. Although some of the information is required, such as income, other information, such as race and gender, are optional (PID, 2008a). Nevertheless, for applicants not applying through COMPASS, data entry personnel capture the financial and demographic information present on an application in a centralized database. The information from applicants applying through COMPASS is automatically stored in the database, rather than entered by a worker. Furthermore, the method an applicant uses to submit an application, electronic or otherwise, is also gathered and stored in the database (PID, 2008a). To evaluate the usage rate of COMPASS, a random sample of 603 CHIP applications was drawn from July through November 2010. If a selected application did not contain the information necessary for hypotheses testing, the application was discarded and another application was selected at random.

Binary logistic regression was used to test the first two sets of hypotheses regarding the income and age of applicants. Although logistic regression may be used for exploratory investigation, the technique may also be employed for hypothesis testing related to a dichotomous dependent variable, such as using or not using COMPASS (Moutinho & Hutcheson, 2008). The independent variables in logistic regression may be continuous or categorical (Moutinho & Hutcheson, 2008). Further, the independent variables in logistic regression do not have to be normally distributed and equality of variances within each group is not a requirement (Moutinho & Hutcheson, 2008). A restriction of logistic regression is the observations in the sample must be independent (Moutinho & Hutcheson, 2008). The decision to use or not use COMPASS by each applicant is independent of the decision made by other applicants. Therefore, the condition of independent observations was met.

To evaluate the hypotheses concerning the income of applicants, a binary logistic regression equation was generated with income as the only predictor variable. The significance of the income coefficient in the regression equation was evaluated using the *z*-statistic (Moutinho & Hutcheson, 2008). A significant *z*-statistic would indicate that applicant income was significantly related to the probability of adopting COMPASS. One advantage of the using logistic regression is that model parameters may be employed to predict the change in the probability of using COMPASS with a unit change in income (Moutinho & Hutcheson, 2008).

Testing of the hypotheses concerning the age of applicants was conducted in a similar fashion as the hypotheses related to the income of applicants. Generating a logistic regression equation permitted testing of the significance of age as a predictor of

the probability of using COMPASS to apply for CHIP. If the coefficient of the age variable in the regression equation was significant, the formulated model could be used to predict the probability of using COMPASS with a unit change in the age of applicants (Moutinho & Hutcheson, 2008).

The gender, race, and ethnicity independent variables were nominal. Therefore, these independent variables were employed to divide the applicants into groups. The frequency and proportion of online CHIP applicants was determined for each group.

Because the gender variable had two levels, a *z*-test was employed to determine if a significant difference existed in the proportion of female applicants who adopted COMPASS compared to the proportion of male applicants who adopted COMPASS (Zikmund, 2003). Similarly, the ethnicity variable had two levels and a *z*-test was used to evaluate the difference in the ethnicity of applicants with regard to the proportion adopting COMPASS. Use of a *z*-test for testing the hypotheses related to the gender and ethnicity of applicants was justified because the sample size and sample independence requirements for this test were met.

Because the race variable had three levels, the *z*-test was not appropriate for testing the equality of the proportion of applicants adopting COMPASS among the races (Zikmund, 2003). Moreover, the characteristics of the underlying data did not permit use of ANOVA or the Kruskal-Wallis test. For circumstances in which the independent and dependent variables are nominal and the independent variable has three or more levels, Zikmund (2003) recommended the use of a chi-square test. Thus, a chi-square test was used to evaluate the hypotheses associated with the race of applicants. Although the chi-square test is nonparametric, a condition for using the test is the expected frequency of

each combination of the levels of the independent and dependent variables must be at least five (Zikmund, 2003). If this condition had not been met, additional random samples would have been drawn until the requirement was satisfied (Zikmund, 2003).

Methodological Assumptions, Limitations, and Delimitations

As stated earlier, the data used in this study was taken directly from applications for CHIP and stored in a centralized database. Nonetheless, data entry errors could affect the validity of the data. As an example, a male applicant could be entered into the database as a female. Furthermore, applicants are not required to provide complete demographic information on a CHIP application. For instance, an applicant's race and ethnicity do not have to be specified on an application (PID, 2008a). To overcome this limitation, an application selected as part of the sample that did not contain complete demographic information was discarded and selection of applications continued until a suitable replacement was located. Although data entry or data omission errors could occur, the indication that an application was made through COMPASS was less likely to be in error. The reason is that an application entered through COMPASS is automatically inserted into the central database and a field is automatically populated signifying the method of application was through COMPASS (PID, 2008a).

Beyond the validity of the data, a researcher should be concerned with the external validity of any conclusions reached in a study. Because random sampling was used, generalization to the population of CHIP applicants in Pennsylvania should be assured (Trochim & Donnelly, 2007; Zikmund, 2003). Despite this assurance, an investigator may be concerned that conclusions based on the applicants for CHIP in Pennsylvania might not apply to the populations in other states. The culture and habits of

applicants for CHIP might not be comparable to applicants for government-sponsored health insurance in another state. One technique to alleviate this fear would be to conduct similar studies in multiple states. Because of time and resource constraints; however, performing this type of research was not proposed.

Although the current study revealed the demographic characteristics of applicants likely to use COMPASS, the reasons for COMPASS diffusion and adoption were not examined in this study. Thus, the results of the study do not include factors that could promote continued diffusion and adoption of COMPASS. Another constraint of the study was that analyses were performed on information from applicants to one of many programs for which a person can apply through COMPASS. As examples, Pennsylvania residents may use COMPASS to apply for food stamps, home energy assistance, Medicaid, and a school lunch program in addition to CHIP (Commonwealth of Pennsylvania, n.d.). Because personnel from different state agencies manage many of these programs, obtaining information concerning applicants to some of the programs was difficult. Therefore, the scope of the study was limited to applicants for CHIP because their information was more readily available for analysis compared to data related to applicants for other programs.

Ethical Assurances

The data analyzed in this study came from a database containing personal information such as names, addresses, dates of birth, and the types of health insurance coverage in which applicants were enrolled. This type of individually identifiable health information is protected from disclosure under provisions of the Health Insurance Portability and Accountability Act (HIPAA) of 1996 (U.S. Department of Health and

Human Services, 2003). Nonetheless, procedures written by attorneys within the PID allow for use of data sets developed from protected health information for purposes of research by employees of the department (PID, 2006).

To use a data set derived from protected health information, a researcher must eliminate identifiable information such as names, postal addresses, telephone numbers, fax numbers, electronic mail addresses, social security numbers, medical record numbers, account numbers, certificate numbers, Internet Protocol addresses, biometric identifiers, and full face photographic images (PID, 2006). The data extracted from the applicant database did not include any of this identifiable information. The extracts from the applicant database only included information required to perform the required analyses. The applicant information taken from the database for this study was (a) the date the CHIP application was completed, (b) the method of making an application, (c) date of birth, (d) gender, (e) race, (f) ethnicity, and (g) household income. In addition to removing identifiable information while creating the data sets, the statistics, conclusions, and study results presented in this manuscript do not contain individually identifiable health information associated with the applicants for CHIP. The removal of individually identifiable health information during the data extraction and presentation of results ensure that provisions of the HIPAA of 1996 were not violated (PID, 2006).

Because the current study involved analysis of secondary data and did not entail interaction with participants, the risk of harm to participants was minimal. Furthermore, every attempt was made to have honest and straightforward interaction with professional colleagues. As an example, the study was discussed with and approved by Peter Adams, the deputy insurance commissioner responsible for CHIP. See Appendix A for a copy of

the approval letter. In addition, extraction of applicant information from the central database did not begin prior to approval of the personnel from the Institutional Review Board of Northcentral University.

Summary

A research study was conducted to investigate the possible linkage of age, income, race, gender, and ethnicity variables with the adoption of an online tool to apply for a government-sponsored health insurance program called CHIP. The study involved the evaluation of a random sample of secondary applicant data in a quantitative design using correlational and comparative analyses. Employment of random sampling permits generalization of the study results to the population of applicants for the health insurance program (Trochim & Donnelly, 2007; Zikmund, 2003). The possible relationship of the income and age of applicants with adoption of the online program was evaluated. In addition, analyses were performed to test for differences in the use of the online program by applicants in various demographic groups.

The demographic information for each applicant to CHIP is stored in a centralized database (PID, 2008a). The individually identifiable health information contained in the database is protected information according to provisions in the HIPAA (1996). Extraction of the data from the central database was conducted in a manner to ensure stipulations in the HIPAA were not violated. Additionally, the deputy insurance commissioner responsible for CHIP approved the research approach. Appendix A contains the approval letter. Nonetheless, no data were collected prior to approval from personnel from the Institutional Review Board of Northcentral University.

Chapter 4: Findings

The purpose of this quantitative study was to investigate the possible connection of the income, age, gender, race, and ethnicity of CHIP applicants to adoption of COMPASS as the method of applying for coverage. To conduct the study, information was gathered from 603 randomly selected applications to CHIP completed during the period of July through November 2010. All applications selected for analysis contained complete demographic information required to test the hypotheses.

The remainder of this chapter is dedicated to discussing the findings from the research conducted in the study. Statistical analyses are presented to investigate each research question. After presenting the results from the statistical analyses, an evaluation is offered to describe the meaning of the findings in light of other research. Finally, the major points of this chapter are provided in a summary.

Results

The descriptive statistics of the income and age of applicants in the sample are presented in Table 1. The average annual income was less than $35,000 and the average age was 38 years.

Table 1

Annual Household Income and Age of Applicants

	M	*SD*
Income	$34,614	$17,058
Age (years)	38.0	8.5

Note. *M* = mean; *SD* = standard deviation.

The distribution of the applicants in the sample according to gender, race, and ethnicity is shown in Table 2. Over twice as many women were in the sample as men. Furthermore, most (71%) of the sample applicants were Caucasian and a large majority (91%) of the sample was not Hispanic.

Table 2

Gender, Race, and Ethnicity of Applicants

	f	%
Gender		
Female	430	71.3
Male	173	28.7
Race		
African American	98	16.3
Caucasian	427	70.8
Other	78	12.9
Ethnicity		
Hispanic	54	9.0
Non-Hispanic	549	91.0

Note. *f* = frequency.

The CHIP applications from the sample were analyzed through a number of statistical techniques to address the research questions. Each research question is restated below, along with the associated hypotheses and the analyses used to test the hypotheses. An alpha value of .05 was used to evaluate the significance of the test statistics.

Household income. The first research question concerned the possible relationship of the income of applicants to adoption of COMPASS to apply for CHIP. The research question and corresponding hypotheses are stated below.

Q1. To what extent, if any, is income level related to the probability of COMPASS adoption?

$H1_0$. Income level is not significantly correlated to the probability of COMPASS adoption.

$H1_a$. Income level is significantly correlated to the probability of COMPASS adoption.

Binary logistic regression was used to evaluate the possible relationship of applicant household income with the probability of adoption of COMPASS to apply for CHIP. This statistical technique may be employed to analyze the relationship between a dichotomous dependent variable and a continuous or categorical independent variable (Moutinho & Hutcheson, 2008). In addition, the independent variables in logistic regression do not have to be normally distributed (Moutinho & Hutcheson, 2008). Nonetheless, a restriction to using binary logistic regression is that observations in the sample must be independent. This restriction was not violated in this study because the decision to use or not use COMPASS was made by each applicant independent of the decision by other applicants. The regression coefficients using income as the predictor variable are shown in Table 3.

Table 3

Logistic Regression Coefficients Using the Income Independent Variable

	b	*SE*	*z*	*p*	Odds ratio
Income	0.019	0.006	3.285	.001	1.019
Constant	-2.078	0.236	-8.788	.000	0.125

Note. *SE* = standard error.

The results in Table 1 indicate the income coefficient was significantly different from zero, $z = 3.29, p = .001$. This outcome signified that the null hypothesis that income was not significantly correlated to the probability of COMPASS adoption should be rejected.

Applicant age. The purpose of the second research question was to investigate the relationship of the age of CHIP applicants with the decision to adopt COMPASS. Following are the research question and corresponding hypotheses.

Q2. To what extent, if any, is age related to the probability of COMPASS adoption?

$H2_0$. Age is not significantly correlated to the probability of COMPASS adoption.

$H2_a$. Age is significantly correlated to the probability of COMPASS adoption.

Binary logistic regression was employed to evaluate the hypotheses related to the age of CHIP applicants. Presented in Table 4 are the regression coefficients using the age independent variable.

Table 4

Logistic Regression Coefficients Using the Age Independent Variable

	b	*SE*	*z*	*p*	Odds ratio
Age	-0.021	0.013	-1.629	.052	0.980
Constant	-0.632	0.479	-1.321	.093	0.531

Note. *SE* = standard error.

The statistics in Table 4 signify the age coefficient was not significantly different from zero, $z = -1.63$, $p = .052$. Therefore, the null hypothesis that age is not significantly correlated to the probability of COMPASS adoption could not be rejected.

Gender comparison. The third research question concerned the proportion of male applicants applying for CHIP through COMPASS compared to the proportion of female applicants using COMPASS. The research question and hypotheses are presented below.

Q3. To what extent, if any, do male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS?

$H3_0$. Male CHIP applicants do not differ from female CHIP applicants, based on the proportion adopting COMPASS.

$H3_a$. Male CHIP applicants differ from female CHIP applicants, based on the proportion adopting COMPASS.

The frequency and percentage of male and female CHIP applicants who used COMPASS to apply for CHIP are presented in Table 5. In addition, a *z* statistic is presented in Table 5 to evaluate the significance of the difference between the proportion of male applicants adopting COMPASS and the proportion of female applicants using

COMPASS. Use of a *z*-test for a difference in proportions was permissible because the sample size was greater than 30 and the sample from the female applicants was independent of the sample from the male applicants (Zikmund, 2003).

Table 5

Frequency and Percentage of Applicants Adopting COMPASS by Gender

		Application method				
Gender	*f*	COMPASS	Other method	Total	z	*p*
Female	f_o	71	359	430	3.135	.001
	% of gender	16.5%	83.5%	100.0%		
Male	f_o	48	125	173		
	% of gender	27.7%	72.3%	100.0%		
Total	f_o	119	484	603		
	% of total	19.7%	80.3%	100.0%		

Note. f = frequency; f_o = observed frequency.

The results in Table 5 indicate the difference in the proportion of male applicants using COMPASS was significantly different from the proportion of female applicants using COMPASS, $z = 3.14$, $p = .001$. Therefore, the null hypothesis was rejected.

Racial comparisons. The fourth research question concerned the difference in the proportion of COMPASS adopters among three racial groups. Following are the research questions and hypotheses.

Q4. To what extent, if any, do CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS?

$H4_0$. CHIP applicants from various racial groups do not differ, based on the proportion adopting COMPASS.

$H4_a$. CHIP applicants from various racial groups differ, based on the proportion adopting COMPASS.

Because three racial groups were studied, a *z*-test for the difference in proportions was not appropriate (Zikmund, 2003). Instead, a Pearson chi-square test was used to evaluate the significance of the difference in the proportion of COMPASS adopters among the groups (Zikmund, 2003). The observed and expected frequencies associated with the racial groups are displayed in Table 6.

Table 6

Observed and Expected Frequencies of Application Method by Race

		Application method		
Race	*f*	COMPASS	Other method	Total
African American	f_o	20.0	78.0	98.0
	% of race	20.4%	79.6%	100.0%
	f_e	19.3	78.7	98.0
	% of race	19.7%	80.3%	100.0%
Caucasian	f_o	84.0	343.0	427.0
	% of race	19.7%	80.3%	100.0%
	f_e	84.3	342.7	427.0
	% of race	19.7%	80.3%	100.0%
Other race	f_o	15.0	63.0	78.0
	% of race	19.2%	80.8%	100.0%
	f_e	15.4	62.6	78.0
	% of race	19.7%	80.3%	100.0%
Total	f_o	119.0	484.0	603.0
	% of total	19.7%	80.3%	100.0%

Note. f = frequency; f_o = observed frequency; f_e = expected frequency.

One requirement of using a chi-square test is the expected frequency in each cell must be at least five (Zikmund, 2003). This condition was met in this study. Analysis of the statistics in Table 6 indicates the differences in the proportion of applicants adopting COMPASS among the three races were not statistically significant, $\chi^2(2, N = 603) = 0.04$, $p = .979$. Thus, the null hypothesis was not rejected.

Ethnicity comparison. The purpose of posing the fifth research question was to investigate the difference in COMPASS adoption between Hispanic and non-Hispanic applicants for CHIP. Following are the research question and corresponding hypotheses.

Q5. To what extent, if any, do Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS?

$H5_0$. Hispanic CHIP applicants do not differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

$H5_a$. Hispanic CHIP applicants differ from non-Hispanic CHIP applicants, based on the proportion adopting COMPASS.

Similar to the investigation of the hypotheses regarding gender, a *z*-test was used to evaluate the hypotheses concerning the ethnicity of CHIP applicants. Use of a *z*-test was permissible because the sample size for both ethnicities was greater than 30 and the sample from Hispanic applicants was independent of the sample from non-Hispanic applicants (Zikmund, 2003). The respective frequencies and percentages of applicants who applied for CHIP through COMPASS and through other methods are displayed in Table 7.

Table 7

Frequency and Percentage of Applicants Adopting COMPASS by Ethnicity

Ethnicity	*f*	Application method			z	*p*
		COMPASS	Other method	Total		
Hispanic	f_o	4	50	54	2.385	.008
	% of ethnicity	7.4%	92.6%	100.0%		
Non-Hispanic	f_o	115	434	549		
	% of ethnicity	20.9%	79.1%	100.0%		
Total	f_o	119	484	603		
	% of total	19.7%	80.3%	100.0%		

Note. f = frequency; f_o = observed frequency.

The statistics in Table 7 indicate the proportion of Hispanic applicants adopting COMPASS was significantly different from the proportion of non-Hispanic applicants adopting COMPASS, $z = 2.39$, $p = .008$. Therefore, the null hypothesis was rejected.

Evaluation of Findings

One of the discoveries made in this study was the positive relationship of the income of CHIP applicants to the probability of COMPASS adoption. This finding supports the conclusion that a higher level of individual wealth is associated with an increased probability of innovation adoption, as revealed by Rogers (2003) while developing the diffusion of innovations theory. Rose (2005) also asserted that higher personal income would be related to elevated levels of Internet use. Rose's contention was supported by the research conducted by Horrigan (2010) who discovered disparities in Internet access between members of high-income households and members of low-

income households. Furthermore, Akers (2006) discovered a positive association between per capita income in a particular state, in the Unites States, and e-government adoption rates. The conclusions made by Akers, Rose, and Horrigan are supported by the positive relationship of the income of CHIP applicants to the probability of COMPASS adoption. Nonetheless, this positive relationship contrasted to the findings of Lopez-Sisniega (2009) who revealed that income was not a significant predictor of the intention to use e-government services.

Another finding from the current study was the relationship of the age of CHIP applicants to the probability of COMPASS adoption was insignificant. This outcome is congruent with the conclusion drawn by Rogers (2003) that an individual's age was not a reliable predictor of the adoption of an innovation. While developing the diffusion of innovations theory, Rogers discovered that although some diffusion studies indicated a significant relationship between the age of individuals and the rate of adoption of an innovation, the authors of other studies did not reach this conclusion.

The lack of association of applicant age to COMPASS adoption also supports the discoveries by Carter and Belanger (2005) and Lopez-Sisniega (2009) that an individual's age was not related to the intention to use e-government services. Thus, the results of the current research in conjunction with the conclusions made by Carter and Belanger and Lopez-Sisniega signify that an individual's age is not significantly related to e-government usage behavior as well as use intention. Nonetheless, when Venkatesh et al. (2003) developed the UTAUT, they revealed that an individual's age was associated with technology adoption in a work environment.

Venkatesh et al. (2003) also concluded that differences existed between male and female individuals with regard to the intention to use computer-based technology. Moreover, Chan et al. (2010) revealed gender differences with regard to satisfaction with e-government systems. The discoveries by Venkatesh et al. and Chan et al. align with the significant difference revealed between male and female CHIP applicants based on the proportion adopting COMPASS.

Gender differences regarding acceptance of e-government or other technologies appear not to be confined to one environment. For example, the research in the current study regarded voluntary use of an e-government service by members of the public. In contrast, Chan et al. (2010) examined the satisfaction with mandatory use of an e-government system. Further, the investigation of Venkatesh et al. (2003) took place in a work environment rather than a public setting.

The significant difference between genders revealed in the current study is not aligned; however, with the insignificant relationship of gender with the intention to use e-government services discovered by Carter and Belanger (2005) and Lopez-Sisniega (2009). The inconsistent results of the current study in comparison to the work of Carter and Belanger and Lopez-Sisniega could be evidence of the discrepancy between use intentions and usage behavior as asserted by Van Ittersum and Feinberg (2010). An alternative explanation could be the connection of gender with acceptance of e-government services may not be consistent in every setting.

In addition to testing for a difference in the COMPASS adoption rate based on gender, variation in adoption rates among three racial groups was evaluated in this study. The analysis indicated that differences in the proportion of CHIP applicants adopting

COMPASS among the three racial groups was not statistically significant. This outcome occurred despite disparities in Internet access among members of different racial groups in the United States (Horrigan, 2010). Carter and Belanger (2005) also concluded that race was not a significant predictor of the intention to use e-government services. Nevertheless, the finding in the current study does not support the contention by Carter and Weerakkody (2008) that racial differences could be linked to the digital divide in the United States.

Carter and Weerakkody (2008) also maintained that ethnicity of individuals could contribute to the digital divide in the United States. This assertion was supported by the discovery by Horrigan (2010) that Hispanic Americans use the Internet less than non-Hispanic Americans. The results of the current study also substantiate the assertion of a disparity between Hispanic and non-Hispanic residents regarding use of Internet services in the United States. The proportion of Hispanic CHIP applicants applying online through COMPASS was significantly different from the proportion of non-Hispanic applicants adopting COMPASS.

Summary

Five research questions were posed as part of this research study to examine the low usage rate of an online, e-government application called COMPASS. Two of the questions concerned the possible relationship of the income and age of CHIP applicants with the adoption of COMPASS to apply for coverage. The other three research questions involved the differences that may exist between groups formed by the gender, race, and ethnicity of applicants with regard to the proportion applying for CHIP using

COMPASS. Applicant information was gathered from a random sample of 603 CHIP applications made between July and November 2010.

Analyses using binary logistic regression were conducted to investigate the research questions concerning the income and age of applicants. The income of applicants was discovered to be positively correlated with the probability of adopting COMPASS to apply for CHIP. This finding supported the assertions made by other researchers (Akers, 2006; Rose, 2005) that higher personal income would be associated with higher adoption rates of e-government services. The positive relationship of applicant income with COMPASS adoption also supports the generalization made by Rogers (2003) that higher personal wealth is positively associated the probability of adoption of an innovation.

Another finding of the current study was the age of CHIP applicants was not associated with the probability of COMPASS adoption. This result supports the generalization by Rogers (2003) that age was not consistently associated with adoption of an innovation. The lack of a relationship of the age of applicants with COMPASS adoption contrasts; however, with the discovery by Venkatesh et al. (2003) that age was related to the intention to use computer-based technology.

The third discovery in the current study was that male applicants differed significantly from female applicants based on the proportion adopting COMPASS. Although this finding supported the conclusion by Venkatesh et al. (2003) that gender differences existed with respect to the intention to adopt computer-based technology, the finding in the current study contrasts with discoveries by Carter and Belanger (2005) and Lopez-Sisniega (2009) who concluded that gender was not a significant predictor of the

intention to use e-government services. The inconsistency between the current study results and the conclusions made by Carter and Belanger and Lopez-Sisniega regarding gender differences could be evidence of the disparity between usage behavior and use intentions as maintained by Van Ittersum and Feinberg (2010).

The analyses in the current study revealed that adoption of COMPASS was not significantly different among three racial groups. This discovery was in line with the conclusion by Carter and Belanger (2005) that race was not a significant factor in predicting the intention to use e-government services. Furthermore, a significant difference was discovered between the proportion of Hispanic applicants adopting COMPASS and the proportion of non-Hispanic applicants using COMPASS. This finding supports the assertions by Carter and Weerakkody (2008) and Horrigan (2010) that the ethnicity of individuals is associated with the digital divide in the United States.

Chapter 5: Implications, Recommendations, and Conclusions

The problem investigated in this study was the low adoption rate of COMPASS among CHIP applicants. The purpose of the study was to evaluate the possible connection of the income, age, gender, race, and ethnicity of CHIP applicants with the use of COMPASS to apply for health care coverage. A quantitative research approach was employed to investigate the problem. The research design involved a combination of correlational and comparative techniques.

One of the limitations of this study was that information on the CHIP applications was assumed to be accurate. Data entry errors or omissions of data by applicants could have produced inaccurate information in the applicant database. Although household income is verified during the processing of an application (PID, 2008a), an applicant could potentially indicate an incorrect date of birth, gender, race, or ethnicity on the CHIP application.

Another limitation of the study was that analyses were restricted to applicants for CHIP. Citizens may use COMPASS to apply for CHIP and a number of other social programs. Therefore, conclusions from this study may not apply to applicants for other government-sponsored programs.

One more limitation of the study was that analyses performed were not meant to establish the reasons for adoption of COMPASS. Identification of demographic variables associated with COMPASS adoption does not mean causation has been established (Zikmund, 2003). In addition, characteristics of COMPASS could promote or discourage adoption of the program (Davis, 1989; Rogers, 2003; Venkatesh et al., 2003). The identification or analysis of such attributes was not part of the current study.

Furthermore, the analyses conducted in this study were not intended to form a basis for evaluation of marketing or outreach policies to promote enrollment in CHIP.

Although this study had limitations, the research conducted in this study met the ethical standards set by members of the Institutional Review Board of Northcentral University. Additionally, permission to conduct the research was obtained from appropriate personnel within the PID. See Appendix A for the approval letter. Moreover, the data were collected in a manner to avoid violating provisions of the HIPAA of 1996.

The remainder of this chapter is organized into three sections. First, implications of the data analyses for each research question are discussed. After the implications, recommendations for application of the research findings are presented along with suggestions for future research. Finally, a discussion of the conclusions and major points of the chapter is presented.

Implications

The research in this study was meant to examine the low usage rate of COMPASS among CHIP applicants. The implications of the research will be presented in the order of the research questions. Limitations affecting the implications are discussed when appropriate.

Household income. The purpose of posing the first research question was to investigate the possible relationship of the income of CHIP applicants with adoption of COMPASS. Binary logistic regression was used to test the hypotheses associated with this question. Based on the tests of the hypotheses, enough statistical evidence was observed to conclude that applicant income was positively related to the probability of

COMPASS adoption, $z = 3.29$, $p = .001$. Moreover, the model coefficients in Table 3 may be used to calculate the probability of COMPASS adoption for specific values of applicant income. The predicted probabilities of COMPASS adoption for a number of different annual household income values are displayed in Table 8.

Table 8

Predicted Probabilities of COMPASS Adoption at Different Income Levels

Annual income (in thousands)	*p*
$20.0	.15
$40.0	.21
$60.0	.28
$80.0	.36
$100.0	.46

Note. p = probability.

As evident in Table 8, the probability of COMPASS adoption increases as the income of an applicant rises. The implication of the statistics in Table 8 is that adoption of COMPASS is more likely for high-income citizens compared to low-income citizens. Based on the regression model, a CHIP applicant with an annual household income of $100,000 is more than three times as likely to adopt COMPASS as an applicant with an annual household income of $20,000. The assertion that higher income will be associated with an increased likelihood of e-government adoption is supported by research from other investigators (Akers, 2006; Rose, 2005).

Applicant age. The second research question concerned the possible relationship of the age of applicants with adoption of COMPASS. A binary logistic regression analysis was also used to investigate this question. The analysis indicated that the age of applicants was not significantly related to the probability of COMPASS adoption, $z = -1.63$, $p = .052$. Thus, government administrators should not assume that adoption of Internet-based methods would be more likely with citizens in particular age groups. This conclusion contrasts to the assumption made by Chan et al. (2010) that younger citizens would be more prone to use e-government services than older citizens.

Gender comparison. The third research question was posed to investigate the difference between genders with regard to the proportion using COMPASS to apply for CHIP. The statistics in Table 5 illustrate that 27.7% of male applicants used COMPASS compared to 16.5% of female applicants using COMPASS. Analysis using a z-test indicated that this difference in the adoption rates between the two genders was significant, $z = 3.14$, $p = .001$. The suggestion from this result is that a disparity exists between male and female applicants with regard to adoption of COMPASS to apply for CHIP. Male applicants appear to be more prone to use COMPASS than female applicants. Nevertheless, the reasons for this discrepancy cannot be identified from the study results.

Race comparisons. The fourth research question concerned the differences between races in relation to the proportion of CHIP applicants applying online. A chi-square analysis was used to evaluate this research question. The differences in the proportion of online applicants among the three races was not statistically significant, $\chi^2(2, N = 603) = 0.04$, $p = .979$. One inference of this outcome is that adoption of

COMPASS has not been higher for CHIP applicants of any race compared to applicants of the other races. Therefore, the design and accessibility of COMPASS do not appear to be biased toward members of a particular race.

Ethnicity comparison. The fifth research question concerned the difference between ethnic groups, based on the proportion adopting COMPASS. The statistics in Table 7 reveal that 7.4% of Hispanic applicants adopted COMPASS compared to 20.9% of non-Hispanic applicants who adopted the program. This difference in the adoption rates was significant, $z = 2.39$, $p = .008$. This finding indicates that a disparity exists between Hispanic and non-Hispanic applicants, based on the COMPASS usage rate. Hispanic applicants may be less likely to use COMPASS than non-Hispanic applicants. Further, the study results support claims by researchers such as Carter and Weerakkody (2008) that ethnic differences have contributed to a digital divide in the United States.

Effects of study limitations. Although the adoption rate of COMPASS differed for various demographic groups, the reasons for the discrepancies were not examined in this study. For instance, the proportion of Hispanic applicants using COMPASS was lower than the proportion of non-Hispanic applicants using the program. Although a number of factors such as language or cultural differences could have contributed to this disparity, the identification of such factors was not part of this study. Because the reasons for using or not using COMPASS were not explored in this study, specific actions likely to promote continued diffusion and adoption of COMPASS cannot be projected, based in the study results.

Another limitation of this study was that analyses were conducted with applications for CHIP in a single state. Although the design of the study should permit

generalization of results to the population of CHIP applicants in Pennsylvania (Ritchey, 2008), the culture and habits of applicants to similar programs in other states may yield different results than observed in this study. One remedy for this concern would be to repeat the study in other states. Time and resource constraints do not permit such studies to be conducted at this time.

Despite some limitations, the results of the research addressed the purpose of this study, which was to investigate the possible relationship of the income, age, gender, race, and ethnicity of CHIP applicants with adoption of COMPASS. In addition to addressing the purpose of the study, the outcomes of the research augment the literature discussed in Chapter 2. As described in Chapter 4, a number of the results from this study supported the conclusions made by some researchers and contradicted the findings of others. Further, the concurrent analysis of the income, age, gender, race, and ethnicity of citizens with regard to adoption of an e-government system makes the current research unique in comparison to the studies reviewed in Chapter 2. Moreover, much of the prior research concerning e-government adoption measured the intention to use e-government systems (Carter, 2008; Carter & Belanger, 2005; Carter & Weerakkody, 2008; Das, DiRienzo, & Burbridge, 2008; Lopez-Sisniega, 2009; Orgeron, 2008; Schaupp & Carter, 2005). In contrast, usage behavior was measured in the current study. Because use intentions are not always accurate predictors of usage behavior (Van Ittersum & Feinberg, 2010), the results of the current study add to the body of knowledge concerning adoption of e-government services.

Recommendations

In addition to supplementing the work of other researchers, the results of the current study may be helpful to public officials attempting to design online methods to apply for a program similar to CHIP. The outcomes of the study indicate the design and availability of COMPASS do not appear to be biased toward a particular age or racial group. This result implies that public administrators should not be overly concerned that members of certain age or racial groups will be disadvantaged by offering Internet-based methods to apply for government-sponsored health insurance.

Although the age and race of applicants were not significant in predicting COMPASS use, disparities were observed based on other demographic variables. The study results indicated the income of applicants was positively related to COMPASS adoption. Furthermore, significant differences in COMPASS adoption rates were revealed based on the gender and ethnicity of applicants. These differences among various demographic groups in this study may raise social equity concerns for public officials considering the exclusive use of online methods to apply for government services. The intent of the social equity principle is that public services should be made available to citizens regardless of economic circumstances or personal traits (Shafritz & Russell, 2005). Thus, members of some demographic groups could be disadvantaged if the application for a government service was only available online.

One possible explanation for variation in adoption rates of e-government services is the lack of access to the Internet. For instance, Horrigan (2010) reported that socioeconomic and ethnic differences among Americans have contributed to disparities in access to broadband Internet service. Therefore, research involving demographic

variables not examined in this study, such as education level, occupation, or primary language, could reveal additional inequities in e-government adoption rates and signify further social equity issues.

This concern over social equity may become more prominent as officials in many states begin to implement online methods to apply for Medicaid, CHIP, or other health insurance plans to fulfill the requirements of the Patient Protection and Affordable Care Act of 2010 (Henry J. Kaiser Family Foundation, 2011). A provision of this act is that state and federal officials will be required to build mechanisms to assist individuals in finding health insurance by January 2014 (Henry J. Kaiser Family Foundation, 2011). Developing online systems is one of the most probable methods of fulfilling this requirement (Henry J. Kaiser Family Foundation, 2011). Thus, research into possible determinants of COMPASS adoption could yield results that will help narrow the disparities between demographic groups with regard to use of online methods to apply for government services.

Research concerning constructs associated with the decision to adopt or not adopt COMPASS could also reveal concepts related to improving the adoption rate of COMPASS. For instance, the diffusion and adoption of an innovation could be influenced by four broad areas: (a) attributes of the innovation, (b) approaches used to communicate about the innovation, (c) the time taken to disseminate information about the innovation, and (d) characteristics of potential adopters of the innovation (Rogers, 2003). Research into some of these areas with regard to COMPASS adoption could produce discoveries concerning the decision to use or not use the program.

The results of research concerning determinants of COMPASS adoption could signify that changes are required to the design of COMPASS to encourage its use. If changes to COMPASS are warranted, input from the public may be helpful in designing new versions of the program. A number of researchers have maintained that seeking the input of citizens in the design of e-government systems is one method to increase their use (Anthopoulos et al., 2006; Carter, 2008; Olphert & Damodoran, 2007). One reason for seeking this input is that citizens have an understanding of their own needs, problems, priorities, and local environment (Olphert & Damodoran, 2007).

The fact that adoption of COMPASS to apply for CHIP has been low might not negate the usefulness of the program. For instance, COMPASS may be used to apply for a variety of government programs. Research regarding the use of COMPASS to apply for programs other than CHIP could reveal different observations than the discoveries made in this study. Moreover, the importance of COMPASS may not be limited to its use to apply for benefits. A consumer looking for information on government programs could view a website as the best option to obtain information and decide to use another method to apply for particular services (Choudhury & Karahanna, 2008). Examination of the relationship between the number of hits on the COMPASS website and the number of applications for various government services could expose noteworthy findings regarding the value of the website.

Conclusions

One of the major discoveries of this study was the significant positive relationship of the income of applicants with adoption of COMPASS. This finding indicated that applicants with higher incomes are more likely to use COMPASS to apply for CHIP than

applicants with lower incomes. Furthermore, significant differences were exhibited in the proportion of online CHIP applicants, based on the gender and ethnicity of the applicants. These disparities signify that offering government services exclusively online could raise social equity concerns. Therefore, traditional methods to apply for services should be maintained. Moreover, research into the determinants of the decision to adopt or not adopt COMPASS is recommended to help ascertain factors contributing to the disparities in adoption rates among members of different income, gender, and ethnic groups.

Although significant differences in the COMPASS adoption rate was observed for members of some demographic groups, the age of applicants was not discovered to be associated with the probability of COMPASS adoption. Thus, the probability of using of COMPASS does not appear to vary with increases or decreases in the age of applicants. Further, no significant difference was observed among the three racial groups, based on the proportion adopting COMPASS to apply for CHIP. One implication of this finding is that public administrators may not need to be exceedingly concerned that offering online methods to apply for services will disadvantage members of various racial groups.

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Appendixes

Appendix A:

Project Approval Letter

June 3, 2010

Institutional Review Board
Northcentral University
10000 University Drive
Prescott Valley, AZ 86314

Dear Sir or Madam:

This letter is to inform you that I approve of the research being proposed by Edward Naugle to study the applicants to the Children's Health Insurance Program (CHIP) who use the Commonwealth of Pennsylvania Application for Social Services (COMPASS), a multi-service web-based application. Mr. Naugle has discussed the project with me on several occasions as he progressed in his coursework. Further, Mr. Naugle has described the method of collecting applicant information from our centralized database to be part of the study. The data will be collected and used in a manner that does not identify the applicants whose information is being studied. This methodology will protect the privacy of applicants and prevent violation of provisions of the Health Insurance Portability and Accountability Act of 1996.

The Pennsylvania CHIP program will obtain great value from a study of applicants by various demographic variables such as age, income, race, gender, and ethnicity. Such a study will provide members of the CHIP program office with a greater understanding of the population we serve and the value of COMPASS. I look forward to seeing the results of the research.

Sincerely,

Peter J. Adams
Deputy Insurance Commissioner
Office of CHIP and adultBasic
Pennsylvania Insurance Department

PJA:mi