AIS Transactions on Human-Computer Interaction

Volume 7 | Issue 4 Article 3

12-2015

Unraveling the Mystery of New Technology Use: An Investigation into the Interplay of Desire for Control, Computer Self-efficacy, and Personal Innovativeness

Sharen Bakke
Cleveland State University, s.bakke@csuohio.edu

Raymond Henry
Department of CIS, Cleveland State University, Cleveland, OH, United States., r.henry22@csuohio.edu

Recommended Citation
Bakke, S., & Henry, R. (2015). Unraveling the Mystery of New Technology Use: An Investigation into the Interplay of Desire for Control, Computer Self-efficacy, and Personal Innovativeness. *AIS Transactions on Human-Computer Interaction, 7*(4), 270-293. Retrieved from https://aisel.aisnet.org/thci/vol7/iss4/3
DOI:

Transactions on Human – Computer Interaction

Research Paper

Unraveling the Mystery of New Technology Use: An Investigation into the Interplay of Desire for Control, Computer Self-efficacy, and Personal Innovativeness

Sharen Bakke
Information Systems Department
Cleveland State University
s.bakke@csuohio.edu

Raymond M Henry
Information Systems Department
Cleveland State University
r.henry22@csuohio.edu

Abstract:

In this paper, we examine how intrinsically motivated competence and autonomy (two basic psychological needs derived from self-determination theory) in concert with personal innovativeness in IT motivate individuals to try new information technologies. In a study with 202 participants we found 1) competence, operationalized as general computer self-efficacy (GCSE), and 2) autonomy, operationalized as desire for control over information technology (DCIT), to positively influence individuals' intention to use new or unfamiliar technologies. Further, we hypothesize and find evidence of an interaction effect that suggests there may be a tradeoff between these constructs. That is, individuals may be inclined to use new technologies because they perceive themselves as having high levels of ability or because they have high levels of desire; they are either competence-driven or desire-driven users. Therefore, correctly identifying potential users into the appropriate user category and providing the necessary training or control mechanisms will likely increase an individual's intention to try new and innovative IT products.

Keywords: Technology Adoption, Desire For Control, Computer Self-efficacy, New Technology Use.

1 Introduction

Advances in technology have led to a proliferation of innovative IT products and applications that are being used for personal and professional use (Junglas & Harris, 2013). Over the last few years, these products and technologies have become a multibillion dollar industry with a projected annual market growth rate of 20 percent (Pettey & Tudor, 2010). As these new technologies become an increasingly integral part of contemporary life, predicting their adoption and use continues to be an important focus for researchers and practitioners (Venkatesh, 2006). While consumers want to improve their productivity and quality of life (Yi, Fiedler, & Park, 2006a), vendors want to correctly assess user demand for new design ideas (Davis, 1989), and organizations implementing these new technologies want to realize the expected benefits (Agarwal, 2000; Agarwal & Karahanna, 2000).

Individuals most likely to use these new products shortly after their introduction into the marketplace generally display a high degree of IT-related personal innovativeness (PIIT), a personality trait that all individuals possess to a greater or lesser degree (Midgley & Dowling, 1978). This willingness to try out any new information technology prompts these individuals to be the first to try something new regardless of the consequences (Agarwal & Prasad, 1998b). They are the ones waiting in lines for days in all weather conditions to be the first to have the latest technology or high-tech gadget (Bedigian, 2013). Determining what makes this sector of society adopt new technologies has great value since these individuals tend to serve as opinion leaders, function as champions for new products, and accelerate the diffusion process (Valente & Davis, 1999).

Through decades of research in fields such as information systems (Pavlou & Fygenson, 2006; Venkatesh, Morris, Davis, & Davis, 2003; Venkatesh, Thong, & Xu, 2012; Yi et al., 2006a), healthcare (Baird, Furukawa, & Raghu, 2012) and consumerism (Anton, Camarero, & Rodriguez, 2013; Zhu, Nakata, Sivakumar, & Grewal, 2007), we know much about the adoption and diffusion of technological products. Decisions to use new technologies are driven by attitudes, which are determined by beliefs (Agarwal & Prasad, 1998b; Lewis, Agarwal, & Sambamurthy, 2003). Perceived ease of use and perceived usefulness (Davis, 1989), two well-known cognitive beliefs of the technology acceptance model (TAM), are strong predictors of technology use (Venkatesh, Speier, & Morris, 2002).

While extant IT adoption models have proved invaluable in determining cognitive factors that lead to technology acceptance, this perspective is somewhat limiting. Individuals seek both cognitive and sensory experiences (Venkatraman & Price, 1990). For example, affective beliefs such as perceived enjoyment (Agarwal & Karahanna, 2000) or perceived visual attractiveness (Agarwal & Karahanna, 2000; Van der Heijden, 2004) may likely influence user acceptance decisions across multiple technologies (Wells, Campbell, Valacich, & Featherman, 2010; Yi et al., 2006a). Consequently, affective beliefs, along with cognitive beliefs, should be considered viable predictors of new technology use. The decision to use an innovative IT product may be intrinsically motivated; those individuals choosing to use the new product may be doing so for the pure enjoyment of the experience. They may find trying new products inherently interesting or mentally stimulating and may experience perceptions of pleasure and satisfaction (Vallerand, 1997). They may be seeking out new and different products or applications or may be searching for new solutions to existing problems (Hirschman, 1980).

Cognitive evaluation theory (CET) addresses two key determinants of intrinsic motivation: feelings of competence and feelings of personal control (Deci & Ryan, 1985). CET proposes that individuals perform behaviors that allow them to experience competency and autonomy (Deci, 1980). Competence is achieved when individuals either have the requisite skills or feel that they have the ability to successfully perform a particular behavior or task (Deci & Ryan, 2000). Individuals achieve autonomy through making choices that give them the opportunity to be in control; they can freely choose when and how to perform an activity (Deci & Ryan, 2000). When a person's feelings of competence and personal control are enhanced, their intrinsic motivation will increase (Deci, 1975). Hence, when individuals feel competence and desire for personal control over technology, they are more likely to try new technologies.

We propose that understanding the impact and interrelationship between these factors will help researchers make sense of the different motivations toward unfamiliar or innovative IT products and will provide insight into the characteristics that predict their use. Once these motivations are clearly identified, new product development teams can use the results to design products that will appeal to those individuals who always seem first to buy and, thus, ensure the successful migration of these innovative IT products into mainstream use.

In this paper, we examine how competence and autonomy, determinants of intrinsic motivation, in concert with IT-related personal innovativeness independently and jointly influence a person's intentions to use new or unfamiliar information technologies. The paper proceeds as follows. In Section 2, we present the theoretical foundations for this research. We focus on how individual differences influence innovative behavior toward new technologies. In Section 3, we describe the research model and present the hypotheses. In Section 4, we outline the research methodology and examine the model's psychometric properties. In Section 6, we conclude the paper by discussing the implications of our findings and the research's limitations, and we make suggestions for future research.

2 Literature Review

2.1 Technology Adoption

Understanding the factors that motivate individuals to use information technologies (IT) has piqued the curiosity of researchers and practitioners since the mid-1970s when organizations realized that adoption of IT systems was not living up to expectations (Compeau & Higgins, 1995; Yi et al., 2006a). Since then, technology adoption has evolved into one of the richest and most mature research streams in the information systems (IS) field (Benbasat & Barki, 2007; King & He, 2006; Lee, Kozar, & Larson, 2003). Researchers have introduced, tested, and applied numerous models to a variety of technologies. These models include TAM (Davis, 1989) and its key extensions TAM 2 (Venkatesh & Davis, 2000) and TAM 3 (Venkatesh & Bala, 2008), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) and its extension UTAUT2 (Venkatesh et al., 2012), innovation diffusion theory (Rogers, 1962), the decomposed theory of planned behavior (Taylor & Todd, 1995), and social cognitive theory (Compeau, Higgins, & Huff, 1999). These models predict IT use based on perceptions and beliefs. Decisions to perform a behavior, such as adopting a particular technology, are driven by an individual's attitudes, which are determined by their salient beliefs about the technology (Agarwal & Prasad, 1998b).

Researchers have also proposed motivation-oriented perspectives where they examine intrinsic and extrinsic motivations and their role in predicting technology acceptance and usage behavior (Davis, Bagozzi, & Warshaw, 1992; Venkatesh & Speier, 1999). They have found that individuals were extrinsically motivated to use a technology "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis et al., 1992, p. 1112) and were intrinsically motivated "for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1113).

Using the TAM framework, Davis et al. (1992) found intrinsic motivation to be a key driver of behavioral intention to use a technology. Subjects used the IT product for the pleasure and enjoyment of the experience; they found it inherently interesting and enjoyable. Researchers have operationalized intrinsic motivation as excitement (Atkinson & Kydd, 1997), enjoyment (Chin & Gopal, 1995; Davis et al., 1992) and computer playfulness (Venkatesh, 2000; Webster & Martocchio, 1992). They have found it to be a holistic experience (Agarwal & Karahanna, 2000) that involves enjoyment and a feeling of flow (Csikszentmihalyi, 1990) and is enhanced through game playing (Venkatesh, 1999; Venkatesh et al., 2002) and hedonic system use (Van der Heijden, 2004; Venkatesh et al., 2012). This literature stream has examined the motivational role of these drivers and their effect on perceived ease of use, a key TAM cognitive belief.

Criticism surrounds the use of TAM-related models as a reliable mechanism for predicting innovative IT product use (Wells et al., 2010). Some researchers feel the TAM model's inability to provide a systematic means of expanding and adapting its core model limits its usefulness in the constantly evolving IT-adoption context (Benbasat & Barki, 2007). Benbasat and Barki (2007, p. 214) remark that, "when TAM is applied to a new technology, it is not clear which component or components of the particular technology are perceived to be useful and which ones are not, even when a user labels it as useful". They conclude that researchers should consider beliefs other than ease of use and usefulness.

2.2 Innovativeness and the Diffusion Process

Individuals react differently toward adopting a new product or service (Midgley & Dowling, 1978). This behavior is based on innovativeness, a global personality trait that reflects a primal tendency to seek out new information, stimuli, or experiences (Gatignon & Robertson, 1985; Hirschman, 1980; Mudd, 1990). Researchers have found this trait to influence the purchase of new technology (in particular, innovative IT products) (Bruner & Kumar, 2007; Yi et al., 2006a).

One can group individuals into normally distributed adopter categories based on when they first begin using a new product or service (Rogers, 1962). Those first to adopt can function with a great deal of uncertainty and risk, whereas those last to adopt require more certainty and little risk. The diffusion process can be thought of as a waterfall; those who are first to use a product pitch the benefits of the new product or service to those who are slower to adopt and so on until the product or service becomes totally diffused in the population (Rogers, 1962).

Roger's argument for the diffusion of new products or services has been used extensively in the IS field to explain the diffusion of IT (Moore & Benbasat, 1991). Individuals that use a product first are confident in their ability to cope with the uncertainties surrounding new products or services, are venturesome, willing to take chances, and risk errors and other costs to take advantage of the potential positive outcomes (Foxall, 1995; Robertson & Kennedy, 1968). These characteristics make them likely candidates for adopting new or innovative technologies before others (Yi et al., 2006a). These individuals, often referred to as "gadget lovers" (Bruner & Kumar, 2007), "technology enthusiasts" (Moore, 2002), or "technophiles" (Mitchell, 1994), tend to use a variety of leading-edge, technology-based goods and the services that complement them.

Individuals first to adopt new IT products possess high degrees of IT-related personal innovativeness (PIIT) (Agarwal & Prasad, 1998b). Similar to its parent, global innovativeness, this domain-specific innovativeness is conceptualized as a trait that is relatively stable across individuals and situations (Agarwal & Prasad, 1998b). This construct measures the degree to which an individual is willing "to try out any new technological product" (p. 206) and captures a person's predisposition toward technological products. Personal innovativeness has been viewed as a direct influencer on perceived ease of use and perceived usefulness (Lewis et al., 2003; Yi, Jackson, Park, & Probst, 2006b) and as a modifier of the relationship between the perceived characteristics of an innovation and behavioral intention (Agarwal & Prasad, 1998a). Using the TAM framework, PIIT research examines users' perceptions of ease of use and usefulness for a variety of technologies including the World Wide Web (Agarwal & Prasad, 1998b), Internet technologies (Lewis et al., 2003), and online buying and PDAs (Yi et al., 2006a).

2.3 Intrinsically Motivated Behavior

Individuals may choose to use a new IT product for the sheer pleasure of the experience (Davis, 1993). Insights gained from a focus group study of young individuals with a great appetite for technology indicate participants viewed their interactions with gadgets as play; their behavior was motivated by curiosity: they wanted to know how things worked and how these products could be pushed to their limits and made to do things that others may not have known they could do (Bruner & Kumar, 2007). Their exploration of the new technology products was intrinsically motivated and satisfies their appetite for cognitive and sensory experiences (Venkatraman & Price, 1990).

Deci's (1975) cognitive evaluation theory (CET), a subset of self-determination theory (SDT) that deals with intrinsic motivation, states that everyone strives to satisfy the basic psychological needs of competence and autonomy. People are more likely to perform a particular activity when they feel confident in their ability to perform the activity successfully and when they can freely choose how and when to pursue the activity (Deci & Ryan, 2000). When these needs are met, a person has greater enjoyment of these activities and is likely to continue the behavior (Deci & Ryan, 2000).

2.4 Competence

Researchers sometimes refer to competence as mastery motivation (Harter, 1978) or striving for superiority (Connell & Wellborn, 1991; Deci, 1980). One considers individuals are considered competent when they can effectively deal with the environment in which they find themselves. They avoid tasks they perceive as exceeding their capabilities and readily participate in tasks they believe they are capable of performing (Bandura, 1977).

Bandura (1986), through his work with the social cognitive theory, defines the self-efficacy construct as an individual's belief in their capability to perform a specific task or behavior: a belief in their own competence. Researchers have introduced and validated computer self-efficacy (CSE), a domain-specific self-efficacy defined as an individual's perceptions of their capability to use computers in the accomplishment of a task (Compeau & Higgins, 1995), in numerous studies (Agarwal, Sambamurthy, & Stair, 2000; Compeau et al., 1999; Marakas, Yi, & Johnson, 1998; Venkatesh & Davis, 1996). Individuals with high self-efficacy are more successful accomplishing computer-related tasks, perceive that computers are easier to use, and are more

likely to develop favorable perceptions of a new information technology (Agarwal, 2000; Compeau & Higgins, 1995; Igbaria & Iivari, 1995; Venkatesh, 2000; Venkatesh & Davis, 1996).

Originally conceived as a unitary construct, Marakas, Johnson, and Clay (2007) suggests CSE comprises general computer self-efficacy (GCSE), which refers to individuals' judgment of efficacy across multiple computer application domains, and task-specific computer self-efficacy, which refers to individuals' perception of efficacy in performing specific computer-related tasks in the domain of general computing. They posit that GCSE is more a product of a lifetime of related experiences and tends to more closely conform to the definition of computer self-efficacy used in the IS literature. Thatcher, Zimmer, Gundlach, and McKnight (2008) argue the CSE construct reflects distinct beliefs about one's ability to perform tasks either on one's own, which they call internal CSE, or with the support of others, which they call external CSE.

2.5 Autonomy

A major premise of SDT is the self-determined nature of behavior. Adler (1930) states that control is an intrinsic necessity of life. Control is manifested through autonomy—individuals' need to pursue their personal values and interests (Deci & Ryan, 2000) and exercise some control over their environment and what happens to them (deCharms, 1968; Glass & Singer, 1972). Autonomy also represents individuals' need to exert personal control, which is "an individual's beliefs, at a given point in time, in his or her ability to effect a change, in a desired direction" (Greenberger & Strasser, 1986, p. 165). The quest for personal control is rarely abandoned; instead, individuals are likely to shift from one method of striving for control to another (Rothbaum, Weisz, & Snyder, 1982).

While the need for personal control appears to be universal, the strength and desire of this need varies greatly among individuals (Rotter, 1966; White, 1959). Some individuals may be highly motivated to see themselves in charge of every situation they encounter; others may have a much weaker urge to control their environment (Burger & Cooper, 1979). Differing levels of motivation to attain control may be attributed to individual differences (Schorr & Rodin, 1984). To describe these individual differences, Burger (1992) has introduced a "desire for control" (DC) construct that measures "the extent to which people generally are motivated to see themselves in control of the events occurring in their lives" (p. 6). Burger found that high desire for control individuals are often not content to accept what life throws their way. They are highly motivated to influence their worlds and are more likely to engage in a task for intrinsically motivated reasons. They are content as long as their need for control is met by a perception that they are in control. They have acquired numerous tricks and techniques to bring the desired and possessed control to acceptable levels (Burger, 1992). These individuals, located at the extreme end of the desire-for-control scale, are commonly known as "control freaks" and insist on having their way in all interactions with others (Burger, 1992). They have a powerful need to control people or circumstances in everyday matters (Burger & Cooper, 1979).

We can make an important distinction between the desire for control and perceptions of being in control. Desire for control is "a measure of how much control individuals would like to have (Greenberger, Strasser, & Lee, 1988, p. 406). Possessed control refers to individuals' beliefs about their ability to influence an outcome through their actions (Greenberger et al., 1988, p. 405). While the amount of possessed control is a state that may vary across situations, desire for control is a relatively stable innate psychological need for control that varies among individuals (i.e., a trait). Similarly, desire for control differs from Rotter's (1966) locus of control. Burger's (1979) desire for control construct is concerned with the extent to which people want control, whereas locus of control indicates the extent to which people perceive they are in control (Burger, 1992). A person with an internal locus of control tends to attribute outcomes of events to their own control. Individuals with a high desire for control have an internal need to control events around them.

Greenberger and Strasser (1986) hypothesize that individuals evaluate personal control as a function of these two principle dimensions: the amount of control desired (Cd) and the amount of control possessed (Cp). This ratio (Cd/Cp) approximates the degree to which individuals at a given point in time are motivated to seek control. When the ratio between control desired and control possessed approaches one, individuals are satisfied with their level of personal control and are less motivated to seek more. When the ratio is greater than one, individuals have a greater desire for control than the amount of control they possess (Greenberger & Strasser, 1986). In that case, they would perform actions that would increase their ability to influence an outcome; that is, increase their possessed control. Discomfort arises when this balance is disrupted. For example, in a dental setting, patients were more likely to experience high levels of distress when they desired a high degree of control but possessed little personal control (Logan, Baron, Keeley, Law, & Stein, 1991).

Charlton (2005) used the desire for control construct in creating a computing-specific measure of control motivation that included computing autonomy and computing need for control subscales. He found the measure was a moderate predictor of computer use.

2.6 Innovative and New Technologies

In this paper, we focus on innovative IT products and new technologies with particular emphasis on the concept of newness. Before delving into antecedents that may predict individuals' intentions to use these IT products, we explore the concept of newness. Newness, according to Blythe (1999), is an attribute assigned to a product by an observer. It is "the degree to which a given IT product or IT concept is outside the observer's experience" (Blythe, 1999, p. 419). It is derived from two factors: the characteristics of the product and the characteristics of the observer. What is new to one person may not be new to another. New or innovative IT products that we consider in this paper include those that are new to the individual.

The traditional TAM cognitive beliefs such as perceived ease of use and perceived usefulness are particularly appropriate when researchers are focused on specific and identifiable technologies. Respondents can assess the characteristics of a particular artifact when responding to survey questions. Difficulties arise when attempting to apply the same basic framework to new technologies. Since the products are inherently unfamiliar to the user, perceptions of the technologies' attributes may be difficult to identify and measure. Perceived ease of use and perceived usefulness may not be especially relevant beliefs for products that have not been or cannot be experienced (Wells et al., 2010). Hence, different factors may be more appropriate for understanding behaviors related to new and innovative IT products.

There is a gap in the literature concerning the adoption of new technologies that are outside individuals' experience. Although researchers have explored constructs dealing with willingness to explore a new technology (Magni, Taylor, & Venkatesh, 2010) or using technology to innovate (Ahuja & Thatcher, 2005; Nambisan, Agarwal, & Tanniru, 1999), little research has been devoted to studying motivational factors that influence intentions to use innovative IT products. The research model and hypotheses that we introduce in Section 3 directly address this issue by exploring the influence of individual characteristics related to competence, autonomy, and personal innovativeness on intentions to use new technologies.

3 Research Model and Hypotheses

The research model (see Figure 1) examines individual characteristics that may predict an individual's Intention to use new technologies. Based on the literature we highlight in Section 2, we focus on three independent variables: personal innovativeness in IT (PIIT), general computer self-efficacy (GCSE), and desire to control information technologies (DCIT). GCSE, a measure of competence in the IT domain, has been explored at great length but not with respect to new or unfamiliar technologies. Similarly, desire for control, a measure of the psychological need for autonomy, and IT-related personal innovativeness have not been examined in the context of understanding predispositions toward new technologies.

3.1 Intention to Use new Technologies

TAM and its variants use behavioral intention as the extent to which an individual intends to perform a specific behavior (Davis, 1989). This intention reflects pre-adoption beliefs and predicts future usage behavior (Ahuja & Thatcher, 2005). Researchers have used this logic to predict behavior in a variety of fields including organizational behavior, marketing, psychology, and information systems (Ajzen, 1991; Sheppard, Hartwick, & Warshaw, 1988; Taylor & Todd, 1995; Venkatesh, Maruping, & Brown, 2006). Ajzen (2002) postulates that, when given a sufficient degree of actual control over a specific behavior, individuals will carry out their intentions when the opportunity arises. Measuring the strength of an individual's intention to use new technologies reflects an individual's predisposition toward using new and unfamiliar IT innovations.

The specific dependent variable under study, intention to use new technologies, refers to an individual's intention to use in the near future an IT product that is outside their realm of experience. This construct differs from other IS studies that examine intentions to use a specific target IT such as accepting telemedicine (Chau & Hu, 2002a), participating in e-commerce (Pavlou & Fygenson, 2006; Venkatesh et al., 2006) or using a computer (Compeau et al., 1999). Examining this outcome variable should provide insights into the antecedents that influence emergent IT use.

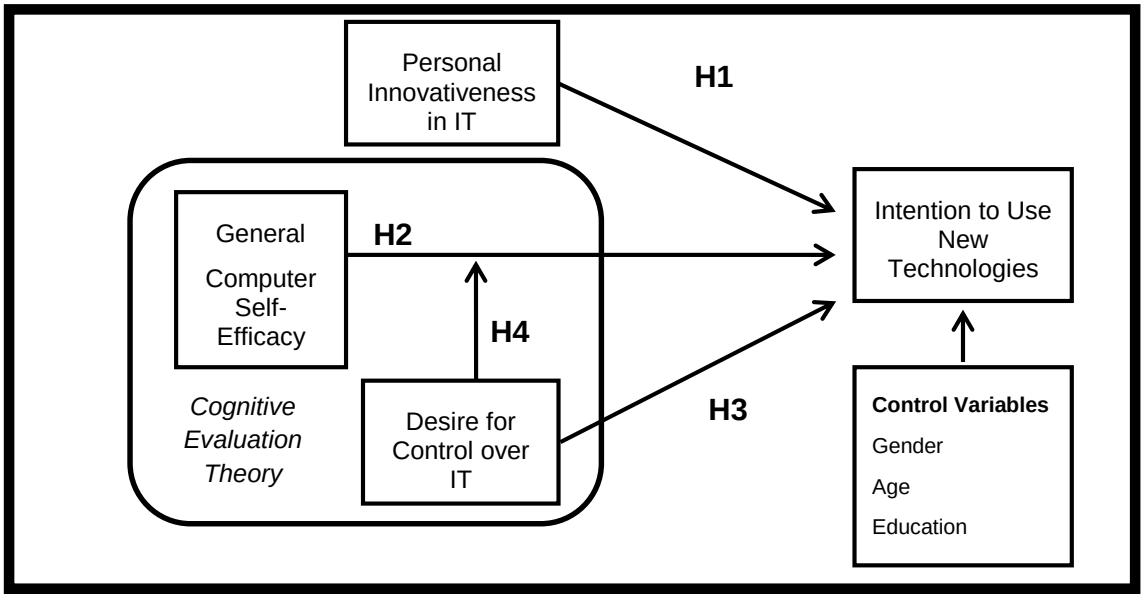

Figure 1. Research Model

3.2 Personal Innovations in IT

PIIT, conceptualized as an individual trait, refers to "the willingness of an individual to try any new information technology (Agarwal & Prasad, 1998b, p. 206). PIIT embodies risk-taking behaviors and an innate ability to deal with uncertainties with respect to information technology. Individuals with higher PIIT seek out information from multiple channels about technologies that are new to them (Agarwal & Prasad, 1998b).

PIIT has received consistent support as an important predictor of technology use and is associated with more positive beliefs about technology use, although the nature of its role has been somewhat unclear (Yi et al., 2006a). Researchers have shown PIIT to moderate the relationship between perceived usefulness and ease of use and intensions to use specific target technologies such as the Internet (Agarwal & Prasad, 1998b). They have also shown it to be a direct determinant of key cognitive beliefs such as ease of use and usefulness (Lewis et al., 2003). Other studies have shown that PIIT, directly and indirectly, influences behavioral intentions (Yi et al., 2006a).

Researchers have yet to explore the relationship between PIIT and intentions to use technologies that may be outside the user's realm of experience. While PIIT measures a willingness to try new technologies, this willingness must, at some point, be translated into more concrete adoption intentions. PIIT will be particularly relevant when constructs such as usefulness and ease of use cannot adequately be evaluated. Intentions to use new technologies represent a stronger commitment to try a new technology—one that indicates a potential action is likely to follow. The willingness reflected by higher levels of PIIT helps to create the excitement that becomes translated into an intention to use new technologies. The anticipation of future experiences requires the individual to tap into their more innate personal innovativeness. Thus, we propose:

H1: Personal innovativeness in IT (PIIT) positively influences an individual's intention to use new technologies.

3.3 General Computer Self-efficacy

Through the work of Bandura (1977) and others, we know much about self-efficacy. This dynamic construct changes over time as new information and experiences are acquired and plays a role in affecting individuals' motivation, behavior, and future intentions to perform a behavior (Bandura, 1977; Gist & Mitchell, 1992; Zhang & Lu, 2002). Individuals who demonstrate strong self-efficacy are more likely to undertake challenging tasks, persist longer, and perform more successfully than those with lower self-efficacy beliefs (Zhang & Lu, 2002).

Since its introduction in the late 1990s, the relationship between computer self-efficacy (CSE) and task performance has been well established in the empirical IS literature (Compeau & Higgins, 1995; Marakas

et al., 1998; Ong, Lai, & Wang, 2004; Sun & Zhang, 2006; Thatcher et al., 2008). Mick and Fournier (1998) identify competence/incompetence as one of the paradoxes individuals face when dealing with technological innovations. Venkatesh and Davis (1996) and Agarwal et al. (2000) found empirical support for a significant relationship between general computer self-efficacy beliefs and perceptions about the ease of use of a specific technology. Others have found CSE to have a significant effect on intentions to use mobile banking (Luarn & Lin, 2005) and ERP systems (Shih, 2006). While the relationship between CSE and technology use has been well researched, its relationship with intentions to use technologies new to the user has not.

Both SDT and CET posit that individuals are more likely to undertake tasks for which they feel confident in their ability to complete successfully. The use of unfamiliar technologies inherently has a high level of uncertainty. Individuals that perceive themselves to be more competent with respect to technology will be more willing to deal with this uncertainty because they know they can deal with any situation that arises. They are confident in their ability to create successful workarounds.

Hill, Smith, and Mann's (1987) findings suggest that efficacy beliefs are sufficiently general to affect an individual's adoption decisions concerning a wide variety of technologically-advanced products. According to Marakas et al. (1998), intentions toward technologies are influenced by a lifetime of related experiences. Marakas et al. (1998) label this general component of an individual's judgment of efficacy across multiple computer application domains as general computer self-efficacy (GCSE). Related experiences help create perceptions of competence that allow individuals to believe they can successfully use a technology even when they know little about it. Thus, we propose:

H2: General computer self-efficacy (GCSE) positively influences an individual's intention to use new technologies.

3.4 Desire for Control over Information Technology (DCIT)

Researchers generally agree that individuals want a sense of personal control over aspects of their lives (Adler, 1930; deCharms, 1968; White, 1959). They obtain this personal control through the ability to make choices. When individuals know choices are available, their confidence increases and their intentions to perform a particular behavior strengthen (Perlmuter, Scharff, Karsh, & Monty, 1980; Veitch & Gifford, 1996). Being able to choose satisfies autonomy, one of the basic psychological needs defined in SDT.

Not all individuals want the same level of control over any given situation (Burger & Cooper, 1979). Individuals with a high desire for control may find it essential to control all aspects all their lives—from the moment they wake up until they retire. Similarly, those with a low desire for control may be satisfied with making only a few decisions as they progress through the day.

When not taken to an extreme, people generally see the desire for control as a positive individual attribute (Burger & Cooper, 1979). People high in this personality characteristic are assertive, decisive, and active. They look to influence events to achieve desired outcomes. They seek out leadership roles and opportunities where they can influence others (Burger & Cooper, 1979). High desire for control leads people to make persistent attempts to influence outcomes; they are likely to be successful in their endeavors at least some of the time (Charlton, 2005).

Burger and Cooper (1979) created a general measure of the desire for control. Domain-specific differences support introducing a new construct, desire for control over information Technology (DCIT), that reflects the level of control, or degree of autonomy, an individual prefers with respect specifically to interaction with information technology.

Early studies have emphasized desire for control as an important factor in interactions with computers (Shneiderman, 1980). Charlton (2005) found evidence that a high desire for control reflects motivation to control information technology. Burger (1992) posits that people with a high desire for control would be more intrinsically motivated to investigate innovative IT products just for the fun of it. This experience would provide an opportunity for them to demonstrate, to themselves and others, that they are masterful manipulators of technology. Consequently, those with a high desire for control over technology would be more likely to use new technologies even before experiencing them. Thus, we propose:

H3: Desire for control over information technology (DCIT) positively influences an individual's intention to use new technologies.

3.5 Moderation of GCSE by DCIT

According to SDT, both GCSE and DCIT represent aspects of an individual's behavioral motivation. GCSE represents an individual's perceived level of competence and has been shown to be a strong predictor of intentions to use existing technologies in multiple computer application domains such as telemedicine (Chau & Hu, 2002b), e-commerce (Pavlou & Fygenson, 2006), and the Internet (Sun, 2008). DCIT reflects an individual's motivation to have control when using IT. While both factors should play an important role in predispositions toward new technologies, we should also consider the relationship between them.

When individuals experience a loss of control, they are motivated to try to regain control through renewed attempts at mastering the situation (Greenberger & Strasser, 1986). Typical strategies would include additional training, more research, or, simply, more practice. The stronger the desire for control, the more individuals will work to rectify situations where they perceive a lack of control. On the other hand, when individuals lack the motivation for control (i.e., possess a low desire for control), they will cease trying to exert control and resort to "learned helplessness" (Wortman & Brehm, 1975).

With regards to IT, when individuals have a high level of GCSE, they believe they have the ability to control outcomes related to their use of IT. They feel they can overcome any obstacle that stands in their way of operating the technology under consideration. However, when individuals have low GCSE, they can either be motivated to learn more about the operation of the technology in question or they can decide they simply lack the ability and give up. The outcome will be based in part on the desire for control the individual possesses. The "stronger the expectation of control, the more controlling behavior or persistence" an individual will show (Greenberger & Strasser, 1986, p. 166). Therefore, the fact that an individual lacks a high degree of GCSE will not deter them from using any technologies they truly wish to use, which suggests that the impact of GCSE on an individual's intention to adopt new IT will be affected by that individual's level of DCIT. Thus, we propose:

H4: Desire for control over information technology (DCIT) moderates the relation between general computer self-efficacy and intention to use new technologies.

4 Methodology

We tested the research model and hypotheses by using data from a survey of part-time undergraduate and MBA students enrolled in classes at a large urban Midwestern state university. We asked individuals to respond to their use of technologies and intentions to use new technologies in the future. A total of 1077 individuals were enrolled in courses and could potentially participate in this survey. A total of 213 surveys were returned, which resulted in a response rate of 19.7 percent. Respondents completed the survey either during class time (83%) or online (17%). Due to missing data, we include only 202 of the surveys that were returned in the analysis. Table 1 shows participants' demographic information. We conducted all analyses in this research with SPSS v20.

4.1 Scale Development and Validation

We used multiple items to measure the constructs in our research model items. We derived items from earlier work wherever possible. We measured all variables used in the study by using seven-point Likert scales. Appendix 1 shows all of the individual items used in the analysis.

We measured general computer self-efficacy (GCSE) by using three items that Compeau and Higgins (1995) originally identified and later classified as measures of internal computer self-efficacy (Thatcher et al., 2008). We measured personal innovativeness in IT using four items from Agarwal and Prasad (1998b). Although only included for our purposes as a control variable, we measured desire for control using four items that we adapted from Burger and Cooper (1979). We operationalized intention to use new technologies using a four-item scale that captures an individual's intentions to use a new or unfamiliar technology in the near future. These new items are based on similar items for intentions used in other IT adoption research but worded to reflect the intended focus of this study.

We developed items to measure DCIT for this study. One can view information technologies as being a composite of the functions they perform and the capabilities they possess. This feature-centric view of technology views features as the building blocks or the components of the technology (Jasperson, Carter, & Zmud, 2005). These features are viewed in abstract terms since the specific implementation of the functionality may not be known. According to Nass and Mason (1990), we can group the functionality of

information technology into three categories: 1) information input, 2) operational control, and 3) information output. These functionalities could be implemented in different ways to provide greater or lesser control to the user. Those with a high desire for control over technology will enjoy knowing they can manipulate the features, whereas individuals with a low desire for control will be content knowing they do not have to make those choices. Our DCIT scale comprises five items that reflect the extent to which individuals desire the ability to control these functions in technologies they use.

We followed standard psychometric techniques in validating the measures and determining the reliability of the scales. We determined the validity and internal consistency of the constructs through factor analysis. We used a principal components method of extraction with varimax rotation to determine if items loaded on the specific construct of interest. All but one of the items loaded on the intended construct with no indication of cross-loading. One item from the PIIT scale had factor loading below recommended values for internal validity. However, because the scale had been used and validated in previous studies, we decided to keep the item in spite of its low factor loading. Table 2 shows the items factor loadings and cross loadings.

Table 1. Sample Characteristics

Demographic variables		Number	Percentage
Gender	Male	123	61%
	Female	79	39%
Age	18-21	53	26%
	22-25	79	39%
	26-30	46	23%
	31-40	16	8%
	41-50	4	2%
	> 51 years	4	2%
Work experience	< 1 year	12	6%
	1-3	41	20%
	3-5	41	20%
	5-10	56	28%
	10-15	32	16%
	15-20	12	6%
	> 20 years	8	4%
Software applications used	0	41	20%
	1-3	59	29%
	3-5	60	30%
	5-10	34	17%
	10+	8	4%

After determining that items loaded appropriately on their intended constructs, we combined items scores into construct measures. Each of the multi-item constructs demonstrated high reliability with Cronbach's alpha reliability scores above .70, which exceeds the recommended cutoffs (Nunnally, 1978). Table 3 shows the correlations between constructs and reliabilities. Table 4 shows the means, value ranges, and standard deviations for the construct measures.

Table 2. Factor Analysis

DCT1	**.807**	.119	.168	.131
DCT2	**.743**	.066	.057	-.043
DCT3	**.733**	.021	-.084	.084
DCT4	**.743**	-.030	.218	.008
DCT5	**.697**	.006	.218	.096
GCSE1	.017	**.788**	.265	.150
GCSE2	.032	**.806**	.229	.032
GCSE3	.061	**.719**	.058	.162
PI1	.177	.146	**.779**	.055
PI2	.014	.147	**.857**	.066
PI3	.175	.156	**.421**	-.127
PI4	.183	.151	**.752**	.112
DC1	.169	.174	-.093	**.747**
DC2	.106	.161	.033	**.762**
DC3	.035	.023	.061	**.889**
DC4	-.065	-.017	.099	**.816**
USIET1	.196	.357	.167	-.011
USIET2	.171	.143	.182	.051
USIET3	.244	.109	.250	.026
USIET4	.184	.054	.130	.182

Table 3. Correlations

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1. Gender	**n/a**									
2. Age	.340**	**n/a**								
3. Education	.252**	.381**	**n/a**							
4. Work experience	.174*	.796**	.332**	**n/a**						
5. Software apps	.065	.305**	.131	.323**	**n/a**					
6. Desire for controls	-.052	.070	.050	.140*	.077	**.808**				
7. PIIT	.042	.027	.140*	.042	.194**	.128	**.768**			
8. General CSE	.116	.220**	.142*	.233*	.151*	.265**	.464**	**.774**		
9. DCIT	-.045	.075	.000	-.048	.107	.166*	.329**	.178*	**.827**	
10. Intention to use new IT	.070	.144*	.164*	.065	.157*	.175*	.480**	.425**	.442**	**.891**
Note: *p < .05, **p < .01; Cronbach's alpha shown on diagonal										

Table 4. Construct Descriptive Statistics

Variable	Min	Max	Mean	Std. deviation
Personal innovativeness in IT	1.00	7.00	4.609	1.211
Desire for control	1.00	7.00	5.953	1.00
Desire for control over IT	2.40	7.00	5.549	0.893
General computer self-efficacy	1.00	7.00	4.712	1.213
Use of new IT	1.00	7.00	5.653	1.107

5 Analysis

We used hierarchical regression to test the direct and interaction relationships hypothesized in the research model. In addition to the primary constructs of PIIT, DCIT, and GCSE and their interaction, we included demographic variables as part of the analysis because previous students have shown that they influence technology adoption. We drew these control variables from the literature and included them in this work to rule out alternative explanations for the findings. They included general desire for control, gender, age, experience in the workforce and frequency of software application use, and they represent variables that have been shown to affect the adoption of technology (Hong & Tam, 2006; Mahmood, Hall, & Swanberg, 2001; Nambisan et al., 1999; Venkatesh, Brown, Maruping, & Bala, 2008; Venkatesh et al., 2012).

In hierarchical regression control variables, hypothesized constructs, and interaction terms are entered in separate stages. This approach allows researchers to see changes in the explanatory power of the regression model associated with various groups of variables (Venkatraman, 1989). In the first stage of our analysis, we entered the control variables in the first step of the regression. In the second step, we entered the independent variables for the hypothesized relationships. In the third step, we entered the appropriate mean-centered cross-product term to test for an interaction effect. We conducted several tests to check that the assumptions behind regression were not violated; we found no significant violations.

6 Results

Table 5 shows the results of the hierarchical regression analysis. The control variables alone account for 6.2 percent of the variance in intentions to use new IT. When we entered only the control variables, the general measure of desire for control was significant ($\beta = 0.182$, $p < .05$). The second model introduced PIIT, DCIT, and GCSE along with the control variables. This model accounted for 35.1 percent of the variance in intentions to use new IT. The independent variables included as part of the theoretical model accounted for 29.1 percent more of the variance than the control variables alone. All three hypothesized relationships were significantly positively related to intention to use new IT (PIIT $\beta = .258$ $p < .01$; GCSE $\beta = .228$ $p < .01$; DCIT $\beta = .286$ $p < .01$). Introducing the IT-specific desire for control variable also caused general DC to no longer be significant. These results provide strong support for Hypotheses 1-3.

Table 5. Regression Results for Intentions to Use New Technologies

	Step 1: control variables	**Step 2: independent variables**	**Step 3: interaction term**
	Standardized β	Standardized β	Standardized β
Constant	3.625**	0.930	1.153*
Gender	0.011	0.005	0.001
Age	0.205	0.119	0.117
Education	0.118	0.081	0.084
Work experience	-0.193	-0.121	-0.104
Software apps	0.125	0.031	0.026
Desire for Control	0.182**	0.042	0.033
Personal innovativeness in IT		0.258**	0.227**
General computer self-efficacy		0.228**	0.250**
Desire for control over IT		0.286**	0.267**
DCIT x GCSE			-0.141*
Adjusted R2	0.062	0.351	0.335
F-Statistic	3.199**	13.103**	12.203**
Change in R2		0.291	0.018
F Change		30.05**	5.759*
Note: * p < .05, ** p < .01			

The third step in the analysis introduced the interaction term GCSE x DCIT to test for moderation. We followed recommendations made in Carte and Russell (2003) in testing for moderation. Entering the interaction term resulted in a significant change in R2 of 0.018 (F-statistic = 5.759, $p < .05$). The interaction term was significant and negative ($\beta = -0.141$, $p < .05$). A negative value for the interaction term when the direct effects of the predictor variables are positive represents an interference or antagonistic interaction (Neter, Kutner, Wasserman, & Nachtsheim, 1996). Figure 2 shows a graph of the interaction. This figure shows the nature of the interaction term in terms of high and low values of GCSE and DCIT. The graph shows that the impact of GCSE was moderated by DCIT, which supports H4. The interpretation of the interaction suggested by examining the graph is that, even when users lack confidence in their abilities as measured by GCSE, they may still have high intentions to use new technologies when they have a strong desire to master those technologies. Conversely, when users have low DCIT but high GCSE, they may still be inclined to use new technologies based on their confidence in their abilities. When users have high GCSE and high DCIT, their intentions to use new technologies are even higher. Intention to adopt new IT is lowest when individuals have low GCSE and low DCIT. In this situation, individuals may believe that that they cannot successfully use new technologies and lack the motivation to overcome their inability. The nature of the interaction between GCSE and DCIT on intentions to use new IT suggests that these factors may simultaneously serve as substitutes and reinforce each other in the adoption of new technologies. We discuss the implications of these findings in Section 7.

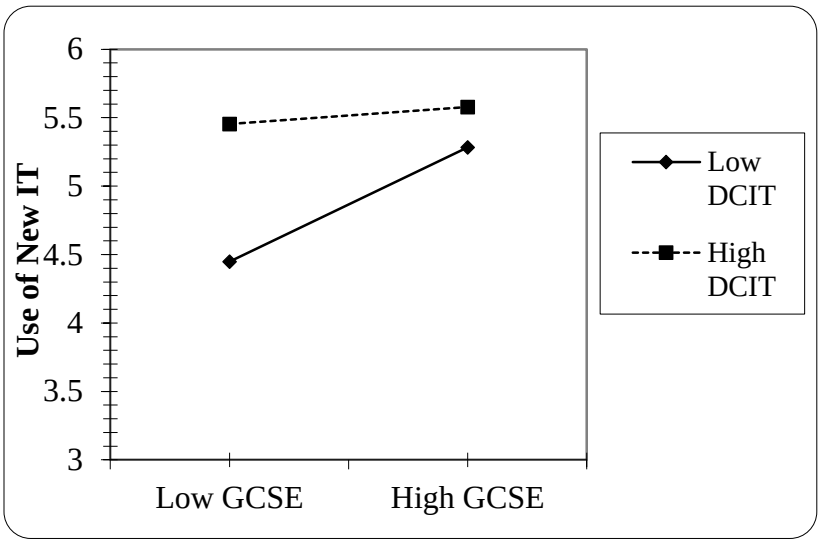

Figure 2. Interaction Effect

7 Discussion

In this study, we focus specifically on new technologies and the predisposition of individuals toward them. We look at individual characteristics that make a potential user more or less likely to adopt new information technologies that are emerging or unfamiliar. In this regard, the results may provide some insight into characteristics of those most likely to adopt first. They also help show what character traits may inhibit people from wanting to try new information technologies. While several factors could drive this behavior, our model focuses on the constructs of domain-specific personal innovativeness, general computer self-efficacy, and desire for control over IT. These are derived from the concepts of competence and autonomy, found in SDT. Our findings demonstrate how these characteristics, individually and jointly, impact individual intentions to use new technologies. The results of this research provide several insights into technology adoption that both confirm and extend our understanding of this phenomenon.

Extant domain-specific personal innovativeness research has clearly shown that individuals with a higher PIIT are more inclined to use existing technologies. Our findings extend this literature by showing that personal innovativeness in IT also predicts the use of new technologies as a broad category. This finding establishes the significance of innate traits such as personal innovativeness in IT as a valid contributor in technology acceptance decisions of new technologies regardless of the product characteristics.

Importantly, in this paper, we introduce, develop, and apply a new construct that provides further insight into individual adoption of technology. While researchers have applied desire for control in several organizational contexts (Greenberger et al., 1988), the IS adoption literature has not done so in great depth. Desire for control reflects the extent to which people prefer to exercise control over the things around them. Researchers have found this trait to vary across individuals and situations (Burger, 1992). In this research, we develop a domain-specific measure of desire for control that applies specifically to using information technologies. Our scale is based on measuring preferences for controlling technology functionality. Our technology-specific measure, DCIT, provides more predictive power in this context than the general measure of desire for control. We found that the positive significant relationship of the general measure of desire for control on intentions to use new technologies disappeared when DCIT was included in the analysis. This finding supports the importance of preferences for personal control in understanding technology use and provides additional support for the validity of our DCIT measure. The positive relationship between this construct and intentions to use new technologies indicates the importance of motivation derived from the need for control in technology adoption. Consistent with a large number of findings across a variety of studies in different IT contexts (Marakas et al., 2007), our findings confirm the importance of GCSE as a driver of technology use. The essential argument behind this relationship asserts that individuals are more likely to engage in a behavior when they feel they have the appropriate level of competence to be successful (Compeau et al., 1999). Our findings show that individuals' perception of their competence in using technology does influence their intentions to use new technologies in the future. Using a new technology requires a user to adapt to its features and functionality, so it is not surprising that an individual's perception of their own capabilities would play an important role in whether or not they would use new technologies (in particular, those outside their realm of experience).

While our findings support the positive relationship between GCSE and new technology use, they also reveal that this relationship may be contingent on other factors. By simultaneously exploring the impact of DCIT and GCSE, we gain better insight into how and when GCSE affects intentions to use new technology. Future intentions to use new technologies may be a particularly relevant context for GCSE because of the inherently higher level of uncertainty and lack of familiarity. In particular, we found that individuals with low levels of GCSE may still adopt new IT when they desire control over technology. For these individuals, the desire for control, or desire for autonomy, served as a motivator that overcomes their perceived lack of competence. This result, while providing new insight into technology adoption, is consistent with theories from social psychology such as SDT (Deci, 1980) and personal control (Greenberger & Strasser, 1986).

Our identifying this interaction makes a particularly interesting contribution to our understanding of technology use. The IS literature has emphasized the importance of GCSE as a driver of technology use or as means to reduce stress that can be associated with technology use (Thatcher & Perrewe, 2002). Our results suggest that, while beliefs about competence and ability are influential, an emphasis on this construct alone overlooks the motivational factors that are also at play. One's desire to exercise control over information technologies and their functionality plays at least an equally important role and may actually be the primary driver of new technology use. This finding may be particularly relevant when considering technologies where the decision to use is more discretionary and existing knowledge may not always be applicable. While GCSE remains a significant factor, an individual's perception of their ability alone will not necessarily lead them to adopt new technologies. When individuals perceive both ability and desire, they show the greatest intention to use new technology. Similarly, when individuals lack both, they show the lowest levels of intention to use new technologies. In these situations, potential users appear to simply give up any efforts to use new technologies. These results largely confirm existing research about the importance of CSE and are consistent with findings of desire for control from other contexts (Burger, 1992).

A particularly important new insight is that GCSE and DCIT appear to provide tradeoffs for one another. In other words, individuals may be inclined to use new technologies because they perceive themselves as having high levels of competence or because they have high levels of desire. Therefore, we can think of the adoption of new technology as either competence driven or desire driven. Competence-driven users are induced to use technology because they believe they have the skills to do so and do not anticipate any impediments to future technology adoption. Their level of use may be somewhat affected by their desire for control, but competence represents the main driver. These users use new technologies out of convenience without high levels of motivation.

Desire-driven users, on the other hand, may use new technologies out of sheer will and are willing to overcome deficiencies in their perceived abilities to use them. Consider the plight of the "control freak": they will often do whatever is necessary to attain control. Burger (1992) concludes that these individuals are

more likely to use active strategies to overcome problems. Those with high DCIT may try harder to make technologies work simply because of their innate characteristics. Regardless of their perceived levels of competence, they will do what they need to use whatever technologies they choose.

These findings have practical implications for producers of new technology and organizations looking to implement technological innovations. The distinction between different types of adopters suggests that different mechanisms could be successful in encouraging different individuals to use new technologies. Organizations can encourage use by providing training that reduces uncertainty and promotes confidence. Providing environments that encourage experimentation and allow desire-driven adopters to discover technology functionality represents another strategy that organizations can employ that taps into these individuals' natural proclivities. For either strategy to be as effective as possible, organizations should be aware of the interaction between GCSE and DCIT to prevent potential users from falling into the trap of "learned helplessness" (Greenberger et al., 1988). Recognizing high-DCIT individuals who can serve as early adopter decision leaders can encourage broader adoption, but organizations must also recognize that those with low DCIT will not seek out the skills they need without some sort of intervention.

8 Limitations and Future Research

As with all studies, this research has several limitations. First, the subjects used in this research were undergraduate and graduate students, and the results may not be generalizable to other populations. There are several reasons to believe that the choice of samples does not affect our ability to generalize to other groups. First, students' beliefs have been shown to be representative of individuals in a variety of occupations (Voich, 1995). King and He (2006), in a meta-analysis of TAM studies, found a significant overlap between users and professional groups, which may provide additional justification for the use of students as surrogates for professionals. Students would not be expected to behave differently from other individuals and have the requisite skills and knowledge to answer appropriately. Since we specifically looked at the adoption and use of new technologies, we considered this sample to be appropriate since it "does represent a subset very likely to be involved in technology use in the future" (Ahuja & Thatcher, 2005). Also, as Agarwal and Karahanna (2000) note, "the issue of generalizability is best addressed through replication in different contexts to identify conditions for the theoretical model" (p. 686).

We collected data for both the independent and dependent measures at a single point in time through self-reports. This presents the possibility of common method bias in our study (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). We conducted Harman's single-factor test and common latent variable tests to detect the presence of common-method bias. These tests did not indicate evidence of common method bias in our data, but we still acknowledge it as a potential limitation in interpreting our findings.

As we note earlier, several factors could drive individual technology use. We look only a limited set of individual characteristics and the relationships between them. Focusing on only a few constructs allows us to explore these specific relationships and to test interactions, but it does not allow us to see how these relationships would hold up in the presence of other factors such as social influences or institutional factors (Lewis et al., 2003). Other individual motivational factors, such as levels of interest or incentives, may impact the relationships we found in this study. Future researchers should look at these relationships as part of a broader set of factors that might impact intentions to use new technologies.

In this paper, we look at individual determinants of intentions to use new or unfamiliar IT innovations. The intentions reflect predispositions towards new technologies that can be influenced by intrinsic motivation. Whether or not these predisposition result in actual new technology use still needs to be established. It may be that the intentions to use new technologies may not always be acted on. Future research looking longitudinally at both the formation of intentions and actual future behaviors would further expand our understanding about the adoption of IT innovations.

9 Conclusion

With this research, we show the effects of individual factors related to personal innovativeness, competency, and autonomy on the adoption of new technologies. We advance our understanding by filling a gap in the literature of IT adoption related to new technology use. Rather than looking at perception of specific target new technologies, we explore the broad category of new or unfamiliar technologies. In doing so, we remove specific perceptions about existing technology and focus on the innate factors that motivate individuals to seek out the newest technologies as soon as they become available.

The findings demonstrate that competence, measured as general computer self-efficacy, and autonomy, measured as desire for control over IT, both directly impact an individual's predisposition toward using new or unfamiliar technologies. We also found evidence of an interaction between these two constructs such that there may be a trade-off in terms of their impacts. Individuals may be inclined to use new technologies because they perceive themselves as having high levels of ability or because they have high levels of desire; they are either competence-driven or desire-driven users. These trade-offs may suggest the need for different strategies to promote the use of new IT depending on the individual. Correctly identifying potential users into the appropriate user category and providing the necessary training or control mechanisms may likely increase individuals' intention to try new and innovative IT products.

References

Adler, A. (Ed.). (1930). *Individual psychology*. Worcester, MA: Clark University Press.

Agarwal, R. (2000). Individual acceptance of information technologies. In R. W. Zmud (Ed.), *Framing the domains of IT management: Projecting the future...through the past* (pp. 85-104). Cincinnati, Ohio: Pinnaflex Educational Resources.

Agarwal, R., & Karahanna, E. (2000). Time flies when you're having fun: Cognitive absorption and beliefs about information technology usage. *MIS Quarterly*, *24*(4), 665-694.

Agarwal, R., & Prasad, J. (1998a). The antecedents and consequents of user perceptions in information technology adoption. *Decision Support Systems*, *22*(1), 15-29.

Agarwal, R., & Prasad, J. (1998b). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*(2), 204-215.

Agarwal, R., Sambamurthy, V., & Stair, R. (2000). The evolving relationship between general and specific computer self-efficacy. *Information Systems Research*, *11*(4), 418-430.

Ahuja, M. K., & Thatcher, J. B. (2005). Moving beyond intentions and toward the theory of trying: Effects of work environment and gender on post-adoption information technology use. *MIS Quarterly*, *29*(3), 427 - 59.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179-211.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology*, *32,* 665-683.

Anton, C., Camarero, C., & Rodriguez, J. (2013). Usefulness, enjoyment, and self-image congruence: The adoption of e-book readers. *Psychology and Marketing*, *30*(4), 372-384.

Atkinson, M., & Kydd, C. (1997). Individual characteristics associated with World Wide Web use: An empirical study of playfulness and motivation. *The Data Base for Advances in Information Systems*, 28(2), 53-62.

Baird, A., Furukawa, J. F., & Raghu, T. S. (2012). Understanding contingencies associated with the early adoption of customer-facing Web portals. *Journal of Management Information Systems*, 29(2), 293-324.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84(2), 191-215.

Bandura, A. (1986), Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bedigian, L. (2013). 31% of Consumers will wait in line for Playstation 4, iPhone 5s*. Benzinga.* Retrieved from http://www.benzinga.com/news/13/06/3708873/slideshow-31-of-consumers-will-wait-in-line-for-playstation-4-iphone-5s-aapl-sne

Benbasat, I., & Barki, H. (2007). Quo vadis, TAM? *Journal of the Association for Information Systems*, *8*(4), 212-218.

Blythe, J. (1999). Innovativeness and newness in high-tech consumer durables. *Journal of Product and Brand Management*, *8*(5), 415-429.

Bruner, G. C., & Kumar, A. (2007). Gadget lovers. *Journal of the Academy of Marketing Science*, *35*(3), 329-339.

Burger, J. M. (1992). *Desire for control: Personality, social, and clinical perspectives.* New York: Plenum Press.

Burger, J. M., & Cooper, H. M. (1979). The desirability of control. *Motivation and Emotion*, *3*(4), 381-393.

Carte, T. A., & Russell, C. J. (2003). In pursuit of moderation: Nine common errors and their solutions. *MIS Quarterly*, *27*(3), 479-501.

Charlton, J. P. (2005). Measuring perceptual and motivational facets of computer control: The development and validation of the computing control scale. *Computers in Human Behavior*, *21,* 791-815.

Chau, P. Y. K., & Hu, P. J. H. (2002a). Examining a model of information technology acceptance by individual professionals: An exploratory study. *Journal of Management Information Systems*, *18*(4), 191-229.

Chau, P. Y. K., & Hu, P. J. H. (2002b). Investigating healthcare professionals' decisions to accept telemedicine technology: An empirical test of competing theories. *Information and Management*, *39*(4), 297-311.

Chin, W. W., & Gopal, A. (1995). Adoption intention in GSS—relative importance of beliefs. *Data Base for Advances in Information Systems*, *26*(2-3), 42-64.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*, *23*(2), 145-58.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, *19*(2), 189-211.

Connell, J. P., & Wellborn, J. G. (Eds.). (1991). *Competence, autonomy and relatedness: A motivational analysis of self-system processes*. Chicago: University of Chicago Press.

Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper Perennial.

Davis, F. D. (1993). User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies*, *38*(3), 475-487.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, *22*(14), 1111-1132.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340.

deCharms, R. (1968). *Personal causation: The internal affective determinants of behavior*. New York: Academic Press.

Deci, E. L. (1975). *Intrinsic motivation*. New York: Plenum.

Deci, E. L. (1980). *The psychology of self-determination*. Lexington, MA: Lexington Books.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227-268.

Foxall, G. R. (1995). Cognitive styles of consumer initiators. *Technovation*, *15*(5), 269-288.

Gatignon, H., & Robertson, T. S. (1985). A propositional inventory for new diffusion research. *Journal of Consumer Research*, *11*(4), 849-867.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, *17*(2), 183-211.

Glass, D. C., & Singer, J. E. (1972). *Urban stress*. New York: Academic Press.

Greenberger, D. B., & Strasser, S. (1986). Development and application of a model of personal control in organizations. *Academy of Management Review*, *11*(1), 164-177.

Greenberger, D. B., Strasser, S., & Lee, S. (1988). Personal control as a mediator between perceptions of supervisory behaviors and employee reactions. *Academy of Management Journal*, *31*(2), 405-417.

Harter, S. (1978). Effectance motivation reconsidered: Toward a developmental model. *Human Development*, *21*, 36-64.

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

Hirschman, E. C. (1980). Innovativeness, novelty seeking, and consumer creativity. *Journal of Consumer Research*, *7*(3), 283-285.

Hong, S., & Tam, K. Y. (2006). Understanding the adoption of multipurpose information appliances: The case of mobile data services. *Information Systems Research*, *17*(2), 162-179.

Igbaria, M., & Iivari, A. (1995). The effects of self-efficacy on computer usage. *Omega*, *23*(6), 587-605.

Jasperson, J., Carter, P., & Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly*, *29*(3), 525-557.

Junglas, I., & Harris, J. (2013). The promise of consumer technologies in emerging markets. *Communications of the ACM*, *56*(5), 84-90.

King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information and Management*, *43,* 740-755.

Lee, Y., Kozar, K. A., & Larson, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems*, *12*(50), 752-780

Lewis, W., Agarwal, R., & Sambamurthy, V. (2003). Sources of influence on beliefs about information technology use: An empirical study of knowledge workers. *MIS Quarterly*, *27*(4), 657-678.

Logan, H. L., Baron, R. S., Keeley, K., Law, A., & Stein, S. (1991). Desired control and felt control as mediators of stress in a dental setting. *Health Psychology*, *10,* 352-359.

Luarn, P., & Lin, H. H. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behavior*, *21,* 873-891.

Magni, M., Taylor, M. S., & Venkatesh, V. (2010). "To play or not to play": A cross-temporal investigation using hedonic and instrumental perspectives to explain user intentions to explore a technology. *International Journal of Human-Computer Studies*, *68*, 572-588.

Mahmood, M. A., Hall, L., & Swanberg, D. L. (2001). Factors affecting information technology usage: A meta-analysis of the empirical literature. *Journal of Organizational Computing and Electronic Commerce*, *11*(2), 107-130.

Marakas, G. M., Johnson, R. D., & Clay, P. F. (2007). The evolving nature of the computer self-efficacy construct: An empirical investigation of measurement, construction, validity, reliability and stability over time. *Journal of the Association for Information Systems*, *8*(1), 15-46.

Marakas, G. M., Yi, M. Y., & Johnson, R. D. (1998). The multilevel and multifaceted character of computer self-efficacy: Toward clarification on the construct and an integrative framework for research. *Information Systems Research*, *9*(2), 126-163.

Mick, D. G., & Fournier, S. (1998). Paradoxes of technology: Consumer cognizance, emotions, and coping strategies. *Journal of Consumer Research*, *25*, 123-143.

Midgley, D. F., & Dowling, G. R. (1978). Innovativeness: The concept and its measurement. *Journal of Consumer Research*, *4,* 229-242.

Mitchell, S. (1994). Technophiles and technophobes. *American Demographics*, *16*, 36-37.

Moore, G. A. (2002). *Crossing the chasm.* New York: Harper Business Essentials.

Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, *2*(3), 192-223.

Mudd, S. (1990). The place of innovativeness in models of the adoption process: An integrative review. *Technovation*, *10*(2), 119-136.

Nambisan, S., Agarwal, R., & Tanniru, M. (1999). Organizational mechanisms for enhancing user innovation in information technology. *MIS Quarterly*, *23*(3), 365-395.

Nass, C., & Mason, L. (Eds.). (1990). O*n the study of technology and task: A variable-based approach.* Newbury Park: Sage.

Neter, J., Kutner, M., Wasserman, W., & Nachtsheim, C. (1996). *Applied linear statistical models* (4th ed.). New York: McGraw-Hill/Irwin.

Nunnally, J. C. (1978), *Psychometric theory*. New York, NY: McGraw Hill.

Ong, C., Lai, J., & Wang, Y. (2004). Factors affecting engineer's acceptance of asynchronous e-learning systems in high-tech companies. *Information and Management*, *41,* 795-804.

Pavlou, P. A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: An extension of the theory of planned behavior. *MIS Quarterly*, *30*(1), 115-143.

Perlmuter, L. C., Scharff, K., Karsh, R., & Monty, R. A. (1980). Perceived control: A generalized state of motivation. *Motivation and Emotion*, *4*(1), 35-45.

Pettey, C., & Tudor, B. (2010). Competitive landscape: Mobile devices, worldwide, 4Q09 and 2009. *Gartner.*

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*(5), 879-903.

Robertson, T. S., & Kennedy, J. N. (1968). Prediction of consumer innovators: Application of multiple discriminant analysis. Journal of Marketing Research, *5*(1), 64-69.

Rogers, E. M. (1962). *Diffusion of innovations*. New York: The Free Press.

Rothbaum, F. M., Weisz, J. R., & Snyder, S. S. (1982). Changing the world and changing the self: A two-process model of perceived control. *Journal of Personality and Social Psychology*, *42*, 5-37.

Rotter, J. B. (1966). *Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs*, *80*, 1-28.

Schorr, D., & Rodin, J. (1984). Motivation to control one's environment in individuals with obsessive-compulsive, depressive, and normal personality traits. *Journal of Personality and Social Psychology*, *46*(5), 1148-1161.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research*, *15*(3), 325-343.

Shih, Y. Y. (2006). The effect of computer self-efficacy on enterprise resource planning usage. *Behaviour and Information Technology*, *25*(5), 407-411.

Shneiderman, B. (1980), *Software psychology: Human factors in computer and information systems*. Cambridge, MA: Winthrop Publishers.

Sun, H., & Zhang, P. (2006). The role of moderating factors in user technology acceptance. *International Journal of Human-Computer Studies*, *64,* 53-78.

Sun, S. (2008). An examination of Disposition, Motivation, and Involvement in the New Technology Context Computers in Human Behavior. *Computers in Human Behavior*, *24*(6), 2723-2740.

Taylor, S., & Todd, P. A. (1995). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(2), 144-176.

Thatcher, J. B., & Perrewe, P. L. (2002). An empirical examination of individual traits as antecedents to computer anxiety and computer self-efficacy. *MIS Quarterly*, *26*(4), 381-396.

Thatcher, J. B., Zimmer, J. C., Gundlach, M. J., & McKnight, D. H. (2008). Internal and external dimensions of computer self-efficacy: An empirical examination. *IEEE Transactions on Engineering Management*, *55*(4), 628-644.

Valente, T. W., & Davis, R. L. (1999). Accelerating the diffusion of innovations using opinion leaders. *The Annals of the American Academy*, *566,* 55-67.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology*, *29,* 271-360.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, 28(4), 695-704.

Veitch, J. A., & Gifford, R. (1996). Choice, perceived control, and performance decrements in the physical environment. *Journal of Environmental Psychology*, *16*(3)*,* 269-276.

Venkatesh, V. (1999). Creation of favorable user perceptions: Exploring the role of intrinsic motivation. *MIS Quarterly*, *23*(2), 239-260.

Venkatesh, V. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, *11*(4), 342-365.

Venkatesh, V. (2006). Where to go from here? Thoughts on future directions for research on individual-level technology adoption with a focus on decision making. *Decision Science*, *37*(4), 497-518.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273-315.

Venkatesh, V., Brown, S. A., Maruping, L. M., & Bala, H. (2008). Predicting different conceptualizations of system use: The completing roles of behavioral intention, facilitating conditions and behavioral expection. *MIS Quarterly*, 3*2*(3), 483-502.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204.

Venkatesh, V., Maruping, L. M., & Brown, S. A. (2006). Role of time in self-prediction of behavior. *Organizational Behavior and Human Decision Processes*, *100*(2), 160-176.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478.

Venkatesh, V., & Speier, C. (1999). Computer technology training in the workplace: A longitudinal investigation of the effect of mood. *Organizational Behavior and Human Decision Processes*, *79*(1), 1-28.

Venkatesh, V., Speier, C., & Morris, M. G. (2002). User acceptance enablers in individual decision making about technology: Toward an integrated model. *Decision Sciences*, *33*(2), 297-316.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, *36*(1), 157-178.

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences*, *27*(3), 451-481.

Venkatraman, M. P., & Price, L. L. (1990). Differentiating between cognitive and sensory innovativeness: Concepts, measurement, and implications. *Journal of Business Research*, *20,* 293-315.

Venkatraman, N. (1989). The concept of fit in strategy research—toward verbal and statistical correspondence. *Academy of Management Review*, *14*(3), 423-444.

Voich, D. (1995). *Comparative empirical analysis of cultural values and perceptions of political economy issues.* Westport, Connecticut: Praeger.

Webster, J., & Martocchio, J. J. (1992). Microcomputer playfulness: Development of a measure with workplace implications. *MIS Quarterly*, *16*(2), 201-266.

Wells, J. D., Campbell, D. E., Valacich, J. S., & Featherman, M. (2010). The effect of perceived novelty on the adoption of information technology innovations: A risk/reward perspective. *Decision Sciences*, *41*(4), 813-843.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review*, *66,* 297-333.

Wortman, C. B., & Brehm, J. W. (Eds.). (1975), *Responses to uncontrollable outcomes: An integration of reactance theory and the learned helplessness model.* San Diego, CA: Academic.

Yi, M. Y., Fiedler, K. D., & Park, J. S. (2006a). Understanding the role of individual innovativeness in the acceptance of IT-based innovations: Comparative analyses of models and measures. *Decision Sciences*, *37*(3), 393-426.

Yi, M. Y., Jackson, J. D., Park, J. S., & Probst, J. C. (2006b). Understanding information technology acceptance by individual professionals: Toward an integrative view. *Information and Management*, *43*, 350-363.

Zhang, A., & Lu, Q. (2002). The regulation of self-efficacy and attributional feedback on motivation. *Social Behavior and Personality*, *30*(3), 281-288.

Zhu, Z., Nakata, C., Sivakumar, K., & Grewal, D. (2007). Self-service technology effectiveness: The role of design features and individual traits. *Journal of the Academy of Marketing Science*, *35*(4), 492-506.

Appendix 1: Measures

Table A1. Measures

Construct			Source
General computer self-efficacy	I could complete this job using the software application		Based on Compeau and Higgins (1995)
	GCSE1	... if there was no one around to tell me what to do as I go.	
	GCSE2	... if I had never used an application like it before.	
	GCSE3	... if I had only the software manuals for reference	
Desire for control	DC1	I prefer a job where I had a lot of control over what I do and when I do it.	Based on Burger and Cooper (1979)
	DC2	I enjoy being able to influence the actions of others.	
	DC3	I enjoy making my own decisions.	
	DC4	I enjoy having control over my destiny	
Desire for control over IT	When using a particular IT application I enjoy knowing ...		Developed for this study based on existing literature
	DCT1	... that the application allows me to validate the output it creates.	
	DCT2	... that the application gives me a workaround in case it doesn't work.	
	DCT3	... that I can specify how I enter data.	
	DCT4	... that I can compare the output from this application with that from another application that performs a similar function.	
	DCT5	... that I can specify how the output looks	
Intentions to use new IT	USEIT1	Given the chance I would use a software application that I am unfamiliar with in the future	Developed for this study based on existing literature
	USEIT2	I can see myself using an IT application that I've never used before within the next 6 months.	
	USEIT3	In the near future I can foresee myself using an unfamiliar software application or IT device.	
	USEIT4	I would be willing to try a software application or IT device that is new to me.	
Personal innovativeness in IT	PI1	If I heard about a new information technology such as a GPS camera, I would look for ways to experiment with it.	Based on Agarwal and Prasad (1998b)
	PI2	Among my peers, I am usually the first to try out new information technologies.	
	PI3	In general, I am hesitant to try out new information technologies. **(reverse coded)**	
	PI4	I like to experiment with new information technologies	

Table A2. Demographic Information

Demographic variables	
Gender	What is your gender? (Female, male)
Age	What is your age? (18-21, 22-25, 26-30, 31-40, 41-50, 51-60, 61 and over)
Education	What is your highest educational level? (High school, some college or associates degree, bachelor's degree, bachelor's plus 1 year, bachelor's plus 2 years, master's degree, professional degree, doctorate degree)
Work experience	How many years have you been in the workforce? (Less than 1 year, 1-3 years, 3-5 years, 5-10 years, 10-15 years, 15-20 years, more than 20 years)
Software applications	Approximately how many software applications do you typically use in one day? (0, 1-3, 3-5, 5-10, more than 10)

About the Authors

Sharen Bakke received her PhD in Management Science from Kent State University. She is an Associate College Lecturer in the Department of Information Systems at Cleveland State University. Her research focuses on factors that influence information technology use, in particular, privacy/invasive perceptions and how these perceptions affect usage. Other research interests include technology adoption, human computer interfaces, knowledge management motivations and diffusion of technology. Her teaching areas include knowledge management, project and business process management and IT for competitive advantage. Her publications appear in the *Journal of Information Systems Education*.

Raymond M. Henry is an associate professor in the Information Systems Department and Director of the Business Analytics programs in the Monte Ahuja College of Business at Cleveland State University. He received his PhD in Information Systems from the University of Pittsburgh. His research explores topics related to IT governance, information systems development, knowledge management, and human-computer interaction. His work has been published in premier journals including *Information Systems Research*, *Journal of Management Information Systems*, *Communications of the ACM*, *Journal of the AIS*, *Journal of Operations Management*, and others.

Transactions on Human – Computer Interaction

Editors-in-Chief

http://thci.aisnet.org/