

5-2012

# Information Technology (IT) Identity: A Conceptualization, Proposed Measures, and Research Agenda

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INFORMATION TECHNOLOGY (IT) IDENTITY: A CONCEPTUALIZATION,  
PROPOSED MEASURES, AND RESEARCH AGENDA

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A Dissertation  
Presented to  
the Graduate School of  
Clemson University

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In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy  
Management

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by  
Michelle Suzanne Carter  
May 2012

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Accepted by:  
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## ABSTRACT

With increasing embeddedness of information technologies (IT) in organizational processes, and services, individuals' long-term IT use has become instrumental to business success. At the same time, IS research has illustrated that under-utilization by end-users often prevents organizations from realizing expected benefits from their technology investments. Because individual use is the critical link between technology investments and enhanced organizational performance through IT, in recent years, information systems researchers have begun to focus attention on the post-adoption phases of technology assimilation. The overarching goal of this relatively new research stream is to understand factors that influence individuals' attempts to use IT to their fullest potential in the work setting.

To advance research on post-adoption IT use, this three essay dissertation develops, operationalizes, and tests the new concept of *information technology (IT) identity*—defined as, *the set of meanings an individual attaches to the self in relation to IT*—as a *product* of individuals' personal histories of interacting with IT, as well as a *force* that shapes their thinking and guides their IT use behaviors.

The first essay builds the core concept through exploring whether young people's individual self-concepts are tied to their interactions with mobile phones. The second essay draws on a rich repertoire of literature to formally theorize the domain and dimensions of IT identity, as well as its nomological net. By examining the processes by which IT identity is constructed and maintained, this essay offers IS researchers a new theoretical lens for examining individuals' long-term IT use. The third essay develops an operational definition of IT identity and empirically tests the conditions under which the

construct is a more or less salient predictor of individuals' post-usage intentions and continued IT use than existing IS constructs. The results presented help delimit a role for IT identity in bridging the gap between current models of use and models that explain long term and richer IT use behaviors. Extending understanding of why and how individuals use IT in the long term may help provide a basis for designing managerial interventions that promote organizational assimilation of IT. Thus, by proposing and operationalizing IT identity as a core construct in explaining individual IT use, this research has the potential to advance theory and contribute to practice.

## ACKNOWLEDGMENTS

I owe a considerable debt of gratitude to those who have helped me through this process.

My advisor, Varun Grover, has been a limitless source of inspiration, encouragement, and knowledge. I feel incredibly privileged to have worked under his tutelage. He has pushed me to produce better work than I thought I could, helped me discover new ways of thinking about myself, as well as the world around me, and given me an incredible amount of support to achieve my goals.

I am so grateful to my committee members for all their support, encouragement, and guidance. I do not know that I would have got through the PhD program at all without the help, advice, and nudging of my friend, mentor, collaborator, and committee member, Jason Thatcher. I know I could not have tackled a dissertation on identity without the insight and guidance of Ellen Granberg. DeWayne Moore calmed my fears and made statistics accessible to me in my first semester at Clemson and has been a calming and thoughtful influence ever since.

I am grateful to all faculty and staff in the Management Department but, in particular, I would like to thank Rich Klein, Russ Purvis, and Roopa Raman, who have supported me in different ways throughout my time at Clemson.

Thanks also go to my fellow doctoral students (past and present) for their feedback and support throughout the program; with special thanks to Tracy Johnson-Hall, Stefan Tams, and Kevin Craig.

As for my family—Ildi, Kirsty, Mick, Mum and Dad: none of them wanted a mention and I cannot thank them enough.

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## PRELUDE AND SCHEMATIC OF DISSERTATION RESEARCH

This dissertation develops, operationalizes, and tests the concept of *information technology (IT) identity*—defined as *the set of meanings an individual attaches to the self in relation to information technology*. In doing so, it makes the case that this novel and powerful concept has the potential to provide far richer understanding of how, through individuals' long-term use, IT can become routinized and, ultimately, infused within organizations.

Today's businesses rely on IT embedded in processes and products for their survival and as a source of competitive advantage (Venkatesh et al. 2008). However, end-users' underutilization of implemented systems often means that organizations fail to realize expected benefits from their technology investments (Jasperson et al. 2005). While technology assimilation research has converged on a shared understanding of individuals' initial decisions to use new ITs (Ortiz De Guinea and Markus 2009; Venkatesh et al. 2003), these decisions do not necessarily translate into long term use behaviors that benefit organizations. Consequently, in recent years, information systems (IS) researchers have begun to focus attention on examining individuals' IT use in the post-adoption phases of assimilation—i.e. “after an [IT] has been installed, made accessible to the user, and applied by the user in accomplishing his/her work activities” (Jasperson et al. 2005). The goal of this relatively new research stream is to provide practitioners with guidelines for designing managerial interventions that promote and manage individuals' long-term IT use.

Because extant models of IT use are rooted in attitude theories, this literature stream largely disregards that the people who are making decisions to continue using ITs are embedded in a network of roles and relationships (i.e. *social structures*) that shape their individual self-concepts and guide their behavioral choices (Stets and Biga 2003). Missing this key element of decision making precludes making accurate predictions of continued IT use; since individuals' self-concepts are a critical determinant of their attitudes and long-term behaviors (Burke 1991a; Burke and Stets 2009; Rosenberg 1979; Stets and Biga 2003). From this perspective, models that focus exclusively on the relationship between beliefs/attitudes toward using a technology and behavior only successfully predict behavior when beliefs/attitudes are aligned with how people see themselves in the social positions they occupy.

Thus, for example, current models could not predict that a nurse may simultaneously hold a positive view of an electronic medical records (EMR) system's potential to improve patient care *and* circumvent mandated use procedures when he/she feels that a new system-enabled admission process conflicts with his/her role identity (i.e. internalized expectations about what it means to be a competent nurse (Burke and Stets 2009). Moreover, difficulties in making accurate predictions may be exacerbated for long-term behaviors that can be critically influenced by an individual's enduring attitudes (Kim et al. 2009; Liao et al. 2009) and past behaviors (Jasperson et al. 2005; Limayem et al. 2007; Warshaw and Davis 1985).

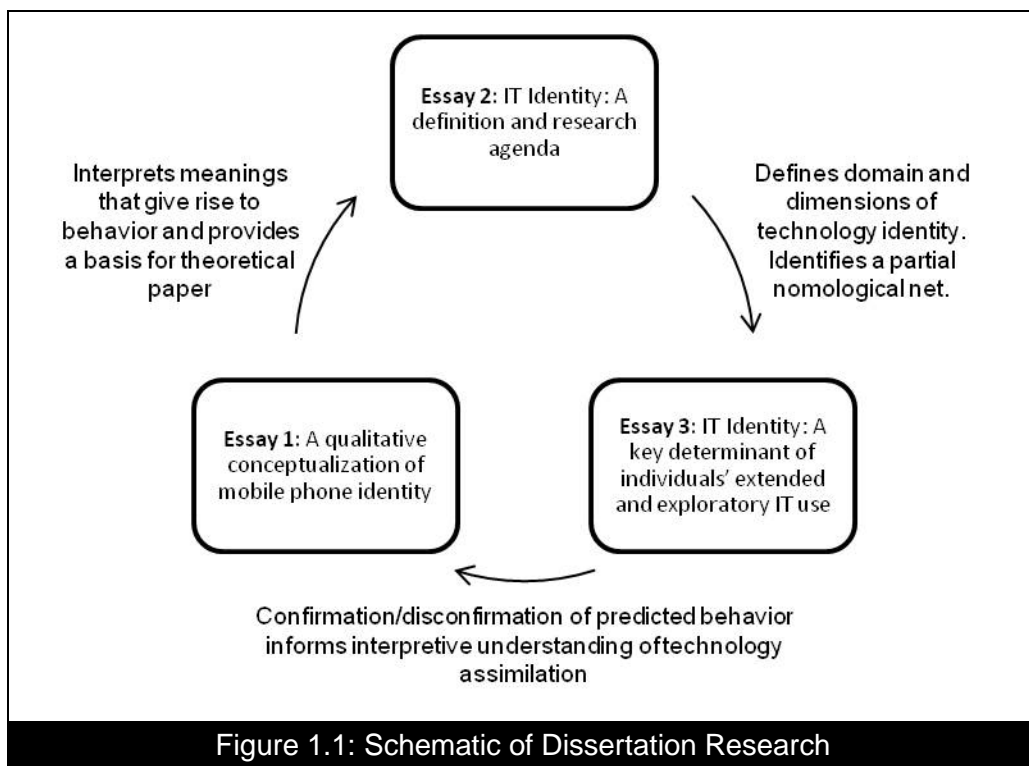
To address this problem, this research examines the links between individuals' identities and the ITs they use. Our broad objective is to extend understanding of how individuals' identities shape their long-term technology use behaviors. More specifically,

because identities are constructed as people interact with the world—and IT has become an essential component of this interaction (Hillmer 2009; Lamb and Davidson 2005; Lamb and Kling 2003)—we believe it is important to consider whether information technologies themselves act as a source of identity. To that end, this three-essay dissertation systematically develops a conceptualization of *IT identity* and elucidates its influence on individuals' long-term technology use.

By investigating the interplay between identity and ongoing IT use, this dissertation research will make two key contributions to the literature on technology assimilation. First, examining the processes by which IT identity is constructed and maintained will offer IS researchers a new theoretical lens for investigating how, through individuals' behaviors, ITs become routinized, and ultimately used to their fullest potential (Chin and Marcolin 2001) within organizations. Second, since people have many identities and interact with ITs in situations where they make decisions aligned with two (or more) identities (Stryker and Burke 2000), it is important to consider the interplay between identities tied to ITs and other identities in the work place. Teasing out these relationships may serve as a basis for designing managerial interventions that promote organizational assimilation of ITs. Thus, by proposing IT identity as a core construct in explaining individual IT use, this research has the potential to advance theory and contribute to practice.

Figure 1.1 presents a schematic of this research. The first essay builds the core concept through exploring whether the personal characteristics young people claim as important aspects of themselves are tied to their interactions with mobile phones. The second essay draws on a rich repertoire of literature to formally theorize the domain and

dimensions of IT identity, as well as its nomological net. The third essay develops an operational definition of IT identity and empirically tests the conditions under which the construct is a more or less salient predictor of individuals' post-usage intentions and continued IT use than existing IS constructs. The results presented help delimit a role for IT identity in bridging the gap between current models of usage and models that explain long term and richer IT use behaviors. Based on our empirical findings, we suggest potential opportunities for future studies to advance understanding of individuals' long-term use of information technologies by bringing IT identity into post-adoption research.



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# ESSAY 1: IT AS A SOURCE OF YOUNG ADULTS' PERSONAL IDENTITIES: A QUALITATIVE CONCEPTUALIZATION OF MOBILE PHONE IDENTITY

## I. INTRODUCTION

As information technologies (ITs) become ever more ubiquitous in individuals' work and social lives, identity issues have attracted increasing attention from IS researchers (Alvarez, 2008, Gal and Kjærgaard, 2009, Gioia et al., 2000, Alvesson and Empson, 2008). To that end, IS researchers have generally taken one of three perspectives. The first, stemming from Goffman's labelling theory (1963), emphasizes the role of *IT as a tool or resource* that people draw on, as an extension of the self, to support social interactions and to project their identities to others (e.g. Burke and Stets, 2009, Lamb and Kling, 2003). Media literature examining how mobile phones communicate information about the self—including group affiliation, social status, and expertise—illustrates this role (e.g. Campbell and Park, 2008, Fortunati, 2005, Katz and Sugiyama, 2006). The second, rooted in structural and practice perspectives (e.g. DeSanctis and Poole, 1994, Orlikowski, 1992, Orlikowski and Robey, 1991, Orlikowski, 2000), examines *how introducing new IT impacts workplace identities* through changing the nature of the roles people perform within organizations (e.g. Alvarez, 2008, Barrett and Walsham, 1999, Van Akkeren and Rowlands, 2007). Related to this, the third approach draws on psychological social identity theory (Tajfal, 1981, Tajfal and Turner, 1986) to investigate *workplace identities' influence on IT acceptance* (Hillmer, 2009, Lee et al., 2006). Together, these perspectives reveal that what people do in the workplace is,

to an increasing extent, influenced by IT—such that, for many, their workplace identities are increasingly interwoven with what they do with ITs (Lamb and Davidson, 2005).

Conceptualizing the relationship between IT and identity is important because, increasingly, people are choosing and becoming familiar with ITs in their personal lives, as well as in the workplace (Schaffner, 2010). This phenomenon—referred to as the *consumerization of IT*—has changed the nature of interactions in which identities are constructed. New forms of communication, such as mobile phones and networked technologies, have reduced social distances between adults and children (Cerulo, 1997); linked the workplace with the personal space (Schaffner, 2010), and created new online communities that transcend geographic and cultural boundaries (Turkle, 1995, Turkle, 2011). In a very real sense, who people are, in the roles they perform, the groups they affiliate with, and this study suggests, in the ways they define themselves as individuals is increasingly mediated by their interaction with IT.

In light of IT's infusion into daily life, we believe it is also important to consider whether the meanings people attach to the self in relation to ITs are integral to their sense of who they are—independent of the roles they perform and the groups they affiliate with. To explore the potential for interactions with ITs to shape individuals' self-concepts, in this study we ask “*Are young adults' personal identities shaped through their interactions with ITs?*”

Because few, if any, consumer technologies enjoy such widespread popularity among young adults (Chen and Katz, 2009, Walsh et al., 2008, Walsh et al., 2010), the mobile phones is the context for investigating this question. Specifically, this research draws on the written narratives of 72 college students, who participated in the project as

ethnographers of their own experiences, to discover the meanings they constructed as they observed and interpreted their own experiences with mobile phones. Based on our analysis, we developed a qualitative conceptualization of *mobile phone identity*.

The rest of the paper is structured as follows. In the next section, we present a conceptual overview. The following section explains the research method employed. Then, we discuss how mobile phone identity develops through young adults' interaction with their mobile phones. The paper concludes by suggesting promising directions for future research.

## **II. MOBILE PHONE IDENTITY: A CONCEPTUAL OVERVIEW**

This study employed an inductive approach to explore whether interacting with mobile phones helps shape young adults' self-concepts. Thus, consistent with prior research (e.g. Gioia and Chittipeddi, 1991), our theoretical framing was derived from analysis of students' narrative accounts in consultation with relevant literature (selection of which was guided by the emerging thematic analysis). As recommended by Suddaby (2006), we suspend interpretive reporting for the sake of efficiency—i.e. to avoid requiring readers to “work through lengthy qualitative data presentation” (p. 637). However, in foreshadowing the theoretical framework and resulting conceptualization of mobile phone identity, we ask the reader to keep in mind that concepts discussed in this section actually emerged after data was collected.

### **Relationships between ITs and Identities**

There are two broad ways to view identity. The first, rooted Goffman's labelling theory (1963), emphasizes the *outward presentation* of the “categories to which individuals are socially recognized as belonging” (Owens, 2003, p. 224). The second,

which underpins sociological identity theories (e.g. Burke and Reitzes, 1981, McCall and Simmons, 1978/1966, Stryker, 1980) and psychological social identity theory (Tajfal, 1981, Tajfal and Turner, 1986), focuses on the *internalized meanings* that individuals attach to the self—in the roles they perform, the groups they affiliate with, and the personal characteristics they claim—that define them as a unique individual (Burke and Stets, 2009, Freese and Burke, 1994). It is this second sense of identity—as “a way of organizing information about the self” (Clayton, 2003)—that is the focus of this study.

People have multiple identities because they affiliate with multiple groups, perform multiple roles, and claim multiple personal characteristics (Burke and Stets, 2009). Consequently, as summarized in Appendix 1, psychological and sociological research, categorizes identities into three major types. *Social identity* (e.g. organizational identity (Mael and Ashworth, 1992, Alvesson and Empson, 2008)), is the set of meanings applied to the self based on membership in a group or category (Tajfal and Turner, 1986). Having a social identity means having a sense of ‘oneness’ with a group (Mael and Ashworth, 1992) through being like others in the group and seeing things from the group’s perspective (Burke and Stets, 2009). *Role identity* (e.g. work role, gender), refers to individuals’ internalized expectations about what it means to be competent in performing some role (Burke and Cast, 1997, Burke and Stets, 2009, Stryker and Burke, 2000). *Personal (or person) identity* refers to the personal characteristics (e.g. moral, hard-working) a person claims that are not shared with others and are not derived from group membership (Alvesson et al., 2008, Burke and Stets, 2009, Gal and Kjærgaard, 2009). A key aspect of identities is that, whether they relate to roles, to groups, or to the

person as a distinct entity, they act as “benchmarks” or standards that guide and shape people’s attitudes and behaviors (Burke and Stets, 2009, Clayton, 2003).

While identity is acknowledged as a useful lens for examining people’s interactions with IT, only a very few researchers have suggested that individuals may experience ITs as an important part of self (Jones and Karsten, 2008, Schwarz and Chin, 2007, Turkle, 2005, Turkle, 2011, Walsh et al., 2010, Kim et al., 2007, Buckingham, 2008). Walsh et al. (2010), for example, in a preliminary study investigating young Australians’ “addiction” to mobile phones, found participants’ frequency of use and addiction (termed “involvement”) to their mobile phones was related to their individual self-concepts. However, the psychological and social factors underlying the relationship between identity and IT use have yet to be fully investigated (Buckingham, 2008, Walsh et al., 2010). By examining the self-meanings young adults attribute to their interactions with mobile phones, this study seeks to illuminate this relationship.

Conceptualizing IT as a source of personal identity is also important because the self-meanings that people claim as their own, independent of others, can be thought of as a more general view of the self and therefore have the potential to pervade role and social identities (Deaux, 1992, Stets and Burke, 2000, Burke and Stets, 2009). To illustrate, through interacting with mobile phones, a person may claim being ‘available’ and ‘accessible’ as important personal characteristics. These self-meanings can spill over into other identities (e.g. an organizational identity). For example, Masmanian et al.’s (2006) study of employees’ use of BlackBerry® devices showed that many employees equated being in perpetual contact with serving organizational interests. Thus, developing

understanding of the relationships between identities tied to ITs and individuals' other identities can help provide a basis for designing actionable guidelines for practice.

### **Mobile Phone Identity**

What types of self-meanings do young adults attach to their interactions with mobile phones? In particular, does interacting with a mobile phone lead to those interactions being incorporated into a person's individual's self-concept? Consistent with prior identity research on place (Proshansky et al., 1983) and the environment (Clayton, 2003, Stets and Biga, 2003, Weigert, 1997), this study examines mobile phone identity as a function of the set of meanings young adults attach to the self in relation to the devices—based on a history of interaction, emotional energy, dependence, and/or relatedness. As an integral part of the self, mobile phone identity can affect the way young adults perceive and interact with the world around them. Mobile phone identity is, thus, potentially a product of young adults' interactions with mobile phones and a motivating force that affects their attitudes and behavior.

## **III. METHOD**

### **The Research Approach, Background, and Sources of Data**

The philosophical assumption underpinning this study is that individuals construct meaning through their experiences of the world and that social processes can be understood through the language used to describe them (Orlikowski and Baroudi, 1991). Consequently, to understand the self-meanings people construct through interaction with mobile phones, it is important to learn about that interaction from their perspective (Chen and Hirschheim, 2004). Consistent with McMillan and Morrison's (2006) investigation of young adults' Internet use, we partnered with college students because these young adults

have grown up during a period of accelerated growth and use of mobile phones.

Moreover, while young adults' memories of early interactions with mobile phones are relatively fresh, they have already begun to "build lifetime patterns of use" (McMillan and Morrison 2006, p. 76).

To this end, in the spring and fall of 2010, our team conducted an exploratory research project in collaboration with 72 junior or senior students aged between 18 and 24 years, who were enrolled in undergraduate level management information systems courses at a large university located in the south eastern region of the United States. At this university, undergraduate students are offered opportunities to partner with faculty in research projects that delve deeper into IT use and, in particular, to explore questions that the students find interesting. This was a formal partnership where both parties (faculty and students) had a vested interest in conducting a successful research project. To more accurately reflect students' partnering role in the project, we henceforth refer to them as "student-researchers." Faculty research team members are referred to as "faculty-researchers." Student-researchers self-selected to take part in the project as ethnographers (Spradley, 1980), whereby they engaged in the dual roles of active participant and observer of their own interactions with mobile phones. While their phones differed in their nuanced features, all student-researchers had phones offering basic voice and data capabilities to text, surf the Internet, etc.

An inductive approach was employed to avoid making a priori assumptions and hypotheses. Thus, student-researchers were not introduced to, or made aware of academic literature on mobile phone use before, or during, the research project. Instead, the research team sought to understand whether young adults' individual self-concepts

are developed through interacting with mobile phones, by discovering the meanings that student-researchers constructed as they observed and interpreted their own experiences. Over the course of a single semester, student-researchers engaged in a series of activities and provided narrative accounts of their experiences. Written narrative accounts have been used extensively to examine human interaction with media (e.g. Barnhurst and Wartella, 1991, Matthews, 2003, McMillan and Morrison, 2006). Narrative accounts are an important source of data in inductive research because they provide an opportunity for reflection on experiences. As such, they “can help capture the evolution of cultural patterns and how those patterns are linked to the lives of individuals” (McMillan and Morrison 2006, p. 76).

Faculty-researchers facilitated the students’ ethnography by providing two extended activities designed to uncover the meanings they attributed to their interactions with mobile phones. After each activity, student-researchers were debriefed. The feedback students provided following the first activity informed the design of the next. In the first activity, student-researchers kept journals documenting three 24-hour periods of mobile phone use and non-use. The purpose of this activity was to sensitize students’ awareness of themselves in relation to their mobile phones. In period one, student-researchers logged their normal mobile phone usage. In period two, the students handed their mobile phones over to the research team and logged their experiences and emotions when they were unable to use their mobile phones<sup>1</sup>, including their use of alternative technologies. In period three, the students documented their reactions to getting their mobile phones back. In the second activity, to gain insight into their patterns of mobile

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<sup>1</sup> To ensure they could be contacted if necessary, student-researchers took steps to inform significant others in advance of the period of non-use. During the period, student-researchers were permitted to use alternative technologies (including others’ mobile phones) to remain in contact as they deemed necessary.



phone use, student-researchers logged their normal mobile phone use for a period of 5 days. At the end of each day, the students wrote a brief paragraph reflecting on that day's mobile phone use.

### **Data Analysis**

Consistent with Gioia and Chittipeddi (1991), ethnographic analysis was conducted in two stages. In the first stage, student-researchers drew on the raw data logs from the two activities to write an autobiographical essay describing what they had learned from their experiences about their relationship with their mobile phone. These autobiographical essays represented a first-order analysis of the raw data from the student-researchers' perspectives. These descriptive accounts reveal how young adults develop a sense of connection to their mobile phones as the meanings they attribute to their mobile phone use transition from "What can I do with a mobile phone?" to "Who am I, through use of a mobile phone?"

In the second stage, faculty-researchers examined the raw data logs and students' first-order findings to uncover the underlying dimensions of young adults' connection to their mobile phones. This addresses one challenge with conducting ethnographic research—i.e., that those immersed in the data may lose the "dispassionate view required for a more theoretical, second-order, analysis" (Gioia and Chittipeddi, 1991, p. 436). Moreover, as noted by Gioia and Chittipeddi, while first-order analysis provides a descriptive view of how young adults develop a sense of connection to mobile phones, it does not necessarily suggest a theoretical basis for understanding that connection. Thus, following Gioia and Chittipeddi, faculty-researchers acted as "detached investigators". In

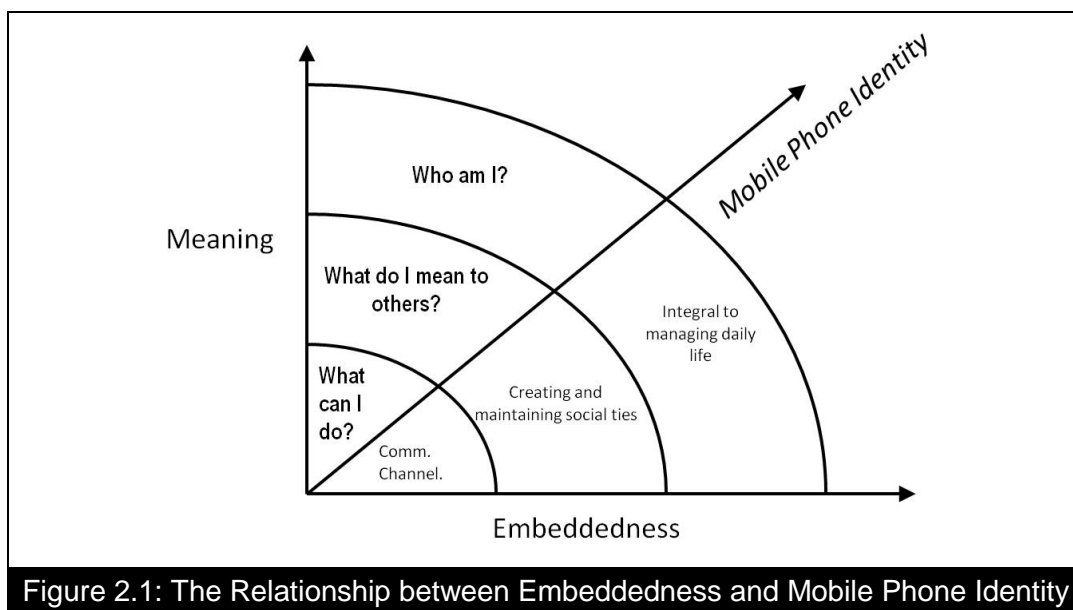
this role, they facilitated student-researchers' first-order analysis and then conducted a more objective and theoretical second-order analysis of the data.

Second-order qualitative content analysis was conducted using the following steps. First, each of the student-researchers' first-order accounts was examined in conjunction with their raw data logs to uncover the meanings rooted in their individual accounts of mobile phone use. Second, the data was analyzed across student-researchers. The "constant comparison" method (Berg, 2000, Strauss and Corbin, 1990) was used to identify key themes and patterns of categories, as well as relationships between categories (e.g. the relationships between a negative emotional response to the absence of a mobile phone, the range of student-researchers' mobile phone use, and the meanings they attributed to that use). Third, categories, patterns, and relationships that had emerged were integrated to form a core concept of what mobile phones mean in the lives of young adults. Finally, faculty-researchers interpreted the emergent core concept and its dimensions from an identity theory perspective to conceptualize mobile phone identity. Appendix 2 summarizes the research approach employed in this study.

### **First-Order Findings**

This section reports first-order findings based on student-researchers' perspectives. This perspective is framed in terms of three broad categories of self-meanings that emerged from the first-order findings: (1) *functional meanings* that answer the question, "What can I do with my mobile phone?"; (2) *relational meanings* that answer the question, "What do I mean to others through my use of a mobile phone?"; and (3) *self-identification meanings* that answer the question, "Who am I, through my use of a mobile phone?" As depicted in Figure 2.1, the first-order findings show that as mobile phones

become increasingly embedded in young adults' daily lives, developing a mobile phone identity answers the question, "Who am I?" *Embeddedness* refers to the extent to which a mobile phone is used across a variety of situations or to support interactions with a variety of others in a given situation (Stryker and Burke, 2000). Direct quotations from student-researchers' autobiographical essays, as well as evidence from related literature, are provided in support of the key findings.



### Functional Meanings: What can I do with my mobile phone?

Student-researchers had literally grown up with the mobile phone. For many, their early experiences were initiated by parents who, typically, cited safety concerns for the phone purchase and service plan subscription. Closely related to safety concerns, many parents are motivated to buy mobile phones to retain a permanent communication channel with their growing children as they become increasingly independent (Chen and Katz, 2009, Palen et al., 2000). Student-researchers' descriptions of early mobile phone use indicate their awareness of their mobile phones' potential to act as a mobile parenting

device (Ling and Yttri, 2006). At the same time, initially, young adults are mostly concerned with how they can use the device to gain a degree of control over their levels of connectedness with parents. One way in which student-researchers achieved this was through “forgetting” to take their phones with them, except on occasions when they might want or need to contact their parents. As one young person wrote:

*When I had to rely on my parents for transportation, I often used it to let them know when and where to pick me up. This was especially helpful for after school activities that would occasionally get cancelled or end before the regular time. My parents also liked for me to take it with me on school trips so that I could contact them easily if I needed to. However, these were about the only ways I would use my mobile phone early on. I would often forget it at home and only rarely use it when I did have it.*

Student-researchers’ first-order findings confirmed that there is a temporal aspect to young adults developing an emotional connection with their mobile phones. However, the embeddedness of mobile phone use in everyday life appears to exert greatest influence on the meanings young adults construct through interacting with their phones. Narrative accounts of student-researchers that used their phones across a narrower range of applications were preoccupied with how physical aspects of the device shaped their use. The following excerpt typified the reflections of those who used their phones primarily as a communication channel (i.e. for text and voice calls):

*I started to ask myself what is it about my phone that makes me want to txt instead of call someone. I looked at my phone and immediately three things*

*jumped out at me: the keyboard, the way the txt conversations are displayed, and the message preview.*

**Relational Meanings: What do I mean to others through my use of a mobile phone?**

The mobile phone begins to take on new meaning as young adults become increasingly reliant on the device to create and maintain social relationships outside of the family. At this stage, young adults' reflections become less about what they can do with the phone and more about what they mean to others via the device. As McMillan and Morrison (2006) report, it is often friends and peers who most strongly impact young adults' initial adoption and use of ITs. One young man, who defined himself as "less than the average mobile phone user," explained the social pressure he felt in high school to purchase a mobile phone and how doing so contributed to a positive sense of self:

*I felt as if I was a little bit "socially awkward" for not having a phone. I also remembered feeling slightly embarrassed when I had to ask friend if I could use their phone. Finally, I remember feeling almost empowered once I finally decided to pay for the phone and the monthly fee.*

Another participant described how having a mobile phone in college became a critical aspect of her developing a sense of belonging and acceptance among her peers:

*I did not have a mobile phone until I started college so during high school I felt left out and separated from other teenagers. I even felt embarrassed because I didn't have one and did not know how to use it. When I bought my first phone, the Motorola Razr in 2005, I felt so cool. Having a phone and using it to connect with others can really boost your self-esteem.*

Mobile phones have become a critical aspect of having social relationships, in part, because they have changed the rules of social interaction. Student-researchers

reported how using mobile phones to coordinate schedules gives them greater flexibility in planning events—to the extent that schedules can be refined right up to the last minute. This ability—referred to as “microcoordination” (Ling and Yttri, 2002)—has become so integral to social interactions that when it is not supported by a mobile phone’s features, its owner can feel excluded from the group:

*If I had [had] text messaging, I feel that people could have texted me their plans and I could have met them there when I got out of the gym. Often times, plans would change, so if someone called me to tell me their plan for the night, they would have to call me back and leave me another message. This would get both annoying and confusing for me and the caller. [If I had had text messaging it] would have made people more incline[d] to try and include me in their plans.*

The emotional distress experienced by many student-researchers when their phones were taken away for 24 hours reinforces how many young adults see the mobile phone as fundamental to creating and maintaining ties with friends. One participant told of how not having his mobile phone negatively affected him and those around him:

*I felt frustrated, stressed and inconvenienced by not having [my phone]. It also affected those around me. My roommates were inconvenienced when they needed rides from class or needed to send information to me. I also found that those who are in on-campus organizations with me found it inconvenient. I lead a team of nine other students and they became frustrated because they could not call or text me when they needed guidance. I was unable to attend a friend’s birthday dinner because they could not get in touch with me. Situations like this*

*reinforced the idea that mobile phone use greatly contributes to my social ties and enables me to maintain friendships well.*

As young adults reflect on how mobile phones affect group membership, they begin to construct self-meanings that answer the question, “What do I mean to others through my use of mobile phones?” In doing so, they internalize social expectations of being perpetually available and accessible via their phones (Katz and Aakhus, 2002):

*I would often receive a missed call from a person. After that person called, they would then return with a string of calls within a few minutes of each other. All of which went unanswered. To me this indicated that either the person thought I was intentionally screening their calls or the person felt I had a responsibility to answer my phone.*

These internalized expectations, in turn, act as standards that shape young adults’ subsequent behaviors and encourage feelings of dependence on the phone for maintaining social relationships:

*With mobile phones people have become used to being able to get in contact with each other nearly all the time whether through calling, texting, or emailing. People seem to get irritated, and I feel guilty, when I do not or cannot respond quickly. If I did not have a phone for a longer period of time I believe my relationships, both social and professional, would have suffered.*

### **Self-Identification Meanings: Who am I through my use of a mobile phone?**

Many student-researchers reported depending on their mobile phones to maintain relationships with family and friends. However, removing some student-researchers’ phones fully revealed how much the mobile phone has become embedded in all aspects of their daily lives. It also provided an opportunity for them to reflect on who they are as

individuals through interacting with their phones. One young woman wrote of her surprise when she discovered that going without a mobile phone for 24 hours “had a bigger impact” on her life than she expected.

*I would reach for my phone and realize I did not have it. I was so bored without my phone. Usually, when I'm bored I will call someone to keep me company.*

*Since I could not do that, I found myself with idle time that I did not know what to do with. I did not recognize on a regular day how much my phone is a bit of a companion... When I went to get it back, I felt connected again. I felt like I had gained a part of myself back and I was back in business. I also felt a little more alive and like I had something in my possession that could occupy every spare moment of my life.*

This participant was a self-described ‘light user’. However, qualitative content analysis of her written account provided evidence that, in addition to supporting relationships with family and friends, her daily use included using the phone to keep to her daily schedule, to provide a sense of safety as she conducted her activities, and to provide entertainment when she was bored at work or at home. Because the mobile phone was an integral part of her everyday life, she experienced its absence as a loss of an important resource for thinking and communicating—and gained a positive sense of self, manifest as increased energy, when it was returned.

One explanation for young adults’ sense of connection to mobile phones is that it reflects the extent to which individuals have invested a part of themselves in their devices (Vincent, 2006). This study’s first-order findings suggest that as young adults’ mobile phone use permeates more aspects of their daily lives, so the meanings they attribute to



that use become increasingly focused on the self, rather than on others. For example, several student-researchers who used a mobile phone across a greater variety of situations reported feeling that an important part of them was missing without their phones. As one young man wrote:

*I was disconnected in a constantly connected world. **I almost felt like I wasn't a real person...***

Related to notions of embeddedness, young adults are willing to invest in their mobile phones because they feel empowered and energized as an outcome of their interactions (Ryan and Deci, 2000). For many student-researchers, the mobile phone was integral to them getting around by themselves, to fighting off fears such as walking alone in the dark or having an accident while driving, and to feeling in control. One young woman wrote of how a mobile phone becomes an important source of self-esteem because it is autonomy-supporting:

*The phone is a means to inform and empower us. It can be something as simple as avoiding traffic or checking the price of an item at different stores. Either way, you have the power and the control... you live by your schedule and don't have to wait for others. Your self-esteem is then fuelled by that power, so you feel more secure.*

The first-order findings suggest that as mobile phone embeddedness increases, young adults' interactions with these devices become integral to their sense of who they are. Through becoming an important part of how young adults see themselves, interacting with mobile phones can, in turn, affect the way young adults perceive, and interact with, their broader social environment, as typified in the following quote from

one student-researcher: “*My mobile phone is so integrated into my life that without my phone I feel as though I am no one, lost on this earth.*” Mobile phone identity is, thus, a product of young adults’ interactions with mobile phones and a motivating force that affects their thinking and behavior.

### **Second-Order Findings**

The first-order findings provide a rich descriptive account of meanings young adults attach to the self in relation to mobile phones. These narratives provide a basis for theorizing about how young adults’ interactions with these devices can become integral to how they define themselves as individuals. This section presents theoretical findings derived from a second-order analysis aimed at uncovering the underlying dimensions of young adults’ self-identification with mobile phones. Appendix 3 illustrates the coding process we followed. In the first step, we identified key categories (e.g. mobile phone features used, patterns of use, and meanings applied to being with and without a mobile phone). Next, we looked for patterns and relationships between categories. Finally, in consultation with identity literature, we integrated the categories around the core concept of *mobile phone identity*— as the set of meanings attached to the self in relation to mobile phones. These meanings exist on a continuum ranging from functional meanings—“my interactions with a mobile phone are separate to my sense of who I am” to self-identification meanings—“my interactions with a mobile phone are integral to my sense of who I am.”

### **Mobile Phone Identity as a Product**

Based on the second-order analysis, we conceptualized mobile phone identity as being comprised of three interrelated dimensions: *emotional energy*, *relatedness*, and

*dependence* arising from young adults' histories of interaction with their mobile phones (summarized, together with illustrative quotes, in Table 2.1).

Table 2.1 Conceptualization of Mobile Phone Identity					
Emergent Concepts	Definition	Illustrative quotes from first-order analysis		Self Meanings	Relevant concepts from other domains
		Functional Meanings	Relational Meanings		
<i>Mobile Phone Identity</i>	The set of meanings attached to the self in relation to mobile phones—based on a history of interaction, emotional energy, dependence, and/or relatedness.	"By having a mobile phone, it is much easier and more convenient for me to communicate with people whenever I have the need."	"People have become used to being able to get in contact with each other nearly all the time whether through calling, texting, or emailing."	"...it actually hit me that my phone is a part of me."  "Essentially, mobile phones are now a part of us as individuals..."	Environmental identity (Clayton, 2003): "a belief that the environment is important to us and an important part of who we are" (p. 46).
<i>Emotional Energy</i>	The extent to which young adults express feelings of confidence, enthusiasm, and energy when thinking about themselves in relation to mobile phones.	"I really like this keyboard and I know it sounds weird but it's almost like Las Vegas when they make the slot machines sound and light up in a pleasing way to make you want to use them more. My keyboard sounds and looks appealing to me."	"I was so excited when I got it back, I made a phone call immediately just because I missed my connection to the outside world."	"I felt a little more alive and like I had something in my possession that could occupy every spare moment of my life"	Positive emotions associated with the natural world (Clayton, 2003).  Emotional response to thinking about the environment—e.g. passionate, enthusiastic, an advocate (Stets and Biga, 2003).
<i>Relatedness</i>	The degree to which young adults express feelings of connectedness when thinking about themselves in relation to mobile phones.	"Mobile phones have become a bigger and bigger part of our lives over the last few years because of advancements in technology... While I do agree face-to-face is great, texting is easy and do-able at almost any time."	"I felt separation anxiety when we were not together... I had a new respect for my connection to my phone. I realized it was a huge part of my life."	"When I got it back, I felt like I had gained a part of myself back and I was back in business."	The extent to which respondents saw themselves as connected with the environment (Stets and Biga, 2003).  The extent to which people feel related to the environment as part of a functioning ecosystem (Clayton, 2003).
<i>Dependence</i>	The extent to which young adults express feelings of reliance when thinking about themselves in relation to mobile phones.	"The truth is our lives have become dependent on the mobile phone because of the convenience."	"I needed to have my phone. I felt phantom vibrates and heard imaginary rings..."	"My mobile phone is like a lifeline to me."	The extent to which people are independent vs. dependent on the environment (Stets and Biga, 2003)

In the context of this study, emotional energy is the extent to which young adults express feelings of confidence, enthusiasm, and energy when thinking about themselves

in relation to mobile phones. Relatedness refers to the degree to which young adults feel a sense of connection with their mobile phones. Dependence is the extent to which young adults feel reliant on their mobile phones in their everyday lives and social interactions. These dimensions vary based on the degree to which young adults' interaction with mobile phones is embedded in their everyday lives. Appendix 4 provides additional illustrative examples using direct quotations from student-researchers' first-order findings. The relationship between embeddedness and the three dimensions of mobile phone identity is discussed in more detail below.

***Embeddedness***—Student-researchers' first-order findings show that the degree to which mobile phone use is embedded in young adults' lives is an important determinant of the meanings they attribute to the device. In particular, student-researchers who predominantly used the phone as a communication channel (i.e. carry, talk, text) tended to focus attention on functional attributes such as device features and capabilities, whereas those who used a wide range of features (e.g. Internet, social media, GPS, software applications, news, etc.) across multiple social situations and relationships, talked of the device as being “part of me” and of being “lost”, or “not real” without it. In that those who focused on the mobile phone's physical form also saw their interactions as unrelated to their sense of self, these findings are consistent with identity research suggesting past level of investment is the most significant determinant of identity formation and maintenance (McCall and Simmons, 1966/1978, Stryker and Burke, 2000).

In the context of young adults and mobile phones, our second-order analysis indicates that investment in mobile phone identity manifests across two dimensions of IT use: (1) investment across a wide range of mobile phone features; and (2) investment

across a variety of situations (Appendix 3). Specifically, our analysis (in consultation with literature on mobile phones (e.g. Chen and Katz, 2009, Vincent, 2006, Walsh et al., 2010)) reveals that as interacting with the mobile phone becomes integral to managing daily life, it results in feelings of emotional energy, relatedness, and dependence on the device for maintaining a sense of who one is. These dimensions are evidenced through the meanings our student-researchers attributed to their mobile phone use.

***Emotional Energy***—Identity research suggests that for individuals’ interactions with nonhuman objects to result in an identity that shapes their thinking and behavior, these interactions should be emotionally significant and valued (Clayton, 2003). Those with high emotional energy feel “pumped up with emotional strength” from taking part in an interaction, have feelings of attachment toward, and are enthusiastic proponents of the other party involved (Collins 1990, p. 32). This implies that mobile phones to be an important source of individuals’ self-concepts, young adults should exhibit confidence and enthusiasm (i.e. *emotional energy* (Collins, 1990)) for interacting with them. Student-researchers’ narrative accounts revealed this dimension of mobile phone identity. As evidenced in our first-order analysis, student-researchers whose mobile phone use was highly embedded reported eagerly anticipating interacting with their phones and feeling ‘more alive’ and ‘pumped up’ with energy when they had the device in their possession.

***Relatedness***—The concept of relatedness differs from the notion of non-human objects as *extensions of the self* (Belk, 1988), inasmuch as the latter views mobile phones as tools to communicate aspects of who one is to others (Campbell and Park, 2008, Fortunati, 2005, Katz and Sugiyama, 2006). In contrast, relatedness reflects an overlapping of boundaries between a young person’s self-concept and a mobile phone,

such that a person's interactions with the device are *incorporated into the self* as resources and characteristics of the individual (Aron et al., 2003, Aron et al., 1992).

Our first-order analysis found that those who interacted with a wider range of mobile phone features across a wider variety of situations expressed strongest feelings of relatedness with their devices. Absent their phones, these individuals reported feeling that an important part of them was 'missing', which negatively impacted their energy levels, their thinking, and their behavior. Without access to the store of cognitions associated with prior interactions—e.g. text and email messages sent/received, numbers stored, appointments made, and games played—several student-researchers could not think of alternative ways to communicate with people—or how to spend their time alone. One explanation for this reaction is that the mobile phone had become so embedded in these individuals' lives that, without their devices, they felt as if they had lost an important resource for thinking and interacting with the world around them (Collins, 1990).

***Dependence***—In the context of interactions, where relatedness refers to an increasing overlapping of boundaries between the notions of the self and another party, dependence reflects the extent to which one party (A) has power over the other (B) as an outcome of B's reliance on A (Kemper and Collins, 1990). Prior literature has identified dependence as an important dimension of individuals' identities in relation to non-human objects (e.g. Clayton 2003; Stets and Biga 2003). In IS research, this potential has also been acknowledged. Schwarz and Chin (2007) suggest that as an individual becomes emotionally attached to an IT, he/she may yield authority "to the IT object...to the point it becomes part of his/her identity" (p.236). In the current study, student-researchers' narrative accounts indicate that as mobile phones become progressively more embedded

in everyday life, young adults become increasingly reliant on them to sustain social relationships with family and friends, as well as for work and play. This finding is consistent with findings in studies that examine the relationship between young adults and the Internet (e.g. McMillan and Morrison 2006). Taken together, these findings imply that dependence is an important underlying dimension of identity.

When mobile phones were removed for 24 hours, our first order analysis revealed differences in student-researchers' levels of dependence on their mobile devices. Those who take a functional view, rely on the convenience provided by their devices. For these individuals, it is simply easier to communicate using a mobile phone. Those who attribute relational meanings to mobile phone use view their phones as fundamental to creating and maintaining social ties. These young adults tend to believe that, absent a mobile phone, their social and professional relationships would suffer. Also, consistent with the findings relating to emotional energy and relatedness, those whose meanings reflect self-identification express the strongest feelings of dependence on their phones. Absent their phones, these individuals reported emotional distress, fear, and, in some cases, panic. Moreover, when this group attempted to imagine a life without mobile phones, they often wrote of how they would be forever changed. Many envisioned being unsafe, or unable to function, and described how their future career prospects—as well as relationships with family and friends—would be irrevocably damaged without their mobile phones. These second order findings illustrate how self-identification meanings that individuals attribute to interacting with mobile phones can spill over into other identities, such that who a person is in relation to their mobile phone becomes linked to who they are in the roles they perform, and the groups they affiliate with.

### **Mobile Phone Identity as a Motivating Force**

Our second order analysis suggests that emotional energy, relatedness and dependence are interrelated dimensions of mobile phone identity—that vary based on differences in the meanings young adults attribute to their mobile phone use. Most significantly, our findings revealed that, in addition to being a product of interactions, mobile phone identity acts as a motivating force on young adults’ attitudes and behaviors. Consistent with research proposing that individuals are motivated by self-esteem (the evaluative aspect of the self-concept) to maintain their current self-concepts (Owens, 2003), this study found that when student-researchers’ interactions with their devices were congruent with their mobile phone identities, it encouraged a positive sense of self. Removing student-researchers’ mobile phones for 24 hours—thus, preventing behavior that confirmed their self-meanings in relation to the devices—uncovered the connection between mobile phones, identity, and personal well-being.

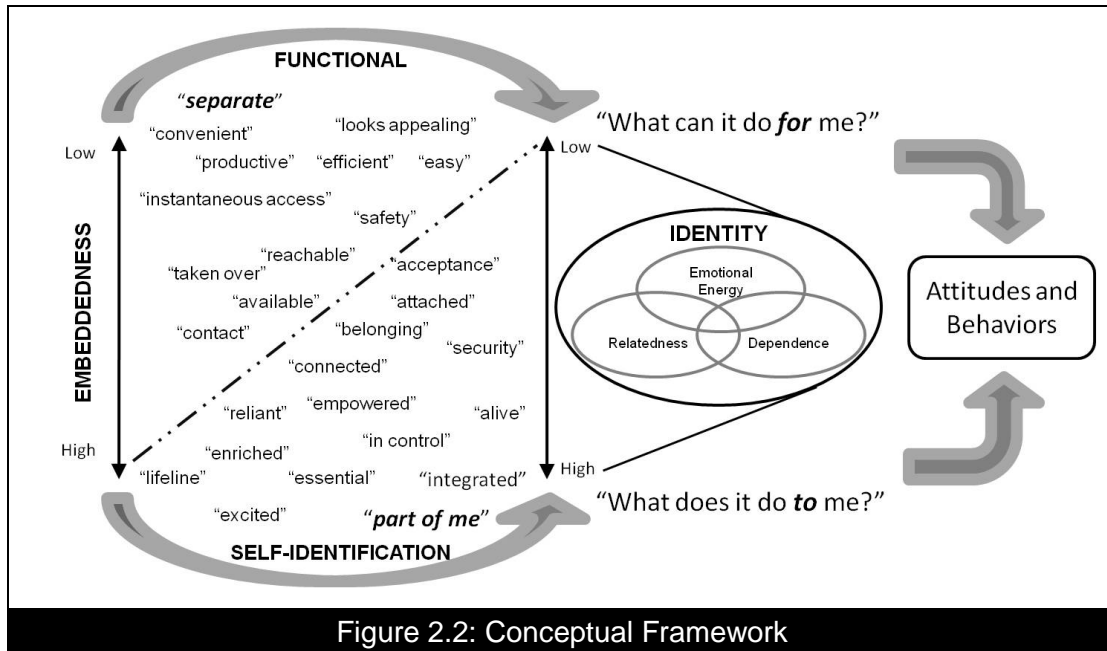
Student-researchers who attributed functional meanings to their interactions, were least affected by removal of their mobile phones, reporting that, despite being “*inconvenienced*” by difficulties it created in communicating effectively, “*taking one day off seemed to be fine.*” In contrast, those who attributed relational meanings reacted in a more ambivalent fashion. On one hand, student-researchers in this group were most likely to express relief at being freed from social expectations for 24 hours—e.g. “*I was getting a break from constantly being able to be contacted and [being] expected to respond.*” On the other, because these individuals viewed their phones as critical to feeling worthy and accepted by others, they became concerned about being disconnected from their social groups and questioned how others might react to their lack of responsiveness: “*Am I*



*missing a very important call from employer?”; “What if someone has an urgent message to send me and they have no other way of contacting me?”; “What if someone thinks I am intentionally not answering their calls?”*

Finally, those who strongly identified with their mobile phones experienced the absence as shrinkage in their sense of self, which resulted in significant emotional distress. Rather than seeking out new situations or ways of interacting with others, many reported going “*into hiding*” until their phones were returned. Once the phones were back in their possession, this group felt more alive, more competent, and more in control of their daily activities—or as one participant wrote, “*I had gained a part of myself back and I was back in business.*” These findings support the view that, for many young adults, mobile phone identity is an important part of their individual self-concept that guides and shapes their attitudes and behaviors.

The conceptual framework that emerged from our second-order analysis is presented in Figure 2.2. In the next section, we draw on this framework to suggest opportunities for future studies to advance research on ITs and identities beyond the context of young adults and mobile phones.



#### IV. DISCUSSION

While the concept that IT may become extensions of self has attracted increasing research attention (Campbell and Park, 2008, Katz and Sugiyama, 2006, Lamb and Kling, 2003), scant consideration has been given to whether interacting with ITs can give rise to self-meanings that define people as individuals. Developing understanding of IT's role as a source of personal identity is important because who people are, independent of others, can influence how they think and act in relation to others (Deaux 1992, Burke and Stets 2009). To this end, this study explored the relationship between IT and personal identity. Drawing on student-researchers' first-order analyses, we conducted a theoretical second-order analysis to develop a qualitative conceptualization of mobile phone identity. This conceptualization contributes to the literature on IT and identity in three ways. First, it identifies three interrelated dimensions of mobile phone identity that vary according to the meanings young adults construct via their interactions with the devices. Second, it develops understanding of the meanings young adults attribute to their mobile phone use

and elucidates how mobile phone identity acts as a motivating force on young adults' attitudes and behaviors. Third, it frames future research on IT use and identities beyond the context of young adults and mobile phones.

### **Nomological Net**

The conceptual framework presented provides a basis for future studies to advance understanding of IT and identity. This study uncovers three interrelated dimensions of mobile phone identity—emotional energy, relatedness, and dependence—that vary based on the meanings that individuals attribute through a history of interactions with mobile phones. Identifying these dimensions is necessary for researchers seeking to examine whether self-meanings that individuals construct through interacting with ITs influence their subsequent attitudes and IT use behaviors. Future research should seek to identify mobile phone identity's nomological network, including its antecedents, consequents, and boundary conditions. One promising area is to identify factors that impact mobile phone identity construction. This study suggests that embeddedness of a device in an individual's everyday life is important. However, how does mobile phone use become so embedded? What other aspects of an individual's history of interactions with mobile phones exert an influence (e.g. technology characteristics, temporal aspects, or quality of interactions)? Moreover, questions remain about the role of personality (Reid and Deaux, 1996) and/or status characteristics (e.g. age, education, and income) (Stets and Harrod, 2004) on the identity construction process.

### **Information Technology Identity**

Moving forward, more research is necessary to explore the extent to which our conceptualization of mobile phone identity is transferable to other types of IT. Given this

study's findings, we believe our work is germane to the broader IS domain and future research should leverage it to advance research on individuals' IT use behaviors. Our findings provide evidence that a functional view of IT represents only one set of meanings that individuals construct based on a history of interactions. This is an important contribution because, in general, IS research has emphasized the functional meanings that individuals attribute to using ITs (Ortiz De Guinea and Markus, 2009). Moreover, IS research has converged on the view that while a functional view is useful for predicting individuals' acceptance and intentions to use new ITs, it is limited in its ability to predict long term behaviors (Agarwal, 2000), particularly where IT use is mandated, interdependent, and/or includes high knowledge barriers (Gallivan, 2001).

### **Empirical Testing**

Given that individuals' behavioral choices are guided by the social structures in which they are embedded—and that individuals are linked to social structures through the identities they claim (Clayton, 2003, Stets and Biga, 2003)—future research should seek to develop measures of IT identity and test its predictiveness of actual use behaviors in contexts where cognitive beliefs such as *perceived usefulness* and *perceived ease of use* (Davis et al., 1989) have had limited explanatory power. Research finds that for repeated behaviors, identity is the *primary motivator* of behavior (e.g. Biddle et al. 1987; Burke 1991; Charng et al. 1988; Granberg and Holmberg 1990; Sparks and Shepherd 1992; Stets and Biga 2003). Identifying ways to influence behaviors directly represents an important step forward for IS researchers seeking to design managerial interventions that promote and manage effective long-term use.

People have many identities. Thus, to provide actionable guidelines for practice, it is necessary to develop understanding of the relationships between identities tied to ITs and individuals' other identities in the workplace. Research on role identities (e.g. McCall and Simmons, 1966/1978, Stryker and Burke, 2000) suggests that the likelihood of an identity being enacted in a given situation may depend on how committed an individual is to the identity in relation to other identities. Suppose, for example, an individual is not heavily invested in their mobile phone identity. In this case, the meanings they attribute to mobile phone use in the workplace may be influenced by their other identities (e.g. the extent to which using the mobile phone supports their workplace interactions or role performance (Lamb and Kling 2003)). Conversely, if an individual is heavily invested in their mobile phone identity, this can spill over into the workplace and influence the meanings they attribute to performing their roles. For example, individuals who have a history of interacting with iPhones® in their personal lives may link their workplace goals and competencies to use of those technologies (Bernoff and Schadler, 2010). A promising direction for future research is to investigate the conditions under which identities tied to interactions with ITs may influence (or are influenced by) individuals' role and social identities.

Commitment to an identity is not the only determinant of behavior. Sometimes, individuals enact identities they are less committed to, based on the extent to which they perceive that doing so will be advantageous in a given situation (Burke and Stets 2009). Situational factors that may determine whether an IT identity can be enacted include the support and rewards available for the identity (Burke and Stets 2009). For example, an organization may attempt to squash individuals' use of the ITs they identify with strongly

because these ITs are not supported by the IT department. Conversely, the organization may try to harness employees' innovativeness by freeing people up to use the ITs they feel comfortable with (Bernoff and Schadler 2010). To design organizational incentive systems that promote and maintain desired use behaviors, it is important to tease out the underlying dynamics of these relationships.

## V. LIMITATIONS

Limitations of this exploratory study should be acknowledged. First, our analysis is based on the written narratives of 18 – 24 year old students. As such, the first-order findings described may not be generalizable to the broad population of mobile phone users. However, our primary goal was to develop understanding of the self-meanings *young adults* construct as they interact with ITs. Researchers with a particular interest in studying the wider social aspects of mobile phone use may seek to extend this work by examining mobile phone identity across a more comprehensive sample of mobile phone users. Second, while research on mobile technologies from the global community is represented, this study's literature review focuses predominantly on issues related to identity. This is because our interest was in exploring the relationship between IT and identity rather than researching the mobile user experience *per se*. To this end, mobile phones were selected as the *context* for discovering the self-meanings young adults construct through their interactions with ITs because students participating in the project were active users of mobile phones. Since a thorough analysis of the mobile user experience is outside the scope of this study, the literature reviewed on the subject of mobile phones is necessarily limited relative to literature on identity. In future research it would be interesting to investigate whether the identities people construct in relation to

mobile and ubiquitous technologies differ significantly from identities tied to other types of IT. Third, the focus and analysis of this study is at the level of the individual and the specific IT in use. To advance research on IT and identity further, researchers may wish to extend the implications of this study to other areas of information systems research, such as information systems development and, in doing so, incorporate another level of abstraction, e.g. addressing identity issues and IT use from a platform-development perspective.

## **VI. CONCLUSION**

Identity is an important concept and the relationship between IT and identity needs to be explored further, since ITs have become an essential component of the interactions in which identities are constructed. To this end, we conducted an exploratory study of young adults' interactions with their mobile phones to discover whether young adults' personal identities are shaped through their interactions with these devices. Based on our findings, in consultation with relevant literature, we conceptualized mobile phone identity as having three interrelated dimensions that vary based on the meanings young adults attribute to their mobile phone use. Our findings imply that mobile phone identity is developed over time, as individuals' interactions with their mobile phones become embedded in their daily lives. Further, we found that acting in ways that are congruent with the self-meanings attached to mobile phone use fosters a positive sense of self in young adults that can, in turn, affect the way they perceive, and interact with, the world around them. On this basis, we suggested potential opportunities for future studies to advance research on IT and identity beyond the context of young adults and mobile phones. Developing understanding of the meanings individuals' attach to the self in

relation to ITs has the potential to provide richer understanding of long-term IT use behaviors and serve as a basis for offering actionable guidelines for practice.



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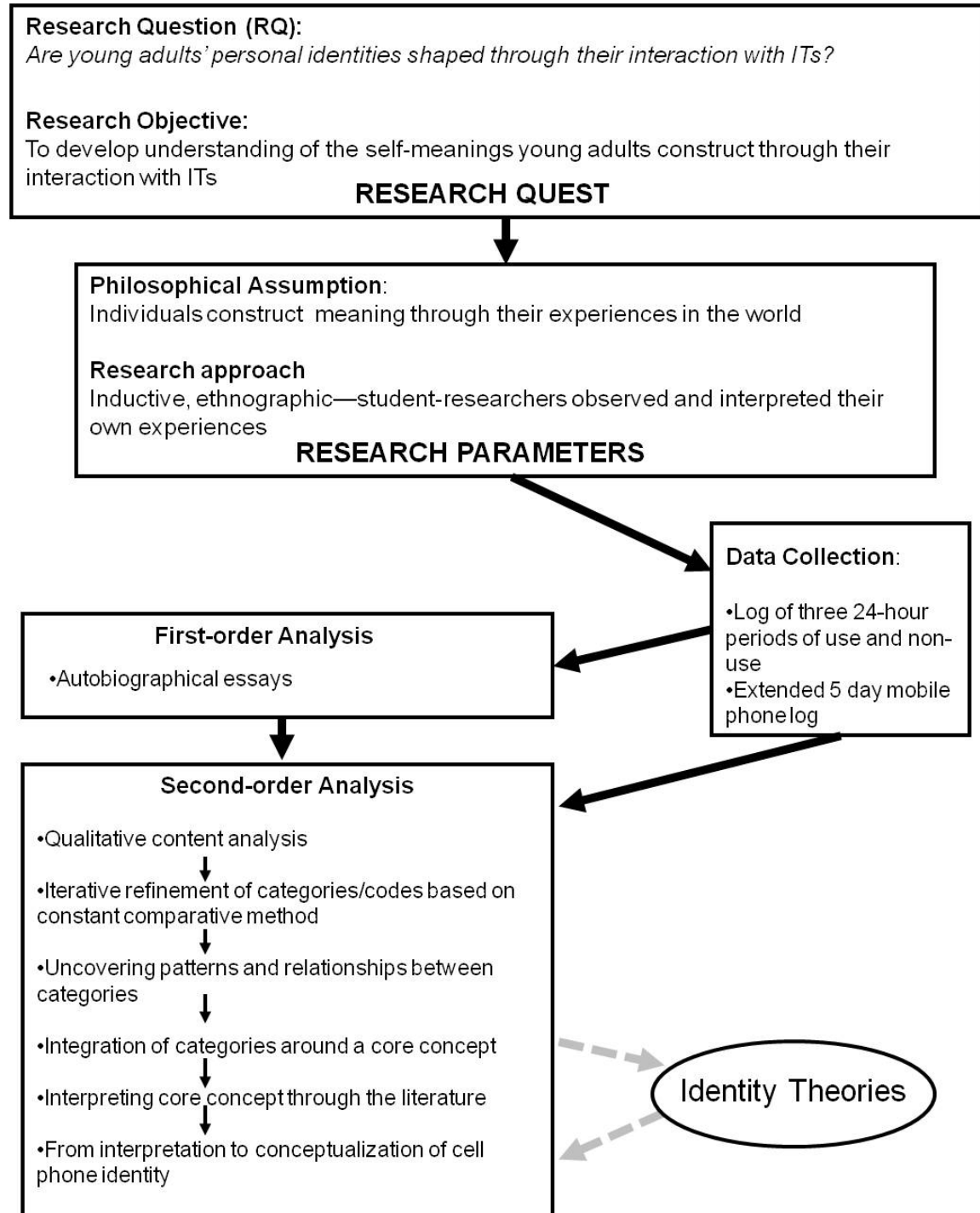
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## APPENDIX 1: IDENTITY AND IS RESEARCH

Features	Personal Identity	Role Identity	Social Identity
<i>Perspective</i>	Psychology (e.g. Hogg, 2006) and Sociology (McCall and Simmons, 1966/1978)	Sociology (e.g. Burke and Reitzes, 1981, McCall and Simmons, 1966/1978, Stryker, 1980)	Psychology (Tajfal, 1981, Tajfal and Turner, 1986)
<i>Definition</i>	Self-meanings that define a person as a distinct entity	Self-meanings tied to a role	Self-meanings tied to a social category or group
<i>Identity Orientation</i>	Person	Role	Group
<i>Self-reference</i>	Me	Me as a role	We
<i>Social Motivation</i>	Self interest	Self-interest, as well as other(s)' interest	Collective welfare
<i>Focus of Behavior</i>	Independent of others	Complementary to others	Similar to others
<i>Basis of self-evaluation</i>	Individual self-concept	Being competent in performing a role	Being like others in a group and seeing things from the group's perspective
<i>Examples of person, role, and social identities</i>	<b>Environment</b> —defined as “one’s self-meanings in relation to the environment (Weigert 1997)” (Stets and Biga, 2003, p. 401) or more specifically, —“the set of meanings attached to the self as the person interacts with the natural environment” (p. 409).	<b>Student</b> —the set of expectations tied to being a student that guide a person’s attitudes and behavior in performing that role (Burke and Stets, 2009).	<b>Organization</b> —“perceived oneness with an organization” (Mael and Ashworth, 1992, p. 103), or how “organizational members define themselves as a social group in relation to their external environment, and how they understand themselves to be different from their competitors” (Alvesson and Empson, 2008, p. 1)
<b>Illustrative Examples of Research on Identities in the IS Domain</b>			
<i>ITs as a tool or resource</i>	Akah & Bardzell (2010) — explores the relationship between appropriating digital artefacts as creative resources in the home and personal identity.	Da Cunha & Orlikowski (2008) —how employees use an online forum to deal with perceived threats to their role identities.  Lamb & Davidson (2005)—how research scientists use ITs for collaboration and to present a professional scientist identity.	Ma & Agarwal (2007)—identity presentation, mediated by IT artefacts, leads to knowledge contribution in online communities.
	Lamb & Kling (2003)—individuals are social actors who use technologies as a resource to display aspects of their personal and workplace identities to others.		
<i>The impact of ITs on role and social identities</i>	Not applicable	Alvarez (2008)—how introduction of enterprise systems impacts role identities.	Moon et al. (2006)—investigates the impact of blogs on social identity on the Internet.
		Van Akkeren and Rowlands (2007)—how feelings of incompetency and frustration with enterprise system impact role and social identities.	
<i>The impact of role and social identities on IT acceptance/ use</i>	Not applicable	Lee et al. (2006)—the impact of self-identity on technology acceptance.	Hinds and Mortenson (2005)—how shared identity moderates the effect of geographic distribution on team conflict.
		Hillmer (2009)—the impact of workplace identities on technology acceptance.	Liu and Chan (2010)—the impact of social identity on perceptions of a virtual healthcare community.
<i>ITs as a source of personal identity</i>	Not formally theorized. Walsh et al. (2010)—found young Australians’ “addiction” to mobile phone was related to their notions of the self. Some (Jones and Karsten, 2008, Schwarz and Chin, 2007, Turkle, 2005, Turkle, 2011) suggest that a person’s relationship with a computer influences their self-concepts, their jobs, and their relationships with others.		

## APPENDIX 2: THE INDUCTIVE RESEARCH APPROACH



### APPENDIX 3: CODING PROCEDURE

The “constant comparison” method (Berg, 2000, Strauss and Corbin, 1990) was used to identify key themes and patterns of categories, as well as relationships between categories. In step 1, data was analyzed across student-researchers’ narrative accounts to identify key categories. In step 2, relationships between categories were identified (e.g. the relationships between being with or without a mobile phone, range of student-researchers’ mobile phone use, and the meanings attributed to that use). In step 3, categories, patterns, and relationships that had emerged were integrated to form a core concept of what mobile phones mean in the lives of young adults.

STEP 1: IDENTIFYING KEY CATEGORIES						
Features Used	Patterns of Use	Where	When	Social Ties	With Phone	Without Phone
Voice calls Texts Email Internet Wi-Fi Social Media Facebook Twitter LinkedIn Games Music Camera Weather GPS Applications News Sport VoIP Calendar Alarm clock Timepiece	Carry Communicate Plan Schedule Organize Coordinate Network Manage Bank Shop To get around Work Play	Room Home Alone Desk Work School In class Between class Outside Car Public Walking Sitting Standing	Morning Afternoon Evening Night Everyday Daily	Mother Father Parents Brother Sister Grandmother Aunt Uncle Friend/Peer Girlfriend Boyfriend Roommate Teammate Fraternity Project Group Employer Professor	Capabilities Features Convenient Easier Appealing Efficient Helpful Access to others Accessible Security Taken over Available Reachable Acceptance Belonging Contact Connected Safety Attached to Lifeline Essential Needed Reliant Dependent In control Productive Enabled Enriched Enhanced Empowered Excited Alive Part of me Integrated	Inconvenient Problems Difficult Tiresome Frustrated Stressed Unproductive Relaxed Guilty Awkward Anxious Concerned Insecure Uneasy Uncomfortable Worried Unsafe Fear Panic Afraid Lost Alone Apart Isolated Disconnected Distracted Bored Unbearable Not a real person



STEP 2: UNCOVERING PATTERNS AND RELATIONSHIPS BETWEEN CATEGORIES				
Embeddedness	Features Used	Extent of use	With Phone	Without Phone
Separate	Carry Voice calls Texts	Occasional Narrow range of features Narrow range of situations To contact people as necessary	Capabilities Features Convenient Easier Appealing Efficient Helpful Safety Productive	Inconvenient Problems Difficult Tiresome Anxious Concerned
Attached	Carry Voice calls Texts Email Internet Wi-Fi Social Media Facebook Twitter LinkedIn VoIP	Frequent use Narrow to wide range of features Used mostly to create new, and maintain existing social ties	Access to others Accessible Taken over Available Reachable Acceptance Belonging Contact Connected Needed Attached to Security	Frustrated Stressed Relaxed Guilty Awkward Insecure Uncomfortable Uneasy Isolated Disconnected Alone Apart Unsafe Worried
Integrated	Carry Voice calls Texts Email Internet Wi-Fi Social Media Facebook Twitter LinkedIn VoIP Calendar Alarm clock Timepiece Games Music Camera Weather GPS Applications News Sport	Wide range of features Wide range of people Wide range of situations Managing Daily Life	Lifeline Reliant Dependent Essential In control Enabled Enriched Enhanced Empowered Excited Alive Part of me Integrated	Unproductive Fear Panic Afraid Lost Distracted Bored Unbearable Not a real person

STEP 3: INTEGRATING CATEGORIES ROUND THE CORE CONCEPT OF IDENTITY			
Degree of Embeddedness	Meanings	Answers the questions	Focus of meaning
<b>Separate—</b> <i>Narrow range of features</i> <i>Communication channel</i>	<b>Functional—</b> Capabilities Convenience Ease Safety	What can a mobile phone do for me?	The phone as a tool
<b>Attached—</b> <i>Narrow to wide range of features</i> <i>Used predominantly to create and maintain social ties</i>	<b>Relational—</b> Belonging Acceptance Security Social expectations	What do I mean to others through my use of a mobile phone?	The phone as my connection to others
<b>Integrated—</b> <i>Wide range of features across a variety of situations</i> <i>Embedded in everyday life</i>	<b>Self-Identification—</b> Emotional Energy Relatedness Dependence	What does a mobile phone do to me? Who am I?	The phone as part of me

#### APPENDIX 4: MEANINGS ATTRIBUTED TO MOBILE PHONE USE

	Available Features	Range of Use	Emotional Energy	Relatedness	Dependence
<b>FUNCTIONAL: SEPARATE</b>	Basic features	Calls, texts, alarm clock	The only thing that really happened was several times I wanted to text my friends about food, or something that had happened in class.	Mostly, I just had the feeling of something missing.	By having a mobile phone, it is much easier and convenient for me to communicate with people whenever I have the need.
	Unlimited texting, unlimited internet access, calendar, alarm, calculator, mp3 player	Calls, texts, alarm clock	The day I spent without my phone was unsettling at times but mostly just frustrating because I wanted to contact people a few times throughout the day	Mobile phones have become a bigger and bigger part of our lives over the last few years because of advancements in technology... While I do agree face-to-face is great, texting is easy and do-able at almost any time.	The truth is our lives have become dependent on the mobile phone because of the convenience.
	Talk, text, video camera, camera, keyboard, wi-fi, Bluetooth, voice command, hands free, Windows Mobile 6.1, Internet access, email, Microsoft office, mp3 player, active sync, calculator	Calls, texts, timepiece	I really like this keyboard and I know it sounds weird but it's almost like Las Vegas when they make the slot machines sound and light up in a pleasing way to make you want to use them more. My keyboard sounds and looks appealing to me.	I have learned a lot about the way I use my phone and I what I like and don't like about it. This will help me in the future to choose my next phone....	My second discovery this semester was the amount of hardware and software functions that are on my phone that I do not use.... If my phone were easier to use then I would not only use it more but would enjoy using it.

	Available Features	Range of Use	Emotional Energy	Relatedness	Dependence
<b>RELATIONAL: ATTACHED</b>	Basic features, internet access, calendar, alarm, calculator.	Calls, texts, timepiece	I felt as if I was a bit "socially awkward" for not having a phone. I also remember feeling almost embarrassed when I had to ask friends if I could use their phone. Finally, I remember feeling almost empowered once I finally decided to pay for the phone and the monthly fee.	Removal of the mobile phone created the notion that I suddenly was not as in touch with the outside world as much as I needed to be. For example, I had questions such as, "Am I missing a very important call from my employer?" "What if someone thinks I am intentionally not answering their calls?"	I feel it would be tough to just give up my mobile phone and try to conduct my life the way I do today. I live in an apartment complex and I honestly cannot think of anyone who has a landline.
	I have a Smartphone.	Calls, texts, timepiece, internet	Once I got past the nervous feeling that I was missing something, I felt relieved that I did not have my phone. I was getting a break from constantly being able to be contacted and expected to respond.	Without my phone, I missed out on always being connected. My phone provides a sense of safety and comfort to my daily activities.	I would not want to go more than a day without my phone... I believe my relationships both socially and professionally would have suffered.
	I do not have a smart phone – it does the basics. No internet access.	Calls, texts, alarm clock, stop watch, calendar, calculator	I was so excited when I got it back, I made a phone call immediately just because I missed my connection to the outside world. On day three, I found myself checking for messages and missed calls more often than normal because of the void I had on day two.	When I go to work or something as simple as taking the trash out, I have my mobile phone with me. I felt separation anxiety when we were not together... I had a new respect for my connection to my phone. I realized it was a huge part of my life.	I needed to have my phone. I felt phantom vibrates and heard imaginary rings... I constantly felt my empty pockets, looking for my phone.

	Available Features	Range of Use	Emotional Energy	Relatedness	Dependence
<b>SELF-IDENTIFICATION: INTEGRATED</b>	My phone is not a Smartphone. It does have internet access	Calls, texts, timepiece, alarm clock, internet, games	I felt a little more alive and like I had something in my possession that could occupy every spare moment of my life	When I got it back, I felt connected again. I felt like I had gained a part of myself back and I was back in business.	The one day of not having my mobile phone available for use made me realize how dependent I have become on it... My mobile phone is like a lifeline to me.
	I have an iPhone, so I have access to hundreds of applications.	Calls, texts, email, Facebook, games, calendar, calculator, GPS, notepad, weather, timepiece, stopwatch, and alarm clock	I was overjoyed when I could use my phone again	I honestly felt that I was completely out of reach of society without my phone. It was difficult to make it through the day without texting or making phone calls.	I realized how much I depend on mobile phone technology in my everyday life.
	I have an iPhone.	Calls, texts, calendar, VoIP, Facebook, weather, news, and games, alarm clock, timepiece	I use the weather application everyday to find out what I should wear. I use news app to see what is going on in the world, so that I can prepare for the future. I use game apps when I get bored... The iPhone has dramatically improved my life.	My mobile phone is so integrated into my life that without my phone I feel as though I am no one, lost on this earth.	I am very dependent on my mobile phone. I use my mobile phone to communicate with others, use social media applications, and to know when and where I have to meet with a group of individuals, just to name a few. I could barely survive without it.

## **ESSAY 2: INFORMATION TECHNOLOGY (IT) IDENTITY: A DEFINITION AND RESEARCH AGENDA**

### **I. INTRODUCTION**

Today's businesses increasingly rely on information technologies (IT) embedded in processes and products for their survival and as a source of competitive advantage (Venkatesh et al. 2008). However, despite huge investments in IT, employees' underutilization of implemented systems often means that organizations fail to realize expected benefits (Jasperson et al. 2005). While technology assimilation research has converged on a shared understanding of individuals' initial decisions to use new ITs (Agarwal 2000; Ortiz De Guinea and Markus 2009; Venkatesh et al. 2003), these decisions do not necessarily translate to effective use in the long-term. Consequently, in recent years, information systems (IS) researchers have begun to focus attention on examining individual IT use in the post-adoption phases of technology assimilation—i.e. “after an [IT] has been installed, made accessible to the user, and applied by the user in accomplishing his/her work activities” (Jasperson et al. 2005). The goal of post-adoption research is to understand how and why individuals use ITs to their fullest potential in the work place (Chin and Marcolin 2001).

In general, post-adoption research (e.g. the IS continuance model (Bhattacharjee 2001; Bhattacharjee and Premkumar 2004)) is consistent with theories of initial use (e.g. the technology acceptance model (TAM) (Davis 1989; Davis et al. 1989) and the unified theory of user acceptance and use of technology (UTAUT) (Venkatesh et al. 2003). Continued use is largely viewed as intentional, driven by a series of conscious decisions

to act (Ortiz De Guinea and Markus 2009, p. 433). As Ortiz de Guinea and Markus (2009) note, these decisions have two key inputs: beliefs (e.g. post-usage perceptions of usefulness) and an individual's affective response to an IT (e.g. satisfaction and attitude<sup>2</sup>).

Because models of IT use are rooted in attitude theories, extant IS literature largely disregards that the people who make continuance decisions about using ITs occupy social positions in networks of roles and relationships (i.e. *social structures*) that guide their attitudes and behavioral choices (Ortiz De Guinea and Markus 2009; Venkatesh et al. 2008). For example, a study focused on examining the relationship between a nurse's beliefs/attitude toward an electronic medical record (EMR) system and his/her ongoing use of the EMR (as in whether to use the system as mandated or to circumvent mandated procedures), crucially misses a third element—*what it means to that person to be competent in performing the nurse role* (Burke 1991).

Missing this element of decision making precludes making accurate predictions of individual IT use; since the meanings people attribute to themselves (i.e. their *identities*) in the social positions they occupy are key determinants of their attitudes and behaviors (Biddle et al. 1987; Burke 1991; Charng et al. 1988; Granberg and Holmberg 1990; Sparks and Shepherd 1992; Stets and Biga 2003). Identities contain individuals' internalized expectations about what it means to be similar to others in groups they affiliate with (e.g. an organization), to be competent in roles they perform (e.g. nurse), and to be uniquely who they are by virtue of the personal characteristics they claim that define them (e.g. being caring) (Burke and Stets 2009).

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<sup>2</sup> While satisfaction and attitude are often synthesized, satisfaction is a transient construct representing an individual's evaluation of an IT based on first-hand experience, while attitude is an enduring affective response to an IT that transcends experiences. As such, the constructs are distinct.

The underlying premise of identity research is that individuals have a fundamental need to think and act in ways that are congruent with important identities (Burke 1991; Burke and Stets 2009). Thus, models that focus exclusively on the relationship between beliefs/attitude toward an IT and individual behavior, could not predict that a nurse may simultaneously hold a positive view of an EMR's potential to improve patient care *and* circumvent mandated use procedures when he/she feels that a system-enabled admission process diverts attention from competently performing part of the nurse role—e.g. providing much-needed emotional support to patients. Moreover, difficulties in making accurate predictions may be exacerbated for long-term behaviors that can be critically influenced by individuals' *enduring* attitudes (Kim et al. 2009; Liao et al. 2009) and past behaviors (Jasperson et al. 2005; Limayem et al. 2007).

To address this problem, this research examines relationships between individuals' identities and the ITs they use. Our broad objective is to extend understanding of how individuals' identities shape long-term technology use behaviors. More specifically, because ITs have become an essential component of the social interactions in which identities are constructed (Hillmer 2009; Lamb and Davidson 2005; Lamb and Kling 2003), we believe it is important to consider whether individuals' interactions with ITs act as a source of identity. By investigating the interplay between identity and IT use, this study makes two key contributions to the technology assimilation literature. First, examining the processes by which individuals construct and maintain identities in relation to specific ITs offers a new theoretical lens for understanding how these technologies become routinized and, ultimately, infused within organizations. Second, since people have many identities and interact with ITs in situations where they make



decisions aligned with two (or more) identities (Stryker and Burke 2000), developing a clear understanding of relationships between identities and IT use is important for researchers and practitioners to design managerial interventions that promote organizational assimilation of information technologies.

To that end, this study brings together identity theories and IS research on technology assimilation to elucidate the role of identity as a core construct in explaining individuals' long-term use of IT. Consistent with prior research, which posits that nonhuman objects may come to be regarded as integral to a person's sense of self (Clayton 2003; Stets and Biga 2003; Weigert 1997), this study proposes that as people interact with particular ITs across a variety of groups, roles, and situations, their interactions with these technologies become integral to their sense of who they are as individuals. Specifically, we conceptualize IT identity—defined here as *the set of meanings an individual attaches to the self in relation to IT*—as a *product* of a history of interactions, as well as a *force* that shapes individuals' thinking and guides their IT use behaviors.

The rest of the paper is structured as follows. The next section begins with a brief discussion of the relationships between social structures, ITs, and identities. Following this, we explain how the identities that people claim as part of their self-concepts act as primary motivators of their behaviors. Next, we examine the various conceptualizations of identity in more detail to uncover common features of all identities that are relevant to developing the IT identity concept. Drawing on this theoretical frame, we then define a partial nomological network for IT identity, including its antecedents, consequents, and boundary conditions. We conclude by examining the interplay between IT identity and

other identities in the work place. The general propositions derived from our theoretical discussion will offer a research agenda for investigating IT identity's role in explaining individuals' long-term IT use.

## **II. THEORETICAL FOUNDATIONS**

In recent years, concepts of self and identity have gained prominence in sociological and psychological domains of social psychology research (Leary and Tangney 2005; Owens 2003). This research interest has resulted in two broad perspectives on the nature and influence of self and identity as constituted by society (Hogg et al. 1995; Owens 2003; Stets and Burke 2005; Stryker and Burke 2000). Sociological perspectives set out to explain how the networks of roles and relationships that individuals are embedded in influence their views of themselves and, subsequently, their behaviors relative to others. In contrast, psychological approaches examine how individuals' categorization of themselves as members of multiple social groups (e.g. political party, sports team, organization) motivates them to think and behave in similar ways to other group members (Hogg et al. 1995). The key difference between the two perspectives is that sociological theories focus on individual behaviors, while psychological theories emphasize group processes and intergroup relations.

Since both approaches assume that individuals' thoughts, feelings, and behaviors depend on the social structures in which they live (Stets and Burke 2005), this section begins with a brief discussion of the relationships between social structures, ITs, and identities. Here, we posit that as social structures and ITs become increasingly entangled, notions of the self and identity cannot be defined without reference to the ITs that people regularly interact with. We suggest that as individuals interact with particular ITs across

a variety of groups, roles, and situations, their relationships with these ITs become important to them, and an important part of their self-concepts that are not shared with other people. On this basis, we propose developing IT identity as a distinct form of identity in the IS context. Then, to elucidate the role of identities in shaping and guiding individuals' attitudes toward and use of ITs, we outline how individuals' identities linked to the larger social structure act as primary motivators of their behaviors. Finally, we examine the various conceptualizations of identity in more detail to uncover common features of all identities that are relevant to developing the IT identity concept.

### **Social Structures, ITs, and Individual Behavior**

The sociological approach to self and identity is rooted in the assumption that a reciprocal relationship exists between self and society (Stets and Burke 2005; Stryker 1980). Society can be defined as “an enduring and cooperating social group whose members have developed patterns of relationships [or behavior] through interaction with one another” (Merriam-Webster Online Dictionary). These patterns of behavior have different levels of analysis that shed light on the link between the self and society (Stets and Burke 2005). At the individual level, examining one individual's behavior over time makes it possible to know that individual. Across individuals, we can look for similarities in individuals' patterns of behavior to develop understanding of larger patterns of behavior that make up social structures—described as the organization of social life (Lopez and Scott 2000).

Social structures can be defined in terms of *institutional structures*, referring to “the cultural and normative expectations that [individuals] hold about each other's behavior” and *relational structures*, which refer to the social networks of relationships

and roles that are defined by these expectations (Lopez and Scott 2000, p. 3).

Sociologists take the view that social structures emerge from the actions of individuals, but that individuals come to know themselves and act within the context of the social structures in which they are embedded.

In many of today's societies, the social structures in which people are embedded are becoming inseparable from patterns of individuals' interactions with ITs (Castells 1996; Castells 1997; Orlikowski 2010). As ITs become ever more ubiquitous, people are choosing and becoming familiar with ITs across all aspects of their personal lives, as well as in the work place (Schaffner 2010). This phenomenon—referred to as the *consumerization of IT*—means that social relations between people and institutions are increasingly maintained via computer-mediated social networks (Hillmer 2009). With the result that individuals' roles and relationships, as well as the cultural and normative expectations that define them, are ever more tied to their interactions with ITs.

New ways of searching, organizing, and presenting information are changing or creating new forms of communication—e.g. keyboard exchanges, text messaging, online interactions (Altheide, 1995; Cerulo, 1997). These new forms of communication disembed social relations from local contexts of interaction (Jones and Karsten 2008), linking the work space with the personal space (Schaffner, 2010), reducing distances between adults and children (Cerulo, 1997); and creating new social structures that transcend temporal, geographic and cultural boundaries (Johnson 2008; Jones and Karsten 2008; Turkle 1995).

Mobile devices and networked technologies ensure people are always available and accessible—and create new expectations about how, when, and where people

perform their various roles and maintain social relations. Lines between relational structures become blurred as people internalize institutional expectations of being in perpetual contact (Gant and Kiesler 2002). Employees equate being accessible to their employing organizations outside of work settings with working in the interests of the organization (Masmanian et al. 2006); parents view being accessible to their children, regardless of whether they are at home or work, as essential to fulfilling their parental roles (Palen et al. 2000); friends and colleagues view having the ability to refine schedules up to the last minute as integral to managing their work and social lives effectively (Ling and Yttri 2002).

Given that, 1) maintaining social relations is becoming increasingly entangled with individuals' use of ITs; and 2) this is changing the nature of the social structures in which people come to know themselves and act, it appears reasonable to assume that a person's history of interactions with ITs will give rise to questions such as, what does this technology mean in my life? What do I mean to others through my use of this technology? Who am I, through my use of this technology?

Consistent with prior research, which posits that nonhuman objects may come to be regarded as an extensions of the self (Belk 1988), this study proposes that as individuals interact with particular ITs across a variety of groups, roles, and situations, their relationships with these ITs become important to them, and an important part of their self-concepts that are not shared with other people. Specifically, we conceptualize IT identity—defined here as *the set of meanings an individual attaches to the self in relation to ITs*—as a *product* of individuals' history of interactions with an IT, as well as a *force* that shapes their thinking and guides their IT use behaviors. To develop

understanding of what motivates these processes, in the next section we outline how individuals' behavioral choices are guided by identities that link them to the larger social structure.

### **Self and Identity**

To understand the role of identities in shaping and guiding individuals' attitudes toward and use of ITs, it is helpful to outline how individuals' identities are linked to the social structure in which they are embedded. To facilitate this, we first demarcate concepts relating to the self, self-concept, and identity. We describe how the self-concept emerges over time as individuals form identities based on how others respond to them and their self-evaluations. Following this, we explain how individuals' are motivated by self-esteem and coherence to enact identities that maintain their current self-concept. The concepts and relationships discussed in this section are presented in Table 3.1.

The *self* can be defined as: “an interactive system of thoughts, feelings, identities, and motives that (1) is born of self-reflexivity and language, (2) people attribute to themselves, and (3) characterizes specific human beings” (Owens 2003, p. 206). This broad definition encompasses notions of the self as both a subject and an object. As a subject, the self refers to “I” or a “mental presence” that “registers a person's experiences, thinks their thoughts, and feels their feelings (Leary and Tangney 2005, p. 7). As an object, the structure and content of the self is represented by the *self-concept*, which contains the totality of meanings individuals hold about themselves—including their *identities* and their feelings of self-esteem (Stets and Burke 2005). The relationships between the self, self-concept and identity are depicted in Figure 1.

**Table 3.1: Self and Identity**

	<b>Self</b>	<b>Identity</b>
<i>Process</i>	"An interactive system of thoughts, feelings, identities, and motives that (1) is born of self-reflexivity and language, (2) people attribute to themselves, and (3) characterize specific human beings" (Owens 2003, p. 206)	Identities are formed as individuals observe and categorize themselves, based on how others respond to them, their goals, and their self-evaluations.
<i>Content</i>	<b>Self-Concept:</b> The totality of meanings we hold about ourselves—including our identities and our feelings of self-esteem (Stets and Burke 2005)	The set of meanings applied to the self... that define what it means to be who one is in a role, a social group, or as a person (Freese and Burke 1994).
<i>Self-Esteem Motive</i>	<b>Self-Esteem:</b> The evaluative aspect of the self-concept Individuals are motivated by self-esteem to maintain their current self-concept (Rosenberg 1979).	Individuals are motivated by: 1. <b>Efficacy-based</b> self-esteem (Bandura 1986) to maintain role-based identities; 2. <b>Worth-based</b> self-esteem (Gecas and Schwalbe 1983) to maintain group-based identities; 3. <b>Authenticity-based</b> self-esteem (Burke and Stets 2009) to maintain person-based identities.
<i>Coherence Motive</i>	<b>Coherence:</b> "having a secure basis for understanding and responding to the world" (Swann et al. 2005, p. 368) Individuals are motivated by a need for coherence to confirm what they already believe and feel about themselves (Swann 1983; 1996; Swann et al. 2005)	Self-meanings—the content of identities—are a key source of coherence (Swann et al. 2005).
<i>Behavior</i>	<b>Self-Verification:</b> The process of actively seeking feedback that confirms one's self-meanings (Swann 1983; 1996; Swann et al. 2005). 1. <b>Selective Interaction:</b> choosing to interact with those who share one's views of oneself, and avoiding those that do not. 2. <b>Identity Cues:</b> displaying cues about who one is via personal appearance, possessions, body posture etc. 3. <b>Interpersonal Prompts:</b> behaving in ways that elicits confirmatory feedback from others.	When people claim an identity they will seek to confirm that others view their behavior as congruent with that identity (Burke and Stets 2009).
<i>Verification Outcome</i>	Successfully verifying what one already believes or feels about oneself, maintains or enhances feelings of self-esteem.	Enhanced self-esteem (efficacy-, worth-, or authenticity-based) reinforces confidence in an identity.

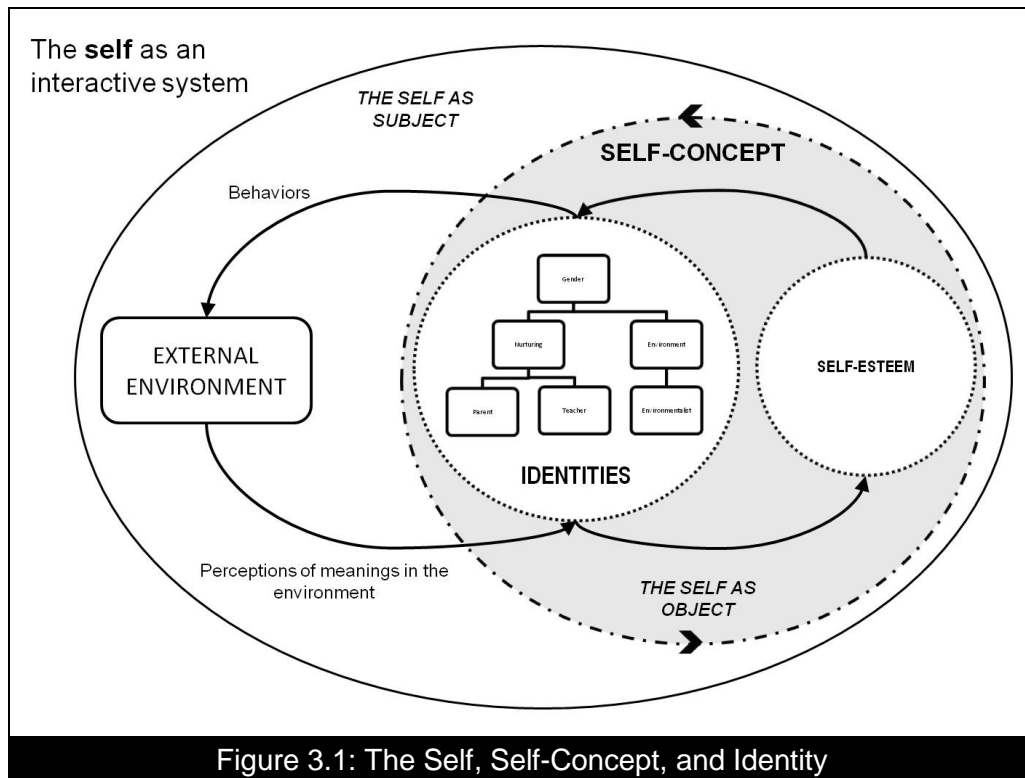


Figure 3.1: The Self, Self-Concept, and Identity

The self-concept emerges over time through a process of “reflected appraisal” in which individuals observe and categorize themselves (i.e. form identities), based on their goals, how they perceive others respond to them, and their self-evaluations (Stets and Burke 2005). This process is made possible because individuals learn the meanings and expectations associated with social categories from others and from the culture in which they exist (Burke 2004). By forming identities, they internalize these shared meanings and expectations with regard to their own behavior. Thus, the content of identities are the meanings people apply to the self about who they are—and how they should act—relative to others, in the roles they perform (e.g. as a parent), the groups they belong to (e.g. as a member of an organization), and in the norms, values, and characteristics they claim that define them as distinct from other people (e.g. as a moral person).



Because individuals interact with others in “the context of a complex, organized, differentiated society”, they develop multiple identities, each of which is tied to an aspect of the social structure in which they are embedded (Stets and Burke 2005, p. 132). A person’s many identities are arranged hierarchically, with identities that are more important and salient across situations having greater potential to influence behavior than less important and less salient identities (Stets and Biga 2003).

Broadly speaking, identities can be classified into three major types. Prior literature on identity distinguishes between identities derived from membership in a group or social category, those focused on roles and interpersonal relationships, and those focused on the self as a unique and identifiable entity (Brewer and Gardner 1996, p. 83; Burke and Stets 2009). ***Social* or *collective identity*** (psychology)—i.e. *we, as a group*, such as an organization (Kreiner and Ashworth 2004; Mael and Ashworth 1992)—refers to self-meanings tied to being like others in a social category or group (Tajfal 1981; Tajfal and Turner 1986). ***Role identity*** (sociology)—i.e. *me, as a role*, such as a gender or work role—refers to individuals’ internalized expectations about what it means to be competent in a role (Burke and Stets 2009; Burke and Tully 1977; Stryker and Burke 2000). ***Person identity*** (sociology) or personal identity (psychology)—i.e. *me, independent of others*—refers to the set of self-meanings that define a person as a distinct entity (Burke and Stets 2009).

As individuals observe and evaluate themselves based on the reflected appraisal process, they are motivated by ***self-esteem***—the evaluative aspect of self-concept—to enact important and salient identities in order to maintain their current self-concept (Owens 2003; Rosenberg 1979; Stets and Burke 2005). Three dimensions of self-esteem

are sustained by social, role, and person identities, respectively: *worth-based* self-esteem results from having a sense of belonging and acceptance in a social group (Gecas and Schwalbe 1983); *efficacy-based* self-esteem is an outcome of confirming that one is competent in performing a role (Bandura 1986; Gecas and Schwalbe 1983); and *authenticity-based* self-esteem is sustained through feeling that one is being true to who one really is as a person (Burke and Stets 2009). According to Owens (2003), protecting and enhancing one's self-esteem across these dimensions is a primary motivator of human behavior. Thus, individuals strive to act in ways that are consistent with the characteristics they claim as distinct entities, to be competent in their roles, and to fit into to the social groups they affiliate with (Burke and Stets 2009; Owens 2003; Rosenberg 1979; Stets and Burke 2005).

In addition to the self-esteem motive, individuals are motivated by a need for *coherence*—i.e. “having a secure basis for understanding and responding to the world” (Swann et al. 2005p. 368)—to confirm what they already believe about themselves (Swann 1983; Swann 1996; Swann et al. 2005). The process of actively seeking self-confirmatory feedback is referred to as *self-verification* (Swann et al. 2005). Since what people believe about themselves is the content of identities, it follows that when people claim an identity, they will seek to verify it. Thus, individuals engage in self-verification activities to help create social environments that reinforce their identities (McCall and Simmons 1978/1966; Swann et al. 2005). For example, individuals are more likely to choose to interact with those who see them as they see themselves (referred to as “*selective interaction*”). A number of studies have found evidence that when individuals' spouses view them as more (or less) favorable than they view themselves, those

individuals become less intimate with their spouses (Burke and Stets 1999; Katz et al. 1996; Swann et al. 1994). Alternatively, one might display “*identity cues*” through the clothes one wears, one’s body posture, or through displaying bumper stickers on a car (Swann et al. 2005). Finally, a person can seek self-verification by using “*interpersonal prompts*” to elicit self-verifying feedback. For example, Swann and Read (1981) found that individuals who thought of themselves as likeable intensified their efforts to present themselves as friendly when they felt others had perceived them as dislikeable.

Feelings of worth-, efficacy-, and authenticity- based self-esteem are maintained and enhanced as an outcome of successfully verifying who one is (Burke and Stets 2009). Because the self is a process as well as an organization, enhanced self-esteem in turn reinforces confidence in the identities person claims, which encourages further self-verification activities. In this way, identities serve three important purposes: (1) they help guide individuals’ behavior; (2) they allow individuals to anticipate the reactions of others in response to their behaviors, and (3) they shape the way individuals view the world around them (Owens 2003).

In this section, we outlined how individuals’ behavioral choices are guided by social, role, and person identities that link them to the larger social structure. Next, we examine these different forms of identity in more detail to identify features of identities that are relevant to the IT identity concept. This discussion provides a set of key takeaways about the identity-behavior link, which we draw on to develop a conceptualization of IT identity in the IS context, including its antecedents, consequents and boundary conditions.

## **Theories of Social, Role, and Person Identities**

Because IT identity represents a new construct in IS research, this study draws on theories of social, role, and person identities from psychology and sociology to develop the concept. Since these identities are often activated simultaneously in a situation, they are mutually influential and “cannot be easily separated” (Burke and Stets 2009, Hillmer 2009, p. 75). Thus, in this section we link psychological and sociological perspectives to explore the concepts of social, role, and person identities, and to identify relevant determinants of IT identity, as well as boundary conditions on its influence.<sup>3</sup> We begin by outlining the multiple bases of identity identified in prior research.

### **The Multiple Bases of Identity**

Many identities are tied to the groups people affiliate with and the roles people perform. Because the bases of social and role identities—i.e. the group and the role—are defined by the culture in which individuals exist, these identities “serve the culture’s purposes” (Burke 2004, p. 9)—that is, they give rise to and maintain the social structures in which they are embedded.

Originating in psychology, *social identity theory* (Tajfal 1981; Tajfal and Turner 1986; Turner et al. 1987) focuses on how identity is derived from membership in a social group or category. From this perspective, individuals’ enhance worth-based self-esteem through becoming like others in some in-group, behaving like other in-group members, and seeing things from the in-group’s perspective (Stets and Burke 2000). This

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<sup>3</sup> In synthesizing these approaches, we aim to avoid theoretical redundancies. However, we note that while the two perspectives use similar language and concepts (e.g. identity, identity salience, and commitment), these hold quite different meanings in psychological vs. sociological approaches (Hogg et al. 1995). Thus, to avoid confusion in language, we adopt terminology from the domain of sociology (i.e. social, role, and person) when referring to different types of identity.

process—referred to as *depersonalization*—means that when individuals are focused on a relevant social identity; their individuality is suppressed in favor of the welfare of the group, and issues affecting it, when the group is relevant in a situation (Brewer and Gardner 1996; Clayton 2003; Sluss and Ashforth 2007).

In contrast to social identity theory, which focuses on similarities among group members, theories emerging from sociology (Burke and Reitzes 1981; McCall and Simmons 1978/1966; Stryker 1980) call attention to the individual as complementary to others in a social network of roles and relationships. The sociological perspective emphasizes interdependencies between roles and counter-roles, which give rise to individuals' internalized expectations about what constitutes role-appropriate behavior (Burke and Stets 2009; Burke and Tully 1977; Stryker and Burke 2000). The social groups or categories that are the focus of social identity theory provide the context (i.e. institutional and relational structures) for the self-meanings a person attributes to performing a role.

The two major variants of sociological thought can be described as follows: the work of Stryker and colleagues' *identity theory* (e.g. Serpe and Stryker 1987; Stryker 1968; 1980; Stryker and Serpe 1982; 1994) focuses on how social structures influence the meanings and expectations (i.e. role identities) individuals assign to themselves and how these identities subsequently affect thinking and behavior. Burke and colleagues' *identity control theory* (e.g. Burke and Cast 1997; Burke and Reitzes 1981; 1991; Burke and Stets 1999; 2009; Riley and Burke 1995; Stets and Burke 2000; Tsushima and Burke 1999) emphasizes how individuals' behavior is influenced by the process of self-verification (i.e. seeking self-confirmatory feedback). Stryker and Burke (2000) argue that each

perspective provides a context for the other—i.e. social structures define expectations tied to social positions, while self-verification (i.e. performing competently in a role) gives rise to and maintains the social structures in which individuals are embedded.

Although the person, independent of others, has garnered much less research attention than groups and roles, in recent years, both psychological and sociological perspectives have begun to recognize the person as a basis for identity (Burke 2004). Nevertheless, such notions remain peripheral to both sets of theories (Burke and Stets 2009). Person identities refer to the personal (culturally recognized) characteristics, values, and norms that individuals claim as part of their self-concepts (that are not shared with other people) and that determine their behavior (Burke and Stets 2009; Meijers 1998). Person identities are constructed in the same way as social and role identities. However, where social identities define individuals in terms of the social categories or groups to which they belong, and role identities define individuals in terms of what they do, person identities contain a set of meanings (e.g. honesty, risk-taking, or creativity) that define individuals as distinct entities (Burke and Stets 2009; McCall and Simmons 1978/1966). When individuals' behavior is independent of others, it is motivated by self-interest (i.e. personal merit and welfare), rather than by serving the collective welfare of a group or the mutual interests of a role and its counter-roles.

The different emphases of psychological and sociological theories are depicted in Figure 3.2. Definitions, key features, and illustrative examples of person, role and social identities are provided in Table 3.2.

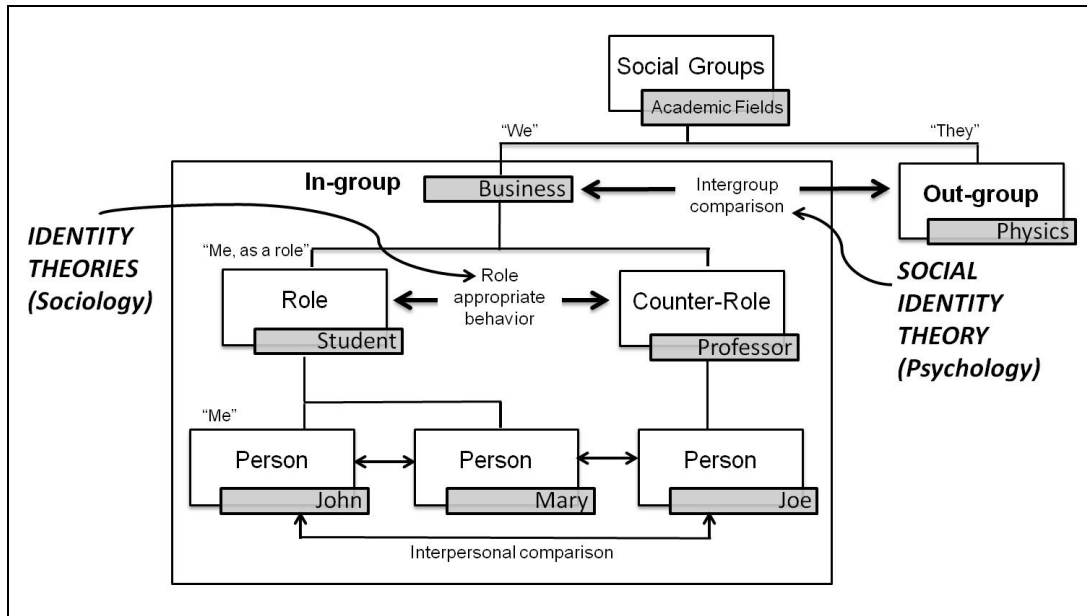


Figure 3.2: Psychological and Sociological Theories on Identity

Table 3.2: The Multiple Bases of Identity<sup>4</sup>

Features	Social Identity	Role Identity	Person Identity
Perspectives	Psychology	Sociology	Psychology and Sociology
Definition	Self-meanings tied to a social category or group	Self-meanings tied to a role	Self-meanings that define person as a distinct entity
Identity Orientation	Group	Role	Person
Self-Reference	We	Me as a role	Me
Social Motivation	Collective welfare	Self-interest, as well as other's interest	Self-Interest
Focus of Behavior	Similar to others	Complementary to others	Independent of others
Basis of Self-Evaluation	Being like others in the group and seeing things from the group's perspective (Stets and Burke 2000, p. 226)	Expectations tied to social positions	Individual self-concept
Illustrative Examples	<p><b>Organization</b>—"perceived oneness with an organization" (Mael and Ashforth, 1992, p. 103).</p> <p><b>Political party</b>—meanings ascribed to oneself as a result of one's attachment to a political party (Greene, 2004)</p>	<p><b>Student</b>—the set of expectations tied to being a student that guide a person's attitudes and behavior as a student (e.g. the extent to which they study, strive to pass tests, complete their courses, etc.) (Burke and Stets, 2009).</p>	<p><b>Environment</b>—defined as "one's self-meanings in relation to the environment (Weigert 1997)" (Stets and Biga, 2003, p. 401) or more specifically, —"the set of meanings attached to the self as the person interacts with the natural environment" (p. 409).</p> <p>Alternatively, "a belief that the environment is important to us and an important part of who we are" (Clayton, 2003, p. 46).</p>

<sup>4</sup> Adapted from Burke and Stets (2009).

This section presented different conceptualizations of identities from psychological and sociological literatures. Our review of these two broad perspectives revealed that social, role, and person identities have different orientations, social motivations, behavioral focuses, and bases for self-evaluation. In the following sections, we discuss how each of these identities are verified and activated in social situations. We begin by describing the content of identities (self-meanings) that act as benchmarks or standards for behavior. A summary of following discussion is presented in Table 3.3 (with rows representing sections, and columns summarizing content).

Table 3.3: Theories of Social, Role, and Person Identities			
Section Heading	Section Content		
	Social Identity	Role Identity	Person Identity
The Content of Identities	Self-meanings that act as a standard for behavior.		
	Exemplifying or representing the stereotypical attributes of the group as a whole".	Being competent in performing a role.	Being “who one is as a person across situations, across time, across relationships” (Burke and Stets, 2009, p. 125).
	Meanings contained in identities are comprised of two interrelated dimensions: A <b>cultural dimension</b> —reflecting the meanings and shared expectations tied to a particular group, role or characteristic that individuals learn from the culture in which they exist An <b>idiosyncratic dimension</b> —referring to individuals’ unique interpretations of these meanings and expectations		
	Usually, measured across two dimensions: An <b>attitudinal dimension</b> —positive evaluation of a group. A <b>cognitive dimension</b> —identification with a group	Most often measured using Osgood et al.’s (1975; 1957) three universal dimensions of affective meanings: <b>Evaluation</b> or <b>Attitude</b> —good vs. bad <b>Potency</b> —strong vs. weak <b>Activity</b> —lively vs. quiet	
How Identities Operate	“An identity process is a continuously operating, self-adjusting, feedback loop: individuals continually adjust behavior to keep their reflected appraisals congruent with their identity standards or references” (Burke 1991b, p. 840).		
Verification of Identity	Verified when self-meanings that are shared with others in a group or category are confirmed	Verification depends on verifying identities of others in a role set (e.g. parent-child; manager-subordinate; professor-student)	verified when the person “distinguishes himself or herself as a unique, identifiable, individual” (Burke 2004)
Activation of identity	<b>Accessibility and Fit</b> —people use readily available social categories to make sense of immediate situations. “The category that best fits the situation becomes the activated category”	<b>Prominence and Salience</b> —the importance of an identity to the self moderated by how advantageous it is to enact the identity in a given situation.	

### The Content of Identities

Regardless of their bases, the meanings that individuals attribute to themselves as they interact with the world around them (self-meanings) comprise the content of all



identities (Burke and Tully 1977). These self-meanings act as “benchmarks” or standards that guide and shape people’s attitudes and behaviors (Burke and Stets, 2009; Clayton, 2003; Stets and Burke, 2000). For social identities this means behaving in similar ways to other group members (Hogg and Abrams 1988; Hogg and Hardie 1992); for role identities it means being competent in performing a role; for person identities, it means being “who one is as a person across situations, across time, across relationships” (Burke and Stets, 2009, p. 125).

***The dimensions of meaning:*** Individuals’ behaviors are guided by the reflected appraisal process, in which others have communicated their evaluations of individuals’ past behavior, as well as by their own imagined views of themselves as members of social groups, role holders, or distinct entities (which provide self-support for an identity). Together, these evaluations confirm or disconfirm the cultural and idiosyncratic meanings contained in social, role, and person identities (Burke and Stets 2009). The content of identities appear to comprise two interrelated dimensions: (1) a ***cultural*** dimension, which reflects the meanings and shared expectations tied to a particular group, role or characteristic that individuals learn from the culture in which they exist, and (2) an ***idiosyncratic*** dimension, which refers to individuals’ unique interpretations of these meanings and expectations (McCall and Simmons 1978/1966; Owens 2003). The key difference between social identity vs. role and person identities is that meanings contained in the former focus on the individual as exemplifying or representing stereotypical attributes of the group as a whole, while role and person identities are focused on the individual relative to others (i.e. as complementary to or different from).

***Measuring the content of identities:*** Affective meaning is viewed as an important component of identity in both psychological and sociological perspectives. To that end, social identity theorists (psychology) measure social identity across two dimensions: an ***attitudinal*** dimension reflecting a person's positive evaluation of the group (Hogg and Abrams 1988; Hogg and Hardie 1992) and a ***cognitive*** dimension relating to a person's sense of oneness or identification with the group (i.e. seeing things from the group's perspective).

Because identity theories (as opposed to social identity theory) focus on the person relative to others, measures of role and person identities do not include a measure of oneness. Some identity theorists have drawn on semantic differential technique and the three universal dimensions of affective meaning identified by Osgood and colleagues (Osgood et al. 1975; Osgood et al. 1957) to measure the meanings an individual attributes to the self in performing a role (self-in-role) or in claiming a personal characteristic as their own (self-as-characteristic) (Burke and Tully 1977). These dimensions are: ***evaluation*** or ***attitude*** (e.g. does the self-in-role evoke good vs. bad feelings?), ***potency*** (is the self-in-role strong vs. weak?), and ***activity*** (is the self-in-role lively vs. quiet?).

For example, Heise's (1977; 1979) affect control theory (ACT), a variant of identity theory, draws on Osgood et al.'s (1957) dimensions of evaluation, potency, and activity (EPA) to measure the meanings (referred to as fundamental sentiments) contained in identities. Additionally, a number of studies have used the semantic differential to investigate the influences of role identities such as gender (Burke and Cast 1997), student (Burke and Reitzes 1981) and spouse (Burke and Stets 1999), as well as person identities such as moral identity (Stets and Carter 2006) and those based on

individuals' relationships with non-human objects such as the natural environment (Stets and Biga 2003).

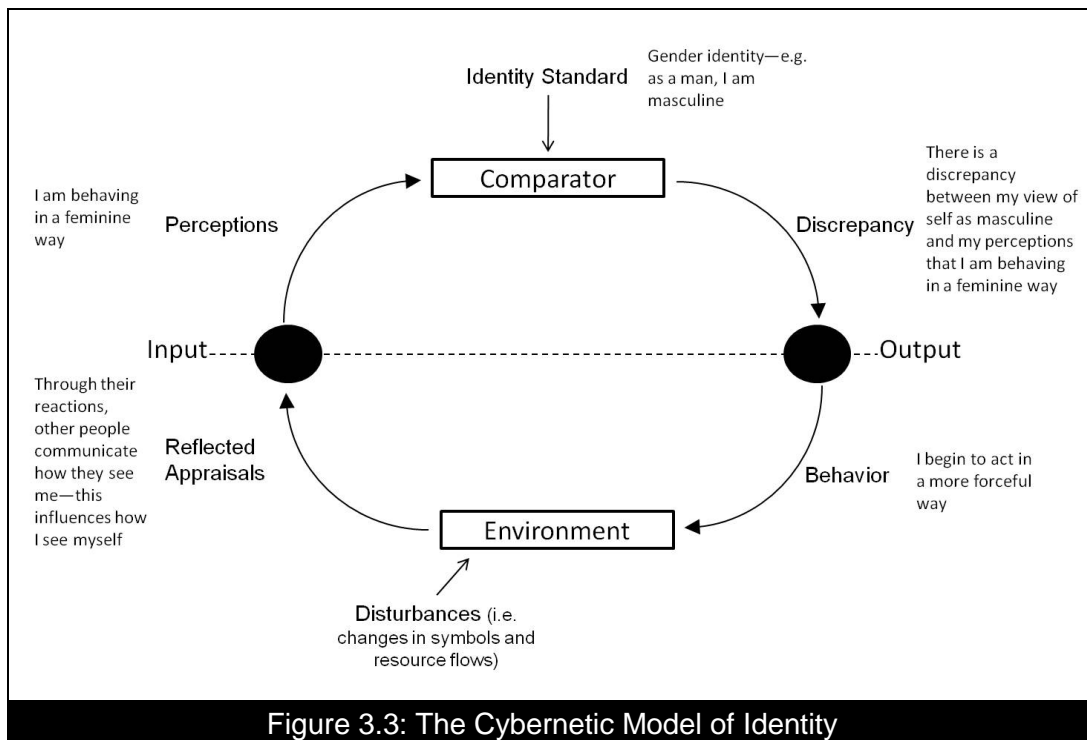
### **How Identities Operate**

While psychological and sociological theories on identity have different origins and emphases, recent advances in identity theory—e.g. identity control theory—suggest that all identities operate in the same way (Burke and Stets 2009). An important assumption of these perspectives is that identity is a process (Owens 2003). As Burke (1991b) writes, “An identity process is a continuously operating, self-adjusting, feedback loop: individuals continually adjust behavior to keep their reflected appraisals congruent with their identity standards or references” (p. 840).

*Identity control theory* incorporates ideas from McCall and Simmons' (1978/1966) role-identity theory, Powers' (1973) cognitive control theory of perception, and Swann's (1983; 1996) notions of self-verification. The resulting cybernetic model consists of four main components (Stryker and Burke 2000): (1) the identity standard, which is “the set of (culturally prescribed meanings) held by an individual, which define his/her behavior in a situation” (p. 287); (2) the individual's perceptions of relevant meanings in a situation; (3) a comparison mechanism (the comparator), which compares (#1) with (#2); and (4) the individual's behavior in response to a discrepancy between (#1) and (#2).

Consistent with Swann's (1983; 1996) notions of self-verification, at the core of identity control theory is that people act to change their environment in order to resolve discrepancies between their perceived self-meanings in a situation and the meanings held by them in an identity—when congruency between meanings in a situation and meanings

contained in an identity is achieved, self-verification occurs and a person's self-esteem is maintained or enhanced (Stets and Burke 2005). Figure 3.3 draws on an example provided by Burke and Stets (2009) to illustrate how the cybernetic model of identity works.



### Verification of Identities

Identity control theory asserts that, while group-, role-, and person-based identities have the same perceptual control and verification processes, they are distinguished from each other by differences in how the verification process works (Burke 2004; Burke and Stets 2009). These differences occur because each type of identity has its own focus. Social identities are verified when self-meanings that are shared with others in a group or category are confirmed (Burke 2004). Verifying a social identity helps people enhance their worth-based self-esteem (or self-worth) in two key ways: (1) belonging to a distinctive group provides a person with a sense of belonging

and acceptance; (2) the person emphasizes the positive aspects of a group to which s/he belongs (the in-group), while denigrating characteristics of some other group (the out-group) (Owens 2003). When people think and behave in concert with other members of a group, their social identity as a group member is verified and their feelings of self-worth are maintained or enhanced (Burke and Stets 2009).

Role identities, in contrast, focus on the individual as complementary to others (Burke and Stets 2009). In this case, verification is based not on who one is, but on what one does (Stets and Burke 2000). As Burke (2004) outlines, a person's role identity is verified when that individual performs a role in way that confirms their internalized expectations about what it means to be competent in the role, as well as the role identity of one, or a few, different others within a set of role relationships. For example, verifying a manager identity implies that subordinates are performing competently in their roles; thereby, verifying the manager role also verifies subordinates' role identities (Sluss and Ashforth 2007). Successfully verifying a role identity leads to increased feelings of efficacy-based self-esteem—i.e. a person's "beliefs about their capabilities to produce designated levels of performance" (Bandura 1986; Compeau et al. 1999, p. 146).

While verification of a social identity rests on exemplifying the stereotypical attributes of a group as whole, and a role identity depends on the mutual verification with others' identities in a role set, person identities provide self-meanings about the person as a distinct entity. Thus, this type of identity is verified when the person "distinguishes himself or herself as a unique, identifiable, individual with qualities that other individuals can count on and use to verify their own person identities (or group or role identities)" (Burke 2004, p. 10). Because person identities represents "the innermost self",

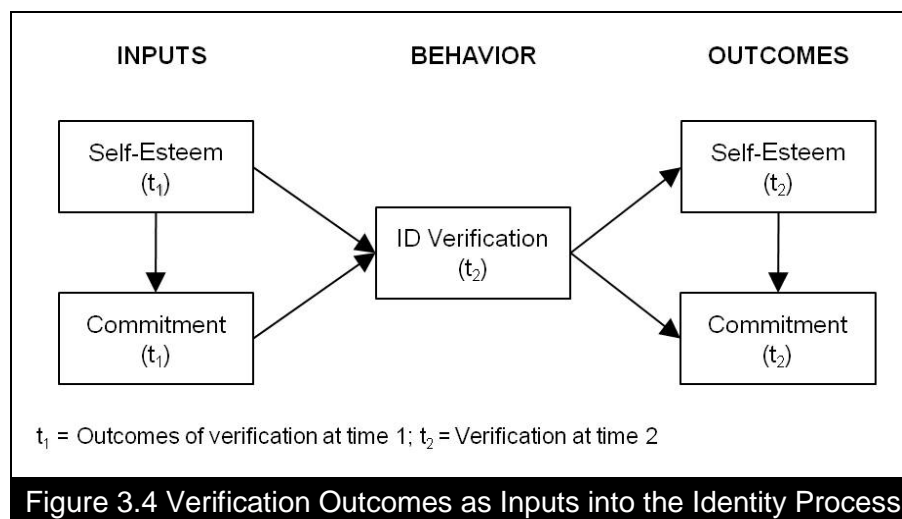
successfully verifying a person identity promotes feelings of *coherence* (Swann et al. 2005)—i.e. stability and wholeness—and *self-respect*—defined as “one’s overall attitude towards the self” (Baron et al. 2006, p. 184). Burke and Stets (2009) refer to these feelings as *authenticity-based* self-esteem. This form of self-esteem is “so important to individuals that they subconsciously fight to maintain it” across various role and social identities (Hillmer 2009, p. 80; Swann et al. 2005).

### **When Identities are Not Verified**

A number of studies have validated that increased self-esteem and commitment are outcomes of successful verifying an identity (e.g. Burke and Stets 1999; Cast and Burke 2002; Riley and Burke 1995). For example, Riley and Burke (1995) found that congruence between a person’s identity in a role and others’ assessments resulted in increased feeling satisfaction with a role performance and with the situation itself. Similarly, Burke and Stets (1999) found that when people can negotiate complementary role behaviors with other group members, they develop a strong attachment to the group. At the same time, an important aspect of the verification process is that people experience negative emotions and diminished feelings of self-esteem when it cannot be successfully verified (Stryker and Burke 2000). For example, Cast (2004) examined the relationship between role congruence and well-being in new parents and showed that parents who were unable to verify their parent identities experienced a decline in feelings of marital and individual well-being. Identity control theory suggests that repeated unsuccessful attempts at self-verification diminish a person’s commitment to an identity, reducing the likelihood of the identity being enacted in the future (Burke and Stets 2009).

### Verification outcomes as inputs to the identity process

In addition to being outcomes of self-verification, emotions and self-esteem are also recognized as inputs in the identity process. For example, Burke and Stets (1999) found that when people had problems verifying a spousal identity it created feelings of depression, which in turn resulted in a reduced commitment to the identity. In another study—which examined the reciprocal relationships between resources (defined by identity theorists as anything that supports individuals and their interactions (Freese and Burke 1994)) and self-verification—Stets and Cast (2007) demonstrated that efficacy-based self-esteem, as an outcome of verifying a spousal identity in one period, becomes a resource that supports verification in a subsequent period. Figure 4 illustrates the reciprocal relationships between self-esteem, commitment, and verification outlined here.



In sum, identities are verified when the shared meanings and expectations in a situation match the self-meanings contained in an identity. However, given that a person has many identities based on various groups, roles, and personal characteristics, an important question remains: in situations where there exist behavioral options aligned with two (or more) identities, why do people choose to verify one identity rather than

another (i.e. how does an identity become *activated* in a situation) (Stryker and Burke 2000)?

### **Activation of Identities**

Researchers address activation of identities somewhat differently based on whether a behavioral option relates to the group (social identity) or the individual (role and person identity). Thus, this section first outlines how activation of social identities has been conceptualized in psychology. Next, we turn attention to how sociologists have specified the activation of role and person identities. Finally, we draw on identity control theory to describe how in a hierarchy of multiple identities, person identities are likely to be more important—and therefore more likely to be activated across situations—than role or social identities (Burke and Stets 2009). Because the various conceptualizations presented use similar language and concepts (e.g. identity, identity salience, and commitment), often with quite different meanings (Hogg et al. 1995), a summary of key concepts as defined by different theories is provided in Table 3.4 . Table 3.4 also states which definitions are adapted by this study and why.



**Table 3.4: Key Concepts from Psychological and Sociological Theories**

Theory	Concept	Definition	Operationalized as	This Study:
Social Identity Theory	Salience	Whether an identity is relevant in a situation (Tajfal 1981).	The actual activation of an identity based on 1. <i>Accessibility</i> —i.e. social categories that are readily available 2. <i>Fit</i> —i.e. congruence between meanings attributed to a stored category and a person's perceptions in the situation (Oakes 1987)	Not included in this study
Identity Theory	Salience	A person's readiness to act out an identity (Stryker and Burke 2000).	The probability of an identity being invoked across a variety of situations, or alternatively across persons in a given situation" (Stryker and Burke 2000, p. 286)	Not included in this study.
	Commitment	"the degree to which persons' relationships to others in their networks depends on possessing a particular identity and role" (Stryker and Burke 2000, p. 286).	Perceived costs that would be incurred if an identity were not activated. Measured along two dimensions: 1. <i>Quantitative</i> : number of social ties 2. <i>Qualitative</i> : strength of ties.	Included as a congruity force within the identity setting (i.e. perceived support = number of interpersonal ties)
Role-Identity Theory	Prominence	The extent to which an identity reflects a person's priorities (McCall and Simmons 1978/1966).	Reflects how important an identity is to the self. Influenced by the extent to which past enactment is associated with: 1. Prior investment 2. Successful self-verification 3. Gaining extrinsic and intrinsic rewards	Used in defining the IT identity construct and to help identify its determinants.
	Salience	The extent to which it is advantageous to enact an identity in a situation (McCall and Simmons 1978/1966).	The interaction between identity prominence and three situational factors. 1. Extent to which identity needs support 2. Extent to which opportunities to enact the identity exist 3. Individual needs/wants rewards.	Included as the interaction between IT identity and congruity forces
	Commitment	The level of investment one has made in an identity (McCall and Simmons 1978/1966).	N/A	Adapted as "prior investment"
Identity Control Theory	Commitment	<i>The sum of forces, pressures, or drives that influence people to maintain congruity between their identity setting and the input of reflected appraisals" (Burke and Reitzes 1991, p. 243)</i>	<i>Perceived support (number of interpersonal ties) and rewards (e.g. satisfaction, praise) in a situation</i>	<i>Congruity forces:</i> 1. <i>Perceived support</i> 2. <i>Perceived rewards</i> 3. <i>Extent to which identity needs support</i> 4. <i>Extent to which individual needs/wants rewards.</i>

## Activation of social identities

In common with role and person identities, people are viewed as having multiple social identities: some of which “are more salient than others; and some may vary in salience in time as a function of a variety of social situations” (Tajfal 1981, p. 255). The notion of *salience* as used in social identity theory refers to whether an identity is relevant in a situation based on *accessibility*—i.e. social categories (such as gender, race, age, etc.) that are readily available and help a person make sense of situations—and *fit*—i.e. which refers to congruence between meanings attributed to a stored category and a person’s perceptions in the situation (Oakes 1987). To illustrate, Oakes gives the example of the “taxi” category having accessibility and fit if a taxi stand is nearby and the person is in a hurry to get somewhere.

In social identity theory, identity salience is considered using Turner et al.’s (1987) self-categorization theory. From this perspective, identities are organized hierarchically at three levels (Owens 2003, p. 225): At the *subordinate level*, individuals categorize themselves by “comparing and contrasting themselves to members of some in-group” (e.g. a research scientist who compares himself to other scientists based not only on his publication success but also along the lines of his ability to mentor others, and in terms of being a good steward for the field). At the *intermediate level*, individuals make categorizations based on “perceived social similarities and differences of some in-group vs. some out-group.” For example, the research scientist may see being a physicist as being a real scientist and view those engaged in behavioral research as “puzzle-solvers”. Finally, at the *superordinate level*, individuals categorize themselves based on what it means to be human vs. some other life form (or perhaps, a nonhuman object). Thus, a

person may be a vegetarian because he feels it is wrong to kill animals (Owens 2003) or an environmentalist because he feels at one with nature (Clayton 2003). The level of identity that is activated depends on whether the individual has a store of readily available categories (accessibility) and whether the meanings applied to those categories match the individual's perception of the situation (fit). In that accessibility and fit are characteristics of the situation in which identities are enacted, this study proposes that salience as specified in social identity theory, exerts a moderating effect on the identity-behavior link.

### **Activation of role and person identities<sup>5</sup>**

Regardless of whether an identity is based on a role or the person, identity control theory's cybernetic model suggests that identities predict behavior only when the meanings contained in an identity correspond to meanings attributed to the behavior (Burke and Stets 2009). To illustrate, we paraphrase Burke and Stets' (2009) example of the relationship between student identity and behavior: if a person's student identity contains the meaning of being "academic", the person should attend classes regularly, pass exams, and finish courses (Burke and Reitzes 1981; Reitzes and Burke 1980). Conversely, if the identity contains meanings of being "social", the person is expected to spend time attending parties and other social events. The implication is that meanings contained in an identity influence how someone behaves, and that a person behaves in ways that confirm their identity.

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<sup>5</sup> While the identity theories referred to in this section (i.e. Stryker's identity theory ((1987; 1968; 1980; 1982; 1994) and McCall and Simmons' (1978/1966) role-identity theory) focus almost exclusively on role identity, identity control theory, which is informed by these theories, suggests that person identity shares the same underlying mechanisms (albeit with a different focus) and can, thus, be considered alongside role identity (Burke and Stets 2009).

While the cybernetic model explains individuals' behavioral choices as an attempt to keep perceived meanings in a situation congruent with meanings in an identity, it does not, by itself, address what makes an identity important or salient enough that an individual will choose to act in accord with that identity rather than another. To understand what makes an identity more likely to be activated, we therefore draw on two theories that specifically consider this question—Stryker and colleagues' (1987; 1968; 1980; 1982; 1994) identity theory and McCall and Simmons' (1978/1966) role-identity theory.

***Stryker's Identity Theory:*** Consistent with Mead's (1934) framework of "society shapes self shapes behavior", identity theory assumes that individuals make choices, and that these choices are influenced by social structures and social interaction. From this perspective, behavior is viewed as a function of an individual's multiple identities (i.e. internalized expectations), organized in what Stryker terms a "salience hierarchy".

***Salience*** (representing Mead's "self") refers to a person's readiness to act out an identity "across a variety of situations, or alternatively across persons in a given situation" (Stryker and Burke 2000, p. 286).

According to Stryker's identity theory, the higher the salience of an identity relative to other identities in the self, the more likely an individual will make choices in accord with that identity (i.e. the identity will be *activated*). The salience of a given identity is influenced by the perceived costs that would be incurred if the identity were not activated, referred to as ***commitment***—"the degree to which persons' relationships to others in their networks depends on possessing a particular identity and role" (Stryker and Burke 2000, p. 286). Commitment (representing Mead's "society") is measured

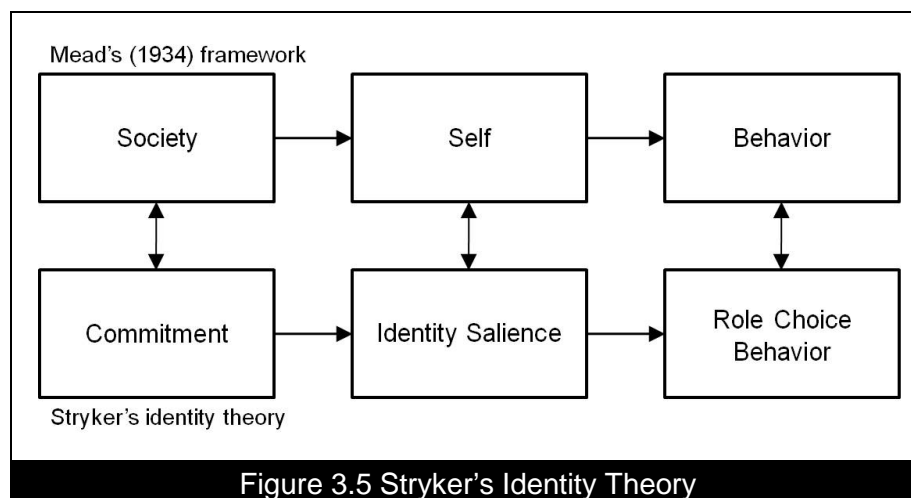
along two dimensions: (1) an interactional (or quantitative) dimension referring to the number of social ties that currently depend on the identity; and (2) an affective (or qualitative) dimension, which refers to the strength of those ties (Stryker and Serpe 1994). In the same way that society is assumed to exist prior to the self, so the number of social ties that depend on an identity (*commitment*) is assumed to have temporal precedence over an individual's readiness to act out the identity (*salience*).

While there are similarities between Stryker's (1980) specification of salience and Tajfal's (1981) conceptualization, Stets and Burke (2000) highlight three distinctions. First, social identity theorists (psychology) use salience to indicate actual activation of an identity (i.e. 0 or 1), while Stryker and colleagues (sociology) measure the probability of its activation (i.e. 0 to 1). Second, social identity theorists have paid scant attention to identities' role in creating or modifying situations (Stets and Burke 2000). In contrast, a key assumption of identity theorists (e.g. Burke and Reitzes 1991; McCall and Simmons 1978/1966; Stryker 1980) is that individuals "seek out opportunities to enact a highly salient identity" (p. 231)—i.e. people actively use identities to change situations. For example, first-year college students tend to decorate their rooms at college in a similar way to their rooms at home (Serpe and Stryker 1987).

Third, social identity theorists' view focuses on "characteristics of the situation in which the identity may be activated" (p. 231), while in Stryker's conceptualization, the salience of an identity is "trans-situational". To paraphrase Stryker and Serpe (1994, p. 18): situations may vary in the degree to which they are more open to one identity rather than another, "but situations themselves do not determine the identities invoked by them." In the sense, that identity salience rests on the number and strength of the ties that depend

upon an identity *across* situations; individual behavior is, at least in part, independent of situational factors. Thus, identity salience, as conceptualized by Stryker, is predictive of long-term behaviors rather than behavior in a specific situation.

Stryker's formulation of identity theory has found strong support in the literature. For example, in examining how religious identities predict participation in religious activities, Stryker and Serpe (1982) demonstrated that commitment to role relationships based on religion predicted the salience of individuals' religious identities, which in turn predicted the time people spent on religious activities. Callero (1985) found similar relationships between commitment to others in the blood donor community, salience of the blood donor identity, and frequency of blood donations. In another study, Nuttbrock and Freudiger (1991) found that the salience of the mother identity predicted first-time mothers' willingness to spend time with their child and to perform the parenting role without support from others. Figure 5 (below) maps Stryker's identity theory to Mead's original framework.



***McCall and Simmons' Role-Identity Theory:*** Similar to Stryker, McCall and Simmons' (1978/1966) role-identity theory sees multiple identities within the self as being organized hierarchically. A key difference is that these authors view identities as being arranged in a hierarchy of ***prominence*** (i.e. importance) that reflects a person's priorities (i.e. "an "ideal self"), while Stryker's notions of salience relates to the probability of an identity being enacted (Burke and Stets 2009). The relative prominence of an identity depends on the degree to which an individual associates its past enactment with (1) significant investment in the identity, (2) successful attempts at self verification, and (3) gaining extrinsic and intrinsic rewards. In that identity prominence transcends particular situations, McCall and Simmons' prominence hierarchy exerts a similar influence on behavior as Stryker's salience hierarchy.

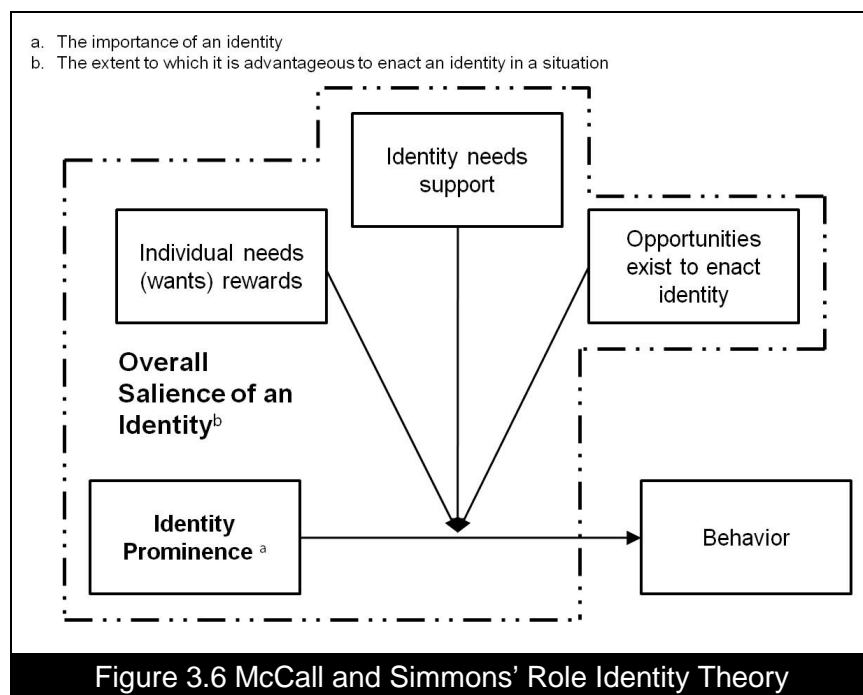
McCall and Simmons' role-identity theory differs from Stryker's identity theory in two key areas. First, McCall and Simmons view individuals as being aware of their important identities, while for Stryker, an identity's salience may only become apparent because a person regularly makes behavioral choices in accord with the identity. Thus, Stryker's salience takes into consideration that individuals may enact identities to which they ascribe little importance, or that they view negatively, so long as a large number of social ties (or a few very strong ties) are dependent on them (Granberg 2011). However, salience is entirely focused on identities tied to role relationships (Burke and Reitzes 1991). Prominence, in comparison, emphasizes what is desirable or preferable to a person from his or her point of view (Stryker and Serpe 1994, p. 19). As such prominence allows for the possibility that some identities (e.g. person identities) are enacted independent of interpersonal relationships.

Second, role-identity theory acknowledges that the importance of an identity (or for that matter, an individual's readiness to act) is not the only determinant of behavior: situations in which people act often involve others and, sometimes, individuals enact less prominent identities based on the extent to which they perceive that doing so will be advantageous in a given situation (Burke and Stets 2009). Thus, the extent to which acting out an identity is possible depends on social structures in the setting, such as how others respond to the person's attempts to enact a particular identity in a given situation. An important assumption of role-identity theory is that enacting an identity rests on negotiations with others, whose expectations may differ from the individual's own expectations (Stets and Burke 2005). When individuals cannot successfully negotiate behavior that matches an identity, their investment in the identity (and feelings of satisfaction) diminish. Support for this view is found in Riley and Burke's (1995) examination of leadership role performance in small groups. In this study, individuals who were unable to negotiate leadership performances that matched their leadership identities were less satisfied and less inclined to stay in the group than those who successfully negotiated their role performance.

To incorporate the negotiated aspect of enacting identities—which is absent in Stryker's identity theory—McCall and Simmons (1978/1966) also identify a salience hierarchy. The key difference being that in Stryker's conceptualization, salience is a structural factor, while McCall and Simmons' explicitly incorporate situational factors into their formulation. From McCall and Simmons' perspective, the probability that an individual will enact an identity is a function of the importance he/she ascribes to the focal identity vs. competing expectations in a situation. To capture this potential conflict



of interests, McCall and Simmons conceptualize the overall salience of an identity as the interaction between identity prominence and three situational factors: (1) the extent to which enacting the identity needs support; (2) the extent to which opportunities exist to enact the identity; and (3) the extent to which an individual needs, or wants, the intrinsic or extrinsic rewards that are usually gained from enacting the identity. This study's interpretation of McCall and Simmons' conceptualization is given in Figure 3.6.



### Linking Sociological Theories

Although the work of Stryker, McCall and Simmons, and Burke emphasize different aspects of how identities are activated, these theories are independent of each other rather than contradictory (Burke and Reitzes 1991). The view that hierarchical ordering of identities affects how people define situations, which in turn guides their behavior, has greater predictiveness when we understand that identity influences behavior only when the meanings of identity and behavior correspond (Stryker and Burke 2000).

For example, someone whose student identity contains meanings of being “social” and not of being “academic” would not be expected to strive to pass exams and finish courses even when that identity is highly important to them.

Notwithstanding the above point, integrating sociological perspectives on activation of identities raises an important issue relating to notions of commitment. In Stryker’s (1968; 1980) formulation, commitment is linked to social ties and refers to the perceived costs (in terms of giving up those ties) that would be incurred if an identity were not activated. For McCall and Simmons (1978/1966), commitment represents the level of prior investment one has made in an identity. Identity control theory asserts that commitment can be understood in terms of the identity process. From this perspective, rather than being defined as a social tie, commitment is “the sum of forces, pressures, or drives that influence people to maintain congruity between their *identity setting* and the input of reflected appraisals” (Burke and Reitzes 1991, p. 243). If, in the situation, these forces are weak, Burke and Reitzes argue that people will act in ways to restore congruity “1) only some of the time, 2) only if the incongruity is extreme, 3) only if little effort is required, 4) only to a limited degree, 5) only in some situations, and 6) only if the cost is not high.”

These different perspectives are consistent in that they view commitment to an identity as increasing the likelihood that an individual will act in accord with the identity. They vary in what commitment means and where the concept is located in relation to the identity-behavior link. For example, Stryker, and McCall and Simmons, conceptualize commitment’s influence on behavior as being mediated by identity salience (or prominence). Identity control theory proposes that commitment—operationalized as the

perceived rewards (e.g. satisfaction, praise, prestige) and support (e.g. number of interpersonal ties) in the identity setting—*moderates* the relationship between identity and behavior.

In linking sociological perspectives, this study adopts McCall and Simmons' (1978/1966) conceptualization of prominence and salience hierarchies (as outlined in Table 4), which assumes that the more positive a person's affective response to an identity, the greater its importance, and the more likely a person will act in accord with the identity when situational factors make it is advantageous to do so. Our rationale for choosing McCall and Simmons' conceptualization rather than Stryker's is twofold. First, because Stryker's salience hierarchy focuses exclusively on role relationships, it does not consider that people often interact with IT for purposes other than maintaining social relations (e.g. when downloading music). Second, because McCall and Simmons' salience hierarchy incorporates situational factors, it allows for specification of boundary conditions on IT identity's influence.

To avoid theoretical confusion, we refer to McCall and Simmons' conceptualization of commitment as *prior investment*. Consistent with McCall and Simmons, we posit that past levels of investment, self-verification outcomes, and extrinsic and intrinsic rewards associated with enacting an identity are determinants of its prominence. In that the likelihood of a person enacting an identity depends on the extent to which it is advantageous to do so in a situation, Burke and Reitzes' (1991) notions of commitment can be incorporated as one aspect influencing the overall salience of an identity. Following these authors, we propose Stryker's commitment (which is a determinant of salience) as moderating the relationship between identity and behavior.

Burke and Stets (2009) maintain that this does not negate the importance of social structures manifest in social ties—rather, it demonstrates how those ties, as well as other factors, such as rewards, impact the strength of the identity-behavior link in the identity setting. Incorporating social ties in this way, also makes it possible to take into consideration that individuals may use IT to which they ascribe relatively little importance, or view negatively, so long as in the context of use a large number of social ties (or a few very strong ties) are dependent upon use of these technologies.

The work of McCall and Simmons further adds to our understanding of boundary conditions by clarifying the moderating influence of perceived support (e.g. social ties) and rewards (e.g. pay, promotion, prestige, intrinsic satisfaction) on the identity-behavior link. From this perspective, the likelihood of someone acting in ways that are congruent with an important identity depends on factors such as whether (in a given situation) the identity needs support and whether the individual needs or wants rewards and support for enacting the identity. To reflect that individuals' drive to maintain congruity between a prominent identity and behavior depends on all of these factors, in this study, we refer to them collectively as *congruity forces*.

### **Person identity as a highly salient identity**

Although research on person identity has remained peripheral to both sociological and psychological perspectives, person identities are likely to be a highly salient (Burke 2004; Burke and Stets 2009). As Burke and Stets (2009, p. 125) explain, people “do not “put on” or “take off” their personal characteristics as they might “take on” and then “exit” particular roles or groups. The meanings [in a person identity] form an essential ingredient as to who they are.” For example, if a person views her- or him-self as

hardworking, s/he will tend to demonstrate this characteristic at work, at home, as well as in the social groups s/he joins. In this way, the meanings contained in the person identity provide individuals with a secure basis for interacting with the world around them across different roles, groups, and situations that they experience.

Because it is activated across a wider range of situations, some researchers consider that in a hierarchy of multiple identities, the person identity would be more important than role or social identities (Burke 2004; Burke and Stets 2009). What this The implication being that “meanings in the person identity would influence the meanings held in one’s role and social identities more so than the other way round” (Burke and Stets 2009, p. 126). All things being equal, this suggests that people will join social groups and undertake roles that are consistent with the personal characteristics, norms, and values they choose that define them as distinct entities (Burke 2004). Nevertheless, as both psychological and sociological perspectives demonstrate, the overall salience of an identity (group, role, or person), and therefore its influence, depends on situational factors (Hogg et al. 1995; McCall and Simmons 1978/1966; Turner et al. 1987). Thus, in circumstances when individuals’ free choice is constrained by factors such as a lack of rewards or support for acting in one’s own interests rather than as a group-member, or role-holder, person identities may be influenced by role and social identities (Burke and Stets 2009).

### **Takeaways from Theories of Social, Role, and Person Identities**

This section synthesized psychological and sociological theories on identity to identify relevant determinants of IT identity, as well as boundary conditions on its influence. Our review reveals three types of identity—social, role, and person—that have

been investigated in the literature. While these identities have different orientations, social motivations, behavioral focuses, and bases for self-evaluation, recent advances in identity research suggests that all identities operate in the same way (Burke and Stets 2009). From this perspective, an identity is a process—motivated by self-esteem and coherence—by which individuals constantly adjust their thinking and behaviors to keep their perceptions of how others view them in a situation—as well as how they view themselves—congruent with meanings they apply to themselves that define what it means to be who they are in that situation.

In addition to highlighting identity processes underlying individuals' thinking and behavior, linking the various social identity and identity theories revealed that because prominence reflects a person's priorities, the importance of an identity to the self is a key determinant of why individuals choose to behave in accord with one identity rather than another. In this regard, person identities, which are seen as reflecting the “innermost self”, are considered the most important type of identity, with greatest potential to influence behaviors across groups, roles, and situations. However, the likelihood of an important identity being enacted depends on the extent to which doing so is perceived as advantageous in a situation. This perception is informed by a set of congruity forces, including perceived support and rewards, which act as boundary conditions on individuals' drives to maintain congruity between their identity and behavior.

Our theoretical discussion provides five key takeaways about the nature of identities and their influence on thinking and behavior.

***Takeaway I:*** *Individuals develop multiple identities relating to the social groups they belong to, the roles they perform, and the personal characteristics they claim as their*

*own. These identities have different bases, focuses, motivations, frames of reference, and bases of self-evaluation.*

***Takeaway II:*** *Because person identities are enacted across a wider range of situations they are likely to (a) be more prominent than role or social identities; and (b) influence role and social identities in situations where individuals have free choice.*

***Takeaway III:*** *An identity gains prominence in a hierarchy of multiple identities based on the degree to which its past enactment is associated with (a) significant investment in the identity; (b) successful verification of the identity; and (c) extrinsic and intrinsic rewards gained.*

***Takeaway IV:*** *Individuals are motivated by coherence and self-esteem to behave in ways that are congruent with prominent identities.*

***Takeaway V:*** *The likelihood that an identity will become the focus of behavior depends on forces in the situation that drive a person to maintain congruity between the identity and behavior.*

In the following sections, we draw on these takeaways to conceptualize IT identity, its nomological network, and the interplay between IT identity and other identities in the work place. First, we present a rationale for developing the IT identity concept.

### **III. A RATIONALE FOR IT IDENTITY**

The takeaways derived from the identity literature provide the theoretical foundations for developing the IT identity construct. In this section, build on these foundations by situating IT identity in extant IS literature. Then, the following section develops a partial nomological network for the construct: first, the nature of IT identity is

defined, followed by its dimensions, its antecedents, its consequents, and boundary conditions on its influence. The paper concludes by examining the interplay between IT identity and other identities in the work place.

### **IT and Identity**

While the concept that nonhuman objects may come to be regarded as part of the individual self-concept is not new (Belk 1988), researchers often ignore their impact in defining identities (Clayton 2003). However, because identities are constructed as people interact with the world—and IT has become an essential component of this interaction—some question whether the concept can be defined without reference to the ITs that people regularly interact with (e.g. Cerulo 1997; Hillmer 2009; Lamb and Davidson 2005; Lamb and Kling 2003; Walsham 2001). Lamb and Kling (2003), for example, argue that IT is fundamental to how individuals see themselves, what they do, and how they do it: “The things we own, use, and display to others make statements about who we are. Our technological possessions and competencies are very much a part of identity, and so it is not surprising that social actors use ITs to construct identities and control perceptions” (p. 217). While this suggests a significant relationship between IT and identity construction, it is unclear what specific type of identities (i.e. social, role, or person) these authors are referring to. Since each suggests its own perspective, a literature review was conducted to uncover how issues related to IT and identities have been investigated by IS researchers to date. Appendix 1 presents a summary of this review.



## **Social Structures and IT Use**

The relationship between organizational social structures and IT use has received widespread attention from researchers. A number of studies have documented how new IT impacts institutional and relational structures through changes in work practices (e.g. Barley 1986; Orlikowski 1996; Schultze and Orlikowski 2004; Vaast and Walsham 2005), communication flows (Avgerou et al. 2004), and power relations (Markus 1983; Markus and Robey 1988). Structural and practice perspectives (e.g. DeSanctis and Poole 1994; Orlikowski 1992; Orlikowski 2000; Orlikowski and Robey 1991) in particular have informed our knowledge of the relationships between IT, behavior, and social structures. These perspectives elucidate how available resources, design standards, and normative expectations influence individuals/groups interactions with ITs. Individuals/groups' interactions with IT, in turn, have the potential to reinforce (or transform) institutional and relational structures as users conform to (or resist/adapt) structures designed and built into technologies.

The potential influence of IT use on changes in social structures within organizations is, thus, well acknowledged in the IS literature. However, as noted by Vaast and Walsham (2005), the related issue of how and why individuals come to use IT in the ways they do remains unresolved. These authors argue that relating what individuals do to how they see themselves in the social positions they occupy is important to developing understanding of how social structures change through IT use. Consequently, to evaluate the extent of current knowledge in this area within the IS literature, a review was conducted to uncover how the relationship between IT and identity has been investigated by information systems (IS) researchers to date

## **IT as a Tool or Resource**

Our literature review revealed that, while there is growing interest among IS researchers in exploring the links between information technologies and identities, limited research has explicitly examined the subject (Gal and Kjærgaard 2009; Nach and Lejeune 2009). When identity has been considered, researchers have generally taken one of three perspectives. First, IT has been viewed as a tool, or resource, that people use to support social interactions and to project their role and social identities (Burke and Stets 2009). For example, Lamb and Kling's (2003) conceptualization of the technology user as a social actor draws on Goffman's (1959; 1963; 1974) labeling theory—which views identities as the statuses, categories, or groups that individuals are socially recognized (i.e. labeled) as belonging (Owens 2003)—to conceptualize technology as a resource that people use to present who they are (as role-holders and members of organizations) to others. Similarly, Lamb and Davidson (2005) explore how research scientists use ITs as a tool for effective collaboration and to present a professional scientist identity.

In the Internet context, studies have shown that presentation of person identities (i.e. who one is), mediated by IT artifacts, influences knowledge sharing and participation in online forums (Ma and Agarwal 2007; Vaast 2007). In addition, Forman et al. (2008) found that provision of identity-descriptive information by reviewers in electronic markets shapes community members' perceptions of products and reviews. IT may also be used as a tool to protect valued identities. Da Cunha and Orlikowski's (2008) examination of how employees used an online forum to help them deal with perceived threats to their identities, illustrates this role.

## **The Impact of IT on Existing Social and Role Identities**

Some researchers have explored the impact of IT on existing social and role identities (e.g. Alvarez 2008; Barrett and Walsham 1999; Kilduff et al. 1997; Moon et al. 2006; Van Akkeren and Rowlands 2007). With respect to social identities, Moon et al. (2006) explored the link between individuals' use of blogs and virtual social identities. In a survey of 173 students, these authors found that levels of perceived enjoyment, as well as social interactions through the blog, increased individuals' feelings of belonging, identification, and self-worth as members of a virtual social group.

In the work place, IT's role in maintaining role identities has also been investigated. For instance, Kilduff's (1997) ethnographic study of a Japanese high-tech company outlines how engineers maintained their role identities through the technologies they created. However, other research emphasizes how introducing new IT into organizations can negatively impact employees' attempts to verify social and role identities through challenging their feelings of competency and relatedness to the employing organization. Van Akkeren and Rowlands' (2007) investigation of a health information system implementation in an Australian radiology practice described how radiologists were unable to verify their social and role identities when the new system created difficulties in performing their work. Because role identities contain expectations about what it means to be competent in a role (Burke and Stets 2009), radiologists' ensuing feelings of inadequacy directly challenged their self-efficacy in performing their roles and, ultimately, their sense of belonging as members of the organization.

Another way in which new IT impacts people's identities is by changing the nature of the roles they perform. These changes may take the form of increased mobility

(D'Mello and Sahay 2007), transitioning to home-based work (Avery and Baker 2002; Brocklehurst 2001), or changes in work place based practices (Alvarez 2008; Barrett et al. 2001; Barrett and Scott 2004; Barrett and Walsham 1999; Schultze and Boland 2000; Walsham 1998) . Prior IS literature mostly focuses on the negative impact of these shifts—for instance, Alvarez (2008) described how ‘best practices’ embedded in a new enterprise system directly challenged employees’ role identities by impinging on their autonomy in performing work tasks. Alvarez’ description of employees’ resistance to these changes provides evidence that individuals’ need for stability is such that when an important identity is challenged, they will (at least initially) intensify their efforts to maintain that identity. At the same time, the potential for new IT to positively change work place identities has also been recognized. For example, Barrett and colleagues (Barrett et al. 2001; Barrett and Walsham 1999) utilized Giddens’ work on social transformation to examine how introducing an electronic trading system provided opportunities for reskilling and changing existing work conditions in addition to raising concerns over deskilling.

As suggested by McCall and Simmons (1978/1966), successful enactment of role identities occurs in negotiation with others. Dickey et al.’s (2007) examination of online chat communications highlights this aspect of the identity process. This study illustrates how a shared frame of reference between online customers and customer service representatives enables a better customer service experience. Dickey et al.’s study focuses on the complementary nature of role identities. In contrast, Alvarez’ (2002) examination of the IS requirements gathering process raises issues of power and conflict in role identity negotiation. Alvarez uses critical discourse analysis to show how analysts

may use their role identities as technologists to frame the requirements gathering process, as well as to challenge and undermine clients' identities.

### **Social and Role Identities' Influences on IT Acceptance and Use**

Finally, some IS research has investigated social and role identities' influences on IT acceptance and use. For example, in the work place, Hillmer (2009) and Lee et al. (2006) examined the influence of individuals' social and role identities on their technology acceptance behaviors. In a grounded theory study, Hillmer found that information technologies were accepted more easily when these did not conflict with what individuals already believed and felt about themselves in the work place. Lee et al. incorporated individuals' role identities as faculty members into a TAM-based model of IT use to show that role identity has significant direct and indirect effects on technology acceptance.

Social (e.g. ethnicity (Kim et al. 2007b)) and role (e.g. gender (Thompson 2002; Trauth 2002)) identities have also been shown to exert an influence on IT use. In the context of networked technologies, developing a collective social identity among group members positively influences virtual collaboration (e.g. Hinds and Mortensen 2005; Sarker and Sahay 2000) and individuals' feelings of connectedness to the Internet (Kim et al. 2007b). Finally, Liu and Chan (2010) examined how individuals' use of virtual healthcare community resources is influenced by group membership. These authors proposed that social identity influences individuals' perceptions of benefits and barriers to seeking social support from the community.

Related to this literature stream, Walsh and coauthors (e.g. Walsh 2010; Walsh and Hajer 2008; Walsh et al. 2010a) take a psychological social identity approach to

investigate the relationship between IT usage and culture. These authors propose individual IT-culture as “an individual’s assumptions, beliefs, values and behaviors linked to IT that result from a person’s membership in a group (or groups) of IT users” (Walsh 2010, p. 4). In common with other social identities, a person’s IT culture serves culture’s purpose by helping to develop/maintain the IT user group(s) in which people are embedded.

### **IT as a Source of Person Identity**

Our literature review highlights a growing interest among IS researchers in exploring the links between IT and people’s social and role identities. Taken together, the studies outlined (and summarized in Table 5) show that what people do (and who they are) is, to an increasing extent, becoming intertwined with what they do with ITs.

Our review also reveals that scant IS research has leveraged the cumulative insights provided by sociological identity theories that *explicitly* set out to explain how individuals’ social positions influence their views of themselves and, subsequently, their role-related behaviors. For the most part, when IS researchers have drawn on sociological perspectives, they have invoked Giddens’ (1984) structuration theory as a theoretical lens. One explanation for this focus is that structurational perspectives (DeSanctis and Poole 1994; Orlikowski 1992; Orlikowski and Robey 1991) have been influential in advancing understanding of IT’s potential to reinforce or transform social structures within organizations. However, while this approach describes how changes in work practices influence social structures and vice versa, it does not explicitly address how this change occurs through individuals’ reflexive cognitive processes (Vaast and Walsham 2005).

Where cognitive processes have been addressed, researchers have focused on how the meanings attributed to the self result from group affiliation and give rise to behavior that is similar to other group members—e.g., Walsh and Hajer’s conceptualization of IT culture as a social identity (Walsh and Hajer 2008; Walsh et al. 2010a). To date, only a very few researchers have suggested that individuals may experience IT as an important part of the self, independent of group membership and roles (Jones and Karsten 2008; Schwarz and Chin 2007; Turkle 2005; Turkle 2011; Walsh et al. 2010b). Walsh et al. (2010b) found that the level of young people’s involvement with their mobile phones was related to their individual self-concepts. Additionally, research suggests that as networked technologies and interactive media become increasingly embedded in everyday life, it is creating a shift in individuals’ cognitive styles from deep attention (i.e. concentrating on a single object for long periods, high tolerance for long focus times, and a preference for single information streams) to hyper attention (i.e. rapidly shifting focus, low tolerance for boredom, and a preference for multiple information streams) (Hayles 2007). However, the role of IT as a source of person identity has yet to be formally theorized.

Conceptualizing IT’s role in defining person identities is important because who someone is, independent of others, can be thought of as a more general view of the self, with the potential to influence that person’s attitudes and behaviors in relation to others (Burke and Stets 2009; Deaux 1992). Since many information technologies can be used across a variety of situations, we propose that these devices have the potential to become integral to how a person thinks and behaves across groups, roles, and time. For example, personal communication devices such as cell phones are not only tools that ensure people are always available and accessible. Nor are patterns of interactions with cell phones

across individuals simply changing culturally shared expectations about what it means to be available and accessible. Individuals perceive and control these meanings with regard to their own behavior, based on their personal histories of interacting with the devices. Thus, based on the nature of these interactions, a person may claim certain levels of availability and accessibility as important personal characteristics. Depending on how much these personal characteristics reflect how a person likes to view him- or her- self, they can, in turn, help determine the meanings that he/she attaches to various social and role identities (e.g., the levels of availability/accessibility he/she is prepared to maintain as a member of an organization (Masmanian et al. 2006), or in performing a parental role (Palen et al. 2000)).

The consumerization of IT supports this view (Bernoff and Schadler 2010). To an increasing extent, individuals who have invested in and become familiar with ITs in their personal lives (e.g. Smartphones, iPad®, personal productivity tools, and social media) are demanding access to these technologies in the work place. Bernoff and Schadler suggest that these demands are motivated by feelings of personal empowerment that individuals derive from their relationships with these technologies.

Given the potential for a specific IT (e.g. a mobile phone) or class of ITs (e.g. the Internet or computers in general) to become so embedded in individuals' lives that they become entangled with being who one is across groups, roles, and situations, it appears reasonable to assume that people will claim personal characteristics as their own that arise from their interactions with these technologies. Thus, we propose that individuals' interactions with IT can be appropriately considered a source person identity. On this basis, the following sections draw on the key takeaways from theories on identities as a



frame for developing IT identity as a distinct form of person identity. First, using *Takeaway I* to guide our analysis, we specify the domain of IT identity, including how the concept is distinguished from other types of identity in its basis, motivation, frame of reference, and bases of self-evaluation.

#### IV. THE DOMAIN OF IT IDENTITY

##### **The Nature of IT identity**

Because IT has become an essential component of the social interactions in which identities are constructed, we assume that a person's history of interactions and perceived relationships with specific ITs will give rise to the question, "Who am I, through my use of this technology?" On this basis, we conceptualize IT identity *as the set of meanings an individual attaches to the self in relation to IT* that attempt to answer this question.

In general, identity theorists accept the logic that asking, "Who am I?" in relation to social objects or categories also involves consideration of "Who am I not?" McCall (2003) labels these twin processes the "Me" and "Not-Me" poles of identity, where the "Me" pole of identity reflects self-identification (i.e. the social object or category is descriptive of the self) and the "Not-Me" pole refers to dis-identification (i.e. the social object or category is *not* descriptive of the self<sup>6</sup>). In keeping with this view, we propose that IT identity exists on a continuum ranging from strong IT identity ("Me")—"my interactions with an IT (or class of ITs) are integral to my sense of who I am"—to weak IT identity ("Not-Me")—"my interactions with an IT (or class of ITs) are completely unrelated to my sense of who I am." Further, consistent with McCall and Simmons'

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<sup>6</sup> In that it is not-descriptive, rather than negative, the "Not-Me" pole of identity is not the same as identifying negatively with a social object, which involves a different set of meanings (i.e. "the social object is in opposition to who I am") (Kreiner and Ashworth 2004).

(1978/1966) notions that identity prominence reflects a person’s “ideal self”, we propose that the stronger IT identity is in relation to a particular IT, the more IT identity will weigh prominently in a person’s hierarchy of identities, and the greater its potential to influence thinking and behavior, particularly with respect to interacting with IT.

### Properties of IT identity

Takeaway I states that the many identities people form have different bases, focuses, motivations, frames of reference, and bases of self-evaluation. Thus, as a first step in defining the IT identity, this section describes the properties of the concept. Table 3.6 provides examples of social, role, and person identities to illustrate where IT identity converges or diverges from prior conceptualizations of identity.

Table 3.5: Distinguishing IT Identity from Other Identities						
<i>Example Identity</i>	<i>Basis of Identity</i>	<i>Identity Orientation</i>	<i>Basic Social Motivation</i>	<i>Focus of Behavior</i>	<i>Frame of Reference</i>	<i>Basis of self-evaluation</i>
<b>Prior Conceptualizations of Person, Role, and Social Identities</b>						
Moral	Person	Person	Self-interest	Me, independent of others	Interpersonal comparison	Self-authenticity
Parent	Role	Relational	Mutual interests of role and counter-role(s)	Me, complementary to others	Role-appropriate behavior	Competency in performing a role
Organization	Social	Group	Collective welfare	We	Intergroup comparison	Group prototype
<b>New Conceptualization of IT identity</b>						
<b>IT</b>	<b>Person</b>	<b>Para-relational</b>	<b>Self-interest</b>	<b>Me, independent of others, in relation to an IT (or class of ITs)</b>	<b>Inter-personal comparison Nature of interactions with IT</b>	<b>Self-authenticity and enactive mastery</b>

IT identity is an individual level construct, capturing the extent to which an individual’s interactions with an IT or class of ITs are integral to his/her sense of self. IT identity is distinct from the related concept of IT culture, as formulated by Walsh and coauthors (Walsh 2010; Walsh and Hajer 2008; Walsh et al. 2010a). As a form of social

identity, the focus of IT culture is on *shared* assumptions, values, and behaviors about IT that are expressed by individuals and that identify them as members of particular IT user groups—e.g., “dangerous users”, “interested users”, “passive users”, etc. IT identity, in contrast, focuses on the self-meanings that individuals attach to their interactions with IT, *independent of others*. As a social identity, IT culture can provide a context (i.e. institutional and relational structures) for the self-meanings a person attaches to their interactions with IT that help to define them as a unique individual. Thus, a strong IT identity may be constituted and help to constitute IT culture within the context of a particular IT users group. However, because IT identity has the potential to transcend specific groups, roles, or situations it is appropriately conceptualized as a *person identity* (Burke and Stets 2009).

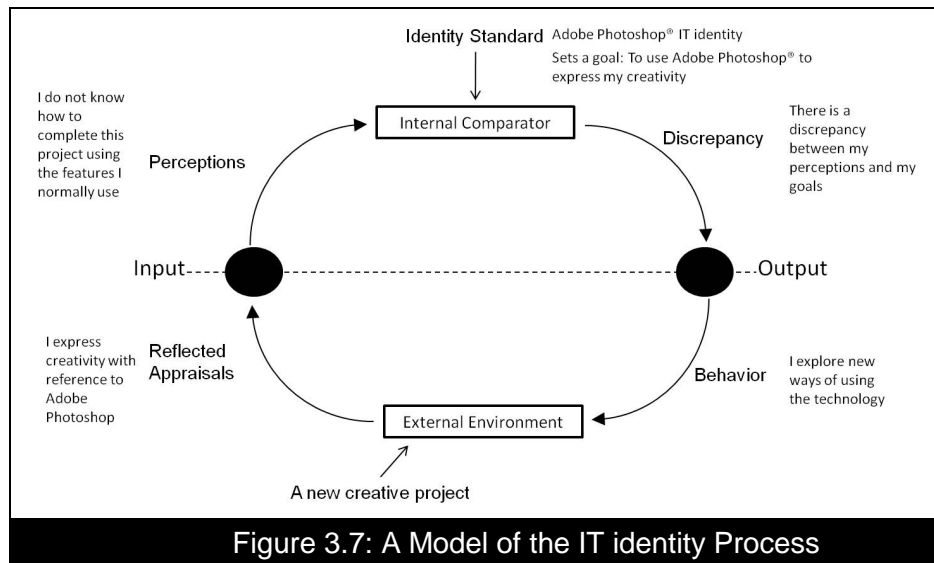
When an IT identity becomes the focus of behavior, its enactment is motivated by personal merit or *self-interest*—for example, an individual with an IT identity tied to Adobe Photoshop® may think to express his/her personal creativity with reference to the technology. This contrasts with social and role identities that, when enacted, serve the collective welfare of a group (e.g. contributing to knowledge in an online support community (Ma and Agarwal 2007) or the mutual interests of a role and counter-role (e.g. to show expertise as a radiologist in treating a patient (Van Akkeren and Rowlands 2007). At the same time, because IT identity is enacted through a person’s interactions with an IT, it has a relational component—i.e. the focus of behavior is “*Me, independent of other people, in relation to an IT.*” Due to this, an underpinning assumption of IT identity is that individuals define themselves in relation to the information technologies they interact with over time.

The assumption that individuals define themselves in relation to IT is based on research that suggests that people have a tendency to treat ITs as social actors (Al-Natour and Benbasat 2009; Nass and Moon 2000; Shank 2010). For example, in a review of experimental studies examining individuals' social responses to computers, Nass and Moon (2000) found that people consistently apply social categories such as gender stereotypes and ethnicity—along with associated assumptions and expectations—to computers. Further, trust research also finds that people respond to information technologies as social actors, treating web sites (Corritore et al. 2003; Vance et al. 2008), online recommendation agents (Komiak and Benbasat 2006; Wang and Benbasat 2005; 2008), and automated systems (Lee and See 2004) as trusted agents. On this basis, some suggest that relationships with ITs are interpersonal in nature. Al-Natour and Benbasat (2009), for example, posit that people's tendency to treat ITs as social actors leads them to perceive and process interactions with IT in the same way as interpersonal interactions—with the result that, over time, individuals form interpersonal relationships with the technologies they interact with on a regular basis.

Consistent with prior IS research, this study proposes that individuals form beliefs about their relationships with information technologies based on a history of interactions. However, in contrast to Al-Natour and Benbasat (2009), we suggest that these relationships are more accurately described as a *pararelational* than interpersonal in nature. Unlike interpersonal relationships involving human actors, each with their own goals and interests (Brewer and Gardner 1996; Burke and Stets 2009; Sluss and Ashforth 2007), relationships between individuals and ITs involve (minimally) a self-interested human actor and an IT that lacks volition and motives. Therefore, while individuals may

perceive themselves as being in a relationship with an IT, such relationships are inherently one-sided. As a consequence, this study suggests that IT identity, in part, reflects an individual's perceptions of his/her *dependence* on an IT rather than interdependency, which is characteristic of identities based on interpersonal relationships (Sluss and Ashforth 2007).

Due to its pararelational orientation, IT identity can be largely understood in terms of what a particular IT comes to mean to an individual through his/her interactions with the technology, independent of others. However, our literature review indicates, the ensuing relationship is never completely free of the social structures in which people exist. In common with all identities, the set of meanings linked to IT use are “understood, communicated, and shared with others” in the culture in which someone exists (Burke 2004, p. 9). Consequently, *interpersonal comparison*, in terms of comparing and contrasting the *nature of one's own interactions with an IT* relative to others, is an important frame of reference for developing and maintaining IT identity. At the same time, to achieve verification, the outcomes of those interactions must match the personal goals of the individual. Consequently, the bases for self-evaluation are *enactive mastery* and *self-authenticity*. Thus, for example, a person who expresses creativity with reference to Adobe Photoshop® verifies his/her Adobe Photoshop® IT identity by comparing his/her mastery of the technology and personal creativity (in terms of the images he/she creates) with others. Figure 3.7 (adapted from identity control theory) illustrates the relationships between IT identity, individuals' interactions with ITs, and identity verification.



In the example given, a person’s claim to being “creative” is (a) entangled with his/her relationship with Adobe Photoshop® and (b) sets a goal (termed identity standard (Burke and Stets 2009)) for the nature of his/her interactions with the software—i.e. to use the software to express creativity. However, a new creative project creates a discrepancy when the person does not know how to complete the project using the features he/she normally interacts with. This prevents the identity from being successfully verified because these perceptions do not match the identity standard. Since the identity standard controls the meanings a person attributes to his/her interactions with the technology, the two sets of meanings cannot be in conflict—how the that individual uses Adobe Photoshop® must serve the goal of expressing creativity (Burke and Stets 2009). Thus, the person modifies his/her behavior by exploring new Photoshop® features to achieve congruity between the images he/she creates and the identity standard.

It is worth noting that use of Adobe Photoshop® does not, in itself, signal that a person has an IT identity. As illustrated in prior research, often the motive for using an IT is that it can act as a tool or resource for verifying important social, role, or person

identities (e.g. da Cunha and Orlikowski 2008; Lamb and Davidson 2005; Lamb and Kling 2003). The difference between IT as a resource for identity verification vs. IT as identity verification is that, as a person identity, the latter (IT identity) influences how individuals tend to approach life's situations. Those with IT identities would think to use IT to solve all kinds of problems; gaining verification of other identities in the process. Further, for IT identity holders, it is likely that the more they associate use of a technology with verification of other valued identities, the stronger and more prominent their IT identity in relation to the technology becomes. This implies that an IT can be either a resource for identity verification or a means of identity verification—or that both can be true at the same time. With this in mind, next, we consider what motivates IT identity formation in the first place.

### **The Motive for IT Identity**

IT identity is motivated by individuals' need to enhance their individual self-concepts through self-expansion—i.e. expanding the sets of meanings one attributes to the self that are not shared with other people. The motivational model of self-expansion suggests that individuals are motivated to expand the self “in the sense that they seek to enhance their potential efficacy by increasing physical and social resources, perspectives, and identities that facilitate achievement of any [personal] goal that might arise” (Aron et al. 2003, p. 478). This study takes the view that as information technologies and social structures become ever more interwoven, the personal goals that might arise are increasingly likely to be linked to use of IT<sup>7</sup>.

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<sup>7</sup> ITs often act as an important source of self-expansion through expanding what economists term “bounded rationality” – neurophysiologic limits on storage, processing, and communication of information.

One way people expand the self is by including important relationships in their individual self-concepts. While this is often taken to mean interpersonal relationships, consumer research suggests that people may also include resources and characteristics of nonhuman objects to which they have become emotionally attached (Belk 1988). Our literature review reveals that how people come to know themselves and act is, to an increasing extent, entangled with what they do with IT. On this basis, it is likely individuals' histories of interacting with IT, which may give rise to perceptions of being in relationships with those technologies (Al-Natour and Benbasat 2009), represent an important source of self-expansion.

Interpersonal comparison is likely to be an important trigger for self-expansion. Self-expansion implies that people are motivated to include important relationships with IT in their individual self-concepts for the purpose of increasing their own physical, social, and personal resources, relative to those resources they perceive as being held by others. Belk (1988) asserts that, lacking important resources, or viewing oneself as having fewer resources in comparison to other people, is a powerful motivator for developing relationships with nonhuman objects.

Studies on self-expansion suggest that an individual's willingness to develop a relationship with an IT is motivated by the extent to which the individual believes that: (a) the relationship will expand the self; (b) it is possible to develop a relationship with an IT (necessary for self-expansion); and (c) the relationship presents an opportunity to experience the process of self-expansion (i.e. one can experience a rapid increase in one's sense of efficacy) (Aron et al. 2003). This implies that even when a person is cognizant that an IT presents an opportunity to expand the self, his/her willingness (or ability) to

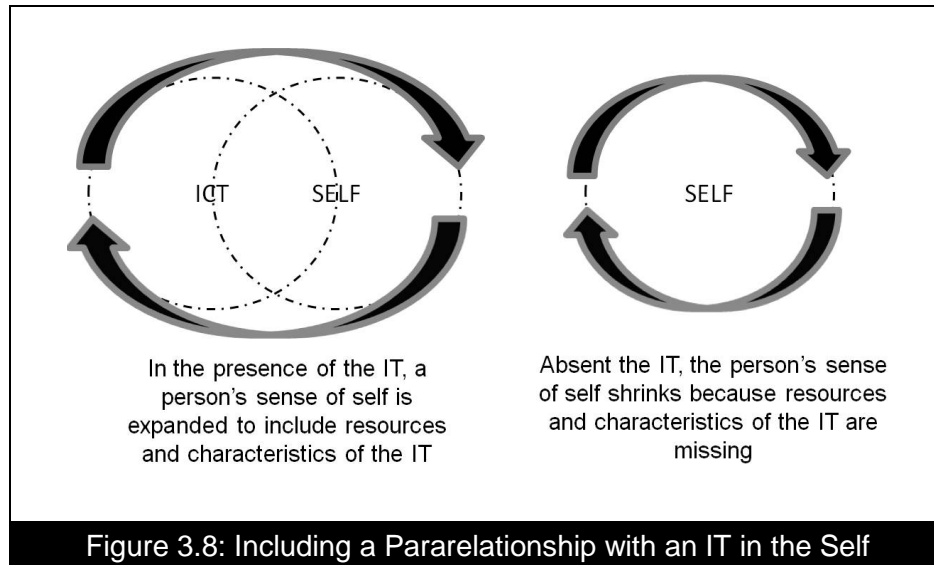


redirect significant attention and resources (e.g. by exploring the many features and situations in which an IT can be used) to pursuing this goal is an important determinant of IT identity formation.

Self-expansion differs from the process of *depersonalization*, which occurs in social or collective identities. An individual does not attempt to become like, or actually be, the IT he/she is using. Thus, there is no “we” in IT identity. Rather, as an important aspect of IT identity, self-expansion suggests that as IT identity becomes increasingly important, individuals experience an increasing overlapping of boundaries between notions of the self and an IT—i.e. a sense of connectedness—with the technology as a source of self-esteem and coherence (Aron et al. 1992; Belk 1988). The overlapping of boundaries between a person and an IT effectively extends the boundary of a person’s self-concept to include resources and characteristics of the technology.

To illustrate, a recent inductive study exploring young people’s relationships with their mobile phones (Working paper, Dept. of Management, Clemson University) found that as mobile phones permeated more aspects of their everyday lives, participants’ feelings of autonomy, empowerment, and of being themselves were inextricably linked to their relationships with these devices. As an example, the authors report, “...the mobile phone was integral to [participants] getting around by themselves, to fighting off fears such as walking alone in the dark or having an accident while driving, and to feeling in control” (p. 18). Moreover, when an IT becomes so embedded in individuals’ self-concepts, a person may not have a readily accessible store of cognitions for thinking and communicating without it (Collins 1990; Vincent 2006). This was evidenced in that, without their phones, several study participants had difficulty thinking of alternative ways

to communicate with people—or how to spend their time alone. These findings suggest that when the boundary of a person’s self-concept is expanded to include resources and characteristics of an IT, its absence (manifest as a loss of resources) is experienced as shrinkage of the self (see Figure 3.8).



### Technology Characteristics that Foster IT Identity Formation

The extent to which an individual believes that self-expansion is both possible and desirable, may rest on the extent to which an IT or class of ITs can be applied across a wide variety of situations and/or social positions. Because individuals derive pleasure from experiencing self-expansion, when they are able to engage in a period of intense interactions with an IT across multiple situations, they are likely to feel energized by the experiences (Aron et al. 2003), and consequently develop a rapid emotional attachment and regard for the IT (Collins 1990; Kemper and Collins 1990). In contrast, when it is not possible to redirect sufficient resources to pursuing self-expansion or “when expansion is slow or nonexistent, [a person may experience] little emotion, or perhaps boredom”

(Aron et al. 2003, p. 482). Consequently, ITs that provide a person with more resources across situations and allow them to experience the intrinsic pleasure of rapid self-expansion are more likely to foster new IT identities than those that appear to gain a person little or nothing.

At a time when social relations between people and institutions are increasingly maintained via computer-mediated social networks (Hillmer 2009), two technology characteristics that are instrumental in disembedding social relations from local contexts of interaction (Jones and Karsten 2008), may be particularly influential in informing this potential. These characteristics are **synchronicity**, defined here as the IT's ability to support synchronous exchange and shared patterns of coordinated behavior (Dennis et al. 2008), and **mobility**, which refers to the IT's ability to provide connectivity, accessibility, reachability, and portability (Basole 2004). While other characteristics serve expansive needs through increasing a person's ability to efficiently process or store information, or have a large range of features that can be applied in some situation that is highly significant to the person, synchronicity and mobility provide portals to other people and places, thus reinforcing individuals' ties to the social structures that guide and shape their behaviors. As such, synchronicity and mobility are likely to be salient predictors of individuals' willingness to develop a relationship with an IT. The significance being that ITs that are high in synchronicity and/or mobility (e.g. Internet-enabled mobile devices, collaborative tools, and social media) have greater potential to foster IT identity than others (e.g. a standalone application). Thus, we propose:

***P 1:** ITs that are perceived as high in synchronicity and mobility are most likely to foster IT identity. However, the extent to which IT identity formation is possible depends on*

*individuals' ability to direct resources and attention in pursuit of the goal of self-expansion.*

Further, an IT's potential to expand the individual self-concept across many situations and social positions has implications for IT identity's potential to influence a person's role and social identities. *Takeaway II*, derived from our theoretical foundations, posits that when an identity is activated across a wide range of situations, it assumes a prominent position in a person's hierarchy of multiple identities (Burke 2004; Burke and Stets 2009). With reference to different classes of technologies, this implies that IT identities tied to information technologies that are high in synchronicity and mobility have greatest potential to influence the meanings held in a person's role and social identities (Burke and Stets 2009, p. 126). Thus, we propose:

***P 2:** IT identities connected to high synchronicity-high mobility ITs will be enacted across a wide range of groups, roles, and situations. All things being equal, these identities are more likely to influence role and social identities (in situations where individuals have free choice) than IT identities connected to low synchronicity-low mobility ITs.*

## **V. THE DIMENSIONS OF IT IDENTITY**

In the preceding discussion, we posited that IT identity formation is motivated by individuals' need to enhance their self-concepts by expanding the sets of meanings they attribute to the self, independent of others. In this section, we build on our formulation to identify three distinct but interrelated dimensions of IT identity, reflecting the extent to which an individual's interactions with an IT are integral to his/her sense of self.

To identify relevant dimensions of IT identity, we invoke two aspects of our theoretical foundations in particular: (1) self-expansion (Aron et al. 2003; Aron et al. 1992), and (2) the universal dimensions of affective meaning (Osgood et al. 1975; Osgood et al. 1957). An underlying assumption of self-expansion is that as a person experiences an increasing sense of *connectedness* with another party in a relationship, that person will express positive emotions and *energy* in relation to the other party, as well as *reliance* upon the relationship to maintain/enhance self-esteem (Aron et al. 2003; Aron et al. 1992). Consistent with this view, the three universal dimensions of affective meaning identified by Osgood and colleagues (Osgood et al. 1975; Osgood et al. 1957) have been applied in identity studies focusing on relationships between individuals (e.g. gender (Burke and Cast 1997), student (Burke and Reitzes 1981), spouse (Burke and Stets 1999) and on individuals' relationships with the natural environment (Stets and Biga 2003)). These dimensions are, *evaluation* (e.g. does thinking about the self in relation to a social object evoke positive feelings?); *activity* (e.g. is the self in relation to a social object seen as energetic?), and *potency* (e.g. is the self in relation to a social object seen as dependent?). In the context of interactions between two parties, Kemper and Collins (1990) equate potency to power, whereby A has power over B that is an outcome of B's dependence on A.

Based on the above, we propose three interrelated dimensions of IT identity that represent an individual's response to her- or him-self in relation to a particular IT (e.g. a mobile phone) or class of ITs (e.g. mobile device technologies). The first dimension, *relatedness*, refers to a blurring of boundaries between notions of the self and an IT experienced as feelings of connectedness with an IT or class of ITs. Relatedness maps to

Aron et al.'s (2003; 1992) connectedness in that as individuals incorporate resources and characteristics of an IT within their individual self-concepts, this manifests as feelings of connectedness with the IT. The remaining dimensions, emotional energy and dependence, map to the three universal dimensions of affective meaning identified by Osgood and colleagues (Osgood et al. 1975; Osgood et al. 1957).

***Emotional energy***, refers to an individual's enduring feelings of emotional attachment and enthusiasm in relation to an IT or class of ITs. Emotional energy maps to evaluation in the sense that individuals attribute positive emotions to themselves in relation to an IT. Emotional energy also maps to activity in that it incorporates individuals' feeling energy and enthusiasm for interacting with an IT. The final dimension, ***dependence***, refers the degree of reliance a person feels on a particular IT or class of ITs as a source of personal well being. Dependence maps to potency when individuals associate their personal well being with the relationship. Implicit in this is an IT's potential to exert power over a person as an outcome of that individual's dependence upon interacting with it (Kemper and Collins 1990). Relatedness, emotional energy, and dependence vary among individuals based on the strength of a person's IT identity. Moreover, once formed, IT identity will influence a person's attitudes toward interacting with an IT, which will, in turn affect his/her subsequent IT use. This study's conceptualization of IT identity and its dimensions is given in Table 3.7. Each dimension is discussed in more detail next.

Table 3.6: Conceptual and Operational Definitions of IT identity and its Dimensions				
Construct	Conceptual Definition	Operational Definition	Maps to...	Similar concepts from other domains
<i>IT identity</i>	The set of meanings an individual attaches to the self in relation to IT. IT identity exists on a continuum ranging from strong IT identity ("Me")—"my interactions with an IT (or class of ITs) are integral to my sense of who I am"—to weak IT identity ("Not-Me")—"my interactions with an IT (or class of ITs) are completely unrelated to my sense of who I am."	Reflected in three interrelated dimensions of affective meaning: emotional energy, relatedness, and dependence.	N/A	<b>Environmental identity</b> (Clayton, 2003): "a belief that the environment is important to us and an important part of who we are" (p. 46).
<i>Relatedness</i>	A blurring of boundaries between notions of the self and an IT experienced as feelings of connectedness with an IT or class of ITs.	The extent to which an individual expresses feelings of connectedness when thinking about her- or him-self in relation an IT or class of ITs.	<b>Connectedness</b> (Aron et al. 1992; 2003)—how close a person feels to the other party in a relationship.	The extent to which respondents saw themselves as <b>connected</b> with the environment (Stets and Biga, 2003).  The extent to which people feel <b>related</b> to the environment as part of a functioning ecosystem (Clayton, 2003).
<i>Emotional Energy</i>	An individual's enduring feelings of emotional attachment and enthusiasm in relation to an IT or class of ITs	The extent to which an individual expresses feelings of confidence, enthusiasm, and energy when thinking about her- or him-self in relation an IT or class of ITs.	<b>Evaluation</b> (Osgood et al. 1957) — does a stimulus evoke positive feelings?  <b>Activity</b> (Osgood et al. 1957)—is the stimulus lively?	<b>Positive emotions</b> associated with the natural world (Clayton, 2003).  <b>Emotional response</b> to thinking about the environment—e.g. passionate, enthusiastic, an advocate (Stets and Biga, 2003).
<i>Dependence</i>	An individual's reliance on an IT as a source of personal well being.	The extent to which an individual expresses feelings of reliance when thinking about her- or him-self in relation an IT or class of ITs.	<b>Potency</b> (Osgood et al. 1957)—is the stimulus strong?	<b>Power:</b> (Kemper and Collins, 1990)- where A has power over B that is an outcome of B's dependence on A.

### IT Identity as Relatedness

Relatedness reflects the overlapping of boundaries between notions of the self and the IT that extends a person's self-concept such that an IT is experienced as part of the self—i.e. resources and characteristics of an IT are incorporated into the self as resources

and characteristics of the individual. There is evidence to suggest that individuals do develop feelings of relatedness with the information technologies they interact with (e.g. Lamb and Davidson 2005; Turkle 2011; Vincent 2006). In societies where IT has assumed a central place in everyday life, the positions people occupy, as well as the cultural and normative expectations that define them, are becoming inseparable from individuals' interactions with these technologies (Hillmer 2009; Orlikowski 2010).

Recent studies indicate that, for many, being connected depends more on the availability of IT than on their physical distance from other people (Hillmer 2009; Turkle 2011). As an example, mobile devices such as Smartphones, free people from time and place constraints by affording individuals the ability to refine schedules up to the last minute (referred to as "microcoordination" (Ling and Yttri 2002)). Microcoordination extends the self by increasing temporal accessibility and decreasing the level of specificity with which schedules need to be negotiated ahead of time (Palen et al. 2000). As noted by Palen et al., absent these devices, individuals become limited in their access to other people, which in turn increases the specificity and time response required to manage their social relations. The diminished ability to maintain social relations resulting from reduced levels of accessibility (as a resource) can be experienced as a contraction of the self. In the works of Turkle (2011) and Vincent (2006), individuals expressed feelings of relatedness to mobile devices in a variety of ways ranging from being "tuned in" to a technology's culture to anxiety at being separated from the IT.

Research in the work place also points to individuals' relatedness with IT. For example, Lamb and Davidson's (2005) examination of the impact of IT on scientists' professional identities highlights that because it is difficult to interact effectively in the



work place without use of IT, over time these technologies become extensions of the people who use them. These authors found that what scientists do is increasingly influenced by advances in information technologies—to the extent that, for many, “the ‘who I am’ of professional identity is interwoven with ‘what I do’ with IT (p. 10).

This study proposes that the degree of relatedness individuals feel reflects the meanings attached to the self in relation to an IT. Those whose meanings exist at the “Me” pole of IT identity are likely to express a much stronger sense of connection with an IT than those whose meanings exist at the “Not-Me” pole. Further, those who feel a strong sense of connection with an IT are likely to habitually enact their IT identity across a variety of situations. For example, a person who views interacting with a Blackberry® device as an integral to their sense of who they are may carry it with them at all times, and use it routinely for managing everyday life.

### **IT Identity as Emotional Energy**

One way in which IT identity manifests is in feelings of *emotional energy* (i.e. enduring feelings of emotional attachment and enthusiasm in relation to an IT or class of ITs) arising from a history of interactions (Collins 1990). Emotional energy is conceptually distinct from emotion as it has generally been investigated in the context of individuals’ IT use. To date, IS researchers largely focused on more transient emotions—e.g. frustration from a system crash, or pleasure in playing a computer game (Ortiz de Guinea and Markus, 2009)—that individuals experience during, or as a result of, specific interactions. Examples include, perceived enjoyment (Agarwal and Karahanna 2000; van der Heijden 2004) and arousal (Kim et al. 2007a), which capture feelings of pleasure and stimulation derived from an interaction; perceived affective quality (Zhang and Li 2004)

and aesthetics (Tractinsky 2004), which refer to an interaction's potential to influence a person's core affect or mood, and satisfaction, which is an emotional state arising from an individual's evaluative judgment of the interaction experience (Bhattacharjee 2001b; Bhattacharjee and Premkumar 2004) .

In contrast to transient experience-specific emotions such as enjoyment or arousal—which can be regarded as the emotional ingredients of one's specific interactions with an IT—emotional energy represents a long-term outcome of a series of successful interactions that transcends all prior emotional experiences. Moreover, where transient emotions are a response to specific experience, emotional energy represents an individual's emotional response to the self (rather than an attitude toward the technology) in relation to a particular IT. Consistent with this study's conceptualization of the “Me”-“Not Me” poles of IT identity, we propose that high emotional energy will be evidenced by high levels of confidence, energy, and positive feelings in relation to an IT. Low emotional energy, in contrast, is expected to manifest as a lack of confidence, boredom, and indifference in relation to an IT.

An important aspect of emotional energy is that it provides individuals with “a store of cognitions that they carry around with them, and use to think and communicate with” (Collins 1990, p. 34). When a person thinks in terms of activities or ideas that were the focus of prior interactions with an ICT, it reinvokes their feelings of emotional energy (high or low), such that it influences their subsequent thinking and behavior (Collins 1990; Vincent 2006). Those whose experiences have resulted in high emotional energy are likely to exhibit great enthusiasm for, and involvement in, interacting with an ICT. For example, Hackbarth et al. (2003) found that as individuals gained knowledge and

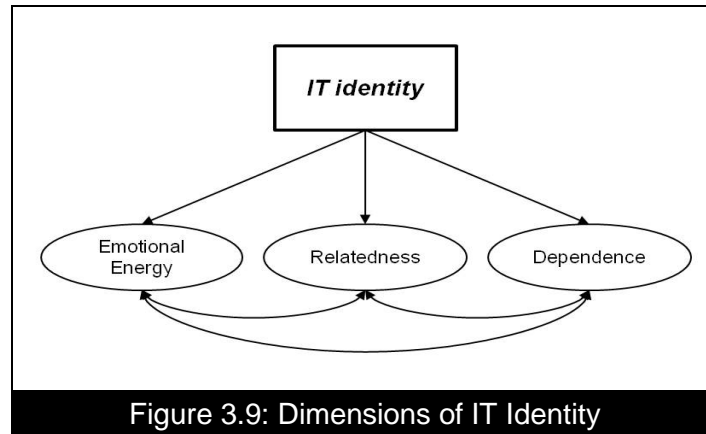
confidence through successfully using electronic spreadsheets over time, it positively influenced their levels of computer playfulness (defined as “an individual’s tendency to interact spontaneously with a computer” (p. 222)). Conversely, those whose experiences have resulted in low emotional energy will feel little emotion, or perhaps boredom, at the prospect of interacting with the IT. Because of its potential to influence thinking and behavior, this study proposes that—as one dimension of IT identity—emotional energy is likely to be an important determinant of individuals’ attitudes toward using IT and their subsequent IT use behaviors.

### **IT Identity as Dependence**

The ubiquitousness of IT means that many institutions and social relationships are organized around these technologies. It seems intuitive, therefore, that when individuals experience IT as an expansion of the self, they will also experience corresponding levels of reliance on them for personal well-being. Prior research provides many examples of individuals’ increasing dependence on IT. Within the work place, for example, people depend on IT to support their interactions, and present who they are, and what their organization represents, to others (Lamb and Davidson 2005; Lamb and Kling 2003). At work and in their personal lives, people depend on new forms of communication such as text messaging and online interactions to manage social commitments. Narrative accounts of Internet use indicate that as the Internet becomes progressively more embedded in everyday life, people are becoming increasingly dependent on it to sustain social relationships with family and friends, as well as for work and play (McMillan and Morrison 2006).

The greater flexibility in coordination that these new forms of communication affords also leads to a corresponding increase in people's reliance on them to meet others' social expectations (Ling and Yttri 2002). Finally, information technologies hold the memories and sentiments associated with prior interactions (e.g. text messages/emails sent and received, games played, appointments made and rearranged, presentations created, etc.). Thus, for many, the IT they use regularly have become an important part of how they understand themselves and their place in their social environment (Turtle 2011; Vincent 2006), which they come to rely on to interact with the world around them.

Schwarz and Chin's (2007) call for IS research to broaden its view of IT acceptance also points to individuals' dependence on IT as an important aspect of identity. These authors suggest that as an individual attaches her- or him-self emotionally and psychologically to an IT, "that individual yields authority (or complies) to the IT object... to the point that it becomes part of his/her identity" (p. 236). That is, the individual views his/her personal well-being or merit as depending on his/her interactions with the IT. Given that the dimensions of IT identity are interrelated, similar to relatedness and emotional energy, individuals' reliance on ITs will be influenced by the extent to which the meanings a person attaches to their interactions with an IT are descriptive of the self, where those individuals with a strong IT identity are expected to express high levels of dependence on an IT. The proposed interrelated dimensions of IT identity are presented in Figure 3.9.



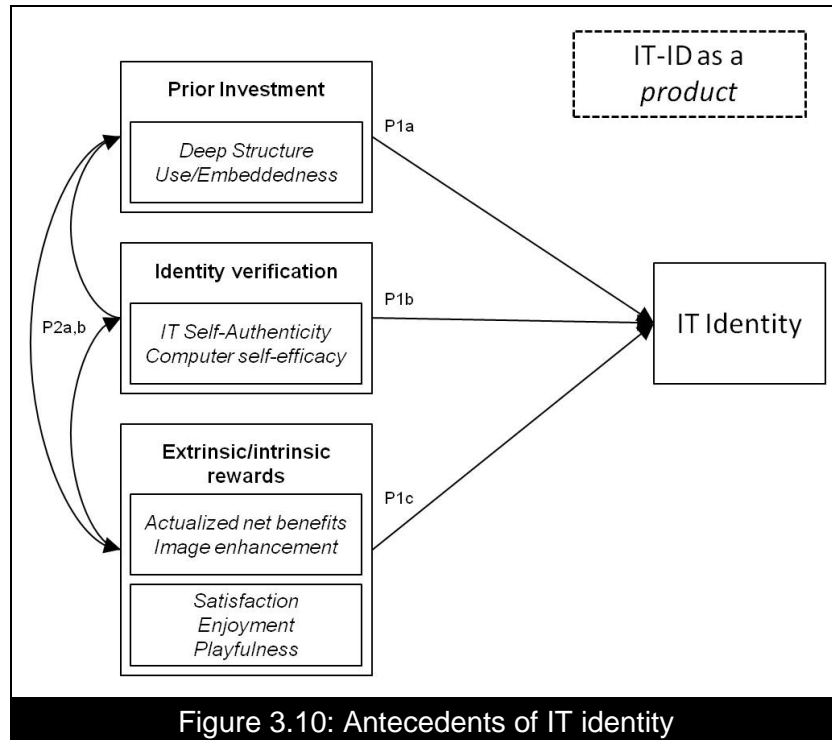
In the context of its nomological network, IT identity can be investigated as an independent variable (i.e. as an antecedent of attitudes toward using an IT and actual IT use behaviors) or as a dependent variable (i.e. as a consequence of a history of interactions). To identify potential antecedents of IT identity, the following section explores the construct as product of individuals' past experiences of interacting with an IT.

## VI. NOMOLOGICAL NETWORK FOR IT IDENTITY

### IT Identity as a Product

Implicit in our conceptualization of IT identity is that people are aware of when their interactions with an IT are integral to their sense of who they are. This study also assumes that the more a person's response to thinking of her- or him-self in relation to an IT (in terms of emotional energy, relatedness, and dependence) reflect the "Me" pole of IT identity, the more prominent the identity, and the more likely a person will act in accord with it. With this in mind, it is important to identify factors arising from individuals' interactions with IT that give rise to, maintain, or enhance the "Me" pole of IT identity.

Our theoretical frame shapes our understanding of factors influencing identities in general. Individuals are motivated by self-esteem and coherence to engage in self-verification activities to maintain the self-meanings that comprise the content of identities (McCall and Simmons 1978/1966; Swann et al. 2005). When an identity is successfully verified, self-meanings are maintained. This reinforces the identity and increases the likelihood it will be enacted in the future. Since identity is a reciprocal process, the outcomes of verification attempts in one period influence the extent to which an identity reflects what is desirable or preferable to a person from his or her point of view in a subsequent period. *Takeaway III* indicates that identities become prominent in a person's hierarchy of multiple identities based on the degree to which that person associates its past enactment with certain levels of (a) investment, (b) successful verification attempts, and (c) extrinsic and intrinsic rewards. Given that prominent identities are most descriptive of the self, we use this takeaway as a frame for identifying potential outcomes of individuals' past experiences with IT that may significantly and positively impact the strength of IT identity. Figure 3.10 presents the propositions developed in this section.



### Prior Investment in IT identity

Perhaps the most significant determinant of a strong IT identity is the extent to which an individual has invested in it previously (McCall and Simmons 1978/1966; Stryker and Serpe 1994). In the context of IT use, this study proposes that individuals' prior investment in IT identity manifests across two dimensions of IT use: (1) investment across a wide range of IT features; and (2) investment across a variety of situations. Vincent's (2006) study of mobile phone use suggests that feelings of emotional energy, relatedness, and dependence on IT result from these types of investment.

#### Investing across a wide range of IT features

We propose that prior investment in IT identity may take the form of engaging in feature extension behaviors in a particular social context—i.e. an individual's behavioral attempts to use an IT beyond the uses intended by its designers or implementers beyond

the uses intended by its designers or implementers (Jasperson et al. 2005; Schwarz and Chin 2007). *intention to explore* (Nambisan et al. 1999), which refers to an individual's intentions to invest time and effort in exploring potential new uses of an IT, *deep structure use* (Burton-Jones and Straub 2006), which reflects the extent to which an individual uses different features of an IT, and *trying to innovate* (Ahuja and Thatcher 2005), which refers to an individual's behavioral attempts to find novel uses of an ICT. Because feature extension use is, by definition, "always voluntary" (Jasperson et al. 2005, p. 532), these constructs reflect an individual's willingness to invest in using a technology to its fullest potential. This follows because, even when adoption and use of IT is mandated by others (e.g. an organization may mandate the use of an enterprise resource planning system, or a parent may insist their child carries a mobile phone with them), individuals have discretion over their actual IT use (Jasperson et al. 2005).

Of the feature extension behavioral intentions and actual behaviors investigated by IS researchers, deep structure use may be the most consistent predictor of IT identity. Deep structure use captures the extent to which an individual interacts with a wide range of a specific IT's features to complete a task or in a specific setting (Burton-Jones and Straub 2006). The nature of deep structure use depends on features of a specific technology. In terms of mobile phones, for example, deep structure use could involve using a wide range of features to maintain social connections (e.g. voice calls, text messaging, social media, or VoIP). For a software application, such as MS Excel, deep structure use may involve using a wide range of features to analyze data, test different assumptions, perform calculations, and derive insightful conclusions (Burton-Jones and Straub 2006). In either case, deep structure use implies that an individual has invested



significant time and effort in understanding an IT well enough to exploit its feature set (Burton-Jones and Straub 2006; Schwarz and Chin 2007). Consequently, a history of deep structure use should be positively associated with IT identity.

Adaptation, learning, and exploratory behaviors are also likely to be outcomes of having a strong IT identity, as individuals seek out opportunities to enact their identities in relation to IT (McCall and Simmons 1978/1966; Swann et al. 2005). However, in contrast to deep structure use, the effects exerted by these behaviors on IT identity in a subsequent period are expected to be mediated by the process of identity verification. Failure to discover more effective, or novel, uses of an IT may result in non-verification of IT identity and lead to diminished feelings of efficacy-based self-esteem (Stryker and Burke 2000).

As suggested by identity control theory (e.g. Burke and Stets 2009; Cast 2004), when exploration of an IT leads to repeated unsuccessful attempts to verify IT identity, it could result in reduced commitment to the identity, leading to a decline in feelings of emotional energy, relatedness, and dependence in relation to the IT; thereby, diminishing the likelihood of the identity being enacted in the future. Consequently, due to their potential to exert negative or positive effects, IS constructs that capture individuals' behavioral attempts to explore or adapt a technology are not posited to be determinants of IT identity. Investigating the potential of adaptation, learning, and exploratory behaviors to interrupt the identity process represents a promising area for future research.

### **Investing across a variety of situations**

Prior investment may also be represented by the extent to which use of particular IT features has become embedded in more aspects of a person's everyday life.

*Embeddedness*, referred to here as *past use of an IT across a variety of situations*, is an important antecedent of IT identity because it directly influences the extent to which a person views interacting with an IT as integral to who they are as a distinct entity. When IT use is restricted to a narrow-range of situations, enacting IT identity across a variety of contexts is necessarily limited.

Conversely, when IT use becomes embedded in multiple social situations, individuals do not put on or take off their IT identities as they take on or exit particular roles or groups. For example, if a person uses the Internet for entertainment, information gathering, managing social ties, as well as for work purposes, that person is likely to view the Internet as an essential component of managing daily life. Similarly, as reported by Turkle (2011), part of the reason that people have become so tethered to mobile devices is that regardless of where someone is physically located, or what they are doing, these technologies act as portals to other people and places. "Wherever you go, you take yourself with you" used to be an axiom. In today's networked societies, unless people leave their mobile devices behind, wherever they go, they take themselves, their roles, and their groups, with them.

While individuals may initially be motivated to use an IT to support an important role or social identity, ultimately, a technology may become so embedded in a person's experiences of different roles, groups, and situations that his/her interactions with it become an integral part of the self. McMillan and Morrison's (2006) investigation into young people's Internet use and Vincent's (2006) mobile phone study support this view. McMillan and Morrison found that young people report an increasing dependency on the Internet for personal well-being as its use permeates more aspects of their everyday lives.

Vincent (2006) proposes individuals' emotional attachment to their mobile phones as an outcome of investing in the devices across situations—as icons of who they are, and repositories for their memories and social connections.

In sum, as a product of a history of interactions, IT identity is influenced by the extent to which a person associates its past enactment with certain levels of deep structure use and/or embeddedness. On this basis, we make the following proposition:

***P3a:** Prior levels of investment (manifest as the average levels of deep structure use and/or embeddedness associated with past interactions with an IT) will positively influence IT identity.*

### **A History of Successful Identity Verification**

Successful identity verification refers to the extent to which the reflected appraisal process has confirmed what an individual knows or believes about the self. As noted earlier, although motivated by self-interest, IT identity is pararelational—the construct reflects individuals' views of themselves in relation to an IT based on a history of interactions. IT identity is verified when the nature of those interactions confirm that the person is behaving in a way that is true to who he/she really is in relation to the IT and has enactive mastery of the technology. Thus, for example, if a person's view of her- or him-self as creative is interwoven with his/her relationship with Adobe Photoshop®, IT identity will be verified when his/her use of the software matches the goal of being creative and produces beautiful images from his/her point of view. As outcomes of past attempts to successfully verify IT identity, feelings of self-authenticity- and efficacy, subsequently act as inputs to the identity process. Thus, an individual's own appraisals of

his/her past interactions with an IT are likely to exert a significant influence on IT identity and, thus, its predictiveness of attitudes and behavior in a subsequent period.

### **IT self-authenticity and computer self-efficacy**

*IT self-authenticity*—defined here as being true to who one really is in one's thoughts, actions, and relational orientation to specific IT or class of ITs (Burke and Stets 2009; Kernis 2003), is proposed as one outcome of IT identity verification that subsequently acts to should increase the strength of IT identity. IT self-authenticity arises from interacting with an IT in ways that are congruent with one's own goals, interests, and beliefs, as opposed to engaging in IT use behaviors simply because it pleases others, or to gain rewards, or avoid sanctions (Kernis 2003). Feelings of self-authenticity are an important source of stability for individuals across all social situations (Burke and Stets 2009; Hillmer 2009; Swann et al. 2005).

Given that IT identity is tied to a person's interactions with an IT, we also propose *computer self-efficacy (CSE)*, defined as “an individual's beliefs about his or her capabilities to use computers” (Compeau et al. 1999, p. 147) as a second outcome of successfully verifying IT identity. As one dimension of self-esteem, self-efficacy is viewed as a key motivator of human behavior (Bandura 1986; Owens 2003). In the context of IT use, CSE is an outcome of enactive mastery (Compeau et al. 1999); implying that the nature of an individual's past interactions with an IT have successfully matched his/her priorities. Prior IS research suggests that CSE positively influences individuals' affective and behavioral responses to IT (e.g. Compeau et al. 1999; Thatcher et al. 2008).

When past interactions with an IT have fostered certain levels of IT self-authenticity and computer self-efficacy, individuals are more likely to view those interactions as valuable and meaningful, and integral to their sense of self. In contrast, individuals whose past interactions were not authentic and/or did not promote a sense of enactive mastery are less likely to voluntarily seek out future interactions—with the result that these individuals view themselves as independent and separate to IT. In sum, as a product of a history of interactions, the strength of IT identity is influenced by the extent to which a person associates its past enactment with certain levels of successful verification attempts. On this basis, we make the following proposition:

***P3b:*** *Prior levels of successful verification attempts (manifest as the average levels of IT self-authenticity and computer self-efficacy associated with past interactions with an IT) will positively influence IT identity.*

As a caveat to this, we note that computer self-efficacy has been conceptualized in IS research as a multi-level and multi-dimensional construct (Marakas et al. 2007; Marakas et al. 1998; Thatcher et al. 2008). Thus, when IT identity refers to a class of ITs (e.g. mobile device technologies), it may be appropriate to operationalize self-efficacy as an individual's beliefs about his or her capabilities to use the class of ITs in general. However, when examining IT identity at the level of a specific IT, researchers should be alert to the notion that individuals may interact with an IT across multiple situations or interact with a wide range of its features in a specific situation. Thus, to more fully capture the effects of self-efficacy on IT identity as it relates to a specific IT, it may be necessary to operationalize the construct at both the feature level of a specific IT (e.g. an Internet application) and at the level of a task/situation (Marakas et al. 2007).

### **Extrinsic and Intrinsic Rewards Associated with Enacting IT identity**

The motivational model of self-expansion proposes that people seek resources that facilitate goal attainment by including attributes of important others in their notions of the self (Aron et al. 2003; Aron et al. 1992). To paraphrase McCall and Simmons (1978/1966, p. 78): “man is still an animal and requires certain material resources [and internal gratifications] to maintain pursuit of his various enterprises...” Hence, those identities that have materially benefited individuals or provided some intrinsic gratifications “are likely to weigh more prominently than those that gain [a person] little or nothing.” Accordingly, this section considers the potential influence of past levels of intrinsic and extrinsic rewards on IT identity. Similar to having a history of significant levels of investment and successful verification attempts, this study proposes a reciprocal relationship between extrinsic/intrinsic rewards and individuals’ interactions with IT. Specifically, an individual may associate past interactions with a certain level of extrinsic/intrinsic rewards, which in turn should increase the strength of IT identity to guide his/her subsequent thinking and behaviors.

#### **Extrinsic rewards**

Potential extrinsic rewards that may be gained from enacting IT identity include improved pay, promotions, prestige, etc. On the basis that these rewards are tied to job performance, IS research has investigated perceived usefulness (Davis 1989)—defined as an individual’s belief that using an IT will improve his/her job performance—as an extrinsic motivator of individuals’ attitudes and IT use behaviors (Davis et al. 1992; Fagan et al. 2008; Lee et al. 2005). The role of image enhancement (Magni et al. 2010; Venkatesh and Davis 2000)—defined as an individual’s belief that using an ICT will

enhance his/her image or status—has also been investigated. A substantial body of literature on individual acceptance and use of IT provides evidence that individuals' initial acceptance decisions are heavily influenced by their beliefs relating to anticipated benefits that may be derived from using an IT.

The relationship between extrinsic motivation (i.e. anticipated rewards) and behavioral intentions has been studied extensively in IS research. However, scant research has considered the relationships between *actual* rewards gained from prior interactions, and individuals' subsequent attitudes and behaviors. Research on identities suggests that actually receiving the benefits associated with past interactions is likely to increase the strength of one's IT identity in relation to a specific IT. Some evidence in support of this is provided by Rai et al.'s (2002) examination of IS success models, as well as Van Akkeren and Rowland's (2007) study of IS implementation in an Australian radiology practice. For example, Rai et al. found that *actualized net benefits* of system use were positively associated with perceived dependence on an ICT. In addition, Van Akkeren and Rowland suggest that the extent to which individuals view interactions with ICTs as a source of *image enhancement* influences their self-perceptions in relation to these technologies: in this study, when past interactions enhanced radiologists' images of themselves, they were more likely to embrace the technology as part of their role.

### **Intrinsic rewards**

While past levels of extrinsic rewards are important determinants of IT identity, individuals may also derive pleasure from the “exploratory challenge” of their interactions with IT (McCall and Simmons 1978/1966, p.79). To this end, several transient experience-specific emotions have been investigated as intrinsic motivators of

individuals' attitudes toward IT and their IT use behaviors (e.g. Agarwal and Karahanna 2000; Bhattacharjee 2001b; Bhattacharjee and Premkumar 2004; Tractinsky 2004; van der Heijden 2004; Zhang and Li 2004). For example, Bhattacharjee (2001) found that individuals' IS continuance intentions were influenced by their *satisfaction* with previous use of a system. For example, Bhattacharjee (2001b) found that individuals' IS continuance intentions were influenced by their *satisfaction* with previous use of a system. Agarwal and Karahanna (2000) describe cognitive absorption, which includes the dimension of heightened enjoyment, as an important antecedent of individual beliefs about an IT.

Several studies have examined the relationship between the pleasures that individuals take from using IT (e.g. *enjoyment*, playfulness, or absorption) and their subsequent cognitive reactions and behavioral intentions about IT use (e.g. Chang 2008; Li et al. 2005; Saade 2007; Venkatesh and Bala 2008; Venkatesh et al. 2002). These studies find that experiences that evoke pleasant feelings or enjoyment are important determinants of individuals' level of engagement and ongoing commitment to using specific technologies. In general, IS research supports the view that the extent to which an individual's past interactions with an IT are emotionally valued may be a significant predictor of his/her self-meanings in relation to that IT (Turel et al. 2007).

In sum, as a product of a history of interactions, IT identity is influenced by the extent to which a person associates its past enactment with certain levels of extrinsic and intrinsic rewards. On this basis, we make the following proposition:

***P3c: Prior levels of extrinsic (manifest as the average levels of actualized net benefits and image enhancement associated with past interactions with an IT) and intrinsic***



*rewards (manifest as the average levels of satisfaction, enjoyment, and playfulness associated with past interactions with an IT) will positively influence IT identity.*

### **Extrinsic/Intrinsic Rewards and Utilitarian vs. Hedonic Information Systems**

It warrants mentioning that prior IS research suggests the relative influence of extrinsic vs. intrinsic rewards on IT use may depend to some extent on the nature of the specific IT that is the focus of that identity (van der Heijden 2004). In Van der Heijden's (2004) well-cited piece, anticipated extrinsic rewards are proposed to be more influential when the primary objective of an IT is productive use (e.g. an ERP system), while anticipated intrinsic rewards are suggested to be stronger predictors of use when an IT primarily serves hedonic purposes (e.g. a computer game). However, more recent research questions this assumption. For example, in a preliminary meta-analysis of 24 studies, Gerow et al. (2009) found intrinsic gratification was as important to understanding the use of utilitarian ITs as it is to understanding hedonic IT use, particularly in the post-adoptive context. IT identity may help shed some light on this apparent contradiction:

From an identity perspective, individuals' initial use of an IT is predominantly driven by the question "what can this IT do for me?" When an IT's purpose is perceived as utilitarian (i.e. the IT provides value to the individual that is external to the interaction itself (van der Heijden 2004), it makes sense that this question is answered based on the likelihood of the individual achieving some material benefits from the interaction. Conversely, when an IT is perceived as hedonic, asking "what can this do for me?" is more appropriately answered in terms of the degree of pleasure one can derive from its use. Thus, in initial use scenarios it is reasonable to expect that anticipated extrinsic

rewards will predict acceptance of utilitarian systems, while anticipated intrinsic rewards will predict acceptance of hedonic systems. However, because IT identity is an attempt to answer the question “Who am I, through my use of this IT?”, a strong IT identity implies that such use is emotionally valued. Consequently, in the context of long-term use, the level of intrinsic rewards associated with past interactions should increase the strength of IT identity (and influence subsequent attitudes and behavior), regardless of whether an IT is perceived as utilitarian or hedonic in nature.

### **Relationships among Antecedents of IT Identity**

We assume that past levels of prior investment, successful verification attempts, and extrinsic/intrinsic rewards are mutually reinforcing. An individual’s prior investment in an IT through deep structure use and/or embeddedness implies successful verification, which should give rise to feelings of IT self-authenticity and computer self-efficacy. This follows because IT self-authenticity suggests that an individual is leveraging the IT across situations in support of his/her personal goals and CSE implies “enactive mastery” of an IT’s feature set (Compeau et al. 1999). As evidence of successful verification, IT self-authenticity and CSE, in turn, are likely to encourage continued investment in the identity. A significant prior investment in IT identity also implies that a person has staked their personal well being on living up to their views of themselves in relation to an IT. Thus, one can make the case that extrinsic/intrinsic rewards act as enablers and outcomes of investment and IT identity verification. Further, the levels of extrinsic/intrinsic rewards gained from enacting IT identity are likely to be associated with levels of IT self-authenticity and computer self-efficacy. On this basis, we make the following propositions:

***P4a:** High levels of investment in IT identity will be associated with high levels of successful verification attempts and high levels of extrinsic/intrinsic rewards.*

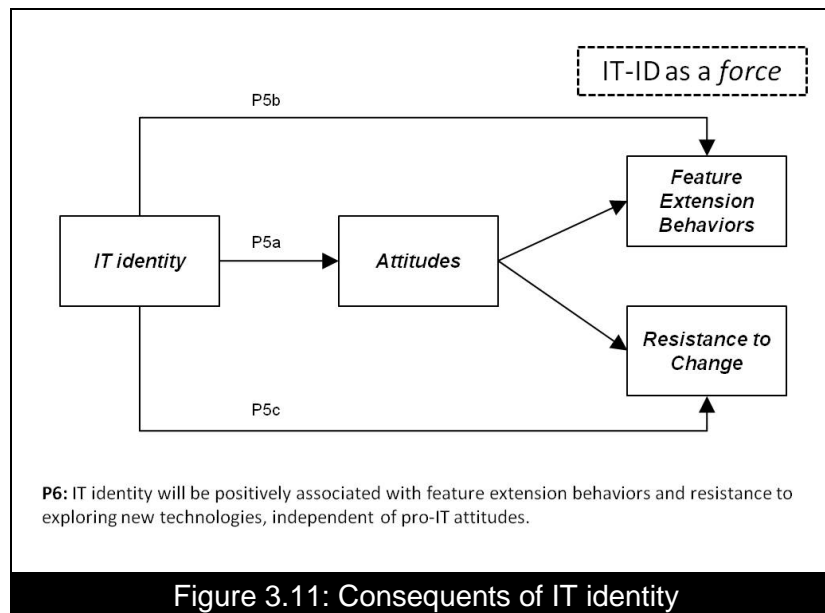
***P4b:** High levels of extrinsic/intrinsic rewards will be associated with high levels of successful verification attempts and high levels of investment in IT identity.*

Given that IT identity's predictiveness of individuals' interactions with IT derives from these factors, examining their interrelationships, as well as their relative influence on IT identity, represents a promising area for future research.

In sum, this section has drawn on identity theories and relevant IS literature to identify and propose potential antecedents of IT identity. Based on our discussion, we propose that IT identity is a product of an individuals' history of interactions with an IT or class of ITs that develops and is maintained based on the degree to those are associated with certain levels of investment in the identity, successful verification attempts, and extrinsic/intrinsic rewards. In the following section, we examine IT identity's role as a predictor of IT use behaviors.

### **IT identity as a Force**

In this section we review current understanding of individuals' acceptance and use of IT. We provide evidence that attitude—an inconsistent predictor of initial acceptance—may be a critical determinant of long-term use. Next, we discuss how IT identity, as the primary motivator of individuals' enduring attitudes and IT use behaviors, provides additional explanatory power by resolving the attitude-behavior inconsistency. Then, we build on this discussion to elucidate on IT identity's role in promoting feature extension behaviors and resistance to new or alternative technologies. The proposed consequents of IT identity are presented in Figure 3.11.



### IT identity, Beliefs, and Attitudes

Much of our current understanding of individuals' IT use grows out of research examining attitudes as determinants of behavior. The technology acceptance model (TAM) (Davis 1989; Davis et al. 1989), and theory of planned behavior (TPB) (Ajzen 1985; Ajzen 1991; Taylor and Todd 1995) are rooted in the assumption that individuals' beliefs about an IT (e.g. usefulness and ease of use) influence their attitude (i.e. their degree of positive evaluative affect) toward using that technology, which in turn determines their behavioral intentions and subsequent behaviors. However, attitude toward using an IT has proven to be an inconsistent predictor of individuals' behavioral intentions to use new IT (Benamati et al. 2010; Kim et al. 2009)—with the result that some discount its role in explaining individuals' IT use behaviors (Venkatesh 2000; Venkatesh and Davis 1996; Venkatesh et al. 2003). Thus, in recent years, the construct has largely disappeared from models of initial acceptance (Venkatesh 1999), UTAUT (Venkatesh et al. 2003), and TAM3 (Venkatesh and Bala 2008)), as well as from those

examining continued use (e.g. Bhattacharjee et al. 2008; Premkumar and Bhattacharjee 2008).

Conversely, while attitude is an inconsistent predictor of individuals' initial acceptance decisions, the construct appears to be a critical determinant of long-term use. Early post-adoption research, for example, showed that attitude fully mediated the effects of beliefs on intentions and behaviors when individuals had experience of the target technology (e.g. Amoako-Gyampah and Salam 2004; Chen et al. 2002; Hsu and Lu 2004; Karahanna et al. 1999). These are important findings, because individuals' enduring attitudes have been linked with temporal persistence, resistance to change, and long-term behaviors (Kim et al. 2009; Stets and Biga 2003). Consistent with this view, in a test of competing models, Liao et al. (2009) found that attitude was a more important predictor of long-term IT use than satisfaction.

Identifying determinants of attitude is important for two reasons. First, a positive attitude toward using or not using a technology is likely to be a more important predictor of long-term IT use or resistance behaviors than cognitive beliefs (which, since they represent an individual's assessment of the cost/benefit consequences of using the technology (Davis 1989) are inherently more fragile). Second, some argue that cognitive beliefs may not matter if researchers can identify ways of influencing attitudes directly (e.g. Agarwal 2000). Thus, identifying ways of influencing attitude directly is critical for designing managerial interventions to promote and manage long-term IT use, which is often routinized and resistant to change (Jasperson et al. 2005).

Research examining the link between individuals' identities and behavior toward the environment suggests that identities are central to understanding how individuals'

develop positive attitudes toward the social objects they interact with (Stets and Biga 2003). For example, in research examining the effects of environment identity on environmental attitudes and behaviors, Stets and Biga (2003) found that where past environmental behavior had been guided by the meanings contained in a person's environment identity, these meanings manifest in enduring positive attitudes toward the environment, and consequently, pro-environment behaviors that were enacted across a variety of situations. Individuals whose interactions with the environment had led to a view of themselves as 'environmentally friendly' were more likely to routinely recycle, buy energy saving appliances, take the bus, etc.

In the IS context, this suggests that when individuals view their interactions with particular ITs as integral to their sense of who they are, it will promote enduring positive attitudes toward use of these technologies, which will influence long-term behaviors. For example, a person whose sense of being control is tied to use of a mobile phone should have an enduring positive attitude toward its use and carry it routinely in situations where they need to get around by themselves, such as walking alone, driving, navigating unfamiliar areas, and meeting up with others.

In addition to predicting attitudes, research suggests that identity may exert independent effects on behavior over and above attitude (Burke 1991a; Rosenberg 1979). As Burke (1991a) explains, when predicting a person's attitude and behavior toward an object, three elements must be considered: (1) the person's attitude toward the object; (2) the person's behavior toward the object; and (3) the person's attitude toward him- or herself, which reflects the self-concept (Rosenberg 1979). When this third element is incorporated into the model, the inconsistency is resolved: (1) is only predictive of (2)

when (1) is congruent with (3). This implies that (3) exerts stronger (and independent) effects on (2) than (1). Thus, incorporating identity into attitude-behavior models makes it possible to explain situations where people behave negatively toward objects they have a positive attitude toward, or positively toward objects they have a negative attitude toward.

Research on the identity-behavior link offers strong evidence that identities do influence behaviors independent of attitudes (e.g. Biddle et al. 1987; Burke 1991a; Charng et al. 1988; Granberg and Holmberg 1990; Sparks and Shepherd 1992; Stets and Biga 2003). More importantly, these studies show that, in the case of repeated behaviors, identity, rather than attitude, is the *primary motivator* of behavior (Stets and Biga 2003). For example, in examining the relative effects of blood-donor identity and attitude on blood donations, Charng et al. (1988) found that “blood donors gave blood when the blood-donor identity became important to them. Further, they found that the more one donated blood, the more the blood-donor identity predicted giving blood, rather than one’s attitude toward donating blood” (Stets and Biga 2003, p. 400).

Charng et al.’s findings are validated by studies examining identity, attitudes, and behavior in a variety of contexts, including: college retention (Biddle et al. 1987), voting intentions (Granberg and Holmberg 1990), exercise behavior (Theodorakis 1994), food choice (Armitage and Conner 1999; Dennison and Shepherd 1995; Sparks and Guthrie 1998; Sparks et al. 1995), and household recycling (Terry et al. 1999). Based on this, the next section develops propositions about behavioral consequents of IT identity. In particular, we posit that, in addition to being a determinant of attitude, IT identity predicts continued IT use behaviors and resistance to new or alternative technologies

### **Consequents of IT identity**

The self-expansion motive explains how individuals' enhance self-esteem by developing and including relationships with ITs in their self-meanings (Aron et al. 2003; Aron et al. 1992; Brewer and Gardner 1996; Sluss and Ashforth 2007). Consistent with *Takeaway IV*, this study assumes that once IT identity is formed, people are motivated by coherence and self-esteem to confirm what they already believe and feel about themselves in relation to ITs (Burke and Stets 2009; Rosenberg 1979; Swann et al. 2005). This has implications for research on post-adoption IT use.

For organizations to realize benefits from their technology investments, it is important to extend understanding of factors that influence individuals' attempts to use ITs to their fullest potential (Chin and Marcolin 2001). In IS research, as well as in the domain of human-computer interaction (HCI), studies agree that, often, as individuals become more experienced with an IT (and therefore more likely to act as effective sources of behavioral innovation), they are less likely to engage in conscious cognitive processing, which leads to few user-initiated innovations over time (Agarwal 2000; Jaspersen et al. 2005; Limayem et al. 2007; Nambisan et al. 1999, and others). Taking an identity approach illuminates individuals' reflexive cognitive processes that stimulate conscious processing and can serve as a basis for designing interventions to manage long-term behaviors.



## **IT identity as a predictor of feature extension behaviors and resistance**

From the perspective of self-expansion (Aron et al. 2003), the extent to which IT identity formation is possible depends on individuals' willingness (and/or ability) to redirect significant attention and resources to exploring the many features and situations in which an IT can be used. When individuals are not willing or able to do this or "when expansion is slow or nonexistent, [a person may experience] little emotion, or perhaps boredom" (Aron et al. 2003, p. 482). In this instance, unless there is a compelling reason to go on consciously processing one's interactions with an IT (an intervention of some kind), over time IT use behavior will tend to become routinized, as individuals—focused on performing activities that have routinely supported their views of themselves (and their needs) in the past (Swann 1983)—stick with already learned routines rather than investing in learning and exploration (Caroll and Rosson 1987; Jasperson et al. 2005).

In contrast, when people are able to direct sufficient attention and resources to the goal of self-expansion, repeated interactions with an IT across situations can become incorporated into their individual self-concepts, as part of a person's picture of who he or she is (Charng et al. 1988). At this point, individuals will actively seek self-verification activities to create and maintain social environments that confirm what they believe and feel about themselves (McCall and Simmons 1966; Swann et al. 2005) *in relation to interacting with the IT*.

Since IT identity is motivated by a desire for self-expansion, engaging in feature extension behaviors to enhance one's potential efficacy and facilitate achievement of personal goals that might arise is an important component of its enactment. Thus, when an opportunity to express creativity arises, an individual with an Adobe Photoshop® IT

identity will think to complete the project using Adobe Photoshop®, rather than by some alternative means. In this instance, the IT identity will be verified only if the person is able to complete the project using the software. Further, because verification of the identity implies enactive mastery of Adobe Photoshop's features, it is likely that the IT identity holder will interact with a wide range of features in the process of completing creative tasks. This view is supported by research on environment identity that found when individuals had strong environment identity, they engaged in a wide range of environmentally friendly behaviors (Stets and Biga 2003), as well as a recent inductive study, exploring young people's relationships with their mobile phones (Carter et al. Unpublished doctoral dissertation). In this work, Carter et al. found a strong relationship between the meanings young people attached to the self in relation to mobile phones and embeddedness (in terms of range and extent of use) of their daily interactions with these devices.

Outward presentation of an identity to others is just one way in which individuals reinforce their claim to the identity. Also important is the way in which individuals represent these identities, internally, to themselves (McCall and Simmons 1978/1966). If, for example, an individual perceives (through interacting with the IT or interpersonal comparison) that he or she lacks important resources (e.g. access to new technology features, knowledge, or skills) for using Adobe Photoshop® creatively, relative to other people, he or she will likely engage in learning and exploratory behaviors to resolve the discrepancy created between his or her view of the self as creative and the perceived lack of resources, which are preventing the identity from being verified.

Finally, because identity is a reciprocal process, outcomes of self-verification activities in one period act as inputs to the process in subsequent periods. Thus, past levels of investment in feature extension behaviors, as well as successful verification attempts, and rewards associated with past interactions are significant determinants of the strength of an IT identity later (McCall and Simmons 1978/1966). The stronger an identity is that is connected to an IT, the more the individual's self-meanings in relation to the technology reflect what is preferable or desirable from that person's point of view (Stryker and Serpe 1994). On this basis, individuals that have made a significant investment in incorporating resources and characteristics of an IT into their views of themselves will be reluctant to seek out alternatives. Consequently, in addition to promoting feature extension behaviors, where these have been generally associated with a history of successful outcomes, IT identity will foster resistance to change. Thus, we make the following propositions:

***P5:** IT identity positively influences attitudes and IT use behaviors. Thus, in the context of post-adoptive IT use, IT identity will be positively associated with (a) an enduring positive attitude toward using the IT; (b) feature extension behaviors; and (c) resistance to change.*

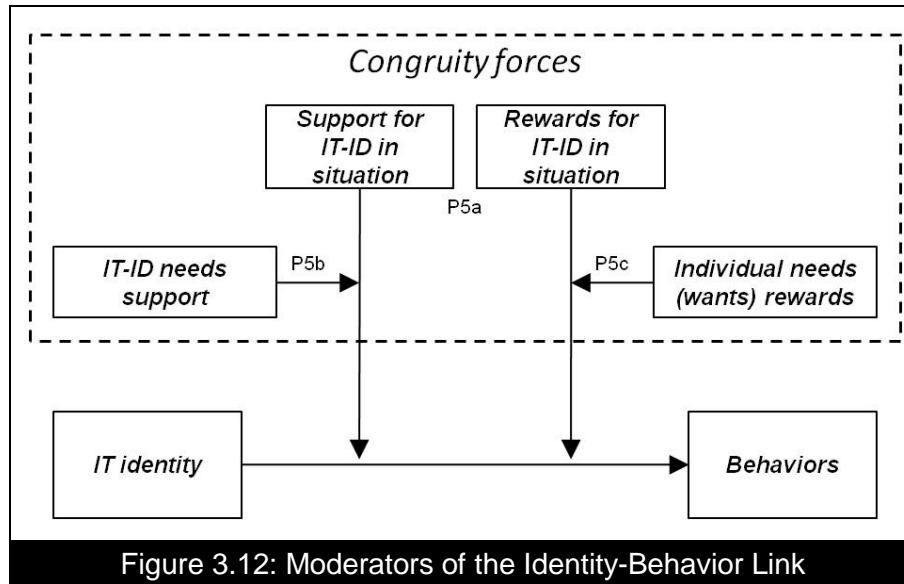
***P6:** IT identity is a primary determinant of IT use behaviors. Thus, in the context of post-adoptive IT use, IT identity will be positively associated with feature extension behaviors and resistance to change, independent of pro-IT attitudes.*

#### **Moderators of the IT identity—Behavior Link**

As a caveat to the above, we note that having a strong identity is not the only determinant of behavior. Sometimes, individuals enact weaker identities when they

perceive it is advantageous to do so in a situation (Burke and Stets 2009). Situational forces that may influence whether an IT identity becomes activated in a situation include the support and rewards available for enacting the identity (Burke and Stets 2009). For example, an organization may attempt to squash individuals' use of the ITs they identify with strongly because these ITs are not supported by the IT department. Conversely, the organization may try to harness employees' innovativeness by freeing people up to use the ITs they feel comfortable with (Bernoff and Schadler 2010). At the same time, not all IT identities need support to be enacted. Nor do individuals always need or want the rewards that are available for enacting the identity. When IT use is not interdependent or has low knowledge barriers, organizations' potential to influence the IT identity—behavior relationship may be lessened. Thus, consistent with *Takeaway V*, we place the following broad boundary conditions (referred to here as *congruity forces*) on IT identity's potential to predict behavior in a given situation (presented in Figure 3.12). Identifying specific boundary conditions represents an important area of investigation for researchers and practitioners seeking to design interventions (e.g. incentives or controls) to manage the overall salience of an IT identity.

***P7:*** *In a given situation, individuals will behave in accordance with IT identity only when a) rewards and support exist in the situation to enact the identity; b) enacting the identity needs support; and c) the individual needs (or wants) the rewards that are usually gained from enacting the identity.*



In sum, this study proposes IT identity as a *product* of an individual’s history of interactions with an IT, as well as a *force* that affects individuals’ attitude toward and actual behavioral interactions with an IT. As a product of interactions, IT identity reflects an individual’s emotional attachment, reliance on, and connectedness with an IT. As a force, IT identity represents the self-meanings attached to an individual’s interactions with an IT that guide that person’s attitudes and behaviors across a variety of roles and situations. Although IT identity has the potential to be highly prominent,—particularly when it is connected to an IT characterized by high synchronicity and high mobility—its predictiveness of individuals’ attitudes and behaviors depends on *congruity forces* determine its overall salience in a given situation. To guide efforts to validate the IT identity construct, Figure 3.13 presents the partial nomological network outlined here.

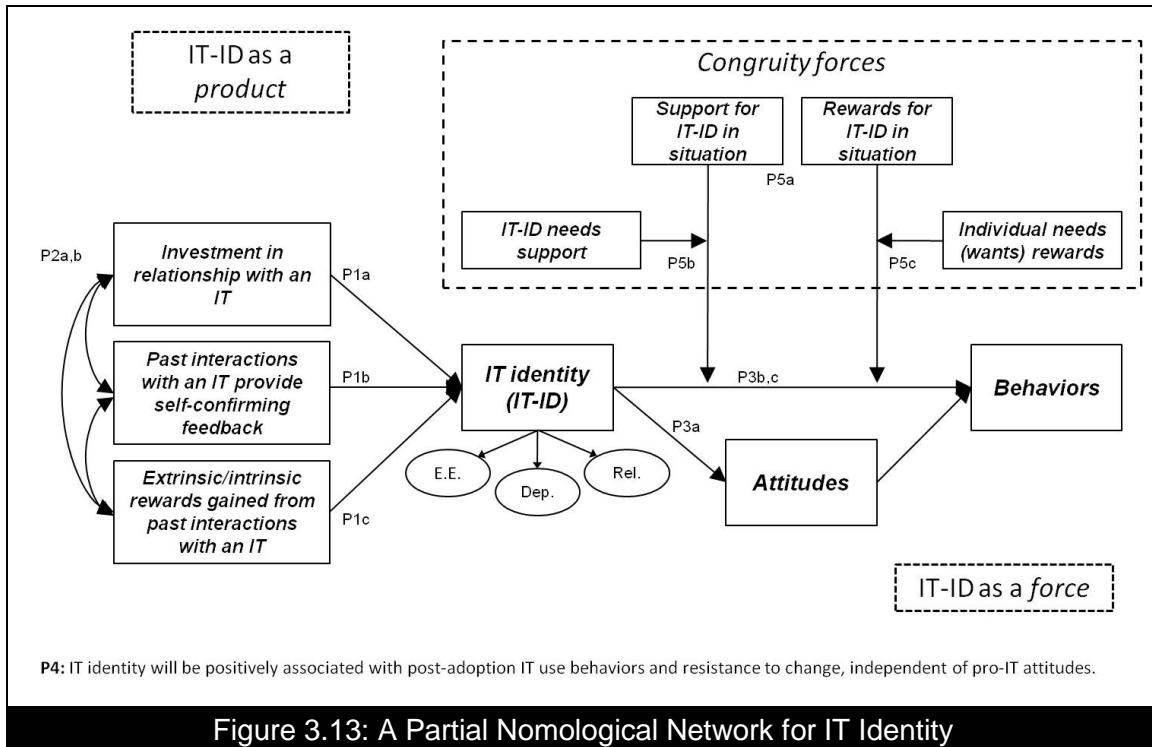


Figure 3.13: A Partial Nomological Network for IT Identity

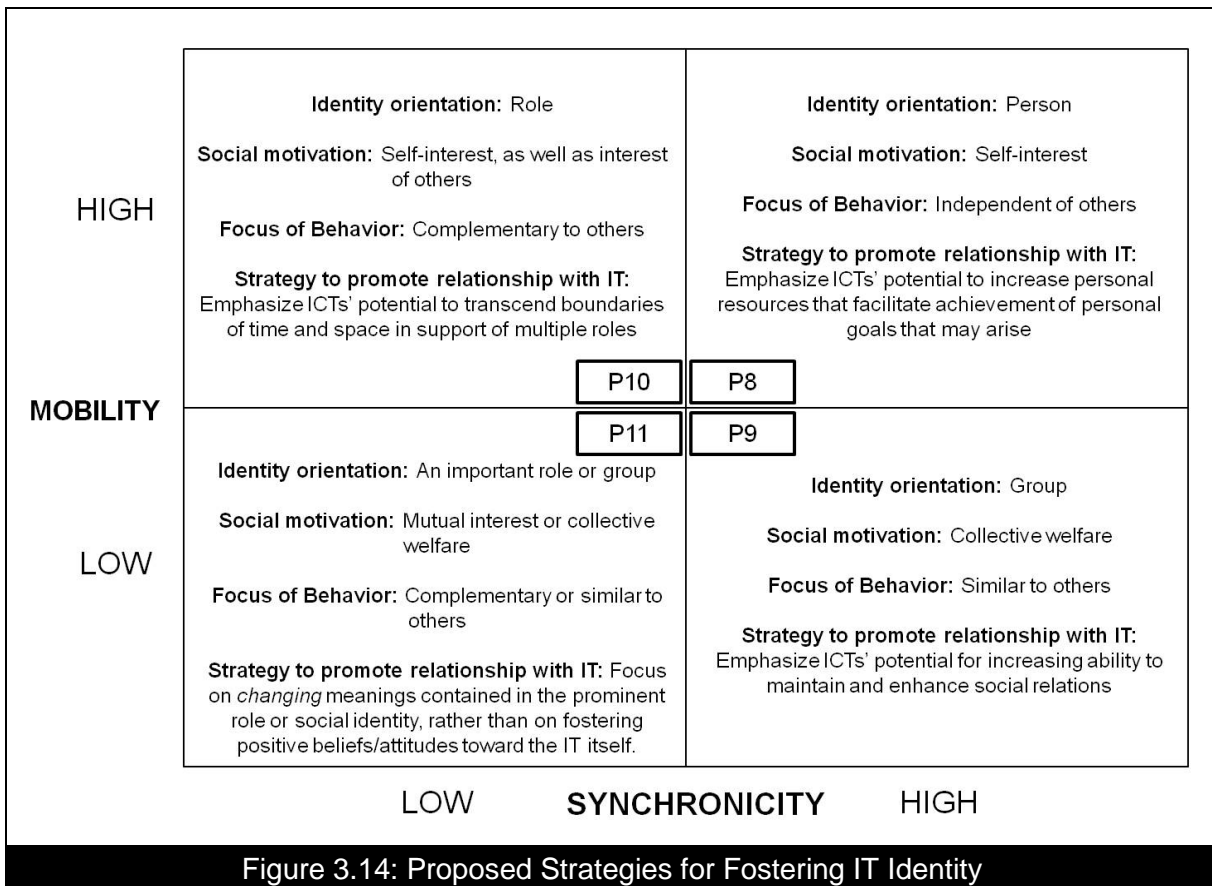
## VII. IT IDENTITY VIS-À-VIS OTHER IDENTITIES

The primary focus of this study has been on examining the processes by which individuals construct and maintain identities in relation to specific IT. However, IT identity represents just one of a person's many identities, each of which are tied to an aspect of the social structures in which that individual lives. Given that people interact with IT in situations where there exist behavioral decisions aligned with multiple identities (Stryker and Burke 2000), it is important to develop understanding of the interplay between individuals' IT identities and their other identities within the work place. Identity research suggests that in situations where individuals are most heavily invested in a work role identity (e.g. as a nurse), the meanings they attribute to IT use may be predominantly influenced by their internalized expectations about performing competently in their work roles (McCall and Simmons 1978/1966; Stryker and Burke

2000). Moreover, in the case where a work place identity is highly prominent and a person's self-meanings in relation to a new implemented IT exist at the "Not-Me" pole of IT identity, the "Not-Me" IT identity may be highly salient in predicting initial use. As noted in the Introduction, a nurse who views his/her interactions with an EMR as completely unrelated to his/her sense of what it means to be a nurse may simultaneously hold a positive view of an EMR's potential to improve patient care *and* circumvent mandated use procedures when he/she feels that a system-enabled admission process diverts his/her attention from providing much-needed emotional support to patients. As a consequence, managerial interventions aimed at fostering IT identity in connection to an organizational ITs cannot be designed without reference to how use of a new technology may conflict with meanings contained in individuals' other prominent identities.

While making clear divisions between IT identity and other work place identities is somewhat arbitrary (Gal and Kjærgaard 2009), our conceptualization of how IT identity is constructed offers insights into the dynamics of these relationships. We have proposed (*P1*) that, all things being equal, IT identities that can be enacted across a wide range of groups, roles, and situations have greatest potential to influence role and social identities. In this instance, individuals are primarily motivated to develop IT identity to increase resources that facilitate achievement of personal goals that might arise. We have also associated these identities with high synchronicity-high mobility ITs (*P2*). In contrast, individuals' attitudes and behaviors toward ITs characterized by low synchronicity and low mobility are most likely to be influenced by meanings contained in important role and social identities. This implies that, depending on an IT's levels of synchronicity and mobility, organizations should employ different strategies to foster IT

identity in relation to the IT. Proposed strategies are summarized in Figure 3.14 and described next.



Our conceptualization of IT identity suggests that to foster IT identity formation in relation to **high synchronicity-high mobility** ITs, organizations should emphasize a technology's potential to increase physical, social, and personal resources that facilitate achievement of any personal goals that may arise. Additionally, providing individuals with the situational support to explore the many features and situations in which an IT can be used will promote rapid self-expansion. For **high synchronicity-low mobility** ITs, which facilitate synchronous exchange and shared patterns of coordinated behavior, organizations need to emphasize a technology's potential to enhance worth-based self-



esteem through expanding a person's ability to think and behave in concert with other members of important in-groups. In the case of *low synchronicity-high mobility* ITs, the focus is on achieving self-expansion through increasing a person's ability to maintain and enhance multiple social relations. Here, organizations should emphasize a technology's potential to transcend boundaries of time and space.

The three strategies outlined above focus on emphasizing how particular technology characteristics can enhance a person's self-concept by increasing their physical and social resources. However, it is worth noting that highlighting an IT's potential as a source of self-expansion is not in itself enough to foster IT identity formation. Organizations must also make it possible for employees to experience rapid self-expansion by providing support for them to redirect *significant* attention and resources to pursuing that goal (Aron et al. 2003). This implies that organizations should consider augmenting end-user training—which is designed to provide employees with the skills necessary to apply an IT in accomplishing work tasks—with an intensive period of applied learning within the work setting that allows employees to immerse themselves in exploring the many features and situations in which an IT can be used.

Finally, low *synchronicity-low mobility* ITs, which provide resources to support specific roles or groups, are least likely to foster a prominent IT identity. Of note, is that because identities are arranged hierarchically, changing the meanings in more important identities creates changes in lower-level identities. Thus, in situations where an IT identity is prominent, a change in IT identity will influence individuals' perceptions of the roles they perform, their social groups, and situations they experience. Conversely,

where a role or social identity is prominent, changing its meanings can lead to changes in a person's attitude and behaviors toward an IT (Burke and Stets 2009).

On this basis, we suggest that fostering IT identity in connection to low-synchronicity-low mobility ITs will require interventions that focus on identifying and *changing* meanings contained in the prominent role or social identity, rather than on fostering positive attitudes toward the IT itself. Thus, if a person's internalized expectations for being a competent nurse are not related to interacting with an IT, the employing organization will need to facilitate identity change—e.g. “as a nurse, providing accurate patient information via an EMR system is an important part of my role” rather than “as a nurse, I am a care-giver, not a data-pusher.” This is in sharp contrast to high mobility or high synchronicity ITs, where, depending on the specific characteristics of a technology, organizations can direct employees' attention to the potential for rapidly expanding the individual self-concept, or on increasing feelings of self-efficacy and self-worth across multiple roles and groups.

While identities are always in process, in the sense that the meanings contained in them are continually changing (Burke and Stets 2009; Gal and Kjærgaard 2009), for the most part this change is cumulative and gradual—usually taking place over a period of some months, rather than over days or weeks. This follows because the verification process means that identities (and therefore the people who claim them) *resist* change (Burke and Stets 2009). Thus, investigating managerial interventions that trigger identity change in higher-level role and social identities to influence individuals' attitudes and behaviors toward IT is critical to understanding long-term IT use behaviors—particularly,

in situations where an IT has limited potential to influence role and social identities. The proposed strategies are formally stated below.

***P8:** To promote relationships with high synchronicity-high mobility ITs, emphasize ITs' potential to increase personal resources that facilitate achievement of goals that may arise.*

***P 9:** To promote relationships with high synchronicity-low mobility ITs, emphasize ITs' potential for increasing ability to maintain and enhance social relations.*

***P10:** To promote relationships with low synchronicity-high mobility ITs, emphasize ITs' potential to transcend boundaries of time and space in support of multiple roles.*

***P11:** To promote relationships with low synchronicity-low mobility ITs, focus on identifying and changing meanings contained in the prominent role or social identity, rather than on fostering positive beliefs/attitudes toward the IT itself.*

## **VIII. CONCLUSION**

This paper formally theorizes a role for IT identity as a core construct in explaining individuals' attitudes toward using information technologies and their long-term IT use behaviors. Identity is an important concept because, at a fundamental level, people think and act in ways that are congruent with the identities that weigh prominently as part of their individual self-concepts. Increasing human-technological entanglement means the relationship between IT and identity needs to be explored further, since IT has become an essential component of the interactions in which identities are constructed and maintained. Examining the processes by which individuals develop and maintain identities in relation to specific ITs, as well identifying technology characteristics that

foster (or inhibit) IT identity formation, offers IS researchers a new theoretical lens for investigating how and why individuals actually use IT.

This essay contributes to the technology assimilation literature in three ways. First, it formally defines the domain and dimensions of IT identity, which is necessary for developing measures to investigate the construct's influence on IT use. Second, it identifies a partial nomological network for IT identity, including its antecedents, consequents, and boundary conditions. Our theoretical discussion explains how, since IT identity is motivated by a desire for self-expansion, engaging in feature extension behaviors to enhance one's potential efficacy is an important component of its enactment. Third, the propositions derived from the theoretical discussion offer a research agenda for investigating IT identity's role in explaining individuals' long-term IT use behaviors. This research agenda provides a basis for extending understanding of organizational assimilation of ITs.

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## APPENDIX 1: INDIVIDUAL/GROUP LEVEL RESEARCH ON IDENTITY IN THE IS DOMAIN<sup>8</sup>

<b>1: IT as a tool to support social interactions and present identities to others</b>				
<i>Author(s)</i>	<i>Year</i>	<i>Description</i>	<i>Theoretical Perspective</i>	<i>Level of Analysis</i>
Adam et al.	2006	Action research to align health information system with users' requirements	Feminist approach	Individual
Akah and Bardzell	2010	Explores the relationship between appropriating digital artifacts as creative resources in the home and personal identity	Design theory	Individual
da Cunha and Orlikowski	2008	How employees' use of an online forum helped them deal with perceived threats to their identity	Practice perspective	Individual
Forman et al.	2008	Presentation of reviewers' identities affects other shoppers' behaviors	Social identity Information processing theory	Group
Lamb and Davidson	2005	How scientists use IT to construct and present a professional scientist identity	Interactionism Network theory	Individual - Group
Lamb and Kling	2003	Develops the user as a social actor model	Labeling theory Institutional theory Structuration	Individual
Ma and Agarwal	2007	Identity presentation, mediated by IT artifacts, leads to knowledge contribution in online communities	Self-presentation theory	Individual
Vaast	2007	Participants' self-presentation in occupational online forums	Symbolic interactionism	Individual

<sup>8</sup> This Appendix integrates and builds on recent reviews of identity research in IS—notably, the works of Gal and Kjærgaard (2009) and Nach and Lejeune (2009)

<b>2: The impact of IT on role and social identities</b>				
<i>Author(s)</i>	<i>Year</i>	<i>Description</i>	<i>Theoretical Perspective</i>	<i>Level of Analysis</i>
Dickey et al.	2007	How a shared frame of reference between customers and online customer service representatives enables coordination	Discourse analysis	Individual
Alvarez	2008	Impact of enterprise system implementation on power relations and identity	Critical discourse analysis	Individual
Alvarez	2002	Issues of identity, conflict, and power in IS requirements analysis	Critical discourse analysis	Individual
Avery and Baker	2002	Impact of IT on the household in a home-based work context	"Reframing"	Group
Barrett and Scott	2004	How increased globalization and IT impacts self-identity during implementation of an e-trading system	Structuration	Individual
Barrett and Walsham	1999	Social transformations induced at the institutional and individual level by new IT in a London Insurance Market	Structuration	Individual - Institutional
Barrett et al.	2001	Social transformations induced by GIS at the institutional and individual level	Structuration	Individual - Institutional
Brocklehurst	2001	Describes experiences of group of professional workers who transitioned to home working through use of IT.	Structuration	Group
D'Mello and Sahay	2007	Investigates the relationship between mobility and changes in identity in the context of global software work	Structuration	Individual
Gal et al.	2008	Relationships between IS, information infrastructures, and organizational identities in the architecture industry		
Kilduff et al.	2005	Investigates technologies that create and sustain work place identity	Structuration	Group
Moon et al.	2006	Investigates the impact of blogs on social identity on the Internet	Social identity	Individual
Schultze and Boland	2000	Tensions between place and space of outsourced computer systems administrators	Theory of practice	Individual
Vaast and Walsham	2005	Investigates how agents adapt work practices to reestablish consonance between IT use and representations of themselves.	Cognitive dissonance	Individual
Van Akkeren and Rowlands	2007	Impact of enterprise system implementation on radiologists' role and social identities	Social actor theory	Individual
Walsham	1998	Examines professional identity in relation to the use of new information technology in organizations	Structuration	Individual

<b>3: The impact of role and social identities and IT acceptance and use</b>				
<i>Author(s)</i>	<i>Year</i>	<i>Description</i>	<i>Theoretical Perspective</i>	<i>Level of Analysis</i>
Hillmer	2009	Examines the influence of role and social identities on technology acceptance behaviors	Social identity Identity/TAM	Individual
Hinds and Mortenson	2005	How shared identity and shared context moderate the effect of geographic distribution on team conflict	Social identity	Group
Kim et al.	2007	The impact of ethnicity on individuals' connectedness to the Internet	Communication infrastructure theory	Group
Lee et al.	2006	The impact of role identity on technology acceptance	Social identity/TAM	Individual
Liu and Chan	2010	The impact of social identity on individuals' perceptions of a virtual healthcare community	Social identity Social support theory	Individual
Sarker and Sahay	2003	Theorizes how development of an "integrative identity" across virtual team is an enabler of successful collaborations	Discourse analysis Structuration	Group
Schwartz and Watson	2005	How employee perceptions of group membership guide the change outcomes of an organization implementing a new IT	Social identity	Group
Thompson	2002	Gender identity and women as IT workers	Action research	Individual
Trauth	2002	Examines the relationship between social shaping of IT and gender identity to theorize about women's participation in the IT sector	Socio-cultural approach	Individual
Walsh	2010	Examines individual IT use as a cultural learning process	Acculturation	Individual
Walsh and Hajer	2008	Conceptualizes IT culture as a form of social identity resulting from membership in a group (or groups) that engage(s) in IT use	Culture Social Identity	Individual
Walsh et al.	2010	Identifies nine archetypal IT user profiles resulting from membership in IT user groups and proposes a cultural perspective on IT adoption and use	Culture Social Identity	Individual

# **ESSAY 3: IT IDENTITY: A KEY DETERMINANT OF EXTENDED AND EXPLORATORY IT USE**

## **I. INTRODUCTION**

With today's information technologies (IT) increasingly embedded in products, processes, and services, their productive use has become instrumental to organizational productivity and positive economic returns (Venkatesh and Goyal 2010). At the same time, prior IS research has illustrated that under-utilization of organizational IT by individuals often prevents organizations from realizing the expected benefits from their technology investments (Devaraj and Kohli 2003; Venkatesh and Goyal 2010).

Assimilation of IT into organizational processes does not begin and end with individuals' initial acceptance and use. Rather, it requires individuals to engage in a sustained period of use in order to acquire the knowledge and skills to adapt to rapidly changing feature sets, as well as embed IT into organizational work processes.

Because use is the critical link between technology investments and enhanced organizational performance through IT (Devaraj and Kohli 2003), in recent years, IS researchers have begun to focus attention on the post-adoption context—i.e. “after an IT application has been installed, made accessible to the user, and applied by the user in accomplishing his/her work activities” (Jasperson et al. 2005). The goal of this research stream is to understand factors that influence individuals' behavioral attempts to use an IT to its *fullest potential* in the work setting (Chin and Marcolin 2001).

Post-adoption research maintains theoretical continuity with models of initial use e.g. the technology acceptance model (TAM) (Davis 1989; Davis et al. 1989) and the

unified theory of user acceptance and use of technology (UTAUT) (Venkatesh et al. 2003). Continued use is largely viewed as intentional behavior, driven by a series of conscious decisions to act (Ortiz De Guinea and Markus 2009, p. 433) . These decisions have two key inputs: *beliefs* (e.g. post-usage perceptions of usefulness) and an individual's *affective response* to his/her behavioral attempts at using the technology (e.g. satisfaction) (Ortiz De Guinea and Markus 2009). Consistent with studies on initial use, post-adoption research largely disregards the social contexts of IT use (Ortiz De Guinea and Markus 2009; Venkatesh et al. 2008). Missing this key element precludes making accurate predictions of long-term IT use behaviors; since continued use occurs within, and depends on, individuals' interactions with the contexts in which they are embedded.

Paradoxically, given the goal of understanding factors that promote productive and embedded use of IT, studies theorizing different types of continued use are notably lacking from post-adoption research. Much of this stream designates behavioral intentions as the dependent variable (e.g. Tiwana and Bush 2005; Vatanasombut et al. 2008; Venkatesh et al. 2011, and others). Where use, rather than intentions, has been considered it is generally measured in terms of duration and/or frequency (e.g. Bhattacharjee et al. 2008; Brown et al. 2011; Venkatesh et al. 2008). To date, few studies have incorporated system features into measures of behavior (Jasperson et al. 2005; Venkatesh and Goyal 2010). Further, despite calls for IS research to develop understanding of behaviors such as adaptation, learning, and reinvention (Agarwal 2000; Benbasat and Barki 2005), scant attention has been directed toward individuals' attempts to explore new features of the IT they regularly interact with (Saeed and Abdinnour-Helm 2008). Hence, as technology assimilation research continues its transition to

examining continued IT use, there is still a need to develop understanding of why and how individuals actually use IT within work settings (Lyytinen 2010). Lacking such understanding limits our ability to offer guidelines for organizations seeking to accrue benefits though individuals' sustained use of organizational ITs.

Sociological social psychology research suggests that incorporating the concept of identity into post-adoption studies can help bridge the gap between our current models of usage and models that explain long term and richer IT use behaviors (Burke 1991a; Stets and Biga 2003). From this perspective, individuals' behaviors are linked to the social context through the identities that they claim. Identities are the sets of meanings people apply to the self about who they are, and how they should act, in the groups they belong to, the roles they perform, and in the norms, values, and characteristics they claim that define them as distinct from other people (Freese and Burke 1994).

The underlying premise of identity research is that individuals have a fundamental need to act in ways that are congruent with identities that are important to maintaining the individual self-concept (Burke 1991a; Burke and Stets 2009). Because IT has become an essential component of the interactions in which identities are developed and maintained (Lamb and Kling 2003; Turkle 2011), the identities that individuals enact in the work place necessarily reflect the changing landscape of IT embedded in organizational processes (i.e. digitalization of the enterprise) . This suggests that to advance research on continued IT use, it is necessary to examine the influence on behavior of the identities individuals develop in relation to IT they use on a regular basis.

To that end, this study proposes that as individuals interact with particular IT across a variety of situations, roles, and groups, these IT can become integral to their

sense of who they are in the many social positions they occupy. Specifically, we conceptualize IT identity—defined here as *the set of meanings an individual attaches to the self in relation to information technology*—as a product of individuals’ history of interactions with an IT that shapes their enduring attitudes, their post-usage behavioral intentions, and their ongoing IT use behaviors.

The rest of the paper is structured as follows. The next section describes current understanding, as well as limitations, of prior research on continued IT use. Following this, we make the case that bringing identity into post-adoption research will enhance explanation and predictiveness of individuals’ long-term use of IT. Next, to elucidate conditions under which IT identity is a salient determinant of post-adoption intentions, we test the construct’s predictiveness for two types of IT in a model incorporating IT identity, attitude, and intentions vis-à-vis an influential model of post-adoption use—the IS continuance model (Bhattacharjee 2001b; Bhattacharjee and Premkumar 2004). Then, because the goal of post-adoption research is to extend understanding of factors that promote use, we examine IT identity’s influence on different measures of behavior relative to those exerted by post-usage perceptions of usefulness (Davis 1989). The paper concludes with a discussion of results, limitations, and implications for research and practice.

## **II. LITERATURE REVIEW**

### **Our Current Understanding of IT Use: The IS Continuance Model**

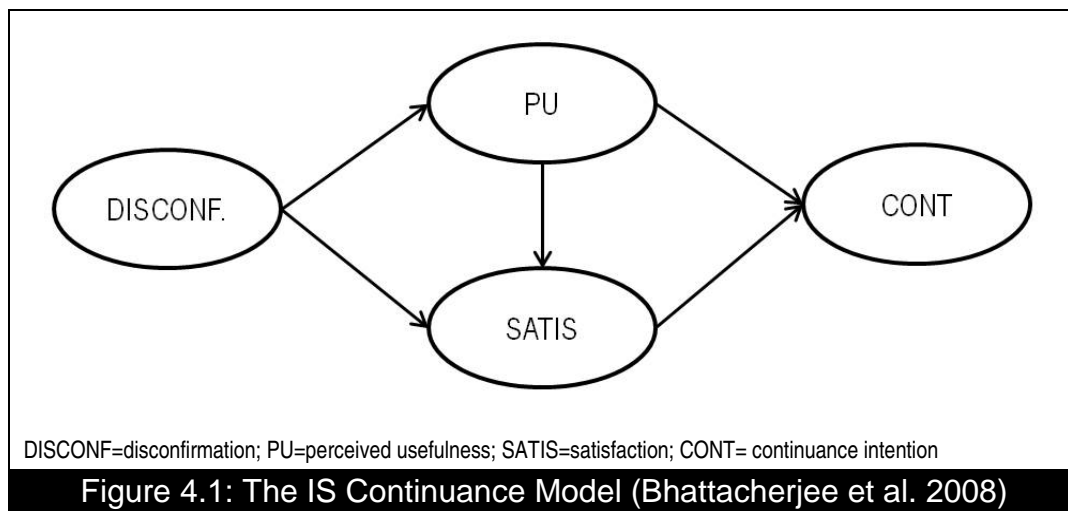
In post-adoption research, the IS continuance model (Bhattacharjee 2001b) has been particularly influential in maintaining continuity with research on initial IT use. This model postulates that individuals’ decisions to continue using an IT are influenced by the

extent to which their pre-usage expectations have been confirmed (or disconfirmed) by actual use of the technology. The IS continuance model is rooted in expectation confirmation theory (ECT) (Oliver 1977; Oliver 1980), which has been applied in marketing research to examine consumers' post-purchase decisions. ECT proposes that prior to using a product for the first time, consumers form expectations about its likely performance. Following a period of use, they develop post-usage perceptions of the product's actual performance, which they compare with their initial expectations. The discrepancy between pre-usage expectations and post-usage perceptions is referred to as *disconfirmation*. Pre-usage expectations and disconfirmation jointly determine satisfaction with the product or service, such that satisfied consumers will form intentions to repurchase the product, while dissatisfied consumers will not.

In adapting ECT to the IS context, Bhattacharjee (2001b) proposed that disconfirmation of pre-usage beliefs (i.e. *the extent to which actual usage experiences are perceived as being better or worse than an individual's pre-usage perceptions about a technology's perceived usefulness* ) influences post-usage perceptions of usefulness (i.e. *the extent to which an individual believes that using the IT will enhance his or her job performance* (Davis 1989)) and satisfaction (i.e. *the degree to which an individual views his or her actual usage experiences positively or negatively*). The underlying premise being that negative disconfirmation of pre-usage beliefs will negatively influence post-usage perceptions of usefulness and satisfaction, while positive disconfirmation will exert a positive influence. Post-usage perceptions of usefulness and satisfaction, in turn, determine continuance intentions (i.e. *the intent to continue using a technology for work-related purposes*). Post-usage usefulness is also posited to influence satisfaction. By



using disconfirmation to link individuals' pre-usage expectations with their post-usage beliefs and satisfaction, the IS continuance model captures how changes in individuals' perceptions resulting from first-hand experience of an IT influences their behavioral intentions to continue using the technology. The IS continuance model is depicted in Figure 4.1.



### Limitations of Current Approaches

Appendix 1 presents the key findings of twenty-seven empirical papers on continued IT use published in major IS journals during the period 2001 - 2011<sup>9</sup>. These studies illustrate the IS continuance model's influence in research examining individuals' ongoing use of IT. However, as summarized in Table 4.1, current approaches have limitations in their potential to shed light on actual continuance behaviors.

<sup>9</sup> While Appendix 1 does not present a comprehensive set of papers on post-adoption research, it does provide a representative sample of continuance research published in major journals during the period. As such, we believe it provides useful insights into our current understanding of individuals' continued IT use.

Table 4.1: Current Approaches to Understanding Individuals' Continued IT Use			
Limitations	Evidenced by	# studies	Implications for research on continued IT use
Current models do not adequately explain the nature of continued IT use	Designation of continuance intention as the dependent variable	21 of 27	1. Intentions are provisional and may change. 2. Narrow measure of continuance intention leads to narrow measure of continued use
	When considered, continued use most often measured as duration or frequency.	5 of 6	3. Duration and/or frequency do not provide information about how individuals actually use IT.
Existing constructs lack power to predict long-term use	Where stated, current models mostly focus on short-term continued use (i.e. < 12 months)	15 of 21	4. Constructs such as disconfirmation, perceived usefulness and satisfaction may have less predictiveness for long-term use.
	The attitude construct has been excluded from most models of continued use	19 of 27	5. Because attitude has been shown to be a key predictor of long-term behaviors, discounting its role limits explanatory/predictive power
The impact of the larger social context has been largely disregarded	Social factors are often excluded from models of continued use	14 of 27	6. The social context of use creates shared expectations for IT use behavior.
	When social factors are included, these are often conceptualized narrowly as facilitating conditions (perceived behavioral control) or social influence (subjective norm)	8 of 13	7. Facilitating conditions and social influence are inconsistent predictors of continuance intentions and use.

### **Limitation 1: Inadequate Explanation of the Nature of Continued Use**

The ability of current approaches to predict and explain continued use is limited in two key ways. First, despite evidence of only a low to moderate correlation between intention and behavior (Davis et al. 1989), existing models often designate intention as the dependent variable. One criticism of intention-based models is that they have limited ability to deal with incomplete information and uncertainty (Venkatesh et al. 2008). Since new information may come to light between forming an intention and performing a behavior, intentions are may be provisional and subject to change; making them unstable, and often inaccurate, predictors of behavior (Ajzen and Fishbein 1980; Sutton 1998). This problem is exacerbated when individuals lack complete volitional control over their behaviors (Davis et al. 1989; Venkatesh et al. 2008).

Second, as outlined in Table 4.2, where existing models have been extended to include behavior, these too have tended to use lean measures of behavior, such as

frequency or duration (e.g. Bhattacharjee et al. 2008; Lankton et al. 2010; Limayem and Cheung 2008; Venkatesh et al. 2008). While this is consistent with much of the research on technology acceptance, it assumes that post-adoption behaviors can be appropriately conceptualized in terms of amount of use. However, as noted by Jasperson et al. (2005, p. 527), this focus does not adequately reflect the reality of continued use behaviors, which, “not only intensify, but may also diminish over time, as the various features of an IT application are resisted, treated with indifference, used in limited fashion, routinized within ongoing work activities, championed, or extended.”

Table 4.2: Measures of IT Use Behaviors				
<i>Richness of measures<sup>1</sup></i>	<i>Measures of behavior</i>	<i>Operationalization</i>	<i>Example(s)</i>	<i># studies using measure</i>
<b>Lean</b>	<b>Duration</b> (Igbaria, 1995; Venkatesh and Davis, 2000)	Self-reported measure of the time spent using a target technology for work-related tasks or system logs	In the past <n> weeks, how much time did you spend using the <target technology> for work-related activities on a typical work day? ___ Hours and ___ Minutes	3
	<b>Frequency</b> (Bagozzi and Warshaw, 1990; Igbaria, 1995, 1996, Mathieson et al. 2001)	Self-reported measure of how often an individual has used a target technology in the past <n> weeks	During the past 3 weeks I used the <target technology> for work-related activities 1 = not at all, 2 = once, 3 = a couple of times, 4 = several times; 5 = many times, and 6 = very many times	5
<b>Somewhat Rich</b>	<b>Breadth of Use</b> (Saga and Zmud, 1994)	Self-reported measure of the number of features an individual has used in support of work	Please indicate which of the following technology features you used for work purpose in the last <n> weeks. (followed by list of technology's features)	1
<b>Rich</b>	<b>Deep Use</b> (Lucas and Spitler, 1999; Schwarz, 2003)	The extent to which an individual reports having employed a number of different features to complete work related tasks using the technology	During the past <n> weeks, my use of features that helped me _____ was (not at all, extremely light... extremely heavy) (followed by list of tasks)	1
	<b>Trying to Innovate</b> (Ahuja and Thatcher, 2005)	The extent to which an individual reports having made behavioral attempts to find new ways of using a target technology in support of a work role	I tried to use the <target technology> in novel ways to support my work role	1
1: Based on Burton-Jones and Straub's (2006) classification of measures of system use				

To date, few studies have incorporated system features into measures of behavior (Jasperson et al. 2005; Venkatesh and Goyal 2010). Moreover, our literature review revealed that scant attention has been directed toward understanding factors that trigger exploratory or innovative use of the technologies that individuals interact with on a regular basis. Only one study in our sample (e.g. Saeed and Abdinnour-Helm 2008) employed measures of extended (i.e. *deep use* (Lucas Jr and Spitler 1999)) and exploratory use (i.e. *trying to innovate* (Ahuja and Thatcher 2005)). Understanding factors that promote extended and innovative use of an IT's feature set is central to understanding how IT become embedded in individuals' behavioral routines and organizational processes.

### **Limitation 2: Lack of Power to Predict Long-Term Use**

Where length of experience with a target technology was stated, most of the studies reviewed investigated initial (< 6 months) or short-term continued use (< 12 months). This emphasis on short-term use creates problems because assumed relationships between predictors and behavior have been shown to attenuate over time (Bhattacharjee et al. 2008; Karahanna et al. 1999; Liao et al. 2009; Venkatesh and Goyal 2010). For example, disconfirmation, which compares pre-usage expectations with post-usage experiences, may suffer from recall bias because current experience is more accessible and salient in memory than an individual's initial expectations about the performance of a technology (Karahanna et al. 1999; Venkatesh and Goyal 2010). As a result, individuals' recall of past expectations may be guided by their current experiences. This acts to reduce the perceived discrepancy between pre-usage expectations and post-usage experiences and leads to inaccurate results (Venkatesh and Goyal 2010).

There also appears to be a temporal aspect to the influences of post-usage perceptions of usefulness and satisfaction. Perceived usefulness, which captures the extent to which an individual perceives that using an IT will enhance his or her job performance, may become less predictive over time because, presumably, individuals are more aware of the ways in which an IT can enhance performance in the initial stages of use. For example, in the first days or weeks of using a tablet PC, users are likely to be highly cognizant of how increased connectivity provides them with greater access to information and allows them to be more responsive to others. Over time, however, the resources afforded by increased connectivity can become assimilated into a person's current view of his or her work role. At this stage, the device's usefulness may be taken for granted, such that its relationship with intentions becomes weaker (Liao et al. 2009).

The effect of satisfaction may also be transitory. Unlike attitude, which represents an enduring affective response to interacting with IT that is experience invariant, satisfaction refers to a short-term affective response based on an immediately preceding usage experience (Bhattacharjee et al. 2008). As such, Bhattacharjee et al. (2008, p.19) note, satisfaction may exhibit an effect only when measured immediately following a period of use—"however, the satisfaction effect is likely to attenuate with increasing temporal separation between prior experience and intention measurements."

In contrast to disconfirmation, perceived usefulness, and satisfaction, attitude—an inconsistent predictor of individuals' initial acceptance decisions—has been shown to be a critical determinant of post-usage intentions (Kim et al. 2009). Still, the attitude construct has largely disappeared from models of continued use. This is consistent with technology acceptance research that has discounted attitude's role in predicting

individuals' intentions to use new IT (Venkatesh 2000; Venkatesh and Davis 1996; Venkatesh et al. 2003). However, excluding attitude from models of continued IT use ignores that initial use and continued use behaviors are conceptually and temporally distinct—and, as such, are not necessarily predicted by the same factors (Bhattacharjee and Barfar 2011; Jasperson et al. 2005).

This view is supported by early post-adoption research, which showed that attitude fully mediated the effects of beliefs on behavioral intentions when individuals had experience of the target technology (e.g. Amoako-Gyampah and Salam 2004; Chen et al. 2002; Hsu and Lu 2004; Karahanna et al. 1999), as well as recent work that found attitude's predictiveness of continuance intention increased with time (Liao et al. 2009). When considered alongside evidence of the diminishing effects of disconfirmation, perceived usefulness, and satisfaction, attitude's role as a key predictor of post-usage intentions warrants investigation.

### **Limitation 3: Disregarding the Impact of Social Factors on Continued Use**

Another shortcoming of current approaches is that existing models often disregard that individuals' continued use of IT is shaped and guided by the social context of use (Ortiz De Guinea and Markus 2009; Stets and Biga 2003). Long-term behaviors, in particular, require interactions with the context that support the use of IT (Jasperson et al. 2005). Lacking such an environment, use would necessarily be limited. Where social factors are taken into account, these too are often conceptualized narrowly as “facilitating conditions” or “social influence” (Bhattacharjee et al. 2008; Venkatesh et al. 2011). Limitations of both concepts have been noted in the literature. Facilitating conditions, which represent the degree to which individuals perceive they have knowledge, resources,

and opportunities to perform a particular behavior, are posited to accurately predict behavior only when these perceptions match the reality of the social context of use (Venkatesh et al. 2008). Social influence, which reflects the extent to which individuals' acceptance and use decisions are swayed by external pressures exerted by important others (Sykes et al. 2009), has been found to exert effects predominantly in the initial stages of mandatory system use (Venkatesh et al. 2003). As outlined in Appendix 1, the precise impacts of these social factors on long-term continuance intentions and use are unclear. This is consistent with behavioral research in other domains that also presents ambiguous findings for the direct relationships between perceived behavioral control (facilitating conditions), subjective norms (social influence), behavioral intentions and behaviors (e.g. Sparks et al. 1995; Terry et al. 1999; Theodorakis 1994).

To more accurately predict the impact of the larger social context on IT use, recent work has utilized social network analysis to examine individuals' initial acceptance and use of new IT (Sykes et al. 2009). This approach takes into account how networks of roles and relationships within the work place facilitate or constrain individuals' access to resources and social norms related to IT use. Social network analysis illuminates how social factors can influence individuals' IT use decisions. However, as noted by Sykes et al. (2009), practical challenges to implementing the approach—for example, the effort required by respondents and difficulties in determining the appropriate boundaries of the social network—place limits on its explanatory power.

In sum, three problems limit the explanatory and predictive potential of current approaches. These are: (1) a narrow focus on intentions and lean measures of use offer do not adequately explain the nature of continued use; (2) incomplete and limited

constructs reduces the ability to predict longer-term use; and (3) a lack of attention to the larger social context does not take into account that use depends on individuals' interactions with the contexts in which they are embedded. In the following section, we make the case that bringing identity into post-adoption research will alleviate limitations of current work to enhance explanation and predictiveness of individuals' continued IT use.

### **Bringing Identity into Research on Continued IT Use**

Identity can be described as “a way of organizing information about the self” that defines what it means to be who one is (Clayton, 2003). Broadly speaking, identities can be classified into three major types. Prior literature on identity distinguishes between identities derived from membership in a group or social category (*social identity*), those focused on roles and interpersonal relationships (*role identity*), and those focused on the self as a unique and identifiable entity (*person identity*) (Brewer and Gardner 1996, p. 83; Burke and Stets 2009). Identity research provides three key takeaways that suggest identity may be useful to understanding individuals' continued IT use. These are outlined in Table 4.3 and discussed in detail next.



**Table 4.3: Studies examining the relationships between identity and behavior**

Row #	Representative Studies from Other Domains	Relationships Examined	Key takeaways from identity research	How identity enhances explanation and predictiveness of continued IT use
1	Biddle et al. (1987); Charng et al. (1998); Dennison and Shepherd (1995); Granberg and Holmberg (1990); Guthrie and Sparks (1998); Sparks and Guthrie (1998); Sparks and Shepherd (1992); Sparks et al. (1995); Terry et al. (1999); Theodorakis et al. (1995)	Identity → Behavioral Intention	<b>Takeaway 1:</b> Identity is a primary motivator of behavior	Unlike more transient constructs, identity is enduring and resistant to change.  Identity exerts independent effects on behavioral intentions and behavior.  Where the predictiveness of satisfaction and perceived usefulness have been shown to diminish with time, the predictive strength of identity on actual behavior increases.
2	Biddle et al. (1987); Granberg and Holmberg (1990); Stets and Biga (2003); Theodorakis (1994); Theodorakis et al. (1995)	Identity → Behavior		
3	Charng et al. (1998); Sparks and Shepherd (1992); Stets and Biga (2003)	Identity → Attitude	<b>Takeaway 2:</b> Identity promotes enduring positive attitudes	Identity promotes enduring attitudes, which in turn positively impact behavioral intentions and behaviors.  In contrast to satisfaction and perceived usefulness, the predictiveness of attitude on behavioral intentions and behavior has been shown to increase over time.
4	Charng et al. (1998); Sparks and Guthrie (1998); Sparks and Shepherd (1992); Terry et al. (1999)	Attitude → Behavioral Intention		
5	Biddle et al. (1987); DeBono and Snyder (1995); Stets and Biga (2003); Theodorakis et al. (1995)	Attitude → Behavior		
6	Callero (1985); Nuttbrock and Freudiger (1991); Stryker and Serpe (1994); Theodorakis et al. (1995)	Social Influence (subjective norm) → Identity	<b>Takeaway 3:</b> Identity links the social context to individual behavior	Studies support the view that the impacts of social influence and facilitating conditions are mediated by identities that link people to the social structures in which they are embedded.
7	Burke and Reitzes (1991); Burke and Stets (2009); McCall and Simmons (1978/1966)	Facilitating (perceived behavioral control) → Identity		

### **Takeaway 1: Identity is a Primary Motivator of Behavior**

Research on identity offers strong evidence that identities influence behavioral intentions and behaviors independent of attitudes (e.g. Biddle et al. 1987; Burke 1991a; Chang et al. 1988; Granberg and Holmberg 1990; Sparks and Shepherd 1992; Stets and Biga 2003). More importantly, these studies show that, in the case of repeated behaviors, identity, rather than attitude, is the *primary motivator* of behavior (Stets and Biga 2003). For example, in examining the relative effects of blood-donor identity and attitude on blood donations, Charng et al. (1988) found that “blood donors gave blood when the

blood-donor identity became important to them. Further, they found that the more one donated blood, the more the blood-donor identity predicted giving blood, rather than one's attitude toward donating blood" (Stets and Biga 2003, p. 400). Charng et al.'s findings are validated by studies examining identity, attitudes, and a variety of repeated behaviors, including: continuing in college (Biddle et al. 1987), voting (Granberg and Holmberg 1990), exercise (Theodorakis 1994), food choice (Armitage and Conner 1999; Dennison and Shepherd 1995; Sparks and Guthrie 1998; Sparks et al. 1995), and household recycling (Terry et al. 1999). These findings suggest that researchers may more accurately predict long-term IT use behaviors by incorporating identity, as well as attitude, into models of continued IT use.

### **Takeaway 2: Identity Promotes Enduring Positive Attitudes**

Identity research indicates that identities are central to understanding how individuals' develop enduring positive attitudes (Stets and Biga 2003). For example, in research examining the effects of environment identity on environmental attitudes and behaviors, Stets and Biga (2003) found that where past environmental behavior had been guided by the meanings contained in a person's environment identity, these meanings were likely to manifest in enduring attitudes, and subsequently, in a wide range of "environmentally-friendly" behaviors, such as recycling, buying energy saving appliances, taking the bus, etc.

Identifying determinants of attitude is important for two reasons. First, an enduring positive attitude toward using or not using a technology is likely to be a more important predictor of long-term IT use than post-usage evaluations of usefulness and satisfaction that have short-lived effects on behavior (Bhattacharjee et al. 2008; Liao et al.

2009). Second, some argue that such transient constructs may not matter if researchers can identify ways of influencing attitudes directly (e.g. Agarwal 2000).

### **Takeaway 3: Identity Links the Social Context to Individual Behavior**

As individuals interact with others in “the context of a complex, organized, differentiated society”, they develop many identities, each of which is tied to an aspect of the social structure in which they are embedded (Stets and Burke 2005, p. 132). Identities are arranged hierarchically, with those that are more salient across situations having greater potential to influence behavior than less salient identities (Stets and Biga 2003).

Identity construction is made possible because individuals learn the meanings and expectations associated with social categories from others and from the social structures in which they exist (Burke 2004). Social structures can be defined in terms of institutional structures, referring to “the cultural and normative expectations that [individuals] hold about each other’s behavior” and relational structures, which refer to the social networks of relationships and roles that are defined by these expectations (Lopez and Scott 2000, p. 3). Identities are the meanings and expectations that individuals internalize about who they are—and how they should act—relative to others, in the groups they belong to (e.g. as a member of an organization), in the roles they perform (e.g. as a parent), and in the norms, values, and characteristics they claim that define them as distinct from other people (e.g. as a moral person) (Freese and Burke 1994).

Because individuals’ hierarchies of multiple identities reflect their cognitive schemas of the social structures in which they are embedded (Stryker and Serpe 1994), identities take into account external factors that facilitate or inhibit performance of a

behavior. In this sense, identities mediate the influence of social structures on individuals' cognitions and behaviors (Burke and Stets 2009). Thus, identity-based models are expected to more accurately predict behavior than models those that either disregard the larger social context or conceptualize its effects narrowly as social influence and facilitating conditions (Charng et al. 1988).

In sum, while existing research on continued IT use has been useful for predicting individuals' continuance decisions, it is limited in its potential to shed light on actual continuance behaviors. In this section, we described how bringing identity into models of continued IT use can enhance explanation and predictiveness of individuals' ongoing IT use. Next, we draw on this theoretical frame to formally define the concept of IT identity and develop hypotheses about its influences on attitudes, behavioral intentions, and use behaviors in the post-adoption period.

### **III. THEORY AND HYPOTHESES**

Bringing identity into research on continued IT use is important because, increasingly, social relations between people and institutions are maintained via computer-based social networks (Hillmer 2009). With the result that, for many, the cultural and normative expectations that define their roles and relationships are becoming inseparable from their interactions with IT (Orlikowski 2010). Mobile phones and networked technologies, in particular, have helped to change the social structures in which identities are constructed. These devices, which act as portals to other people and places, transcend geographic and cultural boundaries (Turkle 2011), reduce social distances between adults and children (Cerulo 1997), and link the workplace with the personal space (Gant and Kiesler 2002; Masmanian et al. 2006). The ubiquitousness of IT

in individuals' work and personal lives, means these technologies have become fundamental to how individuals see themselves, what they do, and how they do it (Lamb and Davidson 2005; Lamb and Kling 2003; Turkle 2011).

Given the potential for a specific IT (e.g. a mobile phone) or class of ITs (e.g. the Internet or computers in general) to become so embedded in individuals' lives that they become entangled with being who one is across groups, roles, and situations, it appears reasonable to assume that a person's history of interactions and perceived relationships with particular ITs will give rise to the question, "Who am I, through my use of this technology?" On this basis, we conceptualize IT identity as the set of meanings an individual attaches to the self in relation to IT that attempt to answer this question.

### **The Domain and Dimensions of IT Identity**

IT identity is an individual level construct, capturing the extent to which a person's interactions with an IT or class of ITs are integral to his/her individual self-concept. In keeping with identity theorists' view that asking "Who am I?" in relation to social objects, also involves consideration of asking "Who am I not?" (McCall 2003), we propose these meanings exist on a continuum ranging from strong IT identity (self-identification)—"my interactions with an IT (or class of ITs) are integral to my sense of who I am"—to weak IT identity (dis-identification)—"my interactions with an IT (or class of ITs) are completely unrelated to my sense of who I am." As indicated by sociological identity theories (Stets and Biga 2003), the stronger a person's IT identity is in relation to a particular IT, the greater its potential to influence his or her behavior, particularly with respect to interacting with IT in the long-term.

IT identity is motivated by individuals' need to enhance their sense of self through self-expansion—i.e. enhancing one's "potential efficacy by increasing physical and social resources, perspectives, and identities that facilitate achievement of any [personal] goal that might arise" (Aron et al. 2003, p. 478). One way to achieve self-expansion is by including resources and characteristics afforded by important relationships in one's individual self-concept. While this is often taken to mean interpersonal relationships, consumer research suggests that people may also include resources and characteristics of nonhuman objects to which they have become emotionally attached (Belk 1988). The notion of self-expansion implies that as a person's IT identity becomes stronger, he/she will express an increasing overlapping of boundaries—i.e. a sense of connectedness—between his/her notions of the self and an IT, as well as emotional attachment to the technology, and feelings of reliance upon the relationship to maintain/enhance his/her self-esteem (Aron et al. 2003; Aron et al. 1992).

Consistent with self-expansion, some identity theorists have drawn on the semantic differential technique and the three universal dimensions of affective meaning identified by Osgood and colleagues (Osgood et al. 1975; Osgood et al. 1957) to measure the meanings an individual attributes to the self in performing a role (self-in-role) or in claiming a personal characteristic as their own (self-as-characteristic) (Burke and Tully 1977). These dimensions are, evaluation (e.g. does thinking about the self in relation to an IT evoke positive feelings?); activity (e.g. is the self in relation to an IT seen as energetic?), and potency (e.g. is the self in relation to an IT seen as dependent?).

Based on the above, we conceptualize IT identity as a higher-order construct, reflecting three interrelated dimensions that represent an individual's affective response

to him- or her- self in relation to a particular IT (e.g. a cell phone) or class of ITs (e.g. mobile device technologies). These dimensions are: ***relatedness***, which refers to a blurring of boundaries between notions of the self and an IT experienced as feelings of connectedness with an IT or class of ITs, ***emotional energy***, referring to an individual's enduring feelings of emotional attachment and enthusiasm in relation to an IT or class of ITs; and ***dependence***, which represents a person's reliance on an IT or class of ITs as a source of personal well being.

Relatedness maps to Aron et al.'s (2003; 1992) notions of connectedness in that as individuals incorporate resources and characteristics of an IT into their self-concepts, this manifests as feelings of connectedness with the IT. Emotional energy and dependence, map to the universal dimensions of affective meaning (Osgood et al. 1975; Osgood et al. 1957). Emotional energy maps to evaluation in the sense that individuals attribute positive emotions to themselves in relation to an IT and to activity in that it incorporates individuals' feelings of energy and enthusiasm for interacting with an IT. Dependence maps to potency when individuals associate their personal well being with the relationship. Implicit in this is the IT's potential to exert power over a person as an outcome of that individual's dependence upon it (Kemper and Collins 1990). Relatedness, emotional energy, and dependence vary among individuals based on the strength of a person's IT identity. Moreover, a strong IT identity will positively influence a person's attitude toward interacting with an IT and, subsequently, his/her continued IT use. This study's conceptualization of IT identity and its dimensions is given in Table 4.4.

Table 4.4: IT identity and its Dimensions			
Higher Order Construct	Conceptual Definition	Operational Definition	Maps to
<i>IT identity</i>	The set of meanings an individual attaches to the self in relation to IT. IT identity exists on a continuum ranging from strong IT identity (self-identification)—“my interactions with an IT (or class of ITs) are integral to my sense of who I am”—to weak IT identity (dis-identification)—“my interactions with an IT (or class of ITs) are completely unrelated to my sense of who I am.”	Reflected in three interrelated dimensions of affective meaning: relatedness, emotional energy, and dependence.	N/A
Underlying Dimensions	Conceptual Definition	Operational Definition	Maps to
<i>Relatedness</i>	A blurring of boundaries between notions of the self and an IT experienced as feelings of connectedness with an IT or class of ITs.	The extent to which an individual expresses feelings of connectedness when thinking about her- or him-self in relation an IT or class of ITs.	<b>Connectedness</b> (Aron et al. 1992; 2003)—how close a person feels to the other party in a relationship.
<i>Emotional Energy</i>	An individual's enduring feelings of emotional attachment and enthusiasm in relation to an IT or class of ITs	The extent to which an individual expresses feelings of confidence, enthusiasm, and energy when thinking about her- or him-self in relation an IT or class of ITs.	<b>Evaluation</b> (Osgood et al. 1957) — does a stimulus evoke positive feelings?  <b>Activity</b> (Osgood et al. 1957)—is the stimulus lively?
<i>Dependence</i>	An individual's reliance on an IT as a source of personal well being.	The extent to which an individual expresses feelings of reliance when thinking about her- or him-self in relation an IT or class of ITs.	<b>Potency</b> (Osgood et al. 1957)—is the stimulus strong?

### Technology Characteristics and Continued IT Use

Much of our current understanding of individuals' acceptance and use of IT is based on models examining individuals' use of static, single-use, IT within organizations (Lyytinen 2010). This paradigm was particularly useful at a time when individuals first encountered technologies in the work place (e.g. PCs, spreadsheets, networking) and then started using them in their personal lives. However, due to rapid technological advances, today, people are using, and becoming familiar with, multi-use, portable, and networked technologies (e.g. Smartphones and tablet computers) in their personal lives before these



IT have infiltrated the work place (Schaffner 2010). These dynamic, “consumer technologies” provide a rich computing platform of features and capabilities, that have application across a broad range of social contexts (Yoo 2010). Most importantly, individuals that are exposed to these technologies in their personal lives are demanding access to them at work (Bernoff and Schadler 2010). Against this backdrop, it is important to explore whether the effects of IT identity on behavior depend on the type of technology (static, single-use vs. dynamic, multi-use platform) that the identity is tied to.

We propose that individuals develop and sustain an IT identity in relation to a technology’s feature set. Static, single-use technologies encourage repeated interactions with a relatively unchanging set of available features. As these repeated interactions become integrated into a person’s view of who he or she is as an individual, they become an important part of maintaining his/her self-concept. This reinforces commitment to enacting the identity, which will be expressed as the intentions to carry on using the technology, as well as exploring new ways of using it as the best means of achieving self-expansion.

Multi-use platform technologies, in contrast, have rapidly changing feature sets due to upgrades and new software applications. This creates environmental disturbances that promote new identity formation, as they present an opportunity to expand the self through incorporating the resources afforded by the new features into the self-concept (Aron et al. 2003). However, they also introduce temporal noise as individuals adjust their cognitions and behaviors to resolve discrepancies between meanings held in the existing IT identity and technological changes. As an example, an individual may express an unwillingness to explore an expanded feature set if doing so conflicts with meanings

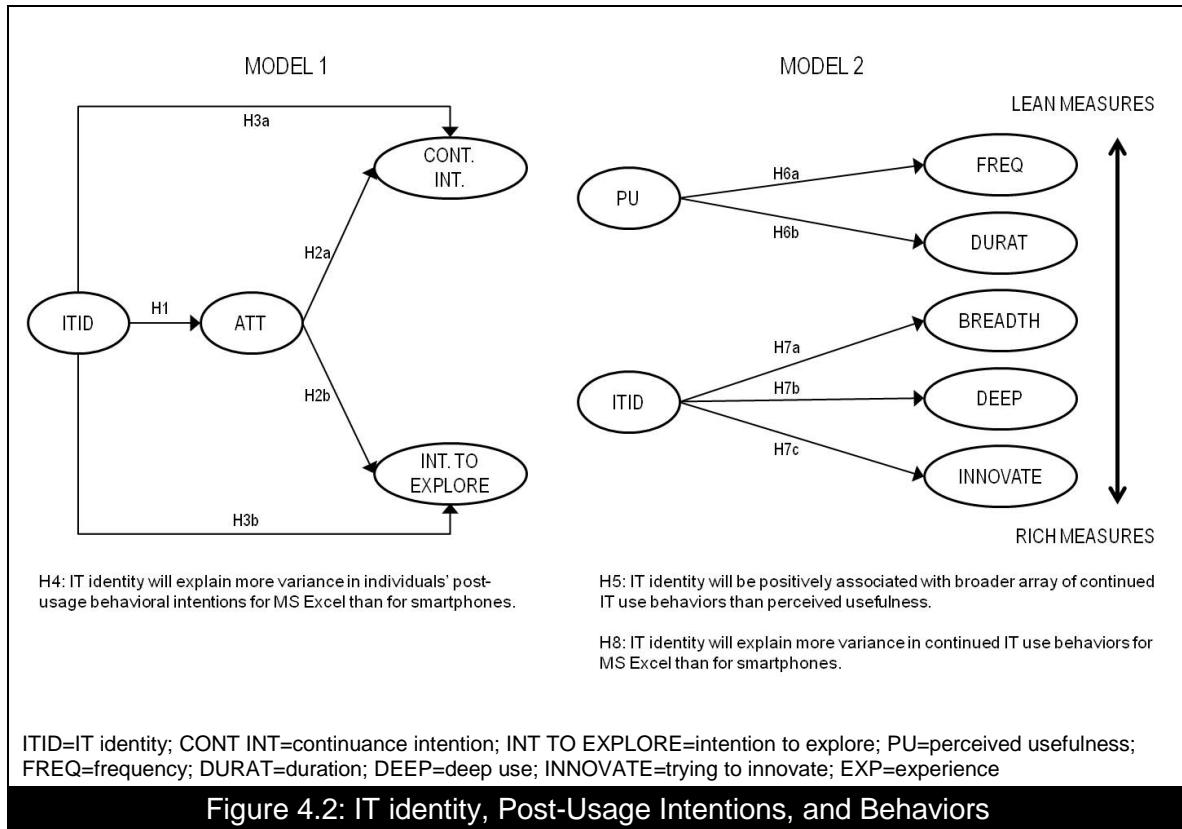
held in the existing identity (Burke and Stets 2009). With the result that IT identity is likely to be less predictive of post-usage intentions and continued use behaviors for dynamic, multi-use platform technologies than for static, single-use, technologies.

### **Testing the Explanatory and Predictive Power of IT Identity**

To delimit a role for IT identity in models of continued IT use, we draw on the key takeaways from identity research (Table 3) to develop hypotheses about the construct's relationships with post-usage intentions and behaviors. We test our hypotheses in two identity-based models of continued IT use. Model 1 examines the construct's influences vis-à-vis the IS continuance model on individuals' continuance and exploratory intentions (collectively termed, *post-usage intentions*) for two information technologies—a static, single-use IT application (MS Excel) vs. a dynamic, multi-use platform (the smartphone)—that are often utilized by individuals in the work context. Key differences between the intention-based IS continuance and IT identity models are summarized in Table 4.5.

<b>Table 4.5: Differences between the intention-based IS continuance and IT identity models</b>		
<b>Relationships in IS Continuance Model</b>	<b>Changes in intention-based IT identity model</b>	<b>Rationale for changes</b>
Disconfirmation → Perceived Usefulness	1. Attitude substitutes for disconfirmation, perceived usefulness, and satisfaction.	1. Disconfirmation, perceived usefulness, and satisfaction effects attenuate with time.
Disconfirmation → Satisfaction	2. Intention to explore added to the model	2. Attitude (as revised expectations) subsumes disconfirmation, perceived usefulness, and satisfaction.
Perceived Usefulness → Satisfaction	3. IT identity posited to influence attitude and post-usage (continuance and exploratory) intentions independent of attitude	3. Attitude has been shown to be a consistent predictor of intention in the post-adoption context.
Perceived Usefulness → Continuance Intention		4. Because IT identity is motivated by a desire for self-expansion, its enactment should involve exploring features of an IT that could enhance self-efficacy.
Satisfaction → Continuance Intention		

Then, because the goal of post-adoption research is to extend understanding of factors that directly promote use, Model 2 investigates IT identity's influences on different measures of behavior relative to those exerted by perceived usefulness for MS Excel and smartphones. Our research models examining IT identity's influence on post-usage intentions and behavior are presented in Figure 4.2 and outlined in detail next.



### Model 1: IT Identity and Post-Usage Behavioral Intentions

The proposed research model utilizes attitude in place of disconfirmation, perceived usefulness, and satisfaction to capture individuals' post-usage evaluation of their ongoing IT use. There are three reasons for this designation. First, prior IS research has shown that the effects of disconfirmation, usefulness, and satisfaction may diminish over time (Bhattacharjee et al. 2008; Karahanna et al. 1999; Liao et al. 2009; Venkatesh

and Goyal 2010). Second, identity research has uncovered a strong positive relationship between identity and attitude toward performing a focal behavior (Table 3, Row 1), which in turn positively impacts behavioral intentions (Table 3, row 2). For example, in the context of identity related to non-human objects, Stets and Biga (2003) found that where past environmental behavior had been guided by the meanings contained in a person's environment identity, these meanings were likely to manifest in positive attitudes toward performing environmentally friendly behaviors. Applied to IT use, this suggests that when interactions with an IT are viewed as integral to a person's sense of self, it will promote a positive attitude toward ongoing use of the technology. This leads to the following hypothesis:

***H1: IT identity will be positively associated with post-usage attitude toward using an IT.***

The third reason for including attitude in our identity-based model is that in the context of continued IT use, attitude has been shown to be a more consistent predictor of behavioral intentions to continue using an IT than other constructs (e.g. Amoako-Gyampah and Salam 2004; Chen et al. 2002; Hsu and Lu 2004; Karahanna et al. 1999; Liao et al. 2009). Attitude may have superior predictiveness because it represents individuals' overall evaluation of their ongoing use of IT, aggregated from prior behavioral, cognitive, and affective information (Maio and Haddock 2010). Given that in the original formulation of expectation confirmation theory, individuals' post-usage attitudes represented their revised expectations (Oliver 1980), we propose this information is represented by the triad of disconfirmation, perceived usefulness, and satisfaction, respectively. Because, in effect, post-usage attitude subsumes

disconfirmation, perceived usefulness, and satisfaction, we expect it to be a better predictor of continuance intention than these more transient constructs.

To further explore attitude's predictiveness of individuals' post-usage behavioral intentions, we also examine what role the construct plays in promoting individuals' exploratory use intentions. Intention to explore, defined as "a user's purpose and motivation to innovate based on perceived business related benefits she will derive from IT deployment" has been proposed as an important predictor of individuals' exploratory behaviors in relation to new IT (Nambisan et al. 1999). However, notwithstanding IS researchers' goal of understanding factors that promote behaviors such as adaptation, learning, and reinvention (Agarwal 2000), research on continued IT use has paid little attention to the construct. Further, to our knowledge the relationship between attitude and exploratory intentions has yet to be explored. Despite a lack of empirical evidence in the IS domain, research in psychology links positive emotion with exploratory behaviors (Dreisbach and Goschke 2004). Given that attitude is expressed in terms of positive or negative valence, we extrapolate these findings to posit that when individuals have a positive attitude toward ongoing use of an IT, this will manifest in intentions to explore the technology. Thus, we hypothesize:

***H2:** Post-usage attitude will be positively associated with individuals' (a) continuance intention, and (b) intention to explore an IT.*

Most importantly, we examine the predictiveness of IT identity on post-usage behavioral intentions. Identity research (Table 3, row 4) shows that identity exerts independent effects over and above those exerted by attitude. Identity is particularly useful for understanding long-term IT use, because repeated behaviors are often

integrated into notions of the self. As such, repeated behaviors can convey meaning over and above the attitudes that a person may have toward the behavior itself (Charng et al. 1988). As regards continuance intention, this implies that when ongoing use of an IT is important to maintaining the self-concept then, regardless of a person's attitude toward performing the behavior, he/she will express an intention to continue using it. Thus, individuals may express the intention to go on responding to work-related emails in the evenings and weekends, regardless of their attitudes toward being in perpetual contact with their employing organizations, because being accessible is an important part of their individual self-concepts.

With respect to intention to explore, identity research suggests that when individuals claim an identity they will seek out opportunities to enact it (McCall and Simmons 1978/1966; Swann et al. 2005). Given that IT identity is motivated by a desire for self-expansion, we suggest its enactment involves exploring features of a technology that could enhance individuals' potential efficacy and facilitate achievement of personal goals that might arise. Identity and attitude theories share the view that behavior is intentional (Stets and Biga 2003). Moreover, when individuals claim an identity they tend to reinforce that claim, not only in the outward presentation of the identity to others but also in the way they represent the identity internally to themselves (McCall and Simmons 1978/1966). On this basis, we would expect that post-usage behavioral intentions based on salient strong IT identity to reflect the desire to expand the self through exploring features of the IT. Thus, we hypothesize:

***H3: IT identity will be directly and positively associated with (a) continuance intentions; (b) intention to explore IT.***

We also examine IT identity's influence on individuals' post-usage intentions in relation to MS Excel (a static, single-use technology) and the Smartphone (a dynamic, multi-use platform technology). As a static, single-use technology, MS Excel encourages repeated interactions with a relatively unchanging set of available features, which reinforces commitment to enacting the identity. This commitment will be expressed as the intentions to carry on using the technology, as well as exploring new ways of using it as the best means of achieving self-expansion. Smartphones, in contrast, have dynamically changing feature sets that can create discrepancies between meanings held in an existing IT identity and new perceptions introduced by technological changes. Since individuals must adjust their cognitions and behaviors to resolve these discrepancies, IT identity will be less predictive of post-usage intentions for smartphones than for MS Excel. Consequently, we propose that the predictiveness of IT identity depends on the extent to which a technology's feature set can be characterized as relatively static vs. dynamically changing. On this basis, we hypothesize:

***H4:** IT identity's predictiveness of individuals' post-usage intentions depends on characteristics of a technology's feature set. IT identity will explain more variance in post-usage intentions for MS Excel (a relatively static feature set) than for the smartphone (a dynamically changing feature set).*

## **Model 2: IT Identity and Continued IT Use Behaviors**

The utility of IT identity to research on continued IT use depends on some evidence that it influences actual use behaviors, and that it offers greater explanatory and predictive power than other determinants. Our literature review revealed that, to date, few studies have incorporated behavior into models of continued IT use. Further, when

behavior has been included, most often it has been operationalized as duration or frequency (Lankton et al. 2010; Limayem and Cheung 2008; Limayem et al. 2007; Venkatesh et al. 2008). One criticism of this narrow focus is that it offers little insight into the nature of IT use (Benbasat and Barki 2005; Lyytinen 2010). Moreover, as Benbasat and Barki (2005) point out, it raises an interesting question “that needs to be answered”—i.e. is perceived usefulness as powerful in explaining reinvention and learning behaviors, as it is in explaining the amount of use?

To tease out the influences of IT identity on continued use (and to address the question posed by Benbasat and Barki), we investigate the construct’s predictiveness relative to perceived usefulness for different measures of use that have been employed in prior empirical IS studies (see Table 2). Examining IT identity’s effects relative to those exerted by perceived usefulness is particularly useful because these constructs operate different levels of analysis, with perceived usefulness being more narrowly focused than IT identity. Perceived usefulness focuses on the value to the individual of using an IT in a particular situation. IT identity, focuses on how interacting with the technology (including the nature of those interactions) has become incorporated into an individual’s self-concept across situations. Due to its broader focus, IT identity has the potential to predict a wider range of behaviors than perceived usefulness. Thus, rather than being substitutable, IT identity and perceived usefulness should exert distinct effects on different conceptualizations of use.

As depicted in Figure 4.2, we investigate the influences of IT identity and perceived usefulness in a model that does not include post-usage intentions. There are two key reasons for this decision. First, research on initial use has found only a low to



moderate correlation between intention and behavior (Davis et al. 1989) – particularly, when behavior is not completely volitional. This problem is posited to be exacerbated for continued use, which cannot be sustained without support from the larger social context of use (Bhattacharjee et al. 2008). Second, the relationships between behavioral intention and different conceptualizations of use have not been theoretically justified in prior research (Burton-Jones and Straub 2006; Venkatesh et al. 2008). Lacking more nuanced measures of intention, extending intention-based models to include usage will not necessarily increase predictiveness or expand our understanding of behaviors that do not logically stem from intention as conceptualized in prior studies.

To examine our proposal that IT identity will predict a broader array of behaviors than perceived usefulness, we first examine both constructs' effects on several measures of behavior that have been employed in prior empirical IS studies (see Table 2): namely, *frequency* and *duration of use* (Igbaria et al. 1995; Igbaria et al. 1996), *breadth of use* (Saga and Zmud 1994), *deep use* (Lucas Jr and Spitler 1999), and *trying to innovate* (Ahuja and Thatcher 2005). Here, we test the hypothesis that IT identity will be positively related to more behaviors than perceived usefulness. Formally stated:

***H5: IT identity will be positively associated with a broader array of continued IT use behaviors than perceived usefulness.***

Next, we specify relationships between perceived usefulness and different conceptualizations of use. While there is little evidence in post-adoption research, to date, to support the view that perceived usefulness actually predicts continued use, we hypothesize that it will be most strongly related to amount of use (i.e. frequency and duration). This assumption is based on a wealth of initial use studies that found perceived

usefulness to be positively associated with amount of use, particularly when use is voluntary and does not involve high knowledge barriers (Gallivan 2001).

One study reviewed here (Saeed and Abdinnour-Helm 2008) has suggested that perceived usefulness may also be related to richer measures of use in situations where engaging with an IT has the potential to enhance an individual's job performance. Saeed and Abdinnour-Helm (2008) tested the construct's predictiveness of deep use (Lucas Jr and Spitler 1999) and trying to innovate (Ahuja and Thatcher 2005). Deep use, which captures the extent to which individuals have employed different features for work purposes, incorporates breadth of use, which represents the number of features an individual has used in support of work. Trying to innovate reflects the extent to which an individual has made behavioral attempts to find new ways of using a technology for work. These authors hypothesized, and found, that when individuals held positive cognitive beliefs about the potential outcomes of their interactions with an IT, they would be more likely to engage in exploratory behaviors. A similarly argued hypothesis related to deep use was not supported, suggesting that perceived usefulness may not be related to extended use (breadth and deep use).

We take the view that because usefulness does not take into account the larger social context, it will have limited ability to predict these richer conceptualizations of behavior. Consequently, while we hypothesize positive relationships between perceived usefulness and frequency/duration of use, we do not propose similar links between perceived usefulness and breadth of use, deep use, or trying to innovate. Formally stated:

***H6: Perceived usefulness will be positively associated with (a) frequency of use, and (b) duration.***

As regards the influences of IT identity, identity has been found to be a primary motivator of long-term behaviors (Table 3, row 5). Identity theorists suggest that when an identity is important to the self, a person will seek out opportunities to enact it (McCall and Simmons 1978/1966; Swann et al. 2005). As noted earlier, research on environment identity found that when individuals had a strong identity tied to the environment, they engaged in environmentally friendly behaviors across a wide range of situations (Stets and Biga 2003). A recent inductive study, exploring young people's relationships with their cell phones provides empirical support for this view in the IS context (Carter et al. Unpublished doctoral dissertation). In this work, Carter et al. found a strong relationship between the meanings young people attributed to the self in relation to cell phones and embeddedness (as the extent to which participants interacted with different phone features or interacted with their phones across situations). On this basis, we would expect to see strong relationships between IT identity, breadth of use, and deep use.

Additionally, we posit that IT identity will predict innovative use of technology. The motivational model of self-expansion posits that increasing self-efficacy expectancy ("the perceived likelihood that the self will be able to achieve a particular goal") is "a goal in its own right" (Aron et al. 2003, p. 479). That is, people are motivated to expand the self because of fundamental drive for self-efficacy. Because IT identity is motivated by individuals' desire for self-expansion, it follows that its enactment involves exploring features of a technology and finding novel ways of using it as the best way to increase self-efficacy expectancy. While we propose that IT identity will be positively related to extended and exploratory use, due to its broad focus, we do not necessarily assume that it

will accurately predict frequency or duration of use in a specific situation. Thus, we hypothesize:

***H7:** IT identity will be positively associated with (a) breadth of use; (b) deep use, and (c) trying to innovate.*

Finally, we examine IT identity's influence on different conceptualizations of continued use in relation to MS Excel and the smartphone. Consistent with H4, we propose that the IT identity's ability to predict continued IT use behavior depends on the extent to which a technology's feature set can be characterized as relatively static vs. dynamically changing. On the basis that repeated interactions with MS Excel's relatively unchanging feature set should reinforce commitment to enacting the identity, while the smartphone's rapidly changing feature set acts as an environmental disturbance on the identity process, we propose that IT identity will be more predictive of behaviors for MS Excel than for the smartphone. Thus, we hypothesize:

***H8:** IT identity's predictiveness of continued IT use behaviors depends on characteristics of a technology's feature set. IT identity will explain more variance in individuals' continued IT use behaviors for MS Excel (a relatively static feature set) than for the smartphone (a dynamically changing feature set).*

### **Control Variables**

Attitude, experience, and age are identified as three variables that may impact performance of continued IT use behaviors. While the relationship between attitude and actual use behaviors has not been established in the IS context, we have proposed attitude as a key determinant of post-usage intentions. Thus, in testing the relative influences of IT identity and perceived usefulness, we statistically control for attitude's effects on

different conceptualizations of behavior. It is also important to control for experience. Research suggests that individuals' behavioral choices may be influenced by relevant past behaviors (e.g. habit), independent of their attitudes toward performing a behavior or how performing a behavior may influence the self-concept (Limayem et al. 2007). In addition, prior research in the post-adoption context has found that assumed relationships between perceived usefulness and post-usage intentions can attenuate over time (Liao et al. 2009), which suggests that experience with a target technology could exert similar effects with respect to behavior. Finally, we control for the effects of age. Age differences have been shown to exist in technology acceptance decisions (Venkatesh et al. 2003) and may impact individuals' willingness to engage with different features of the technologies they interact with.

The proposed hypotheses are presented in Table 4.6. Next, we describe our methodology for operationalizing IT identity and conducting tests of the hypotheses.

Table 4.6: Summary of Hypotheses			
IT identity and Post-Usage Intentions		IT identity, Perceived Usefulness and Continued Use Behaviors	
<i>Item</i>	<i>Hypothesis</i>	<i>Item</i>	<i>Hypothesis</i>
HH1	IT identity will be positively associated with post-usage attitude toward using an IT	H5	IT identity will be positively related to a broader array of continued IT use behaviors than perceived usefulness
H2a	Post-usage attitude will be positively associated with individuals' intentions to continue using an IT	H6a	Perceived usefulness will be positively associated with frequency of use
H2b	Post-usage attitude will be positively associated with individuals' intentions to intentions to explore IT.	H6b	Perceived usefulness will be positively associated with duration of use
H3a	IT identity will be positively associated with continuance intentions	H7a	IT identity will be positively associated with breadth of use
H3b	IT identity will be positively associated with intentions to explore IT.	H7b	IT identity will be positively associated with deep use.
		H7c	IT identity will be positively associated with trying to innovate.
H4	IT identity will explain more variance in individuals' post-usage behavioral intentions for MS Excel than for smartphones.	H8	IT identity will explain more variance in individuals' continued IT use behaviors for MS Excel than for smartphones.

#### IV. RESEARCH METHOD

Having specified the domain of IT identity, we followed Churchill's (1979) suggested procedure for developing and validating its measurement. As outlined in Figure 4.3, this involved a three-stage process of (1) item generation, (2) item refinement and modification, prior to (3) conducting the main study and testing hypotheses. Table 4.7 summarizes participants' roles and outcomes at each stage.

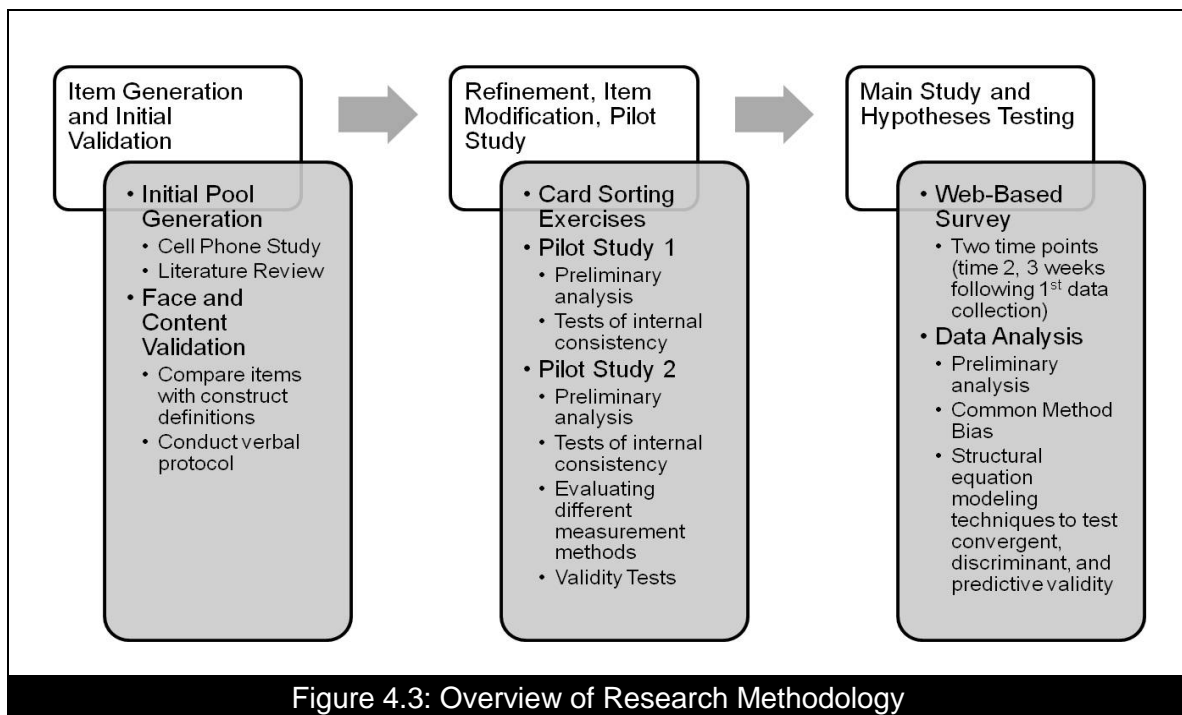


Table 4.7: Research Participants' Roles and Outcomes					
Stage	Steps	Participants	# participants	Activities/Roles	Outcomes
1	Verbal protocol	Undergraduate students, full-time employees	4, 4	Initial validation of the IT identity items, screen out redundant, inapplicable items, and generate additional items	Initial item pool reduced from 34 to 27 items
2	Initial card-sorting exercise	Undergraduate students	6	Assessment of content validity of items using a card-sorting exercise, screening out of ambiguous items	Item pool reduced to 24 items
	Second card-sorting exercise	MBA students	34	Assessment of content validity of items using a card-sorting exercise, screening out of ambiguous items	Item pool reduced to 21 items
	Pilot study 1	Full-time employees	190	Reduce items. Refine survey instrument.	177 valid responses  Item pool reduced to 12 items.
	Pilot study 2	Full-time employees	211	Refine survey instrument	197 valid responses  Likert scale approach determined to be most appropriate.
3	Main study	Full-time employees	277	Response to wave 1 of final survey instrument	264 valid responses
			163	Response to wave 2 of final survey instrument	155 valid responses

### Developing Valid Measures of IT Identity

We used the smartphone as the target technology throughout the item generation, refinement and modification process. A full description of the procedure we followed in stages 1 and 2 to develop valid measures of IT identity is provided in Appendix 2. Items were generated based on a review of the identity literature and an inductive study in which we explored if young people's self-concepts were tied to their interactions with their cell phones. Following recommended practices, we assessed face and content validity using a verbal protocol (Churchill 1979; Malhotra and Grover 1998). In this step, we asked four undergraduate students (who had participated in the cell phone study) and four individuals in full-time employment to assess the clarity of construct definitions, as well as the items used to measure the constructs. Items were then refined and modified

through two card sorting exercises and two pilot studies. In the pilot studies, two independent samples of full-time employees who used smartphones in support of their work roles evaluated the IT identity items via web-based surveys.

Data from the first pilot study was used to arrive at a sample of items that best represented the domain of IT identity (Churchill 1979). In the second pilot, we evaluated two different methods (i.e. Likert vs. semantic differential scales) for measuring IT identity. Results of CFA-based multi-trait multi-method (MTMM) analysis (Byrne 2006), supported the conceptualization of IT identity as a higher-order construct, reflecting three distinct but highly correlated dimensions. GOF statistics for the 1<sup>st</sup> and 2<sup>nd</sup> order models were equivalent (Appendix 2, Table A2-7). These findings indicate that modeling IT identity as a higher-order construct does not significantly change model fit (Bentler and Bonett 1980). MTMM also established that IT identity was measurable by at least two methods. However, further analysis showed both methods were not equally good. Inspection of trait and method loadings provided strong evidence that the Likert scale was a better measure of IT identity than the semantic differential scale.

As a final step, we conducted tests of the higher-order IT identity construct's convergent, discriminant, and concurrent validity in relation to four IS constructs that we expected it to correlate positively with. These constructs were: habit (Limayem et al. 2007); continuance intention (Bhattacharjee and Premkumar 2004); perceived usefulness (Davis 1989; Davis et al. 1989), and intention to explore (Nambisan et al. 1999). Since results offered further support for the reliability (Cronbach's  $\alpha > 0.80$ ), convergent validity (average variance extracted (AVE)  $> 0.50$ ), discriminant validity (off-diagonal latent variable correlations  $< \sqrt{\text{AVE}}$ ), and concurrent validity (positive correlations) of



the IT identity construct (Fornell and Larcker 1981), we conducted a main study to gather sufficient evidence of IT identity's validity and, consequently, its utility to IS research on continued IT use.

### **Main Study and Hypotheses Testing**

The proposed hypotheses were tested empirically using a longitudinal survey research design with data collected via a web-based survey in two waves (wave 2, 3 weeks following first data collection). Our population of interest was all individuals that use smartphones and MS Excel in support of their work roles within an organizational context. Construction of a sample frame from the relevant population supported the external validity of our study (Berkowitz and Donnerstein 1982). Thus, the sampling frame included only those individuals who, at the time of data collection, were working full-time; used smartphones and MS Excel to complete work tasks; and expressed a willingness to complete a survey at 2 separate time points. Screening questions were developed to ensure that respondents matched our target sample frame. Respondents were matched across the two surveys via unique ID numbers.

### **Measures**

With the exception of IT identity, measures were developed or adapted based on existing scales. Measures of deep use (Lucas Jr and Spitler 1999) were tailored to the capabilities available across smartphones and to the major features of MS Excel. As noted by Burton-Jones and Straub (2006), there are difficulties involved in creating reflective constructs that fully capture features of the technology as well as the activities these features can be used for. For example, as a multi-use platform technology, the smartphone has features that allow people to make phone calls, send text messages,

search for information online, and find their way to unfamiliar places. Use of these features may or may not be highly correlated. Similarly, a person may use MS Excel extensively to perform financial calculations but never attempt to visualize data using conditional formatting. In the sense that deep use is a composite of several possible activities, it is defined by its indicators rather than the other way round. Further, items are not necessarily interchangeable—e.g. text messaging is not interchangeable with voice calls; performing numeric calculations on data is not interchangeable with performing financial calculations. Thus, dropping an indicator may alter the domain of the deep use construct. On this basis, the deep use construct was specified as formative, rather than reflective (Jarvis et al. 2003). Appendix 3 details the measures used in both surveys.

Confirmatory factor analysis (CFA), covariance-based structural equation modeling (SEM) techniques, and partial least squares (PLS) analysis were used to establish the convergent, discriminant, and predictive validity of the IT identity construct.

### **Survey Data Collection**

Following recent IS studies (Ayyagari et al. 2011; Roberts and Grover 2011), we used a market research company (Empanelonline: [www.empanelonline.com](http://www.empanelonline.com)) to recruit and administer the online survey to a representative sample of smartphone users (see Appendix 4 for details). Market research panels can help to provide researchers with greater control over their data collection efforts (Ayyagari et al. 2011). For example, these companies have access to extremely large databases of panel members, who are profiled over many attributes, to help ensure that research panels are representative of the US population at large. Moreover, market research companies employ several quality assurance mechanisms, such as verifying demographic information provided by panel

members against validated consumer demographics, and taking steps to identify fraudulent behavior. When used in conjunction with appropriate screening questions, these features help prevent sampling and statistical conclusion errors by ensuring that researchers have access to appropriate sample frames for their studies and can acquire adequate sample sizes and response rates.

### **Sample Size**

We drew on MacCallum et al.'s (1996) approach to determining sample size for CFA and SEM models. Specifically, this approach calculates the sample size needed for a specified number of degrees of freedom, such that the researcher will have sufficient power to reject the null hypothesis that the root mean square of approximation (RMSEA) is less than or equal to a particular non-zero value, e.g.  $H_0: \text{RMSEA} \leq 0.05$  at a given alpha level. We used an online tool (available from <http://quantpsy.org/>) that implements MacCallum et al.'s approach to compute the sample size required for two CFA models: Model 1—the IS continuance model, with 94 degrees of freedom; and Model 2—the IT identity model, with 161 degrees of freedom. For both models, a power level of 0.80 (Cohen 1988) and an alpha level of 0.05 was specified. Because power levels increase with increasing degrees of freedom, the sample size required to test Model 1 of  $n = 169$  was larger than the sample size of  $n = 125$  required to test Model 2. To be conservative, and to allow for attrition between the two surveys, we aimed for a minimum sample size of 250 respondents in wave 1.

### **Wave 1: IT Identity as a Predictor of Post-Usage Behavioral Intentions**

In wave 1, Empanelonline randomly sampled 3,500 panel members who were employed full-time. 1,073 working individuals accessed the online survey. Of these, 661

respondents were not eligible to complete the survey (279 did not use either smartphones or MS Excel for work purposes; 319 did not use smartphones, and 63 did not use MS Excel) and were not allowed to continue. The remaining 277 individuals, who matched the target sample frame, completed the survey.

**Preliminary Analysis:** Screening the data for unusual responses (e.g. “straight-lining”) resulted in 13 responses being rejected. We conducted preliminary analysis on the remaining data, including tests for outliers, non-response bias, skewness, and kurtosis (Tabachnick and Fidell 2007). Univariate outliers were assessed based on standardized residuals. Mahalanobis distance values were used to evaluate multivariate outliers. No outliers were found, leaving a usable sample of 264 cases. Table 4.8 presents sample characteristics. The sample contained an approximately equal number of male and female respondents, with an average age of between 35 and 44 years, and over 70% with at least a Bachelor’s degree.

Table 4.8: Wave 1 Sample Characteristics			
Variable	Value	Frequency	% Respondents
<b>Gender</b>	1: Male	135	51.1
	2: Female	129	48.9
<b>Age</b> Mean: 3.14; Median: 3.00; S.D: 1.023	1: 21 and under	0	0.0
	2: 22 to 34	87	33.0
	3: 35 to 44	85	32.2
	4: 45 to 54	65	24.6
	5: 55 to 64	23	8.7
	6: 65 and over	4	1.5
<b>Experience using smartphones</b> Mean: 3.05; Median: 3.00; S.D: 1.270	1: < 6 months	32	12.1
	2: >=6 months and < 1 year	63	23.9
	3: >=1 year and < 2 years	76	28.8
	4: >=2 years and < 3 years	46	17.4
	5: >= 3 years	47	17.8
<b>Experience using MS Excel</b> Mean: 4.300; Median: 5.00; S.D: 1.060	1: < 6 months	5	1.9
	2: >=6 months and < 1 year	18	6.8
	3: >=1 year and < 2 years	36	13.6
	4: >=2 years and < 3 years	38	14.4
	5: >= 3 years	167	63.3
<b>Education</b> Mean: 3.64; Median: 4.00; S.D: 1.223	1: High School	11	4.2
	2: Some College	35	13.3
	3: Associate's Degree	28	10.6
	4: Bachelor's Degree	132	50.0
	5: Master's Degree	54	20.5
	6: PhD or Equivalent	4	1.5
<b>Total Subjects</b>			<b>264</b>

Next, we conducted wave analysis to determine the extent to which generalizability of findings may be negatively impacted by non-response bias (i.e. bias that occurs when respondents' answers differ significantly from those of non-respondents). In wave analysis, the answers given by initial respondents are compared with those of late respondents, who are used as a proxy for non-respondents (Armstrong and Overton 1977). Since wave 1 data collection occurred over a 6 day period, we used t-tests to compare differences in experience with the target technologies, education, and age, between 48 individuals who responded in the first 2 days (early respondents) with 73 individuals who responded in the final 2 days (late respondents). As indicated in Table 4.9, no meaningful differences in answers were found between early and late respondents. Thus, we conclude that non-response bias did not present a substantial problem.

Table 4.9: Tests of Non-Response Bias: Wave 1 Survey				
	Mean	S.D	<i>t</i> -stat	<i>p</i> -value (2-tail)
Experience with smartphones				
Early Respondents	3.130	1.231	1.254	0.213
Late Respondents	2.840	1.258		
Experience with MS Excel				
Early Respondents	4.398	0.917	0.500	0.618
Late Respondents	4.301	1.151		
Age				
Early Respondents	3.313	0.953	0.879	0.381
Late Respondents	3.151	1.156		
Education				
Early Respondents	3.833	0.949	1.692	0.093
Late Respondents	3.508	1.050		

Then, because non-normal data increase the risk of committing Type 1 and Type 2 errors (Osborne 2002), we conducted tests of skewness and kurtosis. Some researchers suggest that appropriate skewness values are within the range of -1 to +1 (Cruz 2007; Muthen and Kaplan 1985), while others (e.g. Tabachnick and Fidell 2007) suggest that, for large data sets, skewness may present a substantial problem when values exceed +/- 3.29. Results showed that data were moderately to substantially negatively skewed (with

skewness values ranging from -2.006 to -13.359). Consequently, to improve normality, we employed SPSS v.18 data transformation functions to alter the relative distance between data points. As recommended (Osborne 2002; Tabachnick and Fidell 2007), we took a conservative approach to data transformation. For moderately skewed items ( $< \pm 3.00$ ), we employed square root transformation (i.e.,  $\text{SQRT}(c - k)$ , where  $c$  = maximum value of a variable + 1 and  $k$  = variable). Substantially skewed data were transformed using logarithmic transformation (i.e.  $\text{LG10}(c - k)$ ). Following transformation, skewness and kurtosis values were within acceptable ranges. Since inspection of means, standard deviations, and inter-item correlations indicated that data points remained in the same relative order as they were prior to transformation (Osborne 2002), we moved on to assessing internal consistency, convergent and discriminant validity. Appendix 5 details item means and standard deviations before and after data transformation. Cronbach's alphas for the scales are also given. Since these all exceeded recommended heuristics of 0.80 (Fornell and Larcker 1981), we proceeded to assess the validity of constructs in the IT identity model.

***Testing Normality Assumptions:*** We took a multi-step confirmatory factor analysis (CFA) approach, using EQS 6.1, to evaluate our conceptualization of IT identity as a higher-order construct for both smartphones and MS Excel (Byrne 2006). To be valid, SEM techniques such as Maximum Likelihood, require data to be multivariate normal. Thus, in the first step, we examined Mardia's (1970) normalized estimate of multivariate kurtosis to determine the degree to which data were normally distributed. Large positive or negative values (i.e.  $> 8.00$  or  $< -8.00$ ) reflect significant positive and negative multivariate kurtosis respectively (Byrne 2006). Mardia's normalized estimate

for the smartphone data was 29.06 and 32.25 for the MS Excel data, indicating significant positive multivariate kurtosis in both data sets. However, the “robust” method, available in EQS 6.1, makes it possible to use covariance based SEM techniques when data are not normally distributed. The robust method computes the Satorra-Bentler (Satorra and Bentler 1988) (S-B) scaled  $\chi^2$  statistic, along with robust standard errors, CFI, and RMSEA (Bentler 1995). These statistics are considered valid (i.e. “robust”), despite violation of the normality assumption underlying the estimation method (Byrne 2006). Robust goodness of fit (GOF) indices have been used in prior IS research (Roberts and Grover 2011; Swanson and Dans 2000). Consistent with these works, the S-B  $\chi^2$  statistic and corresponding fit indices are reported here.

***Assessing Common Method Bias:*** Common method bias (CMB) was evaluated through comparison of two models using the unmeasured latent variable technique (Podsakoff et al. 2003). In Model 1, items were loaded only on their theoretical constructs. In Model 2, items were allowed to load on an unmeasured latent method factor in addition to their theoretical constructs. Appendix 6 details trait and method loadings for the smartphone and MS Excel data sets. A substantial amount of CMB is present when the introduction of the method factor causes item loadings on theoretical constructs to become non-significant (Elangovan and Xie 1999). In the presence of the method factor, all items, with the exception of EE2: confidence, loaded on theoretical constructs above 0.707 and were significant at  $p < 0.01$  (Hair et al. 2006), suggesting that CMB did not present a substantial problem. Because EE2 loaded highly on the method factor for both data sets, it was dropped from further analysis.

Another method for assessing CMB is to compare differences in the S-B  $\chi^2$  values and CFI for Models 1 and 2 (Byrne 2006). In both data sets, smartphones, the  $\Delta$ S-B was significant at  $p < 0.001$  and  $\Delta$ CFI exceeded the recommended heuristic of 0.01 (Cheung and Rensvold 2002). On the basis of this, we concluded that, while not substantial, there was some evidence of CMB across the two technologies. To be conservative in our approach, we controlled for an unmeasured latent method factor in subsequent analyses of convergent and discriminant validity.

***Evaluating the Second-Order Measurement Model:*** Since earlier MTMM analysis supported our conceptualization of IT identity as a reflective, higher-order construct, we conducted 2<sup>nd</sup> order CFA to test the construct's convergent and discriminant validity. Controlling for the unmeasured latent methods factor, the S-B  $\chi^2$  statistic for the IT identity (smartphone) measurement model was 183.41, 142 df. GOF indices (NNFI = 0.984; CFI = 0.988, RMSEA = 0.033, and RMSEA 90% confidence interval (CI) of 0.017, 0.046) indicated close fit between the hypothesized model and the observed data, based on recommended heuristics of NNFI > 0.95; CFI > 0.95 (Hu and Bentler 1999) and RMSEA < 0.05, RMSEA 90% CI of 0.00, 0.08 (Browne and Cudeck 1993; MacCallum et al. 1996). For MS Excel, the IT identity measurement model also indicated acceptable fit. The S-B  $\chi^2$  statistic was 263.980, 142 df, with GOF indices (NNFI = 0.970; CFI = 0.977, RMSEA = 0.057, and RMSEA 90% confidence interval (CI) of 0.046, 0.068). Correlations among factors and AVEs for both technologies are given in Table 4.10.



Table 4.10: Latent Factor Correlations and AVEs

<b>SMARTPHONE</b>	AVE	<b>ATT</b>	<b>CONT</b>	<b>ITX</b>	<b>ITID</b>
ATTITUDE (ATT)	0.76	<b>0.87</b>			
CONTINUANCE INTENTION (CONT)	0.90	0.71	<b>0.95</b>		
INTENTION TO EXPLORE (ITX)	0.85	0.64	0.49	<b>0.92</b>	
IT IDENTITY – 2 <sup>ND</sup> order (ITID)	0.90	0.77	0.64	0.62	<b>0.95</b>
<b>MS EXCEL</b>	AVE	<b>ATT</b>	<b>CONT</b>	<b>ITX</b>	<b>ITID</b>
ATTITUDE (ATT)	0.75	<b>0.87</b>			
CONTINUANCE INTENTION (CONT)	0.83	0.71	<b>0.91</b>		
INTENTION TO EXPLORE (ITX)	0.88	0.83	0.59	<b>0.93</b>	
IT IDENTITY – 2 <sup>ND</sup> order (ITID)	0.90	0.88	0.65	0.79	<b>0.95</b>
<i>Correlations significant at <math>p &lt; 0.001</math>; AVE=average variance extracted; square root of AVE on diagonal</i>					

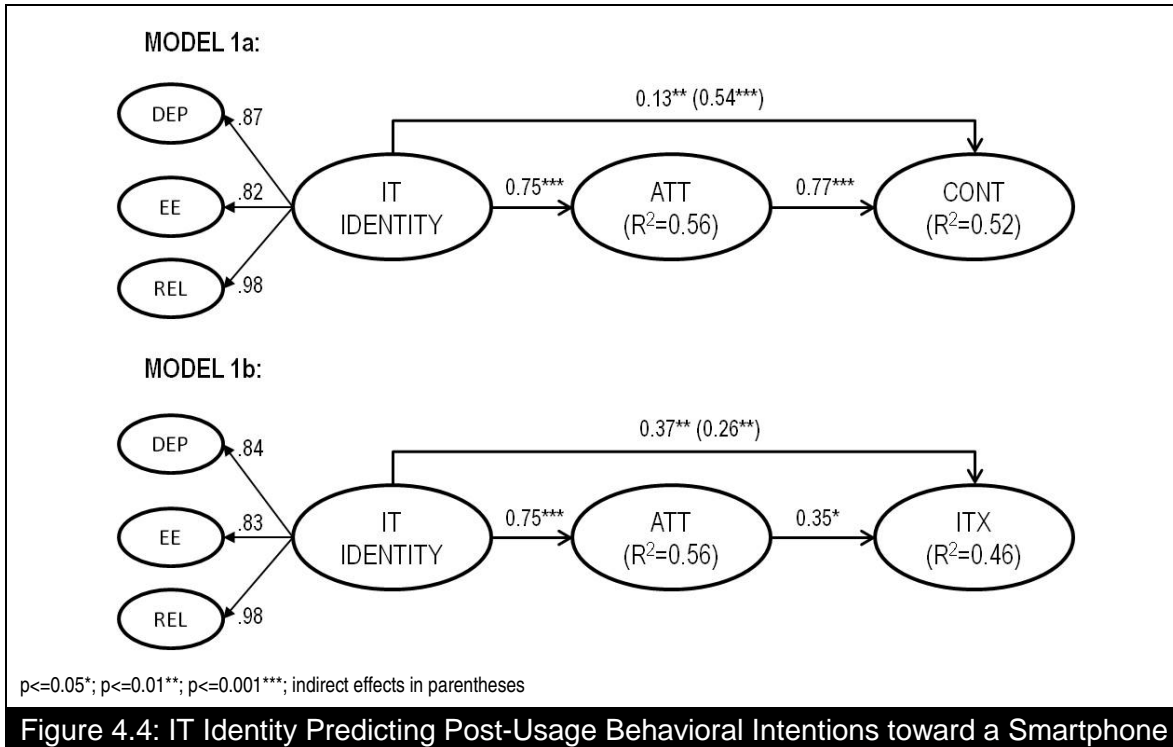
**Evaluating the Predictive Validity of the IT Identity Structural Model:** In the next step, we used EQS 6.1 to test hypotheses 1, 2a, 2b, 3a, 3b, and 4 for smartphones and MS Excel. Figures 4.4 and 4.5, respectively, show the results of four structural models predicting individuals' post-usage behavioral intentions toward use of a smartphone (Models 1a and 1b) and MS Excel (Models 2a and 2b). GOF indices indicated that all hypothesized models fit the observed data well (Bentler and Bonett 1980; Hu and Bentler 1999). As summarized in Table 4.11, fit statistics met, or exceeded, recommended heuristics.

Table 4.11: Summary of Fit Indices for IT Identity Model

	MODEL 1: SMARTPHONE		MODEL 2: MS EXCEL	
	a) Continuance Intention	b) Intention to Explore	a) Continuance Intention	b) Intention to Explore
Chi-sq.	160.401	151.887	197.595	215.031
df	113	113	114*	113
NNFI	0.980	0.983	0.976	0.968
CFI	0.985	0.987	0.981	0.975
RMSEA	0.040	0.036	0.053	0.059
90% CI RMSEA	0.024, 0.054	0.018, 0.050	0.040, 0.065	0.046, 0.071
R <sup>2</sup> Continuance Intention	<b>0.52</b>		<b>0.59</b>	
R <sup>2</sup> Intention to Explore		<b>0.46</b>		<b>0.62</b>
S.E. of R <sup>2</sup>	0.0296	0.0288	0.0268	0.0256
90% CI for R <sup>2</sup>	0.47, 0.57	0.41, 0.51	0.55, 0.63	0.58, 0.66
* The path between ITID and IS continuance was dropped due to evidence of net suppression, which inflated the R <sup>2</sup> of IS continuance intention				

For smartphones, IT identity exerted significant ( $p < .05$ ) indirect and direct influences on post-usage intentions. All proposed relationships were statistically

significant at  $p < 0.05$ . IT identity is highly predictive of attitude (standardized path coefficient,  $\beta = 0.75$ ,  $p < .0001$ ; Attitude  $R^2 = 0.56$ ) and directly influences continuance intention ( $\beta = 0.13$ ,  $p < .001$ ) and intention to explore ( $\beta = 0.37$ ,  $p < .001$ ). IT identity and attitude jointly explain a large amount of variance in continuance intention ( $R^2 = 0.52$ ) and intention to explore ( $R^2 = 0.46$ ).



IT Identity is an important determinant of attitude and post-usage intentions for MS Excel as well as smartphones. As illustrated in Figure 5, the models explain a larger amount of variance in continuance intention ( $R^2 = 0.59$ ) and intention to explore ( $R^2 = 0.62$ ) for MS Excel than for smartphones, supporting H4. IT identity exerted significant ( $p < .05$ ) indirect on both continuance and exploratory intentions. Further, with the exception of the path between IT identity and continuance intention, all proposed direct relationships were significant at  $p < 0.001$ . Thus, hypotheses 1, 2a, 2b, and 3b are

supported for both technologies. The relationship between IT identity and attitude appears to be invariant across the technologies ( $\beta = 0.76$ ,  $p < .0001$ ; Attitude  $R^2 = 0.57$ ). IT identity also has a strong direct influence on intention to explore ( $\beta = 0.45$ ,  $p < .001$ ). The path between IT identity and continuance intention was non-significant but negative (a reversal in sign from the correlation between the two factors). Thus, H3a is supported for smartphones but not for MS Excel. Removing the parameter from the model did not result in a significant deterioration of model fit. However, the effect of attitude was reduced from 0.87 to 0.77, resulting in less variance explained in continuance intention. Taken together, these findings provided evidence of net suppression, i.e. that IT identity was primarily acting to explain error variance in attitude, rather than having a meaningful effect on continuance intention (Messick and Van de Geer 1981). These findings suggest that individuals' decisions to continue using MS Excel are primarily motivated by attitude, while IT identity is a better predictor of *how* they intend to use the technology.

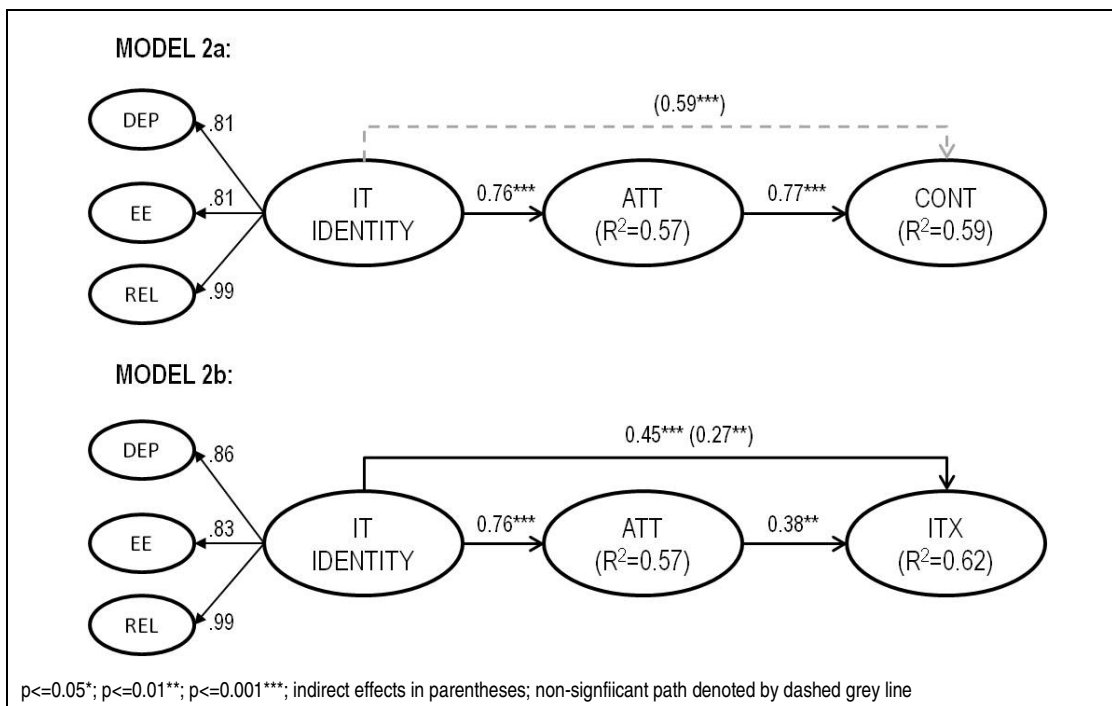


Figure 4.5: IT Identity Predicting Post-Usage Behavioral Intentions toward MS Excel

*Post-hoc Tests—Evaluating IT Identity Model vs. IS Continuance Model:* To further evaluate the utility of IT identity, we compared the variance in post-usage intentions explained by the IT identity model vis-à-vis that explained by the IS continuance model (Bhattacharjee 2001b; Bhattacharjee and Premkumar 2004). Appendix 7 presents trait and method loadings, as well as latent factor correlations, for constructs in the IS continuance model. Appendix 8 shows results of four IS continuance structural models predicting individuals' post-usage behavioral intentions toward use of a smartphone (Models 3a and 3b) and MS Excel (Models 4a and 4b). GOF indices indicated that all hypothesized models fit the observed data well (Bentler and Bonett 1980; Hu and Bentler 1999). As summarized in Table 4.12, fit statistics met, or exceeded, recommended heuristics.

Table 4.12: Summary of Fit Indices for the IS Continuance Model				
	MODEL 3: SMARTPHONE		MODEL 4: MS EXCEL	
	a) Continuance Intention	b) Intention to Explore	a) Continuance Intention	b) Intention to Explore
Chi-sq.	51.921	51.231	43.665	51.313
DF	39	39	39	39
NNFI	0.990	0.990	0.998	0.992
CFI	0.993	0.993	0.998	0.994
RMSEA	0.035	0.035	0.021	0.035
RMSEA CI	0.000, 0.059	0.000, 0.058	0.000, 0.049	0.000, 0.058
R <sup>2</sup> Continuance Intention	<b>0.51</b>		<b>0.57</b>	
R <sup>2</sup> Intention to Explore		<b>0.42</b>		<b>0.49</b>
SE of R <sup>2</sup>	0.0299	0.0321	0.0277	0.0305
90% CI for R <sup>2</sup>	0.46, 0.56	0.37, 0.47	0.52, 0.62	0.44, 0.54

Results indicate that the IS continuance model explains approximately the same amount of variance in continuance intention for smartphones (IS continuance: 90% C.I. for  $R^2 = 0.51 \pm 0.5$  vs. IT identity: 90% C.I. for  $R^2 = 0.52 \pm 0.5$ ) and MS Excel (IS Continuance: 90% C.I. for  $R^2 = 0.57 \pm 0.5$  vs. IT identity: 90% C.I. for  $R^2 = 0.59 \pm 0.5$ ) as the IT identity model, validating the IS continuance model's role in predicting individuals' decisions to carry on using a target technology. However, the IT identity model explains more variance in individuals' intentions to explore new smartphone features (IT identity: 90% C.I. for  $R^2 = 0.46 \pm 0.5$  vs. IS continuance: 90% C.I. for  $R^2 = 0.42 \pm 0.5$ ) and substantially more variance in intention to explore new features of MS Excel (IT identity: 90% C.I. for  $R^2 = 0.62 \pm 0.4$  vs. IS continuance: 90% C.I. for  $R^2 = 0.49 \pm 0.5$ ). In addition, the standard errors of the  $R^2$  for intention to explore in the IT identity model are smaller than those found in the IS continuance model, providing evidence to support the view that the IT identity model offers greater predictiveness of individuals' exploratory intentions.

Finally, perceived usefulness appears to have a weaker relationship with intention to explore than IT identity. The path between perceived usefulness and intention to explore is non-significant for smartphones, while, for MS Excel, perceived usefulness

appears to exert a weaker direct effect than IT identity ( $\beta = 0.35$   $p < .05$  vs.  $\beta = 0.45$   $p < .001$ ), suggesting that IT identity may be a better predictor of exploratory use behaviors. To test this possibility, we conducted a follow up survey in which respondents answered questions about their continued use behaviors. Table 4.13 presents results of hypotheses tests relating to IT identity and post-usage intentions.

Table 4.13: Hypotheses Tests Relating to IT Identity and Post-Usage Intentions			
Hypotheses		Hypothesis Supported?	
		Smartphone	MS Excel
H1	IT identity will be positively associated with attitude toward using an IT	Yes	
H2a	Attitude will be positively associated with continuance intention	Yes	
H2b	Attitude will be positively associated with intention to explore IT.	Yes	
H3a	IT identity will be positively associated with continuance intentions	Yes	No
H3b	IT identity will be positively associated with intentions to explore IT.	Yes	
H4	IT identity will explain more variance in individuals' post-usage behavioral intentions for MS Excel than for smartphones.	Yes	

## Wave 2: IT Identity as a Predictor of Continued Use Behaviors

In wave 2, Empanelonline invited the 264 individuals whose wave 1 responses had been retained for analysis to complete a follow-up survey. Of these individuals, 163 completed the wave 2 survey, for an effective response rate of 62%. Respondents were matched across surveys using unique ID numbers.

**Preliminary Analysis:** Screening the data for unusual responses and outliers resulted in 8 responses being rejected, leaving a usable sample of 155 cases. Table 4.14 presents sample characteristics. Consistent with wave 1, the sample contained an approximately equal number of male and female respondents, with an average age of between 35 and 44 years, and over 70% having at least a Bachelor's degree.

Wave 2 respondents and non-respondents were compared along experience, age, and education. As indicated in Table 4.15, no meaningful differences in answers were

found between the 155 respondents and 109 non-respondents. Thus, we conclude that non-response bias did not present a substantial problem.

Table 4.14: Wave 2 Sample Characteristics			
Variable	Value	Frequency	% Respondents
<b>Gender</b>	1: Male	80	51.6
	2: Female	75	48.4
<b>Age</b> Mean: 3.10; Median: 3.00; S.D: 1.005	1: 21 and under	0	0.0
	2: 22 to 34	51	32.9
	3: 35 to 44	55	35.5
	4: 45 to 54	35	22.6
	5: 55 to 64	11	7.1
	6: 65 and over	3	1.9
<b>Experience using smartphones</b> Mean: 3.05; Median: 3.00; S.D: 1.268	1: < 6 months	17	11.0
	2: >=6 months and < 1 year	42	27.1
	3: >=1 year and < 2 years	39	25.2
	4: >=2 years and < 3 years	30	19.4
	5: >= 3 years	27	17.4
<b>Experience using MS Excel</b> Mean: 4.71; Median: 5.00; S.D: 0.592	1: < 6 months	11	7.1
	2: >=6 months and < 1 year	0	0.0
	3: >=1 year and < 2 years	23	14.8
	4: >=2 years and < 3 years	22	14.2
	5: >= 3 years	99	63.9
<b>Education</b> Mean: 3.81; Median: 4.00; S.D: 1.268	1: High School	6	3.9
	2: Some College	18	11.6
	3: Associate's Degree	14	9.0
	4: Bachelor's Degree	81	52.3
	5: Master's Degree	34	21.9
	6: PhD or Equivalent	2	1.3
<b>Total Subjects</b>			<b>155</b>

Table 4.15: Tests of Non-Response Bias: Wave 2 Survey				
	Mean	S.D	t-stat	p-value (2-tail)
Experience with smartphones				
Respondents	3.052	1.170	-0.036	0.971
Non-Respondents	3.046	1.279		
Experience with MS Excel				
Respondents	4.348	0.978	-0.803	0.422
Non-Respondents	4.239	1.170		
Age				
Respondents	3.096	1.005	0.744	0.458
Non-Respondents	3.190	1.049		
Education				
Respondents	3.810	1.070	-1.180	0.239
Non-Respondents	3.640	1.143		

### *Evaluating the Predictiveness of IT Identity vs. Perceived Usefulness:*

SmartPLS Version 2.0.M3 was used to evaluate IT identity's role as a predictor of continued use behaviors vis-à-vis perceived usefulness. In the IS domain, partial least squares (PLS) path modeling techniques have been recommended when the primary

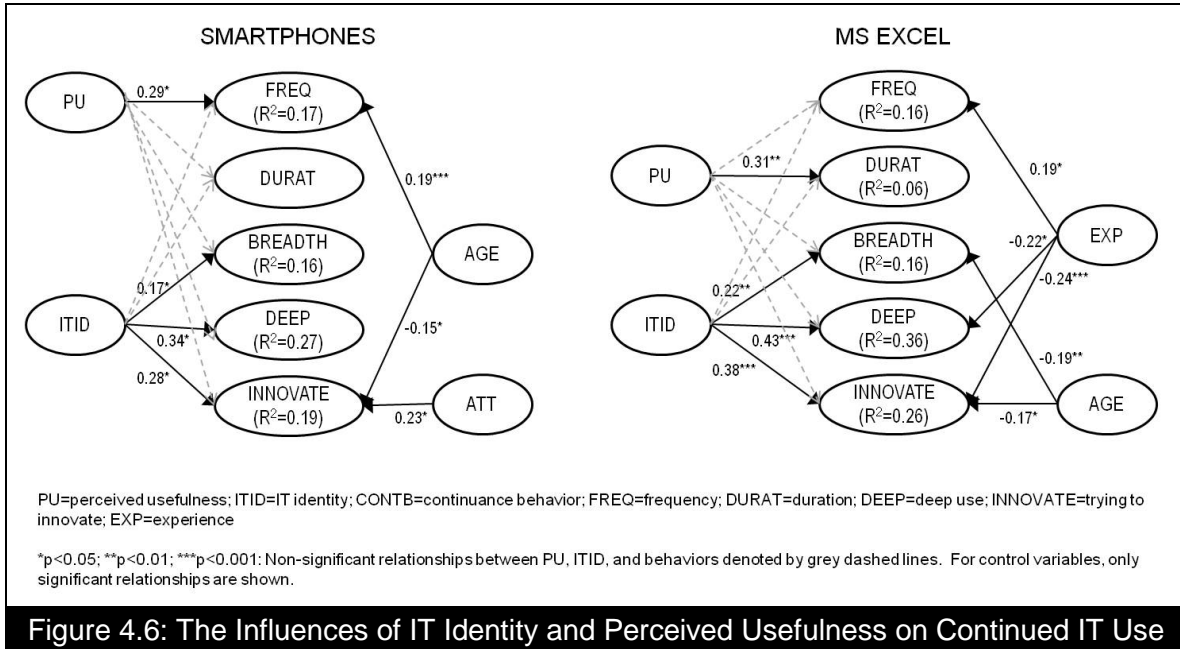
purpose is to explore the relationships between predictors and outcomes, and to test path-specific hypotheses, rather than to confirm the plausibility of a theory-based structural model (Gefen et al. 2000).

Our primary reason for using PLS was that our model included both formative (i.e. deep use) and reflective (i.e. trying to innovate), as well as single indicator measures of behavior (i.e. frequency, duration, and breadth). This basis for using PLS has recently been criticised in the literature (Rouse and Corbitt 2008). Rouse and Corbitt (2008, p. 849) argue that the reason PLS handles formative constructs well is because, regardless of whether constructs have been theorized to be reflective, the composite variables (components) created in PLS are by nature “formative – a linear function formed by a series of items”. These authors also note other limitations of PLS, namely: (1) because PLS components incorporate variance due to error as well as “true” variance, component loadings are inflated; (2) error variance may also attenuate path loadings; and (3) reliabilities and average variance extracted may be overstated.

Because PLS does not provide accurate measures of underlying constructs, this technique allows less precise testing of hypotheses than covariance-based SEM techniques. However, while modeling formative and reflective constructs, and observed variables together in the same model is technically possible using covariance-based SEM, doing so can create problems with model identification (MacCallum and Browne 1993). Thus, notwithstanding the limitations identified by Rouse and Corbitt, PLS was determined to be an appropriate statistical technique for conducting preliminary tests, and for allowing good approximations, of the relationships between IT identity, perceived usefulness, and behaviors. Figure 4.6 presents the path findings for smartphones and MS



Excel. Component loadings, cross loadings, and correlations among variables are presented in Appendix 9.



**Results of Hypotheses Tests:** Consistent with the hypothesis that IT identity has broader focus than perceived usefulness, we found that IT identity did predict a greater number of continued IT use behaviors. Thus, H5 was supported. Our analysis also revealed that, while perceived usefulness influenced continuance intention, it was a poor predictor of behavior overall. Consistent with prior research, we found that perceived usefulness did exert some effect on frequency of use (smartphone:  $\beta = 0.29$ ,  $p < .05$ ; MS Excel:  $\beta = 0.25$ , n.s.), and duration (smartphone:  $\beta = 0.06$ , n.s.; MS Excel:  $\beta = 0.35$ ,  $p < .01$ ). However, this was not consistent across technologies. Therefore, H6a was supported only for smartphones, while H6b was supported only for MS Excel.

We found that, even controlling for attitude, IT identity predicted breadth of use (smartphone:  $\beta = 0.17$ ,  $p < .05$ ; MS Excel:  $\beta = 0.22$ ,  $p < .01$ ), deep use (smartphone:  $\beta =$

0.34,  $p < .05$ ; MS Excel:  $\beta = 0.43$ ,  $p < .001$ ), and innovative use (smartphone:  $\beta = 0.28$ ,  $p < .05$ ; MS Excel:  $\beta = 0.38$ ,  $p < .01$ ). Hence, H7a, H7b, and H7c were supported. Taken together with IT identity's superior predictiveness of exploratory intentions, these findings confirm IT identity's potential to predict a broader array of behaviors than perceived usefulness.

As regard to the effects of technology characteristics on continued IT use, increases in IT identity's  $\beta$ 's and  $p$ -values for MS Excel, lend support to the view that IT identity exerts a stronger influence on continued use of static, single-use, technologies than on dynamic, multi-use platform technologies. Moreover, variance explained in deep use ( $R^2 = 0.35$ ) and trying to innovate ( $R^2 = 0.26$ ) is substantially larger for MS Excel than it is for smartphones. Thus, H8 is also supported.

***The Effects of Control Variables:*** Of note is that attitude and IT identity *jointly* predicted attempts to innovate with smartphones. This suggests that when new features are added to a technology's existing feature set, IT identity has an important role to play in fostering a positive attitude toward exploring new features, as well as in exerting a direct influence on behavior. It is also interesting to note the effects of age and experience on behaviors. Age exerted effects on behaviors for both smartphones and MS Excel. For smartphones, age positively influenced frequency of use. This result suggests that with increasing age, people are more likely to use phones frequently for work-related purposes. The finding that age is negatively associated with innovative behaviors for both technologies is consistent with the widely held assumption that younger people, who have grown up with IT, are more likely to innovate with them than older individuals.

With respect to experience, we found that experience with MS Excel was positively related with frequency of use and negatively related with extended use and innovation. The findings in relation to the latter behaviors raise an interesting temporal aspect to the relationship between IT identity and IT use—i.e. that IT identity is a product of a history of interacting with an IT but that, as users become more experienced with a technology, it acts to inhibit extended use and exploratory behaviors. Thus, to test whether IT identity’s effects on deep use and trying to innovate depended on length of experience, we tested for, but did not find, significant interaction effects between experience and IT identity for MS Excel. Results of the hypotheses tests are summarized in Table 4.16. The implications of our findings are discussed next.

**Table 4.16: Hypotheses Tests Relating to IT Identity, Perceived Usefulness and Behaviors**

Hypotheses		Hypothesis Supported?	
		Smartphone	MS Excel
H5	IT identity will be positively associated with a broader array of continued IT use behaviors than perceived usefulness	Yes	
H6a	Perc'd usefulness will be positively associated with frequency of use	Yes	
H6b	Perc'd usefulness will be positively associated with duration of use	No	Yes
H7a	IT identity will be positively associated with breadth of use	Yes	
H7b	IT identity will be positively associated with deep use.	Yes	
H7c	IT identity will be positively associated with trying to innovate.	Yes	
H8	IT identity will explain more variance in individuals' continued IT use behaviors for MS Excel than for smartphones.	Supported for deep use and trying to innovate	

## V. IMPLICATIONS

While many studies have examined individuals’ decisions to continue using information technologies, current approaches are limited in their potential to shed light on the nature of continued IT use. In particular, little attention has been given to investigating factors that promote extended use of a technology’s feature set, as well as exploratory, innovative, behaviors (Saeed and Abdinnour-Helm 2008). Identifying these factors is central to understanding how IT becomes embedded in individuals’ behavioral

routines and organizational processes. By developing the IT identity construct and validating its measurement and predictive validity, this study contributes to IS research on continued IT use in three ways. First, it provides a set of theory-based definitions and IT identity measures, necessary for investigating IT identity's role in explaining individuals' ongoing use of IT. Second, it delimits a role for IT identity as a core construct in explaining individuals' extended and exploratory use of IT in the post-adoption context. Third, it elucidates conditions under which IT identity is a more or less salient predictor of continued IT use behaviors.

Informed by identity literature, this study advances IS research on continued use by conceptualizing IT identity as the set of meanings that individuals apply to the self in relation IT they regularly interact with, that affects their attitude toward using the technology and their continued use behaviors. In doing so, it provides a set of theory-based definitions and IT identity measures for investigating IT identity's role in explaining individuals' continued IT use. Specifically, IT identity represents the extent to which an individual views his/her interactions with an IT as integral to being who he or she is as a person. CFA-based multi-trait multi-method (MTMM) analysis supported our conceptualization of IT identity as a higher-order construct, reflecting three distinct but highly correlated dimensions. MTMM also established that while IT identity is measurable using different methods, taking a Likert scale approach offers better measurement of the construct's underlying dimensions than the semantic differential scale.

Our results indicate that the stronger IT identity is in relation to a particular IT, the greater its influence on post-usage intentions, extended feature use and innovative use. While the IS continuance model's role in explaining continuance intention was largely

validated, our analysis revealed that IT identity exerted stronger and more consistent effects on individuals' exploratory intentions and innovative behaviors than perceived usefulness. These are important findings because, despite 22 years of research on individual acceptance and use of IT (including 11 years of research on continued use), we still know very little about factors that motivate extended, adaptive, and innovative behaviors (Benbasat and Barki 2005; Lyytinen 2010). Key findings of this study are summarized in Table 4.17. Implications for research and practice are discussed next.

Table 4.17: Key Findings	
Key Findings	Implications for Research and Practice
1. The IS continuance model is equally good as intention-based IT identity model at predicting continuance intention 2. The IT identity model explains substantially more variance in intention to explore an IT than the IS continuance model	<i>Delimits a role for IT identity as a key construct in explaining individuals' decisions to explore features of an IT.</i>
3. IT identity was highly predictive of extended feature use (breadth and deep use), as well as exploratory use (trying to innovate) 4. Perceived usefulness did not predict extended or exploratory use behaviors 5. Perceived usefulness predicted amount of use, while IT identity did not	<i>With its broader focus, IT identity has the potential to predict richer conceptualizations of use across situations.</i>
6. Perceived usefulness and satisfaction were inconsistent predictors of post-usage intentions across technologies 7. Attitude's effects were consistent across technologies	<i>Validates the utility of attitude as a key determinant of behavioral intentions in the post-adoption context.</i>
8. IT identity explained substantially more variance in intentions and behaviors for MS Excel than for smartphones	<i>Technology characteristics place boundaries on IT identity's explanatory potential</i>
9. Experience negatively impacted extended/exploratory use for MS Excel but not for smartphones	<i>Promoting IT identity formation through technology upgrades may mitigate the negative effects of experience</i>

### **Implications for Research**

#### **IT identity as a Key Determinant of Extended and Exploratory Use**

While the role of the IS continuance model in predicting individuals' intentions to carry on using ITs was largely validated, this study delimits a role for IT identity as a key construct in explaining extended feature use and attempts to find new ways of using IT. One explanation for IT identity's predictiveness of richer conceptualizations of use than existing IS constructs is that individuals' many identities reflect their cognitive schemas

of the social structures in which they are embedded (Stryker and Serpe 1994). Because IT identity takes into account external factors that facilitate or inhibit performance of a behavior, a highly salient IT identity should predict a broader array of behaviors, more accurately, than factors that disregard the larger social context (Charng et al. 1988).

Our findings that perceived usefulness predicted intention to explore for MS Excel but not smartphones, and did not predict deep use or trying to innovate for either technology provide evidence in support of this assumption. These findings suggest that, while perceived usefulness is helpful for predicting amount of continued IT use (in terms of frequency and duration), it is not nearly as powerful in explaining the nature of that use. On this basis, we suggest that incorporating IT identity into models that designate extended feature use/exploratory or innovative use as dependent variables should enhance the explanatory potential of these models. To further validate our findings, in future, researchers may wish to investigate how accurately models that incorporate IT identity predict behavior in relation to other technologies and in other contexts of use. For example, it would be interesting to explore whether IT identity is as powerful in explaining feature extension behaviors when the social context of use is highly salient (e.g. in healthcare settings).

### **IT Identity's Potential to Predict a Broader Array of Behaviors**

Having a strong IT identity in relation to an IT means that interacting with it has become integral to an individual's sense of who he/she is as a person. Further, it implies that individuals will seek out opportunities to enact their IT identities as a means of confirming what they already know and believe about themselves (Swann et al. 2005). This suggests that IT identity has the potential to predict a wide range of behaviors across

situations. This is important because, with increasing ubiquitousness of IT, people's interactions with information technologies are no longer confined solely to the work place. Further, because increasingly organizations have embedded IT into their products and services, the end-users of the technologies they implement are no longer just organizational members but also individuals who consume digital products and services outside the organizational context. Thus, new theories, and new conceptualizations of use, that take into account the multifaceted nature of IT use are needed. IT identity, which transcends specific groups, roles, and situations, is likely to be relevant to developing these theories.

### **Technology Characteristics and the Negative Effects of Experience**

Our research found that a dynamically changing feature set can place conditions on IT identity's explanatory potential. On one hand this suggests, and we found, that IT identity is less predictive of continued IT use behaviors for dynamic, multi-use platform technologies than for static, single-use, technologies. On the other hand, our analysis also revealed that experience inhibits extended use and exploratory behaviors for static, but not multi-platform technologies. This implies that the negative influence of experience may be mitigated by technology characteristics (e.g. upgrades that extend the feature set) that promote IT identity formation. These findings suggest a need for future research that investigates the relationships between IT identity, technology characteristics, and experience. Teasing out the underlying dynamics of these relationships would advance understanding the so-called "paradox of the active user" (Carroll and Rosson 1987); where individuals who are more experienced with an IT (and therefore more likely to act as effective sources of behavioral innovation), are also less likely to engage in

innovative behaviors (Jasperson et al. 2005; Limayem et al. 2007; Nambisan et al. 1999, and others).

### **Directions for Future Research**

This study focused on IT identity's role in predicting individuals' ongoing use of information technologies. Another promising avenue is to develop understanding of how individuals' identities in relation to the IT they currently interact with influence their willingness to adopt new or alternative technologies. Identity research suggests that the extent to which an individual has previously invested in an identity is the primary determinant of how integral the identity is to maintaining that person's current self-concept (McCall and Simmons 1966; Stryker and Serpe 1994). Thus, individuals who have made a significant investment in developing and sustaining an identity in relation to a particular IT may be reluctant to embrace alternatives. With increasing ubiquitousness of IT, understanding the interplay between IT identity and willingness to accept or resistance to adoption of new technologies is an important area for future research.

Future research should also seek to understand more of the relationship between IT identity and other work place identities. Because IT identity does not exist in isolation from the many other identities that people develop in the social positions they occupy, managerial interventions cannot be designed without reference to how a new technology may conflict with meanings contained in individuals' other salient identities. For example, under what conditions are work place decisions driven by IT identity rather than a person's work role identity or identity as a member of the organization or vice versa? Prior IS research has demonstrated how introducing new IT into organizations can negatively impact employees' role and social identities through challenging their feelings



of competency and relatedness to the employing organization (e.g. Alvarez 2008; Barrett and Walsham 1999; Van Akkeren and Rowlands 2007). Since individuals interact with IT in situations where there exist behavioral decisions aligned with multiple identities (Stryker and Burke 2000), investigating the interplay between IT identity and other identities within the work place is critical to understanding long-term IT use behaviors.

### **Implications for Practice**

Given IT identity's strong positive relationships with extended and exploratory use behaviors, identifying its antecedents, as well as their relative influence, is highly relevant to designing organizational mechanisms that promote and manage user innovation with IT. Studies on self-expansion suggest that individuals' willingness to invest in interacting with IT is motivated by the extent to which they believe that doing so presents an opportunity to increase their personal and social resources, and depends on their ability to redirect significant attention and resources (e.g. by exploring the many features and situations in which an IT can be used) to pursuing this goal (Aron et al. 2003). Thus, organizations may help to promote IT identity by providing users with access to technological changes that extend an IT's feature set, as well as opportunities to use the IT in new contexts, and by implementing mechanisms to support and reward users' attempts to innovate.

While offering support and rewards for enacting an IT identity may be highly relevant (Burke and Stets 2009), it is worth noting that not all identities need support to be enacted. Nor do individuals always need or want the rewards that are available for enacting the identity (McCall and Simmons 1978/1966). When IT use is not interdependent or has low knowledge barriers, organizations' potential to influence the IT

identity—behavior relationship may be weakened. Thus, identifying specific boundary conditions on IT identity's influence represents an important area of investigation for researchers and practitioners seeking to design incentives or controls to manage the overall salience, and consequently the enactment, of an IT identity.

## **VI. LIMITATIONS**

Limitations of this study should be acknowledged. One study limitation is the use of partial least squares (PLS) analysis for testing IT identity's predictiveness of behaviors. Because PLS components incorporate variance due to error as well as "true" variance, the technique tends to overstate components' loadings, reliabilities, and average variance extracted, while deflating correlations between components. This can have the effect of making constructs seem more discriminant than they really are. As such, PLS offers approximate, rather than precise statistical tests of hypotheses. That being said, PLS has been widely used in the IS domain, particularly in individual level research on acceptance and use of IT. Thus, notwithstanding the limitations identified, it could be argued that PLS offered a fairer comparison (relative to prior IS research) of the relationships between IT identity, perceived usefulness, and behaviors. Nevertheless, the results presented here in respect to behaviors should be considered as preliminary and future research should establish the validity of the IT identity construct using more accurate covariance-based SEM techniques.

A second limitation is that while our conceptualization and measure of IT identity advances understanding on individuals' continued IT use, we note there are other factors that influence individuals' behaviors that were not included in this study. For example, we did not theorize or test for the effect of habit (Limayem et al. 2007). Because the

primary goal of this study was to develop and operationalize the IT identity construct, we felt it was most appropriate to test its predictive validity relative to the most influential approaches to examining continued use. Thus, while the role of habit is attracting increased attention from IS researchers (Ortiz De Guinea and Markus 2009), its relationships with IT identity and behavior remain an area for future research.

In this study, we measured IT identity for smartphones at the device level, while deep use was measured at the level of the software application (e.g. GPS, email, etc.). However, since a person can hold many IT identities in relation to both devices and specific applications, it raises the possibility that an individual may not have a smartphone IT identity, while holding strong IT identities in relation to a subset of its applications. In this instance, measuring IT identity at the device level may make the construct appear less predictive of behaviors than is actually the case. Thus, to more accurately predict behaviors, when IT identity relates to a platform technology rather than to a specific application, it may be more appropriate to capture deep use at the device level or measure IT identities in relation to available software applications. Further empirical testing, with a particular focus on developing understanding of the multilevel and multifaceted nature of IT identity, offers opportunities for establishing the validity IT identity at different levels of abstraction.

## **VII. CONCLUSION**

Against the backdrop of increased embeddedness of IT in organizational processes, it is important to extend understanding of individuals' sustained use if organizations are to accrue expected benefits from their technology investments. To that end, this study sought to advance research on continued IT use by developing an

operational definition of IT identity and testing its explanatory power vis-à-vis existing IS constructs in determining individuals' post-usage intentions and behaviors. Our results showed that individuals who view their interactions with an IT as integral to their sense of who they are, are more likely to engage in extended feature use and exploratory behaviors. At the same time, we found that while post-usage usefulness predicted amount of use, it was not nearly as powerful in explaining the nature of that use. These findings warrant further investigation because they imply that managerial interventions aimed at promoting and managing extended and/or innovative use of IT should direct attention to the meanings individuals attach to themselves in relation to the IT they interact with (i.e. who am I, through my use of this technology?), rather than on the meanings that they attach to the outcomes of interacting with IT (i.e. what can this technology do for me?).

This study contributes to the IS literature in three ways. First, it develops and validates a theory-based set of IT identity measures. Second, it elucidates how technology characteristics place conditions on IT identity's influence and, third, it delimits a role for IT identity in helping to bridge the gap between our current models of usage and models that explain long term and richer IT use behaviors. On this basis, we suggested potential opportunities for future studies to advance understanding of individuals' long-term use of information technologies by bringing IT identity into research on continued IT use.

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## APPENDIX 1: STUDIES ON IT CONTINUANCE INTENTIONS AND USE

Study <sup>10</sup>	Context	Social Factors	Attitude Included?	Dependent Variable(s)	Experience with Target IT	Theory Base <sup>11</sup>	Key Findings
(Bhattacharjee and Premkumar 2004, MISQ)	1: Computer-based training 2: Rapid application development tool use	None	Yes	Continuance intention	1: Pre-usage to 3 months 2: Pre-usage to 1 month	IS Continuance Model, TAM	Post usage perceptions of usefulness predicted continuance intention. Attitude did not predict continuance intention.
(Bhattacharjee 2001a, DSS)	Online brokerage	None	No	Continuance intention	Not stated	IS Continuance Model, TAM, Agency Theory	Satisfaction and perceived usefulness jointly predicted continuance intention
(Bhattacharjee 2001b, MISQ)	Online banking	None	No	Continuance intention	Mean experience = 8 months	IS Continuance Model	Satisfaction and perceived usefulness jointly predicted continuance intention
(Bhattacharjee et al. 2008, JCIS)	Document management system	Facilitating conditions	No	Frequency, Number of applications, % of customer requests processed	Pre-usage to 3 months	IS Continuance Model	Satisfaction and perceived usefulness jointly predicted continuance intention. Facilitating conditions had a significant effect on behavior.
(Brown et al. 2011, ISR)	Knowledge sharing system	None	No	Duration	Pre-usage to 6 months	IS Continuance Model, TAM	Perceived usefulness exerts significant influence on duration of use

<sup>10</sup> **JOURNAL LEGEND:** B&IT=Behavior & Information Technology; Database=The DATA BASE for Advances in Information Systems; DSS=Decision Support Systems; EJIS=European Journal of Information Systems; IEEE-TEM=IEEE Transactions on Engineering Management; IJHCS=International Journal of Human-Computer Studies; IJIM=International Journal of Information Management; ISJ=Information Systems Journal; ISR=Information Systems Research; I&M=Information & Management; JCIS=Journal of Computer Information Systems; MISQ=Management Information Systems Quarterly

<sup>11</sup> **THEORY BASE LEGEND:** IDT = innovation diffusion theory; TAM = technology acceptance model; TPB = theory of planned behavior; TRA = theory of reasoned action; UTAUT=unified theory of acceptance and use of technology

Study	Context	Social Factors	Attitude Included?	Dependent Variable(s)	Experience with Target IT	Theory Base	Key Findings
(Chiu and Wang 2008, I&M)	e-Learning system	Social influence Facilitating conditions	No	Continuance intention	Participants had registered for at least one web-based course	UTAUT, Expectancy-Value Theory	Social influence and facilitating conditions did not influence continuance intention
(Chiu et al. 2007, ISJ)	e-Learning system	Fairness	No	Continuance intention	All respondents had used an e-Learning system at least once	IS Success Model, Social Exchange Theory	Continuance intention primarily explained by satisfaction. Perceptions of fairness were inconsistent predictors of satisfaction and continuance intention.
(Deng et al. 2010, EJIS)	Mobile internet services	None	No	Continuance intention	Mean experience = 3.15 years	IS Continuance Model Cognitive Absorption	Cognitive absorption influenced satisfaction, which in turn determined continuance intention
Hong et al. (DSS, 2008)	Mobile Internet	None	No	Continuance intention	Mean experience = 17.2 months	IS Continuance Model, TAM	TAM had more explanatory power than IS Continuance Model.
Hong et al. (JCIS, 2008)	Telecom web portal	None	Yes	Continuance intention	Not stated	IS Continuance Model, TPB	Attitude/switching costs jointly determined intention. Habit did not exert a significant effect.
(Hsieh et al. 2008, MISQ)	Internet TV	Subjective norm Perceived behavioral control	Yes	Continuance intention	2 months to 12 months	TPB	Attitude had stronger influence on continuance intention than subjective norm on continuance intention. Perceived behavioral control was influential only for socio-economically advantaged individuals.

Study	Context	Social Factors	Attitude Included?	Dependent Variable(s)	Experience with Target IT	Theory Base	Key Findings
(Hsu and Chiu 2004, B&IT)	e-file service	Subjective norm Perceived behavioral control	No	Continuance intention	Not stated	TPB	Satisfaction impacted by interpersonal influences. Perceived behavioral control did not influence continuance intention.
(Karahanna et al. 1999, MISQ)	MS Windows OS	Subjective norm	Yes	Behavioral intention to Continue Using	Initial and short-term use	TRA, IDT	Attitude predictive of continuance intention, while subjective norm was not.
(Kim et al. 2007a, IJHCS)	Mobile internet services	None	Yes	Continuance Intention	Not stated	IS Continuance	Attitude was primary predictor of continuance intention. Arousal (satisfaction) did not predict continuance intention.
(Lankton et al. 2010, I&M)	University Internet application	None	No	Continued IT use (Frequency)	Not stated	Learning Theory, Habit	Prior use and habit did not always predict continued IT use.
(Liao et al. 2009, IJIM)	e-Learning system	None	Yes	Continuance intention	Three categories of users: initial adopters (< 6 months); short-term (>6 months and < 12 months); long-term users (> 12 months)	TAM, IS Continuance Model, Cognitive Model	The effects of perceived usefulness and satisfaction diminished over time, while the effect of attitude on continuance intention increased. Usefulness did not exert a significant effect on continuance intention for short-term and long-term users.
(Limayem and Cheung 2008, I&M)	Web-based teaching platform	None	No	IS Continuance Usage (Frequency)	Post-usage: data collection at 4 and 8 weeks	IS Continuance Model, Habit	Habit negatively moderated the effects of continuance intention of behavior. Satisfaction had direct positive effect on behavior.

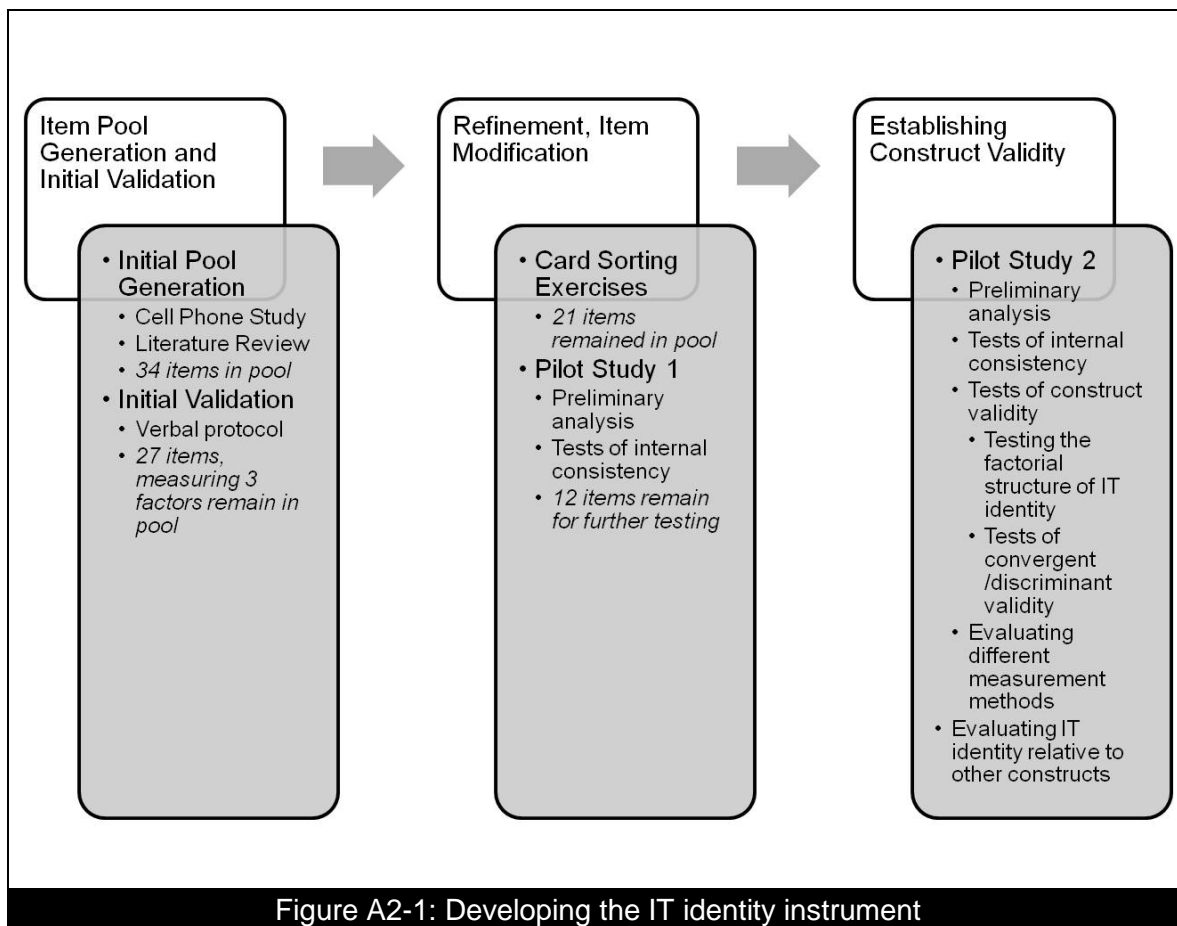


Study	Context	Social Factors	Attitude Included?	Dependent Variable(s)	Experience with Target IT	Theory Base	Key Findings
(Limayem et al. 2007, MISQ)	WWW	None	No	IS Continuance Usage (Frequency, Duration, Extent of Use)	Not stated (Data collection involved 3 rounds over 13 week period)	IS Continuance Model, Habit	Habit negatively moderated the influence of continuance intention on continuance usage.
(Premkumar and Bhattacharjee 2008, Omega)	Computer-based training	None	No	Continuance intention	Pre-usage to 1 month	IS Continuance Model, TAM	Perceived usefulness and satisfaction jointly determined continuance intention.
(Saeed and Abdinnour-Helm 2008, I&M)	Web-based student information system	None	No	Extended Use and Exploratory Use	Mean = 2.5 years	TAM, IS Success Model	Perceived usefulness better predictor of exploratory use than extended use.
(Tiwana and Bush 2005, IEEE-TEM)	Expertise-sharing network	Reputation and relational capital	No	Continuance intention	Mean experience = 11.9 months	Prior investment & IS Continuance Model	Reputation, relational capital, and satisfaction had significant positive effects on continuance intention, while prior usage did not exert a significant effect.
(Vatanasombut et al. 2008, I&M)	Online banking	Trust, Relationship commitment	No	Continuance intention	Not stated	Commitment-Trust Theory, IS Continuance Model, TAM	Relationship commitment and trust were positively related to continuance intention
(Venkatesh and Goyal 2010, MISQ)	Human resource e-system	None	Yes	Continuance intention	Pre-usage to 6 months	IS Continuance Model, TAM	Behavioral intention decreased as post-usage usefulness deviated from pre-usage perceptions of usefulness. The effect of negative disconfirmation of beliefs was stronger than the effects of positive disconfirmation.

Study	Context	Social Factors	Attitude Included?	Dependent Variable(s)	Experience with Target IT	Theory Base	Key Findings
(Venkatesh et al. 2011, ISJ)	e-Government portal	Social influence Facilitating conditions	Yes	Continuance intention	Pre-usage to 4 months	IS Continuance Model, UTAUT	Post usage beliefs influence attitude. Beliefs and attitude jointly determine continuance intention. Social influence did not influence intention and facilitating conditions was an inconsistent predictor.
(Venkatesh et al. 2008, MISQ)	Web-based system	Facilitating conditions	No	Behavioral expectation, Duration, Frequency, Extent of use	Pre-usage to 1 year	UTAUT	Facilitating conditions and behavioral intention jointly predicted behavioral expectation. Behavioral expectation and intention jointly predicted use.
(Wu and Kuo 2008, Database)	Google search engine	None	No	Continuance intention	Participants ranged from initial users (< 3 months) to long-term users (5 years or more)	TAM, Self-perception theory	Perceived usefulness did not predict continuance intention when habit was included in the model.

## APPENDIX 2: DEVELOPING THE IT IDENTITY INSTRUMENT

We followed Churchill's (1979) suggested procedure for developing and validating the measurement of IT identity. As outlined in Figure A2-1, this involved a three-stage process of (1) item generation and initial validation, (2) item refinement and modification, and (3) establishing construct validity. Each stage is described in detail next.



### Item Pool Generation and Initial Validation

#### Item Generation

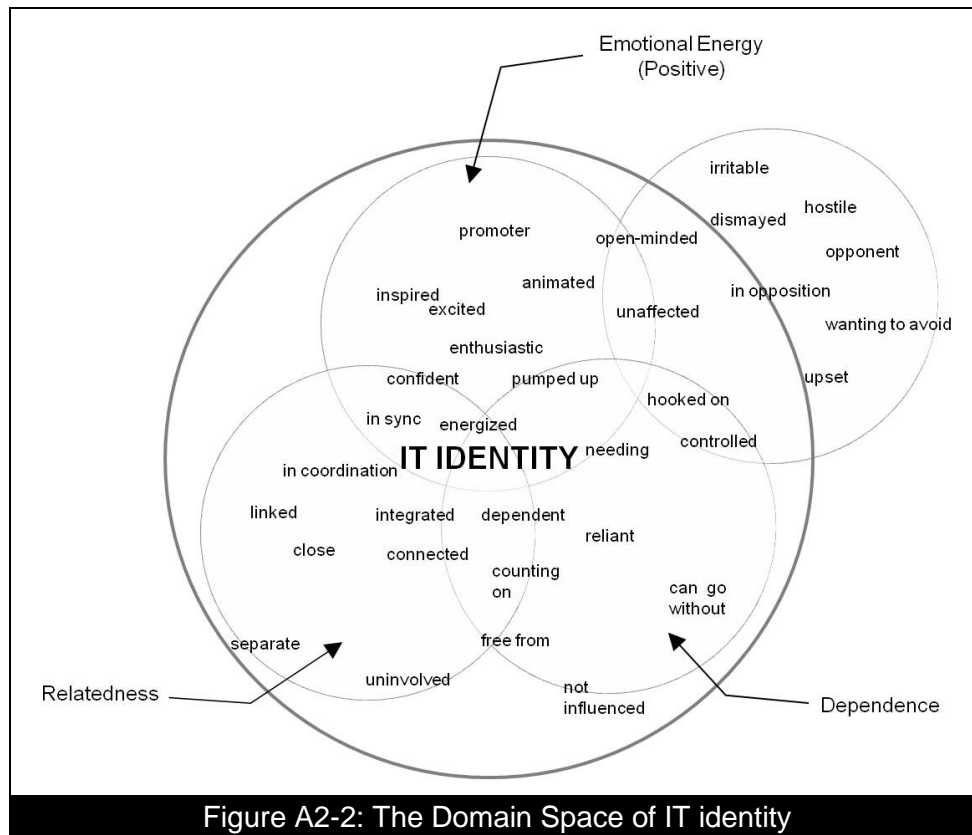
The first step in item pool generation and initial validation was a two prong process, involving an exploratory study of young people's relationships with their cell

phones (Carter et al. Unpublished doctoral dissertation) and literature review of how identity has been measured previously in sociological and psychological identity theories. This process resulted in an initial item pool containing 34 items measuring four factors (presented in Table A2-1). Three of these factors were posited to capture the domain space of IT identity, which we defined as the set of meanings an individual attaches to the self in relation to IT. Consistent with McCall (2003), we proposed that IT identity exists on a continuum ranging from strong IT identity (self-identification)—“my interactions with an IT (or class of ITs) are integral to my sense of who I am”—to weak IT identity (dis-identification)—“my interactions with an IT (or class of ITs) are completely unrelated to my sense of who I am.”

Following literature on self-expansion (Aron et al. 2003), as well as Osgood et al.’s (1975; 1957) evaluation-potency-activity (E-P-A) dimensions of affective meaning, we posited that IT identity can be represented by three interrelated dimensions: (1) positive emotional energy (neutral to positive); (2) relatedness (measuring the extent to which individuals felt separate vs. connected in relation to an IT); and (3) dependence (measuring the degree to which individuals felt dependent on vs. independent from an IT). Of note, Osgood et al.’s evaluation dimension captures both positive and negative emotional responses. However, as defined, IT identity does not include a negative emotional pole because, in keeping with McCall (2003), we take the view that viewing oneself as being in opposition to a social object is not the same as viewing oneself as unrelated to it. To confirm this assumption, we included a fourth factor in our initial item pool, which measured individuals’ neutral to negative emotional response to themselves

in relation to IT. We termed this factor *negative emotional energy*. The domain space for IT identity is presented in Figure A2-2.

Table A2-1:Initial item pool		
Factor	Item #	Item Measure
Thinking about myself in relation to my smartphone, _____ my smartphone		
DEPENDENCE	DEP1	I am dependent on
	DEP2	I am counting on
	DEP3	I am reliant on
	DEP4	I am needing
	DEP5	I am controlled by
	DEP6	I am free from*
	DEP7	I can go without*
	DEP8	I am not influenced by*
	DEP9	I am independent of*
	DEP10	I am hooked on
POSITIVE EMOTIONAL ENERGY	EEP1	I am a promoter of
	EEP2	I feel animated thinking about
	EEP3	I feel enthusiastic thinking about
	EEP4	I feel pumped up thinking about
	EEP5	I feel inspired thinking about
	EEP6	I feel excited thinking about
	EEP7	I feel energized thinking about
	EEP8	I feel confident thinking about
	EEP9	I am unaffected by*
RELATEDNESS	REL1	I am in sync with
	REL2	I am close to
	REL3	I am connected with
	REL4	I am integrated with
	REL5	I am in coordination with
	REL6	I am linked with
	REL7	I am separate to*
	REL8	I am uninvolved with*
NEGATIVE EMOTIONAL ENERGY	EEN1	I am an opponent of
	EEN2	I am open minded about*
	EEN3	I am hostile to
	EEN4	I feel upset thinking about
	EEN5	I am irritable thinking about
	EEN6	I am in opposition to
	EEN7	I feel dismayed thinking about
	EEN8	I am wanting to avoid
*: reverse coded items		



### Initial Validation

Next, we conducted a verbal protocol with 4 undergraduate students and 4 individuals in full-time employment. The specific goal of the verbal protocol was to provide initial support of measurement items' face and content validity (Churchill 1979; Malhotra and Grover 1998). Participants were asked to assess the clarity of construct (factor) definitions, as well as the items used to measure the constructs. In addition, participants were asked to suggest additional items that they felt should have been included in the pool. Participants' feedback confirmed our theoretical understanding that "negative emotional energy" was outside of the domain space of IT identity. Consequently, this factor was dropped and "positive emotional energy" renamed

“emotional energy.” Following the verbal protocol, 27 items measuring 3 factors remained in the pool for further refinement.

### **Refinement and Item Modification**

#### **Card Sorting Exercises**

In the next stage, the three IT identity factors and the pool of 27 items were refined and modified through card sorting exercises and two pilot studies. To support construct validity, an initial card sorting exercise was carried out with the assistance of 6 undergraduate students (Malhotra and Grover 1998; Moore and Benbasat 1991). In this exercise, participants were instructed to assign each item to one of the three factors, or to an “other” category, based on the construct definitions provided. At the end of the exercise, participants were invited to explain why any items had been assigned to the “other” category. Items were assessed based on heuristics for measuring observer agreement for categorical data (Landis and Koch 1977). Specifically, items with a Kappa at or above a moderate level (0.41 to 0.60) **and** an average pairwise agreement close to or greater than 0.80 were retained. After the initial card sorting exercise, 24 items remained in the item pool. To further validate the IT identity factors, a second card sorting exercise was conducted with the assistance of 34 part-time MBA students (i.e. working individuals) in July 2011. After the 2nd card sorting exercise, 21 items remained in the item pool. These items are presented in table A2-2.

Table A2-2: Measurement Items for IT Identity (pilot study)			
Factor	Item Measure	Kappa	Average Pairwise Agreement
Thinking about myself in relation to my smartphone, _____ my smartphone			
DEPENDENCE	I am dependent on	0.77	91.53%
	I am counting on	0.59	84.58%
	I am reliant on	0.71	89.03%
	I am needing	0.71	89.03%
	I am controlled by	0.71	89.03%
	I am free from*	0.42	78.00%
	I can go without*	0.66	87.08%
Thinking about myself in relation to my smartphone, I feel _____			
EMOTIONAL ENERGY	energized	0.92	97.06%
	confident	0.64	86.54%
	pumped up	0.77	91.44%
	excited	0.78	91.71%
	enthusiastic	0.66	87.08%
	animated	0.59	84.58%
	inspired	0.92	97.06%
Thinking about myself in relation to my smartphone, I am _____ my smartphone			
RELATEDNESS	in sync with	0.42	78.00%
	close to	0.53	82.18%
	connected with	0.92	97.06%
	integrated with	0.53	82.18%
	in coordination with	0.66	87.08%
	linked with	0.77	91.53%
	separate to*	0.64	86.54%
*: reverse coded items			

### Pilot Study 1

To further refine the IT identity measurement items, we conducted an initial pilot test of the survey instrument. The primary purpose of this step was to arrive at a sample of items that best represented the domain of IT identity (Churchill 1979). 190 full-time employees who used smartphones in support of their work roles evaluated the IT identity items via a web-based survey. Screening the data for unusual responses (e.g. “straight-lining”) resulted in a sample size of 184.



## Preliminary Analysis

After transforming reverse coded items, we conducted preliminary analysis, involving tests of outliers, skewness, and kurtosis (Tabachnick and Fidell 2007). Univariate outliers were assessed based on standardized residuals. No variables had a value exceeding 3 standard deviations from the mean. Thus, we determined that univariate outliers did not present a problem. We used Mahalanobis distance values to evaluate multivariate outliers. Results indicated 8 cases that were potential outliers with a distance of greater than  $\chi^2$  (21 df) = 46.80, at  $p < 0.001$ . Visual inspection revealed that 7 of these were separate from other cases (see Figure A2-3). These cases were dropped from analysis, leaving a usable sample of 177 cases. Sample characteristics are presented in Table A2-3.

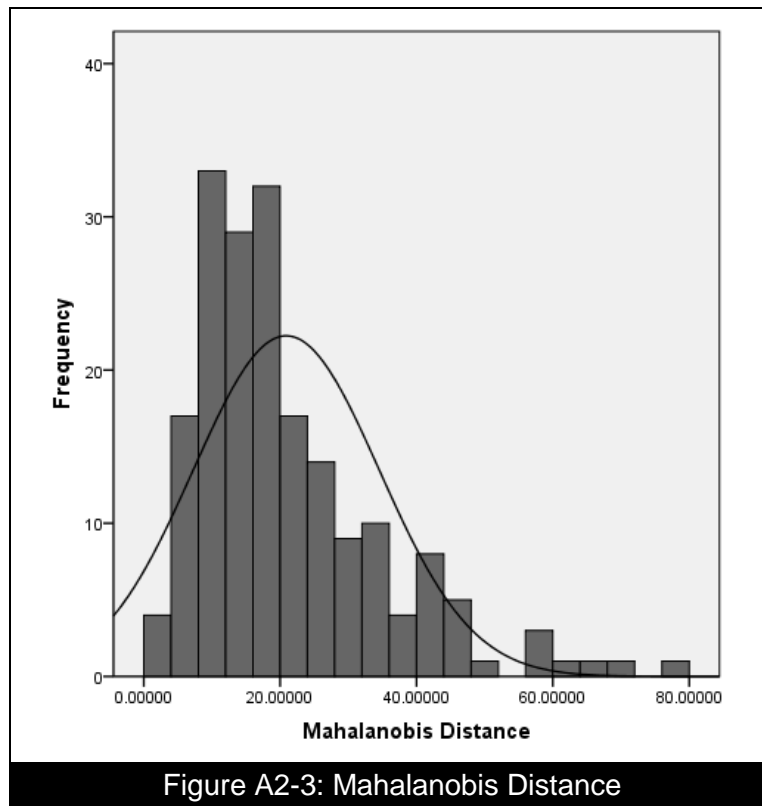


Table A2-3: Sample Characteristics			
Variable	Value	Frequency	% Respondents
<b>Gender</b>	1: Male	116	65.5
	2: Female	61	34.5
<b>Age</b> Mean: 3.48; Median: 3.00; S.D: 1.061	1: 21 and under	0	0.0
	2: 22 to 34	34	19.2
	3: 35 to 44	62	35.0
	4: 45 to 54	48	27.1
	5: 55 to 64	28	15.8
	6: 65 and over	5	2.8
<b>Experience using smartphones</b> Mean: 3.99; Median: 4.00; S.D: 1.197	1: < 6 months	8	4.5
	2: >=6 months and < 1 year	15	8.5
	3: >=1 year and < 2 years	34	19.2
	4: >=2 years and < 3 years	34	19.2
	5: >= 3 years	86	48.6
<b>Education</b> Mean: 4.06; Median: 4.00; S.D: 1.149	1: High School	5	2.8
	2: Some College	18	10.2
	3: Associate's Degree	14	7.9
	4: Bachelor's Degree	77	43.5
	5: Master's Degree	50	28.2
	6: PhD or Equivalent	13	7.3
<b>Total Subjects</b>			<b>177</b>

Next we conducted tests of skewness and kurtosis. Prior research suggests that appropriate skewness values are within the range of -1 to +1 (Cruz 2007; Muthen and Kaplan 1985). However, for large data sets, Tabachnick and Fidell (2007) recommend cutoff values + or - 3.29. Results showed that items were moderately to substantially negatively skewed (ranging from -1.2743 to -6.7668). Consequently, after reflecting the data, these items were transformed using logarithmic transformation. Data transformation improves normality of the data by reducing the distances between data points. Following transformation, we again conducted tests of skewness and kurtosis. Results showed that these were within acceptable ranges. Then, as recommended (Osborne 2002), we inspected the new means, standard deviations, as well as correlations between items to ensure that data points remained in the same relative order as they were prior to transformation. As nothing unusual was found, we moved on to assessing internal consistency of the three IT identity factors.

## Tests of Internal Consistency

Internal consistency was assessed using Cronbach's alpha. As recommended, during this step we dropped items that exhibited low inter-item correlations (Churchill 1979). Further, to avoid issues with multicollinearity, we also examined each item's squared multiple correlation. Items with extremely high squared multiple correlations and correspondingly high inter-item correlations were also dropped (Holmes 1979). As presented in Table A2-3, Cronbach's alphas for the three factors based on retained items exceeded recommended heuristics of 0.80 (Fornell and Larcker 1981). At the end of this step, 12 items were deemed suitable for additional testing with new data (Table A2-4).

Table A2-4: Measurement Items for IT Identity (pilot study 1)			
Factor	Item Measure	Outcome of pilot study	CA <sup>12</sup>
Thinking about myself in relation to my smartphone, I am _____ my smartphone			
DEPENDENCE	dependent	Retained	0.91
	counting on	Retained	
	Reliant on	Retained	
	needing	Retained	
	controlled by	Dropped due to low inter-item correlation	
	free from*		
	can go without*		
Thinking about myself in relation to my smartphone, I feel _____			
EMOTIONAL ENERGY	energized	Retained	0.92
	confident	Retained	
	pumped up	Retained	
	excited	Dropped due to high multiple squared correlation and high inter-item correlations	
	inspired		
	enthusiastic	Retained	
	animated	Dropped due to low inter-item correlation	
Thinking about myself in relation to my smartphone, I am _____ with my smartphone			
RELATEDNESS	in sync with	Dropped due to high multiple squared correlation and high inter-item correlations	0.92
	close to	Retained	
	connected	Retained	
	integrated	Dropped due to low inter-item correlation	
	separate*		
	in coordination	Retained	
	linked	Retained	

<sup>12</sup> CA=Cronbach's alpha (based on retained items)

## **Pilot Study 2**

We conducted a second pilot study to establish construct validity in relation to the remaining items—i.e. that they measured what they were intended to measure (Churchill 1979). As before, participants were acquired through a marketing firm that recruited a representative sample. However, in this pilot, we utilized the services of a second market research company (Empanelonline: [www.empanelonline.com](http://www.empanelonline.com)) that provided us with the capability to test two methods (i.e. Likert vs. semantic differential scales) for measuring IT identity.

Our rationale for evaluating different measurement methods was twofold. First, as Churchill (1979, p. 70) asserts, “A fundamental principle in science is that any particular construct or trait should be measurable by at least two methods. Otherwise the researcher has no way of knowing whether the trait is anything but an artifact of the measurement procedure.” Second, since all methods are not equally good (Churchill 1979; Menezes and Elbert 1979), we wanted to evaluate which approach was most appropriate for measuring the IT identity construct. 211 full-time employees who used smartphones in support of their work roles evaluated the final set of IT identity items via a web-based survey.

### **Preliminary Analysis**

Screening the data for unusual responses and outliers resulted in a usable sample size of 197. Table A2-5 presents sample characteristics for the final data set.

Table A2-5: Sample Characteristics			
Variable	Value	Frequency	% Respondents
<b>Gender</b>	1: Male	89	45.2
	2: Female	108	54.8
<b>Age</b> Mean: 3.27; Median: 3.00; S.D: 0.993	1: 21 and under	0	0.0
	2: 22 to 34	49	24.9
	3: 35 to 44	69	35.0
	4: 45 to 54	59	23.9
	5: 55 to 64	16	8.1
	6: 65 and over	4	2.0
<b>Experience using smartphones</b> Mean: 2.91; Median: 3.00; S.D: 1.254	1: < 6 months	26	13.2
	2: >=6 months and < 1 year	58	29.4
	3: >=1 year and < 2 years	49	24.9
	4: >=2 years and < 3 years	36	18.3
	5: >= 3 years	28	14.2
<b>Education</b> Mean: 3.64; Median: 4.00; S.D: 1.223	1: High School	12	6.1
	2: Some College	33	16.8
	3: Associate's Degree	16	8.1
	4: Bachelor's Degree	95	48.2
	5: Master's Degree	34	17.3
	6: PhD or Equivalent	7	3.6
<b>Total Subjects</b>			<b>197</b>

Next we conducted tests of skewness and kurtosis on both the Likert and semantic differential scale items. Results showed that items were substantially negatively skewed (ranging from -3.981 to -9.304). Consequently, to improve normality, we followed the same data transformation procedure as in pilot study 1. Following, transformation, skewness and kurtosis values were within acceptable ranges. Since inspection of means, standard deviations, and inter-item correlations indicated that data points remained in the same relative order as they were prior to transformation, we moved on to assessing internal consistency of the three IT identity factors.

### Tests of Internal Consistency

Internal consistency of the semantic differential and Likert scales was assessed using Cronbach's alpha. As presented in Table A2-6, Cronbach's alphas for both scales exceeded recommended heuristics of 0.80 (Fornell and Larcker 1981). Noteworthy, is that the reliabilities of the Likert scales is higher across the three factors. This might be explained by the smaller standard deviations for Likert scale items vs. semantic

differential items, suggesting that the Likert scale format has higher precision than the semantic differential scale (Menezes and Elbert 1979). The two scales appear similar in terms of item means, suggesting that neither scale has greater tendency to evoke higher responses (termed, *leniency* (Menezes and Elbert 1979)).

Table A2-6: Internal Consistency of Semantic Differential and Likert Scales											
Semantic Differential Scale		Before Transformation					After Transformation				
Thinking about how you view yourself in relationship to your cell phone, where would you place yourself between each bipolar statement referencing cell phones:											
Item	Item Description	MIN	MAX	M.	S.D.	CA	MIN	MAX	M.	S.D.	CA
SDDEP1	NEEDING - ABLE TO GO WITHOUT	1	7	5.42	1.604	.82	.00	.85	.331	.266	.84
SDDEP2	COUNTING ON -- NOT COUNTING ON	1	7	5.62	1.385		.00	.85	.308	.243	
SDDEP3	RELIANT -- NOT RELIANT	1	7	5.59	1.424		.00	.85	.312	.245	
SDDEP4	DEPENDENT -- INDEPENDENT	1	7	5.09	1.561		.00	.85	.397	.251	
SDEE1	PUMPED UP -- BORED	1	7	5.27	1.358	.86	.00	.85	.379	.231	.86
SDEE2	CONFIDENT - NOT CONFIDENT	1	7	5.76	1.341		.00	.85	.282	.244	
SDEE3	ENTHUSIASTIC -- EMOTIONLESS	1	7	5.24	1.549		.00	.85	.370	.254	
SDEE4	ENERGIZED -- PASSIVE	1	7	5.20	1.545		.00	.85	.382	.242	
SDREL1	CONNECTED -- DETACHED	1	7	5.59	1.406	.89	.00	.85	.313	.243	.89
SDREL2	IN COORDINATION -- UNRELATED	1	7	5.31	1.481		.00	.85	.368	.235	
SDREL3	CLOSE -- DISTANT	1	7	5.47	1.486		.00	.85	.331	.252	
SDREL4	LINKED -- SEPARATE	1	7	5.29	1.560		.00	.85	.361	.253	
Likert Scale		Before Transformation					After Transformation				
Item	Item Description	MIN	MAX	M.	S.D.	CA	MIN	MAX	M.	S.D.	CA
Thinking about myself in relation to my smartphone, I am _____ my smartphone											
DEP1	NEEDING	1	7	5.49	1.361	.92	.00	.85	.336	.238	.92
DEP2	COUNTING ON	1	7	5.86	1.177		.00	.85	.272	.221	
DEP3	RELIANT ON	1	7	5.75	1.283		.00	.85	.287	.238	
DEP4	DEPENDENT ON	1	7	5.49	1.480		.00	.85	.331	.243	
Thinking about myself in relation to my smartphone, I feel _____											
EE1	PUMPED UP	1	7	5.12	1.389	.90	.00	.85	.407	.224	.89
EE2	CONFIDENT	1	7	5.79	1.205		.00	.85	.287	.221	
EE3	ENTHUSIASTIC	1	7	5.34	1.337		.00	.85	.369	.227	
EE4	ENERGIZED	1	7	5.43	1.310		.00	.85	.353	.228	
Thinking about myself in relation to my smartphone, I am _____ with my smartphone											
REL1	CONNECTED	1	7	5.77	1.236	.92	.00	.85	.291	.223	.91
REL2	IN COORD	1	7	5.61	1.268		.00	.85	.325	.214	
REL3	CLOSE	1	7	5.56	1.283		.00	.85	.332	.221	
REL4	LINKED	1	7	5.67	1.289		.00	.85	.307	.228	

To test for differences in means, we conducted a paired samples t-test (Table A2-7). Results showed differences in only 4 of the 12 means and, in each case, the mean for the semantic differential item was higher than the mean for the Likert item. From this we

conclude that, where differences exist, the semantic differential scale evokes higher responses than the Likert scale.

**Table A2-7: Paired Samples t-test of difference in means**

Pair	Mean	S.D	Std. Error Mean	95% Confidence Interval of the Difference		Sig. (2-tailed)
				Lower	Upper	
SDDEP1 – DEP1	-.00558	.25420	.01811	-.04130	.03013	n.s.
<b>SDDEP2 – DEP2</b>	<b>.03548</b>	<b>.22992</b>	<b>.01638</b>	<b>.00317</b>	<b>.06779</b>	<b>.032</b>
SDDEP3 – DEP3	.02485	.22686	.01616	-.00702	.05673	n.s.
<b>SDDEP4 – DEP4</b>	<b>.06597</b>	<b>.24690</b>	<b>.01759</b>	<b>.03128</b>	<b>.10066</b>	<b>.000</b>
SDEE1 – EE1	-.02788	.20037	.01428	-.05604	.00027	n.s.
SDEE2 – EE2	-.00586	.20576	.01466	-.03477	.02306	n.s.
SDEE3 – EE3	.00062	.24699	.01760	-.03409	.03532	n.s.
SDEE4 – EE4	.02881	.22069	.01572	-.00219	.05982	n.s.
SDREL1 – REL1	.02238	.19940	.01421	-.00564	.05039	n.s.
<b>SDREL2 – REL2</b>	<b>.04251</b>	<b>.21637</b>	<b>.01542</b>	<b>.01210</b>	<b>.07291</b>	<b>.006</b>
SDREL3 – REL3	-.00061	.22018	.01569	-.03154	.03033	n.s.
<b>SDREL4 – REL4</b>	<b>.05361</b>	<b>.23925</b>	<b>.01705</b>	<b>.01999</b>	<b>.08723</b>	<b>.002</b>

### Tests of Construct Validity

We used a multi-step process to evaluate construct validity. A covariance-based structural equation modeling (SEM) tool, EQS v. 6.1, was used to conduct the statistical analyses discussed here. First, we tested the a-priori hypothesis that IT identity reflects three underlying dimensions. Next, we tested the convergent and discriminant validity of the semantic differential and Likert scales using a confirmatory factor analysis (CFA) approach to conducting multi-trait multi-method analysis (Byrne 2006; Menezes and Elbert 1979). Then, we evaluated which of the two scale approaches offered better measurement of IT identity by partitioning factor loadings into trait and method loadings and comparing the average variance extracted (AVE) for both traits and methods. Finally, having determined which approach was better, we went on to test the convergent and discriminant validity of the IT identity measures relative to established IS constructs.

***Testing the factorial structure of IT identity:*** In the first step, we tested the hypothesis that responses to the IT identity (a) semantic differential and (b) Likert scales could be explained by 3 distinct but correlated factors: dependence (DEP), emotional

energy (EE), and relatedness (REL). This involved comparing differences in the goodness of fit of three hypothesized models and the sample data for each scale: Model 1—where IT identity was modeled as a unidimensional construct; Model 2—where IT identity was modeled as three first-order factors (dependence; emotional energy; and relatedness); and Model 3—where IT identity was modeled as three first-order factors and one second-order factor (IT identity). Because Models 2 and 3 are statistically equivalent, model comparison involved comparing differences in fit statistics between each of these models with Model 1 (the baseline model). Assuming that a multi-dimensional structure is supported, the decision to model IT identity as a higher-order construct is theoretical, rather than statistical. Table A2-8 summarizes fit indices for each scale. Because Mardia's normalized estimate (29.14) indicated significant positive multivariate kurtosis, we used the Satorra-Bentler  $\chi^2$  statistic (Satorra and Bentler 1988) and corresponding robust fit estimates to assess goodness of fit (GOF) (Byrne 2006). GOF indices for model comparisons are presented in Table A2-9. Cronbach's alphas and correlations between factors are given in Table A2-10. Results are discussed next.

Table A2-8: Summary of fit indices for semantic differential and Likert scales							
Semantic Differential Scale							
Equivalent Models	$\chi^2$	df	Chi-square/df	CFI	NNFI	RMSEA	RMSEA 90% CI
Model 1: Unidimensional	96.011	54	1.78	0.969	0.963	0.063	0.042,0.083
Model 2: 3-dimensions	66.314	51	1.30	0.989	0.986	0.039	0.000,0.063
Model 3: 2 <sup>nd</sup> Order CFA	66.893	51	1.25	0.988	0.985	0.040	0.000,0.064
Likert Scale							
Equivalent Models	$\chi^2$	df	Chi-square/df	CFI	NNFI	RMSEA	RMSEA 90% CI
Model 1: Unidimensional	224.820	54	4.15	0.888	0.863	0.127	0.109,0.144
Model 2: 3-dimensions	69.952	51	1.37	0.988	0.984	0.043	0.010,0.067
Model 3: 2 <sup>nd</sup> Order CFA	68.861	51	1.35	0.988	0.985	0.042	0.005,0.066



Table A2-9: Differential GOF indices for model comparisons						
<i>Model Comparison</i>	Semantic Differential Scale			Likert Scale		
	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$
<u>Unidimensional vs. 3-dimensions</u>						
Model 1 vs. Model 2	29.70	3	0.02	155.87	3	0.1
<u>ITID as a higher order construct</u>						
Model 1 vs. Model 3	29.12	3	0.019	155.96	3	0.1

Table A2-10: Correlations and Reliabilities				
<u>Method</u>		SEMANTIC DIFF		
SEMANTIC DIFF	DEP	<b>0.84</b>		
	EE	0.83	<b>0.86</b>	
	REL	0.92	0.94	<b>0.89</b>
<u>Method</u>		LIKERT		
LIKERT	DEP	<b>0.92</b>		
	EE	0.70	<b>0.89</b>	
	REL	0.87	0.81	<b>0.91</b>

Blue = Cronbach's alphas; Red = correlations between factors

For the semantic differential scale, Model 1 shows good fit ( $CFI=0.969$ ;  $NNFI=0.963$ ;  $RMSEA=0.063$ , and  $RMSEA\ 90\% \ CI=0.042, 0.083$ ). Nevertheless, there is strong statistical ( $\Delta\chi^2$  of 29.70, significant at  $p<.001$ ) and non-statistical ( $\Delta CFI$  of 0.02  $>0.01$  (Cheung and Rensvold 2002)) evidence for modeling IT identity as a 3-dimensional construct. Models 2 and 3 are statistically equivalent. Thus, statistical ( $\Delta\chi^2$  of 29.12 sig. at  $p<.001$ ) and non-statistical ( $\Delta CFI$  of 0.019  $>0.01$ ) support for the 2nd order factorial structure is expected, given that Model 2 fits the data better than Model 1.

One issue of concern with the semantic differential scale is that correlations between the relatedness (REL) factor and the dependence (DEP) and emotional energy (EE) factors (0.92 and 0.94, respectively) are higher than the recommended cutoff value of 0.90 (Bagozzi et al. 1991). This may suggest that, in fact, the semantic differential

scale is more appropriately modeled as a unidimensional construct. To test this possibility, a test of differences in chi-square and CFI was conducted to evaluate whether the dimensions are in fact distinct. For each pair of factors, the fit of Model 2 was compared with a model that constrained their correlation to 1. Results are given in Table A2-11 and discussed below.

<b>Table A2-11: Discriminant validity of IT identity factors (semantic differential scale)</b>				
<b>Model Comparison</b>	<b><math>\Delta\chi^2</math></b>	<b>df</b>	<b>Sig.</b>	<b><math>\Delta</math>CFI</b>
Model 2 (3-dimensions) vs. Model 4 (DEP-REL correlation constrained to 1)	9.356	1	<0.01	0.02
Model 2 (3-dimensions) vs. Model 5 (EE-REL correlation constrained to 1)	5.873	1	<0.05	0.006
Model 2 (3-dimensions) vs. Model 6 (EE-DEP correlation constrained to 1)	30.698	1	<0.001	0.004

Results show that while  $\Delta$ CFI was trivial when constraining EE-REL and EE-DEP correlations to be equal, in each case, a significant chi-square difference provides statistical evidence of discriminant validity. When these results are considered in conjunction with the differential GOF indices for model comparisons, we can conclude that there is evidence to support the hypothesis that the IT identity semantic differential scale can be explained by 3 distinct but correlated factors.

As regards the IT identity Likert scale, the extremely poor fit of Model 1 (CFI=0.888; NNFI=0.863; RMSEA=0.127, and RMSEA 90% CI=0.109, 0.144) contrasts starkly with the close fit of Model 2 (CFI=0.988; NNFI=0.984; RMSEA=0.043, and RMSEA 90% CI=0.010, 0.067). The resulting  $\Delta\chi^2$  of 155.87, significant at  $p<.001$ , and  $\Delta$ CFI of 0.1 >0.01 provide strong evidence for modeling IT identity as a 3-dimensional construct. Correlations between the factors (0.70, 0.87, and 0.80) are less than the recommended cutoff value of 0.90 (Bagozzi et al. 1991). Further, correlations between factors are much lower than the square root of each factor's Cronbach's alpha, providing further evidence that the dimensions of IT identity are discriminant (Churchill 1979). In

sum, there is strong statistical and non-statistical evidence to support the hypothesis that the IT identity Likert scale can be explained by 3 distinct but correlated factors.

Differences in GOF ( $\chi^2$ , CFI, NNFI, and RMSEA) indices for the IT identity semantic differential scale: Model 2 and GOF indices for the IT identity Likert scale: Model 2 were trivial, suggesting that the scales be evaluated further to determine which offered the better approach for measuring the IT identity construct.

***Tests of Convergent and Discriminant Validity:*** In the next step, we followed the recommended practice of using multi-trait multi-method (MTMM) analysis to test convergent and discriminant validity of different measures of the same construct (Churchill 1979). Consistent with prior studies, we took a CFA approach to conducting MTMM analysis of the IT identity semantic differential and Likert scales (Byrne 2006; Menezes and Elbert 1979). As outlined by Byrne (2006, p. 329), the general CFA approach involves comparing the hypothesized MTMM model with a “nested series of more restrictive models in which parameters are either eliminated or constrained equal to zero or 1.0.” Differences in GOF ( $\chi^2$ , CFI) indices are used to evaluate convergent and discriminant validity.

Following Byrne (2006), we conducted CFA using four models: Model 1 had freely correlated traits (dependence, emotional energy, and relatedness) and freely correlated methods (semantic differential and Likert); Model 2 had no traits and freely correlated methods; Model 3 had perfectly correlated traits and freely correlated methods, and Model 4 had freely correlated traits and uncorrelated methods. Table A2-12 summarizes each model’s GOF indices. Differential GOF indices for model comparisons are given in Table A2-13. Results of construct validity tests are discussed next.

Table A2-12: Summary of fit indices						
	$\chi^2$	df	CFI	NNFI	RMSEA	RMSEA 90% CI
Model 1 (freely correlated traits/freely correlated methods)	237.05	224	0.997	0.996	0.017	0.000, 0.034
Model 2 (no traits/freely correlated methods)	550.02	251	0.921	0.913	0.075	0.067, 0.084
Model 3 (perfectly correlated traits/freely correlated methods)	316.11	227	0.977	0.971	0.043	0.031, 0.054
Model 4 (freely correlated traits/uncorrelated methods)	239.05	225	0.996	0.995	0.017	0.000, 0.034

Table A2-13: Differential GOF indices for model comparisons			
<i>Model Comparison</i>	$\Delta\chi^2$	$\Delta df$	$\Delta CFI$
<u>Convergent Validity</u>			
Model 1 vs. Model 2	312.97	27	0.076
<u>Discriminant Validity</u>			
Model 1 vs. Model 3	79.06	3	0.02
Model 1 vs. Model 4	2.00	1	0.001

Convergent validity assesses the extent to which independent measures of the same construct or trait are correlated (Churchill 1979). In CFA, comparing a model in which traits are specified (Model 1) with one where they are not (Model 2) provides a test of convergent validity; whereby a significant  $\Delta\chi^2$  and  $\Delta CFI > 0.01$  provide support for convergent validity (Byrne 2006). As outlined in Table A2-12, comparison of Model 1 vs. Model 2 results in  $\Delta\chi^2$  of 312.97, 27 df, which is significant at  $p < 0.001$ . Additionally,  $\Delta CFI > 0.076$ . Thus, we can conclude that there is evidence to support that both scales measure the same construct.

Discriminant validity is assessed in terms of traits and methods; whereby, for trait discriminant validity, correlations between independent measures of different traits should be negligible (Byrne 2006). Trait discriminant validity can be tested by comparing a model with perfectly correlated traits (Model 3) with one in which traits are freely correlated (Model 1). The larger the discrepancy between chi-square and CFI values, the stronger the support for discriminant validity (Byrne 2006). Our comparison

shows a statistically significant ( $p < 0.001$ )  $\Delta\chi^2$  of 79.06, 3 df, and  $\Delta CFI = 0.02 > 0.01$ , providing support that the dimensions of IT identity are discriminant.

For method, evidence of discriminant validity can be tested by comparing a model in which method factors are freely correlated (Model 1) with one in which method factors are uncorrelated (Model 4). Here, a large  $\Delta\chi^2$  or large  $\Delta CFA$  argues for a lack of discriminant validity (Byrne 2006). As shown in Table A2-13, the  $\Delta\chi^2$  between Model 1 and Model 4 is not statistically significant. Additionally, the  $\Delta CFI = 0.001$  is substantially less than the recommended value of 0.01 (Cheung and Rensvold, 2002), providing strong evidence that the methods are discriminant. Having established that IT identity was measurable by at least two methods, we moved on to evaluating which approach (semantic differential or Likert) offered the best measurement of the construct.

***Evaluating the IT Identity Semantic Differential vs. Likert Scale Approaches:***

To evaluate the two approaches to measuring IT identity, we compared factor loadings and AVE extracted by items for both traits and method (Table A2-14). The high AVE Method of 0.49 and low AVEs for Traits (0.60, 0.61, and 0.57) provide clear evidence of method bias in responses to the semantic differential scale. In contrast, the Likert scale items have a much lower AVE Method at 0.22 vs. high Trait AVEs (0.81, 0.84, and 0.78). When considered alongside the trivial differences in the two scales' GOF indices, as well as the extremely high correlations among semantic differential factors, we can conclude with some degree of confidence that the Likert scale provides a better measure of the IT identity construct than the semantic differential scale.

**Table A2-14: Trait and Method Factor Loadings, AVE Trait, AVE Method**

Semantic Differential Scale						
Factor	Item	Item Description	Trait Loading	Method Loading	AVE Trait	AVE Method
FACTOR 1: DEPENDENCE	SDDEP1	NEEDING - ABLE TO GO WITHOUT	0.57	0.50	0.60	0.49
	SDDEP2	COUNTING ON -- NOT COUNTING ON	0.60	0.45		
	SDDEP3	RELIANT -- NOT RELIANT	0.63	0.47		
	SDDEP4	DEPENDENT -- INDEPENDENT	0.59	0.38		
FACTOR 2: EMOTIONAL ENERGY	SDEE1	PUMPED UP -- BORED	0.70	0.38	0.61	
	SDEE2	CONFIDENT - NOT CONFIDENT	0.60	0.48		
	SDEE3	ENTHUSIASTIC -- EMOTIONLESS	0.55	0.60		
	SDEE4	ENERGIZED -- PASSIVE	0.59	0.46		
FACTOR 3: RELATEDNESS	SDREL1	CONNECTED -- DETACHED	0.65	0.50	0.57	
	SDREL2	IN COORDINATION -- UNRELATED	0.53	0.58		
	SDREL3	CLOSE -- DISTANT	0.54	0.64		
	SDREL4	LINKED -- SEPARATE	0.56	0.44		
Likert Scale						
Factor	Item	Item Description	Trait Loading	Method Loading	AVE Trait	AVE Method
FACTOR 1: DEPENDENCE	DEP1	NEEDING	0.82	0.22	0.81	0.22
	DEP2	COUNTING ON	0.78	0.29		
	DEP3	RELIANT	0.81	0.25		
	DEP4	DEPENDENT	0.81	0.24		
FACTOR 2: EMOTIONAL ENERGY	EE1	PUMPED UP	0.89	0.05	0.84	
	EE2	CONFIDENT	0.75	0.26		
	EE3	ENTHUSIASTIC	0.84	0.23		
	EE4	ENERGIZED	0.87	0.21		
FACTOR 3: RELATEDNESS	REL1	CONNECTED	0.80	0.29	0.78	
	REL2	IN COORDINATION	0.78	0.25		
	REL3	CLOSE	0.79	0.26		
	REL4	LINKED	0.76	0.22		

***Evaluating IT Identity Relative to Other Constructs:*** The preceding steps provided evidence in support of the internal consistency of the IT identity measure. However, as Churchill (1979) points out, this does not show that the construct will behave as expected in relation to other constructs. Thus, as recommended (Churchill 1979; Malhotra and Grover 1998), we conducted tests of IT identity's convergent, discriminant, and concurrent validity in relation to IS constructs that we expected it to correlate positively with. Table A2-15 presents the latent correlation matrix for IT Identity and four constructs used in IS: habit (Limayem et al. 2007); continuance intention (Bhattacharjee and Premkumar 2004); perceived usefulness (Davis 1989; Davis et al. 1989), and intention to explore (Nambisan et al. 1999). AVE for all constructs exceeded 0.50 and the square roots of the AVEs exceeded off-diagonal correlations

providing preliminary evidence of convergent and discriminant validity (Fornell and Larcker 1981). Moreover, as expected, IT identity correlated positively with all other constructs, offering initial support for concurrent validity (Churchill 1979; Malhotra and Grover 1998).

Table A2-15: Latent correlation matrix for the second-order IT identity construct						
	AVE	ITID	HAB	CONT	PU	ITX
IT IDENTITY (ITID)	0.86	<b><u>0.93</u></b>				
HABIT (HAB)	0.73	0.64	<b><u>0.83</u></b>			
CONTINUANCE INTENTION (CONT)	0.75	0.60	0.74	<b><u>0.86</u></b>		
PERCEIVED USEFULNESS (PU)	0.76	0.76	0.82	0.83	<b><u>0.87</u></b>	
INTENTION TO EXPLORE (ITX)	0.75	0.63	0.67	0.59	0.68	<b><u>0.86</u></b>
Square root of AVEs given in diagonal; all correlations significant at $p < 0.05$						

In sum, following item generation and initial validation, items were refined and modified through two card sorting exercises and two pilot studies. Data from the first pilot study was used to arrive at a sample of items that best represented the domain of IT identity (Churchill 1979). In the second pilot, we evaluated two different methods (i.e. Likert vs. semantic differential scales) for measuring IT identity. Results of CFA-based multi-trait multi-method (MTMM) analysis (Byrne 2006), supported the conceptualization of IT identity as a higher-order construct, reflecting three distinct but highly correlated dimensions. MTMM also established that IT identity was measurable by at least two methods. Further analysis provided strong evidence that the Likert scale was a better measure of IT identity than the semantic differential scale. Finally, tests of the higher-order IT identity construct's convergent, discriminant, and concurrent validity in relation to other constructs offered further evidence in support of IT identity's construct validity. Thus, we proceeded to conduct a main study to gather sufficient evidence of IT identity's validity and, consequently, its utility to IS research on continued IT use.

## APPENDIX 3: SURVEY MEASURES

IT IDENTITY: TIME 1 MEASURES		
<b>INFORMATION ABOUT YOUR USE OF INFORMATION TECHNOLOGIES AT WORK</b>		
<p><i>In the following questions, by “<b>smartphone</b>”, we mean a mobile device technology that:</i></p> <ol style="list-style-type: none"> <li><b>1.</b> Can run software applications (or “apps”)</li> <li><b>2.</b> Provides access to the Internet</li> <li><b>3.</b> Has hardware-based (physical keys) or software-based (touch screen) QWERTY keyboard</li> <li><b>4.</b> Handles email</li> <li><b>5.</b> Requires subscription to a data plan</li> </ol>		
<b>SCREENING QUESTIONS</b>		
<p><i>Are you currently in full-time employment? <b>Yes</b> (go to next question)    <b>No</b> (thank you for your time)</i></p>		
<p><i>In this question, by “<b>work-related purposes</b>” we mean using your smartphone for activities such as sending/receiving work-related emails, making/receiving work-related calls, scheduling work-related appointments, etc.</i></p> <p><i>Do you currently use a <b>smartphone</b> for work-related purposes? <b>Yes</b> (go to next question)    <b>No</b> (thank you for your time)</i></p>		
<p><i>Do you currently use <b>MS Excel</b> in your work? <b>Yes</b> (go to main survey)    <b>No</b> (thank you for your time)</i></p>		
<b>MAIN SURVEY</b>		
<p><b>Thinking about using a smartphone for work-related purposes, please evaluate the accuracy of the following statements as they relate to using a smartphone at work</b></p> <p><i>Extremely Inaccurate, Inaccurate, Somewhat Inaccurate, Neutral, Somewhat accurate, Accurate, Extremely Accurate</i></p>		
<p><b>Perceived Usefulness</b> (Davis 1989; Davis et al 1989; Venkatesh et al, 2003)</p>	<p>The degree to which an individual expresses a belief that using a smartphone for work-related purposes will enhance his or her job performance</p>	<p>Using a smartphone in my job enables me to accomplish tasks more quickly, Using a smartphone improves my job performance Using a smartphone in my job increases my productivity Using a smartphone enhances my effectiveness on the job</p>
<p><b>Attitude</b> (Bhattacharjee and Premkumar, 2004; Davis et al 1989; Fishbein and Ajzen, 1975; Taylor and Todd, 1995)</p>	<p>The degree to which an individual expresses positive or negative feelings toward using a smartphone for work-related purposes</p>	<p>Using a smartphone for work-related purposes is a bad/good idea I dislike/like the idea of using a smartphone for work-related purposes Using a smartphone for work-related purposes is unpleasant/pleasant</p>
<p><b>How long have you been using your current smartphone for work-related purposes?</b></p>		
<p><b>Experience</b> (Liao et al, 2009)</p>	<p>How long an individual has been using his/her current smartphone for work-related purposes</p>	<p>Less than 6 months At least 6 months but less than 1 year At least 1 year but less than 2 years At least 2 years but less than 3 years 3 years or longer</p>
<p><b>Thinking about your <i>past interaction</i> with a smartphone at work where would you place yourself between each bipolar statement referencing smartphones</b></p> <p><i>I am _____ with my use of a smartphone for work related purposes</i></p>		
<p><b>Satisfaction</b> (Bhattacharjee, 2001; Bhattacharjee and Premkumar, 2004)</p>	<p>The degree to which an individual views his or her actual usage experiences positively or negatively</p>	<p>Extremely displeased ... Extremely pleased Extremely dissatisfied ... Extremely satisfied</p>



## IT IDENTITY: TIME 1 MEASURES

**Compared to the expectations I had before using a smartphone for work-related tasks, the ability of the smartphone \_\_\_\_\_ was (much worse than expected .... much better than expected).**

<b>Confirmation (Perceived Usefulness)</b> (Bhattacharjee and Premkumar, 2004)	The degree to which an individual's actual usage experience is perceived as better as or worse than his or her pre-usage beliefs about the smartphone's ability to enhance his or her job performance.	To enable me to accomplish tasks more quickly, To improve my job performance To increase my productivity at work To enhance my effectiveness on the job
<p><b><i>In these questions, we are interested to know more about <u>how you view yourself in relationship to your smartphone.</u></i></b></p> <p><b><i>Please indicate the extent to which you agree or disagree with the following statements.</i></b></p> <p><i>Strongly Disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i></p>		
<b>Emotional Energy</b>	The degree to which an individual expresses feelings of confidence, enthusiasm, and energy when thinking about her- or him-self in relation to the smartphone	Thinking about myself in relation to my smartphone, I feel _____ Pumped up Confident Enthusiastic Energized
<b>Relatedness</b>	The degree to which an individual expresses feelings of connectedness when thinking about her- or him-self in relation to the smartphone	Thinking about myself in relation to my smartphone, I am _____ with my smartphone Connected In coordination Close Linked
<b>Dependence</b>	The degree to which an individual expresses feelings of reliance when thinking about her- or him-self in relation to the smartphone	Thinking about myself in relation to my smartphone, I am _____ my smartphone Needing Counting on Reliant on Dependent on
<p><b><i>In these questions, we are interested in how you might use or not use your smartphone for work-related purposes in the next 3 weeks.</i></b></p> <p>Thinking about performing your work role in the next 3 weeks, please evaluate the following statements</p> <p><i>Strongly disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i></p>		
<b>Continuance Intention</b> (Bhattacharjee and Premkumar, 2004; Taylor and Todd, 1995; Venkatesh et al, 2003)	The degree to which an individual expresses the intent to continue using a smartphone for work-related purposes	I intend to continue using a smartphone for work-related purposes I predict I will carry on using a smartphone for my job I plan to continue using a smartphone to support my work role
<b>Intention to Explore</b> (Nambisan et al, 1999)	The degree to which an individual expresses the intent to explore new features of a smartphone and find potential use in support of his or her work role	I intend to explore new features of the smartphone for potential application in my work context I plan to explore new smartphone functions for enhancing the effectiveness of my work I intend to spend considerable time and effort exploring new smartphone features for potential application in my work

## IT IDENTITY: TIME 1 MEASURES

### INFORMATION ABOUT YOU

<b>Age</b>	1 = 21 and under; 2 = 22 to 34; 3 = 35 to 44; 4 = 45 to 54; 5 = 55 to 64; 6 = 65 and over
<b>Gender</b>	0 = Male; 1 = Female
<b>Education</b>	Highest level of education completed: 1 = High school; 2 = Some college; 3 = Associate's degree; 4 = Bachelor's degree; 5 = Master's degree; 6 = PhD or equivalent
<b>Occupational Group</b>	(adapted from International Standard Classification of Occupations (ISCO-1958)) <a href="http://laborstailoorg/applv8/data/isco58ehtml">http://laborstailoorg/applv8/data/isco58ehtml</a>  <b>Which of the following categories best describes your occupation?</b> 0 = professional and technical workers; 1 = executive and managerial workers; 2 = administrative, administrative support, and clerical workers; 3 = marketing and sales workers; 4 = service, sport, and recreation workers; 5 = mechanics, installers, and repairers; 6 = workers in transport and communication occupations; 7 = craftsmen, production-process, and construction workers; 8 = farmers, fisherman, hunters, loggers, and related workers; 9 = miners, quarrymen, and related workers; 10 = workers not classified elsewhere

### IN THE FOLLOWING QUESTIONS, WE ARE INTERESTED TO KNOW ABOUT HOW YOU VIEW USING MS EXCEL IN THE WORK CONTEXT.

**Thinking about using MS Excel for work-related purposes, please evaluate the accuracy of the following statements as they relate to using MS Excel at work**

*Extremely Inaccurate, Inaccurate, Somewhat Inaccurate, Neutral, Somewhat accurate, Accurate, Extremely Accurate*

<b>Perceived Usefulness</b> (Davis 1989; Davis et al 1989; Venkatesh et al, 2003)	The degree to which an individual expresses a belief that using MS Excel for work-related purposes will enhance his or her job performance	Using MS Excel in my job enables me to accomplish tasks more quickly, Using MS Excel improves my job performance Using MS Excel in my job increases my productivity Using MS Excel enhances my effectiveness on the job
<b>Attitude</b> (Bhattacharjee and Premkumar, 2004; Davis et al 1989; Taylor and Todd, 1995)	The degree to which an individual expresses positive or negative feelings toward using MS Excel for work-related purposes	Using MS Excel for work-related purposes is a bad/good idea I dislike/like the idea of using MS Excel for work-related purposes Using MS Excel for work-related purposes is unpleasant/pleasant

### How long have you been using MS Excel for work-related purposes?

<b>Experience</b> (Liao et al, 2009)	How long an individual has been using MS Excel for work-related purposes	Less than 6 months At least 6 months but less than 1 year At least 1 year but less than 2 years At least 2 years but less than 3 years 3 years or longer
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**Thinking about your *past interaction* with MS Excel at work where would you place yourself between each bipolar statement referencing MS Excel?**

*I am \_\_\_\_\_ with my use of MS Excel for work related purposes*

<b>Satisfaction</b> (Bhattacharjee, 2001; Bhattacharjee and Premkumar, 2004)	The degree to which an individual views his or her actual usage experiences positively or negatively	Extremely displeased    Extremely pleased Extremely dissatisfied    Extremely satisfied
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## IT IDENTITY: TIME 1 MEASURES

*Compared to the expectations I had before using MS Excel for work-related tasks, the ability of the MS Excel \_\_\_\_\_ was (much worse than expected .... much better than expected).*

<b>Confirmation (Perceived Usefulness)</b> (Bhattacharjee and Premkumar, 2004)	The degree to which an individual's actual usage experience is perceived as better as or worse than his or her pre-usage beliefs about the MS Excel's ability to enhance his or her job performance.	To enable me to accomplish tasks more quickly, To improve my job performance To increase my productivity at work To enhance my effectiveness on the job
<b><i>In these questions, we are interested to know more about <u>how you view yourself in relationship to MS Excel</u>. Please indicate the extent to which you agree or disagree with the following statements.</i></b> <i>Strongly Disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i>		
<b>Emotional Energy</b>	The degree to which an individual expresses feelings of confidence, enthusiasm, and energy when thinking about her- or him-self in relation to MS Excel	Thinking about myself in relation to MS Excel, I feel _____ Pumped up Confident Enthusiastic Energized
<b>Relatedness</b>	The degree to which an individual expresses feelings of connectedness when thinking about her- or him-self in relation to MS Excel	Thinking about myself in relation to MS Excel, I am _____ with MS Excel Connected In coordination Close Linked
<b>Dependence</b>	The degree to which an individual expresses feelings of reliance when thinking about her- or him-self in relation to MS Excel	Thinking about myself in relation to MS Excel, I am _____ MS Excel Needing Counting on Reliant on Dependent on
<b><i>In these questions, we are interested in how you might use or not use MS Excel for work-related purposes in the next 3 weeks.</i></b> Thinking about performing your work role in the next 3 weeks, please evaluate the following statements <i>Strongly disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i>		
<b>Continuance Intention</b> (Bhattacharjee and Premkumar, 2004; Davis, 1989; Taylor and Todd, 1995; Venkatesh et al, 2003)	The degree to which an individual expresses the intent to continue using MS Excel for work-related purposes	I intend to continue using MS Excel for work-related purposes I predict I would continue using MS Excel for my job I plan to continue using MS Excel to support my work role
<b>Intention to Explore</b> (Nambisan et al, 1999)	The degree to which an individual expresses the intent to explore new features of MS Excel and find potential use in support of his or her work role	I intend to explore new features of MS Excel for potential application in my work context I plan to explore new MS Excel functions for enhancing the effectiveness of my work I intend to spend considerable time and effort exploring new MS Excel features for potential application in my work

## IT IDENTITY: TIME 2 MEASURES (SMARTPHONE)

*In these questions, we are interested in your use or non-use of a smartphone for work-related purposes during the last 3 weeks. By "work-related purposes" we mean using your smartphone for activities such as sending/receiving work-related emails, making/receiving work-related calls, scheduling work-related appointments, etc*

<b>Construct</b>	<b>Operationalization</b>	<b>Item Measures</b>
<b>Duration</b> (Igbaria, 1995; Venkatesh and Davis, 2000; Venkatesh et al., 2003)	Self-reported measure of the time spent using a smartphone for work-related tasks	In the past 3 weeks, how much time do you spend using the smartphone for work-related activities on a typical work day? ____ Hours and ____ Minutes
<b>Frequency</b> (Bagozzi and Warshaw, 1990; Igbaria, 1995, 1996, Mathieson et al. 2001)	How often an individual has used a smartphone in the past 3 weeks	Thinking of your use of a smartphone during the past 3 weeks, please indicate how often you have used a smartphone for work-related purposes  <i>During the past 3 weeks I used a smartphone for work</i> 1 = very many times, 2 = many times, 3 = several times, 4 = a couple of times; 5 = once, and 6 = not at all
<b>Breadth of Use</b> (Saga and Zmud, 1994)	The number of features an individual has used in support of work	Please indicate which smartphone features you have used in support of work during the past 3 weeks  Voice Calls, Text Messaging, Emails, Instant Messaging, Browser, Calendar, Address Book, Task List, Calculator, MemoPad, Camera, Video, Music, Media Player, GPS, News, Clock, Social Networking, 3 <sup>rd</sup> party software applications
<b>Deep Use</b> (Lucas and Spitler, 1999; Schwarz, 2003)	Extent to which the individual has employed different applications of the smartphone in the context of work	On a scale of 0 to 7, where 0 = <i>Not at all</i> , 1 = <i>Extremely Light</i> and 7 = <i>Extremely Heavy</i> , please evaluate the extent of your use of different smartphone functions during the past 3 weeks  During the past 3 weeks, my use of features that helped me _____ was ( <i>not at all, extremely light... extremely heavy</i> )  Make/receive work-related voice calls Send/receive work-related text messages Send/receive work-related emails Use the browser to search for work-related information Use personal organizer functions Synchronize the smartphone with other workplace systems Get to unfamiliar locations Collaborate with colleagues
<b>Trying to Innovate</b> (Ahuja and Thatcher, 2005)	The degree to which an individual has made behavioral attempts to find new ways of using a smartphone in support of his or her work role	Thinking about ways you used a smartphone to support your work role in the past 3 weeks, please indicate the extent to which you agree or disagree with the following statements  <i>Strongly disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i>  I tried to find new uses of the smartphone I tried to identify new applications of the smartphone I tried to discover new uses for the smartphone I tried to use the smartphone in novel ways

## IT IDENTITY: TIME 2 MEASURES (MS EXCEL)

*In these questions, we are interested in your use or non-use of MS Excel for work during the last 3 weeks*

<b>Construct</b>	<b>Operationalization</b>	<b>Item Measures</b>
<b>Duration</b> (Igbaria, 1995; Venkatesh and Davis, 2000; Venkatesh et al., 2003)	Self-reported measure of the time spent using MS Excel for work-related tasks	In the past 3 weeks, how much time did you spend using MS Excel for work-related activities on a typical work day? ___ Hours and ___ Minutes
<b>Frequency</b> (Bagozzi and Warshaw, 1990; Igbaria, 1995, 1996, Mathieson et al. 2001)	How often an individual has used MS Excel in the past 3 weeks	Thinking of your use of MS Excel during the past 3 weeks, please indicate how often you have used MS Excel for work-related purposes <i>During the past 3 weeks I used MS Excel for work</i> 1 = very many times, 2 = many times, 3 = several times, 4 = a couple of times; 5 = once, and 6 = not at all
<b>Breadth of Use</b> (Saga and Zmud, 1994)	The number of features an individual has used in support of work	Please indicate which MS Excel features you have used in support of work during the past 3 weeks Numeric/Mathematical, Statistical, Text, Conditional, Financial, Lookup/Reference, Date & Time, Conversion, Charts & Graphs, Pivot Tables, Database, Add-in software, VBA Macros, Pictures & Drawing
<b>Deep Use</b> (Lucas and Spitler, 1999; Schwarz, 2003)	Extent to which the individual has employed different applications of MS Excel	On a scale of 0 to 7, where 0 = <i>Not at all</i> , 1 = <i>Extremely Light</i> and 7 = <i>Extremely Heavy</i> , please evaluate the extent of your use of different MS Excel features during the past 3 weeks <i>During the past 3 weeks I used features that helped me</i> _____ Perform numeric calculations on data Look up values in the data Perform financial calculations Present results graphically Visualize data using conditional formatting Validate my data Link MS Excel workbooks Share data with other work place systems Collaborate with colleagues
<b>Trying to Innovate</b> (Ahuja and Thatcher, 2005)	The degree to which an individual has made behavioral attempts to find new ways of using MS Excel in support of his or her work role	Please indicate the extent to which you agree or disagree with the following statements <i>Strongly disagree, Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree, Strongly Agree</i> I tried to find new uses of MS Excel I tried to identify new applications of MS Excel I tried to discover new uses for MS Excel I tried to use MS Excel in novel ways

## **APPENDIX 4: DATA COLLECTION DETAILS**

We used Empanelonline to administer the data collection for our main study. Empanelonline has access to over 1.3 million individuals, who “double opt-in” to register as panelists. The double opt-in process means that prospective panelists first indicate their interest in joining the panel by signing up at Empanelonline’s web site. At this stage, they are asked a variety of questions that are designed to help target for surveys that panelists will be interested, and qualified, to take. These include questions about job title, industry, company size, geography, number of children, household income, etc. Following completion of the initial recruitment survey, Empanelonline sends an invitation to the listed address, and the individual must take action to confirm his or her intent to join the panel.

As part of the initial recruitment process, Empanelonline carry out checks to verify that prospective panelists are who they say they are, including verifying respondents against third-party databases, validating email and postal addresses, and testing “reasonableness” of responses—e.g. using data mining techniques to check a person’s stated income level compared to profession, appropriateness of age compared to children’s ages, etc. Empanelonline also takes steps to ensure that respondents are qualified to answer surveys, through maintenance of the online panel. These steps include flagging and removing “professional survey takers”; monitoring how many invites and surveys each panelist has taken, implementing knowledge-based questions that define whether a respondent is qualified to take a survey, removing non-responsive panelists if they have been inactive for six months.

Our population of interest was individuals who work full-time and use IT within an organizational context. Empanelonline sent an email to a nationally representative random sample of panel members who fit that profile, inviting them to take part in the survey. The email invitation contained the link to the survey, a brief description of the research topic, estimated length, description of incentive, as well as contact and opt-out information. For completing the survey, respondents were provided with incentive points. The specific target frame was individuals who, at the time of data collection, were working full-time and used both smartphones and MS Excel to complete work tasks. To ensure respondents matched the target sample frame, the survey included the following screening questions:

*Are you currently in full-time employment?*

***Yes** (go to next question)    **No** (thank you for your time)*

*In the following questions, by “**smartphone**”, we mean a mobile device technology that:*

- 1. Can run software applications (or “apps”)*
- 2. Provides access to the Internet*
- 3. Has hardware-based (physical keys) or software-based (touch screen) QWERTY keyboard*
- 4. Handles email*
- 5. Requires subscription to a data plan*

*By “**work-related purposes**” we mean using your smartphone for activities such as sending/receiving work-related emails, making/receiving work-related calls, scheduling work-related appointments, etc.*

*Do you currently use **a smartphone** for work-related purposes?*

***Yes** (go to next question)    **No** (thank you for your time)*

*Do you currently use **MS Excel** in your work?*

***Yes** (go to next question)    **No** (thank you for your time)*

## APPENDIX 5: DATA TRANSFORMATIONS

Smartphone Item Means, Standard Deviations, and Cronbach's Alphas Before and After Data Transformation										
		Before Transformation				After Transformation				
Item	Item Description (truncated)	MIN	MAX	M.	S.D.	MIN	MAX	M.	S.D.	C.A
DEP1	Needing	1.00	7.00	5.424	1.252	0.00	0.85	0.356	0.226	0.91
DEP2	Counting on	1.00	7.00	5.735	1.149	0.00	0.85	0.301	0.220	
DEP3	Reliant	1.00	7.00	5.591	1.214	0.00	0.85	0.328	0.219	
DEP4	Dependent on	1.00	7.00	5.447	1.327	0.00	0.85	0.347	0.235	
EE1	Pumped Up	1.00	7.00	4.784	1.358	0.00	0.85	0.462	0.212	0.89
EE2	Confident	1.00	7.00	5.777	1.166	0.00	0.85	0.290	0.225	
EE3	Enthusiastic	1.00	7.00	5.375	1.299	0.00	0.85	0.362	0.231	
EE4	Energized	1.00	7.00	5.133	1.332	0.00	0.85	0.404	0.227	
REL1	Connected	1.00	7.00	5.799	1.054	0.00	0.85	0.294	0.208	0.89
REL2	In coordination	1.00	7.00	5.580	1.097	0.00	0.85	0.339	0.203	
REL3	Close	1.00	7.00	5.345	1.242	0.00	0.85	0.373	0.220	
REL4	Linked	1.00	7.00	5.629	1.182	0.00	0.85	0.323	0.216	
DIS1	To enable me to accomplish tasks (better/worse)	1.00	7.00	5.337	1.087	1.00	2.65	1.595	0.345	0.91
DIS2*	To improve my job performance (better/worse)	1.00	7.00	5.299	1.078	1.00	2.65	1.608	0.342	
DIS3	To increase productivity (better/worse)	1.00	7.00	5.292	1.087	1.00	2.65	1.610	0.339	
DIS4	To enhance my effectiveness on the job ((better/worse)	1.00	7.00	5.284	1.078	1.00	2.65	1.613	0.340	
PU1	<target IT> enables me to accomplish tasks more quickly	1.00	7.00	5.807	1.172	0.00	0.85	0.282	0.228	0.90
PU2*	<target IT> Improves my job performance	1.00	7.00	5.758	1.177	0.00	0.85	0.293	0.226	
PU3	<target IT> increases my productivity	1.00	7.00	5.875	1.118	0.00	0.85	0.273	0.218	
PU4	<target IT> enhances my effectiveness on the job	1.00	7.00	5.848	1.130	0.00	0.85	0.276	0.222	
SAT1	Extremely displeased.... Extremely pleased	1.00	7.00	5.773	1.025	0.00	0.85	0.304	0.196	0.81
SAT2	Extremely dissatisfied .... Extremely satisfied	1.00	7.00	5.754	1.091	0.00	0.85	0.304	0.204	
ATT1	Using <target IT> is a good/bad idea	1.00	7.00	6.019	1.011	0.00	0.85	0.245	0.212	0.83
ATT2	I dislike/like the idea of using <target IT>	1.00	7.00	5.905	1.118	0.00	0.85	0.263	0.224	
ATT3	Using <target IT> for work-related purposes is pleasant/unpleasant	1.00	7.00	5.587	1.140	0.00	0.85	0.331	0.219	
CONT1	I intend to continue using <target IT>	1.00	7.00	6.110	1.106	0.00	0.85	0.217	0.220	0.94
CONT2	I predict I would continue using <target IT>	1.00	7.00	6.174	1.082	0.00	0.85	0.202	0.218	
CONT3	I plan to continue using <target IT>	1.00	7.00	6.087	1.063	0.00	0.85	0.225	0.217	
ITX1	I intend to explore new features of <target IT>	1.00	7.00	5.417	1.279	0.00	0.85	0.358	0.224	0.90
ITX2	I plan to explore new <target IT> functions....	1.00	7.00	5.405	1.269	0.00	0.85	0.359	0.226	
ITX3	I intend to spend considerable time and effort exploring <target IT>	1.00	7.00	4.871	1.542	0.00	0.85	0.436	0.240	

\* Dropped due to extremely high multiple squared correlations



# MS Excel Item Means, Standard Deviations, and Cronbach's Alphas Before and After Data Transformation

Item	Item Description (truncated)	Before Transformation				After Transformation				C.A
		MIN	MAX	M.	S.D.	MIN	MAX	M.	S.D.	
DEP1	Needing	1.00	7.00	5.42	1.252	0.00	0.85	0.39	0.242	0.93
DEP2	Counting on	1.00	7.00	5.73	1.149	0.00	0.85	0.36	0.232	
DEP3	Reliant	1.00	7.00	5.59	1.214	0.00	0.85	0.38	0.242	
DEP4	Dependent on	1.00	7.00	5.45	1.327	0.00	0.85	0.40	0.241	
EE1	Pumped Up	1.00	7.00	4.78	1.358	0.00	0.85	0.51	0.225	0.92
EE2	Confident	1.00	7.00	5.78	1.166	0.00	0.85	0.34	0.244	
EE3	Enthusiastic	1.00	7.00	5.38	1.299	0.00	0.85	0.46	0.235	
EE4	Energized	1.00	7.00	5.13	1.332	0.00	0.85	0.49	0.226	
REL1	Connected	1.00	7.00	5.80	1.054	0.00	0.85	0.41	0.239	0.93
REL2	In coordination	1.00	7.00	5.58	1.097	0.00	0.85	0.40	0.219	
REL3	Close	1.00	7.00	5.34	1.242	0.00	0.85	0.46	0.225	
REL4	Linked	1.00	7.00	5.63	1.182	0.00	0.85	0.44	0.231	
DIS1	To enable me to accomplish tasks (better/worse)	1.00	7.00	5.32	1.201	1.00	2.65	1.59	0.367	0.94
DIS2*	To improve my job performance (better/worse)	1.00	7.00	5.34	1.223	1.00	2.65	1.59	0.373	
DIS3	To increase productivity (better/worse)	1.00	7.00	5.39	1.200	1.00	2.65	1.57	0.365	
DIS4	To enhance my effectiveness on the job ((better/worse)	1.00	7.00	5.35	1.215	1.00	2.65	1.59	0.370	
PU1	<target IT> enables me to accomplish tasks more quickly	1.00	7.00	5.72	1.206	0.00	0.85	0.30	0.230	0.92
PU2*	<target IT> Improves my job performance	1.00	7.00	5.79	1.223	0.00	0.85	0.28	0.231	
PU3	<target IT> increases my productivity	1.00	7.00	5.82	1.185	0.00	0.85	0.28	0.229	
PU4	<target IT> enhances my effectiveness on the job	1.00	7.00	5.81	1.117	0.00	0.85	0.28	0.220	
SAT1	Extremely displeased.... Extremely pleased	1.00	7.00	5.59	1.345	0.00	0.85	0.32	0.232	0.87
SAT2	Extremely dissatisfied .... Extremely satisfied	1.00	7.00	5.65	1.246	0.00	0.85	0.32	0.219	
ATT1	Using <target IT> is a good/bad idea	1.00	7.00	5.94	1.105	0.00	0.85	0.26	0.225	0.87
ATT2	I dislike/like the idea of using <target IT>	1.00	7.00	5.70	1.332	0.00	0.85	0.29	0.239	
ATT3	Using <target IT> for work-related purposes is pleasant/unpleasant	1.00	7.00	5.45	1.424	0.00	0.85	0.34	0.245	
CONT1	I intend to continue using <target IT>	1.00	7.00	6.05	1.062	0.00	0.85	0.23	0.220	0.93
CONT2	I predict I would continue using <target IT>	1.00	7.00	6.08	1.043	0.00	0.85	0.23	0.219	
CONT3	I plan to continue using <target IT>	1.00	7.00	6.00	1.101	0.00	0.85	0.24	0.222	
ITX1	I intend to explore new features of <target IT>	1.00	7.00	5.17	1.341	0.00	0.85	0.40	0.223	0.91
ITX2	I plan to explore new <target IT> functions....	1.00	7.00	5.27	1.356	0.00	0.85	0.38	0.229	
ITX3	I intend to spend considerable time and effort exploring <target IT>	1.00	7.00	4.83	1.574	0.00	0.85	0.44	0.237	

\* Dropped due to extremely high multiple squared correlations

## APPENDIX 6: IT IDENTITY MODEL: TRAIT AND METHOD LOADINGS

Trait/Method Loadings for the Smartphone Data Set			
<i>Factor</i>	<i>Item</i>	<i>Trait Loading</i>	<i>Method Loading</i>
ATTITUDE	ATT1	0.73	0.18
	ATT2	0.85	0.20
	ATT3	0.70	0.17
DEPENDENCE	DEP1	0.86	-0.17
	DEP2	0.78	-0.11
	DEP3	0.83	-0.30
	DEP4	0.94	-0.30
EMOTIONAL ENERGY	EE1	0.78	-0.03
	EE2	0.65	0.49
	EE3	0.79	0.13
	EE4	0.82	0.09
RELATEDNESS	REL1	0.78	-0.11
	REL2	0.86	-0.01
	REL3	0.86	-0.01
	REL4	0.84	-0.01
IS CONTINUANCE INTENTION	CONT1	0.92	0.12
	CONT2	0.87	0.17
	CONT3	0.90	0.18
INTENTION TO EXPLORE	ITX1	0.89	0.21
	ITX2	0.86	0.23
	ITX3	0.79	0.09
IT IDENTITY	DEP	0.89	
	EE	0.88	
	REL	0.94	

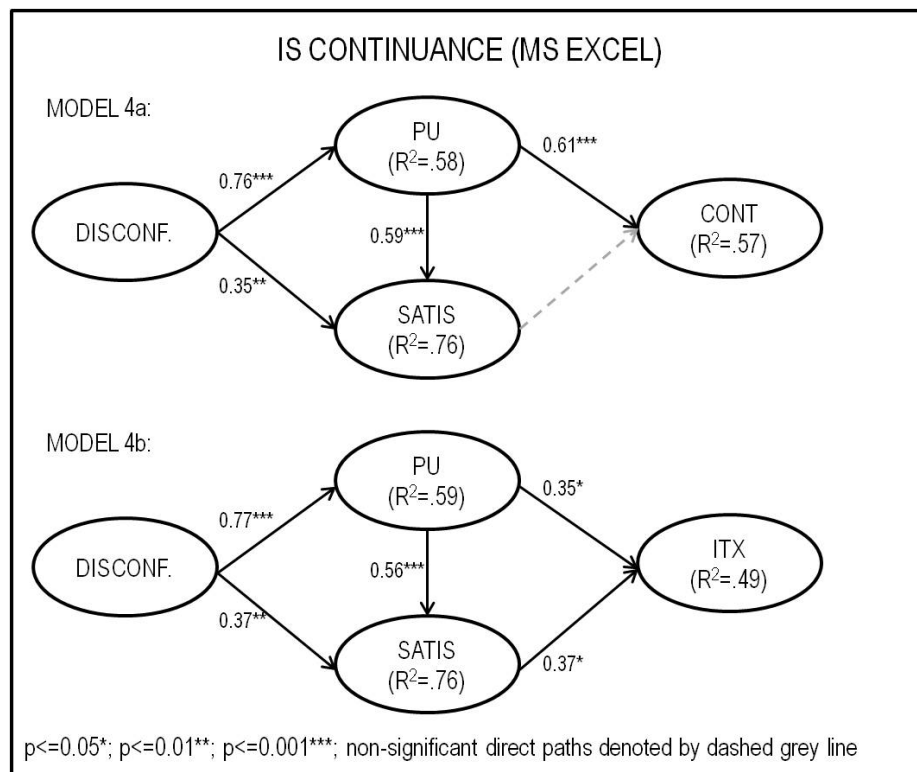
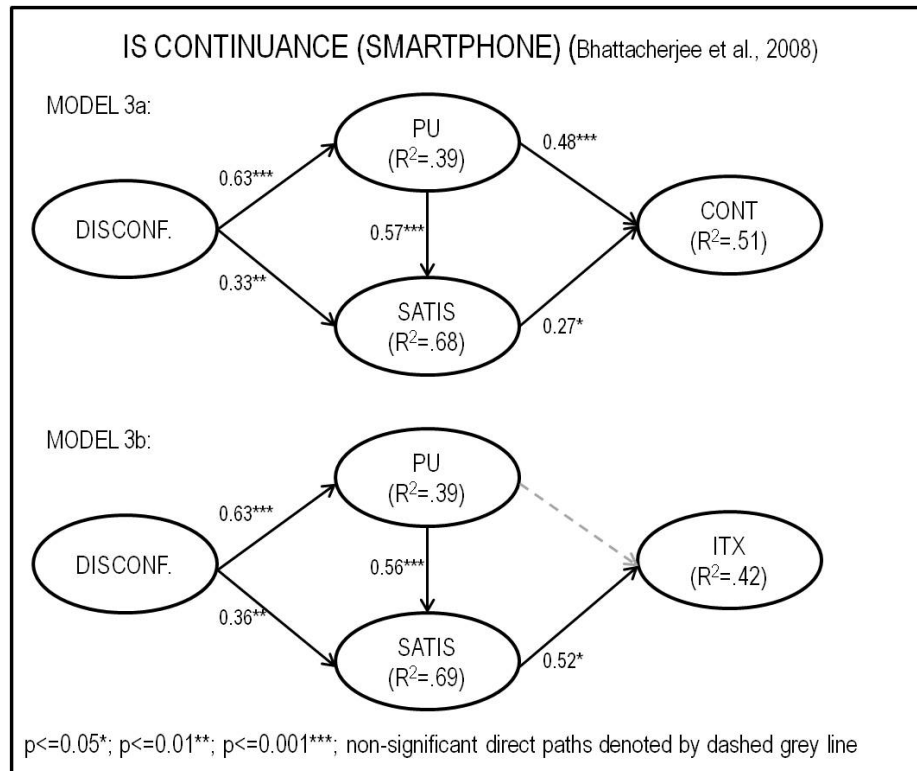
Trait/Method Loadings for the MS Excel Data Set			
<i>Factor</i>	<i>Item</i>	<i>Trait Loading</i>	<i>Method Loading</i>
ATTITUDE	ATT1	0.71	0.42
	ATT2	0.75	0.45
	ATT3	0.82	0.20
DEPENDENCE	DEP1	0.88	0.30
	DEP2	0.84	0.18
	DEP3	0.86	0.22
	DEP4	0.81	0.31
EMOTIONAL ENERGY	EE1	0.89	-0.31
	EE2	0.68	0.43
	EE3	0.81	0.20
	EE4	0.90	-0.29
RELATEDNESS	REL1	0.89	0.16
	REL2	0.87	0.17
	REL3	0.90	0.02
	REL4	0.90	0.05
IS CONTINUANCE INTENTION	CONT1	0.92	0.12
	CONT2	0.78	0.48
	CONT3	0.81	0.44
INTENTION TO EXPLORE	ITX1	0.90	0.02
	ITX2	0.88	0.02
	ITX3	0.86	0.26
IT IDENTITY	DEP	0.85	
	EE	0.94	
	REL	0.96	

## APPENDIX 7: IS CONTINUANCE MODEL—FACTOR LOADINGS AND CORRELATIONS

Trait and Method Loadings for the Smartphone Data Set			
SMARTPHONE			
Factor	Item	Trait Loading	Method Loading
DISCONFIRMATION	CONF1	0.83	0.12
	CONF2	0.89	0.12
	CONF4	0.88	0.2
PERCEIVED USEFULNESS	PU1	0.81	0.27
	PU3	0.82	0.43
	PU4	0.78	0.29
SATISFACTION	SAT1	0.82	-0.17
	SAT3	0.75	-0.32
IS CONTINUANCE INTENTION	CONT1	0.88	-0.23
	CONT2	0.86	-0.23
	CONT3	0.94	-0.02
INTENTION TO EXPLORE	ITX1	0.88	0.21
	ITX2	0.85	0.35
	ITX3	0.75	0.23
MS EXCEL			
DISCONFIRMATION	CONF1	0.83	0.2
	CONF2	0.89	0.24
	CONF4	0.88	0.19
PERCEIVED USEFULNESS	PU1	0.9	0.03
	PU3	0.88	0.21
	PU4	0.89	-0.07
SATISFACTION	SAT1	0.82	0.17
	SAT3	0.75	0.06
IS CONTINUANCE INTENTION	CONT1	0.91	-0.2
	CONT2	0.89	-0.15
	CONT3	0.91	-0.18
INTENTION TO EXPLORE	ITX1	0.88	0.22
	ITX2	0.86	0.18
	ITX3	0.78	0.32

Latent Factor Correlations and AVEs (controlling for unmeasured latent methods factor)						
SMARTPHONE	AVE	DIS	PU	SAT	CONT	ITX
DISCONFIRMATION (DIS)	0.83	<u>0.91</u>				
PERCEIVED USEFULNESS (PU)	0.81	0.63	<u>0.90</u>			
SATISFACTION (SAT)	0.82	0.69	0.77	<u>0.91</u>		
CONTINUANCE INTENTION (CONT)	0.88	0.48	0.71	0.65	<u>0.94</u>	
INTENTION TO EXPLORE (ITX)	0.88	0.56	0.57	0.61	0.48	<u>0.94</u>
MS EXCEL						
DISCONFIRMATION (DIS)	0.83	<u>0.91</u>				
PERCEIVED USEFULNESS (PU)	0.89	0.63	<u>0.90</u>			
SATISFACTION (SAT)	0.79	0.73	0.85	<u>0.91</u>		
CONTINUANCE INTENTION (CONT)	0.90	0.49	0.71	0.69	<u>0.94</u>	
INTENTION TO EXPLORE (ITX)	0.85	0.58	0.60	0.68	0.56	<u>0.95</u>
All correlations significant at $p < 0.001$ ; square root of AVE on diagonal						

## APPENDIX 8: IS CONTINUANCE STRUCTURAL MODELS



## APPENDIX 9: PLS COMPONENT LOADINGS AND CROSS-LOADINGS

Smartphone: Factor Loadings and Cross Loadings										
	AGE	ATT	BREADTH	DU	DURATION	EXP	FREQ	ITID	PU	TRY
AGE	<b><u>1.00</u></b>	0.08	-0.15	-0.13	0.01	0.07	0.22	0.05	0.08	-0.11
ATT1	0.09	<b><u>0.83</u></b>	0.25	0.27	0.05	0.13	0.30	0.36	0.57	0.27
ATT2	0.09	<b><u>0.88</u></b>	0.26	0.30	-0.02	0.22	0.32	0.57	0.74	0.25
ATT3	0.03	<b><u>0.84</u></b>	0.23	0.34	0.17	0.23	0.23	0.49	0.68	0.28
BREADTH	-0.15	0.29	<b><u>1.00</u></b>	0.60	0.20	0.19	0.31	0.30	0.29	0.40
DU1	-0.02	0.29	0.43	<b><u>0.75</u></b>	0.27	0.19	0.37	0.35	0.31	0.27
DU2	-0.11	0.30	0.51	<b><u>0.83</u></b>	0.31	0.29	0.24	0.35	0.31	0.35
DU3	-0.04	0.28	0.42	<b><u>0.72</u></b>	0.26	0.15	0.43	0.32	0.34	0.24
DU4	-0.16	0.26	0.52	<b><u>0.83</u></b>	0.34	0.14	0.21	0.41	0.22	0.50
DU5	-0.13	0.24	0.48	<b><u>0.76</u></b>	0.27	0.05	0.20	0.39	0.21	0.45
DU6	-0.17	0.10	0.47	<b><u>0.46</u></b>	0.22	0.07	0.23	0.20	0.08	0.41
DU7	-0.18	0.18	0.46	<b><u>0.58</u></b>	0.24	0.09	0.20	0.25	0.14	0.31
DU8	-0.02	0.24	0.47	<b><u>0.70</u></b>	0.30	0.13	0.37	0.36	0.25	0.40
DURATION	0.01	0.08	0.20	0.37	<b><u>1.00</u></b>	-0.04	0.17	0.07	0.08	0.20
EXPER	0.07	0.23	0.19	0.21	-0.04	<b><u>1.00</u></b>	0.19	0.22	0.26	0.05
FREQ	0.22	0.33	0.31	0.34	0.17	0.19	<b><u>1.00</u></b>	0.21	0.38	0.01
DEP1	0.04	0.42	0.20	0.40	0.02	0.15	0.23	<b><u>0.79</u></b>	0.35	0.25
DEP2	0.14	0.57	0.23	0.38	0.08	0.22	0.28	<b><u>0.83</u></b>	0.51	0.25
DEP3	0.18	0.42	0.14	0.31	-0.03	0.17	0.19	<b><u>0.75</u></b>	0.42	0.14
DEP4	0.06	0.40	0.20	0.28	-0.07	0.19	0.17	<b><u>0.77</u></b>	0.43	0.16
EE1	-0.06	0.29	0.33	0.39	0.15	0.08	0.06	<b><u>0.77</u></b>	0.22	0.45
EE3	-0.06	0.40	0.24	0.38	0.07	0.19	0.06	<b><u>0.77</u></b>	0.29	0.38
EE4	0.09	0.40	0.18	0.29	0.06	0.03	0.06	<b><u>0.70</u></b>	0.30	0.42
REL1	0.04	0.49	0.21	0.29	0.05	0.15	0.19	<b><u>0.85</u></b>	0.44	0.24
REL2	0.06	0.48	0.29	0.45	0.13	0.22	0.24	<b><u>0.75</u></b>	0.37	0.23
REL3	-0.02	0.44	0.27	0.39	0.02	0.29	0.10	<b><u>0.79</u></b>	0.36	0.28
REL4	0.03	0.41	0.31	0.38	0.02	0.20	0.19	<b><u>0.86</u></b>	0.35	0.24
PU1	0.04	0.68	0.27	0.38	0.14	0.21	0.36	0.45	<b><u>0.89</u></b>	0.18
PU2	0.10	0.67	0.24	0.29	0.07	0.26	0.36	0.41	<b><u>0.92</u></b>	0.19
PU4	0.08	0.75	0.27	0.29	0.00	0.23	0.31	0.42	<b><u>0.90</u></b>	0.23
TRY1	-0.06	0.29	0.35	0.40	0.15	0.05	0.01	0.31	0.21	<b><u>0.93</u></b>
TRY2	-0.06	0.32	0.37	0.35	0.16	-0.01	0.05	0.31	0.21	<b><u>0.90</u></b>
TRY3	-0.15	0.29	0.36	0.45	0.20	0.05	0.04	0.29	0.18	<b><u>0.94</u></b>
TRY4	-0.12	0.23	0.36	0.44	0.24	0.09	-0.06	0.33	0.20	<b><u>0.86</u></b>

Smartphone: Correlations among PLS Components and AVEs												
	AVE	C.A.	1	2	3	4	5	6	7	8	9	10
1. AGE	1.00	1.00										
2. ATTITUDE	0.73	0.81	0.09	<b><u>0.85</u></b>								
3. BREADTH	1.00	1.00	-0.18	0.30								
4. DEEP USE	0.00	0.00	-0.17	0.38	0.51							
5. DURATION	1.00	1.00	-0.04	0.09	0.15	0.25						
6. EXPERIENCE	1.00	1.00	0.22	0.05	-0.04	-0.30	-0.09					
7. FREQUENCY	1.00	1.00	0.00	0.30	0.42	0.27	0.35	0.18				
8. IT IDENTITY	0.61	0.94	0.09	0.71	0.30	0.51	0.09	-0.10	0.26	<b><u>0.78</u></b>		
9. USEFULNESS	0.82	0.89	0.13	0.83	0.23	0.29	0.16	0.13	0.34	0.63	<b><u>0.91</u></b>	
10. INNOVATE	0.82	0.93	-0.18	0.26	0.45	0.71	0.26	-0.30	0.24	0.40	0.23	<b><u>0.91</u></b>
Square root of AVEs for reflective constructs bolded and underlined; CA = Cronbach's alpha; correlations significant at p<0.05, unless indicated by grey shading												

MS Excel: Component Loadings and Cross Loadings										
	AGE	ATT	BREADTH	DU	DURATION	EXP	FREQ	ITID	PU	TRY
AGE	<b><u>1.00</u></b>	0.09	-0.18	-0.17	-0.04	0.22	0.00	0.09	0.13	-0.18
ATT1	0.17	<b><u>0.77</u></b>	0.10	0.08	0.02	0.19	0.26	0.44	0.80	0.06
ATT2	0.08	<b><u>0.91</u></b>	0.29	0.37	0.13	0.09	0.25	0.63	0.77	0.24
ATT3	0.04	<b><u>0.91</u></b>	0.32	0.42	0.07	-0.04	0.28	0.71	0.68	0.28
BREADTH	-0.18	0.30	<b><u>1.00</u></b>	0.51	0.15	-0.04	0.42	0.30	0.23	0.45
DU1	-0.07	0.42	0.44	<b><u>0.75</u></b>	0.26	-0.04	0.39	0.47	0.34	0.48
DU2	-0.14	0.34	0.47	<b><u>0.78</u></b>	0.29	-0.14	0.42	0.44	0.32	0.57
DU3	-0.01	0.41	0.43	<b><u>0.66</u></b>	0.25	0.02	0.38	0.46	0.38	0.44
DU4	-0.21	0.24	0.41	<b><u>0.75</u></b>	0.19	-0.26	0.15	0.35	0.20	0.61
DU5	-0.13	0.36	0.42	<b><u>0.82</u></b>	0.16	-0.28	0.14	0.40	0.27	0.62
DU6	0.02	0.43	0.45	<b><u>0.74</u></b>	0.20	-0.12	0.32	0.47	0.39	0.58
DU7	-0.15	0.30	0.47	<b><u>0.92</u></b>	0.26	-0.32	0.25	0.47	0.24	0.69
DU8	-0.09	0.24	0.42	<b><u>0.68</u></b>	0.25	-0.21	0.33	0.37	0.27	0.62
DU9	0.04	0.28	0.37	<b><u>0.56</u></b>	0.29	-0.08	0.40	0.37	0.31	0.54
DURAT	-0.04	0.09	0.15	0.25	<b><u>1.00</u></b>	-0.09	0.35	0.09	0.16	0.26
EXP	0.22	0.05	-0.04	-0.30	-0.09	<b><u>1.00</u></b>	0.18	-0.10	0.13	-0.30
FREQ	0.00	0.30	0.42	0.27	0.35	0.18	<b><u>1.00</u></b>	0.26	0.34	0.24
DEP1	0.08	0.49	0.14	0.19	0.02	0.03	0.23	<b><u>0.73</u></b>	0.49	0.12
DEP2	0.15	0.63	0.20	0.27	0.02	-0.01	0.22	<b><u>0.80</u></b>	0.61	0.17
DEP3	0.11	0.67	0.22	0.31	0.01	-0.01	0.25	<b><u>0.84</u></b>	0.63	0.23
DEP4	0.06	0.60	0.26	0.36	0.03	-0.07	0.21	<b><u>0.83</u></b>	0.56	0.22
EE1	0.03	0.48	0.28	0.60	0.12	-0.16	0.16	<b><u>0.83</u></b>	0.37	0.54
EE3	0.05	0.53	0.31	0.57	0.14	-0.24	0.16	<b><u>0.86</u></b>	0.43	0.50
EE4	0.01	0.49	0.31	0.59	0.14	-0.21	0.18	<b><u>0.82</u></b>	0.41	0.56
REL1	0.11	0.66	0.18	0.43	0.10	-0.08	0.26	<b><u>0.90</u></b>	0.57	0.27
REL2	0.07	0.70	0.25	0.43	0.11	-0.04	0.29	<b><u>0.86</u></b>	0.62	0.31
REL3	0.05	0.67	0.34	0.47	0.11	-0.08	0.26	<b><u>0.91</u></b>	0.57	0.34
REL4	0.12	0.56	0.21	0.42	0.06	-0.10	0.19	<b><u>0.88</u></b>	0.51	0.37
PU1	0.14	0.79	0.22	0.24	0.15	0.19	0.34	0.58	<b><u>0.93</u></b>	0.19
PU2	0.08	0.78	0.26	0.34	0.16	0.02	0.30	0.61	<b><u>0.93</u></b>	0.25
PU4	0.15	0.71	0.16	0.18	0.13	0.16	0.30	0.54	<b><u>0.90</u></b>	0.19
TRY1	-0.17	0.29	0.40	0.69	0.26	-0.29	0.30	0.40	0.27	<b><u>0.94</u></b>
TRY2	-0.21	0.22	0.47	0.69	0.24	-0.29	0.19	0.38	0.18	<b><u>0.94</u></b>
TRY3	-0.12	0.27	0.40	0.67	0.20	-0.28	0.20	0.40	0.26	<b><u>0.96</u></b>
TRY4	-0.18	0.17	0.41	0.62	0.26	-0.28	0.21	0.33	0.16	<b><u>0.92</u></b>

MS Excel: Correlations among PLS Components and AVEs												
	AVE	C.A.	1	2	3	4	5	6	7	8	9	10
1. AGE	1.00	1.00										
2. ATTITUDE	0.76	0.85	0.09	<b><u>0.87</u></b>								
3. BREADTH	1.00	1.00	-0.18	0.30								
4. DEEP USE	0.00	0.00	-0.04	0.09	0.51							
5. DURATION	1.00	1.00	0.22	0.05	0.15	0.25						
6. EXPERIENCE	1.00	1.00	-0.00	0.30	-0.04	-0.30	-0.09					
7. FREQUENCY	1.00	1.00	0.09	0.71	0.42	0.27	0.35	0.18				
8. IT IDENTITY	0.70	0.94	0.13	0.83	0.30	0.51	0.09	-0.10	0.26	<b><u>0.84</u></b>		
9. PERC'D USEFULNESS	0.84	0.91	-0.18	0.26	0.23	0.29	0.16	0.13	0.34	0.63	<b><u>0.92</u></b>	
10. TRYING TO INNOVATE	0.88	0.96	0.09	0.30	0.45	0.71	0.26	-0.30	0.24	0.40	0.23	<b><u>0.94</u></b>
Square root of AVEs for reflective constructs bolded and underlined; CA = Cronbach's alpha; correlations significant at p<0.05, unless indicated by grey shading												