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The mediating influence of smartwatch identity on deep use and innovative individual performance

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Abstract

Given its personal and ubiquitous nature, the smartwatch can easily become infused into individuals' daily lives, social roles, and relationships. This type of intertwinement of an information technology (IT) in the daily lives of individuals creates an IT identity. To understand this phenomenon in the personal IT context, this research draws from the IT identity and valence frameworks to examine how benefits and risks of smartwatch use affect deep use and innovative individual performance through smartwatch identity. Specifically, we examine how social interactions and belongingness (i.e., benefits) and privacy risk (i.e., risk) influence the building of the smartwatch identity, and in turn both deep use and innovative individual performance. Further, we explore the mediating influence of smartwatch identity. Using a survey, we collected data from 216 smartwatch users. The analysis provides evidence for the IT identity to deep use link and IT identity to innovative individual performance link. This work contributes to the IT identity literature by examining and showing how both positive and negative aspects of the smartwatch influence identity construction. This work also demonstrates the relationships between IT identity and performance, and deep use and performance. For practice, we offer insights for enhancing identity and performance.

KEYWORDS

digitization, innovative individual performance, IT identity, risks, smartwatch, social interaction

1 | INTRODUCTION

Smartwatches are ubiquitous personal computing devices worn around the wrist that incorporate timekeeping, phone calling, and multimedia functionalities. Gartner (2017) forecasts that sales of wearable devices reached 30.5 billion US dollars in 2017 and that smartwatches make up 9 billion US dollars of that amount. With expected unit sales of 141 million in 2018 (Statistica, 2018a), the use of smartwatches is on the rise. Two of the most common and transformative uses of the smartwatch are interacting with others and fitness tracking (Ogbanufe & Gerhart, 2018). Indeed, smartwatches are often advertised as being able to produce efficiency and effectiveness gains for individuals. However, for individuals to realize these productivity and performance gains, they must use the appropriate features of the smartwatch. Further, given its personal, ubiquitous, and noninvasive design, smartwatches are easily infused into individuals' daily lives, social roles, and relationships. This type of intertwinement of information technology (IT) in the daily lives of individuals has always captured the attention of researchers interested in understanding how such advanced technologies transform and dominate lives (Leonardi, 2011) and how its intertwinement creates an IT identity (Carter & Grover, 2015). Taken together, the smartwatch usage and its intertwinement in individuals' lives suggest the importance of examining not only how the smartwatch may be transforming individuals' everyday lives through its feature uses, but also how users view the smartwatch as central to their identity.

Many consumer electronic devices have been used for productivity (e.g., digital cameras, mobile devices) and for healthcare (e.g., heart monitors, blood pressure monitors), and have mostly been external to the body or lacked ubiquity. In contrast, the uniqueness of the smartwatch lies in its attachment to the individual's body, which allows information about the individual to be digitized. With the rise of consumer wearables and ubiquitous computing, we are entering the age of the quantified self (Goes, 2013), and the digitization of the individual. Indeed, attaching a computing device to a person's body signals a new level of intimacy with an IT and a paradigm shift in the role of technology in everyday life (Vodanovich, Sundaram, & Myers, 2010).

As an IT device, the smartwatch seems suited for building a strong IT identity. Carter and Grover (2015, p.941) note that the types of IT that "are most likely to foster a strong IT identity" are ones where (a) the IT provides a breadth of access to the individual's social and technology networks, (b) the IT has "broader applications across a broader range of social contexts", and (c) the IT is beneficial in situations that are very significant to the individual.

Where other personal consumer technologies can be shared with others, the smartwatch is not usually easily sharable. Because the smartwatch is strapped to the body and has direct contact with the skin, it could be deemed more personal and therefore less amenable to being shared with others. When a personal object is less amenable to being shared, it is possible for the owner to experience a level of personal connection or an emotional attachment to the object. In relation to IT identity, the feeling one has with a personal and nonsharable device could be described as an emotional response one has when thinking about themselves in relation to the IT (Carter & Grover, 2015).

In addition, because of its proximity to the body, the smartwatch interacts with and engages the user's body in ways that are different from other personal consumer technologies (Ogbanufe & Gerhart, 2018). For example, in some of the environments where the use of smartphones is frowned upon or even disallowed, (e.g., hospital nurses, warehouses, federal workers: CoreMark, 2018; Fong, 2019), individuals may still wear their smartwatches. As a result, the smartwatch is more infused in the individual's daily life and activities. Given that the smartwatch's proximity to the body lets it stay with the individual and go anywhere the individual goes, it provides an increased "level and breadth of access" (Carter & Grover, 2015) to the individual's social life. The individual can connect to others (e.g., social networks) and access their personal resources through their smartwatch. This increased flexibility and the ubiquitous nature of the smartwatch affords the individual many new forms of connecting with others, which means that individuals become more reliant or dependent on the smartwatch (Carter & Grover, 2015). Moreover, the proximity of a device can have an impact on how attached a user is to a device, suggesting a more natural relationship with identity (Turner & Turner, 2013). Further, because touch is intimate, immediate, and there is often a tendency to increase interaction with that which initiates the touch (Thayer, 1986), the haptics touch in smartwatches could also provide individuals with a level of intimacy and interaction that may be unparalleled by other personal

IT devices. Hence, the smartwatch is applicable to situations that other personal devices are not. For example, its haptics touch reminds one of personal goals and activities, gives immediate feedback, and commends the individual when goals are accomplished. As a result, it may have "broader applications across a broader range of social contexts" (Carter & Grover, 2015). Because of its haptics touch and the interaction it creates with the user, there is a "feeling of connectedness" (Carter & Grover, 2015) one has with the smartwatch. This engagement with the physical person allows it to be an information resource, but also a data collection device. Researchers refer to such IT and user intertwinement as IT Identity (Carter & Grover, 2015). Thus, due to its personal and social capabilities, the smartwatch lends itself to IT identity construction and verification. Even though the smartwatch is especially suited for IT identity, in a broader sense it is representative of other IT devices that can engender identity.

Benefits resulting from the experience of using an IT can act as a catalyst for IT identity (Carter & Grover, 2015). Specifically, the types of benefits are those that support the individual's social interactions and networks (Burke & Reitzes, 1981; Stryker & Burke, 2000), and those that increase personal and social resources such as effectiveness and belongingness (Carter & Grover, 2015). Hence, we assess the effects of perceived benefits as determinants of IT (smartwatch) identity. IT identity then leads to enhanced uses of technology (Carter & Grover, 2015). That is, when individuals successfully form an IT identity, they are more likely to not only use the technology in ways that it was designed to be used, but also in enhanced ways (Carter & Grover, 2015), and then improved performance follows (Sykes & Venkatesh, 2017).

While smartwatch experiences and perceptions related to benefits increase identity, risk perceptions may diminish the individual's smartwatch identity. The notion is that exploring certain risk perceptions of the technology may be helpful in understanding IT identity. Privacy issues (e.g., concern and invasion) are particularly salient to ubiquitous and personal consumer technologies (Bellotti & Sellen, 1993) such as the smartwatch. Although IT identity literature has increased our understanding of the factors that strengthen IT identity, there is less on the risk factors that are characteristic of the technology. Hence, an objective of this research is to not only capture how benefit-related experiences strengthen identification, but also the potential for risk-related experiences to weaken identification with a smartwatch. By exploring perceived privacy risk, which is a characteristic of the smartwatch, we increase the understanding of how IT identity is enacted despite the risks. This aspect of identity enactment is important in our understanding because it provides a balanced view of both the strengthening and weakening of IT identity.

Furthermore, the IT identity framework proposes that use behaviors are outcomes of IT identity. The notion is that the more integral the IT is to the self, the more the individual will interact with the IT through feature use and enhanced uses of the technology (Carter & Grover, 2015). While, this supports the identity literature that suggests the identity influences behavior, it does not account for possible behavioral changes or innovative changes that are enacted as a result of increased IT identity and increased IT use. This is important for two reasons. First, because individuals need to reinforce their identities, they may be amenable or motivated to try new things or create new ways to perform. In other words, they are motivated to innovatively enhance their performance (e.g., new ideas about fitness goals, new communication styles or methods). Second, behavioral changes and innovative performance resulting from IS use has been a hallmark of IS research (Kuegler, Smolnik, & Kane, 2015; Leonardi, 2014). Hence, this study also expects to bridge the IT identity and system usage literature by examining IT identity and its impact on innovative individual performance.

In sum, the objective of this study is to expand the IT identity framework in the context of a particular ubiquitous technology (smartwatches) to examine the benefits and risk factors that confirm smartwatch identity, and in turn, its relationship with deep use and innovative individual performance. Hence, we seek to answer the research questions: *Do benefit and risk factors fortify smartwatch identity? Does smartwatch identity develop enhanced innovative individual performance?* Considering the benefit and risk aspects of the smartwatch identity, we draw on the valence framework (Peter & Tarpey, 1975) to inform our understanding of the consideration of benefits and risks.

This study is expected to contribute to research and practice. For research, by examining the capability of the IT to support and increase the individual's personal and social resources, we extend the IT identity framework in the ubiquitous and personal computing context. By examining both benefits and risk factors driving the confirmation of

smartwatch identity, we present a balanced view of the strengthening and weakening of identity. Thus, increasing our understanding of the enactment of identity in spite of risk factors. Further, by evaluating the relationship between IT identity and innovative individual performance, we extend the IT identity framework to new outcomes. Finally, we integrate the theoretical perspectives of IT identity theory with the valence framework in the understanding of smartwatch identity.

For practice, we expect that the understanding of the factors contributing to individuals' smartwatch identity, deep use, and innovative individual performance will provide insights to manufacturers about feature uses that increase personal performance that can be enhanced to promote more user engagement and reduce abandonment. Furthermore, we provide useful understanding of factors that strengthen and weaken the individual's identity with a ubiquitous technology. This understanding may be applicable to developers who must design tools and applications perceived as benefits and risks (e.g., invasive of privacy). The rest of the article is organized as follows. Theoretical background is discussed, followed by hypotheses development. Then, the research method is presented followed by data analysis. Finally, theoretical and practical implications are described in the discussion.

2 | THEORETICAL BACKGROUND

In this section, we discuss the theoretical lens (i.e., IT identity) and the key-dependent variables (i.e., deep use and innovative individual performance).

2.1 | IT identity

At the center of IT identity theory is the concept of identity, which answers the question, "who am I?" in relation to a social object (Burke & Reitzes, 1981; McCall, 2003). Identity can be described as the meanings that an individual attributes to him/herself and the meaning that others attribute to the individual (Burke & Reitzes, 1981). Identities can manifest at different levels: individual, relational, or collective (Vignoles, Schwartz, & Luyckx, 2011). At the individual level, there are four types of identities that are often defined: personal, role, social, and material (Vignoles et al., 2011). Personal identity refers to an individual's definition of themselves (Vignoles et al., 2011). Role identity calls on how an individual fulfills certain expectations to match their role, and therefore identifies with different concepts in accordance with fulfilling that role (Biddle, 1986). Similarly, social identity explains how an individual fits within a social group, and the individual will identify with concepts that align with their social standing (Vignoles et al., 2011). Material identity considers how we use products to help manifest our understanding of our own identity (Belk, 1988). The different types of identity have to be interconnected to form one identity because an individual does not limit themselves to just one factor that gives them unique identity. In other words, one person might identify as an athletic (personal), executive (role), who is wealthy (social), and an Apple user (material). As illustrated by the example, all these unique aspects form one individual identity, and none of them would be accurate in fully describing the individual when taken alone.

Today, the question of "who am I?" is increasingly intertwined with what individuals do with IT. Because IT is traditionally an artifact, identity with an IT has been formulated as a material identity (Carter, 2013). As IT becomes part of individuals' activities, researchers have suggested that IT is involved in *shaping* personal identity (Jones & Karster, 2008). Further, as individuals become attached to an IT, they yield authority to the IT object, so much so that the IT becomes part of their identity (Schwarz & Chin, 2007). Thus, IT identity describes how the individual's everyday use of a technological object strengthens the individual's identity (Carter & Grover, 2015). Wherein the individual seeks to answer the question, "who am I in relation to a technological object?" The more pervasive technologies are in our daily lives, the more it is intertwined with our social structures and who we are. IT identity in this context refers to the inseparable nature of IT and our social structure. An IT is an element of technology that can be used for

manipulating information, communicating information, and socializing with others (Carter & Grover, 2015). With respect to the specific technology in this study, the smartwatch, we posit that the individual's relationship with the smartwatch is particularly salient to their self-concept because the smartwatch is not shared with others (Carter, Grover, & Thatcher, 2012).

It has been argued that identities can be constructed in the same manner, irrespective of whether it is a social, personal, or material identity (Carter & Grover, 2015). Initially, the motive for constructing an identity can be personal, for building or enhancing one's self-concept. However, identity is usually constrained by the social context, meaning that one's idea of a personal goal must align and be consistent within the social context surrounding the individual. For example, one's idea of identifying as an "Apple person" should fall within the *social context* of what it means to be an "Apple person." Accordingly, IT identity is both "personal and social" in its construction (Carter & Grover, 2015).

An individual that views a smartwatch as integral to the self verifies their identity when changes that result from interacting with the smartwatch match the level of individual performance they claim as an individual (Carter & Grover, 2015). IT identity is a high-order multi-dimensional construct that reflects an individual's expression of relatedness, dependence, and emotional value in relation to an IT (Carter & Grover, 2015). Relatedness refers to "the blurring of boundaries between the self and an IT, and manifest as feelings of connectedness with the IT" (Carter & Grover, 2015). Dependence refers to the individual's "sense of reliance upon an IT", while "emotional energy refers to a person's feelings of emotional attachment and enthusiasm in relation to an IT" (Carter & Grover, 2015).

These factors are of importance in the context of the smartwatch. Due to the ubiquitous nature of the smartwatch and its proximity to the individual's body, there may be increased dependence, relatedness, and emotional value on the smartwatch for tasks such as emails, texts, and other performance-based activities. The increased accessibility afforded by the smartwatch may lead to a corresponding increase in the individual's reliance on the smartwatch to meet their performance expectations.

Identity theories suggest that the development of IT identity depends on how an IT supports a person's social networks (Carter & Grover, 2015). Thus, the solidification of IT (smartwatch) identity is based on how the smartwatch helps the individual to support, maintain, and manage their social interactions and relationships. There is a recognition that IT-enabled social interactions lead to identity formation (Lamb & Davidson, 2005; Lamb & Kling, 2003). Prior research on social interactions and relations have generally been shown to have positive effects on identity (Charng, Piliavin, & Callero, 1988; Moon, Pu, & Lawrence, 2006).

Benefits derived from the smartwatch, also termed usefulness, convenience, effectiveness, and so on, have effects on the strength of IT identity. Carter and Grover (2015) note that the capacity of an IT to increase the individual's personal and social resources (e.g., effectiveness, belongingness) are important determinants of IT identity strength and should be considered in understanding the IT identities. Belongingness, also known as "being part of," is the connectedness and affiliation one experiences with others (James, Lowry, Wallace, & Warkentin, 2017; Lee & Robbins, 1995). Thus, an IT that provides the capability for individuals to feel like they belong and are part of other people's lives may increase the individual's IT identity. Smartwatches have been known to provide lifesaving benefit capabilities such as drowsiness detection (Li, Lee, & Chung, 2015) and diabetes monitoring (Årsand, Muzny, Bradway, Muzik, & Hartvigsen, 2015). Others find that they improve communicating with others and fitness (Ogbanufe & Gerhart, 2018).

In contrast to benefits, some individuals may view aspects of the smartwatch as risky due to privacy risk concerns.[1] The smartwatch has the potential to capture and transmit private information such as speech, video images, and signals from body sensors. As a ubiquitous technology, its unobtrusive nature implies that it can transmit and receive information with ease, and its design empowers its users with more flexible applications that support the capture, communication, and recall of many kinds of personal information. However, the same unobtrusiveness calls into question its potential for supporting its invasive nature (Bellotti & Sellen, 1993). It has been widely suggested that individuals are more accepting of potentially invasive (privacy) technology if they believe its benefits are more than the risks (Ladd, 1991).

While the intertwinement of the smartwatch based on benefits—capacity to increase personal and social resources—is appealing to users, privacy risk factors may negatively impact the individual's smartwatch identity. Because the smartwatch is not shared with others (Carter et al., 2012), is strapped to the skin of the user, and generates personal information that is generally considered private, any misuse of such information is salient to the individual's self-concept. By incorporating a risk factor that is characteristic of the personal and ubiquitous nature of the smartwatch, we suggest that IT identity (in our case, smartwatch identity) is influenced by both positive and negative features. We draw upon the valence framework (Peter & Tarpey, 1975) to inform our understanding of the effect of the simultaneous consideration of benefits and risks on smartwatch identity.

2.2 | Identity—deep use link

Earlier identity research sought to explore the link between identity and behavior (Burke & Reitzes, 1981) and provide evidence that in postacceptance use, identity is the primary motivator of use behavior. Identity also plays a strong role in repeated and continuous behaviors. The notion is that repeated behavior is "incorporated" in the individual's self-concept (identity). In studies that examine the influence of identity on repeated behavior such as exercise behavior (Theodorakis, 1994) and blood donations (Charng et al., 1988), identity was found to increase long-term behaviors. Recent studies have also found that identity is a strong determinant of various use behaviors. For example, individuals with higher social identities are more oriented toward variety use, while those with stronger relational identities are more oriented toward reinforced use of social media (Pan, Lu, Wang, & Chau, 2017). In exploring the role of identity in streaming apps usage, identity salience was found to be significant in its relationship with the usage and recommendation of the apps (Oyedele & Simpson, 2018). Hence, we explore the effect of IT identity on IS use behavior.

IS use is an important construct in IS research (Burton-Jones & Straub, 2006). IS use has been conceptualized and measured in different ways such as duration of use, frequency of use, breath of use, and extent of use, among others. Burton-Jones and Straub (2006) created a classification of the different conceptualizations of IS use in the literature, and suggest that most individual-level research employed the lean (duration and extent of use) conceptualization. Following their recommendation to conceptualize IS use that integrates the user, task, and system; we employ a rich conceptualization of use: deep use. Deep use considers more than just if the technology is used, but also how (task) and what (features) is meant by use. This allows deep use to better understand the real-world usage of the technology (Wand & Weber, 1995).

Deep use as a key behavioral outcome is appropriate for this research for a few reasons. First, the smartwatch is a complex system that integrates the functions of timekeeping, smartphone, fitness and health, coaching, and touch. As such it is not a simple device that can be measured with only duration and extent of use, thus, deep usage measures are required. Second, unlike other IS, the smartwatch is a ubiquitous personal device that is strapped to the body of the user and affords accessibility that is unparalleled to any other personal computing device. It is designed to help individuals accomplish personal tasks and achieve personal goals of increasing efficiency, effectiveness, and productivity in their personal lives. Employing deep use captures the extent to which the individual employs the system features for achieving the tasks that have personal impact. Third, IT identity framework suggests that when IT identity has been formed and has become embedded within the individual's personal social network, it is characterized by the enhanced use of the technology (Carter & Grover, 2015). Such enhanced use has been described as explorative use (Bagayogo, Lapointe, & Bassellier, 2014) and exploitative use (Burton-Jones & Straub, 2006).

2.3 | Identity—performance link

Our theoretical context is supported by the established relationship between system use and individual performance. This is an important context in DeLone and McLean's IS success model (DeLone & McLean, 1992) and Burton-Jones

and Straub's (2006) system usage models, which suggest a link between system use and individual performance. Individual performance represents a key performance outcome at the individual level that a consumer technology is expected to *enhance*. It is an indication that the individual has an *improved* productivity or there is a change in the user's activity (Delone & McLean, 2003). Decades of research have suggested that individual performance is influenced by system use (Burton-Jones & Straub, 2006; Delone & McLean, 2003). It has also been suggested that the assessment of performance can be accomplished through assessment of behavior or outcomes (Sonnentag & Frese, 2002). Individual performance has been conceptualized and defined with terms such as increased quantity, quality, or accuracy of tasks (Sykes & Venkatesh, 2017).

However, the type of individual performance that specifically focuses on behavioral changes is referred to as innovative individual performance (Kuegler et al., 2015). According to previous research (Janssen & van Yperen, 2004), individual performance and innovative individual performance are different concepts. While individual performance is related to task efficiency and effectiveness (Goodhue & Thompson, 1995), innovative individual performance is concerned with idea generation and the realization of new and novel ideas (Kuegler et al., 2015). Doll and Torkzadeh (1998) also argue that over and above the use of information technology to improve productivity, individuals use it to create new ideas (innovative individual performance). Hence, innovative individual performance transcends increases in the quantity and quality of one's tasks and also includes the creation of new ideas, new ways of interacting, and behavioral changes. At the individual level, the notion of innovation and behavioral changes resulting from IS use has been a hallmark of IS research. For example, Leonardi (2014) identifies two innovative behavioral changes resulting from an online knowledge-sharing platform. He argues that individuals (a) found new ways of learning that involves observing others' communications instead of learning from personal experience, and (b) achieved innovation in the way they found knowledge, which made them avoid work duplication. Individuals also used knowledge in new ways and combined knowledge into new ideas. The innovations represent new ways of working that were achieved by using new technology.

In addition, Kallinikos and Tempini (2014) argue that information technology changes the nature of work and individual tasks. For example, they showed how new forms of digital technology affects patient reporting (use) and generated new medical work practices (innovation). These examples demonstrate the impact of technology not only in individual performance (i.e., productivity in terms of increased quantity, quality, and accuracy of task), but also in innovative individual performance (i.e., innovation in terms of creativity, creating new ideas, new ways of interacting).

Not only is there a link between identity and use behavior, but we also posit that there is a relationship between IT identity and innovative individual performance.

Identities are self-meanings that are formed through interaction with others. The meanings of the self are learned from responses of others to one's own actions. Identities are also symbolic and reflexive in nature (Burke & Reitzes, 1981). The reflexive nature of an identity allows the existence of a link between identity and performance. An identity provides an individual with a frame of reference in which to interpret his/her actions. This same frame of reference is used to assess the individual's performance (Burke & Reitzes, 1981). Hence, the link between identity and performance is through common meanings. The meanings that people ascribe to an individual are based on the meanings of the performances (outcomes such as weight loss, productivity goals, communication goals, and fitness goals) produced by the individual. Therefore, researchers have argued that variations in one's identity is a determinant of variations in the individual's performance (Burke & Reitzes, 1981). The central idea is that because individuals need to reinforce, support, and confirm their identities, they are motivated to innovatively enhance performance. For example, a smartwatch user known for their quick responses using their smartwatch (smartwatch identity), and who wants to continuously be known as a quick responder (reinforcing identity), would maintain their response performance as well as seek new ways to exceed performance. The same may be true for a smartwatch user interested in health and fitness. They may be motivated to use the fitness and exercise coaching features (deep use) and motivated to seek new ways to maintain or surpass levels of fitness performance (innovative individual performance).

In the context of IT identity (Carter & Grover, 2015), few studies have empirically evaluated the relationship between IT identity and deep use. Fewer still are studies investigating IT Identity and innovative individual

performance. Although few in number, Hassandoust (2017) investigated and found that IT identity was instrumental in forming extended use, integrative use, and emergent use behaviors in a professional capacity. A close examination of Appendix A (Table A1) shows that there has been research seeking to expound identity in different technology contexts. The majority of the studies deal with the effect of identity on various system usage, and there is none that deals with the effect of identity on innovative individual performance. Hence, this paper seeks to do just that, and examine the effect of smartwatch IT identity and deep use of features of the smartwatch on innovative individual performance.

3 | MODEL AND HYPOTHESES DEVELOPMENT

Figure 1 presents our proposed research model. The model shows that smartwatch (IT) identity influences deep use and innovative individual performance. In turn, deep use of the smartwatch influences innovative individual performance. According to IT identity theory, experiences with a device will relate to how strongly a user identifies with the technology (Carter & Grover, 2015). We note the risk and benefit aspects of the antecedents of IT identity. Given the pervasiveness of the smartwatch and its capability to monitor and transmit user's personal information, we assess the individual's perception of privacy concerns as a risk factor. In addition, taking into consideration the literature's (including identity and IT identity) acknowledgment of the strong role played by social interactions and belongingness in building identity (Burke & Reitzes, 1981), we incorporate these as benefit factors that build smartwatch identity. The valence framework is used to explain the individual's mental calculation to determine if the overall benefits outweigh the net risk (Peter & Tarpey, 1975), in allowing the smartwatch to be a fundamental part of their self-understanding (Carter & Grover, 2015). The use of a smartwatch in this study is voluntary, personal, and not mandated by an organization.

3.1 | Perceived benefits

Benefits resulting from the experience of using an IT has been described as a source of IT identity (Carter & Grover, 2015). Benefits affect the perceived dependence on IT (Rai, Lang, & Welker, 2002). This relationship is important because a key dimension of IT identity is dependence. In addition, identity literature (Burke & Reitzes, 1981; Stryker & Burke, 2000) suggests that identity construction depends on the IT's capability to support the individual's

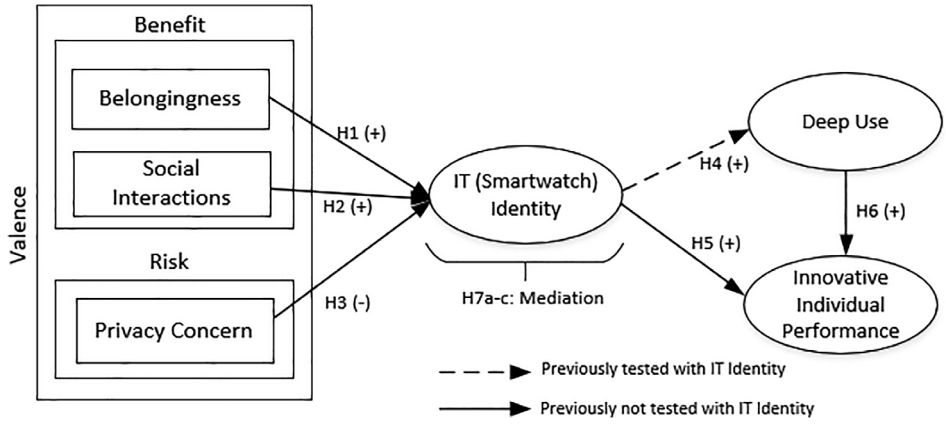

FIGURE 1 Proposed research model

social interactions and network. Carter and Grover (2015) also suggest that the capacity of an IT to "increase personal and social resources" such as effectiveness and belongingness are important determinants of IT identity. Given the call to seek determinants and antecedents that are beneficial for identity affirmation, two specific benefits of a smartwatch were identified for smartwatch identity; social interaction and belongingness. Belongingness has been suggested as a potentially important determinant of IT identity (Carter & Grover, 2015), and social interaction is recognized as an identity formation determinant (Lamb & Davidson, 2005; Lamb & Kling, 2003). The two constructs fulfill the requirement for not only increase one's social resources but also for expanding one's self-concept. Neither have been theorized or tested in the IT identity literature.

In theorizing the relationships between the benefits antecedents and the confirmation of IT identity, we formulate the following arguments. (a) IT identity is a material identity. Given that (b) the IT identity framework suggests that determinants of IT identity should include IT capabilities that increase social and personal resources, (c) and that social interaction and belongingness are smartwatch enabled capabilities/experiences that increase personal and social resources; therefore, (d) social interaction and belongingness are determinants of IT identity. As a result, two specific benefits of a smartwatch identified in this research are belongingness and social interaction.

Belongingness has been identified as a key piece of the self (Kohut, 1984). Belongingness refers to companionship, affiliation, and connectedness with others (Lee & Robbins, 1995). People grow their self-concept by belonging to groups and it is a key piece of identity (Ashforth, Harrison, & Corley, 2008). In other words, formation of the one's self-concept (identity) is created through one's belongingness. The smartwatch has capabilities that connect the individual to other users or that help the user participate with other people. These capabilities help the individual achieve personal and social goals of belongingness. This in turn intensifies their identification with the smartwatch. Prior research indicates that belongingness is more important in virtual environments than in face to face situations (Thatcher, Wilson, & Brown, 2017). When an individual believes that the smartwatch increases their belongingness capacity, their identity with the smartwatch increases. Building on the call to investigate how IT-supported social resources such as belongingness builds IT identity; we hypothesize:

H1 *Belongingness positively relates to smartwatch identity*.

Identity can be understood through an individual's interaction with others (Goffman, 1959). Prior to the pervasiveness of IT, early concepts referred to face to face interactions as "the reciprocal influence of individuals upon one another's actions when in one another's immediate physical presence" (Goffman, 1959). However, with the prevalence of IT in our daily lives, IT-supported interactions have become rampant in many settings such as social networking sites and virtual communities. These types of interactions refer to the exchange of information between individuals that is supported by IT (Lamb & Kling, 2003). IT-supported interactions also construct identities for individuals that use them. The role of IT-supported social interactions that build identities has been recognized (Lamb & Davidson, 2005; Lamb & Kling, 2003). Identity can be influenced by the scope and reach of the social relations supported by the IT (Lamb & Davidson, 2005). In our case, the smartwatch is positioned to influence identity not only because of the personal and ubiquitous nature of the IT, but also because of the characteristic nature of its proximity to the individual. Individuals are able to interact with others through smartwatches without constraints on physical boundaries and can immediately access information. The smartwatch has capabilities that allow the individual to interact with others in ways that increase their social relationships. According to the IT identity framework, IT-enabled capabilities that increase an individual's personal and social resources (relationships), will strengthen and expand one's identity and self-concept. Hence, we posit that social interactions will intensify an individual's identification with their smartwatch. When a smartwatch user interacts with others through their activity tracker, s/he is able to tell whether their friends are achieving their goals and can also interact with them throughout the day to encourage them. Hence, when individuals engage in interactions with others through their smartwatch, they are enacting their smartwatch identity. Therefore, we hypothesize:

H2 *Social interactions positively relate to smartwatch identity*.

3.2 | Perceived risk

The risk literature has outlined potential risks for various technologies, including psychological risks and privacy risks (Featherman & Pavlou, 2003). In addition, the IS literature has used the valence framework through privacy calculus (Dinev & Hart, 2006) to argue that technologies have both benefits and risks that must be balanced, and the net benefit must outweigh the risk if a user will use an IT. Privacy risks are particularly salient to ubiquitous and personal consumer technologies (Bellotti & Sellen, 1993) such as the smartwatch. Smartwatches are designed as personal devices and often include features that track users' private health data, moods, and very personal activities. The smartwatch collects and can transmit sensitive information to others, with or without the user's knowledge.

The key idea here is that while smartwatch experiences and benefits confirm and increase identity, there are characteristics of the smartwatch that may diminish the individual's smartwatch identity. Because a smartwatch is personal, ubiquitous, and has close proximity to the body, the privacy concern related to the collection, dissemination and use of information generated (e.g., heart rate, fitness data, and blood pressure) from one's personal smartwatch through the individuals' daily activities could be particularly salient. Privacy concern refers to the individual's concerns about the possible loss of privacy. Such losses within online environments and social networks can be embarrassing (Choi, Jiang, Xiao, & Kim, 2015) and may even be more so with personal IT devices that track very personal information. When individuals are concerned that their private information could be exposed or misused by unauthorized parties (e.g., discriminatory profiling, targeted marketing; Montgomery, Chester, & Kopp, 2017), smartwatch identity may be diminished. The identity literature suggests that when experiences with an IT fail to meet one's expectations, identities cannot be strengthened, resulting in a diminished self-concept (Carter & Grover, 2015; Stryker & Burke, 2000). According to the IT identity framework, IT-enabled capabilities that decrease or jeopardize one's personal and social resources, will weaken one's identity and self-concept. Hence, we posit that privacy concerns will reduce an individual's identification with their smartwatch. In other words, because of the concern that their private information could be exposed or misused by unauthorized parties, smartwatch identity may be diminished. Hence, we hypothesize:

H3 *Perceived privacy concern negatively relates to smartwatch identity*.

3.3 | Deep use and innovative performance impact

Deep use captures the extent to which the individual employs system features for achieving the tasks that are significant to them. When an IT is integral to an individual's self-concept, they tend to deeply use the system's features in ways that are significant to the individual. The identity literature suggests that in order to reinforce their identity, individuals will selectively interact with others or use specific features (Burke & Stets, 1999; Carter & Grover, 2015). An individual with a strong smartwatch identity will tend to explore and use features of the watch to accomplish more and varied tasks even when those tasks may have been performed using other IT devices. For example, in addition to using smartwatch-specific features, those with a strong smartwatch identity may use their smartwatch for making phone calls, texting, listening to music, and so on, which are tasks traditionally and previously performed on the smartphone.

Furthermore, in order to maintain their smartwatch identity when situations present an opportunity to express their communications speed, the individual may seek out specific smartwatch features that allow them to initiate and respond to communications. A strong IT identity individual will seek out opportunities to explore and use many features of the IT. This may be similar to how enthusiasts, whose identities are formed around a specific object (e.g., car model) seek out opportunities to showcase the objects. In other words, it is possible to know if an IT has become an integral part of a person's self-concept by their behavioral use of myriad features of the technology. As a technology becomes more ingrained in a user's lifestyle, the users will look for new functional affordances of that tool (Goh, Gao, & Agarwal, 2011). In addition, to maintain an identity, a user will engage in a consistent pattern of use to

strengthen that identity (Charng et al., 1988). Prior studies have examined the influence of identity on various behaviors such as blood donation (Charng et al., 1988) and exercise (Theodorakis, 1994) and suggest that identity is a primary motivator of behavior. In terms of IT use, studies have also demonstrated the influence of identity on the use of self-streaming apps (Oyedele & Simpson, 2018) and social media use (Pan et al., 2017). The IT identity framework maintains that when IT identity has been formed and has become embedded within the individual's personal and social network, it is characterized by the enhanced use of the technology (Carter & Grover, 2015).

Furthermore, identity and behavior have been argued to have a complex reciprocal relationship, which suggests a reverse causality. However, researchers have maintained that identity has causal primacy over behaviors and behavioral controls such as self-efficacy (Tierney & Farmer, 2011). Identity theorists suggest that the salience of a specific identity within the individual's self-concept is usually followed by behaviors that are associated with that identity (Farmer, Tierney, & Kung-Mcintyre, 2003). Given that individuals seek opportunities where they receive feedback that are consistent with their identity, there are usually little adjustments to their behaviors to create consistency between their identity and how others view them. In other words, because individuals choose behaviors that reflect their identity, identity serves as a behavioral guide (Cast, 2003). Together, this suggests that the enactment of identity drives behavior and that identity is an antecedent of behavior (Tierney & Farmer, 2011). Moreover, a series of identity—behavior studies in IS draw attention to identity as a precursor for behavior. For example, Ma and Agarwal (2007) find that identity verification influences knowledge contribution in an online community. Mishra, Anderson, Angst, and Agarwal (2012) also find that physician identity reinforcement influences electronic health system use. In our case, a person with a strong smartwatch identity is motivated to perform behaviors that confirms that identity. We concur with identity theorists who argue that "for reasons implied in Mead's analysis, we believe the major causal direction is that incorporated into our model" (Stryker & Serpe, 1982) and that "the influence of identity on behavior is far greater than the reverse" (Burke & Reitzes, 1981). For these reasons, the main focus of this study is on the direction between smartwatch identity and deep use behavior rather than the reverse. That is, we expect that a strong smartwatch identity will increase deep use of the smartwatch. Therefore, we hypothesize:

H4 *Smartwatch identity positively relates to deep use of a smartwatch.*

While deep use is important, it is also important to consider how identity impacts performance and behavioral changes. In other words, over and above the impact of IT identity on deep use, we argue that smartwatch identity will also generate innovative performance because of the continued need to verify and confirm one's identity. Innovative individual performance has an implication on a change in performance (Kuegler et al., 2015). Innovative individual performance indicates that an individual has an improved productivity, a change in the user's activity (Delone & McLean, 2003), and created new or novel ideas (Torkzadeh & Doll, 1999). Identity theorists suggest that variations in an individual's identity determine variations in the individual's performance (Burke & Reitzes, 1981). The notion is that because individuals have a need to reinforce and confirm their identities, they will seek opportunities to achieve new levels of performance.

Individuals are more likely to perform innovative activities on their IT (smartwatch) when their IT is a central aspect of their self-concept. On the other hand, if an IT is not an integral part of the individual's self-concept, the individual tends not to tinker with the technology to find new things or new ways of achieving goals. For example, an individual who identifies with Microsoft Excel will find innovative and novel ways to use the software. In the case of a smartwatch, someone with a strong smartwatch identity will come up with new ideas about communicating, interacting, and socializing with others. That is, s/he will look for new ways to increase their performance with the smartwatch. Hence, the stronger the IT identity, the more the individual is motivated to innovatively perform. Therefore, we hypothesize:

H5 *Smartwatch identity positively relates to innovative individual performance.*

Innovative individual performance resulting from IT use suggests that the individual uses IT to create new ideas and realize new ways of doing things. That is, we expect that deep use of features of the smartwatch will be an

important source for innovative individual performance. There is at least one reason why the enhanced use of the features of an IT should influence the individual's innovative performance. Individuals who are interested in deeply using the features of an IT device or mastering their devices usually have a personal and intrinsic interest in the tasks and activities they are performing, and this personal interest motivates new and innovative ideas (Janssen & van Yperen, 2004). The more an individual uses the features of the smartwatch, the more the individual finds innovative and novel ways to use the smartwatch. Deep use of email, text, and fitness features could create new ideas for communicating and socializing with others. For example, individuals find new ways to capture selfies or portrait photos by tapping a button on the smartwatch. Also, fitness activity features can be used in new ways to encourage and challenge others to higher goals. Moreover, previous studies have found that IT use increases innovative individual performance. For example, Kuegler et al. (2015) found that the use of social software platforms positively influences innovative performance of the individuals. Therefore, we hypothesize:

H6 *Deep use of the smartwatch positively relates to innovative individual performance.*

Mediation refers to when an independent variable (*x*) causes an intervening variable (*m*), and that intervening variable causes a dependent variable (*y*) (MacKinnon et al., 2002). Mediation allows researchers to "identify fundamental processes underlying human behavior that are relevant across behaviors and contexts" (MacKinnon & Fairchild, 2009, p. 16). Our model includes an inherent intervening variable, and we propose that smartwatch identity will mediate the effects of social interaction, belongingness, and privacy concern on deep use and individual performance. This mediation relationship should exist because smartwatch supported social interactions, belongingness, and privacy concern, impact identity, which in turn influences deep use and innovative individual performance. Accordingly, our mediated model presents a causal theoretical chain (Kenny, 2008) in which benefits and risk factors increase and decrease identity, respectively, which in turn increases deep use and performance. In describing the mediation process, we follow the literature to describe the antecedents ($x \rightarrow m$), the outcome, and the mediator ($m \rightarrow y$). First, recall the identity literature that suggests that IT-supported social interactions and belongingness build identity (Lamb & Kling, 2003; Zhang, 2008). Second, the IT identity framework suggests that IT identity drives deep use (Carter & Grover, 2015), and that identity drives performance (Burke & Reitzes, 1981). Following the arguments from the literature, we propose that IT identity is a mediator between the antecedents of smartwatch identity and deep use and innovative individual performance. Effectively, these relationships are better explained with smartwatch identity as a mediator. Given that prior IT use research suggests that the antecedents could on their own influence or yield the outcomes (deep use and innovative performance), we expect the mediation effect to be partial rather than full. As a result, we hypothesize:

H7 *Smartwatch identity will mediate the effects of (a) social interactions, (b) belongingness, and (c) privacy concern on deep use and innovative individual performance.*

4 | RESEARCH METHOD

4.1 | Measurement scales

To test the relationships between risks and benefits, smartwatch identity, and outcomes, we conducted a research study built on a survey of smartwatch users. The survey consisted of validated scales from existing literature and adapted to our research context. We used a 7-point Likert scale to measure the items. Perceived benefits were operationalized as two constructs specific to smartwatches: belongingness and social interactions. Belongingness was adapted from a psychology study by Lee and Robbins (1995) that measures how individuals fit into a group. It was contextualized to measure how connected a smartwatch user feels to other smartwatch users. Social interactions were operationalized from a measure of online video game interaction quality (Lin & Bhattacherjee, 2010) and adapted to measure how social interactions are enhanced by smartwatch use. Privacy concern measures were

contextualized from Miltgen and Smith (2015), Dinev and Hart (2014) and Choi et al. (2015). Smartwatch identity was developed by Carter (2013) based on her conceptualization of the theoretical underpinnings of identity. It is measured as a formative-reflective construct consisting of three dimensions: dependence, relatedness, and emotional energy (Carter, 2013). The conceptualization of relatedness, dependence, and emotional energy satisfy the decision rules for formative constructs (Jarvis, MacKenzie, Scott, & Podsakoff, 2003). In a formative-reflective hierarchical component model, the higher-order construct (Smartwatch Identity) is a common concept of many specific formative lower-order constructs (relatedness, dependence, and emotional energy). These three lower-order constructs combine different identity-relevant characteristics (Jarvis et al., 2003; Petter, Straub, & Rai, 2007). The outcome variables are deep use and innovative individual performance. Deep use was operationalized directly from a smartwatch study to measure the use of different features specific to a smartwatch (Ogbanufe & Gerhart, 2018). The ultimate dependent variable, innovative individual performance, is regarded in the literature as a change in behavior or innovative performance impact and is operationalized using measures for task innovation and innovative performance impact (Doll & Torkzadeh, 1998; Kuegler et al., 2015). We contextualized these measures to assess the innovative and new ways of behaving resulting from smartwatch use. All measures, means, and standard deviations are listed in Appendix B.

4.2 | Data collection

We recruited survey participants from Amazon Mechanical Turk (MTurk). IS researchers have increased their use of MTurk because MTurk represents a diverse population that is more generalizable than student samples. In addition, the data is arguably as reliable as other sampling populations (Buhrmester & Kwang, 2011; Jenkins, Anderson, Vance, Kirwan, & Eargle, 2016). Also, students are less likely to own a smartwatch because they have less disposable income and wearables are more heavily adopted by those with a high income (Statistica, 2018b). Following Steelman, Hammer, and Limayem (2014), only participants from the United States are used in this study because including a global sample would result in many cultural differences, and cultural differences can be seen at the individual level (Yoo, Donthu, and Lenartowicz (2011). For a study focused on identity, this can be problematic because identity is often related to culture (P. B. Smith, 2011). Since data collection occurred in 1 day, nonresponse bias was not a major concern. Nonetheless, we compared early and late responders of the survey and found no statistically significant differences between the groups, suggesting response bias is not an issue (Armstrong & Overton, 1977). Appendix C describes other checks performed to ensure data quality.

To find the minimum sample sizes required for our study, we conducted power analyses using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). We used values of alpha = 0.05, power = 0.95, number of predictors = 5, and estimated effect size = 0.15. The minimum sample of 138 is determined to achieve adequate power for statistical interpretation for the dependent variable (innovative individual performance).

To ensure integrity in the results, we cleaned the data by setting up several criteria in the survey. First, we only allowed smartwatch users to participate in the survey. Second, we included three attention checks throughout the survey requesting respondents to select a specific answer. Specifically, these items directed the respondent to choose a specified answer (each of them different) and were randomly placed in the middle of item blocks. Using the survey software settings, participants that failed the attention check questions were dropped from completing the survey. Out of 389 participants who clicked the link to consider participating in our survey, 79 were ejected from the survey for failing attention checks. We discarded 92 incomplete surveys and 2 that listed smartwatches that were unknown to the researchers, and 216 completed the survey, giving us a completion rate of approximately 55%. The final sample included a wide range of people. Most survey participants were employed full time (67.6%) and most had at least a 2-year degree (71.3%). Other demographic statistics are listed in Table 1. The Apple Watch was the most commonly owned smartwatch and most of the sample owned their smartwatch for more than a year.

TABLE 1 Demographics

Type of smartwatch	
Apple watch	120
Samsung	32
Fitbit	23
Other	41
Gender	
Female	107
Male	108
Missing	1
Income	
Less than $30 000	38
$30 000–$59 999	70
$60 000–$89 999	56
$90 000+	51
Missing	1
Length of smartwatch ownership	
Less than 1 year	56
1 year	72
2 years	57
3 years	23
4 years	6
4+ years	2
Age	
19–24	43
25–29	45
30–34	61
35–39	27
40–44	16
45+	23

5 | DATA ANALYSIS AND RESULTS

5.1 | Measurement model

In analyzing the theoretical model, we used partial least squares (PLS) using SmartPLS 3.0 (Ringle, Wende, & Becker, 2015). PLS is considered appropriate for testing formative and reflective constructs in a single model (Chin & Newsted, 1999) and complex models (Chin, Peterson, & Brown, 2008).

Three approaches to modeling hierarchical latent variables in PLS-SEM have been proposed in the literature, including the repeated indicator, sequential latent variable score, and the hybrid approach. See Becker, Klein, and Wetzels (2012) for an expansive discussion of each approach. Because of its ability to estimate all constructs simultaneously instead of estimating lower-order and higher-order dimensions separately, we use the repeated indicator approach in this study. In this approach, the higher-order latent variable is built by specifying a latent variable that uses all the manifest variables of the underlying lower-order latent variables (Becker et al., 2012; Lohmöller,

1989). A repeated indicator approach should only be used when the lower-order constructs have an equal number of indicators. Since there are four items in each of the three constructs, the items in this study meet this requirement.

Common method bias is a threat in all survey research (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). To try to mitigate this threat, we asked questions on a 7-point Likert scale, as well as asked open-ended questions. Because CMB is a common concern without an agreed upon best test, we included two tests of CMB. First, we assessed common method bias by applying Harman's single factor test. This test evaluates if one factor is responsible for the majority of covariance among the variables by performing an unrotated factor analysis of all factors (Podsakoff et al., 2003). Our results indicate five factors emerge with the largest factor explaining 38.093% of the variance. Since it is less than half, our data passes Harman's single factor test. Second, to ensure the robustness of our check for CMB we performed a PLS-SEM test (Kock, 2015). Kock (2015) suggests that when all factor-level VIFs resulting from a full collinearity test are lower than 3.3, the model is considered free of common method bias. This approach is arguably a comprehensive procedure for simultaneously assessing both classical and lateral collinearity, indicating the presence or absence of pathological collinearity and common method bias (Kock, 2015; Kock & Lynn, 2012). Several studies in IS implement this approach at further validating CMB (e.g., Moody, Siponen, & Pahnila, 2018; Schmitz, Teng, & Webb, 2016). Our results indicate they are below 3.3 (see Appendix D). Based on our results, CMB is not a major concern.

Next, we assessed reliability of the items. Reliability is an indicator of how consistently the items measure the construct in question (Kerlinger & Lee, 2000). We evaluated composite reliability (CR), which should be greater than 0.7 to indicate a reliable scale (Bagozzi & Yi, 1988). We further tested Cronbach's alpha (CA) at the 0.7 threshold (Nunnally & Bernstein, 1994). Table 2 indicates all CRs and CAs are greater than 0.81, indicating adequate reliability.

Validity assesses measurement items in regards to how well an item measures its intended construct (Kerlinger & Lee, 2000). We first evaluated face validity when developing the scales. Next, we completed an exploratory factor analysis (EFA) in SPSS with a varimax rotation to determine convergent validity. The cross-loadings are found in Appendix E. The results indicate that in all but one case, all items load highly on their intended constructs, meeting the minimum recommended threshold of 0.7 (Chin, 1998). Further, the average variance extracted (AVE) for our constructs are all higher than 0.65, and should be higher than 0.5 (Henseler, Ringle, & Sinkovics, 2009). Finally, discriminant validity is achieved when the square root of AVE (displayed on the diagonal of Table 2) is greater than the correlation coefficients of other constructs (Chin, 1998). Our analysis indicates that this threshold is also met.

In addition to assessing reliability, convergent validity, and discriminant validity of the measurement items and constructs employed in our research (Chin, 1998; Hair, Hult, Ringle, & Sarstedt, 2014), we also assess discriminant validity following the recently proposed heterotrait–monotrait ratio (HTMT) method. To do so, we compare and assess whether the HTMT value is below a suggested threshold of 0.85 (Henseler et al., 2009). See Appendix F for

TABLE 2 Reliability, AVE, and correlations of focal variables

Correlation coefficients among measures									
	CA	**CR**	**AVE**	**1**	**2**	**3**	**4**	**5**	**6**
1	0.94	0.95	0.80	0.89					
2	0.90	0.93	0.77	0.42	0.88				
3	0.95	0.96	0.65	0.60	0.45	0.81			
4	0.94	0.96	0.85	0.23	−0.05	−0.05	0.92		
5	0.81	0.91	0.84	0.37	0.51	0.47	0.03	0.92	
6	0.87	0.91	0.66	0.24	0.61	0.42	−0.08	0.60	0.81

Note: 1—belongingness; 2—innovative individual performance; 3—smartwatch identity; 4—privacy concern; 5—social interactions; 6—deep use.

complete HTMT values. All values are below 0.72 indicating the criterion is met. A second way to determine discriminant validity with HTMT is to calculate confidence intervals and ensure they are below 1 (Henseler et al., 2009). Appendix F shows these are less than 1 for our data.

5.2 | Structural model

After determining the measurement model was sound, we evaluated the strength of relationships between the constructs. Six models shown in Table 3 were tested to show the relationships in the research model. Model 1 tests the relationship between the independent variables and identity. Each of these relationships is significant and, in the directions hypothesized. These antecedents explain 46% of the variance in smartwatch identity. Model 2 considers the same relationships with the control variables, which explain 3% of the variance in smartwatch identity, with only gender as a significant control variable. Models 3 and 4 show the relationships between identity and deep use. Smartwatch identity explains 11% of the variance in deep use and the controls add an additional 8% of explanation. The relationships are in the direction hypothesized. Models 5 and 6 show the relationships between smartwatch identity, deep use, and innovative individual performance. These variables explain 43% of the variance in innovative individual performance. The high R^2 value suggests that smartwatch identity and deep use have a large impact on innovative individual performance. The coefficients are positive, as hypothesized. No control variables are significant at the 0.05 level. Therefore, the control variables are not a large indicator of our outcome variables.

Together, the results indicate all six hypotheses are significant at the 0.001 level, except the relationship between privacy concern and identity (H3), which is significant at the 0.05 level. The identified perceived benefits (belongingness and social interactions) and risk (privacy concern) explain 46% of the variance in smartwatch identity. The antecedent explains 11% of the variance in deep use, and both explain 43% of the dependent variable, innovative individual innovative performance.

TABLE 3 Structural model results

	Smartwatch identity		Deep use		Innovative individual performance	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	Main only	Main + controls	Main only	Main + controls	Main only	Main + controls
Main						
BELONG	0.56***	0.53***	—	—	—	—
SOINT	0.26***	0.27***	—	—	—	—
PC	–0.19*	–0.18*	—	—	—	—
Identity	—	—	0.34***	0.34***	0.25***	0.25***
Deep use	—	—	—	—	0.52***	0.56***
Controls						
Age	—	0.06	—	–0.19*	—	0.04
Gender	—	–0.13*	—	–0.00	—	0.09
Income	—	0.00	—	0.12	—	–0.06
Brand	—	0.07	—	–0.11	—	0.09
Length	—	0.06	—	–0.16*	—	0.06
R^2	0.46	0.49	0.11	0.19	0.43	0.45

Note: Two-tailed tests; ***$p < .001$, **$p < .01$, *$p < .05$.
Abbreviations: BELONG, belongingness; BRAND, smartwatch brand; Length, length of use; PC, privacy concern; SOINT, social interactions.

TABLE 4 Mediation analysis

The indirect mediated effect (ab) bias corrected CI					The total effect (C′) bias corrected CI					
	2.5%	97.5%	*p*-value	Zero		2.5%	97.5%	*p*-value	Zero	Type
BELONG → IDEN → PERF	0.060	0.229	.002	No	BELONG →PERF	0.138	0.333	.000	No	Partial
SOINT → IDEN → PERF	0.031	0.130	.006	No	SOINT → PERF	0.052	0.202	.002	No	Partial
PC → IDEN → PERF	−0.101	−0.009	.041	No	PC →PERF	−0.15	−0.008	.030	No	Partial
BELONG → IDEN → USE	0.087	0.282	.000	No	BELONG →USE	0.087	0.282	.000	No	Partial
SOINT → IDEN → USE	0.030	0.189	.024	No	SOINT→ USE	0.03	0.189	.024	No	Partial
PC → IDEN → USE	−0.133	−0.006	.056	No	PC →USE	−0.133	−0.006	.056	No	Partial

Abbreviations: BELONG, belongingness; IDEN, smartwatch identity; PC, privacy concern; PERF, innovative individual performance; SOINT, social interactions; USE, deep use; Zero, zero included?

In addition to a hierarchical model, we also ensure the robustness of the results by performing data analysis using three IT Identity items identified as short-form scales (Carter, 2013). The results in Appendix G are consistent with the results of the hierarchical model.

5.3 | Mediation effects

To test for mediation of smartwatch identity, we employed the bootstrap method which evaluates confidence intervals (Bollen & Stinet, 1990). Shrout and Bolger (2002) argue this method is better for moderate sample sizes. It also allows direct testing of the mediation, instead of testing indirect relationships (Hayes, 2009). To employ this method, three paths are tested. First, the relationship between the independent variables and the mediating variable is tested. It is then resampled at least 1000 times, and the coefficient is multiplied by the coefficient of the path between the mediating variable and the dependent variable (Hayes, 2009). Simultaneously, the coefficient for the values between the independent variable and dependent variables are calculated. Finally, we evaluated if the confidence interval includes zero. If it does not, then you can assume with 95% confidence that the mediation is not zero, and therefore it exists (Hayes, 2009). If the confidence interval for the relationship between the independent variables and dependent variables is also nonzero, this indicates full mediation (Shrout & Bolger, 2002). The results are depicted in Table 4 and indicate partial mediation in our model.

6 | DISCUSSION

Our objective was to leverage the benefits and risks of smartwatch use to explain smartwatch identity, deep use, and innovative individual performance to better understand the digitization of the individual. We drew on the IT identity framework and identity literature and argued that the use of the smartwatch for social interactions and

belongingness influences the strength of smartwatch identity, which in turn increases deep use and innovative individual performance. Further, we drew on the valence framework and argued that the simultaneous risk and benefit considerations of smartwatch use contribute to strengthening and weakening of smartwatch identity. In addition, we argued that these effects would be partially mediated by smartwatch identity. Finally, we explored whether the benefits outweigh the risks in the confirmation of smartwatch identity. The result confirms our predictions and underscores the importance of belongingness, social interactions, and privacy concern in driving smartwatch identity, deep use, and innovative performance.

6.1 | Theoretical implications

Our work provides multiple contributions to IS research. This work expands the nomological network related to IT identity, particularly as it relates to social benefits that drive identity and the innovative individual performance that result from identity and deep use. The expansion is done through incorporating the social aspects of technology use (i.e., social interaction and belongingness) that build identity, with IT identity as a key mediator of deep use and innovative individual performance. This approach complements and extends the IT identity framework related to the prediction of deep use and advances our understanding of the role of social interactions and belongingness in the strengthening of IT identity in general and smartwatch identity in particular. The work presented in this paper complements and extends the IT identity research in four ways. First, it goes beyond examining how traditional conceptualizations of benefits derived from the IT influence identity and examines how the inherent risk characteristics of the IT affects identity. Second, it explicitly examines how the capacity of the smartwatch to increase one's social resources strengthens smartwatch identity. Third, using the valence framework, it explores the consideration of both benefits and risk. In other words, we explored whether the benefits outweigh the risks of becoming one with one's smartwatch. Fourth, it goes beyond the IT identity to deep use relationship and explores the relationships between IT identity and innovative individual performance, and deep use and innovative individual performance. By focusing on the social aspects of the smartwatch, our work complements research that suggests that IT-supported social interactions and belongingness can build identity (Lamb & Davidson, 2005; Lamb & Kling, 2003; Zhang, 2008) and extends work on IT identity that calls for a focus on the capacity of an IT to increase social resources (Carter & Grover, 2015). In addition, by focusing on innovative individual performance as the ultimate dependent variable, our work also extends work in IT identity (Hassandoust, 2017).

Specifically, we demonstrate that smartwatch supported social interactions and belongingness are important in strengthening smartwatch identity. In regard to social interactions, survey respondents note that it is "easier to stay connected" and "easier to reply faster" with a smartwatch, emphasizing the social nature of the smartwatch. In fact, using a smartwatch makes one survey respondent "much more social and in touch with family and friends." Respondents also indicated belongingness was also an important factor because using a smartwatch "is a different way of communicating and makes the user feel like he belongs to a select group." The conceptualizations of IT-supported social interactions in previous studies were mainly based on workplace IT such as emails, teleconferencing, and videoconferencing. This work empirically tested and validated the effectiveness of IT-supported interactions in strengthening identities when the IT is ubiquitous, personal, and voluntary. Given the prevalence of ubiquitous personal technological devices, the inclusion and testing of these factors in IT identity research is an important contribution to research.

Through the research model, we show that these antecedents reinforce identity, but also change outcome behaviors that are consistent with identity. Deep use is an indicator of users expanding their uses of an IT through use of functional affordances. Respondents indicate a smartwatch "gives me more communication at my fingertips," suggesting it goes beyond the tools of a smartphone. It can also improve on the tools that the user already knew existed because there are new tools available. One respondent boasts that the smartwatch "shows me that there are always different ways of keeping in touch with people." The smartwatch also encourages behavior changes through innovative individual performance. "Due to the competition it creates with others, I would say it helps me interact

better" according to one survey participant. Another argues, "it helps me to concentrate and not jump my proposed goals" and a different respondent states, "it has a positive [effect] in both my [business] and personal life."

The results in terms of the risk aspect of the smartwatch has implications for IS research. By incorporating risk factors that are undeniably inherent in every technology and perhaps even more so in a smartwatch, which is physically attached to the individual's body, we contribute to theory in two ways. First, we identify a need to assess both the benefits and risk factors in the strengthening of smartwatch identity. Second, we extend the understanding of IT identity and more specifically, the building of smartwatch identity in spite of the risk factors. This represents new knowledge and a key component of the overall contribution of our research. The implication for research is that researchers interested in using the IT identity framework should identify not only the benefits that reinforce identity, but also the risk characteristics of the technology that could dampen IT identity. We also provide a possible answer posed by scholars regarding whether the benefits of ubiquitous devices outweigh its risk (Bellotti & Sellen, 1993; Ladd, 1991). In our model, the influence of benefit factors on smartwatch identity was relatively stronger than risk, demonstrating that benefits of social interactions and belongingness are more important to individuals than privacy risks. The relationships in the current study may offer a new view of theorizing IT identity. In his seminal work on theoretical contributions, Whetten (1989) notes that a theoretical model in which such new relationships exist, "is a useful guide for research." As a result of this work, we can see that the same IT that could help an individual express, maintain, or expand their identity could also be used to reduce, diminish, and in some cases, damage one's identity. There are examples of individuals (e.g., YouTube Stars) who build and maintain their identity through social media capabilities (follows, likes, retweets). Following our research, future studies could examine, for example, the social media capabilities that can build and at the same time damage one's social media identity. On the one hand, these studies would identify new IT identities, and on the other hand, explore both sides of the IT identity process: the increasing and reducing aspects. In addition, if an IT designer develops a reputation for violating users' privacy, ignoring privacy violations or actions of others on their platform such as cyberbullying, these could result in feelings of harm, fear or other negative emotions. Over time, these emotions and privacy perceptions could lead to the breakdown of IT identity on the organization's IT (e.g., a specific app or device), and may transfer to other IT devices or apps owned[2] or acquired in the future by the same organization. Hence, privacy risks in IT identity research may benefit from a longitudinal design that seeks to understand how privacy risks weaken IT identity over time.

Further research is needed to identify other personal resources (e.g., self-efficacy, resilience, control) and social resources (e.g., status, reputation, power) afforded by other personal IT devices, which could create new identities and bring individuals closer to what they would like to be (possible self). For example, perception of control has been linked to lower stress and better job performance (Bulatao & Anderson, 2004) because individuals believe they have control over their environment. Also, according to Van-Dierendonck (2011), feeling connected to others can lead to self-determination. Self-determined individuals may be better able to use personal resources provided by an IT in building stronger relationships with others and also help others develop self-determination. Hence, building on our research, future research could examine how a personal IT device that affords one the perception of control and self-determination affects their IT identity. Furthermore, when an IT increases one's evaluation of the quality of their relationship, it may also encourage the formation of new and stronger relationships (Dutton, Roberts, & Bednar, 2010). Hence, concepts that assess relationship quality may be important determinants of IT identity and could be incorporated in future research studies.

The IT identity framework was developed to explain how the experience of using IT influences the confirmation of IT identity, and in turn how IT identity affects several behaviors (e.g., feature use, enhanced use, and resistance). By using innovative individual performance as the ultimate dependent variable, we extend the IT identity model to not only incorporate the theoretically based performance that results from behavior (Burton-Jones & Straub, 2006; Delone & McLean, 2003), but also the link between identity and innovative individual performance. Though we used the smartwatch, which is personal and ubiquitous, these arguments can be generalized to the workplace context.

Using robust bootstrapping tests for mediation, we were able to establish that smartwatch identity partially mediates the effects of social interactions, belongingness, and privacy concern on deep use and innovative individual

performance. These results are important contributions because they further validate the role of IT identity (smartwatch in our case) as a key mechanism through which the benefit and risk factors affect deep use and innovative individual performance. Theoretically, we point out that this study is the first study that empirically tested the effects of IT identity as a mediator.

6.2 | Practical implications

Understanding the factors that impact smartwatch identity is an important step in understanding a truly digitized individual. Given that the nature of ubiquitous technology can make it difficult to distinguish between the self and the technology, the role that identity plays in the digitized self is important.

The insights from this study could encourage practitioners to create or enhance features that increase smartwatch identity, such as social interaction, belongingness, and other features that increase the individual's social resources. According to Carter and Grover (2015), individuals can identify with IT at different levels. This means that while individuals identify with the smartwatch on one level, they can also identify with specific smartwatch apps. These identities can occur simultaneously, whereby the interactions between both can be evoked and reinforced at the same time. Hence, the findings from this study should encourage smartwatch manufacturers and smartwatch app developers to build apps and features that engender belongingness, social interactions, and other features that increase the individual's social resources. The use/experience with the apps increases both smartwatch identity and the app identity. These features will serve to drive continued and enhanced use of the smartwatch, which may increase the demand and sales of new and enhanced smartwatches. Practitioners could incorporate features that further enhance "innovative individual performance," as well as the identities of the individuals who use them.

Though the premise of this research leans towards the use of smartwatches in a personal and voluntary manner, the insights from this study can be beneficial in a professional and workplace environment. With the use of the smartwatch, individuals can accomplish goals and perform at high levels, which can be a source of personal and job satisfaction (Sonnentag & Frese, 2002), as well as increase the individual's work-related social resources. For example, when a professional's use of the smartwatch increases their performance in the workplace (increased response time, keeping appointments, etc.), it can also influence the individual's work-related social resources (i.e., social capital and relational capital). Central to work-related social resources is the variety, quantity, and quality of relationships that the individual has at work (Dutton et al., 2010). For example, Jamie (a smartwatch user) could invite Taylor (another smartwatch user) to a smartwatch activity competition or to share activities. This simple act can increase Jamie's social resources, such that the quality of Jamie's relationship with Taylor has increased, as has the diversity/type of relationship Jamie has with Taylor. Research suggests that these types of social resources strengthen employees in ways that include meaningful attachments at work (Kahn, 2007) and employee socialization (Ashforth, Saks, & Lee, 1998). Research also suggests that when individuals have wider or better-quality relationships with others, it increases job involvement, creativity, and greater coordination in teamwork (Atwater & Carmeli, 2009; Dutton et al., 2010; Gittell, 2005).

Other practical implications emerge from the results related to the relationships between identity, deep use, and innovative performance. We found that smartwatch identity increases deep use and innovative individual performance. Therefore, creating smartwatch applications that foster identity and deep use of the smartwatch are important. There are many ways this can be accomplished. First, given that applications that increase individual's social resources are important in building identity, designers need to approach application design carefully to ensure that it encourages and satisfies the need for social interactions between individuals, as well as belongingness. Designers should also seek ways to integrate features that display the results of such interaction by showing the extent, intensity, and nature of social interactions and bond (Zhang, 2008). Such information validates the individual's view of their interaction with others and their belongingness to a group, which further builds smartwatch identity. Practitioners can build into the IT/Smartwatch, the capacity to increase other personal and social resources

(e.g., evaluation quality of relationship quality, personal information disclosure; Dutton et al., 2010). Second, using the measures in this research, application designers should identify individuals who have successfully built an IT identity, and then provide different ways in which deep use of the IT can be enacted. For example, a user with a smartwatch identity could be introduced to other features of the smartwatch (deep use) and other ways to increase their performance and personal impact on others (innovative individual performance). Further, application designers should incorporate features that display performance metrics that gauge individuals' social activities and achievements, thus, encouraging further performance.

The results showing the relationship between privacy concern and identity could also be insightful to application designers. Identifying factors that could weaken smartwatch identity should be important for smartwatch manufacturers and app developers, because individuals with reduced IT identity may ultimately stop using the IT device as they lose dependence, relatedness, and emotional energy with the device. Practitioners could use the findings to make feature changes to minimize the potential for specific features to weaken identity. They can also build new features to mitigate such effects or remove features completely. For example, when it came to light that "Amazon Alexa" listened and sent user conversations to other people without the user's awareness or permission, it is possible that such feature capabilities would have diminished the IT (Alexa) identity in some users who are outraged or surprised that their private conversations could be shared without permission. Recent reports suggest that Amazon has built features that give users the capability to delete Alexa requests and voice transcriptions (Tung, 2019). Furthermore, in the design for privacy in ubiquitous and personal computing devices, application designers can address the need for control and feedback of information captured by the devices (Bellotti & Sellen, 1993) by incorporating features that allow individuals to control whether to share and the type of information that can be shared. Control aspects empower users "to stipulate what information they project and who can get hold of it," while the feedback aspect informs users "when and what information about them is being captured and to whom the information is being made available" (Bellotti & Sellen, 1993). Given that some smartwatches operate independent of the smartphone, integrating these privacy features may be important.

6.3 | Limitations

While the study offers several contributions, it is also subject to certain limitations. First, the study sample is limited to users in the United States, which limits generalizability. This is a deliberate choice because IT identity is likely different across societies and cultures. To adequately capture how smartwatch identity is confirmed, we limited the sample to ensure the identified features were relevant. Future research should include a different cultural sample, or multiple cultures simultaneously to improve generalizability of the results. Further, the sample was collected on Amazon MTurk. Although an inherent bias may exist given that participants were paid a nominal fee for participation, this practice can be considered much in the same manner as providing course credit for student's participation. In both cases, there is a potential for improperly motivating participants. Nonetheless, because participants of this study were required to be smartwatch owners, we believe it adds to the appropriateness of the sample. Second, this research relied on self-reported data by the users. While this can create bias in responses, identity is intimate to the user and therefore perceptions of the user are important. By employing variables that are representative of users' perceptions, we acknowledge that these are opinions. Third, our research uses cross-sectional data that is representative of a specific point in time. Identity is a complex construct that is dynamic over a person's lifetime. As a result, a longitudinal study could prove useful for future research to better understand how relationships change over time and how smartwatch identity evolves as the user allows the technology to become more embedded. The cross-sectional nature of our data also limited the possibility of testing the reciprocal effects of the identity confirmation process. Indeed, the IT identity framework suggests that a feedback loop exists between deep use and the antecedents of IT identity. Future research should incorporate longitudinal data to test and confirm the feedback loop from behavior to IT identity. Finally, given that this research contextualized and narrowed the IT Identity

framework to smartwatches (a form of wearable technologies), the model may be mostly generalizable to the context of wearable devices. Even though the smartwatch represents only one category of devices that signal a paradigm shift in how IT devices are infused in the individual's life, future research should explore other IT artifacts that are particularly prone to identity.

7 | CONCLUSION

We draw from the IT identity and valence frameworks and explore the influence of benefits (belongingness and social interactions) and a risk (privacy concern) on smartwatch identity. Further, we evaluate the effect of smartwatch identity on two outcome variables: deep use and innovative individual performance and investigate the mediating effect of smartwatch identity on the outcome variables. Our results demonstrate the mediating effect of smartwatch identity on deep use and innovative individual performance. In addition, by incorporating the relationships between (a) IT (smartwatch) identity and innovative individual performance and (b) deep use and innovative individual performance, we advance the IT identity theory.

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ENDNOTES

[1] "Though there are definitional differences between privacy risk and privacy concern (J. Smith, Dinev, & Xu, 2011), Miltgen and Smith (2015) combine both privacy concerns and privacy risk, termed privacy risk concern, and note that it is concerns associated with privacy risks.

[2] We thank the Associate Editor for this suggestion.

[3] We thank Reviewer 1 for this suggestion.

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APPENDIX A

TABLE A1 Selected studies on identity and behavior

Author/theory	Study objective	Key IVs	DVs	Key results[a]
Oyedele and Simpson (2018)/ identity theory	What is the role of self-identity in value and use of self-service streaming apps? And do perceived values and self-identity affect actual usage and recommendation of the apps	Convenience value, emotional value, social value, monetary value, cognitive effort	Recommend (REC), hours of USE (USE), identity salience (IDS)	IDS → USE IDS → REC
Thatcher, Wilson, and Brown (2017)/ identity theory	Explores the determinants of identity communication in virtual settings	Self-verification (SV), self-enhancement (SE), belonging (BEL), distinctiveness (DIS), self-protection (SP)	Identity communication (IDTC)	DIS → IDTC
Pan, Lu, Wang, Chua (2017)	Explores the differential influences of social self-identity and relational identity on social media usage.	Social identity (SID), relational identity (RID)	Varied use (VU), reinforced use (RU)	SID → VU SID → RU RID → VU RID → RU
Ma and Agarwal (2007)/ identity theory	Examines the role of identity verification and communication as a key driver for facilitating knowledge contribution	Perceived identity verification (PIV), satisfaction (SAT), virtual co-presence (VCP), self-preservation (SP), deep profiling (DP), persistent labeling (PL)	Knowledge contribution (KC)	PIV → KC PIV → SAT VCP → PIV SP → PIV DP → PIV
Theodorakis (1994)/theory of planned behavior and identity theory	To investigate the effect of role identity and attitude strength on exercise behavior	Role identity (RID), attitude strength (ATTS)	Behavioral intention (INT)	RID → INT ATTS → INT
Charng et al. (1988)/theory of reasoned action identity theory	The differential effects of theory of reasoned action and identity theory on long term blood donation behavior.	Role identity (RID), social relations (SREL), habit	Behavioral intention (INT), behavior (BEH)	SREL → BEH RID → BEH
Mishra et al. (2012)/ identity theory	Explores assimilation of EHRS by physicians through a theoretical lens of physicians' identities.	Physician community identity reinforcement (PPCIR), physician community identity deterioration (PPCID)	EHR assimilation (ASM)	PPCIR →ASM PPID →ASM
Moon et al. (2006)/social identity	Explores the effect of social interaction and enjoyment of blogging on the expansion of social identity	Social interaction (SIT), enjoyment, cognitive social identity (CSI), affective social identity (ASI), evaluative social identity (ESI)	Social identity, intention to expand social network (INT), satisfaction with life (SAT)	SIT →CSI SIT →ASI SIT →ESI ENJ →ASI ENJ →ESI CSI →INT ASI →INT ESI →INT CSI →SAT

(Continues)

TABLE A1 (Continued)

Author/theory	Study objective	Key IVs	DVs	Key results[a]
Shen, Yu, and Khalifa (2010)/social identity theory, social presence theory	Explores the effect of social identity, system design and social presence on knowledge contribution in virtual communities	Awareness (AWS), affective social presence (ASP), cognitive social presence (CSP)	Social identity (SID), knowledge contribution (KC)	AWS →KC ASP →KC ASP →SID CSP →KC CSP →SID SID →KC
Tsai and Bagozzi (2014)/ social-psychological	Examines the effects of cognitive, emotional, and social determinants of shared we-intentions on member contribution behavior	Social identity (SID), norms, desire to contribute (DES), we- intentions (WINT)	Knowledge contribution (KC)	Desire →WINT SID →DES NORM →DES WINT →KC
Arbore, Soscia, and Bagozzi (2014)/ symbolic value	Explores the re-specification of a previous technology adoption model with the inclusion of self-identity in the context of personal ubiquitous technologies	Self-identity (SID), social influence (SI), enjoyment (ENJ)	Behavioral intention (INT)	SID →INT SI →INT ENJ →INT
Lee, Lee, and Lee (2006)/ identity theory	In both mandatory and voluntary use contexts, the effect of self-identity is tested on usage intention, perceived usefulness and perceived ease of use.	Self-identity (SID), perceived usefulness (PU), perceived ease of use (PEOU)	Usage intention (UI), behavior (usage)	SID →UI SID →PU SID →PEOU
Terry, Hogg, and White (1999)/ social identity theory	Investigates the roles played by self-identity and social identity in the context of attitude-behavioral intention relations (recycling)	Self-identity (SID), subjective NORM (NORM), attitude (ATT), PAST behavior (PAST)	Intention (INT), behavior(BEH)	Sid→INT PAST →INT ATT →INT PAST →BEH INT →BEH
Ray, Kim, and Morris (2014)/ engagement theory	Examines the effect of self-identity verification on engagement in an online community	Self-identity verification (IDV),	Community engagement (CE), satisfaction (SAT)	IDV →CE
Hassandoust (2017)/ identity theory, IT identity	Examines the effects of IT identity and role identity on various use patterns such as extended use, integrative use, and emergent use	IT identity (ITDT), role identity (RDT)	Extended use (EXU), integrative (IGU) use, and emergent use (EMU)	ITDT → IXU ITDT → IGU ITDT → EMU RDT → IXU RDT → IGU RDT → EMU ITDT →RDT

[a]Only significant results are reported.

APPENDIX B: MEASUREMENT ITEMS

Item	Measure	Mean	SD
BELONG1	Among my friends that use smartwatches, there is a sense of brother/sisterhood.	4.05	1.70
BELONG2	I feel like I can participate with anyone who has a smartwatch.	4.11	1.68
BELONG3	I am in tune with smartwatch users.	3.93	1.76
BELONG4	I feel connected to others that have smartwatches.	4.03	1.79
BELONG9	My friends who have smartwatches feel like family.	3.71	1.72
DEEPUSE1	When I use my smartwatch, I use features that would help me respond quickly to emails and texts	4.74	1.65
DEEPUSE2	When I use my smartwatch, I use features that help me immediately view information (e.g., texts, emails, tweets)	5.08	1.65
DEEPUSE3	When I use my smartwatch, I use features that help me view notifications (e.g., incoming calls, texts, reminders, emails)	5.15	1.62
DEEPUSE4	When I use my smartwatch, I use features that help me decide whether it is worth pulling out my phone.	5.25	1.70
DEEPUSE5	When I use my smartwatch, I use features that help me stay on track on tasks (e.g., haptics feedback, coaching, challenges).	5.02	1.55
DEP1	Thinking about myself in relation to my smartwatch, I am needing my smartwatch.	4.52	1.66
DEP2	Thinking about myself in relation to my smartwatch, I am counting on my smartwatch.	4.84	1.58
DEP3	Thinking about myself in relation to my smartwatch, I am reliant on my smartwatch.	4.73	1.66
DEP4	Thinking about myself in relation to my smartwatch, I am dependent on my smartwatch.	4.33	1.75
EMO1	Thinking about myself in relation to my smartwatch, I feel pumped up.	4.55	1.46
EMO2	Thinking about myself in relation to my smartwatch, I feel enthusiastic.	4.91	1.46
EMO3	Thinking about myself in relation to my smartwatch, I feel energized.	4.84	1.48
EMO4	Thinking about myself in relation to my smartwatch, I feel confident.	4.98	1.45
PERF1	My smartwatch helps me come up with new ideas.	4.35	2.02
PERF2	My smartwatch helps me try out innovative ways to meet fitness goals.	4.52	1.97
PERF3	My smartwatch helps me try new ways to interact with others.	4.60	1.92
PERF4	My smartwatch helps me create new healthy habits.	4.27	1.97
PC1	I am concerned that personal information on my smartwatch could be misused.	4.06	1.69
PC2	I am concerned that personal information on my smartwatch could be stolen.	4.06	1.75
PC3	I am concerned that personal information on my smartwatch could be used in a way that I did not foresee.	4.15	1.65
PC4	I am concerned about threats to my personal privacy when using my smartwatch.	3.94	1.75
REL1	Thinking about myself in relation to my smartwatch, I am connected with my smartwatch.	5.12	1.42
REL2	Thinking about myself in relation to my smartwatch, I am in coordination with my smartwatch.	5.20	1.31
REL3	Thinking about myself in relation to my smartwatch, I am close with my smartwatch.	4.90	1.46
REL4	Thinking about myself in relation to my smartwatch, I am linked with my smartwatch.	5.09	1.43
SOINT1	My smartwatch allows me to communicate and interact with others.	5.18	1.29
SOINT2	I can interact (e.g., call, text, email, give feedback) with others on my smartwatch.	5.08	1.50

Abbreviations: BELONG, belongingness; DEP, dependence; EMO, emotional energy; IDEN, smartwatch identity; PC, privacy concern; PERF, individual performance; REL, relatedness; SOINT, social interactions.

APPENDIX C: DATA QUALITY CHECKS

We also ensured data quality by checking for outliers. Outliers are observations that significantly differ from other observations. We used Boxplots in SPSS to check for outliers. Following Hoaglin and Iglewicz (1987), we used the suggested 2.2 multiplier. We found no outliers in our data. Specifically, for each construct (PC, SOINT, BELONG, DEEPUSE, PERF, IDREL, IDEMO, IDREP), we averaged their items to create a single-item measure. We ran the Boxplot analysis for each construct measure to provide its lower and upper limits. Using the upper and lower limits, and the suggested 2.2 interquartile range (IQR) multiplier, we found that all the measures were within the range.

APPENDIX D: PLS-SEM COMMON METHOD BIAS TEST

PERF	BELONG	IDEN	PC	SOINT	DEEPUSE
	1.75	1.89	1.14	1.80	1.64
USE	BELONG	PERF	IDEN	PC	SOINT
	1.82	1.54	1.85	1.16	1.52
IDEN	BELONG	PERF	PC	SOINT	DEEPUSE
	1.38	1.82	1.09	1.75	1.92
PC	BELONG	PERF	IDEN	SOINT	DEEPUSE
	1.36	1.71	1.58	1.80	1.98
SOINT	BELONG	PERF	IDEN	PC	DEEPUSE
	1.85	1.87	1.82	1.12	1.70
BELONG	PERF	IDEN	PC	SOINT	DEEPUSE
	1.75	1.39	1.02	1.79	2.01

Abbreviations: BELONG, belongingness; IDEN, smartwatch identity; PC, privacy concern; PERF, individual performance; REL, relatedness; SOINT, social interactions.

APPENDIX E: CROSS LOADINGS

	BELONG	DEEP USE	DEP	EMO	PERF	PC	REL	SOINT	IDEN
BELONG1	**0.89**	0.16	0.50	0.51	0.32	0.23	0.32	0.33	0.49
BELONG2	**0.84**	0.20	0.48	0.47	0.38	0.19	0.42	0.35	0.50
BELONG3	**0.91**	0.26	0.54	0.55	0.41	0.18	0.40	0.36	0.55
BELONG4	**0.92**	0.22	0.52	0.54	0.39	0.23	0.39	0.34	0.54
BELONG5	**0.89**	0.21	0.55	0.57	0.37	0.20	0.41	0.29	0.57
DEEPUSE1	0.27	**0.80**	0.24	0.26	0.57	0.01	0.33	0.53	0.30
DEEPUSE2	0.17	**0.88**	0.26	0.23	0.58	−0.09	0.38	0.55	0.32
DEEPUSE3	0.14	**0.86**	0.20	0.18	0.52	−0.05	0.34	0.43	0.26
DEEPUSE4	0.12	**0.85**	0.20	0.20	0.45	−0.09	0.34	0.54	0.27

(Continues)

	BELONG	DEEP USE	DEP	EMO	PERF	PC	REL	SOINT	IDEN
DEEPUSE5	0.25	**0.66**	0.44	0.46	0.35	−0.10	0.50	0.40	0.52
DEP1	0.56	0.28	**0.91**	0.63	0.31	0.01	0.61	0.35	0.80
DEP2	0.52	0.30	**0.91**	0.74	0.33	−0.06	0.64	0.34	0.84
DEP3	0.52	0.32	**0.93**	0.68	0.36	0.00	0.64	0.39	0.83
DEP4	0.51	0.31	**0.91**	0.65	0.35	0.02	0.64	0.36	0.81
EMO1	0.55	0.28	0.66	**0.93**	0.33	−0.02	0.63	0.38	0.82
EMO2	0.53	0.28	0.66	**0.91**	0.37	−0.02	0.66	0.37	0.83
EMO3	0.58	0.26	0.65	**0.92**	0.38	0.03	0.64	0.35	0.82
EMO4	0.48	0.37	0.67	**0.86**	0.37	−0.08	0.73	0.42	0.84
PERF1	0.43	0.55	0.37	0.41	**0.89**	−0.04	0.41	0.51	0.44
PERF2	0.33	0.63	0.27	0.29	**0.91**	−0.11	0.35	0.50	0.34
PERF3	0.36	0.49	0.30	0.32	**0.87**	0.00	0.36	0.40	0.36
PERF4	0.36	0.46	0.36	0.38	**0.85**	−0.01	0.41	0.37	0.42
PC1	0.26	−0.10	0.03	0.00	−0.03	**0.91**	−0.11	0.10	−0.03
PC2	0.20	−0.03	0.01	0.02	−0.01	**0.90**	−0.08	0.06	−0.02
PC3	0.20	−0.03	−0.02	−0.03	0.01	**0.92**	−0.09	0.03	−0.05
PC4	0.21	−0.11	−0.01	−0.04	−0.10	**0.95**	−0.13	0.01	−0.07
REL1	0.34	0.47	0.57	0.61	0.43	−0.15	**0.87**	0.43	0.75
REL2	0.32	0.42	0.60	0.67	0.43	−0.13	**0.88**	0.39	0.79
REL3	0.43	0.36	0.60	0.63	0.32	−0.06	**0.85**	0.37	0.76
REL4	0.41	0.38	0.64	0.66	0.33	−0.07	**0.88**	0.42	0.80
SOINT1	0.35	0.54	0.38	0.40	0.51	0.031	0.44	**0.93**	0.45
SOINT2	0.34	0.57	0.34	0.37	0.42	0.031	0.41	**0.91**	0.41

Abbreviations: BELONG, belongingness; DEP, dependence; EMO, emotional energy; IDEN, smartwatch identity; PC, privacy concern; PERF, individual performance; REL, relatedness; SOINT, social interactions.

APPENDIX F: HETEROTRAIT-MONOTRAIT (HTMT) CORRELATIONS

	BELONG	PERF	IDEN	PC	SOINT
BELONG					
PERF	0.46				
IDEN	0.63	0.48			
PC	0.25	0.06	0.07		
SOINT	0.43	0.59	0.53	0.05	
DEEPUSE	0.26	0.68	0.46	0.09	0.72

Abbreviations: BELONG, belongingness; IDEN, smartwatch identity; PC, privacy concern; PERF, individual performance; REL, relatedness; SOINT, social interactions.

Heterotrait-monotrait (HTMT) Confidence Intervals.

	Original sample (O)	Sample mean (M)	Confidence intervals	
			2.50%	97.50%
BELONG → IDEN	0.54	0.53	0.39	0.66
IDEN → PERF	0.23	0.23	0.09	0.37
IDEN → DEEPUSE	0.42	0.42	0.25	0.58
PC →IDEN	−0.19	−0.18	−0.31	−0.004
SOINT → IDEN	0.28	0.28	0.15	0.42
DEEPUSE → PERF	0.52	0.52	0.39	0.64

Abbreviations: BELONG, belongingness; IDEN, smartwatch identity; PC, privacy concern; PERF, individual performance; REL, relatedness; SOINT, social interactions.

APPENDIX G: ADDITIONAL ANALYSIS

In addition to a hierarchical model, we also ensure the robustness of the results by performing data analysis using short-form IT Identity scales developed by Carter (Carter, 2013). There are only three items (Thinking about myself in relation to my smartwatch, I feel (a) dependent on my smartwatch, (b) energized, (c) connected with my smartwatch). The results in Table G1 below are consistent with the results from the hierarchical model.

TABLE G1 Additional analysis using short-form IT Identity construct

	Smartwatch identity		Deep use		Innovative individual performance	
	Main only	Main + controls	Main only	Main + controls	Main only	Main + controls
Main						
BELONG	0.51***	0.51***	—	—	—	—
SOINT	0.28***	0.28***	—	—	—	—
PC	−0.18*	−0.16*	—	—	—	—
IDENTITY	—	—	0.34***	0.35***	0.27***	0.28***
DEEP USE	—	—	—	—	0.52***	0.55***
Controls						
AGE	—	0.07	—	−0.20*	—	0.03
GENDER	—	−0.15**	—	0.00	—	0.11
INCOME	—	0.00	—	0.12	—	−0.06
BRAND	—	0.06	—	−0.10	—	0.09
LENGTH	—	0.01	—	−0.15*	—	0.07
R^2	0.43	0.46	0.12	0.19	0.43	0.46

Notes: Two-tailed tests; ***$p < .001$, **$p < .01$, *$p < .05$.
Abbreviations: BELONG, belongingness; BRAND, smartwatch brand; LENGTH, length of use; PC, privacy concern; SOINT, social interactions.

TABLE G2 Direct links models

	Smartwatch identity		Deep use		Innovative individual performance	
	Main only	Main + controls	Main only	Main + controls	Main only	Main + controls
Main						
BELONG	0.51***	0.51***	−0.05	−0.065	0.26***	0.23*
SOINT	0.28***	0.27***	0.55***	0.51***	0.55***	0.13
PC	−0.18*	−0.16*	−0.09	−0.098	−0.06	−0.08
IDENTITY	—	—	0.18	0.19*	0.07	0.08
DEEP USE	—	—	—	—	0.47***	0.44***
Controls						
AGE	—	0.07	—	−0.15*	-	0.00
GENDER	—	−0.14**	—	0.042	—	0.12
INCOME	—	0.00	—	0.063	—	−0.04
BRAND	—	0.06	—	0.015	—	0.11*
LENGTH	—	0.03	—	0.17**	—	0.12*
R^2	0.43	0.46	0.40	0.44	0.47	0.51

Note: Two-tailed tests. ***$p < .001$, **$p < .01$, *$p < .05$.
Abbreviations: BELONG, belongingness; BRAND, smartwatch brand; LENGTH, length of use; PC, privacy concern; SOINT, social interactions.

For completeness, we also test the direct links[3] from benefit and risk factors to deep use and innovative individual performance, using the short form identity scales (Table G2).

As direct links to deep use, belongingness and privacy concern are not significantly related, while social interactions is significantly related. As direct links to innovative individual performance, belongingness, privacy concern, and deep use are significantly related, while privacy concern and smartwatch identity are not. In addition, smartwatch identity is not significantly related to innovative individual performance. These results indicate differences with the main model and suggest the need for a mediation model, as indicated in the main research model (Table 3).