Journal of the Association for Information Systems
JAIS

Research Article

Technology, Humanness, and Trust: Rethinking Trust in Technology

Nancy K. Lankton
Marshall University
lankton@marshall.edu

D. Harrison McKnight
Michigan State University
mcknight@bus.msu.edu

John Tripp
Baylor University
John_Tripp@Baylor.edu

Abstract

Information systems (IS) research has demonstrated that humans can and do trust technology. The current trust in technology literature employs two different types of trust in technology constructs. Some researchers use human-like trust constructs (e.g., benevolence, integrity, and ability), while other researchers use system-like trust constructs (e.g., helpfulness, reliability, and functionality). Interestingly, past research shows that both sets of measures influence important dependent variables, but the literature does not explain when one type should be used instead of the other type. In this paper, we use trust, social presence, and affordance theories to shed light on this research problem. We report on two studies. In study 1, we argue first that technologies vary in their perceived "humanness". Second, we argue that, because users perceive two technologies to differ in humanness, they will develop trust in each technology differently (i.e., along more human-like criteria or more system-like criteria). We study two technologies that vary in humanness to explore these differences theoretically and empirically. We demonstrate that, when the trust construct used aligns well with how human the technology is, it produces stronger effects on selected outcome variables than does a misaligned trust construct. In study 2, we assess whether these technologies differ in humanness based on social presence, social affordances, and affordances for sociality. We find that these factors do distinguish whether technology is more human-like or system-like. We provide implications for trust-in-technology research.

***Keywords**: Trust in Technology, Social Presence Theory, Social Response Theory, Human-like Trust, System-Like Trust, Affordance Theory.*

* Elizabeth Davidson was the accepting senior editor. This article was submitted on 4th March 2014 and went through two revisions.

Volume 16, Issue 10, pp. 880-918, October 2015

Technology, Humanness, and Trust: Rethinking Trust in Technology

1. Introduction

Trusting in technology or believing that a technology has desirable (i.e., trustworthy) attributes seems reasonable because we talk about trusting in non-human entities in everyday discourse. For example, we trust a new car to operate properly so we can safely use it for travel (Holzner, 1973). McKnight (2005) argues that we trust bridges enough to calmly walk under them. Similarly, we trust word processing software to save our data, and we trust the Internet to share data with others. However, some influential researchers argue that trust does not exist between humans and technologies. For instance, Shneiderman (2000) claims that "If users rely on a computer and it fails, they may get frustrated or vent their anger by smashing a keyboard, but there is no relationship of trust with a computer" (p. 58). Similarly, Friedman, Khan, and Howe (2000) assert that "people trust people, not technology" (p. 36). Yet, despite some differences between human-technology exchanges and interpersonal exchanges, more and more researchers now acknowledge that humans can and do trust technology. In fact, researchers have shown trust in technology to influence acceptance of various technologies such as online recommendation agents (Wang & Benbasat, 2005), business information systems (Lippert, 2007), m-commerce portals (Vance, Elie-Dit-Cosaque, & Straub, 2008), and knowledge management systems (Thatcher, McKnight, Baker, Arsal, & Roberts, 2011).

While this recent literature demonstrates the viability of trust in technology and its crucial influences, it is surprisingly inconsistent regarding what constitutes technology-trusting beliefs. Some researchers have conceptualized and measured trust in technology as if the technology were a human. That is, they have measured technology trust using the human-like trust constructs of integrity, ability/competence, and benevolence that researchers have traditionally used to measure interpersonal trust (Vance et al., 2008; Wang & Benbasat, 2005) (see Table 1). In contrast, other researchers have measured technology trust using system-like trust constructs such as reliability, functionality, and helpfulness (McKnight, Carter, Thatcher, & Clay, 2011) (see Table 1). Researchers using both approaches have published empirical studies that provide evidence for their view of trust in technology. For example, it seems reasonable for users to associate human-like trusting beliefs with an online recommendation agent that has voice and animation as in Wang and Benbasat (2005). Likewise, it seems reasonable for McKnight et al. (2011) to use system-like trusting beliefs for a technology such as Excel that has no voice and animation features.

However, choosing which trust in technology constructs to use may not always be clear-cut. Researchers may ask respondents about a technology's integrity (a human-like trait) even though the respondent may not accept the idea that a technology can display integrity. This situation could happen if the technology is less human-like and more system-like, such as if it lacks animation and has no voice capabilities. In other situations, respondents might be asked about the technology's functionality. If the technology seems more human-like (e.g., with voice and animation), respondents may not think about its functionality but rather its competence—a human-like capability. In both situations, using the wrong trust constructs may be misleading and cause conflict or confusion among respondents because of the mismatch between the construct and the technology being assessed.

We address this problem by investigating the human-like versus system-like nature of technologies and whether the degree of humanness matters for choosing which trusting belief constructs to use. Humanness means to have the form or characteristics of humans (humanness, n.d.). Several theories describe how human-technology relationships can develop differently based on the technology's human-like nature or its "humanness". Social presence theory (Short, Williams, & Christie, 1976), social response theory (Nass, Steuer, & Tauber, 1994), and affordance theory (Gibson, 1977) describe aspects of technologies and users' interactions with technologies that can make them seem more or less human-like and, thereby, exhibit different levels of "humanness". Based on this research, we make two hypotheses. First, we hypothesize that technologies can differ in humanness. Second, we predict that users will develop trust in the technology differently depending on whether they perceive it as more or less human-like, which will result in human-like trust having a stronger influence on outcomes for more human-like technologies and system-like trust having a stronger influence on outcomes for more system-like technologies.

Table 1. Major Trust in Technology Constructs Used	
Human-like trusting beliefs	**Corresponding system-like trusting beliefs**
Definition	**Definition**
Integrity: the belief that a trustee adheres to a set of principles that the trustor finds acceptable (Mayer, Davis, & Schoorman, 1995).	**Reliability:** the belief that the specific technology will consistently operate properly (McKnight et al., 2011).
Ability: the belief that the trustee has the group of skills, competencies, and characteristics that enable them to have influence within some specific domain (Mayer et al., 1995). **Competence:** the belief that the trustee has the ability to do what the trustor needs to have done (McKnight et al., 2002).	**Functionality:** the belief that the specific technology has the capability, functions, or features to do for one what one needs to be done (McKnight et al., 2011).
Benevolence: the belief that the trustee will want to do good to the trustor, aside from an egocentric profit motive (Mayer et al., 1995).	**Helpfulness:** the belief that the specific technology provides adequate and responsive help for users (McKnight et al., 2011).
Exemplar Studies	**Exemplar Studies**
Vance et al. (2008): m-commerce portal Wang & Benbasat (2005): online recommendation agent	Lippert & Swiercz (2005): human resource information system McKnight et al. (2011): spreadsheet Muir & Moray (1996): simulated pump mechanism Thatcher et al. (2011): knowledge management system

We test these predictions using two technologies: one that is more system-like and one that is more human-like. We use data from a questionnaire study (study 1) to show that people rate technologies differently in humanness and that, for matches (e.g., human-like trust and more human-like technology), trust has a stronger influence on outcome variables (e.g., intention to continue using, enjoyment) than for mismatches (e.g., human-like trust and more system-like technology). In a follow-up study (study 2), we test some of the assumptions we make in study 1 about the factors underlying humanness.

We do not examine all the facets of a technology's human-like nature, nor do we examine all the boundary conditions on our results. As a first attempt to examine this issue, we take two technologies used in different contexts that we believe will differ in perceived humanness. We examine which trust in technology construct is more appropriate (i.e., not misleading and in harmony with user perceptions) in the differing technology-use contexts. We contribute by being the first study, to our knowledge, that addresses this problem. We also suggest opportunities for future research.

2. Theoretical Background

2.1. Trust in Humans and Trust in Technology

Much IS trust research examines trust in humans or human organizations such as an e-commerce vendor (Bhattacherjee, 2002; Gefen, Karahanna, & Straub, 2003), a virtual team member (Jarvenpaa, Knoll, & Leidner, 1998), or a trading partner (Nicolaou & McKnight, 2006). However, despite differences between human-technology exchanges and interpersonal exchanges, more and more researchers have acknowledged that many people also place trust in the technological artifact itself. This trust is called trust in technology and differs from trust in humans because it represents a human-to-technology trust relationship rather than a human-to-human trust relationship. Recently, McKnight et al. (2011) examined the differences between trust in humans concepts and the corresponding trust in technology concepts, including disposition to trust, structural assurance, trusting beliefs, and trusting intention. In this study, we examine trusting beliefs in technology, which are beliefs that a specific technology has the attributes necessary to perform as expected in a given situation in which negative consequences are possible (McKnight et al., 2011). This definition is based on the trust in humans concept defined as beliefs that the other party has suitable attributes for performing as expected in a specific situation regardless of the ability to monitor or control that other party (Mayer et al., 1995).

Trust researchers examine trust according to its stages, its economic or social psychological view, and its dimensionality. While trust in technology researchers have examined both the initial (Wang & Benbasat, 2005) and more knowledge-based or experiential (Lippert, 2007) stages of trust, we mainly examine knowledge-based trust in technology in which users have experience with the technology. Further, trust in humans may be based on a cost-benefit calculus (an economic perspective) or on social psychological perceptions (Lewicki & Bunker, 1996). In this study, we examine the social psychological perception of trust in technology, which is more common in this research area (Wang & Benbasat, 2005). Finally, trust researchers have distinguished between the uni-dimensional (trust and distrust are bipolar opposites of the same scale) and two-dimensional views (trust and distrust are separate constructs) of trust (Lewicki, Tomlinson, & Gillespie, 2006). We do not address this distinction because studying distrust is beyond our scope.

2.2. Human-like and System-like Trust in Technology

Researchers usually measure trust between people by using three human-like trusting beliefs: integrity, competence, and benevolence (Mayer et al., 1995; McKnight, Choudhury, & Kacmar, 2002) (Table 1). Ability/competence is the belief that a person has the skills, competencies, and characteristics that enable them to have influence in some specific domain. Benevolence is the belief that a person will want to do good to the trustor aside from an egocentric profit motive. Integrity is the belief that a person adheres to an acceptable set of principles. Researchers have used these human-like trusting beliefs to study trust in technology because people tend to anthropomorphize technologies and ascribe to them human motivation or human attributes (Nowak & Rauh, 2005; Reeves & Nass, 1996). For example, Wang and Benbasat (2005) studied trust in online recommendation agents (RAs) and found that these human-like trusting beliefs significantly influenced individuals' perceived usefulness and intention to use RAs. Vance et al. (2008) use these beliefs to study m-commerce portals.

When used in a human-to-human trust relationship, these trusting beliefs assume human trustees have volition (the power to choose) and can make ethical decisions. It is not as clear, however, whether technologies have volition or can make ethical decisions without being pre-programmed to do so. Because of this issue, some researchers have developed alternative trust belief constructs that do not assume technologies have volition or ethical decision making capability. For example, Lippert and Swiercz (2005) use utility, reliability, and predictiveness, and Söellner, Hoffman, Hoffman, Wacker, and Leimester (2012) use performance, process, and purpose to represent technology-trusting beliefs.

We adopt McKnight et al.'s (2011) conceptualization of system-like trust in a technology's reliability, functionality, and helpfulness to measure trust in technology because these three attributes were directly derived from, and are corollaries to, the human-like trust attributes of integrity, competence, and benevolence (Table 1). While conceptually congruent with the human-like trusting beliefs, these system-like trusting beliefs are less likely to violate humans' understanding of a technology's capabilities. Reliability is conceptually similar to integrity and is the belief that the technology will consistently operate properly (McKnight et al., 2011) (Table 1). Functionality is conceptually similar to competence and means the belief that the technology will have the capability, functions, or features to do what one needs to be done (McKnight et al., 2011) (Table 1). Finally, helpfulness is the conceptual corollary to benevolence and means the belief that the technology will provide adequate and responsive help (McKnight et al., 2011) (Table 1). Trust researchers have found that system-like beliefs fit into the trust nomological network and influence other behavioral beliefs and the intention to explore and use technologies such as human resource information systems (Lippert & Swiercz, 2005), knowledge management systems (Thatcher et al., 2011), supply chain management systems (Lippert, 2007), and spreadsheet software (McKnight et al., 2011).

However, the literature is not clear whether contexts exist in which using one set of trust constructs is more or less appropriate than using the other. It could be that each type's influence on outcome variables depends on users' perceptions of a technology's human-like characteristics. If these perceptions matter to trust, the choice of whether to use a human-like or a system-like trust concept (and its measures) may make a crucial empirical difference. For example, if one chooses to use human-like trust measures when the technology is not human-like, the respondents may be confused and not know how to answer. The opposite may also be true. If one uses system-like trust measures when the technology is very human-like, respondents may not be able to relate to those measures well. In both cases, using the wrong type of trust measures for the technology may result in lower path coefficients between the trust variables and outcomes than would otherwise occur.

We operationalize a technology's humanness along a continuum between system-like and human-like. That is, a technology's humanness is the extent to which individuals perceive it to be more human-like or person-like than system-like, technology-like, or tool-like. Social cognitive theories argue that people categorize objects in their environment and differentiate them as humans, animals, or objects (Kunda, 1999; Nowak & Rauh, 2005). For example, the old "twenty questions" game often starts with the question "Animal, vegetable, or mineral?". It has historically been rather easy to categorize a technology as an object (i.e., not human). However, IT systems can display certain human characteristics that make them seem quite human-like. For example, robots that can interact with people and online interactive avatars (e.g., Breazeal, 2004; Cassell & Bickmore, 2000) are technologies some would say are more human-like than system-like. Since people may not fully agree on how human-like a technology is, the humanness construct is subjective and based on individual perceptions.

2.3. Social Presence and Social Response Theories

Several theories, such as social presence theory, help explain what makes a technology seem more human-like. Social presence is "the degree of salience of the other person in a mediated communication and the consequent salience of their interpersonal interactions" (Short, Williams, & Christie, 1976, p. 65). Social presence theory posits that the attributes of a technology influence whether it is perceived as being more sociable, warm, and personal than other technologies based on the extent to which it allows a user to experience other individuals as being psychologically present. Researchers have used social presence in two distinct ways: to refer to a property of a medium in mediated communications and to refer to participants' perceptions, behavior, or attitudes in mediated interactions (Gunawardena, 1995; Rettie, 2003). Rettie (2003) explains that social presence may be a property of the medium and is also related to a property of perception or interaction because the characteristic is derived from the effect of the medium on the participants' perceptions and on their interpersonal interactions.

Since its development, researchers have largely used social presence theory to study computer-mediated communication and online learning (Lowenthal, 2010). This research has focused on both how people connect to other people through technology and how people interact with the technology itself (Qiu & Benbasat, 2009). Researchers have also used social presence theory to investigate online marketing and e-commerce websites (Gefen & Straub, 2003; Kumar & Benbasat, 2006). Much of this research has examined the ways in which one can enhance social presence. For example, IS researchers have found that one can increase individual perceptions of social presence with socially rich text content and personalized greetings (Gefen & Straub, 2003), emotive text and human images (Hassanein & Head, 2007; Cyr, Head, & Pan, 2009), live chat and online reviews (Cyr, Hassanein, Head, & Ivanov, 2007), interactivity and voice (Wang, Baker, Wagner, & Wakefield, 2007), humanoid embodiment and human voice-based communication (Qiu & Benbasat, 2009), and consumer reviews and product recommendations (Kumar & Benbasat, 2006).

Social presence influences several important technology acceptance variables such as enjoyment and flow (Hassanein & Head, 2007; Qiu & Benbasat, 2009; Wang et al., 2007), usefulness (Cyr et al., 2007; Hassanein & Head, 2007), and loyalty (Cyr et al., 2007). Most important to trust research is the finding that social presence can increase technology trust (Cyr et al., 2007; Cyr et al., 2009; Gefen & Straub, 2003; Qiu & Benbasat, 2009). Social presence can increase trust because it reduces perceived ambiguity and risk, which results in more positive attitudes including perceptions that the technology is more trustworthy (Kumar & Benbasat, 2006). Further, social presence can build trust because it provides trust-building cues such as body language and other physical cues (Gefen & Straub, 2003). It is easier to hide untrustworthy behavior in contexts in which social presence is low (Hassanein & Head, 2007).

Social presence is closely related to social response theory in that people may respond to a technology with higher social presence as though it were human (Gefen & Straub, 2003). Social response theory emerged from the "computers are social actors" paradigm (Nass et al., 1994). It posits that people respond to technologies that possess human-like attributes or social cues much the same way they respond to humans even though they know they are interacting with a technology (Moon, 2000; Reeves & Nass, 1996). People use simplistic social scripts when responding to computers with human-like traits and/or behaviors. Whenever computer technology exhibits human-like behaviors, such as language production, taking turns in conversation, and reciprocal responding, the user is more likely to personify the technology (Moon, 2000; Nass, Moon, Fogg, Reeves, & Dryer, 1995). For example, people may make kind comments about a computer that demonstrates courtesy (Wang et al., 2007). Other studies examining websites and avatars have demonstrated that politeness norms (Nass, Moon, & Carney, 1999), gender stereotypes (Nass, Moon, & Green, 1997), personality response (Nass et al., 1995), and flattery effects (Fogg & Nass, 1997) are similar whether interacting with another human or a computer interface.

2.4. Affordance Theory

One can also examine a technology's human-like nature from an ecological perspective. This perspective holds that people perceive the environment directly in terms of its affordances, which means its potentials for action, without significant intermediate stages involving memory or inferences such as in the case of social cognitive theory (Gaver, 1991). Researchers have used the notion of affordances to develop a better understanding of different technologies, including those that are socially oriented (Conole & Dyke, 2004). Affordances are relational in the sense that they focus on the interactions between objects and the people who will use them (Gaver, 1991). Since trust in technology is also relational, it is likely that affordances can provide cues about a technology's human-like nature that could affect the type of trust one has in a system.

Object affordances relate to an entity or object's attributes that enable action by an observer (Gibson, 1977). An affordance is not simply an attribute or property of the object. It is a potential act or behavior permitted by the object because of its attributes (Michaels & Carello, 1981). In short, affordances are opportunities for action (Markus & Silver, 2008). For example, a computer affords usability by providing onscreen buttons and scroll bars (Gaver, 1991). Researchers have depicted how observers evaluate affordances (Norman, 1990; Hartson, 2003). An observer first perceives an object's physical component, which means that the object's properties must be visible and/or detectable (Gibson, 1977; Hartson, 2003). Like other perceptions, the observer interprets or understands an affordance associated with the physical characteristics of the object based on prior experience and learning, their own characteristics, and goal(s) for action. Given that an affordance is perceived and understood, it becomes an opportunity for action if it provides the observer a way to reach their goal (Gibson, 1977; Stoffregen, 2003). In this way, affordances are emergent properties of the observer-entity system (Stoffregen, 2003).

The nature of affordances can differ greatly depending on whether the object is human or non-human. Gibson (1977) distinguishes the source of affordances when comparing non-human objects to human (or animal) objects. While all affordances are based on an observer's perceptions, in human-to-inanimate object relationships, affordances are based on a one-way relationship in which the observer simply perceives the object's properties (Gibson, 1977). For example, someone might perceive a ball as affording "graspability" because of its shape and size. Humans perceive non-human objects as fit for a particular use and may use that object as a "tool" to achieve a goal. These affordances are relatively static and consistent across uses.

Gibson (1977) contrasts these object affordances with the dynamic and rich social affordances of human (and animal) objects such as the ability to give and receive affection and love or the ability to engage in conversation and debate. Social affordances are the possibilities for action that people offer one another (Gaver, 1996). Because there is a two-way interaction in these relationships, social affordances are based on both the entities' properties and interactive behaviors. These affordances change over time as the entities' properties change (Gibson, 1977) and a shared understanding emerges (Hutchby, 2001). For example, an infant learns about human affordances because "When touched [humans] touch back, when struck, they strike back; in short they interact with the observer and with one another. Behavior affords behavior…" (Gibson, 1977, p. 76). Because humans are animate and social, their affordances are dynamic and interactive (Gibson, 1977). Technologies can provide social affordances in the way they appear and act human-like. For example, computerized conversational agents present social affordances by interpreting and responding to human voices (Breazeal, 2004).

Affordances for sociality, on the other hand, are action potentials the environment offers that support and enable interactions with other people (Gaver, 1996). A technology's material features can influence its affordances for sociality (Gaver 1996; Treem & Leonardi, 2012). One example of a technology's (e.g., online social media) affordance for sociality is visibility, which affords users the ability to make their behaviors, knowledge, preferences, and communication network connections that were once very hard to see visible to others through status updates and personal profiles (Treem & Leonardi, 2012). Another example is metavoicing, which affords users the ability to engage in the ongoing online knowledge conversation by reacting online to others' presence, profiles, content, and activities by retweeting or voting on a posting (Majchrzak, Faraj, Kane, & Azad, 2013). These examples are affordances for sociality because the technology feature enables social interaction between people. Affordances for sociality can affect socialization, knowledge sharing, and power processes in organizations (Majchrzak et al., 2013; Treem & Leonardi, 2012).

In summary, social presence is a technology's ability to transmit social cues and increase one's awareness of others, social affordances are action potentials a technology offers a person through its social nature, and affordances for sociality are action potentials a technology offers that support and enable one to interact with other people. While different, these concepts are related. Social affordances are related to social presence: for example, Cyr et al. (2009) found that a website with human images and facial features that can display human emotion (a social affordance) resulted in higher social presence over a website with just text. Further, features that provide affordances for sociality can also influence social presence. In Cyr et al. (2007), interactive elements such as synchronous chat and asynchronous reviews that provide affordances for sociality evoked higher perceived social presence. Kreijns (2004) confirms this finding by explaining how affordances for sociality affect social presence through their ability to contribute to sociality.

We performed two studies to test hypotheses related to these concepts and their underlying theories. In study 1, we examined whether users perceive differences in humanness between technologies differing in social presence, social affordances, and affordances for sociality. We then analyzed whether these differences in humanness result in differences in how trusting beliefs influenced important outcome variables. In study 2, we examined certain humanness factors that support the theoretical assumptions made in study 1 about social presence, social affordances, and affordances for sociality. We measured humanness in study 1 at a general level, but IS researchers have long studied specific aspects related to humanness, such as social presence, interpersonal communication, dynamism, responsiveness, and animation. In study 2, we examined whether these specific constructs distinguish humanness.

3. Study 1: Research Model and Hypothesis Development

In this section, we first predict that users will perceive that technologies can differ in humanness (H1). Subsequently, we analyze the influence of human-like and system-like trust on outcomes in two ways. First, If a particular technology is more human-like, human-like trust in that technology will have a stronger influence on outcomes than will system-like trust in that technology (H2). Likewise, if a particular technology is more system-like, system-like trust in that technology will have a stronger influence on outcomes than will human-like trust in that technology (H3). Second, between two technologies that differ in humaness, human-like trust will have a stronger influence on outcomes for the more human-like technology than for the more system-like technology (H4). Likewise, system-like trust will have a stronger influence on outcomes for the more system-like technology than for the more human-like technology (H5). As such, H2 and H3 are as within-technology views of the how the trusting beliefs will influence outcomes, and H4 and H5 are between-technology views. Figure 1 depicts these hypotheses.

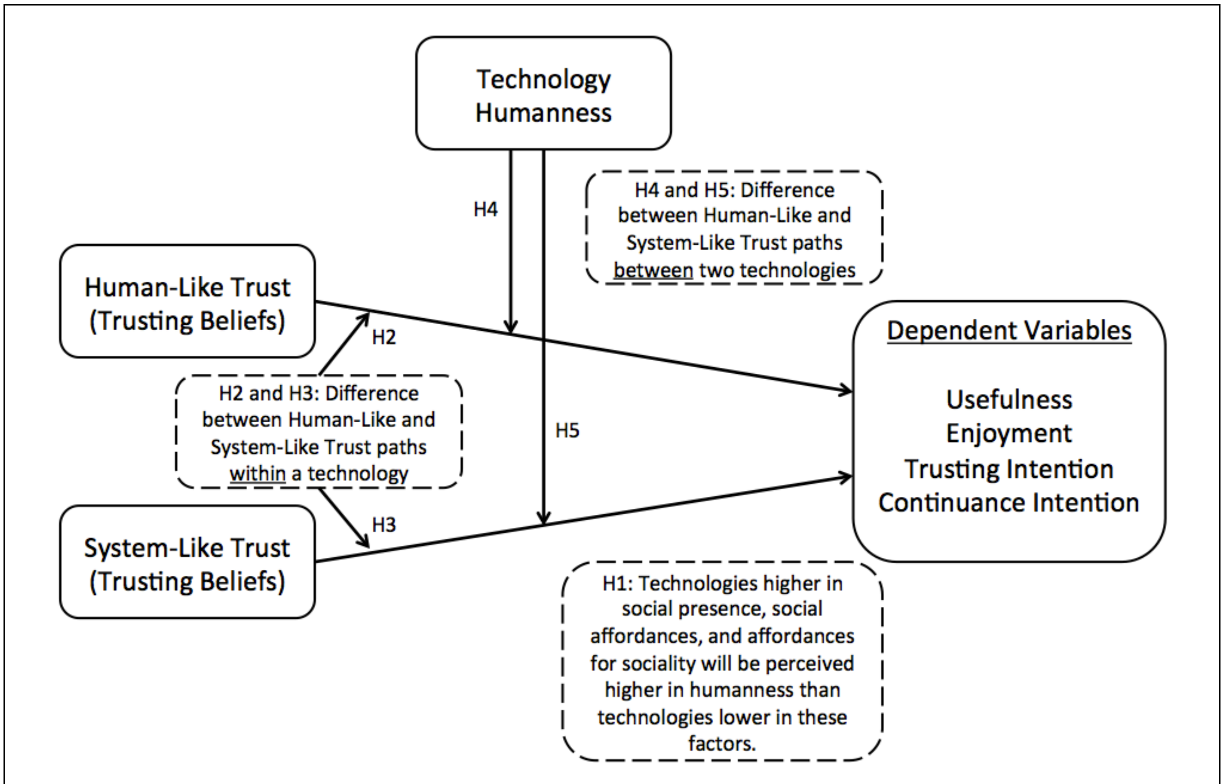

Figure 1. Conceptual Model

3.1. Technology Humanness (H1)

We first predict that users will perceive that technologies differ in humanness. We offer reasons for this based on social presence, social affordances, and affordances for sociality. Previous research has categorized technologies by social presence and affordance levels (Rice, Hughes, & Love, 1989; Treem & Leonardi 2012). We extend this work by reasoning that differences in social presence and affordances will result in differences in perceived humanness.

Social presence may result in higher perceived humanness because users will respond to technologies with higher social presence as if they are surrogates for humans (Gefen & Straub, 2003), which can occur because higher social presence can result in users not noticing either the mediated (e.g., broadcasted people on TV) or the artificial (e.g., animated characters) nature of objects that they experience (Lee, Peng, & Jin, 2006). Lee et al. (2006) explain that designing robots with high levels of social presence can lead to truly social experiences where social robots are experienced as if they were real social actors. Other studies support social presence as an indicator of humanness because they show that feelings of social presence play a crucial role in shaping technology users' social responses to computers (Lee & Nass, 2004).

It is also possible that technologies possessing more social affordances may be perceived as more human-like than technologies possessing more object affordances. For example, Siri is a technology built to offer social affordances because it attempts to mimic a human in the way it interacts with the user and offers advice[1]. Users may feel they can be social with a technology such as Siri and perceive it as more human than Excel, a technology that has few, if any, social affordances. Excel was not built to mimic a human and afford two-way interaction; instead, it possesses more object-like or technological affordances such as usability through its user interface (Gaver, 1991).

Humans may also perceive differences in humanness based on a technology's affordances for sociality. While affordances for sociality may not affect perceived humanness as much as social affordances (i.e., computers talking, looking like a human), users may still feel technologies with affordances for sociality are more human-like than technologies without them. Technologies with affordances for sociality allow two-way, social interactions with others. For example, users may perceive a social media technology such as Facebook as being more human-like because it offers ways to communicate with other people through its personal profile and status update features[2]. Individuals may perceive technologies with few or no affordances for sociality as being less human-like and more system-like.

In summary, social presence, social affordances, and affordances for sociality are all reasons why humans may perceive differences in perceived humanness. As such, we hypothesize:

> **H1:** Individuals will perceive *technologies higher in social presence, social affordances, and affordances for sociality higher in humanness than technologies lower in these factors*.

Subsequently, we examine hypotheses about matches between the technology's human-like nature and the type of trust, and how this affects the relationship between trust and outcome variables.

3.2. Humanness and Trusting Belief Effects (H2-H5)

The next hypotheses deal with the influence of trusting beliefs on outcomes based on perceived humanness. To ensure our results are not a function of using a single dependent variable, we hypothesize that trusting beliefs will influence perceived usefulness (perceived value of using an IT), enjoyment (perceived fun or enjoyment from using an IT), trusting intention (willingness to depend on an IT), and continuance intention (behavioral intent to continue using an IT over a longer-term usage period). We chose these constructs to focus on how trusting beliefs (a specific object-oriented belief) differentially affect the components of post-adoption IT use, including specific object-oriented attitudes, general behavioral beliefs, and continuance intention (Wixom & Todd, 2005).

Trusting beliefs represent object-oriented beliefs (Wixom & Todd, 2005) because they describe beliefs about a technology's attributes (Thatcher et al., 2011). Trusting intention is an object-oriented attitude because it reflects an evaluative response to these technology attributes (Benamati, Fuller, Serva, & Baroudi, 2010). Trusting beliefs should influence trusting intention because individuals with high trusting beliefs will perceive that the trustee (i.e., the target technology) has desirable characteristics to enable them to depend on it in the future (McKnight et al., 2002). Other researchers have found a relationship between both human-like (Benamati et al., 2010) and system-like (Lankton, McKnight, & Thatcher, 2014) trusting beliefs and trusting intention.

[1] One of our helpful reviewers provided this example.
[2] Again, we thank the reviewers for this helpful explanation and example.

Usefulness and enjoyment represent general behavioral beliefs because they relate to whether using the technology (the behavior) is useful and enjoyable. While trust may influence other behavioral beliefs, usefulness and enjoyment represent both extrinsic and intrinsic motivations for using technology. Trusting beliefs should influence usefulness because trustworthy systems can enhance performance and productivity and help users successfully accomplish their tasks (Gefen et al., 2003). Empirical evidence supports that both human-like and system-like trusting beliefs influence usefulness (Gefen et al., 2003; Thatcher et al., 2011). Trusting beliefs should also influence enjoyment because the more individuals perceive that a technology has desirable attributes that reduce feelings of risk and uncertainty, the more they will feel comfortable (and, thus, enjoy) using it. Research has found that human-like trusting beliefs significantly influence enjoyment in online payment systems (Rouibah, 2012). While we could find no research that has examined system-like trust's influence on enjoyment, we expect this relationship to exist because enjoyment influences the use of word processing software that may be perceived as more system-like (Davis, Bagozzi, & Warshaw, 1992).

Finally, we include continuance intention as a dependent variable (Wixom & Todd, 2005). While the other factors we discuss above may mediate the relationship between trusting beliefs and continuance intention, trusting beliefs can also have a direct influence on continuance intention. Interacting with a trustee requires the user to deal with complexities and uncertainties (Gefen et al., 2003). Trust is a psychological step that can help the user rule out the possibility of undesirable technology performance and increase the user's intention to use the system (Gefen et al., 2003). Researchers have found that human-like trusting beliefs (Gefen et al., 2003) and system-like trusting beliefs (McKnight et al., 2011) influence continuance intention.

For H2 and H3, we propose that the degree to which one perceives an IT as either more human-like or more system-like influences the development of one's trusting beliefs in that technology (Figure 1). If individuals perceive the technology as more human-like, they will have more highly developed human-like trusting beliefs in the technology than system-like trusting beliefs. This perceptual matching of the type of trusting beliefs to an IT's human-like nature is supported by social response research that has found that users assign human attitudes, intentions, and behaviors to computers that are perceived as more human-like (Nass et al., 1995). This finding suggests that humans will assign human-like trusting beliefs to technologies that are more human-like. Further, Katagiri, Nass, and Takeuchi (2001) found that, when people respond to computers, they unconsciously and automatically search for similarities between human and technological characteristics to guide their behaviors. Only if the computer characteristics simulate what users understand as human characteristics will they respond with human-like behaviors (e.g., reciprocity in their study). If the computer characteristic is not similar to a human characteristic, then the user may not respond as if the technology was human, which suggests that, if a technology is human-like, individuals will form more well-developed human-like trusting beliefs.

In the social presence literature, Cyr et al. (2009) found through interviews that subjects in a high social presence condition (human images with facial features) were more apt to make positive comments about its emotion-inciting qualities such as friendliness and to make negative comments about its functionality. These findings suggest that users feel more comfortable attributing trust qualities that are more human-like and emotion-based such as integrity and benevolence to technologies that are more human-like than they are to attributing system-like trust qualities such as functionality.

Trust theory supports this conclusion as well. McKnight, Cummings, and Chervany (1998) discuss how individuals use categories to form trusting beliefs. For example, a salesperson group may be considered less trustworthy than a teacher. It is possible that, when forming trusting beliefs, individuals will first categorize the technology as being more human-like or system-like, which will help them form the matching type of trusting beliefs.

Trust research further discusses how cognitive consistency is important in trust relationships. Individuals will feel more comfortable maintaining consistency between trusting beliefs and the perceptions that form them (McKnight et al., 1998). The theory of cognitive dissonance (Festinger,

1957) is based on the idea that people seek consistency in their beliefs and attitudes in any situation in which two cognitions are inconsistent. Having inconsistent beliefs is unpleasant and uncomfortable. Overall, the consistency between humanness perceptions and trusting beliefs should affect the trusting beliefs' ability to influence dependent variables because consistent beliefs will be more fully developed than will inconsistent beliefs. Because most information technologies are not exclusively system-like or human-like, we do not assume that the development of trusting beliefs is dichotomous. Instead, we believe that both sets of trusting beliefs will be present in most cases. However, we believe that the trusting beliefs that more closely match the properties of a specific technology will be better developed than those that are less congruent.

For example, beliefs about the benevolence of a virtual reality software system that is perceived as highly human-like because of its interactivity and animation will probably be better developed and, thus, more influential than beliefs about its helpfulness. That is, because the virtual reality software has characteristics that users perceive as human-like, users will attribute human characteristics such as benevolence to it. Therefore, these human-like trusting beliefs will have a stronger influence on outcome variables than will the system-like trusting beliefs. These beliefs will resonate with users as they contemplate interacting in quasi-human ways with the system. As such, we hypothesize:

> **H2:** *For a technology that is perceived to have higher humanness, human-like trusting beliefs will have a stronger influence than will system-like trusting beliefs on: a) perceived usefulness, b) enjoyment, c) trusting intention, and d) continuance intention.*

H2 addresses whether or not, for a higher humanness technology, the human-like trusting beliefs will more strongly influence the dependent variables than will the system-like beliefs, which is a within-technology view (see H2 and H3 in Figure 1).

H3 addresses a lower humanness technology from a within-technology view. Individuals using a system-like technology with low social presence and few social affordances and few affordances for sociability will be more likely to have better developed system-like trusting beliefs (reliability, functionality, and helpfulness beliefs) than human-like trusting beliefs (integrity, competence, and benevolence beliefs). For example, because a technology such as Microsoft Excel exhibits little if any interpersonal communication, users will be more likely to think about Excel as a tool that has reliability, which is a more system-like characteristic that reflects a system consistently operating properly, than as a person with integrity, which is a more human characteristic that reflects keeping commitments. It may even seem unnatural to think of Excel's integrity. This rationale is consistent with Cyr et al. (2009) who found that when subjects viewed the low social presence website with no images, they were more apt to make positive functional comments about its structure, whereas they made negative comments about its affectivity. Affectivity could encompass a more emotion-laden attribute such as integrity.

In addition, two of the human-like trusting beliefs—integrity and benevolence—have moral overtones that make them difficult to attribute to a system-like technology. For example, it is hard to think about Excel as having the moral agency required to display integrity, a concept that implies moral reasoning. It may also be difficult to think about Excel as having benevolence because it would imply that Excel cares about the user (see Table 1). For this reason, we propose that the reliability and helpfulness trusting beliefs will be better developed and have a stronger influence than will the integrity and benevolence trusting beliefs. Friedman et al. (2000) specifically addresses this issue. They say that attributing morality to technologies that do not have morality may be confusing for users because it conflates the moral and non-moral sources of trust problems and diverts important resources from discovering remedies. Because of this issue, these system-like trusting beliefs will be more fully developed and will have a stronger influence on the use-related dependent variables. As such, we hypothesize:

> **H3:** *For a technology that is perceived to have lower humanness, system-like trusting beliefs will have a stronger influence than human-like trusting beliefs on: a) perceived usefulness, b) enjoyment, c) trusting intention, and d) continuance intention.*

Whereas H2 and H3 provide within-technology views of the influence of the human-like and system-like trusting beliefs, H4 and H5 provide between-technology views (see H4 and H5 in Figure 1). It is likely, for example, that an individual’s integrity beliefs about a more human-like technology will have a stronger influence on continuance intention than will the individual’s integrity beliefs about a more system-like technology because users will not only try to maintain cognitive consistency about a single technology but also try to maintain their feelings of consistency between technologies.

The social presence literature supports the idea that individuals can distinguish among different technologies in terms of their social presence. It shows fairly consistent social presence rankings such that face-to-face communication has the highest social presence, with video, telephone, and memos having lower social presence in that order (Rice et al., 1989). More recent studies show, for example, that instant messaging falls in between email and telephone in terms of social presence (Kuyath & Winter, 2006). Affordance researchers have also compared and contrasted affordances for sociality among different technologies. For example, Treem and Leonardi (2012) analyze how affordances for sociality differ among social media and other technologies such as email and databases. They propose that these differences may have differing effects on organizational processes.

This literature suggests that differences between the humanness of technologies may moderate how strongly human-like trusting beliefs or system-like trusting beliefs influence outcomes. In Cyr et al. (2009), individuals were more likely to make positive human-like comments about the more human-like interface than about the less human-like interface. This comfortableness in associating more human, trust-like traits with the more human interface could mean the human-like trusting beliefs are better developed. This, in turn, can lead to human-like trusting beliefs having a stronger impact on outcomes for the higher-human technology. For example, because of consistency in associating human-like traits to a more human-like virtual reality technology than to Excel, human-like trust should have a stronger influence on continuance intention for a virtual reality technology than for Excel. As such, we hypothesize:

> **H4:** *Human-like trusting beliefs will have a stronger influence on: a) perceived usefulness, b) enjoyment, c) trusting intention, and d) continuance intention for a technology that is perceived to be higher in humanness than for a technology that is perceived to be lower in humanness.*

Likewise, system-like trusting beliefs should have a stronger influence on continuance intention and other dependent variables for a more system-like technology than a more human-like technology. Because users will believe a technology such as a spreadsheet is less human-like and more system-like, they will be able to attribute system-like trusting beliefs to it more easily. The subjects in Cyr et al. (2009) had more positive system-like comments about the more system-like interface. Therefore, system-like trust will have a stronger influence on a technology perceived to be less human-like and more system-like. As such, we hypothesize:

> **H5:** *System-like trusting beliefs will have a stronger influence on: a) perceived usefulness, b) enjoyment, c) trusting intention, and d) continuance intention for a technology that is perceived to be lower in humanness than for a technology that is perceived to be higher in humanness.*

Together, Hypotheses 2-5 provide both within-technology tests and between-technology tests of how humanness affects the influence of trusting beliefs on outcomes. If these hypotheses are supported, then the technology’s humanness matters in developing trusting beliefs. Trusting beliefs that are better formed because they match the technology’s human/system orientation should have a greater influence on outcomes. If a mismatch occurs, the constructs will have less influence.

4. Study 1: Research Method and Data Analysis

We used a survey methodology to test the hypotheses about technology humanness and trusting beliefs. By surveying rather than controlling the social context in an experiment, we could capture differences in the two technologies' humanness and detect relationships among constructs in naturally occurring situations, which is important because we did not seek to detect what features of humanness result in human-like and system-like trust having more or less influence on the outcomes. Rather, we analyzed whether or not, in a naturally occurring environment, perceived humanness differs between two technologies. We also tested whether these differences in humanness result in certain trusting beliefs having more or less influence on the outcome variables.

To test the hypotheses, we asked respondents about two technologies that we predicted would differ significantly in humanness. We predicted that the first technology, Microsoft Access, would be more system-like because: a) it does not readily allow a user to experience others as being psychologically present (lower social presence), b) it has little if any animation and is less responsive (fewer social affordances), and c) it offers few means for interpersonal communication and dynamism (fewer affordances for sociality). Facebook, the second technology, would be more human-like technology because: a) it allows users to experience others as being psychologically present through “likes” and other posts (higher social presence), b) it has high animation in terms of pictures posted and apps and responsiveness (more social affordances), and c) it facilitates interpersonal communication and dynamism of content with friends (more affordances for sociality).

We chose Microsoft Access and Facebook because they have interesting trust implications. For example, Dwyer, Hiltz, and Passerini (2007) found that users have an average trust in social networking sites, and a Pew Internet study (Madden & Smith, 2010) found that 28 percent of online social network users ages 18-29 said they “never” trust social networking websites, which suggests that 72 percent sometimes have some trust in them. Prior research also shows that students have moderate trust in Access and that this trust can influence important outcomes such as satisfaction and trusting intention (Lankton et al., 2014).

Further, we chose these two technologies because they differ, at least for our samples, in their use context. We assume that Facebook is used by our sample mostly for personal reasons. Access is a work-related technology often used in a classroom context. Although we do not necessarily equate personal use technologies with higher humanness versus work-related technologies with lower humanness—for example, online social media can be used in both personal and work settings—it may be that this is the case for our study. This difference can make it interesting to study the type of trust constructs to which respondents might best relate. We discuss how use context can impact future research in Section 7.2.

4.1. Sample and Procedures

We conducted the survey with junior- and senior-level undergraduate business students at a large U.S. university in a required introductory IS course. We used student subjects because they are fairly homogeneous in terms of individual characteristics such as age, education, and experience and they have been used in many e-commerce trust studies that comprise the bulk of IS trust research (e.g., Gefen et al., 2003). In all, 495 out of 511 possible students completed the survey for a 97 percent response rate. Non-responders were those who did not attend class that day. Due to the high response rate, we did not test for non-response bias. To encourage attendance, we gave students 60 course points (6% of 1,000 possible) for completing an unrelated exercise that immediately followed the survey. To encourage participation, we randomly selected one survey participant from each of the thirteen classes to receive a nominal gift (two two-scoop ice cream certificates). Because we administered the study across thirteen classes, we performed mean difference tests on the study variables by class and found no significant mean differences. We also found no significant correlations between class membership and study variables. These findings suggest no systematic differences in variables exist by class.

Respondents had experience with both technologies. For Access, 87 percent had used the software before that semester. Also, the class's coursework included a computer-based tutorial, four 50-minute lab sessions, and an Access assignment that included creating tables and queries. The survey took place several weeks after students had completed their Access exercises and after they had received their evaluation of the Access assignment, so they could reflect back on their experience with it. To ensure users had experience with Facebook, we asked if they had used it and excluded those who had not (45 respondents). We also excluded 15 respondents who did not finish the questionnaire or used patterned responses (e.g., all 7s), which resulted in a final sample size of 435. On average, respondents reported having used Facebook for 3 years, and Access for 1.6 years. Because of this difference, our analyses controlled for experience level. The tasks in which they used the two technologies were natural tasks for them (i.e., using a database for coursework, using Facebook for social networking) rather than contrived tasks to which they could not relate, which increases the validity of the results.

The students conducted the survey online during lab. Subjects first read the human subjects statement and clicked to signify their willingness to participate. Then they responded regarding their gender and age. Next, there were sections with technology-specific survey questions. In each section, respondents answered questions about their experience level with the technology, their trusting beliefs and perceptions about the four dependent variables, and finally their perceptions of each technology's humanness. They were presented with identical survey questions except for the name and uses of the technology. Near the beginning of the questionnaire, we asked students to indicate the name of the social networking website they used the most, and to think about that website anytime they saw "MySNW.com" in the questionnaire. We only used in the analysis respondents who indicated Facebook was their main social networking website. The survey first asked the trusting beliefs and dependent variable questions about a recommendation agent (RA) software, which they used as an educational experience immediately before the survey (we include results involving the RA in the discussion as a boundary test). Next were questions for the trusting beliefs and dependent variable questions about Access and then Facebook. We followed this order primarily to make the questionnaire consistently presented and easy for the subjects to do. We thought the RA educational experience would capture their interest from the start. We also thought that asking about Facebook last would keep respondents' interest to the end of the questionnaire. We did not vary the order of the sections because we did not expect order to bias our hypotheses tests based on the differential nature of the hypotheses. For example, for the same technology, we predict that some constructs will have a stronger influence and some will have lesser influence. Finally, we asked questions about technology humanness at the very end of the questionnaire.

4.2. Measurement Items

We adapted validated scales from prior research (Appendix A): usefulness (Davis, Bagozzi, & Warshaw, 1989), enjoyment (Davis et al., 1992), trusting beliefs, trusting intention, and disposition to trust (McKnight et al., 2011; McKnight et al., 2002), and continuance intention (Venkatesh, Morris, Davis, & Davis, 2003). While Access was required for the class, we believe that it was appropriate to measure Access continuance intention because we measured the items after the required coursework. Thus, the items refer to students' continued future use after the course. Other researchers have followed this same practice (Bhattacherjee & Premkumar, 2004).

We modeled human-like and system-like trust as reflective second-order factors each composed of their respective trusting beliefs: integrity, competence, and benevolence beliefs for human-like trust, and reliability, functionality, and helpfulness beliefs for system-like trust. A second-order factor is a multidimensional construct that accounts for the relationships among the first-order factors (Tanriverdi, 2006). We chose to model human-like and system-like trust as second order factors first because trust theory proposes that trust is a general construct comprising specific dimensions or facets (Gefen et al., 2003; Mayer et al., 2005). Much trust research conceptualizes trust as a general concept composed of specific dimensions (Wang & Benbasat, 2005; Thatcher et al., 2011). Second, trust theorists provide clear conceptual differences between human-like and system-like trust dimensions, which allowed us to develop separate second-order trust constructs made up of these different dimensions (McKnight et al., 2011).

We modeled the first-order trust dimensions as reflective (not formative) of the higher-order trust constructs because trust theory suggests the dimensions of trust will vary together and be reflective of the overall trust construct. Reflective treatment of the dimensions also follows the guidelines in Hardin, Chang, and Fuller (2008). First, reflective first-order factors tend to have high inter-correlations. Trusting beliefs tend to be consistent because of cognitive dissonance theory, which posits that individuals try to resolve conflicting beliefs to reduce dissonance (McKnight et al., 2002). Second as we discuss in Section 2.1, trust is most often treated as a psychological construct (i.e., trusting beliefs). As a psychological construct, trusting beliefs exists apart from any attempt to measure it (Schwab, 1980). Yet knowing what the construct means helps one to measure it properly. Hence, the trusting beliefs construct will influence its components. Third, we used reflective first-order factors because we did not seek to explain variance in trusting beliefs.

At the end of the survey, to make sure we had properly assessed Facebook to be more human-like and Access to be less human-like, we measured humanness or how human-like versus system-like respondents felt each technology was. We developed three new items for the scale. To ensure content validity for the humanness scale, we chose wording for the scale endpoints based on definitions and use of similar terms in prior research. We used the terms "human-like" and "person-like" as endpoints on one side. Human-like means "pertaining to, characteristic of, or having the nature of people" (humanlike, n.d.-a). That is, it means suggesting human characteristics for animals or inanimate things (humanlike, n.d.-b). Studying the anthropomorphism of an online avatar, Nowak and Rauh (2005) asked respondents to rate whether the image looked human/did not look human. Further, the word "person" is related to the word "human" because one can define the former as an individual human being (person, n.d.). Baylor and Ryu (2003) asked respondents to rate how much the online agent in their study seemed like a person as a measure of their person-like construct. We chose the terms "technology-like" and "machine-like" at the other end of the scale. Technology is a common term that we thought would encompass both Access and Facebook. We interchanged this term with the term machine-like because machinery is synonymous with technology. We used age, gender, disposition to trust, and experience with the technology as control variables.

4.3. Measurement Model Analysis

We used XLStat PLSPM 2012 to validate the scales and test hypotheses. We chose XLStat PLSPM because it can handle complex SEM-PLS models with second order factors and can automatically run group analyses, which we used to test differences in the trusting belief path coefficients between technologies. We tested to see if the sample size for our study was adequate. We ran a power test and found that, for a power of 0.80 and a sample size of 435, we should be able to detect an effect size of about 0.15 at $\alpha = .05$. We also assessed the normality of our data. PLS is robust to small or moderate skew or kurtosis (up to skew = 1.1 and kurtosis = 1.6) (Goodhue, Lewis, & Thompson, 2012). However, some researchers show that skewness and kurtosis over 1 can result in lower power (Marcoulides & Chin, 2013). Others say that more extremely skewed data (skew = 1.8 and kurtosis = 3.8) result in lower power (Goodhue et al., 2012). We feel that using PLS was appropriate because most of our items had skewness and kurtosis between +1 and -1, indicating only small non-normality. There were only 15 out of the 60 items with skewness and/or kurtosis greater than 1, with the largest skewness statistic at 1.322 and the largest kurtosis statistic at 1.772.

We separately analyzed the measurement model for each technology. The models demonstrated adequate convergent validity since the PLS loadings ranged from 0.88 to 0.99 (see Tables 2 and 3). Also, the Cronbachs Alphas (CAs), consistency reliabilities (CRs), and average variances extracted (AVEs) for each construct exceeded established standards (AVE-0.50; CR/CA-0.70, per Fornell & Larcker, 1981) (see Tables 4 and 5). The measurement models also had adequate discriminant validity since each square root of the AVE was greater than any correlation in that construct's row or column (Fornell & Larcker, 1981) (see Tables 4 and 5). Also, the PLS cross-loadings were all substantially lower than the loadings (Gefen & Straub, 2005) (see Tables 2 and 3). We also found that multicollinearity was not a major problem because variance inflation factors ranged from 1.04 to 3.58, which are less than the 4.00 (Fisher & Mason, 1981) and 5.00 (Menard, 1995) recommended maximum values. Also, no variable had a condition index above 30 and had two variance decomposition proportions greater than 0.50, which also alleviates multicollinearity concerns (Belsley, Kuh, & Welsch, 1981). Finally, using the Harman's one-factor method, we found common method variance was not a problem in either data set because the first factor explained less than half of the total variance explained by all the factors.

Table 2. PLS Factor Loadings: Facebook

	1	2	3	4	5	6	7	8	9	10	11	12
Integrity 1	**.97**	.43	.65	.56	.49	.45	.39	.37	.41	.30	.25	.16
Integrity 2	**.98**	.38	.65	.53	.45	.43	.37	.32	.37	.26	.25	.13
Integrity 3	**.97**	.41	.67	.54	.48	.46	.41	.34	.39	.28	.26	.17
Competence 1	.40	**.97**	.27	.51	.68	.18	.64	.64	.58	.64	.22	.11
Competence 2	.40	**.97**	.29	.51	.66	.18	.63	.65	.58	.62	.24	.10
Competence 3	.41	**.98**	.28	.53	.68	.20	.64	.66	.59	.63	.25	.12
Benevolence 1	.68	.34	**.93**	.44	.39	.45	.36	.31	.37	.21	.20	.15
Benevolence 2	.63	.26	**.91**	.47	.38	.57	.33	.28	.37	.22	.18	.20
Benevolence 3	.58	.20	**.93**	.38	.26	.44	.29	.22	.32	.15	.16	.12
Reliability 1	.54	.58	.41	**.94**	.69	.45	.49	.52	.52	.46	.26	.12
Reliability 2	.52	.46	.47	**.95**	.64	.48	.37	.38	.47	.35	.26	.13
Reliability 3	.53	.47	.43	**.96**	.64	.47	.41	.39	.49	.35	.26	.14
Functionality 1	.48	.68	.36	.66	**.94**	.41	.57	.60	.57	.54	.28	.15
Functionality 2	.46	.63	.35	.66	**.95**	.42	.57	.55	.54	.50	.29	.16
Functionality 3	.45	.65	.35	.64	**.94**	.41	.54	.56	.55	.53	.29	.12
Helpfulness 1	.44	.19	.50	.48	.42	**.97**	.22	.21	.22	.14	.15	.07
Helpfulness 2	.45	.20	.50	.46	.44	**.97**	.22	.22	.22	.14	.13	.08
Helpfulness 3	.46	.18	.51	.48	.42	**.96**	.21	.17	.19	.13	.15	.12
Usefulness 1	.37	.62	.34	.41	.56	.21	**.96**	.73	.67	.65	.32	.19
Usefulness 2	.41	.64	.34	.44	.57	.22	**.97**	.72	.65	.65	.31	.20
Usefulness 3	.39	.63	.34	.44	.58	.22	**.97**	.72	.66	.64	.32	.19
Enjoyment 1	.34	.68	.28	.45	.59	.21	.73	**.97**	.66	.74	.33	.16
Enjoyment 2	.36	.65	.28	.44	.60	.19	.73	**.97**	.67	.73	.35	.17
Enjoyment 3	.35	.63	.27	.43	.57	.21	.72	**.97**	.65	.71	.32	.13
Trusting intention 1	.41	.62	.37	.51	.57	.22	.70	.68	**.97**	.67	.31	.18
Trusting intention 2	.38	.57	.36	.51	.56	.22	.64	.63	**.97**	.61	.28	.19
Trusting intention 3	.39	.57	.37	.50	.56	.19	.66	.67	**.98**	.66	.32	.17
Continuance intention 1	.29	.64	.20	.40	.54	.13	.66	.75	.65	**.99**	.29	.15
Continuance intention 2	.28	.64	.21	.40	.55	.14	.67	.75	.66	**.99**	.29	.16
Continuance intention 3	.27	.63	.19	.40	.54	.14	.65	.72	.65	**.98**	.30	.15
Humanness 1	.20	.22	.16	.27	.27	.13	.27	.30	.27	.28	**.92**	.00
Humanness 2	.24	.23	.19	.23	.26	.15	.28	.29	.28	.24	**.93**	.01
Humanness 3	.28	.23	.17	.26	.29	.13	.35	.34	.30	.29	**.91**	.08
Disposition to trust 1	.16	.09	.17	.13	.13	.10	.17	.14	.15	.11	.06	**.92**
Disposition to trust 2	.14	.11	.15	.12	.14	.08	.18	.14	.17	.14	.04	**.94**
Disposition to trust 3	.13	.11	.12	.12	.15	.07	.20	.17	.20	.19	.00	**.88**

Table 3. PLS Factor Loadings: Access												
	1	2	3	4	5	6	7	8	9	10	11	12
Integrity 1	**.97**	.62	.62	.52	.53	.42	.51	.25	.44	.37	.16	.09
Integrity 2	**.98**	.61	.57	.56	.48	.40	.45	.23	.43	.35	.15	.08
Integrity 3	**.97**	.64	.60	.52	.52	.44	.46	.25	.46	.37	.14	.11
Competence 1	.61	**.95**	.55	.66	.67	.46	.63	.28	.55	.50	.17	.09
Competence 2	.63	**.97**	.56	.67	.66	.45	.63	.27	.54	.48	.16	.11
Competence 3	.62	**.96**	.57	.66	.67	.45	.66	.31	.56	.50	.10	.11
Benevolence 1	.61	.61	**.93**	.56	.55	.51	.50	.35	.46	.45	.00	.10
Benevolence 2	.53	.50	**.91**	.54	.48	.62	.44	.42	.47	.44	.06	.07
Benevolence 3	.56	.52	**.94**	.54	.50	.50	.44	.35	.44	.41	.05	.13
Reliability 1	.53	.68	.54	**.93**	.75	.49	.64	.36	.57	.53	.06	.10
Reliability 2	.53	.60	.56	**.94**	.66	.58	.54	.41	.61	.46	.02	.10
Reliability 3	.54	.67	.58	**.96**	.73	.56	.62	.41	.62	.54	.03	.11
Functionality 1	.47	.65	.51	.73	**.95**	.52	.70	.45	.56	.57	.00	.10
Functionality 2	.52	.68	.52	.72	**.97**	.52	.66	.41	.58	.57	.06	.12
Functionality 3	.51	.65	.55	.68	**.95**	.53	.64	.41	.58	.57	.03	.11
Helpfulness 1	.42	.48	.58	.59	.55	**.94**	.33	.47	.54	.49	.06	.05
Helpfulness 2	.43	.46	.56	.55	.52	**.97**	.40	.46	.53	.46	.09	.06
Helpfulness 3	.39	.40	.53	.51	.49	**.95**	.37	.48	.51	.43	.15	.07
Usefulness 1	.47	.65	.48	.62	.68	.42	**.97**	.40	.60	.63	.05	.18
Usefulness 2	.51	.66	.50	.62	.69	.41	**.98**	.41	.61	.63	.06	.17
Usefulness 3	.46	.63	.48	.61	.68	.42	**.98**	.41	.60	.65	.07	.18
Enjoyment 1	.26	.31	.41	.43	.45	.49	.43	**.98**	.59	.60	.21	.09
Enjoyment 2	.27	.33	.41	.43	.46	.51	.43	**.98**	.61	.61	.21	.07
Enjoyment 3	.20	.24	.36	.36	.39	.44	.36	**.96**	.54	.56	.25	.05
Trusting intention 1	.44	..56	.46	.63	.58	.51	.61	.54	**.95**	.66	.01	.16
Trusting intention 2	.42	.52	.47	.57	.54	.53	.55	.57	**.95**	.63	.04	.17
Trusting intention 3	.44	.57	.48	.62	.60	.56	.61	.59	**.97**	.66	.01	.16
Continuance intention 1	.38	.50	.48	.54	.60	.49	.64	.61	.67	**.98**	.05	.12
Continuance intention 2	.37	.50	.46	.53	.59	.49	.63	.61	.67	**.98**	.03	.13
Continuance intention 3	.35	.50	.42	.48	.56	.44	.63	.54	.63	**.96**	.01	.10
Humanness 1	.13	.12	.04	.03	.05	.09	.08	.21	.01	.01	**.91**	.07
Humanness 2	.15	.15	.03	.02	.01	.08	.05	.21	.02	.03	**.92**	.10
Humanness 3	.14	.12	.04	.02	.03	.12	.03	.21	.04	.05	**.90**	.04
Disposition to trust 1	.08	.10	.10	.11	.09	.07	.16	.07	.15	.10	.09	**.92**
Disposition to trust 2	.10	.09	.08	.08	.09	.03	.16	.04	.14	.11	.10	**.94**
Disposition to trust 3	.09	.11	.12	.11	.15	.08	.19	.11	.18	.14	.02	**.88**

We next tested the second-order factors' appropriateness (Tanriverdi, 2006; Wetzels, Odekerken-Schroder, & van Oppen, 2009). First, we found the first-order factors in each second-order construct were significantly intercorrelated ($p<0.01$) and of moderate to high values ranging from 0.29 to 0.75 (see Tables 4 and 5). Second, we found that each first-order factor was significantly related to the second-order construct with loadings ranging from 0.63 to 0.92, all significant at $p<0.001$ (see Figures 2 and 3) (Tanriverdi, 2006; Wetzels et al., 2009). Third, the second-order construct CAs (0.72-0.86), CRs (0.84-0.92), and AVEs (0.62-0.79) were all within the above-suggested guidelines. Fourth, the second-order factor model goodness-of-fit compared well to baseline goodness-of-fit cutoffs (absolute goodness of fit 0.554-0.634, relative goodness of fit -.952-0.955) (Wetzels et al., 2009). Finally, the second-order factors generally influenced the variables of interest (Tanriverdi, 2006). For example, system-like trust significantly influenced all four dependent variables for Access. These tests show that using reflective second-order trusting belief factors was appropriate.

Table 4. Means, Standard Deviations (SD), Cronbach Alphas (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and Correlations: Facebook

	Mean	SD	CA	CR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Integrity	4.69	1.33	.97	.98	.94	**.97**														
2. Competence	6.04	1.43	.97	.98	.95	.42	**.97**													
3. Benevolence	4.44	1.34	.92	.95	.86	.68	.29	**.92**												
4. Reliability	5.00	1.30	.95	.97	.90	.56	.53	.46	**.95**											
5. Functionality	5.57	1.17	.94	.96	.90	.49	.69	.37	.69	**.95**										
6. Helpfulness	4.41	1.41	.97	.98	.94	.46	.19	.52	.49	.44	**.97**									
7. Usefulness	5.39	1.07	.97	.98	.94	.40	.65	.35	.44	.59	.22	**.97**								
8. Enjoyment	5.64	1.11	.97	.98	.94	.36	.67	.28	.45	.60	.21	.75	**.97**							
9. Trusting intention	5.39	1.18	.97	.98	.95	.40	.60	.38	.52	.58	.22	.68	.68	**.97**						
10. Continuance intention	5.87	1.30	.99	.99	.97	.29	.65	.20	.41	.55	.14	.67	.75	.66	**.99**					
11. Humanness	4.71	1.56	.91	.94	.84	.26	.24	.19	.27	.30	.15	.33	.34	.31	.29	**.92**				
12. Age	20.80	1.19	na	na	na	-.03	-.01	-.05	.04	-.02	-.05	.01	-.01	.04	.04	.00	**na**			
13. Gender	na	na	na	na	na	-.02	.03	.02	.00	.02	-.02	-.01	.07	.02	.05	.07	-.09	**na**		
14. Experience	4.46	1.68	na	na	na	.15	.52	.07	.27	.44	.11	.45	.53	.44	.55	.21	-.04	.00	**na**	
15. Disposition to trust	4.94	1.18	.90	.94	.84	.16	.11	.16	.14	.15	.09	.20	.16	.19	.16	.04	-.05	.00	.04	**.91**

Table 5. Means, Standard Deviations (SD), Cronbach Alphas (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and Correlations: Access

	Mean	SD	CA	CR	AVE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Integrity	5.58	1.16	.97	.98	.94	**.97**														
2. Competence	5.83	1.20	.96	.97	.93	.64	**.96**													
3. Benevolence	5.07	1.32	.91	.95	.85	.62	.58	**.92**												
4. Reliability	5.44	1.33	.94	.96	.89	.56	.69	.59	**.95**											
5. Functionality	5.53	1.34	.95	.97	.91	.52	.69	.55	.75	**.95**										
6. Helpfulness	4.81	1.48	.95	.97	.91	.43	.47	.59	.57	.55	**.95**									
7. Usefulness	5.31	1.24	.97	.98	.95	.49	.66	.50	.63	.70	.42	**.98**								
8. Enjoyment	3.62	1.55	.97	.98	.94	.25	.30	.40	.42	.44	.50	.42	**.97**							
9. Trusting intention	4.68	1.44	.96	.97	.92	.45	.57	.49	.63	.60	.56	.62	.60	**.96**						
10. Continuance intention	4.76	1.63	.97	.98	.95	.37	.51	.47	.54	.60	.49	.65	.61	.68	**.97**					
11. Humanness	2.15	1.29	.90	.94	.83	-.16	-.15	.04	-.02	-.03	.10	-.06	.23	.01	.03	**.91**				
12. Age	20.80	1.19	na	na	na	.11	.04	.08	.05	.00	.06	.00	-.03	.04	.06	.10	**na**			
13. Gender	na	na	na	na	na	-.05	-.02	-.05	-.03	.00	.03	.02	.04	-.04	.03	.00	-.09	**na**		
14. Experience	3.30	1.54	na	na	na	.20	.18	.16	.15	.17	.20	.16	.16	.24	.26	-.04	-.01	-.06	**na**	
15. Disposition to trust	4.94	1.18	.90	.94	.84	.09	.11	.11	.11	.12	.06	.18	.07	.17	.12	-.08	-.05	.00	.03	**.91**

4.4. Hypothesis Testing

To test H1, we ran a t-test for the difference in humanness means for the two technologies. We found that participants considered Facebook to be significantly more human-like (mean = 4.71) than Access (mean = 2.15; $p<0.001$), which supports H1. We also found humanness for both technologies was significantly different ($p<0.001$) from the scale midpoint of 4.00, which suggests that participants considered Facebook to be significantly more human-like than average and Access significantly more system-like. These results support our operational choice of Facebook as the more human-like technology and Access as the more system-like.

Subsequently, we tested the remaining hypotheses (H2-H5) by analyzing and comparing the results of two structural models—one for Facebook and one for Access. For H2 and H3 (the within-technology hypotheses), we tested path coefficient differences for human-like and system-like trust effects in the same model: the model for the higher humanness technology (Facebook) for H2, and the model for the lower humanness technology (Access) for H3. For H4 and H5 (the between-technology hypotheses), we tested path coefficient differences for human-like (H4) and system-like (H5) trust effects between the higher humanness (Facebook) and the lower humanness (Access) models. In this way, the technologies proxy for the humanness construct in the analysis. We used the group difference tests in XLStat (Keil et al., 2000) to test the differences in path coefficients.

Figures 2 and 3 present the structural model results and Table 6 presents the hypotheses-testing results for H2-5. H2a-d hypothesize that, for a highly human technology, human-like trusting beliefs will have a stronger influence than will system-like trusting beliefs. Testing for significant differences between the human-like versus system-like path coefficients for Facebook (Figure 2), the high-humanness technology, we found that the human-like trust coefficient was significantly stronger than the system-like trust coefficient for usefulness (0.45*** versus 0.11*, p<0.001), enjoyment (0.36*** versus 0.16**, p<0.01), and continuance intention (0.31*** versus 0.11*, p<0.01). The difference between the trusting intention coefficients was not significantly different at p<0.05 (0.36*** versus 0.22***, p=0.054). These results support H2a, b, and d, but not c.

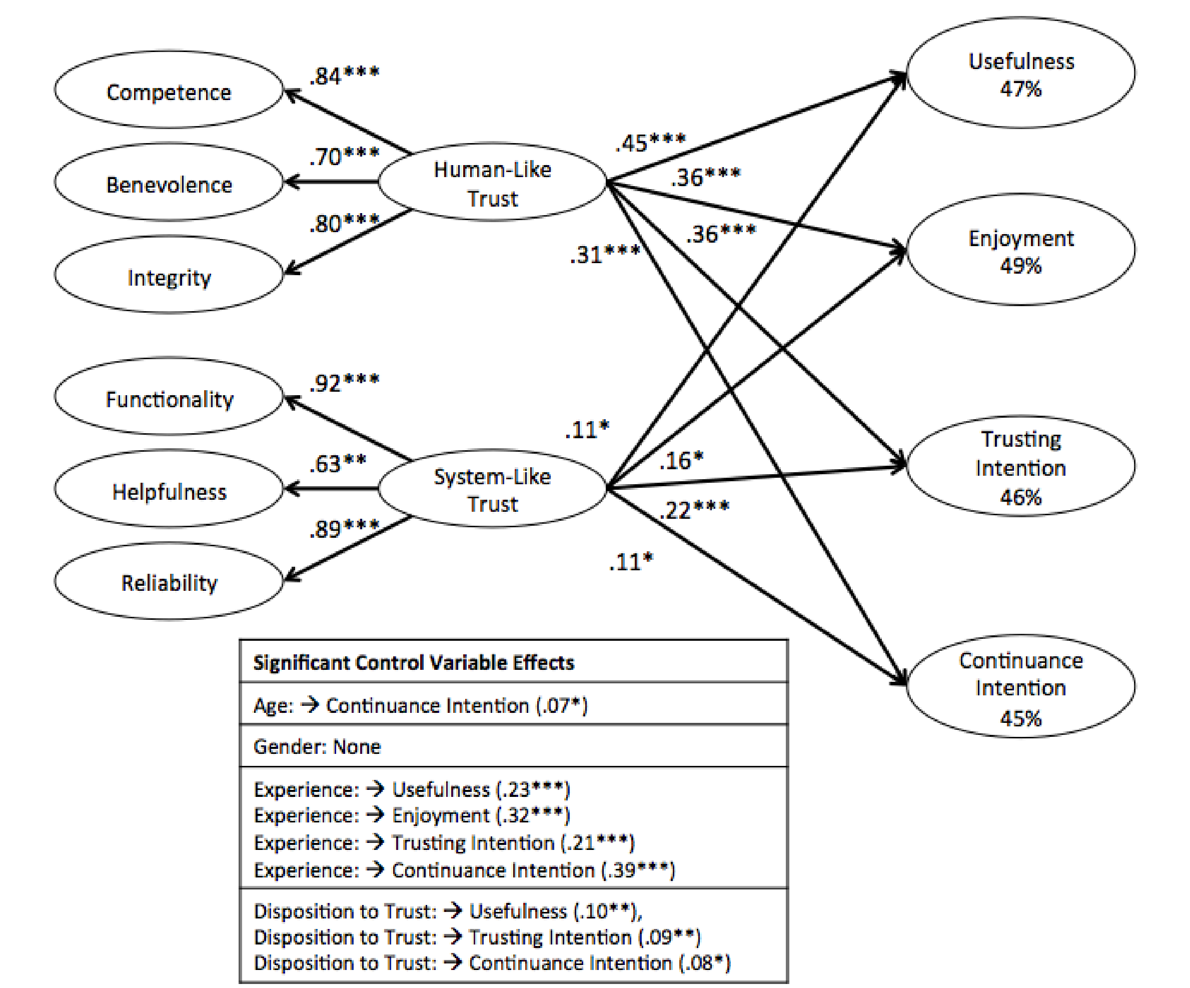

Figure 2. Results: Facebook

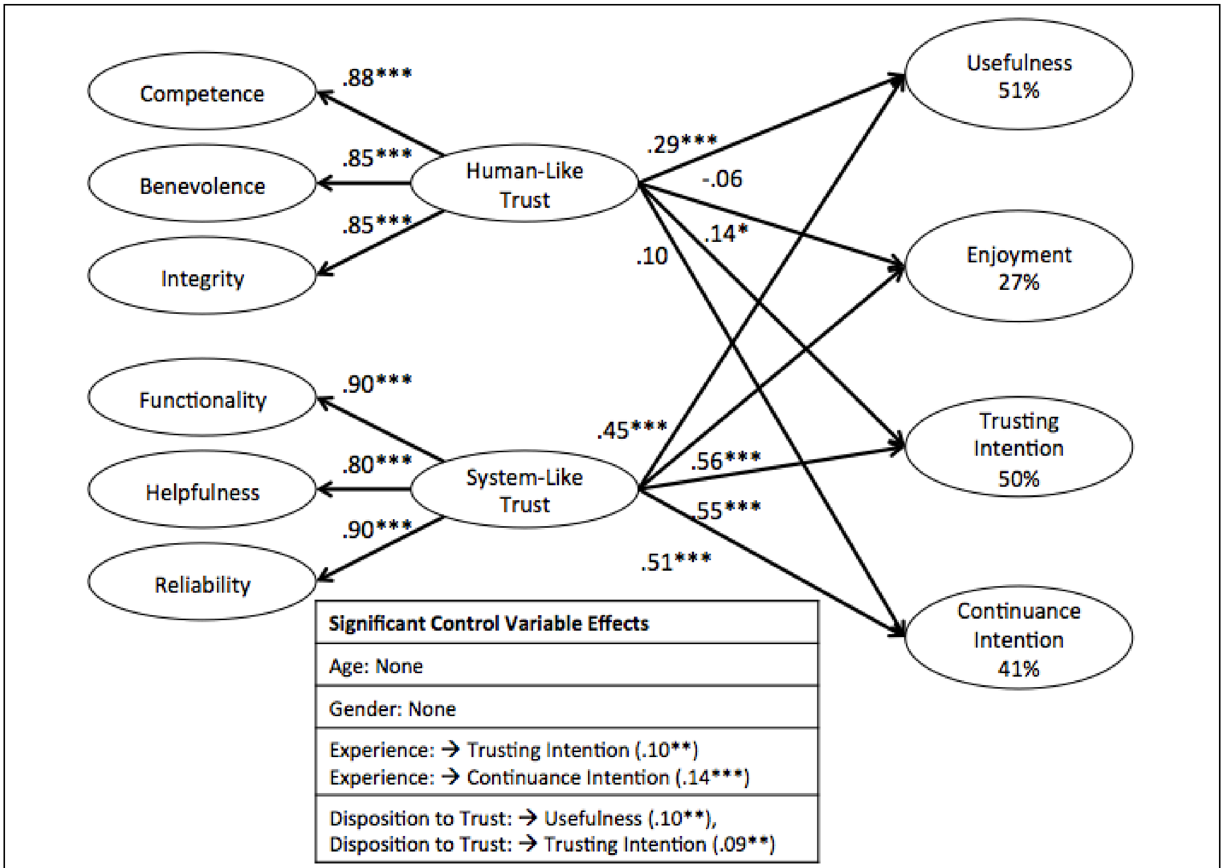

Figure 3. Results: Microsoft Access

H3 predicts a within-technology influence for a low humanness technology. Figure 3 and Table 6 show that the results fully support H3a-d for Access because system-like trust had a significantly stronger influence than human-like trust for usefulness (0.45*** vs. 0.29***, $p<0.05$), enjoyment (0.56*** vs. -0.06ns, $p<0.001$), trusting intention (0.55*** vs. 0.14*, $p<0.001$), and continuance intention (0.51*** vs.0.10ns, $p<0.001$).

For these within-technology hypotheses, we also examined how much the human-like trust construct and the system-like trust construct contributed to the R^2 of each dependent variable. To do this, we compared the R^2 of each dependent variable with and without each of the independent variables included in the model (Carter, Wright, Thatcher, & Klein, 2014; Chin, 1998; Cyr, 2008), where we calculated the effect size of each independent variable (f^2) as: $f^2 = [(R^2 included - R^2 excluded) / 1 - R^2 included]$. Cohen (1988) provides the following criteria for interpreting effect size: (1) for small effect size, $0.02 < f^2 \leq 0.15$; (2) for medium effect size, $0.15 < f^2 \leq 0.35$; and (3) for large effect size, $f^2 > 0.35$. For Facebook, human-like trust had larger effect sizes than system-like trust. The difference in effect sizes was the largest for usefulness where human-like trust had a medium effect size $f^2 = 0.17$, and system-like trust had a very small effect size ($f^2 = 0.01$). Enjoyment, trusting intention, and continuance intention had smaller differences in effect sizes ($f^2 = 0.11$ and 0.01 for enjoyment; $f^2 = 0.10$ and 0.03 for trusting intention; $f^2 = 0.07$ and 0.01 for continuance intention). For all four dependent variables in the Access model, system-like trust had medium effect sizes and human-like trust had small effect sizes ($f^2 = 0.17$ and 0.07 for usefulness; $f^2 = 0.17$ and 0.00 for enjoyment; $f^2 = 0.25$ and 0.01 for willingness to depend; $f^2 = 0.18$ and 0.00 for continuance intention). These results provide additional support for H2 and H3.

Next, we performed the between-technology tests. To test H4, we examined the significance of differences in the human-like trusting belief path coefficients between Facebook and Access. We found support for H4b-d but not H4a. For H4b-d, the human-like trusting belief had a significantly stronger influence on enjoyment (0.36*** vs. -0.06ns, p<0.001), trusting intention (0.36*** vs. 0.14*, p<0.001), and continuance intention (0.31*** vs. 0.10ns, p<0.05) for Facebook than for Access. For H4a, Table 6 shows the path coefficients did not significantly differ between the two technologies for usefulness (0.45*** versus 0.29***, ns).

Table 6. Hypotheses Test Results

	Hypothesis	Sig.	Supported?
Within-technology tests			
H2a	Facebook human-like trust → usefulness (.45***) > Facebook system-like trust → usefulness (.11*)	p < .001	Yes
H2b	Facebook human-like trust → enjoyment (.36***) > Facebook system-like trust → enjoyment (.16**)	p < .01	Yes
H2c	Facebook human-like trust → trusting intention (.36***) > Facebook system-like trust → trusting intention (.22***)	p = .054	No
H2d	Facebook human-like trust → continuance intention (.31***) > Facebook system-like trust → continuance intention (.11*)	p < .01	Yes
H3a	Access system-like trust → usefulness (.45***) > Access human-like trust → usefulness (.29***)	p < .05	Yes
H3b	Access system-like trust → enjoyment (.56***) > Access human-like trust → enjoyment (-.06ns)	p < .001	Yes
H3c	Access system-like trust → trusting intention (.55***) > Access human-like trust → trusting intention (.14*)	p < .001	Yes
H3d	Access system-like trust → continuance intention (.51***) > Access human-like trust → continuance intention (.10ns)	p < .001	Yes
Between-technology tests			
H4a	Facebook human-like trust → usefulness (.45***) > Access human-like trust → usefulness (.29***)	p > .05	No
H4b	Facebook human-like trust → enjoyment (.36***) > Access human-like trust → enjoyment (-.06ns)	p < .001	Yes
H4c	Facebook human-like trust → trusting intention (.36***) > Access human-like trust → trusting intention (.14*)	p < .001	Yes
H4d	Facebook human-like trust →continuance intention (.31***) > Access human-like trust → continuance intention (.10ns)	p < .05	Yes
H5a	Access system-like trust → usefulness (.45***) > Facebook system-like trust → usefulness (.11*)	p < .001	Yes
H5b	Access system-like trust → enjoyment (.56***) > Facebook system-like trust → enjoyment (.16**)	p < .001	Yes
H5c	Access system-like trust → trusting intention (.55***) > Facebook system-like trust → trusting intention (.22***)	p < .001	Yes
H5d	Access system-like trust →continuance intention (.51***) > Facebook system-like trust → continuance intention (.11*)	p < .001	Yes

Next, we tested H5. The H5 results show consistent support for H5a-d. System-like trust had a stronger influence on perceived usefulness (0.45*** vs. 0.11*, p<0.001), enjoyment (0.56*** vs. 0.16**, p<0.001), trusting intention (0.55*** vs. 0.22***, p<0.001), and continuance intention (0.51*** vs. 0.11*, p<0.001) for Access than for Facebook. Overall, the results support 87.5 percent (14 out of 16) of the hypothesized differences.

To examine the nuances of humanness, we included an open-ended question on the survey. After asking the first set of technology humanness questions (how “technology-like” versus “human-like” Facebook and Access are), we asked respondents to: “Please briefly explain why”. We received 224 responses (52% response rate). Eighty-three responses said Facebook enables interpersonal interaction, which could be considered an affordance for sociality (Gaver, 1996). This was by far the most common comment about Facebook's humanness. Interestingly, 32 comments said Access is a program or a technology (not a human), which suggests that Access is much more system-like than human-like. Also, 25 said Access involves no interpersonal interaction, which again suggests that interaction was a key to their judging humanness.

5. Study 1: Summary of Results

In study 1, we proposed and found that (1) users perceive differences in humanness between technologies and (2) the influence of trust in technology type on outcomes depends on the humanness of the technology. We tested the latter by assessing the impact of both human-like and system-like trusting beliefs on usefulness, enjoyment, trusting intention, and continuance intention by using two technologies that users perceived had different levels of humanness. The results support 14 of the 16 hypotheses: in general, the more human-like the technology, the stronger the influence of human-like trusting beliefs, and the more system-like the technology, the stronger the influence of system-like trusting beliefs.

For the more human-like technology (Facebook), human-like trust had a stronger influence on the four outcomes, while system-like trust had a weaker influence except on trusting intention. It appears that human-like and system-like trusting beliefs are both important for one's being willing to depend on a social network site. This finding may be due to the unique characteristics of social media sites on which users depend in terms of the technology that enables them to be social and the quality of the sociality experienced while using the technology. For the less human-like technology, Microsoft Access, almost the reverse was true. System-like trust more strongly influenced the outcomes, whereas human-like trust had a weaker influence. The difference was significant for all four dependent variables. These results show that the humanness of a technology matters in terms of which type of trusting beliefs has a stronger influence on outcomes, and suggest that respondents are more comfortable when technology and trust type match.

When analyzing differences across technologies, the path coefficients for Access were significantly different than those for Facebook for all but human-like trusting beliefs' influence on usefulness. Users matched human-like qualities with usefulness regardless of the technology's humanness. We will need more research to see if this is consistent across other technologies. For example, we may not have found support for this hypothesis because Access was rated a 2.15/7.00 on the humanness scale and Facebook was rated 4.71/7.00. We may have found support if we had used technologies that differed more in perceived humanness.

Regarding users' perceiving differences in humanness, we found that respondents considered Facebook more human-like than Access. One weakness in this study is that we did not confirm that social presence, social affordances, and affordances for sociality correspond to respondents' humanness perceptions. Thus, we cannot fully pinpoint the nature of our general humanness construct vis-a-vis other related concepts. Study 2 addresses this weakness.

6. Study 2

As a follow-up to study 1, in study 2, we investigated whether specific respondent perceptions of a technology's social presence, social affordances, and affordances for sociality coincide with their perceived humanness. While we assumed based on theory that technologies differing in these factors would also differ in humanness, we only measured humanness and not the factors themselves. In this study, we used social presence and four other variables that represent social affordances and affordances for sociality. We chose these four factors because they are dimensions of interactivity, which researchers have described as an action potential (Kreijns, Kirschner, & Jochems, 2002). Further, these factors apply to a range of business and browser-delivered systems.

6.1 Study 2: Hypotheses Development

As we describe in detail in Section 3.1, social presence can distinguish humanness. In that section, we argue that high perceived social presence indicates high perceived humanness because users will respond to technologies with higher social presence as if they are surrogates for humans (Gefen & Straub, 2003). For this reason, we predict that technologies higher in social presence will also be higher in humanness. As such, we hypothesize:

> **H6:** *Mean perceived social presence will be higher for technologies that are perceived higher in humanness.*

The first interactivity dimension, responsiveness, means the extent to which the technology responds to information needs by providing advice, feedback, or help (Ha & James, 1998). We consider responsiveness a social affordance because, by giving help and advice, a technology is affording two-way communication between the technology and the user, which provides action possibilities such as allowing the user to accomplish task-related goals.

We predict that higher responsiveness will relate to humanness. Humans tend to be responsive to each other, which makes responsiveness a human trait. Further, when a technology's communication is designed to be similar to the immediate and two-way responses typical of human interpersonal interactions, consumers should respond to it as if it were a social actor (Wang et al., 2007). Also, because responsiveness implies intelligence, more responsive technologies should be perceived as more human-like (Heeter, 1989). As such, we hypothesize:

> **H7:** *Mean perceived responsiveness will be higher for technologies that are perceived higher in humanness.*

The next interactivity dimension, animation, means the extent to which the technology uses graphics, pictures, and/or graphic movement to present information. Animation is a social affordance because it can provide rich feedback and communication (Johnson, Bruner, & Kumar, 2006), which provides action possibilities to the user such as deciding what to buy on a website or deciding the next step to take in an online learning environment.

We predict that individuals will perceive a technology with animation as having higher humanness because animation is also a human-like trait. That is, people can get animated. Research shows people treat technologies as more human-like if the technologies display human physical characteristics, which can be achieved through graphics. For example, humans reveal more information to, cooperate more with, trust more, and ascribe higher credibility to technologies that have human physical attributes than to those that do not (Cassell & Bickmore, 2000; Sproull, Subramani, Kiesler, Walker, & Waters, 1996). Researchers have also found that users consider technologies with a human-like interface to be more engaging than other interfaces that perform the same functions (Koda & Maes, 1996; Takeuchi & Naito, 1995). As such, we hypothesize:

> **H8:** *Mean perceived animation will be higher for technologies that are perceived higher in humanness.*

The next interactivity dimension, interpersonal communication, means the extent to which the technology facilitates communication among people (Heeter, 1989). Interpersonal communication is an affordance for sociality because it affords an action potential for social interaction and engagement with other people (Conole & Dyke, 2004).

We predict that individuals will assess technologies that afford interpersonal communication with others as higher in humanness than technologies that do not afford interpersonal communication. As we mention earlier, respondents from study 1 commented that they felt Facebook was more human-like because it allowed interpersonal interaction. In fact, one respondent said: "Facebook is very human-like because you are interacting with other people on the site". For Access, one respondent who rated it as less human-like said: “You’re not communicating with people through Microsoft Access”. These answers suggest the respondents viewed the technologies’ humanness based on its ability to enable communication with other people. Technologies that enable interpersonal communication are not only perceived as being more interactive (Heeter, 1989) but are also perceived as relationship enablers (Polkosky, 2008), both of which suggest humanness. As such, we hypothesize:

> **H9:** *Mean perceived interpersonal communication will be higher for technologies that are perceived higher in humanness.*

Lastly, we examine dynamism, which means the extent to which a technology’s informational content changes between uses. In Heeter’s (1989) interactivity dimensions, dynamism relates to the “ease-of-adding-information” dimension, which describes more interactive systems as having user-generated content that others can access. We consider dynamism an affordance for sociality since it reflects how the technology affords users the ability to interact with others by posting and seeing new information and by changing information already provided by another.

We predict that users will perceive technologies with high dynamism as more human-like because dynamism increases interest and enhances interaction and collaboration. As content changes, users will perceive the technology as more human-like because this changing and unpredictable information provides more social opportunities. Similar to interpersonal communication, this dynamism also promotes interpersonal relationships. For example, a profile update by one user can attract the attention of another user and, thus, lead to future interactions. This human connection will make users perceive the technology as more human-like. Dynamism also relates to the contingent nature of interactive systems that can result in unpredictable content or experiences (Burgoon et al., 2000) that are characteristic of human relationships. For example, multiple-player games, blogs, search engines, and other user-generated content applications are high in dynamism because users can generate content that makes each user’s experience unique (Orlikowski, 2007; Rozendaal, Buijzen, & Valkenburg, 2010). Because dynamism affords these interactive and social experiences, we predict that technologies with high dynamism will be perceived as more human-like. In contrast, a technology controlled by a single user, such as a word processing application, would display relatively static and predictable data across user sessions and, thus, be perceived as less dynamic and less human-like. As such, we hypothesize:

> **H10:** *Mean perceived dynamism will be higher for technologies that are perceived higher in humanness.*

6.2. Study 2: Methodology

For study 2, we also used a survey methodology. We followed procedures similar to study 1’s survey by using a group of students in the same class but in a subsequent semester. Except for the humanness items, each respondent answered items relating to only one of the technologies (randomly assigned), which resulted in 110 responses for Access and 119 for Facebook. We used the social presence items from Gefen and Straub (2003) (see Appendix B for measures). We developed measures for the four other factors from theoretical definitions and past research. Then, we conducted a pilot study card sorting technique with all five factors using 32 students to see if the items were cohesive within factor and distinguishable among factors. We made only minor item adjustments after this process.

6.3. Study 2: Data Analysis and Results

We again used XLStat PLS to analyze convergent and discriminant validity of the measures. We found that all PLS loadings were greater than .70 and cross-loadings were less than loadings (see Tables 7 and 8). The CAs were .75 and above, the CRs were .84 and above, and the AVEs were .64 and above (see Tables 9 and 10)—all well above suggested minimums (Fornell & Larcker, 1981). Also, each square root of the AVE was greater than any correlation in that construct’s row or column (Fornell & Larcker, 1981) (see Tables 9 and 10). These tests evidence the constructs’ convergent and discriminant validity. Multicollinearity was also not a problem because all condition indices were less than .30 and there were no two variance proportions greater than .50 (Belsley et al., 1981).

Table 11 lists the means for the variables in total and by technology. Similar to study 1, we found that Facebook had significantly higher humanness than Access (4.76 versus 2.00, p<.001). F-tests support H6, H8, H9, and H10 because Facebook (the higher humanness technology) had higher mean social presence, interpersonal communication, dynamism, and animation, than Access. However, H7 (responsiveness) was not supported

Table 7. PLS Factor Loadings: Facebook

	1	2	3	4	5	6
Dynamism1	**0.89**	0.58	0.44	0.39	0.22	0.47
Dynamism2	**0.92**	0.46	0.43	0.41	0.18	0.46
Dynamism3	**0.93**	0.45	0.38	0.40	0.24	0.42
Interpersonal communication1	0.46	**0.89**	0.47	0.41	0.39	0.63
Interpersonal communication2	0.51	**0.93**	0.52	0.41	0.28	0.59
Interpersonal communication3	0.49	**0.89**	0.51	0.49	0.28	0.54
Animation1	0.40	0.51	**0.87**	0.51	0.21	0.56
Animation2	0.38	0.56	**0.76**	0.43	0.31	0.52
Animation3	0.35	0.31	**0.82**	0.49	0.25	0.55
Responsiveness1	0.44	0.55	0.53	**0.89**	0.32	0.55
Responsiveness2	0.39	0.42	0.55	**0.94**	0.27	0.53
Responsiveness3	0.38	0.37	0.54	**0.93**	0.25	0.50
Humanness1	0.18	0.29	0.26	0.28	**0.90**	0.42
Humanness2	0.20	0.30	0.28	0.25	**0.92**	0.42
Humanness3	0.25	0.37	0.31	0.29	**0.89**	0.47
Social presence1	0.56	0.82	0.58	0.49	0.39	**0.70**
Social presence2	0.41	0.51	0.67	0.53	0.44	**0.94**
Social presence3	0.40	0.53	0.56	0.49	0.43	**0.95**
Social presence4	0.45	0.60	0.57	0.53	0.45	**0.91**

Table 8. PLS Factor Loadings: Access

	1	2	3	4	5	6
Dynamism1	**0.93**	0.62	0.58	0.18	0.33	0.66
Dynamism2	**0.91**	0.46	0.48	0.24	0.30	0.58
Dynamism3	**0.91**	0.56	0.62	0.17	0.43	0.72
Interpersonal communication1	0.55	**0.94**	0.61	0.31	0.32	0.66
Interpersonal communication2	0.46	**0.92**	0.58	0.30	0.28	0.55
Interpersonal communication3	0.64	**0.89**	0.72	0.31	0.39	0.79
Animation1	0.54	0.71	**0.93**	0.48	0.42	0.79
Animation2	0.62	0.66	**0.97**	0.40	0.52	0.86
Animation3	0.57	0.59	**0.95**	0.39	0.51	0.82
Responsiveness1	0.20	0.35	0.39	**0.93**	0.18	0.36
Responsiveness2	0.18	0.28	0.36	**0.94**	0.13	0.33
Responsiveness3	0.22	0.31	0.48	**0.93**	0.22	0.43
Humanness1	0.38	0.33	0.49	0.19	**0.89**	0.54
Humanness2	0.38	0.35	0.50	0.17	**0.94**	0.53
Humanness3	0.32	0.32	0.42	0.18	**0.93**	0.49
Social presence1	0.70	0.73	0.80	0.39	0.53	**0.95**
Social presence2	0.69	0.70	0.84	0.37	0.54	**0.97**
Social presence3	0.69	0.67	0.86	0.36	0.55	**0.96**
Social presence4	0.66	0.68	0.83	0.42	0.53	**0.95**

Table 9. Means, Standard Deviations (SD), Cronbach Alphas (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and Correlations: Access

	Mean	SD	CA	CR	AVE	1	2	3	4	5	6
1. Dynamism	3.69	1.44	.91	0.94	0.84	**0.92**					
2. Interpersonal communication	3.78	1.46	.91	0.94	0.84	0.60	**0.92**				
3. Animation	3.10	1.70	.94	0.96	0.90	0.61	0.69	**0.95**			
4. Responsiveness	4.64	1.35	.93	0.95	0.87	0.21	0.33	0.44	**0.93**		
5. Humanness	2.00	1.26	.91	0.94	0.85	0.39	0.36	0.51	0.19	**0.92**	
6. Social presence	3.09	1.72	.97	0.98	0.92	0.71	0.73	0.87	0.40	0.56	**0.96**

Table 10. Means, Standard Deviations (SD), Cronbach Alphas (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and Correlations: Facebook

	Mean	SD	CA	CR	AVE	1	2	3	4	5	6
1. Dynamism	5.22	1.33	.90	0.94	0.83	**0.91**					
2. Interpersonal communication	5.74	1.21	.88	0.93	0.82	0.54	**0.90**				
3. Animation	4.94	1.26	.75	0.86	0.67	0.45	0.55	**0.82**			
4. Responsiveness	4.67	1.27	.91	0.94	0.85	0.44	0.48	0.58	**0.92**		
5. Humanness	4.76	1.57	.89	0.93	0.81	0.23	0.35	0.31	0.30	**0.90**	
6. Social presence	5.14	1.29	.90	0.93	0.77	0.49	0.65	0.67	0.57	0.48	**0.88**

Table 11. Hypotheses Testing Results

Humanness dimension	Access n = 110	FB n = 119	F-Test (p value)	Supported (Yes/No)
Humanness	2.00	4.76	110.771, p<.001	Yes
H6: Social presence	3.09	5.14	49.201, p<.001	Yes
H7: Responsiveness	4.64	4.67	.569, ns	No
H8: Animation	3.10	4.94	61.099, p<.001	Yes
H9: Interpersonal communication	3.78	5.74	91.321, p<.001	Yes
H10: Dynamism	3.69	5.22	48.114, p<.001	Yes

6.4. Study 2: Summary of Findings

In study 2, we examined whether social presence, social affordances, and affordances for sociality differ by humanness. We found that all three can make a technology seem more/less human-like. For example, we predicted users would perceive Facebook to be more human-like because it provides interpersonal communication and dynamism—two important affordances for sociality. Our results support this prediction. These findings also confirm comments made by users in study 1 about Facebook's ability to enable interpersonal interaction.

We also predicted that users would perceive Facebook to be more human-like because it provides responsiveness and animation—two social affordances. While we found that users perceived Facebook to have significantly more animation than Access, they perceived Facebook to have similar responsiveness as Access, which could be because both Access and Facebook are responsive through a help function. We envisioned that users would also think about Facebook's ability for them to obtain advice and responses through the friend network when answering this question. Access does not have this ability. However, this did not seem to make a difference for our users. Perhaps users' equating the responsiveness of Access with that of Facebook implies that, for the type of technology it is and for what it can do, Access is just as responsive as Facebook.

We note that the Tables 9 and 10 correlations between humanness and the five factors show that some factors were more highly related to humanness than others. Among the five factors, social presence correlated the highest with humanness for both Facebook (0.48) and Access (0.56). Also noteworthy is that for Access, the correlation between humanness and animation was high (0.51), whereas for Facebook it was not (0.31). Further, dynamism correlated somewhat higher with humanness for Access (0.39) than for Facebook (0.23). These interesting differences show that each technology likely has a general humanness that finds its basis in different factors.

7. Overall Implications, Limitations, and Conclusions

Overall, our findings from studies 1 and 2 enhance trust in technology research. Some researchers have contemplated whether individuals can trust technology at all (e.g., Friedman et al., 2000). Others have shown that individuals can trust technology, albeit sometimes differently from humans (McKnight et al., 2011). No research to date has examined whether the influence of these different technology trusting beliefs depends on a technology's humanness. Together, studies 1 and 2 show the importance of understanding a technology's humanness and the need for matching the technology's humanness with the technology trusting beliefs. These findings have implications for future research.

7.1. Understanding a Technology's Humanness

An important contribution of this research is that it is one of the first to study the general humanness concept. We contribute by showing that humanness is a viable construct for distinguishing between two different technologies. While providing some insight, this study also raises questions and opens opportunities for much more research on technology and humanness. We show that a technology's humanness involves more than just its social presence. We show that the two-way interactivity and relational aspect of social affordances and affordances for sociality also distinguish humanness. Because we included only a few social affordances and affordances for sociality in our study, researchers should investigate other factors that might distinguish perceived humanness. For example, we did not examine voice or audio as a social affordance because voice did not apply to our technologies. However, for a technology such as Siri, voice is an important social affordance that could help distinguish its humanness. Further, as we mention earlier, Treem and Leonardi (2012) discuss other affordances for sociality such as visibility and metavoicing. Investigating additional social affordances and affordances for sociality will help researchers better understand technology humanness.

Another need for future research is to further explore the conceptualization and measurement of humanness. We measured humanness on a bipolar scale from "much more technology-like" to "much more human-like". It could be that humanness is not a uni-dimensional construct but rather a bi-dimensional construct with system-like being one construct and human-like being another construct, which is similar to how trust and distrust are considered two separate constructs (Lewicki et al., 1998). Being two different concepts would better portray users who perceive a technology as being both system-like and human-like, which could be the case with some technologies that provide both tool-like functionality and human-like features.

Our study 2 findings raise a related question: instead of considering humanness a general construct measured with three items like we did, could one theorize humanness as a second-order construct that is reflected by specific first-order factors that are components of social presence, social affordances, and affordances for sociality? Researchers exploring such a second-order construct could integrate it into a nomological humanness network. For example, it may be that such a second-order construct is distinct from and predicts our more general humanness construct. Or researchers might find that social presence mediates the effects of social affordances and affordances for sociality on the first-order humanness construct from our study. These are all possible avenues for future research.

A final interesting humanness finding with implications is that some respondents did not think either of the technologies as human-like. In Study 1, 90 respondents rated both Access and Facebook below the scale midpoint of 4.00 (50 in Study 2), which means they thought both technologies were more system-like. Also, 15 of these respondents (10 in Study 2) rated both Facebook and Access 1.00 on the humanness scale, which means they strongly agreed that both technologies were system-like. Researchers should try to determine differences between these respondents and those who ranked one or both technologies at or above the midpoint. Researchers could also perform a cluster analysis to identify groups with common responses to the humanness items of which a group with low humanness scores might emerge. It could be that the humanness factors identified in study 2 are more or less important in indicating humanness based on cluster membership. It could also be that results from study 1 about the importance of trust type might differ by humanness cluster.

7.2. Matching a Technology's Humanness with the Technology Trusting Beliefs

Our study findings also suggest that, because technologies can vary greatly in humanness, trust in technology researchers should recognize that a technology's humanness can affect the influence of trusting beliefs on dependent variables. We show that a "one-trust-type-fits-all" approach does not work because of humanness perceptions. However, we do not prescribe an either-or approach for using these trusting beliefs. Our results show that, while matches between a technology's humanness and the trust construct provide more significant relationships, mismatches can also have significant effects even though the effect sizes are smaller. For example, in study 1, the results show that, even for the high humanness technology, system-like trusting beliefs significantly influence the outcome variables. Likewise, for the low humanness technology, human-like trusting beliefs still significantly influence outcomes. It seems reasonable that, for Facebook, tool-like trust attributes can still impact users' perceptions of the technology. If users' cannot trust in the website's reliability, functionality, and helpfulness, they may not want to continue using it. While the relationship between human-like trust and outcomes is stronger in most cases, system-like trust still matters (see Figure 2). This may be because, in part, Facebook is a tool that helps one do social networking. For Access, human-like trusting beliefs (i.e., integrity, competence, and benevolence) still significantly influence usefulness and trusting intention though not as strongly as do the system-like trusting beliefs. This suggests that users' dissonance with mismatches between technology humanness and trust type varies in strength. It could also suggest that the strength of one's dissonance is dependent not just on the technology and its level of humanness but also on the outcome variable being investigated.

Another research implication is that we found that people respond socially to (i.e., trust) technologies that differ in humanness. Reeves and Nass (1996) also found that respondents did not need much of a cue to respond to computers socially because they were polite to computers with both voice and text capabilities. Our study provides a modest extension in the area of social response theory because we show that trust (the response) and the way it is measured differs based on the way a human versus a system demonstrates a trustworthy attribute. Researchers could use this finding to investigate other responses from the "computers-are–social-actors" paradigm. For example, researchers may find that a more system-like technology can demonstrate politeness but not in the same way humans demonstrate it, which would result in differentiating a more system-like politeness construct from a more human-like politeness construct. A match between the politeness construct and the technology's humanness may provide more influential effects on important outcome variables.

Another research implication related to matching technology humanness to trust is that results should be examined among different technologies to explore boundary conditions. For example, we wondered how robust our results would be if we examined a technology with humanness between that of Access and Facebook. As an initial attempt to investigate this, we analyzed our data on student use of a prominent online recommendation agent (RA) called myproductadvisor.com (Wang & Benbasat, 2007), which we thought would be less human-like than Facebook and more human-like than Access. We first analyzed the RA's mean humanness. Results confirmed that, the RA humanness mean (3.37/7.00) was significantly different from both the Access (2.15/7.00) and Facebook means (4.71/7.00). The RA was also significantly different from the scale midpoint (4.0 on the 7-point scale). These results imply that, while the RA is significantly more system-like than human-like, it is not as system-like as Access. Next, we tested the RA with our H's 2-5 by comparing the RA's results to those of Access and Facebook. For the within-technology RA tests, the human-like trust constructs predicted better than system-like constructs in three cases out of four (75%), with the other case not significantly different. In sixteen between-technology comparison tests, we found ten (63%) provided evidence RA was more like

Facebook in humanness, two (12%) that RA was more like Access in humanness, and four (25%) that RA was not like either. Overall, the path coefficients showed that RA trust influenced outcomes somewhat better using human-like constructs for most outcomes. We ascribe the more significant influence of the human-like RA trust constructs to how adept people are in ascribing human-like qualities to partially human technologies such as RAs (Nass et al., 1995).

Finally, our results provide implications for researchers to explore other technology use contexts. With our studies, we examined a high-human technology in a personal context and a low-human technology in a work (classroom) context. Further research should examine our model to compare a high-human technology in personal and work contexts and a low-human technology in personal and work contexts. For example, researchers should investigate how Facebook would compare to a technology such as IBM Connections, a different social networking platform that is modeled after Facebook. Both of these technologies are used to facilitate social interactions and both are focused on affordances for sociality, but they differ in that Facebook is primarily used for personal interactions, while IBM Connections is used primarily for professional interactions. Only in this way can context be ruled out as an alternative hypothesis to the effects of humanness.

7.3. Study Limitations

One study limitation is that the experience levels with the technologies were different, with most respondents having multiple years of experience with Facebook (mean = 3 years) and less experience with Access (mean = 1.6 years). Also, while we did not measure frequency of use, which is also a limitation, our respondents likely used Facebook more frequently than Access. While this may have introduced differences, we did control for length of technology experience. Also, since people can differentiate better among trustees when they have more experience with them (Lewicki, McAllister, & Bies, 1998), our study provides a conservative test for finding differences in trust between technologies when one technology was not new (Facebook) and the other was relatively new (Access) to most respondents.

Another study limitation is that we did not vary the order of the questions delivered. All respondents answered trust and outcome questions about myproductadvisor.com first, then about Access, and then about Facebook. Respondents possibly rated Facebook more human-like because it came last. However, that logic would imply the RA would have lower scores than would Access, which was not true, meaning no systematic order bias seems to exist.

Another limitation is that, while we examined trusting beliefs, we did not study other types of trust such as institution-based trust (e.g., structural assurance). Different types of trust may be relied on in a given situation, and these types may trade off efficacy weights depending on the situation. For example, some trust studies have shown that e-commerce consumers rely on a complex combination of institution-based trust and interpersonal (human-like) trust to buy from or share information with websites (Gefen et al., 2003; Pavlou & Gefen, 2004). Website use often depends on factors that decrease the inherent risks, and various types of trust may decrease different risks to different degrees. These risks may also change over time along with the types of trust needed to address them. We did not examine such tradeoffs and how they relate to humanness, but future studies should.

7.4. Conclusion

We conducted this study to determine whether users perceive that technologies differ in humanness and whether having a technology's humanness match the type of trusting beliefs produces stronger influences on outcomes. These goals stem from prior research, some of which has used human-like trust constructs and some of which has used system-like trust constructs. We found that system-like trust constructs had a stronger influence on outcomes if the technology was low in humanness, while human-like trust constructs had a stronger influence if the technology was high in humanness. Our findings also hold implications for IS research. First, they show that researchers should consider the technology's humanness when choosing their technology trust constructs. Additionally, researchers should consider a technology's social presence, social affordances, and affordances for sociality because they relate to its humanness. Finally, this research reveals that one can effectively measure trust in non-human-like technologies without trying to unreasonably apply human attributes to that technology. By using system-like trust attributes that better suit the technologies' nature, researchers will be able to fill vital trust research gaps.

Acknowledgements

We thank Dr. Frederick A. Rodammer at Michigan State University who facilitated our data collection.

References

Baylor, A. L., & Ryu, J. (2003). Does the presence of image and animation enhance pedagogical agent persona? *Journal of Educational Computing Research, 28*(4), 373-395.

Belsley, D. A., Kuh, E., & Welsch, R. E. (1981). *Regression diagnostics*. New York: John Wiley and Sons.

Benamati, J., Fuller, M. A., Serva, M. A., & Baroudi, J. (2010). Clarifying the integration of trust and TAM in e-commerce environments: Implications for systems design and management. *IEEE Transactions on Engineering Management*, *57*(3), 380-393.

Bhattacherjee, A., G., & Premkumar. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *MIS Quarterly, 28*(2) 229-254.

Bhattacherjee, A. (2002). Individual trust in online firms: Scale development and initial test. *Journal of Management Information Systems, 19*(1) 211-241.

Breazeal, C. (2004). Social interactions in HRI: The robot view. *IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews, 34*(2), 181-186.

Burgoon, J. K., Bonito, J. A., Bengtsson, B., Cederberg, C., Lundeberg, M., & Allspach L. (2000). Interactivity in human-computer interaction: A study of credibility, understanding, and influence. *Computers in Human Behavior, 16*(6), 553-574.

Carter, M., Wright, R. T., Thatcher, J. B., & Klein, R. (2014). Understanding online customers' ties to merchants: The moderating influence of trust on the relationship between switching costs and e-loyalty. *European Journal of Information Systems*, *23*(1), 185-204.

Cassell, J., & Bickmore, T. (2000). External manifestations of trustworthiness in the interface. *Communications of the ACM, 43*(12), 50-56.

Chin, W. W. (1998). The partial least squares approach to structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* New York: Academic Press.

Conole, G., & Dyke, M. (2004). What are the affordances of information and communication technologies? *Association for Learning Technology Journal, 12*(2), 113-124.

Cyr, D. Head, M., & Pan, B. (2009). Exploring human images in website design: A multi-method approach. *MIS Quarterly*, *33*(3), 539-536.

Cyr, D. (2008). Modeling web site design across cultures: Relationships to trust, satisfaction, and e-loyalty. *Journal of Management Information Systems*, *24*(4), 47-72.

Cyr, D., Hassanein, K., Head, M., & Ivanov, A. (2007). The role of social presence in establishing loyalty in e-service environments. *Interacting with Computers*, *19*(1), 43-56.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

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

Dwyer, C., Hiltz, S., & Passerini, K. (2007). Trust and privacy concern within social networking sites: A comparison of Facebook and MySpace. In *Proceedings of the 2007 Americas Conference on Information Systems*.

Festinger, L. (1957). *A theory of cognitive dissonance.* Stanford, CA: Stanford University Press.

Fisher, J. C., & Mason, R. L. (1981). The analysis of multicollinear data in criminology. In J. Fox (Ed.), *Quantitative criminology* (pp. 99-125). New York: Academic Press.

Fogg, B. J., & Nass, C. I. (1997). Silicon sycophants: The effects of computers that flatter. *International Journal of Human-Computer Studies*, *46*(4), 551-61.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*(1), 39-50.

Friedman, B., Khan, P. H., Jr., & Howe, D. C. (2000). Trust online. *Communications of the ACM, 43*(12), 34-40.

Gaver, W. W. (1991). Technology affordances. In *Proceedings of the SIGCHI Conference on Human factors in Computing Systems: Reaching Through Technology* (pp. 79-84). New Orleans, Louisiana: ACM.

Gaver, W. (1996). Affordances for interaction: The social is material for design. *Ecological Psychology, 8*(2), 111-129.

Gefen, D., Karahanna, E., & Straub, D. (2003). Trust and TAM in online shopping: An integrated model. *MIS Quarterly, 27*(1), 51-90.

Gefen, D., & Straub, D. (2003). Managing user trust in B2C e-services. *E-Service Journal*, *2*(2), 7-24.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-graph: Tutorial and annotated example. *Communications of the Association for Information Systems*, *16*(5), 91-109.

Gibson, J. J. (1977). The theory of affordances. In R. E. Shaw & J. Bransford (Eds.), *Perceiving, acting and knowing,* Hillsdale: Lawrence Erlbaum Associates.

Goodhue, D. L., Lewis, W., & Thompson, R. (2012). Does PLS have advantages for small sample size or non-normal data? *MIS Quarterly*, 36(3), 981-1001.

Gunawardena, (1995). C. Social presence theory and implications for interaction and collaborative learning in computer conferences. *International Journal of Educational Telecommunications, 1*(2/3), 147-166.

Ha, L., & James, E. L. (1998). Interactivity reexamined: a baseline analysis of early business websites. *Journal of Broadcasting and Electronic Media, 42*(4), 457-474.

Hardin, A., Chang, J., & Fuller, M. A. (2008). Formative vs. reflective measurement: Comment on Marakas, Johnson, and Clay 2007. *Journal of the Association for Information Systems, 9*(9), 519-534.

Hartson, H. R. (2003). Cognitive, physical, sensory, and functional affordances in interaction design. *Behaviour & Information Technology, 22*(5), 315-338.

Hassanein, K., & Head, M. (2007). Manipulating social presence through the web interface and its impact on attitude towards online shopping. *International Journal of Human-Computer Studies, 65*(8), 689-708.

Heeter, C. (1989). Implications of new interactive technologies for conceptualizing communication. In J. L. Salvaggio & J. Bryant (Eds.), *Media use in the information age: Emerging patterns of adoption and consumer use* (pp. 217-235). Hillsdale, NJ: Lawrence Erlbaum.

Holzner, B. (1973). Sociological reflections on trust. *Humanitas, 9*(3), 333-345.

Humanlike. (n.d.-a). In *Dictionary.com.* Retrieved from http://dictionary.reference.com/browse/human like

Humanlike. (n.d.-b). In *The free dictionary.* Retrieved from http://www.thefreedictionary.com/human like

Humanness. (n.d.) In *The free dictionary*. Retrieved from http://www.thefreedictionary.com/human ness

Hutchby, I. (2001). Technologies, texts and affordances. *Sociology, 35*(2), 441-456.

Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998). Is anybody out there? Antecedents of trust in global virtual teams. *Journal of Management Information Systems, 14(*4), 29-64.

Johnson, G. J., Bruner, G. C., & Kumar, A. (2006). Interactivity and its facets revisited. *Journal of Advertising, 35*(4), 35-52.

Katagiri, Y., Nass, C., & Takeuchi, Y. (2001). Cross-cultural studies of the computers are social actors paradigm: The case of reciprocity. In M. J. Smith, G. Salvendy, D. Harris, & R. Koubek (Eds.), *Usability evaluation and interface design: Cognitive engineering, intelligent agents, and virtual reality* (pp. 1558-1562). Mahwah, NJ: Lawrence Erlbaum Associates.

Keil, M., Tan, B. C. Y., Wei, K.-K., Saarinen, T., Tuunainen, V., & Waasenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly*, *24*(2), 299-325.

Koda, Y., & Maes, P. (1996). Agents with faces: The effects of personification of agents. In *Proceedings of HCI'96* (pp. 98-103). London, UK: Springer-Verlag.

Kreijns, K. (2004). *Sociable CSCL environments; Social affordances, sociability, and social presence* (Unpublished doctoral dissertation). Open University of the Netherlands, The Netherlands.

Kreijns, K., Kirschner, P. A., & Jochems, W. (2002). The sociability of computer-supported collaborative learning environments. *Educational Technology & Society, 5*(1), 8-22.

Kumar, N., & Benbasat, I. (2006). The influence of recommendations and consumer reviews on evaluations of websites. *Information Systems Research, 17*(4), 425-429.

Kunda, Z. (1999). *Social cognition: Making sense of people*. Cambridge, MA: MIT Press.

Kuyath, S. J., & Winter, S. J. (2006). Distance education communications: The social presence and media richness of instant messaging. *Journal of Asynchronous Learning Networks, 10*(4), 67-82.

Lankton, N., McKnight, D. H., & Thatcher, J. B. (2014). Incorporating trust-in-technology into expectation disconfirmation theory. *Journal of Strategic Information Systems, 23*(2), 128-145.

Lee, K. M., Peng, W., & Jin, S.-E. (2006). Can robots manifest personality? An empirical test of personality recognition, social responses, and social presence in human-robot interaction. *Journal of Communication, 56*(4), 754-772.

Lee, K. M., & Nass, C. (2004). The multiple source effect and synthesized speech: Doubly disembodied language as a conceptual framework. *Human Communication Research, 30,* 182-207.

Lewicki, R. J., & Bunker, B. B. (1996). Developing and maintaining trust in work relationships. In R. Kramer, & T. Tyler (Eds.), Trust in organizations: Frontiers of theory and research (pp. 114-139). Thousand Oaks, CA: Sage.

Lewicki, R. J., Tomlinson, E. D., & Gillespie, N. (2006). Models of interpersonal trust development: Theoretical approaches, empirical evidence, and future directions. *Journal of Management, 32*(6) 991-1022.

Lewicki, R. J., McAllister, D. J., & Bies, R. J. (1998). Trust and distrust: New relationships and realities. *Academy of Management Review, 23*(3), 438-458.

Lippert, S. K. (2007). Investigating post-adoption utilization: An examination into the role of interorganizational and technology trust. *IEEE Transactions on Engineering Management, 54*(3), 468-483.

Lippert, S., & Swiercz, P. (2005). Human resource information systems (HRIS) and technology trust. *Journal of Information Science, 31*(5), 340.

Lowenthal, P. R. (2010). The evolution and influence of social presence theory on online learning. In S. Dasgupta (Ed.), *Social computing: Concepts, methodologies, tools, and applications* (pp. 113-128). Hershey, PA: IGI Global.

Madden, M., & Smith, A. (2010). *Reputation management and social media*. Retrieved from http://www.pewinternet.org/2010/05/26/reputation-management-and-social-media/

Majchrzak, A., Faraj, S., Kane, G. C., & Azad, B. (2013). The contradictory influence of social media affordances on online communal knowledge sharing. *Journal of Computer-Mediated Communication*, *19*(1), 38-66.

Marcoulides, G. A., & Chin, W. W. (2013). You write, but others read: Common methodological misunderstandings in PLS and related methods. In H. Abdi, W. W. Chin, V. Esposito Vinzi, G. Russolillo, & L. Trinchera (Eds.), *New perspectives in partial least squares and related methods* (Vol. 56, pp. 31-64). New York, NY: Springer.

Markus, M. L., & Silver, M. S. (2008). A foundation for the study of IT effects: A new look at Desanctis and Poole's concepts of structural features and spirit. *Journal of the Association for Information Systems, 9*(10), 609-632.

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of Management Review, 20*(3), 709-734.

McKnight, D. H. (2005). Trust in Information Technology. In G. B. Davis (Ed.), *The Blackwell encyclopedia of management: Management information systems* (pp. 329-331). Malden, MA: Blackwell.

McKnight, D. H., Carter, M., Thatcher J. B., & Clay, P. F. (2011). Trust in a specific technology: An investigation of its components and measures. *ACM Transactions on Management Information Systems, 2*(2), 12-32.

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information Systems Research, 13*(3), 334-359.

McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of Management Review, 23*(3), 473-490.

Menard, S. W. (1995). *Applied logistic regression analysis*. Thousand Oaks, CA: Sage.

Michaels, C. F., & Carello, C. (1981). *Direct perception*. Englewood Cliffs, NJ: Prentice-Hall.

Moon, Y. (2000). Intimate exchanges: Using computers to elicit self-disclosure from consumers. *Journal of Consumer Research, 26*(4), 323-339.

Muir, B., & Moray, N. (1996). Trust in automation. Part II. Experimental studies of trust and human intervention in a process control simulation. *Ergonomics, 39*(3), 429-460.

Nass, C. I., Moon, Y., & Carney, P. (1999). Are people polite to computers? Responses to computer-based interviewing systems. *Journal of Applied Social Psychology, 29*(5), 1093-1110.

Nass, C. I., Moon, Y., Fogg, B. J., Reeves, B., & Dryer, C. (1995). Can computer personalities be human personalities. *International Journal of Human–Computer Studies, 43*(2), 223-239.

Nass, C. I., Moon, Y., & Green, N. (1997). Are computers gender-neutral? Gender stereotypic responses to computers. *Journal of Applied Social Psychology*, 27(10), 864-876.

Nass, C., Steuer, J. S., & Tauber, E. (1994). Computers are social actors. In *Proceedings of the CHI Conference* (pp. 72-77). Boston, MA: Springer-Verlag.

Nicolaou, A. I., & McKnight, D. H. (2006). Perceived information quality in data exchanges: Effects on risk, trust, and intention to use. *Information Systems Research, 17*(4), 332-351.

Norman, D. A. (1990). *The design of everyday things.* New York: Basic Books.

Nowak, K. L., & Rauh, C. (2005). The influence of the avatar on online perceptions of anthropomorphism, androgyny, credibility, homophily, and attraction. *Journal of Computer-Mediated Communication, 11*(1), 153-178.

Orlikowski, W. J. (2007). Sociomaterial practices: Exploring technology at work. *Organization Studies, 28*(9), 1435-1448.

Pavlou, P., & Gefen, D. (2004). Building effective online marketplaces with institution-based trust. *Information Systems Research*, *15*(1), 37-59.

person. (n.d.). *Dictionary.com Unabridged*. Retrieved October 05, 2015, from http://dictionary.com/ browse/person

Polkosky, M. D. (2008). Machines as mediators: The challenge of technology for interpersonal theory and research. In E. A. Konijn, S. Utz., M. Tanis, & S. B. Barnes (Eds.), *Mediated interpersonal communication* (pp. 34-57). New York: Taylor & Francis.

Qiu, L., & Benbasat, I. (2009). Evaluating anthropomorphic product recommendation agents: A social and relational perspective to designing information systems. *Journal of Management Information Systems, 25*(4), 145-182.

Reeves, B., & Nass, C. (1996). *How people treat computers, television, and new media like real people and places*. Cambridge: Cambridge University Press.

Rettie, R. (2003). Connectedness, awareness and social presence. In *Proceedings of the 6th Annual International Workshop on Presence.*

Rice, R. E., Hughes, D., & Love, D. (1989). Usage and outcomes of electronic messaging at an R&D organization: Situational constraints, job level, and media awareness. *Office: Technology and People, 5*(2), 141-161.

Rouibah, K. (2012). Trust factors influencing intention to adopt online payment in Kuwait. In *Proceedings of the Southern Association for Information Systems Conference* (pp. 195-202). Atlanta, GA: SAIS.

Rozendaal, E., Buijzen, M., & Valkenburg, P. M. (2010). Comparing children's and adults' cognitive advertising competences in the Netherlands. *Journal of Children and Media, 4*(1), 77-89.

Schwab, D. P. (1980). Construct validity in organizational behavior. In B. M. Staw & L. L. Cummings (Eds.), *Research in organizational behavior* (pp. 3-43). Greenwich, CN: JAI Press.

Shneiderman, B. (2000). Designing trust into online experiences. *Communications of the ACM, 43*(12), 57-59.

Short, J., Williams, E., Christie, B. (1976). *The social psychology of telecommunications.* London, UK: John Wiley.

Söellner, M., Hoffman, A., Hoffman, H., Wacker, A., & Leimeister, J. M. (2012). Understanding the formation of trust in IT artifacts. In *Proceedings of the 33rd International Conference on Information Systems*.

Sproull, L., Subramani, M., Kiesler, S., Walker, J. H., & Waters, K. (1996). When the interface is a face. *Human-Computer Interaction, 11*(2), 97-124.

Stoffregen, T. A. (2003) Affordances as properties of the animal-environment system. *Ecological Psychology, 15*(2), 115-134.

Takeuchi, A., & Naito, T. (1995). Situated facial displays: Towards social interaction. In *Proceedings of the International Conference on Computer Human Interaction CHI* (pp. 450-455). Denver, CO: ACM.

Tanriverdi, H. (2006). Performance effects of information technology synergies in multibusiness firms. *MIS Quarterly, 30*(1), 57-77.

Thatcher, J. B., McKnight, D. H., Baker, E. W., Arsal, R. E., & Roberts, N. H. (2011). The role of trust in postadoption IT exploration: An empirical examination of knowledge management systems. *IEEE Transactions on Engineering Management, 58*(1), 56-70.

Treem, J. W., & Leonardi, P. M. (2012). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association, *Communication Yearbook, 36*, 143-189.

Vance, A., Elie-Dit-Cosaque, C., & Straub, D. W. (2008). Examining trust in information technology artifacts: The effects of system quality and culture. *Journal of Management Information Systems, 24*(4), 73-100.

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

Wang, W., & Benbasat, I. (2005). Trust in and adoption of online recommendation agents. *Journal of the Association for Information Systems, 6*(3), 72-101.

Wang, W., & Benbasat, I. (2007). Recommendation agents for electronic commerce: Effects of explanation facilities on trusting beliefs. *Journal of Management Information Systems, 23*(4), 217-246.

Wang, L. C., Baker, J., Wagner, J. A., & Wakefield, K. (2007). Can a retail web site be social? *Journal of Marketing, 71*(3), 143-157.

Wetzels, M., Odekerken-Schroder, G., & van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly, 33*(1), 177-195.

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research, 16*(1), 85-102.

Appendices

Appendix A: Study 1: Measurement Items

Perceived usefulness *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (Davis et al., 1989)*
1. Using [Microsoft Access/MySNW.com[3]] improves my performance in [database work/online social networking].
2. Using [Microsoft Access/MySNW.com] increases my productivity in [database work/online social networking].
3. Using [Microsoft Access/MySNW.com] enhances my effectiveness in [database work/online social networking].

Enjoyment *(7-point Likert scale from (1) strongly disagree to (7) strongly agree (Davis et al. 1992)*
1. I find using [Microsoft Access /MySNW.com] to be enjoyable.
2. The actual process of using [Microsoft Access/MySNW.com] is pleasant.
3. I have fun using [Microsoft Access/MySNW.com].

Trusting intention *(7-point Likert scale from (1) not true at all to (7) very true) (McKnight et al., 2002)*
1. When I [do a class assignment/ network socially online], I feel I can depend on [Microsoft Access/MySNW.com].
2. I can always rely on [Microsoft Access/MySNW.com] for [a tough class assignment/ online social networking].
3. I feel I can count on [Microsoft Access/MySNW.com] when [doing my assignments/ networking online].

Continuance intention *(7-point Likert scale from (1) Not true at all to (7) Very true) (Venkatesh et al. 2003)*
1. In the near future, I intend to continue using [Microsoft Access/MySNW.com].
2. I intend to continue using [Microsoft Access/MySNW.com].
3. I predict that I would continue using [Microsoft Access/MySNW.com].

Technology trusting belief—functionality *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2011)*
1. [Microsoft Access/MySNW.com] has the functionality I need.
2. [Microsoft Access/MySNW.com] has the features required for my tasks.
3. [Microsoft Access/MySNW.com] has the ability to do what I want it to do.

Technology trusting belief—helpfulness *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2011)*
1. [Microsoft Access/MySNW.com] supplies my need for help through a help function.
2. [Microsoft Access/MySNW.com] provides competent guidance (as needed) through a help function.
3. [Microsoft Access/MySNW.com] provides whatever help I need.

Technology trusting belief—reliability *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2011)*
1. [Microsoft Access/MySNW.com] is a very reliable [piece of software/ website].
2. [Microsoft Access/MySNW.com] does not fail me.
3. [Microsoft Access/MySNW.com] is extremely dependable.

[3] As we explain in Section 4.1., we used “MySNW.com” as a placeholder for the social networking website that students used the most.

Technology trusting belief—integrity *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2002)*
1. [Microsoft Access/MySNW.com] is truthful in its dealings with me.
2. [Microsoft Access/MySNW.com] is honest.
3. [Microsoft Access/MySNW.com] keeps its commitments.

Technology trusting belief—competence *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2002)*
1. [Microsoft Access/ MySNW.com] is competent and effective in [providing database tools/providing online social networking].
2. [Microsoft Access/MySNW.com] performs its role of [database software/facilitating online social networking] very well.
3. [Microsoft Access/MySNW.com] is a capable and proficient [software package/online social network provider].

Technology trusting belief—benevolence *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2002)*
1. [Microsoft Access/MySNW.com] acts in my best interest.
2. [Microsoft Access/MySNW.com] does its best to help me if I need help.
3. [Microsoft Access/MySNW.com] is interested in my well-being, not just its own.

Technology humanness *(7-point Likert scale: see endpoints below) (author developed)*
For each item below, please rate how technology-like versus human-like that item is: (*(1) Much more Technology-like to (7) Much more Human-like*)
1. MySNW.com
2. Microsoft Access

For each item below, please rate how machine-like versus person-like that item is: (*(1) Much more Machine-like to (7) Much more Person-like*)
1. MySNW.com
2. Microsoft Access

For each item below, please rate how technology-oriented versus human-oriented its attributes or qualities are: (*(1) Has many more techno qualities to (7) Has many more human qualities*)
1. MySNW.com
2. Microsoft Access

Control variable: disposition to trust technology *(7-point Likert scale from (1) strongly disagree to (7) strongly agree) (McKnight et al., 2002)*
1. My typical approach is to trust new information technologies until they prove to me that I shouldn't trust them.
2. I usually trust in information technology until it gives me a reason not to.
3. I generally give an information technology the benefit of the doubt when I first use it.

Control variable: experience *(7-point Likert scale from (1) have not used at all to (7) more than 5 years)*
1. How long have you been using [Microsoft Access/MySNW.com]?

Appendix B: Study 2: Measurement Items

Social presence *(7-point Likert scale from (1) strongly disagree to (7) strongly agree)*
1. There is a sense of sociability with [Microsoft Access/MySNW.com].
2. There is a sense of human warmth with [Microsoft Access/MySNW.com].
3. There is a sense of human contact with [Microsoft Access/MySNW.com].
4. There is a sense of personalness in [Microsoft Access/MySNW.com].

Interpersonal communication *(7-point Likert scale from (1) strongly disagree to (7) strongly agree)*
1. [Microsoft Access/MySNW.com] facilitates interpersonal communication.
2. [Microsoft Access/MySNW.com] enables two-way information sharing.
3. [Microsoft Access/MySNW.com] allows me to email, blog, chat, or otherwise communicate with other people.

Dynamism *(7-point Likert scale from (1) strongly disagree to (7) strongly agree)*
1. The content on [Microsoft Access/MySNW.com] often changes between uses.
2. The information that is on [Microsoft Access/MySNW.com] is not static across uses.
3. The content on [Microsoft Access/MySNW.com] is not predictable each time I use it.

Responsiveness *(7-point Likert scale from (1) strongly disagree to (7) strongly agree)*
1. [Microsoft Access/MySNW.com] is responsive to my information needs.
2. [Microsoft Access/MySNW.com] provides timely (or almost timely) answers to my questions.
3. I am able to obtain advice and feedback from [Microsoft Access/MySNW.com] without delay.

Animation *(7-point Likert scale from (1) strongly disagree to (7) strongly agree)*
1. [Microsoft Access/MySNW.com] uses graphics and/or graphic movement to present information.
2. [Microsoft Access/MySNW.com] has a lot of pictures.
3. There is a lot of animation in [Microsoft Access/MySNW.com].

Technology humanness *(7-point Likert scale: see endpoints below) (author developed)*
For each item below, please rate how technology-like versus human-like that item is: (*(1) Much more Technology-like to (7) Much more Human-like*)
   a. MySNW.com
   b. Microsoft Access

For each item below, please rate how machine-like versus person-like that item is: (*(1) Much more Machine-like to (7) Much more Person-like*)
   a. MySNW.com
   b. Microsoft Access

For each item below, please rate how technology-oriented versus human-oriented its attributes or qualities are: (*(1) Has many more techno qualities to (7) Has many more human qualities*)
   a. MySNW.com
   b. Microsoft Access

About the Authors

Nancy K. LANKTON is an Associate Professor at Marshall University. She teaches accounting information systems and information systems auditing. Her main research interests include trust's impacts on individual and organizational use of information technology, privacy behaviors related to social networking websites, and decision making in organizations. She has published in journals such as *Contemporary Accounting Research, IEEE Transactions on Engineering Management, Journal of the Association for Information Systems,* and the *Journal of Management Information Systems.*

D. Harrison MCKNIGHT is an Associate Professor at Michigan State University. Dr. McKnight has served as Associate Editor at *MIS Quarterly* and *Information & Management* and currently serves at *Journal of Trust Research*. His research interests include trust in technology and trust change over time. He has published in such journals as *MIS Quarterly*, *Information Systems Research*, *Journal of the Association for Information Systems*, *Journal of Management Information Systems*, and the *Academy of Management Review*.

John F. TRIPP is Assistant Professor of Information Systems at Baylor University. Before beginning his PhD, he worked for more than 17 years in industry as a software developer, project manager, and IT Director. He completed his PhD at Michigan State University in 2012, completing his dissertation on the impacts of agile development methodology on project success. His research has appeared or is forthcoming in the *Journal of the Association for Information Systems*, *Information Systems and e-Business Management,* and the *Journal of Management Systems*. His research has appeared in the proceedings of multiple conferences including the *International Conference on Information Systems*, the *Hawaii International Conference on Systems Sciences*, the *European Conference of Information Systems,* and the *Americas Conference on Information Systems.*