MACHINE AND PERSON INTERACTIVITY: THE DRIVING FORCES BEHIND INFLUENCES ON CONSUMERS' WILLINGNESS TO PURCHASE ONLINE

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ABSTRACT

This paper proposes and tests a model using two dimensions of interactivity (machine and person) to predict consumers' intentions to purchase online. Analysis of the results of an online survey of 1,744 respondents revealed that machine interactivity is positively associated with online purchase intentions through its influence on physical telepresence, attitudes, perceived behavioral control and trust. Person interactivity is positively associated with online purchase intentions through its influence on social telepresence, subjective norms, perceived behavioral control and trust. This paper also compares the relative influence of machine interactivity and person interactivity on intention to purchase online. Implications of the results are discussed to provide guidance for future research and business recommendations to marketers.

Keywords: interactivity, online purchase, electronic commerce, machine interactivity, person interactivity

1. Introduction

In the light of today's recession and competitive pressures in the business-to-consumer (B2C) Web commerce arena, vendors face significant problems in converting their site visitors into real customers and, eventually, loyal patrons. A recent Market Live Performance Index (MLPI) and a survey by MarketingSherpa indicated that the average shopping cart abandonment rate was nearly 60 percent [Tejada 2008]. The results from MarketingSherpa showed that a majority of customers abandoned their shopping carts at the check out process due to design problems (i.e., poor usability), speed, and trust issues [Aldiri et al. 2008; Tejada 2008]. Many site visitors are comparison shoppers and never intended to complete the purchase in the first place [Baxter 2007]. The great challenge to the Web merchants, therefore, goes beyond attracting customers to their Web sites. Web stores need to create a compelling Web site that will entice potential customers to actually purchase products from them.

Many authors in the practitioner and academic literature suggest that interactivity may provide the key for this enticement. However, compared to the emphasis that the concept of interactivity has received in the electronic commerce literature, much less empirical work has been done to understand the role of interactivity on influences leading to consumers' willingness to purchase online - for exceptions, see Wu and Chang [2005], Eun-Young and Youn-Kyung [2004], Hoffman et al. [1999] and Li et al. [2002]. In addition, several reviews of literature in the area of interactivity [Suntornpithug and Todorovic 2010; Cho and Cheon 2005; Rollet 2001; Hoffman and Novak 1996; Steuer 1992] conclude that interactivity is a complex concept consisting of two dimensions (machine and person interactivity). Machine interactivity involves an interaction between humans and contents on the screen (machine). Person interactivity involves an interaction between customers and other participants (for instance salespersons and other customers) in the communication process through an online medium. Much of the research in this area, however, fails to examine the effects of these two dimensions together in the same model (see [Hoffman and Novak 1996; Ji Hee and George 2008] as cases in point. Except for Tan and Teo's [2000] work, most interactivity studies seem to leave out the effect of person interactivity, in particular. Accordingly, comparisons of the relative influence of these two dimensions on intention to purchase online are difficult.

This paper proposes a model of interactivity that attempts to address this shortcoming. The two main objectives of the paper are: 1) to identify and prioritize dimensions of interactivity (machine and person) that will lead to customers' intention to purchase product/services online, and 2) to determine whether the proposed interactivity model for Web commerce is valid and reliable. This is especially significant given recent growth of e-commerce [Winters et al. 2010] which is projected to increase by an average of over ten percent for the next several years [Grau 2010]. To participate and take advantage of the opportunities that arise, it is even more compelling that the issue of shopping cart abandonment be better understood and addressed.

The paper first presents a review of the literature in interactivity, outlines the theoretical model, describes the research methodology and data analyses conducted, and presents the findings of the study. The paper concludes with the discussion of the implications of the research.

2. Literature Review
2.1. Definition of Interactivity

Over the past 20 years, "interactivity has been widely discussed in various fields such as advertising, marketing, communication, information science, computer science, and education" [Mcmillan and Hwang 2002]. Little consensus on the meaning of the term interactivity, however, is evident in the literature. As Liu and Shrum [2002] posit, the main reason for the apparent inconsistencies of the definitions of interactivity offered in the literature may derive from the fact that different researchers have simply addressed interactivity from different perspectives. From an extensive review of the literature, interactivity seems to have been conceptualized around the perspectives of users, structure, and process [Mcmillan 1997].

The user view of interactivity argues that interactivity is a characteristic of individuals making use of media rather than the media themselves [Chen 1984]. Research in this area has focused on how individuals use interactive media [Walther 1994]) and how users' individual differences are related to that use [Kayany et al. 1996]. The structural view of interactivity believes that the concept of interactivity is a property of the medium itself (for instance, the ability to provide immediate two-way communication [Rheingold 1993). Finally, there is the more promising perspective labeled 'the process view' of interactivity. This perspective emphasizes the roles and behaviors of the participants, content of the message, and sequences of actions. Hoffman and Novak's study [1996], for example, focused on the commercial application of the World Wide Web which involved both human-to-human interaction via the computer and human-to-computer interaction. These two types of interactions concerned not only a user trait and a medium trait, but also some explicit content as well as an overall process of the interaction.

Because current Web commerce technologies make it possible for users, medium, content and the communication process to be interactive, such a holistic view incorporating the roles of the communication participants, contents of the message, characteristics of the medium, and the sequence of communication actions seems to be most the pragmatic and relevant perspective from which to view interactivity. This is the perspective adopted in this paper.

2.2. Dimensions of Interactivity

Research on interactivity using a process view has tended to take one of two directions when attempting to operationalize the construct, namely: interactivity with the medium and interactivity through the medium [Hoffman and Novak 1996]. Interactivity with the medium focuses on human-to-computer interface (machine interactivity), while interactivity through the medium emphasizes human-to-human communication as mediated by the computer (person interactivity). People perceive a high degree of interactivity in the environment when they are able to effectively control the outcome of their interactions.

Machine Interactivity. The concept of interactivity is central to the idea of an interaction between a person and a computer or programs on the computer. Machine interactivity exists when a person clicks on the machine and the machine does something (such as retrieving information or presenting content) in response to a person's request. With machine interactivity, an interaction between companies and consumers does not exist. Rather, consumers simply interact directly with the communication contents through a machine [Hoffman and Novak 1996].

From the perspective of hypermedia computer-mediated-environments (CME), machine interactivity refers to an interaction between a person and a CME. Steuer suggests that information or content is not directly sent from senders to receivers, rather, "mediated environments are created and then experienced" [Steuer 1992, p. 78]. He uses the term "telepresence" to describe the mediated perception of an environment and further claims that when consumers interact with a CME, the consumers incur two types of perceptions: 1) the physical environment in which one is present, and 2) the environment created or mediated by the computer. He argues that the latter contributes to consumers' perceptions of machine interactivity and that machine interactivity should be operationalized as "the extent to which users can participate in modifying the form and content of mediated environments in real time" [Steuer 1992, p. 84].

Four components of machine interactivity have been identified in the research literature: speed, mapping, range [Hoffman and Novak 1996; Steuer 1992], and relevancy [Ji Hee and George 2008]. Speed refers to the rapidity of the response of the machine to a particular action; mapping refers to the naturalness and intuitiveness of Web navigation that customers will experience; range refers to the number of possible actions (such as hyperlinks, search engine, downloading, or product trial) available to a customer at a given time; and, finally, relevancy is the ability to provide a message or content tailored to each visitor's needs and desires. These components determine the degree to which users can participate in modifying the form and content of a mediated environment in real time.

Person Interactivity. It is generally accepted that interactivity not only deals with the medium or environments created by the medium, but also, with communicating with other people [Rice 1993]. Dyson states that an interaction with humans is involved with giving and getting attention and feedback from salespersons, friends and colleagues [Dyson 1993]. Hoffman and Novak [1996] called this type of reaction person-interactivity. In the online context, person interactivity, therefore, can be defined as the degree of social interconnectedness between customers and other participants, including salespersons and other customers, in the communication process through an online medium.

Two concepts in social psychology most related to person interactivity are interpersonal closeness [Lee and Robbins 2000] and shared values [Byrne 1971]. Interpersonal closeness occurs when persons feel accessible, available, and subject to one another [Goffman 1963]. Interpersonal closeness is a function of intimacy [Argyle and Dean 1965] and immediacy [Wiener and Mehrabian 1968]. While intimacy is the degree that the participants in the communication are willing to share intimate knowledge of their wants, needs, and expectations, immediacy or psychological closeness refers to the psychological distance a person places between oneself and others in the communication. Shared values refer to the level of similarity of values that exists among participants in the communication process [Nicholson et al. 2001]. Shared values that customers are looking for in their exchanges with businesses include prompt, informative, and precise responses from salespersons or customer service representatives [Tractinsky and Rao 2001]. It can therefore be stated that interpersonal closeness and shared values determine the degree to which customers feel interconnected with the salesperson or other customers via the Internet.

A significant proportion of the literature has focused on the buyer-seller relationship in regular marketing channels [Sheth 1976; Williams et al. 1990]. However, little analysis has focused on the buyer-seller relationship in the context of the WWW - see Jarvenpaa and Todd [1996]. In addition, the role of buyer-buyer interactions needs to be explored. The study reported in this paper examines the role of buyer-seller and buyer-buyer interactivity in Web commerce.

2.3. Hoffman and Novak's Model of Intent to Use a Hypermedia Computer-Mediated Environments (CME)

The 1996 work of Hoffman and Novak underpins the study reported in this paper. The aforementioned study used the Theory of Planned Behavior to develop a model to explain the salient predictors of a consumer's intentions to use a hypermedia computer-mediated environment (CME). Interactivity was incorporated into their model and was initially conceptualized as having two dimensions: machine and person interactivity, however, only machine interactivity was fully captured in the 1996 model. In that model, machine interactivity was proposed to indirectly lead to positive attitudes toward using hypermedia CME through flow (conceptualized as cognitive state experienced during navigation) and directly lead to perceived behavioral control toward using hypermedia CME. Later in 2000, Novak and others conducted an empirical study to test that initial model of intent to use a Web site and found that higher levels of interactivity (measured by speed) significantly led to flow (beta coefficient = 0.07); however, higher levels of flow experience did not significantly lead to positive attitudes at the significance level of 0.05 [Novak et al. 2000]. In addition, higher levels of interactivity were not significantly associated with perceived behavioral control, which was found as a significant predictor of purchase intention, at the significance level of 0.05. As admitted in their paper, the reason that the results were not as hypothesized, in part, is likely due to the fact that their measure of interactivity was unidimensional and limited; therefore, the measure did not fully capture interactivity.

Other studies have attempted to test Hoffman and Novak's theoretical model of internet adoption. Tan and Teo [2000], for example, found that attitude and perceived behavioral control factors, rather than social influence, played significant roles in influencing the intention to adopt Internet banking. Another study showed a positive linkage between attitude toward the site and purchase intentions [Lynch et al. 2001]. A slightly earlier study had suggested that subjective norms correlated significantly and positively with the use of the Web for online purchases [Korgaonkar and Wolin 1999]. The study reported in this paper aims to fill this void by proposing that interactivity is a complex concept consisting of two dimensions (machine and person interactivity) and each dimension is measured by a multi-items scale (as discussed in a later section). The following discussion about different studies that tested interactivity with other related constructs will help frame the thinking that incorporated both machine and

person interactivity into the same model, and, hence, making possible the comparisons of the relative influence of these two dimensions on intention to purchase online.

3. Proposed Theoretical Model

Although few conceptual frameworks of the role of interactivity on online purchasing intention are available, theories (such as interactivity, theory of planned behavior, telepresence, and trust) contained in previous studies from several academic fields, are utilized to help frame the model proposed for this study. As noted earlier, the literature suggests that interactivity is a complex concept consisting of the two dimensions of machine and person interactivity. The theory of planned behavior (TOPB) provides important constructs that seem to result from interactivity. These constructs are attitudes, subjective norms, perceived behavioral control, and intention to purchase [Hoffman and Novak 1996]. To take full advantage of the concept of interactivity, telepresence is included in this study because it has been the construct most often associated with interactivity in the literature [Steuer 1992]. Based on the telepresence literature, two dimensions are identified: physical telepresence and social telepresence [Jeandrain 2001]. These two components of telepresence seem to play vital roles in transmitting the influence of machine and person interactivity to perceived behavioral control [Venkatesh and Johnson 2002], attitudes [Li et al. 2002], and subjective norms [Walther 1996] by converting the cognitively involving experiences produced by effective human-to-computer interaction (machine interactivity) and human-to-human communication via computer (person interactivity) into the simulated perception of direct experience of a real shopping environment.

To complete the picture, other studies have identified trust as an important issue that determines consumers' willingness to shop online - for example Khalid et al. [2008]. They also suggest that, in turn, trust can be formed through a high degree of perceived behavioral control, positive attitudes, and positive subjective norms. The concept of trust is therefore included in this study.

From the foregoing, seventeen hypotheses and four propositions were generated to guide the current study (see Figure 1). The model postulates that the end result of high levels of interactivity is that the customer will be inclined to shop online and make a purchase. For the customer, increased perceived behavioral control is the intermediate outcome of higher levels of machine and person interactivity. While high machine interactivity leads to increased physical telepresence, high person interactivity leads to increased social telepresence. Physical telepresence positively influences perceived behavioral control and attitudes for online purchasing. Higher levels of social telepresence leads to increased perceived behavioral control and positive subjective norms for online purchasing. In addition, higher machine interactivity should also lead to a positive attitude toward online purchasing, while higher person interactivity should lead to a higher degree of subjective norms for online purchasing. Higher levels of perceived behavioral control, attitudes, and subjective norms for online purchasing should all lead to higher levels of trust and intention to purchase. Trust directly affects intention to purchase online.
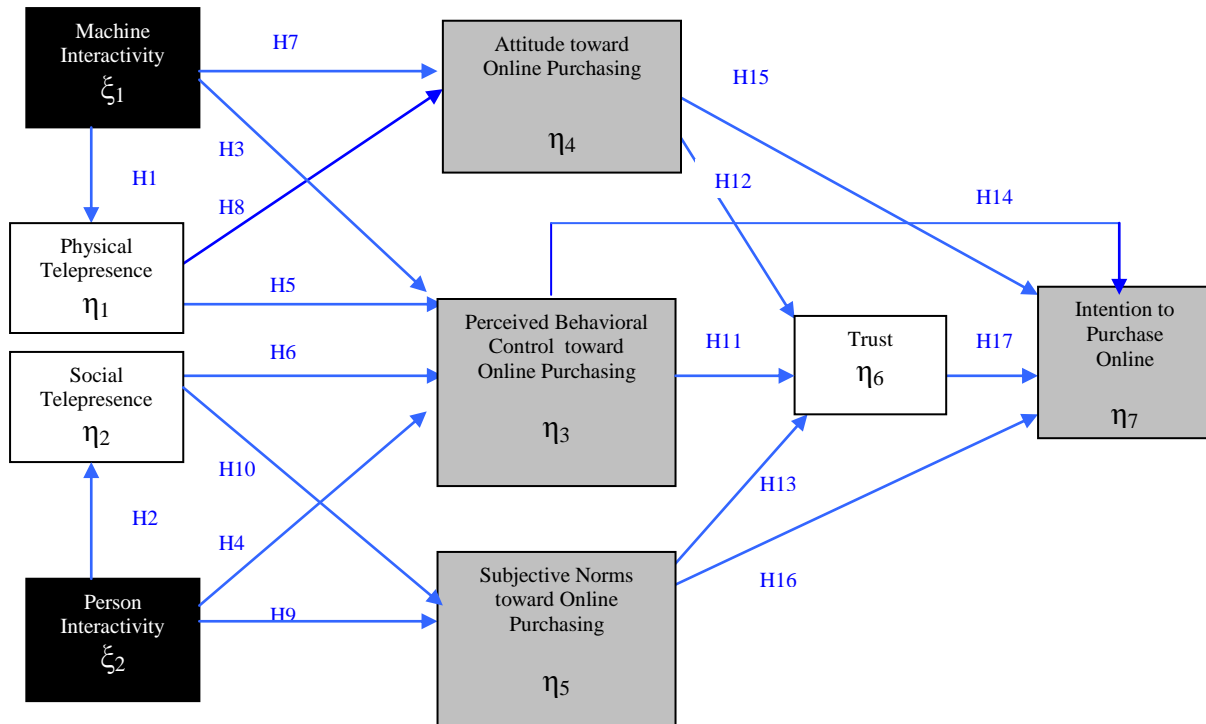
Figure 1: Proposed Structural Model

The following section contains a discussion of the five intermediate outcomes of interactivity, and how these outcomes relate to trust and intention to purchase. The hypotheses for this study are also introduced and justified.

3.1. Telepresence

Steuer [1992, p.76] defines presence as "the natural perception of an immediate environment" and telepresence as "the mediated perception of an environment" via the Internet. Two types of telepresence are physical telepresence and social telepresence [Jeandrain 2001]. Physical telepresence occurs when customers perceive they are transported into the environment defined by the message or information on the Web. This experience allows the customers to focus on an environment created by the Web merchants on the Internet and feel that the virtual environment with which they are interacting is more real and dominate the actual physical environment [Barnes 1975].

According to Lombard and Snyder-Duch [2001], social telepresence occurs when the Internet is so transparent that the customers perceive it as simply a conduit to interact with other persons on the Internet in the same way as in person-to-person interaction. It is the subjective sensation that remote persons are actually co-located within a virtual space. The strength of the customers' experience of social telepresence, therefore, can be measured in terms of the degree to which the customers psychologically perceive a person to be physically present when interacting with him/her via an online communication. The research supporting these conceptualizations is discussed alongside said conceptualizations.

3.1.1.Physical Telepresence and Machine Interactivity

The impact of machine interactivity on physical telepresence can be best understood by realism [Heeter 1992], transportation [Lombard and Ditton 1997], and immersion perspectives of telepresence [Biocca and Delany 1995]. According to these views, individuals perceive physical telepresence when they can escape from their physical environment before them and enter into an artificial environment created on the Web. The artificial environment looks, sounds, and feels so realistic that individuals react realistically to such an environment.

With machine interactivity, Web vendors can facilitate customers' experience of physical telepresence by increasing the degree to which the customers can participate and modify the content of mediated environments in real time. Browsing through the Web site with a high response rate of interaction (speed), a high number of ways in which customers can manipulate (range), greater flexibility of movement within the site (mapping), and a higher degree of relevant content (relevancy), customers are more likely to be immersed in the environment defined by the Web content and at the same time let go their physical environment. In addition, the customers are most likely to lose track of time and enjoy traversing through the site exploring products or services information in the same way they do in in-store shopping. The link between machine interactivity and physical telepresence has been found in

studies by Klein [1999], Coyle and Thorson [2001] and Li et al. [2002]. Based on this empirical support, the following hypothesis is presented:

H1: The greater the degree of machine interactivity the customers perceive, the greater the degree of physical telepresence they will experience.

3.1.2.Social Telepresence and Person Interactivity.

Social presence theory [Short et al. 1976], media richness theory [Rice 1992], and social actor theory [Lombard and Ditton 1997], all suggest that social telepresence can be induced by the sense of immediacy [Weiner and Mehrabian 1968] and intimacy [Hackman and Walker 1990]. In addition, channel expansion theory posits that when communication participants acquire significant amounts of relevant experience communicating with a specific communication partner, they will develop an associated knowledge base for that individual [Carlson and Zmud 1999]. Such a knowledge base enhances more effective encoding and decoding of rich messages on a channel tailored to that person and increases the use of cues relevant to that individual. For example, participants can use cues that contain information having a richer meaning for their communication partners by referring to shared experiences or using shared jargon. The ability to participate in increasingly rich communication via the channel will make communication participants perceive the channel as becoming increasingly rich (experienced as an expansion in channel functionality) and they feel that other communication partners are co-located within the same channel space. Several studies have established the relationship between person interactivity and social telepresence [Venkatesh and Johnson 2002; Wang et al. 2007]. Borrowing from these past studies, the following hypothesis is presented:

H2: The greater the degree of person interactivity the customers experience, the greater the degree of social telepresence they will experience.

3.2. Perceived Behavioral Control

In this study, perceived behavioral control represents an intrinsically motivating aspect of human-computer interactions. It refers to the level of confidence customers have in their ability to control their online shopping process. Perceived behavioral control reflects: 1) the perceived control over access to descriptions of products/ services (information search); 2) perceived control over the access to interpersonal communications; 3) perceived control over the acquisition and purchasing processes; and 4) perceived control over the access that Web stores have over their personal information during online navigation process by taking into account past experiences and expected obstacles with the behavior [Hoffman et al. 1999].

3.2.1.Perceived Behavioral Control and Machine Interactivity.

Given sufficient levels of machine interactivity, customers can use the hypertext environment of the Web to search and control information at a deep level. The customers can interact with and change their environment through an interactive interface, a good mapping of the Web site, and a variety of different features that can be manipulated on the Web site (such as drop down menus, context-specific help menus, etc.). Through a highly interactive interface, customers can control the navigation process as they see fit; they can select customized content enabling shopping comparisons and speeding the process of finding the items [Weible and Wallace 1998] in different forms (text, graphic, audio); they can track their order information; and they can enter into a discussion with salespersons or other buyers when needed [Bandura 1997]. Through these experiences, customers' perceived behavioral control can be elevated. This expectation was confirmed in the study by Ariely [2000]. Consistent with this, we propose that machine interactivity is likely to significantly influence customers' perceived control and present the following hypothesis:

H3: A high degree of machine interactivity will lead to customers' increased perceived behavioral control toward online purchasing.

3.2.2.Perceived Behavioral Control and Person Interactivity.

Social cognitive theory posits that individuals develop self-efficacy beliefs or perceived behavioral control as a result of the information they receive from interaction with others [Bandura, 1997; Bolt et al. 2001]. Online feedback mechanisms via various online communication outlets (like e-mails, Web conferences, or message boards), allow customers to communicate their concerns with sellers or other customers in a more intimate and immediate way. This experience can enrich customers with socio-emotional content and allow customers to develop friendships in virtual communities [Parks and Roberts 1998]. Friendship, in turn, allows customers the confidence to request Web merchants to ensure that their information privacy will always be valued. Since there is no existing empirical evidence to support the linkage between person interactivity and perceived behavioral control, this study aims to fill this void by taking into account the above conjecture and presents the following hypothesis:

H4: A higher degree of person interactivity will lead to customers' increased perceived behavioral control toward online purchasing.

3.2.3.Perceived Behavioral Control and Physical Telepresence.

According to social cognitive theory, self-efficacy or perceived behavioral control is a form of self-evaluation which can be influenced by an individual's own experience [Bandura 1997; Bolt et al. 2001]. With the experience of physical telepresence, customers feel that the virtual environment that they are interacting with seems as real and dominant as the actual physical environment [Hoffman and Novak 1996]. This experience allows customers to develop confidence in traversing through the site in search of relevant information, to control the navigation process, to navigate anywhere they want as well as to disclose only the personal information that they want. Customers are permitted to experience and interact with an almost life-like shopping environment, 'in safety and at convenient times' and this experience allows customers to feel somehow in control of the interaction [Weiss and Jessel 1998]. In line with this, the following hypothesis is presented:

> H5: A higher degree of physical telepresence will lead to customers' increased perceived behavioral control toward online purchasing.

3.2.4. Perceived Behavioral Control and Social Telepresence.

In the context of online conference meetings, Buxton [1992] suggests that the creation of a sense of social telepresence of remote persons in real time is important in building confidence among conversational partners. He asserts that online communication should be encouraged to imitate face-to-face meetings because in such an environment, group members are able to observe each other's eye contact and facial expressions, and gestures. These experiences allow group members to feel confident in their role in the meeting. Several studies have tested the association between social telepresence and perceived behavioral control and found that social telepresence had a positive relationship with perceived behavioral control - see for instance Venkatesh and Johnson [2002]. The following hypothesis is, therefore, presented:

> H6: A higher degree of social telepresence will lead to customers' increased perceived behavioral control over online purchasing.

3.3. Attitudes Toward Online Purchasing

Available literature defines attitudes toward online purchasing as the degree to which a person has favorable or unfavorable evaluations/appraisals of the online purchasing [Jarvenpaa et al. 2000].

3.3.1. Attitudes toward Online Purchasing and Machine Interactivity.

Attitudes toward online purchasing can be derived from the experience of machine interactivity. Stern [1994] states that as a customer becomes interactive, "s/he goes somewhat farther, not only agreeing to cooperate with the communicator, but also responding to the message in real-time by means of seeking information or making a purchase" (p. 13). Machine interactivity appeals to customers because it allows customers to easily navigate through information that best matches their tastes and needs in real time [Ducoff 1996]. Customers' beliefs in these benefits in combination with their favorable evaluations of these aspects can encourage them to develop positive attitudes toward online purchasing with particular Web merchants. Several studies have found a positive relationship between machine interactivity and attitudes [Klein 1999; Li et al. 2002; Dongyoung et al. 2007]. This suggests the following hypothesis:

> H7: A higher degree of machine interactivity will lead customers to form a positive attitude toward online purchasing.

3.3.2. Attitude toward Online Purchasing and Physical Telepresence.

The relationship between physical telepresence and attitudes has also been examined in the literature [Klein 1999; Wright and Lynch 1995]. Croft et al. [1969] posit that the participants who perceive a high degree of physical telepresence generate a stronger level of favorable evaluations towards the object than those who perceive lower levels of physical telepresence. Their study showed that participants who watched live communication formed more extreme attitudes toward the presented message than those who watched a videotape of the same message. Other studies have also found that physical telepresence has a significant and positive impact on attitudes toward the Web site [Klein 1999; Coyle and Thorson 2001; Li et al. 2002; Velitchka and Barton 2006]. Based on these, this study hypothesizes that:

> H8: A higher degree of physical telepresence will lead customers to form a positive attitude toward online purchasing.

3.4. Subjective Norms toward Online Purchasing

In this study, subjective norms toward online purchasing are defined as the perceived social pressure from significant others in the online purchasing environment to perform or not perform online purchasing. It is perceived pressure, from salesperson or other customers (that interact with customers via an online communication) that approve or disapprove of what customers want to do when it comes to online shopping. This study proposes that subjective norms can be influenced by person interactivity and social telepresence.

3.1.1. Subjective Norms and Person Interactivity.

In line with previous research, customers' perceptions of social pressure or subjective norms can grow out of ongoing interaction with sellers-buyers or buyers-other buyers. Several studies have established that interpersonal communications with one another lead to familiarity and that, in turn, generally stimulates one's liking for that person in that it allows participants in the communication process to explore their similarities, to be familiar with each other, and to perceive themselves as a social unit or a community member [Walther 1994; Arkin and Burger 1980]. Having a good relationship with a salesperson through a chat room or e-mail, customers might perceive some social pressure to purchase online in conformance with the expectations of a salesperson. In other cases, customers might be active in an online discussion with friends or other customers through a message board, e-mail, chat room, newsgroup, etc. Word-of-mouth communication through such sources produces a reliable and trustworthy perception so that customers may decide to engage in an online purchase [Hoke and Galenskas 1997]. One of the few studies investigating the relation between the two dimensions of person interactivity (interpersonal closeness and shared values) and subjective norms, found that these two dimensions correlated positively with dimensions of social pressure [Burgoon 1999/2000]. Hence, it can be hypothesized that:

H9: The higher the degree of person interactivity the customers experience, the more favorable the subjective norms with respect to online purchases the customers will perceive.

3.4.2. Subjective Norms and Social Telepresence.

As amply documented in the social presence literature, when people have the sense that others are psychologically present and that communication is active, people have a tendency to expend considerable social energy trying to affiliate with and get others to like and appreciate them [Walther 1996]. According to the social influence literature, the presence of other people has potential in influencing people's conformity. Conformity refers to the fact that people tend to change their beliefs or actions as a reaction to real or imagined group pressure. Social comparison theory avers that people tend to compare their judgments and actions to those of others that are considered to be of equivalent standing. This behavior is done to increase the individuals' confidence that the information is accurate and relevant under conditions of high ambiguity [Abrahamson and Rosenkopf 1993].

Following the above logic, the perception that salespersons or others are psychologically present, over time, makes it relatively easy for customers to accept salespersons' or other customers' intentions, impressions, and persuasion attempts. Under ambiguous circumstances, such as when little reliable information is available, these social influence attempts become social pressure encouraging customers to comply with the norms of the pressure groups. For example, through e-mail correspondence, a salesperson may use the 'foot-in-the-door' technique [Freedman and Fraser 1966] by asking customers for a small request and then getting customers to purchase products or services online with the company, however, the consumers have a relatively easier option of disengaging from the buying process than in the physical environment by simply 'logging off' [van Dolen et al. 2007 and Dennis and Garfield 2003], especially when the salespersons are very aggressive. Another example is encouragement from other customers who already bought products from the company and posted relevant information about those products on the company's Web board. These examples show that social telepresence influences customers to 'feel' social pressure to perform an online purchase with a particular Web merchant.

Since no existing empirical study supporting the relationship between social telepresence and subjective norms has been identified, a potential contribution of this study is to test this linkage. Hence, this study hypothesizes that:

H10: The higher the degree of social telepresence the customers experience, the more favorable the subjective norms with respect to online purchases the customers will perceive.

3.5. Trust

In online shopping, customer trust is considered to be one of the most important concepts in business-to-customer e-markets (Hoffman et al. 1999]. This paper defines trust as the trustor's (consumer) willingness to rely on the trustee (online store) and take action in a situation involving the risk of opportunism (that is, a circumstance where such action makes the trustor vulnerable to the trustee), in the hope of a positive outcome. Beside the general business practices of online stores, privacy and security are major concerns determining consumers' willingness to trust Web vendors [Hoffman et al. 1999]. To build trust, this study postulates that favorable perceived behavioral control, attitudes towards online purchasing, and subjective norms with respect to online shopping are determinants of trust, and, accordingly, presents the following hypothesis:

3.5.1. Trust and Perceived Behavioral Control toward Online Purchasing.

In line with Hoffman et al's [1999] study, a nationwide survey found that the most important reason that people do not trust online shopping is not because of operational issues, but because of an issue related to control over their personal information [www.ehanrick.com 2001]. Customers perceive a lack of trust when they feel they lack control over the access that Web stores have over their personal information during the online navigation process.

Customer's lack of perceived behavioral control or confidence is assumed to reflect past experience as well as anticipated obstacles, which directly affect customers' perceptions of the security and privacy of online shopping [Hoffman et al. 1999]. Once customers feel that they have control over a computer-mediated environment, they will perceive lower risk from engaging in online transactions. Hence, if the Web vender incorporates these concerns into the site design, companies will be rewarded with customer trust. Customers will incur a state of willingness to rely on such Web vendors, that is, they will be more willing to disclose personal information and trust online purchasing with such vendors [Dwyer and LaGace 1986]. Therefore, this study hypothesizes that:

H11: A high degree of perceived behavioral control will lead to increased trust by customers.

3.5.2. Trust and Attitude toward Online Purchasing.

Of the few empirical studies which have examined how attitudes might influence trust, Garbarino and Johnson [1999] show that trust can be influenced by attitudes toward service experiences. Their rationale behind this link is based on trust and information-processing theories. As Morgan and Hunt [1994] postulated, one of the antecedents of trust is relationship benefits, which refers to superior benefits in products, services, processes, or technologies that firms continually seek out to add value to their own offerings. Relationship benefits are attitudes that arise as the products of cognitive and memory processes. Customers recognize these relationship benefits by synthesizing many experiences and perceptions about companies' services, products, processes, or technologies. It is a higher-order synthesis of information that customers deduce from other inferences or experiences. Therefore, positive attitudes towards a product or firm can serve as an antecedent to the formation of trust. In line with Garbarino and Johnson's work, this study expects that attitudes will lead to trust.

H12: More favorable attitudes toward online shopping will lead to increased perceptions of trust by customers.

3.5.3. Trust and Subjective Norms toward Online Purchasing.

Trust is a socially constructed concept that can also be formed through subjective norms or social pressure from significant others to perform a particular behavior [Nicholson et al. 2001]. To build trust, parties need the full information that comes from person-to-person interactions. A series of ongoing discussions or feedback become incentives for communicants to want to belong to the community and, consequently, feel the need to conform to the social norms established by that community. As a result, these social pressures may become incentives for cooperative conduct and the reduction of opportunism among communicants [Scott and Derlega 1983]; however, as acknowledged earlier, customers have relatively easier option of disengaging from the online buying process. Notwithstanding the aforesaid relative ease, Morgan and Hunt [1994] consider these incentives as determinants of the feeling of trust.

In the online context, salespersons and other customers may provide social pressure for customers to buy products/services from particular Web sites. Online dialogue between salespersons and customers via e-mail or customers and other customers via message boards or chat rooms may help foster communication, goodwill, and, thereby, trust by stimulating ones' liking for each other and ones' sense of being part of the particular community. Therefore, the customers may feel assured that their order will be fulfilled, their privacy will be protected, and their credit card numbers and personal information will not be hacked, hence, the following hypothesis is presented:

H13: A higher degree of positive subjective norms toward online purchasing will lead to increased trust by customers.

3.6. Intention to Purchase Online

A purchase is the ultimate concern of a Web provider. It is an activity that results in sales to the firm, and it is a direct measure of successful e-commerce. Prior research [Keiser and Krum 1976] has predominantly used purchase intention as a proxy for actual choice [Varadarajan 1986]. In this study, intention to purchase online refers to the stated inclination of a person to engage in online purchasing at a particular Web site. The interactivity of the Web environment is the key characteristic that allows customers to consider alternative purchases by providing information to help customers screen the choices, place an order and, at the same time, provides social interaction [Alba et al. 1997]. Favorable attitudes, perceived behavioral control, and subjective norms toward online purchasing will then be possible. The Web environment also provides the potential for establishing trust between the transacting parties. Consequently, attitudes toward online purchasing, perceived behavioral control, subjective norms toward online purchasing, and trust will influence customers to form intentions to purchase online.

3.6.1. Intention to Purchase Online and Perceived Behavioral Control

This study posits that a customer's intention to purchase online at a particular Web site increases as perceived behavioral control increases. Several studies have found that perceived behavioral control has a significant positive relationship with purchase intentions [Hoffman et al. 2000; Tan and Teo 2000]. Consequently, this study proposes that:

H14: A higher degree of perceived behavioral control toward online purchase will lead to increased intentions to purchase online by customers.

3.6.2. Intention to Purchase Online and Attitudes

Through learning and affective-cognitive consistency techniques, positively valued outcomes often increase one's feelings toward the behavior that leads to the achievement of the outcome. Following the same logic, this study posits that customers' favorable attitudes toward shopping online with particular Web sites, which arise from customers' beliefs about the consequences resulting from shopping with particular Web sites and the customers' affective responses to those consequences, will increase customers' intentions to shop with particular Web merchants. Theoretical and empirical justification for the link between attitude and intended behaviors can be found in the works of Lu and Lin [2002], and Tan and Teo [2000] . Therefore, the following hypothesis is offered:

H15: Favorable attitudes toward online purchases will lead to increased intentions to purchase online by customers'.

3.6.3. Intention to Purchase Online and Subjective Norms.

The justification for the link between subjective norms and intention to purchase can be explained via the mechanism of the collective effects of social influence on behavioral intention. Two types of social influences that customers may receive are: (1) informational influence, which occurs when customers accept information as evidence of reality, and (2) normative influence, which occurs when customers conform to the expectations of others [Bearden et al. 1986]. Kelman [1958] suggests that social influence operates through three processes: internalization, identification, and compliance. Internalization is a form of informational influence which is generated from accepting information from expert sources and integrating such information into one's cognitive system. Identification and compliance are forms of normative influence. While identification is produced by feeling a bond with a likable source and persists for as long as the likable source is still salient, compliance results from a powerful source having control over the message recipient in the form of rewards and punishments. Karahanna et al. [1999] maintain that the collective effects of these influences will lead to behavioral intentions; that is, shopping online. Several empirical studies have found a positive effect of subjective norms on intentions to adopt information technology [Hooft et al. 2004] and on purchase intention [Korgaonkar and Wolin 1999]. This study, therefore, offers the following hypothesis:

H16: The more favorable the subjective norms are with respect to purchasing online, the stronger the customer's intention will be.

3.6.4. Intention to Purchase Online and Trust.

Given the nature of transactions that occur among entities that have never met before and the difficulty for customers to assess product quality prior to purchase [Fung and Lee 1999], trust is considered crucial in the online transaction process. Several studies have found that privacy and security issues were the main concerns for customers in making decisions to shop on the Internet [Udo 2001; Hoffman et al. 1999]. Lynch et al's [2001] study suggested that trust positively led to purchase intention. Consequently, this study offers the following hypothesis:

H17: A high degree of trust will lead to increased customers' intentions to purchase online.

4. Methodology

4.1. Development of Measures

The following nine constructs were used in this study, namely: machine interactivity, person interactivity, physical telepresence, social telepresence, perceived behavioral control toward online purchasing, attitudes toward online purchasing, subjective norms toward online purchasing, trust, and intention to purchase online. The scales for this study were developed based on literature pertaining to these nine constructs in the model. Wherever possible, existing scales with previously established levels of reliability and validity were used to measure the variables, otherwise, new items were developed based on relevant literature reviewed on each construct, followed by a series of tests. Also, as suggested by Anderson and Gerbing [1984] and Bentler and Chou [1987], multi-item scales instead of a single nominal item were used to measure each latent construct. For each construct, the respondents were asked to rate their degree of agreement and disagreement with its measuring items on a 5-point Likert scale.

Following Steuer's definition, Machine Interactivity refers to "the extent to which users (customers) can participate in modifying the form and content of mediated environment in real time" [Steuer 1992, p. 84]. This study used a 12-item scale to measure four components of machine interactivity, namely: speed [Novak et al. 2000], range, mapping, and relevancy [Rao et al. 1998].

Person Interactivity is defined as the degree of social interconnectedness between customers and salespersons, or customers and other customers through an online medium [Dyson 1993]. Two components of person interactivity are interpersonal closeness and shared values. This study used a 5-item scale developed based on Liu's measure

[2003] to gauge interpersonal closeness. A new 4-item scale was developed based on Suntornpithug and Sherrell' [2006] measure of shared values.

Physical Telepresence is defined herein as the degree to which the customers psychologically perceive that they are present in the environment generated by the computer and that environment with which they are interacting is more real and dominates the actual physical environment (that is, the sense of being there in a mediated environment) [Steuer 1992]. A 4-item scale was used to measure physical telepresence [Novak et al. 2000].

Social Telepresence refers to the degree to which the customers psychologically perceive a person to be physically present when interacting with him/her via an online communication [Lombard and Snyder-Duch 2001]. This study used a 4-item scale developed based on Nowak's measure [2001]

Perceived Behavioral Control toward Online Purchasing is defined as the level of confidence that customers have in their ability to control their online shopping process. A 5-item scale based on Novak et al's [2000] and Tan and Teo's [2000] work was used to measure perceived behavioral control toward online purchasing.

Attitude toward Online Purchasing is defined as the degree to which a person has a favorable or unfavorable evaluation or appraisal of the online purchasing experience. A 5-item scale, of which 4 items were derived from Novak et al's [2000] measure of attitudes (Cronbach's alpha = .861) and 1 new item was developed to capture overall attitudes, was used to measure a consumers' attitudes toward online purchasing with a particular Web store.

Subjective Norms toward Online Purchasing are defined as the perceived social pressure from significant others in the online purchasing environment to perform an online purchase. A 3-item scale was developed to measure this construct. This measure comprised the following referents: salespersons or other customers that the customers were interacting with through the use of online communication available on the Web site.

This paper defines trust as the trustor's (consumer) willingness to rely on the trustee (online store) and take action in a situation involving the risk of opportunism; (that is, a circumstance where such action makes the trustor vulnerable to the trustee), in the hope of a positive outcome. 6 items adapted from Smith et al's [1996] study were used to reflect consumer information privacy concerns. 5 items pertaining to consumers' security concerns were modified from Cheung and Matthew's [2000] study to capture the information security aspect of trust. The additional 3 items, adapted from Miyazaki and Fernandez' [2001] measure, were used to capture consumers' feeling of trust toward business practices of particular online stores.

Intention to purchase online refers to the consumer's perceived likelihood of purchasing the products or services online [Dodds et al. 1991]. 3 items were adapted from Nowlis and Simonson [1997] and 2 items were derived from Yoo and Stout's [2001] work. In sum, 61 scale items were used in this study - see Appendix 1 for a complete listing.

4.2. Data Collection

An invitation to participate in an online survey questionnaire was sent to 3,712 of the SurveyComplete's online panelists who had agreed to participate in the study in exchange for a chance to win one of three DVD players as prizes in a drawing. A total of 1,744 usable responses were returned, resulting in a 47 percent response rate. The wave analysis method [Armstrong and Overton 1977] was used to assess nonresponse bias by comparing early respondents with those of the late respondents. The results showed that there were no differences in the distributions between the early respondents and the late respondents in terms of gender, age, annual household income, household purchase decision making role, number of years using the Web, types of Web users, internet access, and internet access speed, indicating that there was an absence of response bias in the collected data. The characteristics of the respondents to this survey were comparable to recent 2009 Internet user profiles [Pew Research Center 2010]. On gender, the 1,744 respondents were split between male (41%) and female (59%). Most respondents were fairly young, between the ages of 20 to 29 (28%); had some college education (34%); were from households with fairly high household incomes (more than $60,000) (32%); made almost half of their household's purchase decisions (37%); had over four years experience with the internet (80%); considered themselves average internet users (44%); had fast internet access speed (43%); made an online purchase less than once a month (41%); and reported spending between $100-$500 on purchases through online stores in the past 6 months (42%).

5. **Data Analysis**

Following Anderson and Gerbing [1988], a two-step model building approach was employed, wherein the measurement models were tested first, then the measurement parameters were fixed while the structural model was tested. Since this study had sufficiently large sample size to conduct a cross-validation test to minimize error probability and capitalization on chance, the 1,744 usable responses were randomly split into two equal groups of 872 respondents each so as to determine whether the results from the second group (model validation) replicated the results from the first group (model estimation) in terms of the estimated parameters and relationships with the constructs.

Initially, the evaluation of skewness and kurtosis characteristics of the data distributions was conducted and the results showed that the measurement items for this study were normally distributed and the multivariate normality assumption was met (i.e., skewness and kurtosis values less than the critical values recommended by Byrne [1971]).

5.1. Model Estimation Sample

5.1.1. Measurement Model

Confirmatory factor analysis (CFA) was used to test the measurement model specifying the posited relations of the observed variables or measurement items to the underlying constructs. Through the process of CFA, items were candidates for refinement or deletion from the proposed measurement model if they: 1) demonstrated insignificant loadings for the expected construct (t <1.96); 2) had low squared multiple correlation ($r^2 < 0.40$); 3) showed several large residuals with other indicators (standardized residuals >2.58); 4) shared large, unexplained variance due to correlated errors with other indicators (modification indices of Theta Delta >3.84); or 5) shared common variance with multiple indicators of some other construct(s) (modification indices of Lambda X >3.00 [Bagozzi and Yi 1988]). This refinement and item deletion process was followed until the goodness-of-fit criteria recommended in the literature were attained - see Bagozzi and Yi [1988]). Additionally, the set of measures for each construct was examined for individual item reliability as well as evidence of construct, convergent, and discriminant validity.

The nine-construct model was evaluated using the 61 items. The measurement model was checked to assure that the parameter estimates exhibited the correct sign and magnitude and were consistent with underlying theories. The initial model did not achieve an acceptable level of goodness-of-fit (chi-square = 7,176.13, d.f. =1,733; normed chi-square = 4.14; p $\leqslant$ 0.0; Root Mean Squared Error of Approximation (RMSEA) = 0.067), compared to the suggested thresholds (i.e., a probability value of the chi-square tests greater than 0.05; normed chi-squared less than 3.0; GFI and CFI greater than 0.90; AGFI greater than 0.80, and RMSEA less than 0.05 indicate a satisfactory model fit [Bagozzi and Yi 1988]).

Given the inability of the initial model to reach the recommended threshold levels, a modification procedure was followed to try to improve the fit of the proposed measurement model to the data. The final CFA model with the remaining 34-item model produced an adequate fit with a chi square of 1,391 (df = 491), p $\leqslant$ 0.0, $\chi 2/df$ = 2.8, GFI=0.91, AGFI=0.89, CFI=0.95, RMSEA=0.049. It is noted that the chi-square index is sensitive to sample size differences (i.e., the increased sample size will tend to lead to a significant chi square), hence, the normed chi square (the ratio of the chi square divided by the degree of freedom) along with other fit indices were used to determine whether the model fits the data. The results showed that the χ^2/df statistic for the revised measurement model was less than 3.0, suggesting that the measurement model fit the sample data well. The commonly cited fit indices such as GFI and CFI were all greater than 0.90, AGFI was greater than 0.80, and RMSEA was less than 0.50, suggesting an excellent model fit.

The individual item reliability or squared multiple correlations of 34 items were closer to or greater than the recommended .40 threshold [Bollen 1989]. All constructs had composite reliability values ranged between 0.81 and 0.93, which were greater than the 0.60 threshold, suggesting acceptable levels of reliability for all constructs [Bagozzi and Yi 1988]. The average variance extracted values for all constructs ranged between 0.49 and 0.77. All constructs had average variance extracted values close to (machine interactivity) or above (person interactivity, physical telepresence, social telepresence, perceived behavioral control, attitudes, subjective norms, trust, and online purchase intention) the recommended level of 0.50 [Bagozzi and Yi 1988]. Also, within each construct, factor loadings were acceptable (Lambda-X > 0.5) and significant (t-statistics > 1.96), suggesting that all constructs achieved acceptable degree of convergent validity [Anderson and Gerbing 1988].

Finally, after comparing the average variance extracted to squared correlations for each item, the results indicated that all pairs of constructs (except for control and attitudes) had average variance extracted larger than the construct's shared variance (the squared correlations or phi 2) [Fornell and Larcker 1981]. Therefore, it can be concluded that all constructs satisfied discriminant validity requirements.

5.1.2. Structural Model

Using the model estimation sample (n=872), structural equation modeling (SEM) was used to estimate parameters of the hypothesized structural model specifying theoretical relationships between or among the nine constructs (machine interactivity; person interactivity; physical telepresence; social telepresence; perceived behavioral control; attitudes; subjective norms toward online shopping; trust; and intent to purchase online).

5.1.2.1. Base Model

The structural model was analyzed based on the modified, 34-item measurement model discussed in the previous section using a maximum likelihood estimation method – see Appendix 2 and Appendix 3 for the 34 scale items. The measurement model loadings and error terms for each indicator were fixed at their corresponding values from the CFA for the measurement model. Given these nine constructs, 5 items loaded onto machine interactivity; 3 items loaded onto person interactivity; 3 items loaded onto physical telepresence; 4 items loaded onto social

telepresence; 3 items loaded onto perceived behavioral control; 4 items loaded onto attitudes; 2 items loaded onto subjective norms; 7 items loaded onto trust; and 3 items loaded onto intent to purchase online.

The hypothesized relationships among the constructs are displayed in Figure 1 where machine interactivity ($\xi 1$) and person interactivity ($\xi 2$) were considered as exogenous variables; physical telepresence ($\eta 1$), social telepresence ($\eta 2$) perceived behavioral control ($\eta 3$), attitudes ($\eta 4$), subjective norms toward online shopping ($\eta 5$), trust ($\eta 6$), and intention to purchase ($\eta 7$) were considered as endogenous variables.

An initial analysis revealed some misfit in the model to the data, suggesting that the proposed initial model could be improved (chi Square = 2,036.72, d.f. = 568, $x2/df$ = 3.6; p $\leqslant$ 0.0, and GFI = 0.87, AGFI = 0.87; CFI = 0.92; RMSEA=0.059).

5.1.2.2.Revised Model Based on Modification Indices:

A review of modification indices suggested that the initial structural model would fit the data better if a direct path from perceived behavioral control to attitudes (Beta 4,3) was added. The value of the modification index of Beta (4,3) was 258.55. It was reasonable to assume that online shoppers who possess a high degree of confidence in internet shopping would be more likely to rate online shopping favorably. Koufaris et al's [2002] study found that perceived behavioral control was positively associated with consumers' attitudes towards online shopping. In line with that finding, this study added the Beta (4,3) path to the model. The re-estimations provided a final structural model exhibiting evidence of a good fit to the collected data (chi Square = 1,442.85, d.f. = 566, $x2/df$ = 2.54; p $\leqslant$ 0.0, and GFI = 0.90, AGFI = 0.90; CFI = 0.95; RMSEA=0.046).

It is noted that since measures for perceived behavior control and attitudes did not meet the criterion for good discriminant validity (i.e., the measures for these two constructs may not differ from each other), this linkage between perceived behavioral control and attitudes may be speculative and possibly an artifact of the measurement properties of the scales and therefore, the inclusion of this linkage in the model is simply done for the purpose of improving model fit. Further research on this linkage is needed.

The post-hoc chi-square differences tests [Anderson and Gerbing 1988] revealed statistically significant differences between the initial and revised models at the significance level of 0.01 (Chi-square critical value is 6.635). The final revised model for this study is shown in Figures 2 and 3.

5.1.3.Structural Model Hypotheses Tests

The 17 hypotheses that were proposed were tested using structural equation modeling on both the estimation and validation samples. Whereas the results of the analyses of the model estimation sample are shown in Appendix 4, these are superimposed and diagrammatically depicted in Figure 2. Figure 3 shows the corresponding results for the validation sample. The standardized coefficients and t-values for each hypothesized path are reported in both Figures 2 and 3. In both cases, the standardized coefficient explains the correlation between two constructs. The path coefficients with t-values exceeding the critical value of 1.96 (significant level of .05) were considered significant. The solid lines in both figures represent the significant paths whereas dotted lines show nonsignificant paths. Numbers are the standardized path coefficients with t-values in parentheses.
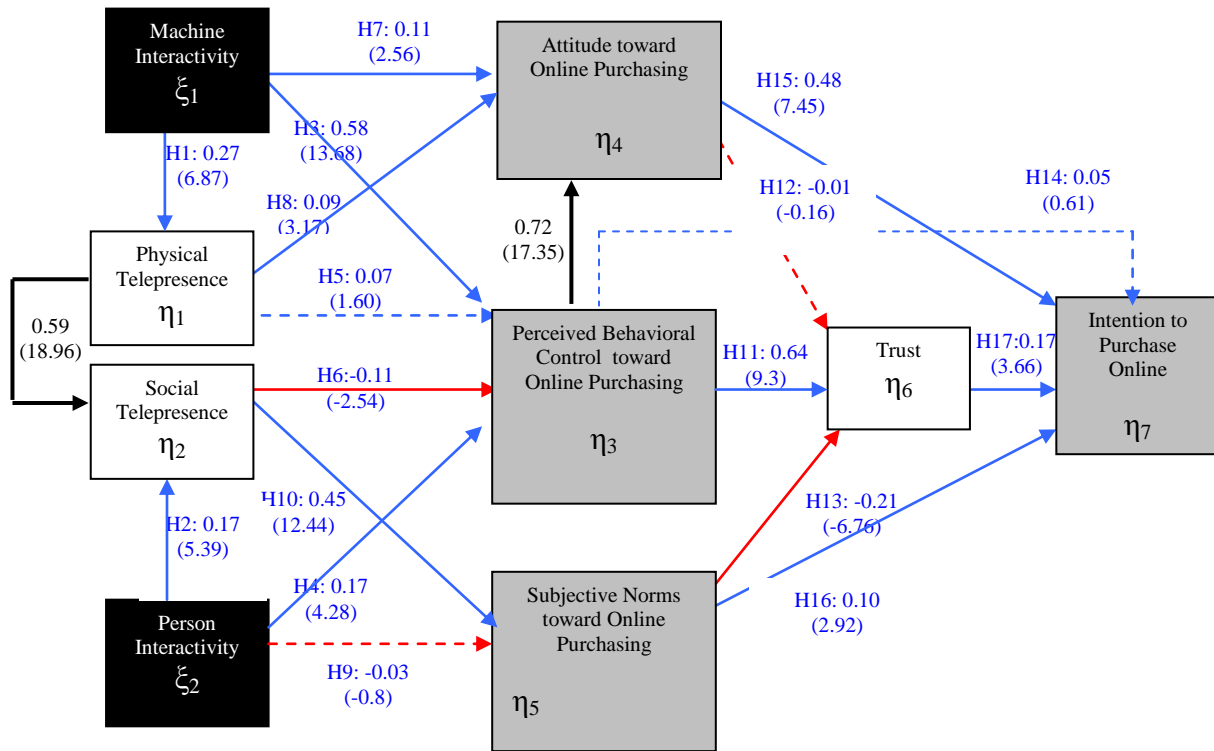
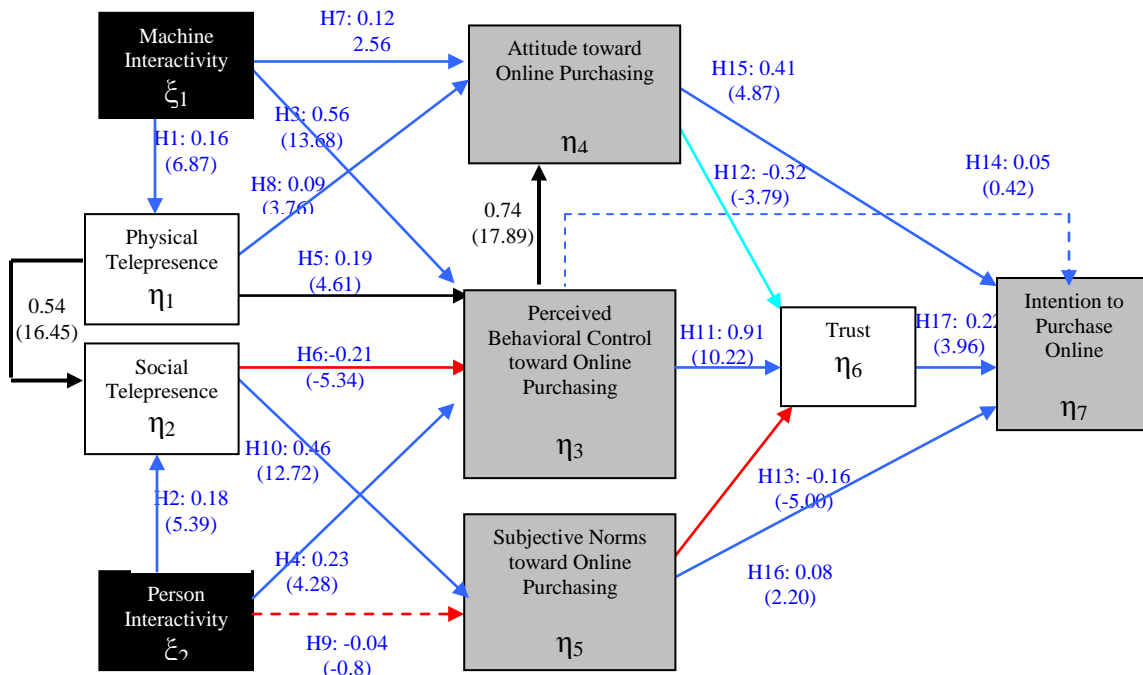Figure 2: Results of Equation Modeling of the Estimation Sample

Figure 3: Results of Equation Modeling of the Validation Sample

5.2. Model Validation Sample

The second sample (model validation sample of n = 872) was used for validation and replication purposes. The majority of the results (measurement model and structural model) obtained from the model validation sample fit

the data from the model estimation sample. Consistent with the results of the model estimation sample, 14 out of 17 hypotheses were significant and 11 of these were in the predicted direction (H1, H2, H3, H4, H7, H8, H10, H11, H15, H16, and H17). The only difference was the results of hypothesis 5. While the SEM analysis results of the model estimation did not show a significant effect of physical telepresence on perceived behavioral control (standardized coefficient = 0.07, t-value = 1.60), the results of the model validation sample showed a significant effect of this linkage (standardized coefficient = 0.19, t-value = 4.61, $p \leq 0.005$). It is noted that although the result for the model estimation sample did not show significant effect, its t-value was close to the critical value of 1.96 at a significance level of 0.05 and the result was in the predicted direction. Therefore, it can be stated that the measurement model and structural model from the estimation sample were reliable and valid.

5.3. Hypotheses Testing

The analysis of the final revised structural equation model of both model estimation and validation samples showed that eleven out of seventeen hypotheses were supported (H1, H2, H3, H4, H7, H8, H10, H11, H15, H16, and H17). Hypothesis 5 was insignificant when using the model estimation sample; however, it was significant when using the model validation sample. Hypothesis 14, though not significant for both samples, was in the predicted direction. The other five hypotheses (H6, H9, H12, H13, and H14) were not supported because the results were not in the predicted direction as suggested by the literature in the virtual reality area. In addition to 17 proposed paths (17 hypotheses), two additional paths were recommended (control → attitudes and physical telepresence → social telepresence).

Accordingly, the structural equation model analysis of the direct effects of each construct concluded that online consumers who perceived that they browsed a Web site that was fast, easy to navigate, and had relevant information (machine interactivity) were more likely to be immersed in the environment defined by the Web content and felt as though they were shopping in a real store (physical telepresence) (H1). These results were consistent with the findings of studies by Klein [1999], Coyle and Thorson [2001], and Li et al. [2002].

This study also showed that consumers who felt a high degree of machine interactivity and/or physical telepresence were more likely to feel confident in participating in online shopping (H3 and H5, respectively) and were more likely to have positive attitudes toward shopping with a particular online store (H7 and H8, respectively). These findings were consistent with previous studies - H3: [Ariely 2000]; H5: [Kim and Biocca 1997]; H7: [Klein 1999; Li et al. 2002]; H8: [Klein 1999; Coyle and Thornson 2001; Li et al. 2002]).

Person interactivity was found to have a positive relationship with social telepresence (the sense that other persons are actually co-located within a virtual space) (H2) as supported by previous studies [Venkatesh and Johnson 2002; Carlson and Zmud 1999] and with perceived behavioral control (H4). However, the findings did not show that person interactivity led to subjective norms toward online purchasing (H9), and this may imply that online shoppers did not necessarily see interpersonal interaction with salespersons or other customers as major sources of social pressure to purchase online.

Social telepresence was found to have a positive relationship with subjective norms toward online shopping with particular Web sites (H10), but not with perceived behavioral control (H6), which may result from the fact that online shoppers may feel intimidated or less comfortable with the perceived presence of salesperson [Beech et al. 2000].

Three concepts from the theory of planned behavior--perceived behavioral control, attitudes, and subjective norms-- were hypothesized to have positive effects on trust. However, the results showed that only perceived behavioral control had significant positive effects on trust (H11), while attitudes and subjective norms toward online shopping did not show positive effects on trust (H12 and H13, respectively). Therefore, this study's findings imply that online shoppers did not use their attitudes and perceived social pressure as cues to activate their trust toward the online store. This finding contradicts findings from a previous study by Garbarino and Johnson [1999].

Finally, attitudes (H15), subjective norms (H16) toward online purchasing with a particular Web site, and trust (H17) were found as immediate determinants of intention to purchase online. These findings were consistent with previous research - H15: [Tan and Teo 2000; Lynch et al. 2001]; H16: [Korgaonkar and Wolin 1999]. However, perceived behavioral control toward online purchasing did not have a significant effect on intention to purchase online (H14), while other research [Hoffman et al. 2000; Tan and Teo 2000] found a significant relationship between perceived behavioral control and intention to purchase online.

5.4. Post Hoc Analyses of Total Effects of Machine Interactivity vs. Person Interactivity

It is also interesting to compare the relative total effects of machine interactivity with those of person interactivity on perceived control, trust, and intention to purchase online. As shown in Table 1, the analyses of the model estimation sample disclosed that machine interactivity (standardized coefficient = 0.58, t = 14.21) had higher total effects than those of person interactivity (standardized coefficient = 0.15, t = 3.82) on *perceived behavioral control*. Machine interactivity (standardized coefficient = 0.35, t = 11.39) was also found to have stronger total

effects than person interactivity (standardized coefficient = 0.08, t = 3.23) on *trust*. Similarly, machine interactivity (standardized coefficient = 0.36, t = 12.27) had stronger total effects than person interactivity (standardized coefficient = 0.08, t = 3.85) on *intention to purchase online*. The analyses of the model validation sample disclosed that machine interactivity (standardized coefficient = 0.58, t = 15.17, p ≤ 0.005) had higher total effects than those of person interactivity (standardized coefficient = 0.19, t = 5.30, p ≤ 0.01) on *perceived behavioral control*. Machine interactivity (standardized coefficient = 0.34, t = 10.74, p ≤ 0.005) was also found to have stronger total effects than person interactivity (standardized coefficient = 0.12, t = 4.67, p ≤ 0.005) on *trust*. Similarly, machine interactivity (standardized coefficient = 0.33, t = 12.40, p ≤ 0.005) had stronger total effects than person interactivity (standardized coefficient = 0.19, t = 5.00, p ≤ 0.01) on *intention to purchase online*. These findings were consistent with the results of the model estimation sample

Table 1: Total Effects of Machine Interactivity vs. Person Interactivity
      (The Model Estimation Sample)

Independent Construct	*Dependent Construct*	*Direct Effects*	*Indirect Effects*	*Total Effects*	*t-value (Total Effects)*
MACHINT	CONTROL	0.58	0	0.58	14.21***
PERINT	CONTROL	0.17	-0.02	0.15	3.82***
MACHINT	TRUST		0.35	0.35	11.39***
PERINT	TRUST		0.08	0.08	3.23***
MACHINT	INTENT		0.36	0.36	12.27***
PERINT	INTENT		0.08	0.08	3.85***

6. Research Implications and Conclusion

A recent survey by MarketingSherpa indicated that the average shopping cart abandonment rate was nearly 60 percent, showing that Web vendors still face the problem of converting these site visitors into real purchasers [Tejada, 2008]. The great challenge to the Web merchants, therefore, goes beyond attracting customers to their Web sites. Web stores need to create a compelling Web site that will entice potential customers to actually purchase products from them.

6.1. Practical and theoretical Implications

This study proposes and tests an interactivity model. It identifies two dimensions of interactivity (machine interactivity and person interactivity) as key underlying factors behind the potential success of Web commerce design. The findings offer promising value to Web vendors in at least five ways.

First, by understanding that both dimensions of interactivity (machine and person interactivity) can lead to potential sales using Web commerce, and that establishing these two types of interactivity is not beyond the current capability of interactive design, Web vendors can improve their Web sites by not only making their sites fast, easy to navigate, and customizable to customers' needs (machine interactivity), but also by focusing more on promoting interpersonal communication through customer-to-salesperson and customer-to-customer interaction. Web vendors can do this by paying more attention to customers' feedback and allowing customers to interact with other customers through product or service reviews.

Second, this study examines the priority of machine interactivity and person interactivity in delivering desirable outcomes. In a context of competing goals and limited resources, Web vendors may be forced to invest in one type of interactivity over the other. Obtained results will be helpful in facilitating efficient allocation of resources by Internet firms, which are better able to target key kinds of customers and, thereby, can result in a higher return-on-investment. By creating a Web site with high machine interactivity, Web vendors could enhance the value of product information presented and engage customers in an active shopping experience, increase customers' positive attitudes, and boost customers' perceived control over the shopping process with particular Web sites. While customers' perceived control over online shopping, through customers' perceptions of trust, resulted in customers' intention to purchase products or services online, attitudes and subjective norms could lead to intention to purchase online directly and ultimately could turn the intention into an actual purchase online. Therefore, Web vendors should make sure that their Web sites load quickly, have little waiting time between each click, are easy to navigate, and have relevant and helpful product information immediately accessible.

Person interactivity was found to be an effective strategy for increasing social telepresence, improving customers' confidence in buying online, and increasing favorable subjective norms through social telepresence, resulting in customers' perception of trust toward the Web site. Consequently, the high degree of subjective norms and trust led to intention to purchase online. Therefore, Web managers may find that strategies that emphasize customers' needs, wants, and satisfaction will lead to incoming revenues. For example, to tailor solutions that

enhance customers' emotional interconnectedness with the Web vendors, sites should establish intimacy, immediacy, or shared values with the customers through online communication via an email or chat room when necessary. This way, customers can receive communications that are better fitted to their needs and lifestyles, and the online vendors can benefit from a group of high-value repeat customers.

Third, physical telepresence/social telepresence are proposed to be the bridges between machine interactivity/person interactivity and other satisfying outcomes, leading to intentions to purchase online. The results showed that physical telepresence (the perception of a direct shopping experience in a mediated environment) had positive effects on customers' attitudes and perceived behavioral control in the same way as those of a direct experience. Therefore, to enhance customers' attitude and perceived control toward a particular Web site, a Web merchant should develop a Web site that has high interactivity, which can lead to physical telepresence by including features on the site that allow customers to sample a product while surfing the Internet (for instance, design T-shirts, test-drive a car, tour the house, use the program demo, etc.).

For social telepresence, the findings showed that the subjective sensation that remote persons are actually co-located within a virtual space is important in exerting social pressure for customers to buy products online. By recognizing that customers expect interactive communication with salespersons to be more like the real-time, face-to-face interaction that occurs in personal selling, vendors can move away from the asynchronous, one-way communication used on most Web sites today. Web vendors should take full advantage of the interactive characteristics of the Internet by investing the time and money to build a Web site that affords social telepresence, and focus more on a dialogue with their customers in a bid to lessen the unpredictable elements in customers' purchase behaviors. Careful training of representatives of Web vendors in online dialogue would subsequently be needed.

Fourth, trust has a positive impact on intention to purchase online. The results revealed that a Website's trustworthiness was crucial in encouraging customers to shop and purchase products or services at a particular Web site. Therefore, Web managers need to systematically develop the trustworthiness of their Websites. For example, Web vendors can add features such as customer-service guarantees, third-party certifications of a site's credibility, and former customer testimonials.

Finally, machine interactivity, person interactivity, physical telepresence, and social telepresence scales used in this study can be utilized by Web businesses to measure the degree of interactivity and telepresence of the sites. These scales, in conjunction with perceived control, attitudes, subjective norms, trust and intention to purchase online scales, will be useful indicators of the potential success of a Web merchant.

6.2. Future Research

The clarification of the role of both machine interactivity and person interactivity on desirable outcomes made in this study will hopefully prompt more interest from other practitioners and researchers; and, hence, future empirical research can be done to purify the understanding of this important interactivity construct and the impact of its utilization on shopping cart abandonment rate.

Future research can extend this study for example, by testing whether this interactivity model holds across different customers' experiences, shopping orientation, types of products, countries, etc. Future studies could replicate and extend the current work by including these variables as potential moderators with a view toward further understanding the roles of machine interactivity and person interactivity in the online purchasing process. Lastly, in the current study, machine interactivity, person interactivity, physical telepresence, and social telepresence were measured through self-reporting by asking the subjects to express agreement or disagreement with the statements and give a numerical value to each level of agreement on a five-point Likert scale. There is a chance that self-reported sensory evaluations may either inflate or underrate the real effects. Therefore, it would also be valuable to replicate the current study by using a laboratory experiment in future research.

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Appendix 1: Scale Items

Code	Scale Items
	MACHINE INTERACTIVITY
V1	Interacting with this Web site is TEDIOUS.
V2	Pages on this Web site usually load QUICKLY.
V3	When I browse information on this Web site, there is VERY LITTLE WAITING TIME between my actions and the computer's response.
V4	It feels NATURAL navigating through this Web site.
V5	Navigating this Web site is COMPLICATED
V6	Interacting with this Web site is INTUITIVE.
V7	The number of different ways that I can interact with the information on this Web site is LIMITED. (e.g., zoom pictures, search products in the price ranges, and etc.)
V8	The range of what can be manipulated on this Web site is NARROW (e.g., hyperlinks, drop down menus, search engine, image map, and etc.).
V9	At any time, there are MANY different actions (e.g., cancel order, add coupon, contact customer service, choose means of delivery, track orders, and etc.) available to me as I navigate through this Web site.
V10	This Web site makes relevant product information IMMEDIATELY ACCESSIBLE.
V11	This Web site supplies HELPFUL relevant product information (e.g., product description, product pictures, price, reviews by other customers, and etc.).
V12	The information provided on this Web site is CUSTOMIZED to my needs.
	PERSON INTERACTIVITY
V13	On this web site, if a visitor submits a request, the request is answered promptly.
V14	This web site values visitors' shopping satisfaction.
V15	On this web site, it is easy to find the telephone number on the web site.
V16	This web site is interested in gathering visitors' feedback.
V17	This web site is interested in what visitors to the site have to say.
V18	This web site has page for recording customers' reviews and recommendation on products or services.
V19	This web site encourages visitors to interact with a salesperson (e.g., via e-mail, chat room, etc).
V20	This web site encourages visitors to interact with the site.
V21	This web site facilitates two-way communication between the visitors and the site.
	PHYSICAL TELEPRESENCE
V22	I feel like I AM IN a 'virtual reality' when I enter this Web site.
V23	When I enter this Web site, I feel that I am PARTICIPATING in a real environment.
V24	I forget about my immediate surroundings when I enter this Web site.
V25	When I enter this Web site, I am totally ABSORBED in the online environment.
	SOCIAL TELEPRESENCE
V26	This Web site allows me to talk to salespersons or other customers on-line as though they were in the same room.
V27	On this web site, I feel a sense of being face-to-face with a salesperson.
V28	On this Web site, I feel that other people (e.g., salespersons, other customers, and etc.) via an online communication seem 'REAL.'
V29	This Web site makes me feel I could get to know other people (e.g., salespersons, other customers, and etc.) that I met at this web site.
	PERCEIVED BEHAVIORAL CONTROL
V30	I feel that I have CONFIDENCE over my product/services search on this Web site.
V31	I find it is EASY to access customer services at this Web site.
V32	I clearly know the RIGHT THINGS TO DO (not confused) about the transaction process (e.g., paying process) at this Web site.
V33	I feel COMFORTABLE with a level of the security this Web site provides in the payment process.
V34	I feel I HAVE ENTIRE CONTROL over my personal information during online navigation process on this Web site.
	ATTITUDES
V35	Shopping with this online store is PLEASANT.

Code	Scale Items
V36	Shopping with this online store has MANY BENEFITS (e.g., fast, easy, convenient, and etc.).
V37	I am CONTENT shopping with this online store.
V38	Shopping with this online store SATISFIES my needs.
V39	In general, I have GOOD ATTITUDES toward online shopping with this online store.
	SUBJECTIVE NORMS
V40	I would like very much to make PURCHASES with this online store because others think I should do it.
V41	If other buyers think that purchases with this online store are valuable, THEN I SHOULD BUY online.
V42	Others strongly support MY PURCHASING with this online store.
	TRUST
V43	I feel SECURE about the electronic payment system of this online store.
V44	This online store ENSURES that transactional information is protected from being accidentally altered or destroyed during transmission on the Internet.
V45	I think that the security of my personal information is AT STAKE when shopping with this online store.
V46	I think that this online store IMPLEMENTS security measures to protect my information from hackers.
V47	I think that this online store has the ABILITY to verify my identity for security purpose.
V48	I think that this online store will share my personal information with other companies WITHOUT my authorization.
V49	It BOTHERS me when this online store asks me for personal information.
V50	I think that this online store is collecting TOO MUCH personal information from me.
V51	I think that this online store will use my personal information for other purposes WITHOUT my authorization.
V52	I think my personal information in this online store's database is NOT ACCURATE.
V53	I think that UNAUTHORIZED people (i.e., hackers) have access to my personal information when shopping at this online store.
V54	There might be general MISREPRESENTATIONS OR FRAUD shopping with this online store.
V55	I feel shopping with the online store has LOW POTENTIAL for NON-delivery of ordered products.
V56	In general I TRUST shopping with this online store.
	INTENTION TO PURCHASE
V57	I am LIKELY TO BUY with this online store even though all OTHER VENDORS (e.g., television home shopping, catalogues and mail order, and 800-number purchases) could offer the same product with the same price.
V58	I am LIKELY TO PURCHASE with this online store even though other WEB VENDORS could provide the same product with the same price.
V59	I am LIKELY TO PURCHASE with this online store even though other CONVENTIONAL STORES could provide the same product with the same price.
V60	I am LIKELY TO VISIT this online store again in the future.
V61	I am LIKELY TO RECOMMEND this online store to my friends.

Appendix 2: Individual Item Reliability, Composite Reliability, and the Average Variance Extract of the Model Estimation Sample

Item	Standardized Factor Loading (Lambda)	t-Values	Squared Multiple Correlation (R^2)	Error Variance	Composite reliability	Average Variance Extracted
Machine Interactivity					0.83	0.49
V4	0.75		0.56	0.44		
V2	0.70	19.07	0.50	0.51		
V3	0.73	19.73	0.53	0.47		
V10	0.67	18.16	0.45	0.55		

Item	Standardized Factor Loading (Lambda)	t-Values	Squared Multiple Correlation (R^2)	Error Variance	Composite reliability	Average Variance Extracted
V11	0.63	16.99	0.39	0.60		
Person Interactivity					**0.86**	**0.68**
V17	0.91		0.83	0.17		
V16	0.89	31.13	0.79	0.21		
V18	0.65	20.97	0.42	0.58		
Physical Telepresence					**0.84**	**0.65**
v24	0.91		0.84	0.17		
v22	0.58	18.17	0.33	0.66		
V25	0.89	32.04	0.79	0.21		
Social Telepresence					**0.92**	**0.74**
V28	0.88		0.77	0.23		
V26	0.82	30.56	0.66	0.33		
V27	0.87	34.29	0.75	0.24		
V29	0.88	34.86	0.77	0.23		
Perceived Control					**0.81**	**0.58**
V30	0.81		0.65	0.34		
V32	0.76	22.95	0.58	0.42		
V34	0.72	21.59	0.52	0.48		
Attitudes					**0.93**	**0.77**
V37	0.92		0.84	0.15		
V36	0.79	31.42	0.63	0.38		
V38	0.87	38.70	0.76	0.24		
V39	0.92	44.62	0.85	0.15		
Subjective Norms					**0.87**	**0.77**
V40	0.90		0.81	0.19		
V41	0.86	18.45	0.75	0.26		
Trust					**0.89**	**0.54**
V51	0.82		0.68	0.33		
V45	0.59	17.69	0.34	0.65		
V48	0.77	24.83	0.59	0.41		
V50	0.72	22.59	0.51	0.48		
V52	0.76	24.57	0.58	0.42		
V53	0.75	24.07	0.56	0.44		
V54	0.71	22.55	0.51	0.50		
Intention to Purchase					**0.85**	**0.66**
V57	0.87		0.76	0.24		
V58	0.84	26.69	0.71	0.29		
V59	0.71	22.07	0.50	0.50		

Note: The first item in each set of scale items was set to 1.00 to set the scale for its intended construct.

Appendix 3: Individual Item Reliability, Composite Reliability, and the Average Variance Extract of the Model Validation Sample

Item	Standardized Factor Loading (Lambda)	t-Values	Squared Multiple Correlation (R^2)	Error Variance	Composite reliability	Average Variance Extracted
Machine Interactivity					0.82	0.48
V4	0.71	- -	0.50	0.50		
V2	0.72	18.35	0.51	0.48		
V3	0.73	18.58	0.53	0.47		
V10	0.66	17.05	0.44	0.56		
V11	0.63	16.21	0.39	0.60		
Person Interactivity					0.84	0.64
V17	0.90	- -	0.80	0.19		
V16	0.88	27.03	0.77	0.23		
V18	0.58	17.78	0.34	0.66		
Physical Telepresence					0.82	0.60
v24	0.87		0.75	0.24		
v22	0.59	17.46	0.35	0.65		
V25	0.84	24.58	0.71	0.29		
Social Telepresence					0.90	0.69
V28	0.87	- -	0.77	0.24		
V26	0.77	26.77	0.59	0.41		
V27	0.84	30.96	0.71	0.29		
V29	0.85	31.41	0.72	0.28		
Perceived Control					0.77	0.53
V30	0.73	- -	0.54	0.47		
V32	0.74	20.09	0.55	0.45		
V34	0.71	19.37	0.51	0.50		
Attitudes					0.93	0.76
V37	0.91	- -	0.82	0.17		
V36	0.80	31.58	0.64	0.36		
V38	0.85	35.77	0.73	0.28		
V39	0.92	42.08	0.84	0.15		
Subjective Norms					0.84	0.72
V40	0.85	- -	0.72	0.28		
V41	0.85	16.22	0.72	0.28		
Trust					0.88	0.51
V51	0.83	- -	0.69	0.31		
V45	0.55	16.51	0.31	0.70		
V48	0.76	24.62	0.58	0.42		
V50	0.72	22.76	0.51	0.48		
V52	0.69	21.83	0.48	0.52		
V53	0.76	24.42	0.57	0.42		

Item	Standardized Factor Loading (Lambda)	t-Values	Squared Multiple Correlation (R^2)	Error Variance	Composite reliability	Average Variance Extracted
V54	0.66	20.48	0.44	0.56		
Intention to Purchase					**0.86**	**0.67**
V57	0.87		0.75	0.24		
V58	0.84	26.31	0.70	0.29		
V59	0.73	22.88	0.53	0.47		

Appendix 4: Hypothesis-Testing Results for Proposed Model Based on Direct Effects of the Model Estimation Sample

Hypotheses	Independent Construct	Dependent Construct	Standardized Coefficients	Standard Errors	t-Value	Conclusion
H1	Machine Interactivity	Physical Telepresence	0.27***	0.04	6.87	Support
H2	Person Interactivity	Social Telepresence	0.17***	0.03	5.39	Support
H3	Machine Interactivity	Perceived Control	0.58***	0.04	13.68	Support
H4	Person Interactivity	Perceived Control	0.17***	0.04	4.28	Support
H5	Physical Telepresence	Perceived Control	0.07	0.04	1.60	No support
H6	Social Telepresence	Perceived Control	-0.11**	0.04	-2.54	No support
H7	Machine Interactivity	Attitudes	0.11**	0.04	2.56	Support
H8	Physical Telepresence	Attitudes	0.09***	0.03	3.17	Support
H9	Person Interactivity	Subjective Norms	-0.03	0.04	-0.8	No Support
H10	Social Telepresence	Subjective Norms	0.45***	0.04	12.44	Support
H11	Perceived Control	Trust	0.64***	0.07	9.3	Support

Hypotheses	Independent Construct	Dependent Construct	Standardized Coefficients	Standard Errors	t-Value	Conclusion
H12	Attitudes	Trust	-0.01	0.07	-0.16	No Support
H13	Subjective Norms	Trust	-0.21***	0.03	-6.76	No Support
H14	Perceived Control	Purchase Intention	0.05	0.08	0.61	No Support
H15	Attitudes	Purchase Intention	0.48***	0.06	7.45	Support
H16	Subjective Norms	Purchase Intention	0.10***	0.03	2.96	Support
H17	Trust	Purchase Intention	0.17***	0.05	3.66	Support

Significance at *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.005